# FINANCIAL STABILITY REVIEW

## DECEMBER 2006

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**FINANCIAL STABILITY REVIEW**

**DECEMBER 2006**

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# CONTENTS

# PREFACE

Financial stability can be defined as a condition in which the financial system – comprising of financial intermediaries, markets and market infrastructures – is capable of withstanding shocks and the unravelling of financial imbalances, thereby mitigating the likelihood of disruptions in the financial intermediation process which are severe enough to significantly impair the allocation of savings to profitable investment opportunities. Understood this way, the safeguarding of financial stability requires identifying the main sources of risk and vulnerability such as inefficiencies in the allocation of financial resources from savers to investors and the mis-pricing or mismanagement of financial risks. This identification of risks and vulnerabilities is necessary because the monitoring of financial stability must be forward looking: inefficiencies in the allocation of capital or shortcomings in the pricing and management of risk can, if they lay the foundations for vulnerabilities, compromise future financial system stability and therefore economic stability. This Review assesses the stability of the euro area financial system both with regard to the role it plays in facilitating economic processes, and to its ability to prevent adverse shocks from having inordinately disruptive impacts.

The purpose of publishing this Review is to promote awareness in the financial industry and among the public at large of issues that are relevant for safeguarding the stability of the euro area financial system. By providing an overview of the possible sources of risk and vulnerability to financial stability, the Review also seeks to play a role in preventing financial crises.

The analysis contained in this Review was prepared with the close involvement of, and contribution by, the Banking Supervision Committee (BSC). The BSC is a forum for cooperation among the national central banks (NCBs) and supervisory authorities of the EU and the ECB.

# I OVERVIEW OF RISKS TO FINANCIAL STABILITY

Past issues of the Financial Stability Review (FSR) have highlighted several vulnerabilities and financial imbalances that were assessed as being capable of posing material risks for the stability of the euro area financial system. Given these vulnerabilities, there was some concern that the shift to less accommodative monetary policies in all the major economies could have exposed stretched asset valuations and overextended balance sheets, thereby triggering disorderly adjustments. This did not happen. Although there was a bout of volatility across a broad range of financial markets during May and June 2006, partly prompted by uncertainty about the likely future course of monetary policy interest rates in the US and Japan and the potential implications for global economic activity, the markets comfortably absorbed the disturbance, and no major financial institution was significantly impacted. There were also anxieties that an idiosyncratic collapse of a large hedge fund or of a cluster of smaller and similarly positioned funds could be a trigger for inclement asset price dynamics. Yet when Amaranth Advisors – a multi-strategy hedge fund around twice the size of Long-Term Capital Management, a fund whose near-failure in 1998 threw global financial markets into turmoil – plunged into financial distress in September 2006, this event had little discernible impact on markets.

The fact that the global and euro area financial systems have so far proven resilient to adverse disturbances, and that risks which could test the shock-absorbing capacity of the euro area system in a material way have not materialised, while comforting, does not provide grounds for complacency. Recent financial disturbances occurred in an environment where market liquidity remained fairly abundant, which enhanced the capacity of market participants to cope with shocks. However, with less accommodative monetary policy, the climate for global financial markets could prove more challenging. Moreover, some pre-existing financial imbalances have remained, others have grown in importance, and some new ones have begun to emerge. Whether their rebalancing

would in reality impose strains on the euro area financial system depends on the condition of the system, the likelihood of risks occurring, and their potential impact if they were to occur. In this respect, it is encouraging that the strength and resilience of the euro area financial system continued improving in the six months after the finalisation of the June 2006 FSR. With the macro-financial environment remaining broadly favourable, the credit quality of key non-financial counterparties of banks – households and firms – generally remained high. At the same time, improvements in the risk management practices of financial firms as well as a greater tendency of investors to discriminate among assets on the basis of underlying fundamentals contributed to ensuring that higher financial market volatility during the summer did not prevent these markets from facilitating the intermediation of capital. Conditions for raising funds in credit and equity markets remained favourable, there was further and broad-based improvement in the profitability of banks, and the balance sheets of insurance companies were strengthened further. In addition, key financial infrastructures – including payment systems such as TARGET, and securities clearing and settlement systems – remained robust and continued operating smoothly.

With the euro area financial system in a generally healthy condition and the economic outlook remaining relatively favourable, the most likely prospect is that financial system stability will be maintained in the period ahead. However, it is also important to consider how the system would cope with plausible adverse and potentially high-impact events, however unlikely these may appear at present. In this respect, there are a number of important sources of risk and vulnerability which financial firms should be taking into account in their risk management arrangements. Some of these risks are global, others are common to the financial markets of several mature economies, and some are euro area- and country-specific in nature.

A global source of medium-term risk for the stability of financial systems continues to be

large global financial imbalances, despite some rebalancing of global growth patterns and recent declines in oil prices. Concerning risks that are common to mature economy financial markets, the premia for bearing risk embedded in asset prices – especially for corporate credit and emerging market risk – have remained at very low levels. While it is clear that the underlying fundamentals explain a large part of the compression of these premia, their tightness continues to leave little room for adverse surprises such as disappointing macroeconomic outcomes. There has also been greater unease about the exponential growth of credit risk transfer (CRT) markets, coupled with the increasing presence of hedge funds in these markets – institutions which tend to be rather opaque about their activities. These concerns have included uncertainties about the way in which these markets have redistributed credit risks across the financial system, and about the capability of the market to function under stress, for instance if, indeed when, the credit cycle starts to deteriorate. Finally, concerning sources of risk within the euro area, rapid re-leveraging in some parts of the corporate sector – induced in part by a surge in leveraged buyout (LBO) activity facilitated by private equity funds – will, coupled with growing household sector financial imbalances, require close monitoring in the period ahead.

The remainder of this section examines these sources of risk and vulnerability in more detail, and concludes with an overall assessment of the financial stability outlook.

### RISKS FROM GLOBAL FINANCIAL IMBALANCES

While all indications are that global financial imbalances have been widening at a slower pace than before, they still remain very large and are not expected to narrow significantly in the short term. The prolonged accumulation of expanding US current account deficits has been a source of unease among policymakers about the medium-term sustainability of the US external position. This is because the financing of these deficits relies on the continuation of ever-greater capital inflows from surplus emerging market and oil-producing economies. This pattern of global capital flows runs counter to the traditional notion that mature economies tend to export capital to emerging regions where profitable investment opportunities are often more plentiful. It also cannot be excluded that the growing reliance on inflows from oil-exporting countries may leave the funding of the US current account sensitive to geopolitical risk. At the same time, the build-up of US net foreign debt has been mirrored in substantial foreign exchange reserve accumulation by emerging market economies (EMEs), especially in Asia, possibly significantly in excess of the amounts needed to insure against financial crises. Moreover, in an environment of very low long-term interest rates in both the US and the euro area, the expected returns on some EME reserves are very low, or even negative. In addition, the monetary authorities of countries retaining pegs, or close links, to the US dollar may face the risk of valuation losses on their reserves over the medium-term.

As has been noted in previous Reviews, from a financial stability viewpoint the main source of unease about the size and distribution of global financial imbalances continues to be the possibility of an abrupt asset portfolio reallocation by the official or private sectors or both, perhaps driven by a sudden deterioration in the risk appetite of global investors for maintaining their exposure to US securities. The strength of US productivity growth over recent years, together with highly liquid and transparent US financial markets, which offer a considerable variety of instruments, have clearly been important factors in attracting abundant global savings to the US. This has helped in making the likelihood of an abrupt unwinding of these imbalances rather low. However, if such an event were to occur, it could entail sudden and destabilising changes in global capital flow patterns which could exert significant upward pressure on US long-term interest rates, credit spreads and equity risk premia. Given the increasingly global nature of the asset allocation process, this

would probably entail spillovers across the financial markets of most economies, possibly rendering access to capital markets more challenging for EMEs. Under such circumstances, global banks and their counterparties – especially institutional investors and hedge funds – could face increased risks from falling asset prices. At the same time, sizeable and probably highly correlated asset price movements could, together with spikes in market volatility, impair market liquidity and undermine the hedging of financial risks. Since this could also have contractionary implications for the global economy, it would probably have a generally adverse affect on the earning capacity and capital bases of financial institutions. As such, this would represent a challenging test of their risk management systems and loss-absorption capacities.

### RISKS IN GLOBAL CAPITAL MARKETS

Rising short-term interest rates produced flatter market yield curves in the six months following the finalisation of the June 2006 FSR. Although growing at slower rates, an abundance of liquidity in global financial markets together with very high saving rates in some emerging market regions – especially in Asia – relative to domestic investment opportunities appear to go a long way towards explaining why long-term interest rates and credit spreads have been remarkably unperturbed by the shift to less accommodating monetary policies in the G3 economies. Among other potential explanatory factors, structural developments such as the exponential growth of CRT markets – which have facilitated better diversification and hedging of credit risk as well as an enhancement of liquidity in underlying markets – appear to have been driving a more lasting narrowing of corporate bond spreads. At the same time, demographic risks such as longevity risk have risen at a time when returns on traditional investments have declined. Faced with the prospect that pension and retirement obligations could be underfunded, some investors may have been pushed into assuming too much risk,

leading to an over-compression of risk premia, especially in emerging market and high-yielding corporate bond markets. Moreover, by lowering margin requirements, historically and persistently low market volatility across a broad range of asset classes may have enabled some investors – including the proprietary trading desks of investment banks and hedge funds – to take on additional risk by leveraging their positions. As a result, and notwithstanding improvements in the fundamentals underpinning these asset prices, the upshot has been a "pricing for perfection" in the sense that valuations – including those in equity markets – appear to be based on very favourable expectations regarding future economic outcomes and low risk premia.

To the extent that long-term interest rates and risk premia have been driven too low in some financial markets, valuations could prove vulnerable to several potential unexpected adverse disturbances. These include the possibility of disturbances such as renewed spikes in oil prices, which could lead to market perceptions of upward risks to price stability; the possibility of a pick-up in external funding by firms; or the risk of a change in global asset allocation, possibly brought about by growing unease regarding global imbalances. If such a triggering event of sufficient severity were to occur, it could bring about upturns, possibly of an abrupt nature, in long-term bond yields as well as credit and equity risk premia across mature capital markets. This would imply significant market portfolio losses for banks and non-bank financial firms, and would most likely imply a loss of income for banks from other market-related activities. Some banks could also face heightened counterparty risks if the hedge funds they lend to were thrown into financial distress. Moreover, in such a scenario market liquidity could dry up and undermine the hedging of financial risks, while primary issuers, especially corporations with ratings at the lower end of the credit quality spectrum, could struggle to find investors for their securities.

One of the most significant structural developments in financial markets over the past decade has been the exponential growth of credit derivatives markets, not only in terms of size but also in terms of product diversity. The development of these markets has undoubtedly contributed to the stability of the banking system by allowing banks to measure and manage their credit risks more efficiently and effectively. While these markets have most likely facilitated a better distribution of credit risk across the financial system, this does not mean that the risks have disappeared. In this connection, some concerns have been voiced that the efforts of banks to hedge their credit risks may have led to concentrations of risk outside the banking system. The available data are insufficient to make a sound assessment of this hypothesis, but if current trends continue, it is likely that traditional methods for assessing the ability of the banking system to cope with unexpected credit cycle deterioration will need to be radically adjusted.

A large part of the recent unease about credit risk being transferred outside the banking system concerns the growing role of hedge funds as counterparties to banks in this transfer process. Hedge funds clearly make a valuable contribution to financial markets as they actively pursue arbitrage opportunities, thereby improving pricing efficiency and enhancing market liquidity. However, little is known about their activities or the scale of their involvement in CRT markets, although there are some indications that this has increased in recent years. Hence, it is difficult to assess how the market would function in the event of the collapse of a key hedge fund or of a cluster of smaller funds that were particularly active in the protection selling side of the CRT market. For instance, there are some concerns that a hedge fund failure could imply that credit protection is not available for protection buyers when it is most needed. In any case, it seems clear that a drying up of CRT market liquidity could undermine the hedging of credit risk and the syndication of LBO loans, possibly to the

point of triggering deterioration in the credit cycle, by rendering banks more cautious about extending loans if they find they cannot lay the credit risk off in the market. Hence, more and better quality data are needed to assess this interplay adequately.

## EXPOSURES TO EURO AREA NON-FINANCIAL SECTORS

An evaluation of the credit risks posed by firms and households depends upon two factors: the nature and size of the exposures of banks and financial market participants, including investors in equities, corporate bonds and CRT instruments; and balance sheet conditions in the two sectors.

Over the past six months, notwithstanding indications of continuing strength in corporate sector profitability, there have been mounting signs that an adverse turn in the corporate sector credit cycle is becoming increasingly likely. Credit rating downgrades have been outpacing upgrades, and the balance of firms being placed on review for a rating downgrade vis-à-vis those being placed on review for a rating upgrade has widened. There are several factors that could account for this, including rising leverage ratios – driven primarily by a surge in debt-financed mergers and acquisitions (M&As), increasing LBO activity facilitated by private equity funds, and rising share buybacks – together with a further tightening of monetary conditions and expectations of a future slowdown in the pace of profit growth. Nevertheless, market-based indicators of credit risk have remained very low, and bank credit standards have not responded to these developments. This disconnection might on the one hand reflect an abundance of liquidity in financial markets that has possibly held credit spreads at very low levels and underpinned intense competition among banks in business lending, as reflected in declining margins. However, it could on the other hand also reflect greater concerns among market participants about the possibility of idiosyncratic and

adverse credit events than about the possibility of a general unfavourable turn in the credit cycle.

Looking ahead, although risks in the corporate sector remain low, rapidly rising leverage and increasing recourse to short-term funding has left firms' balance sheets vulnerable to adverse disturbances such as the possibility of slower than expected growth, unexpected rises in oil prices, or unexpected interest rate rises. From a financial stability viewpoint, a significant deterioration in corporate sector credit quality would not only imply greater loan losses for banks, but it could also trigger an asset price adjustment in credit markets, especially if the frequency of unexpected idiosyncratic corporate defaults were to rise.

From a financial stability viewpoint, further increases in household sector leverage since the finalisation of the June 2006 FSR, together with additional rises in short-term interest rates, have raised the vulnerability of the sector to adverse disturbances. Looking ahead, the risks for euro area household balance sheets include risks to household incomes, as well as interest rate risks and, in some countries, house price and financial market risks as well.

The risk of a significant deterioration in the debt-servicing ability of the household sector as a whole remains remote when taking the central macroeconomic outlook for the euro area into account. As euro area household leverage has reached unprecedented heights, past experience cannot help in terms of assessing its sustainability. However, household sector debt ratios in the euro area have remained lower, on aggregate, than those in other mature economies, where household sectors have managed to endure significant increases in short-term interest rates without any material impact on their creditworthiness. However, aggregated data for the euro area conceal wide disparities across individual Member States: interest rate risks are not evenly spread across the euro area, given cross-country differences in debt levels, contractual interest rate variability

of mortgages, and typical loan maturities. In particular, there are continuing concerns regarding balance sheet vulnerabilities in countries where debt ratios are well above the euro area average, especially those in which debt is predominantly financed at floating interest rates.

Risks on the asset side of euro area household sector balance sheets also appear to have increased over the past six months. For the euro area as a whole, house prices have risen further, albeit at a slower pace than before, and in some countries price-to-rent ratios suggest that there is scope for a slowdown in the pace of future house price inflation, or even a correction. In this connection, it is notable that the October 2006 ECB Bank Lending Survey indicated increasing concerns among euro area banks about the housing market outlook even though the intensity of competition continued to bear down on margins. There are also some indications that the financial asset side of household balance sheets is becoming increasingly exposed to market risk, either directly or indirectly in the form of mutual fund savings or defined contribution pension plans.

All in all, it is clear that household sector balance sheet vulnerabilities are likely to be largest in those Member States in which house prices have risen beyond their intrinsic values, where indebtedness is relatively high and where variable-rate contracts are the most common type of mortgage product. Hence, in the event of an adverse macroeconomic disturbance, banks in these Member States could be exposed to deteriorating credit quality. As for exposures to the risk of a property price reversal, banks in many Member States appear by and large to have carefully managed the risks inherent in the collateral used to secure mortgages by setting loan-to-value ratios at conservative levels, even though signs of intensifying competition in mortgage markets may have led to a loosening of credit standards. This means that euro area households would probably have to bear the brunt of any property price reversal.

## PERFORMANCE OF THE EURO AREA BANKING SECTOR

Consolidating on the steady and broad-based improvement that got underway in 2003, the profitability of large and complex banking groups (LCBGs) in the euro area was strengthened further in the first half of 2006. Underpinning the further strengthening of profitability was continued growth in lending volumes which was strong enough to compensate for further lending margin erosion resulting from intense competition. Non-interest sources of income also contributed to bottom-line results: fees, commissions and trading revenues all benefited from a generally favourable macro-financial environment. At the same time, there was continued cost-containment and further declines in impairment charges. Despite declining slightly in the first half of 2006, owing to a rise in risk-weighted assets, solvency ratios remained comfortably in excess of regulatory minimum requirements. One particularly encouraging development from a financial stability perspective was that the institutions that had the lowest capital ratios in 2005 improved them in the first six months of 2006.

Looking ahead, notwithstanding the flatness of the market yield curve slope, market analysts are expecting that the profitability of euro area LCBGs is likely to strengthen further in the short term, underpinned by a favourable economic outlook and benign credit conditions. The diversification of banks' income is also set to improve further, given the continued strengthening of lending to the corporate sector. However, as discussed above, there are still some risks to the operating environment for banks in the period ahead.

As for the risks posed by global financial imbalances, banks tend to manage and hedge their foreign exchange exposures effectively, but it cannot be excluded that some of their more important counterparties – both non-bank financial and non-financial firms – may not have managed these risks as well. At the same time, while larger banks have made significant advances in their stress-testing practices, it is not clear whether stress tests adequately reflect situations of impaired financial market liquidity.

Concerning the possibility of an upturn in long-term interest rates and risk premia, in such a scenario banks could be exposed to greater than normal market risks. The direct market risks faced by LCBGs are likely to prove to be manageable. However, they may still face risks to other market-related business activities, as well as counterparty risks from both non-financial and non-bank financial firms, where risk management practices may be less advanced. While counterparty risk management practices in large banks are known to be improving, it is unclear whether the intensity of competition, for instance in the provision of prime brokerage services to hedge funds, may have compromised standards at the margin, especially for medium-sized banks.

On the other hand, banks would also face risks if long-term interest rates were to remain low for a protracted period, especially if the market yield curve were to flatten further, since this would exacerbate the challenges already facing the sector in generating interest income from core business. Moreover, as low interest rates may have sustained tight credit spreads, to the extent that banks' pricing of credit risks is market-sensitive, medium-term vulnerabilities related to the pricing of credit risk could be building up.

Regarding risks associated with the growing possibility of an unfavourable turn in the credit cycle, precisely how euro area LCBGs would be affected remains unclear. Just as the very low levels of loan impairment charges over recent years might, in part, be explained by the recourse of large banks to the CRT markets to shed and diversify their credit risks, the impact of an adverse turn of the credit cycle on banks might be more muted than in earlier downturns. That said, the expansion of the exposures of banks to short-term leveraged financing over

the past six months should be carefully monitored.

Concerning risks within the banking system, banks have faced challenges in recent years in growing, or even maintaining, their interest income, given margin erosion and intense competition in the granting of loans. Hence, there is a risk that banks may have loosened their credit standards too much, possibly leaving them with greater exposures to the risk of adverse credit events.

A near-term issue for euro area LCBGs will be the implementation of the Basel II accord in January 2007. Once implemented, the accord should result in a significant improvement in the risk management framework of banks. A smooth transition to the new environment will be enhanced by close cooperation between banks and their regulators during the implementation phase.

Forward-looking indicators based on asset prices continue to suggest that the outlook for the euro area banking sector remains bright. Nevertheless, some options-based market indicators do point towards concerns that the downside risks to banking sector profitability are likely to be greater than the upside ones in the period ahead, possibly reflecting the fact that vulnerabilities and financial imbalances have continued to grow over the past six months. This, however, should be conditioned on the fact that profitability levels were relatively high in the first half of the year.

**PERFORMANCE OF THE EURO AREA INSURANCE SECTOR**

Insurance firms have placed greater focus on risk management, risk-adjusted pricing and core profitability, all of which have continued to support a positive outlook for the sector, especially for large firms. Ongoing improvements in asset liability management, together with efforts to optimise capital structures – with rising levels of hybrid capital issuance and subordinated debt – have

underpinned a generally positive assessment by market participants. As large firms in the sector are continuing to implement international accounting standards and are bringing their portfolios into line with the requirements of Solvency II, some increased volatility may occur, although this is likely to remain subdued owing to the benefits to market participants from greater transparency and better management of balance sheet risks. However, there are a number of risks facing the industry in the period ahead. For the non-life sector, the strength of competition is likely to weigh further on underwriting income, which could drive further consolidation within the sub-sector. For the life sub-sector, ongoing challenges facing the sector include pressure to close balance sheet mismatches in an environment of persistently low long-term interest rates and effectively managing longevity risk.

**OVERALL ASSESSMENT**

The strength and resilience of the euro area financial system has been confirmed in the six months following the finalisation of the June 2006 FSR, although several potential sources of risk and vulnerability have grown in the past six months. Some of these vulnerabilities could be transformed into plausible, albeit unlikely, risk scenarios by unexpected changes in global liquidity conditions or unexpected credit events.

A medium-term risk for global financial stability continues to be the possibility of an abrupt unwinding of global imbalances. This is not only because these imbalances are expected to widen further, but also because the financing of the US current account deficit could prove unsustainable in the medium term, and may moreover have become vulnerable to geopolitical risk. While the likelihood of an abrupt adjustment still appears rather low the materialisation of such an event would represent a challenging test for the risk management systems and loss-absorption capacities of key financial institutions. Within the euro area, the

relentless rise of household sector indebtedness will require close monitoring, as will the recent surge of leverage in some parts of the corporate sector.

Within the financial system, to the extent that long-term rates and risk premia have been driven too low in some financial markets, valuations could prove vulnerable to several potential adverse disturbances, which could leave banks exposed to greater than normal risks, especially if market events were to challenge the loss-absorption capacities of their counterparties. There has also been growing unease about the extent of CRT outside the banking system, especially concerning the extent to which hedge funds may have taken on greater credit risk exposure. Again, this is not so much because of doubts about the risk management capacities of hedge funds, which are often quite advanced, but because very little is known about how CRT markets would function under stressed conditions.

# II THE MACRO-FINANCIAL ENVIRONMENT

## 1 THE EXTERNAL ENVIRONMENT

*After the finalisation of the June 2006 FSR, global real long-term interest rates remained very low, lower than both historical and expected long-term averages for real economic growth. While various explanations have been put forward for this, persistently low real interest rates seem to have been an important factor in debt accumulation by households and firms as well as the inflation of prices across a host of asset classes. To the extent that this has led to asset price misalignment, some asset prices may be vulnerable to correction or, if it were to persist, it could result in wider financial imbalances. A global source of medium-term risk for the stability of financial systems continues to be the large global financial imbalances, despite some rebalancing of global growth patterns and recent declines in oil prices.*

## 1.1 RISKS AND FINANCIAL IMBALANCES IN THE EXTERNAL ENVIRONMENT

### GLOBAL IMBALANCES

Large global financial imbalances have been associated with sizeable capital inflows into the US and corresponding outflows from surplus economies. From a financial stability perspective, they represent an important vulnerability for the global financial system, as adverse disturbances could lead to abrupt changes in these flows, possibly sparking large asset price adjustments. By early November 2006, the indications were that the large US external imbalance had widened further, albeit at a slower pace than over the previous two years (see Chart 1.1).

There are, however, some factors that could prevent a further significant widening of the US current account deficit. Private consumption growth is expected to moderate over the coming quarters and the fiscal outlook is gradually improving, thus providing further favourable conditions for a stabilisation of the current account. Looking ahead, a gradual slowdown

of the US economy and an ongoing recovery in the euro area are factors that may contribute to a narrowing of global imbalances.

Recent survey data indicate that there has been no significant change in the contribution of foreign public investors to the financing of the US current account deficit. However, evidence does exist that foreign investors have increasingly been shifting funds away from US Treasury debt towards higher yielding bonds issued by US government agencies (such as Freddie Mac and Fannie Mae) and the corporate sector.

While the relative share of Asian economies – especially China and Japan – as counterparts to the US imbalance remained large, there was a notable shift towards oil-producing countries. In the six months after the finalisation of the June 2006 FSR, more than half of the flows into US long-term securities stemmed from the UK and Caribbean financial offshore centres, both of which are known conduits for the recycling of funds from oil-producing countries in the Middle East. At the same time, the rise in



**Chart 1.1 The US current account deficit and its counterparts**

(1996 - 2007, USD billions)
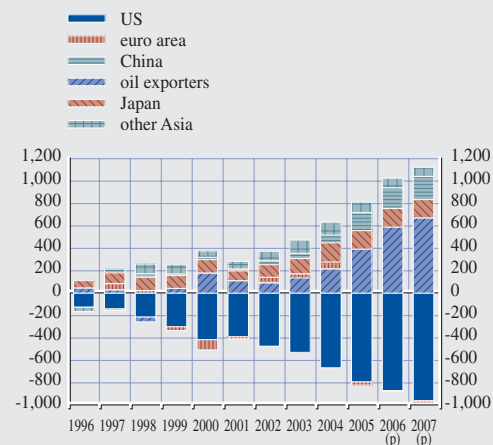
Sources: IMF World Economic Outlook and ECB calculations.
Note: Data for 2006 and 2007 are projections.

oil prices has played an important role in widening the US trade deficit since mid-2004. While the recycling of oil revenues has helped finance the US current account deficit, it could also leave US financial markets more vulnerable to volatility in capital flows, especially volatility linked to geopolitical risk.

Major central banks in Asia increased the pace of their accumulation of already sizeable foreign reserve holdings in the first half of 2006 to nearly USD 400 billion annualised, up from about USD 200 billion in the second half of 2005. In absolute terms, China accounted for the largest proportion of Asian reserve accumulation holdings, at around USD 220 billion. Thus the outlook for the Chinese economy is of considerable importance both for the financing of the US current account deficit, and for the likelihood that an adverse disturbance could trigger an abrupt adjustment (see Box 1). Although the process of diversification of

### RECENT DEVELOPMENTS REGARDING CHINA AND GLOBAL IMBALANCES

The single largest vulnerability to a disorderly correction of global current account configurations arising from EMEs continues to stem from a number of downside risks to the Chinese economy. Though still notable, the risks in this context since the completion of the June 2006 FSR appear to be on an incipient downward trend in spite of the upturn in domestic economic activity over the same period. Five developments underlie this assessment:

First, vulnerabilities posed by large short-term speculative inflows betting on a large renminbi appreciation declined after May 2006, at least in the short term. The difference between the Chinese basic balance – the sum of the trade surplus and foreign direct investment (FDI) inflows – and foreign exchange reserve accumulation can provide an indication as to the extent of speculative inflows into China. In the year up to July 2006, the basic balance accounted for about 80% of the increase in foreign exchange reserves, up from 68% over the same period a year earlier. This suggests that recent patterns in foreign exchange reserve accumulation have been primarily driven by fundamental factors, and at an increasing rate. At the same time, market expectations of a further renminbi appreciation declined, as reflected in the RMB/USD non-deliverable forward market. In this connection, as long as bond yields remain lower in China than in the US, speculation via carry-trades between the US and Chinese government bonds is likely to be curbed. However, speculative inflows could resurface if the Chinese authorities were to encounter difficulties in managing expectations of a gradual and orderly renminbi appreciation.

Second, large foreign exchange interventions have continued to pose a major challenge for domestic monetary management and banking sector stability. Although the People's Bank of China (PBC) sterilised 63% of the increase in base money resulting from foreign exchange interventions in the first half of 2006, these still accounted for 43% of the growth of broad money (M2). From June 2005, M2 growth continuously overshot the central bank's target of 16% for 2006, expanding by 18.4% year on year in July. Bank credit also continued to grow above target, recording 16.3% year-on-year growth in July 2006, against a target of 13%. In response, the PBC took a number of additional measures to rein in liquidity, the most important being two successive 0.5 percentage point hikes in the bank's reserve requirement ratios in July and August, and two 27 basis point hikes in retail lending rates in April and August. Coupled with stepped-up issuances of sterilisation bonds, these measures succeeded in raising the benchmark one-year

**Chart B1.1 Chinese money market, retail and deposit rates**

(%)

- one-year retail deposit rate
- one-year yield
- PBC excess reserve requirement
- one-year PBC base lending rate
- one-year or less retail lending rate
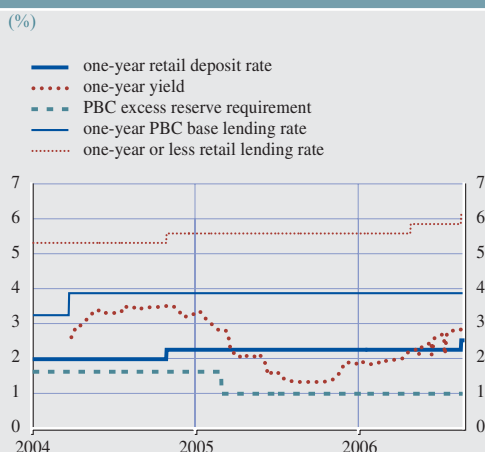


Source: CEIC Data.

**Chart B1.2 M2, credit growth and inflation in China**

(% per annum)

- M2 growth
- bank lending growth
- M2 growth target
- CPI
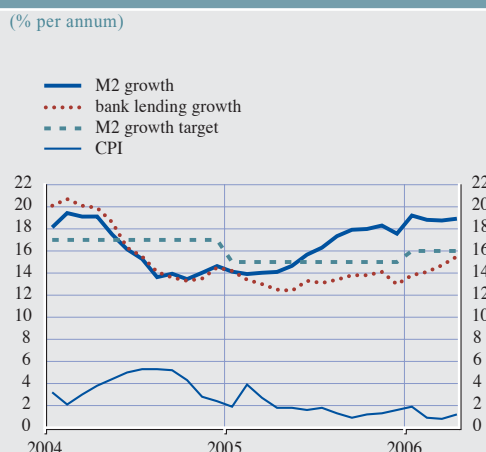


Source: CEIC Data.

bond yield just above the retail deposit rate. However, bond yields still remained below their early 2005 levels (see Chart B1.1). Banks – in particular large state-owned ones – continue to have to remunerate deposits at rates not far below the returns they receive from their rising bond portfolios. At the same time, they are coming under increasing pressure to cut down on the growth of their higher yielding loan assets. This could ultimately weaken the condition of banks by reducing their net interest income. It is still too early to judge what impact the latest tightening measures will have on M2 and lending growth. However, although there has been no discernable inflationary impact of the liquidity influx so far (see Chart B1.2), the authorities seem more concerned with curtailing the accelerating trend of liquidity growth (particularly that of lending) than with complying with the much lower target levels which had originally been set. This is because the PBC is keenly aware of the fact that banks need to find uses for excessive deposit levels and liquidity flowing from foreign exchange interventions, in order to avoid any short-term damage to their balance sheets. The PBC also has to ensure that credit keeps flowing to sectors that have been earmarked for support by the government.

Third, policy challenges stemming from rising sterilisation costs also remained contained in the six months after the finalisation of the June 2006 FSR. Although sterilisation bonds amounted to 16% of 2005 GDP, one-year Chinese yields were still more than 200 basis points below one-year US Treasury yields, implying that the PBC could continue to profit from its sterilisation operations. However, the large share of foreign exchange reserve assets on the central bank's balance sheet (60% of total assets) has left it vulnerable to a large renminbi appreciation.

Fourth, in spite of the buoyant pace of investment in China, the risk of a hard landing appears to be on the decline. Although investment rebounded strongly in the course of 2006, its composition became more balanced, and it was supported by an upturn in profit growth. Moreover, unlike in 2003-2004, the rebound was not led by sectors notorious for overcapacity problems, and instead was more driven by the contribution of light industries.

Fifth, in light of the importance of Chinese import demand as a driver of export growth in Asia and around the globe, the slower than expected growth of Chinese imports in the face of accelerating GDP growth during H1 2006 remains a matter of concern. There are a number of competing explanations for this development, including i) a deceleration of export growth, which has dragged down imports consisting of intermediate goods and components destined for processing and re-export (which account for nearly 50% of total imports); ii) the somewhat changed composition of investment, with less import-intensive light industrial sectors leading the investment rebound; iii) the enhanced ability of some domestic producers to substitute for previously imported goods; and iv) the official investment figures, which possibly overstate the true extent of investment growth. It is still too early to assess the relative weight of each of these factors in explaining the recent moderation of imports. However, the extent to which investment rebounds in the import-intensive heavy industrial and construction sectors will, to a large extent, determine whether or not imports gain momentum in the remainder of the year.

reserves away from the US dollar has continued, the speed at which this has taken place since 2000 has not been so fast as to significantly affect exchange rates.

Looking forward, some favourable developments – such as the partial rebalancing of growth across different regions of the world economy – are tentatively underway, which could assuage concerns as to the likelihood of an abrupt and disorderly correction of global current account imbalances, at least in the short term. However, in the medium term, the possibility of a disorderly adjustment remains a significant vulnerability for the global financial system, particularly if policies to reduce these imbalances are either not implemented at all, or insufficiently so.

## US SECTOR BALANCES

In combination with a wide current account imbalance and persistently low real interest rates, large US budget deficits may – by raising the financing needs of the US public sector – risk crowding out US private sector debt issuance and exerting upward pressure on global real interest rates, especially if foreign investors were to lose some of their appetite for US government securities. In this respect, an important factor in containing further expansion of the current account deficit in the short term was the decline in the US federal budget deficit,

which according to the Congressional Budget Office (CBO) stood at 2.3% in fiscal year (FY) 2006 (ending on 30 September), down from 2.6% in the previous FY. This improvement in the fiscal deficit also resulted in a fall in the debt-to-GDP ratio. Indeed, by the end of FY 2006, the gross debt of the general government (reflecting the value of outstanding liabilities) had fallen to 62.5% of GDP, according to International Monetary Fund (IMF) estimates.

Nevertheless, despite improvements in the short-term outlook, the medium-term US fiscal outlook has remained a source of concern in the absence of corrective measures, in particular against a backdrop of population aging and rising healthcare costs, which are projected to place an ever-increasing burden on public retirement and healthcare systems in the US.

The financial condition of US non-financial sectors can also be important for euro area financial stability for several reasons, two of which can be highlighted. First, many euro area financial institutions have direct exposures to the US corporate sector through lending, and conditions in this sector may also affect the financing costs faced by large euro area firms in global capital markets, both through competing demands for funds as well as in the global pricing of corporate sector credit and equity market risks. Second, a rising level of US household

**Chart 1.2 US non-farm, non-financial corporate sector financing gap**

(Q1 1980 - Q2 2006, % of GDP)
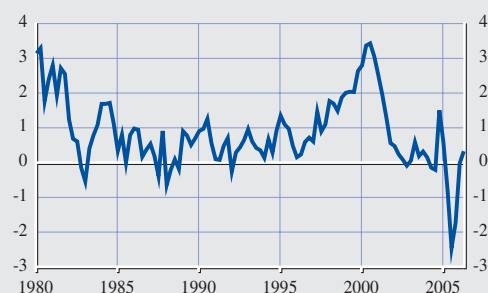


Source: US Federal Reserve Board.
Note: The financing gap equals capital expenditures less internal funds and inventory valuation adjustments. A positive gap indicates the need for external financing.

**Chart 1.3 US commercial banks: credit quality of commercial and industrial loans**

(Q1 1984 - Q2 2006, %)

— non-current loan rates
····· charge-off rates
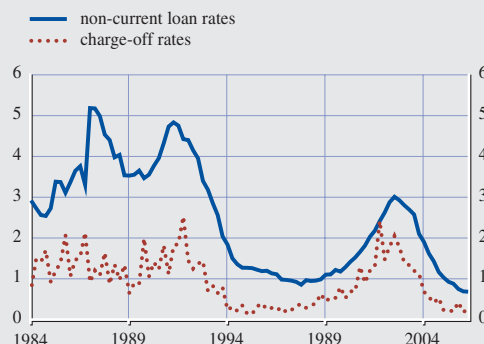


Source: Federal Deposit Insurance Corporation.
Note: Non-current loans are loans and leases more than 90 days past due or in non-accrual status. Charge-offs are quarterly annualised rates.

sector indebtedness could, if it proves unsustainable, pose risks and create vulnerabilities for the financial stability of the euro area through three main channels: euro area banks' direct exposures to this sector, counterparty US credit institutions exposed to US households, and holdings of mortgage-backed securities issued by US credit institutions.

Owing to long-term gains in labour productivity that were well ahead of compensation growth and stable demand, and the positive impact of earlier cost-cutting, US non-farm, non-financial corporate sector profits as a share of sector output have been increasing since 2001 and reached 13% in the first half of 2006 – the highest level in over a decade. In combination with low interest rates, the surge in profits was used to strengthen balance sheets and accumulate large cash holdings. As a result, the US corporate sector took on the unusual position of a net lender from the second quarter of 2005 until the first quarter of 2006 (see Chart 1.2).

The strengthened financial condition of US non-financial corporations was reflected in very low default rates on corporate bonds. At the same time, delinquencies on business loans extended by commercial banks fell to very low levels (see Chart 1.3). Indicators of the solvency

of firms, such as liability-to-asset ratios – also continued to improve (see Chart S1), and the ratio of liquid assets to short-term liabilities reached its highest level since the early 1960s (see Chart 1.4).

However, after the second half of 2005 firms began to draw down their cash balances from elevated levels, shareholder buybacks rose, dividends were raised, business spending was increased, and firms generally became more acquisitive. These recent developments can also explain the pick-up in demand for short-term credit by US corporations witnessed since the

**Chart 1.4 Liquid assets to short-term liabilities of US non-farm non-financial corporate sector**

(Q1 1960 - Q2 2006, %)
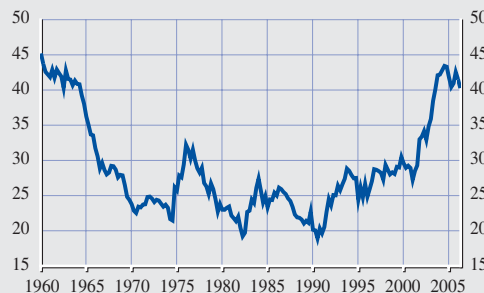


Source: US Federal Reserve Board.

end of 2005. At the same time, the October 2006 Federal Reserve *Senior Loan Officer Opinion Survey on Bank Lending Practices* noted that bank lending conditions either remained unchanged (for large and medium-sized enterprises) or were eased further (for small firms). This allowed loan leverage ratios to rise to levels last seen in 1997, probably on account of steadily growing activity in cash-financed mergers and acquisitions. These developments together are also reflected in the evolution of the financing gap, which moved back into positive territory in the second quarter of 2006 (see Chart 1.2).

All in all and even though historical indicators have sent no clear signs, these factors – to the extent they foster higher leverage ratios at a time when interest rates have been rising – could leave US corporate sector balance sheets vulnerable to a turn in the credit cycle.

Turning to US households, US household spending has been an important driver of economic expansion during the past four years, notwithstanding rising energy prices and lacklustre employment growth. As a result, household saving turned negative after April 2005, financed in part through home equity withdrawal, which rose to a record 6% of US household disposable income in 2005.

Dis-saving by US households also contributed to rising sector indebtedness: in the six months after the finalisation of the June 2006 FSR, household debt continued growing at a faster rate than disposable personal income, bringing the debt-to-disposable income ratio to a new historical high of 130% in the second quarter of 2006 (see Chart S3). Mortgage credit growth remained the predominant source of rising household sector indebtedness; the pace of consumer credit growth by contrast fell in the first quarter. In addition, the household debt service ratio (DSR) increased by about 0.55 percentage point compared with the first quarter of 2005, while the wider financial obligations ratio (FOR) rose by 0.73 percentage point over the same period (see Chart S4).[1] This

notwithstanding, delinquency rates on credit card debt and auto loans remained contained, suggesting that US household were still able to meet their financial obligations at prevailing interest rate levels.

The October 2006 Federal Reserve *Senior Loan Officer Opinion Survey on Bank Lending Practices* noted weaker demand by households both for residential mortgages and for consumer loans, and little change in lending standards on mortgages. Growth in consumer credit had slowed down owing to continued home equity withdrawal, rising interest rates and also possibly owing to the Bankruptcy Abuse Prevention and Consumer Protection Act, which was signed into law in October 2005. This has made it more difficult for individuals filing for bankruptcy to have their debts written off as opposed to submitting a repayment plan, and could explain why there was a surge in registered bankruptcy filings in the third and fourth quarters of 2005 ahead of the inception of the new law, and a subsequent drop thereafter (see Chart 1.5).

The weakening of mortgage credit demand appears to have been primarily related to the slowdown in US housing market activity in the course of 2006. This was reflected in a drop in new housing projects as well as in weak sales of both new and existing homes. This dampening in housing activity is likely to have an adverse affect on consumption and residential investment, and has already started to affect the degree of mortgage equity withdrawal, which fell back in the second quarter of this year to only 2% of household disposable income (see Chart 1.6). Compounding this risk, higher-risk borrowers tend as of late 2006 to be more clustered in US regions which have witnessed the strongest rates of home price appreciation, and which are thus probably more vulnerable to a correction (see Box 2).[2]

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1 The DSR is an estimate of the ratio of debt payments to disposable personal income. Debt payments consist of the estimated required payments on outstanding mortgage and consumer debt. The FOR, a broader measure, adds automobile lease payments, rental payments on tenant-occupied property, homeowners' insurance and property tax payments to the DSR.
2 See Federal Deposit Insurance Company (2006), "Summer 2006 Outlook: The Evolution of the Credit Cycle".

**Chart 1.5 Consumer credit as a percentage of personal income and bankruptcy filings in the US**

(Q1 1990 - Q2 2006)

- personal bankruptcies (thousands, left-hand scale)
- consumer credit (right-hand scale)
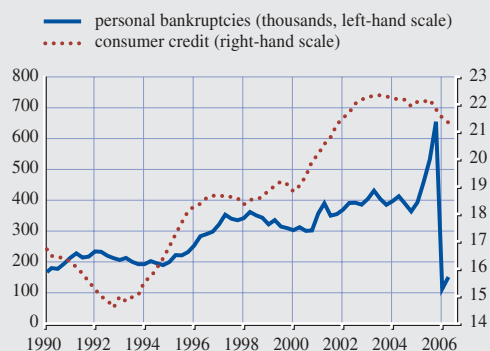


Sources: US bankruptcy courts and the Conference Board.

**Chart 1.6 US home equity withdrawal**

(Q1 1960 - Q2 2006, % of household disposable income)
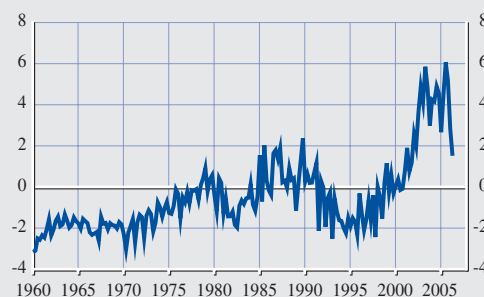


Source: Federal Reserve Board.

**Box 2**

**POTENTIAL REGIONAL HOUSING MARKET CORRECTIONS IN THE UNITED STATES: WHAT ROLE FOR STATE-LEVEL SPILLOVERS?**

In recent years, US house prices have risen rapidly: by the end of 2005, aggregate nominal and real house prices were about 70% and 53% respectively above their early-2000 levels. These large overall changes at the national level, however, mask considerable heterogeneity in house price dynamics across cities, states and regions during this period. To a large extent, these differences can be attributed to the importance of local conditions in determining housing market conditions. For instance, from 2000 onwards property price inflation in areas with lower elasticity of land supply – such as coastal areas – was more pronounced than in other regions of the country. Reflecting this heterogeneity, the distribution of house price changes across 387 US metropolitan statistical areas has been wider since 2000 than it was during the 1990s, and considerably more positively skewed (see Chart B2.1). This geographical heterogeneity in house price changes can be contrasted with generally declining income dispersion across states over recent decades, prompting the question whether house prices, especially in some regions of the US, have become decoupled from their underlying fundamental determinants. While there is much debate as to the degree to which house prices are on aggregate misaligned with the underlying fundamentals for the US as a whole – in particular given the possibility of structural changes affecting house price relationships with the fundamentals or historical norms[1] – it would appear that house prices may well be overvalued in some US cities. If so, this would mean that some local markets could be vulnerable to house price correction. In this regard, this Box analyses a key issue for financial stability, namely the extent to which any prospective local housing market correction would spill over to other areas of the country. For instance, if the potential for far-reaching spillovers is high, this would mean that a generalised

1 See for instance the Joint Center for Housing Studies (2006), "The State of the Nation's Housing 2006", which suggests that at least part of the recent surge in house prices may be due to structural changes in the relationship between house prices and the underlying fundamentals.

2000-2005
1990-1999

max-min
average

Sources: Office of Federal Housing Enterprise Oversight (OFHEO) and ECB calculations.
Note: The chart shows the kernel density for average house price inflation over the periods 1990-1999 and 2000-2005. The surface of each density function adds up to 1.
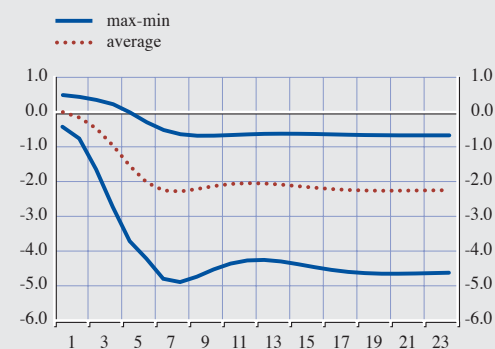
Source: ECB calculations.
Note: The chart is based on the estimates of a GVAR model including the 31 largest US states. The average response shows the population-weighted average.

property price downturn could be triggered not only by traditional macroeconomic variables, such as income and interest rates, but also by local factors.

One way of assessing the potential that local shocks could spill over to other parts of the country is to make use of a cross-section vector auto-regression methodology[2] that explicitly allows for the possibility of interdependencies between state and country-wide factors. In applying this model, individual vector error-correcting models for the 31 largest US states were estimated in which the state-specific real income per capita and house prices are related to corresponding state-specific averages of these measures in the other US states weighted by distance, along with deterministic variables (such as time trends) and the real interest rate for the nation as a whole.[3] These individual state models are then linked together to derive generalised impulse response functions.

By way of illustrating the potential of state-level spillovers, Chart B2.2 considers the contagion effects on other states of a 10% negative shock to Californian house prices.[4] A population-weighted average of responses indicates that such a correction would lower house prices in the long run in the other US states by between 0.6 and 4.6%, with an average response of almost 2.5%. In this simulation, the transmission of the initial shock to other local housing markets – which more than likely reflects relatively high intra-regional labour mobility and strong

2  See S. Dées, F. Di Mauro, H. Pesaran and V. Smith (2006), "Exploring the International Linkages of the Euro Area: a Global VAR Analysis", *Journal of Applied Econometrics,* forthcoming.

3  The real interest rate used in the model is the ten-year government bond yield deflated by the PCE deflator. The other states' real house prices and income per capita feed into each state-specific vector error-correction model (VECM) through two variables which each represent a weighted average of all other states' house prices and income per capita. The weights are inversely related to the distance the other states have to the state considered in the VECM. The model was estimated using quarterly data for the period Q1 1986 to Q4 2005.

4  California was chosen as an illustrative case, given that several studies have found potential overvaluation in this state. For instance, Petersen (2006) finds that California had the lowest housing affordability in 2005 in the US, whereas Himmelberg, Mayer and Sinai (2005) show that southern California was one of the two areas in the US that in the fourth quarter of 2005 appeared relatively expensive, based on imputed rent-to-income ratios (see D'Ann M. Petersen (2006), "Texas Housing: A boom with no Bubble?", Southwest Economy, No. 3 May/June; and C. Himmelberg, C. Mayer and T. Sinai (2005), "Assessing High House Prices: Bubbles, Fundamentals, and Misperceptions", *NBER Working Papers,* No. 11643).

national financial integration in the US – is relatively rapid, materialising fully within two years.

From a financial stability viewpoint, the possibility that adverse disturbances in local property markets might be propagated to other parts of the US implies that potential triggers for a more widespread housing market disturbance could extend well beyond unexpected changes in interest rates or in the state of the aggregate US business cycle. Hence, with a high degree of housing market integration, falling property prices in one region, for instance as a result of a sector-specific shock, could lead to more generalised financial sector distress via various channels. These include direct effects on mortgage borrowers and lenders, and indirect effects through contracting economic activity. While recent financial innovations, such as increased securitisation of mortgage debt, imply a mitigation of these risks for the banking sector, exposures to US housing market conditions still remain with investors in mortgage bonds, including systemically important US government-sponsored enterprises (GSEs). Such risks could also extend to the euro area financial system, both directly through exposures of financial institutions to the US housing market, and indirectly through any contagion from a weakening US macroeconomy.

In addition, mortgage credit has become increasingly available during the past two years at a time when mitigating controls on credit exposures have weakened.[3] At the same time, however, it should be stressed that the share of more risky non-traditional, sub-prime and adjustable rate mortgages (ARMs), although steadily increasing, has also remained limited.

### REGION-SPECIFIC IMBALANCES

Owing to their importance for the activities of euro area banks, developments in non-euro area EU countries require monitoring from a financial stability viewpoint. By early November 2006 the short-term economic outlook for most non-euro area EU countries remained favourable and broadly unchanged since the June 2006 FSR. The most significant change from a euro area financial stability perspective was a sequence of interest rate hikes which may have eroded the capacity of borrowers to service their debts (see Box 3).

In the UK, the largest economy in this group of countries, GDP growth is expected to remain close to potential over a three-year horizon, feeding into higher lending growth after early 2006, led by (mainly secured) lending to

households and non-financial corporations. According to the July 2006 Bank of England Financial Stability Report, household balance sheets are robust on aggregate, but personal insolvencies began to rise sharply among a minority of households between December 2005 and June 2006. The picture is similar in Sweden and Denmark, where economic growth and its outlook remain firm, with continued buoyant bank lending to households and (more recently) to companies. However, bank lending in both countries decelerated somewhat in August.

In the EU countries of central and eastern Europe, GDP growth remained robust in the first half of 2006, driven by domestic demand and fuelled by rapid credit expansion. Bank lending accelerated in most of these countries in early 2006, but began to slow down towards mid-2006 in some of them. Credit growth was strongest in the Baltic countries (above 30% per annum in July 2006), despite some more recent deceleration.

3   See Office of the Comptroller of the Currency (2005), "Survey of Credit Underwriting Practices", which provides evidence of loosening underwriting standards at nationally charted banks.

## ARE THE EXTERNAL POSITIONS OF THE NEW EU MEMBER STATES EXCESSIVE?

From a financial system stability perspective, among a broad set of economic and political indicators to be taken into account when assessing a country's vulnerability to a currency crisis, it is crucial to assess the evolution of the external imbalances of countries. By late 2006, with the major exception of the US, collectively the central and eastern European countries (CEEC) were the only region in the world recording sizeable and persistent current account deficits. By contrast, Asian and Latin American countries recorded either moderate deficit or surplus positions. Although the CEEC are economically relatively small, financial distress in these countries could entail more widespread financial stability risks. For instance, the Asian crisis in 1997-1998 demonstrated that financial distress in one country can affect a much larger economic area if investors simultaneously withdraw their funds from countries with similar characteristics. From a euro area perspective, the CEEC are particularly relevant given their geographic proximity and the participation of some of these countries in the Exchange Rate Mechanism (ERM) II.

Against this background, this Box examines from various perspectives the external positions of the new EU Member States (NMS) from the CEEC as one element in the analysis of these countries' vulnerability to financial stability risks. In more detail, it looks into developments in the current account balance, its financing as well as the net international investment position (i.i.p.) and level of external indebtedness.

Current account positions remain rather diverse across the NMS. Estonia and Latvia recorded the highest current account deficits in recent years, reaching at times even double-digit levels if measured in terms of GDP (see Chart B3.1). The Hungarian current account deficit was also large, averaging about 7% of GDP between 2002 and 2006, which was partly related to the country's high fiscal deficit. On the other side of the spectrum, Slovenia and Poland have recorded smaller current account deficits in recent years. In the other NMS, average current account deficits in the range of 4-6% of GDP were recorded in the period 2002-2005. Among those countries, the patterns in Slovakia's current account balance represent a good example, whereby current account deficits were rather volatile without necessarily implying sharp exchange rate fluctuations: the Slovak deficit declined from 8% of GDP in 2002 to close to balance in 2003, followed by a strong reversal in the following years.

Overall, while deficits of such magnitudes could signal problems in terms of cost and price competitiveness, they may also reflect the catching-up processes taking place in these economies. One way of assessing whether these current account deficits can be considered "excessive" is to estimate a model that takes intertemporal aspects into account, and then to determine so-called equilibrium current account positions. Studies employing such an approach suggest that the deficits observed in the NMS have mostly stayed within sustainable ranges, although it must be kept in mind that such estimates are surrounded by significant uncertainty.[1] At the same

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1 See M. Bussière, G. Müller and M. Fratzscher (2004), "Current Accounts Dynamics in OECD and EU Acceding Countries – An Intertemporal Approach", *ECB Working Paper,* No. 311; S. Herrmann and A. Jochem (2005), "Determinants of Current Account Developments in the Central and East European EU Member States – Consequences for the Enlargement of the Euro Area", *Deutsche Bundesbank Discussion Paper* No. 32; M. Doisy and A. Hervé (2003), "Les déficits courants des PECO: quelles implications pour leur entrée dans l'Union européenne et la zone euro?", *Economie Internationale,* 93, first trimester, pp. 59-88; and M. Rubaszek (2005), "Fundamental Equilibrium Exchange Rate for the Polish Zloty", *NBP Working Papers,* No. 35.

**Chart B3.1 Current account, net FDI inflows and international investment position (i.i.p.)**

(average 2002 - 2006, i.i.p.: 2005, % of GDP)

current account deficit (left-hand scale)
net FDI inflows (left-hand scale)
i.i.p. (right-hand scale)
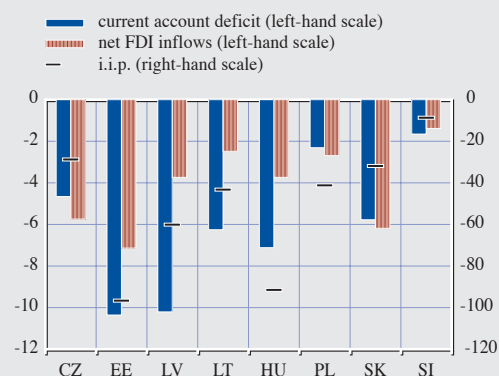


Source: ECB.
Note: Data for 2006 include the four-quarter moving average until the second quarter of 2006. The current account refers to the combined current and capital account balance.

time, these models also indicate that current account deficits that are significantly higher than 10% of GDP – as experienced at times in Estonia and Latvia – are likely to prove unsustainable from a medium-term perspective. According to these models, there are also signs of an excessive current account position in Hungary, particularly when the deficit rose above 8% of GDP.

Financial stability risks also depend on the structure of the financing of the current account deficits. If a significant share of the current account deficit is financed through longer-term and less volatile sources, a current account deficit may be considered more sustainable. Net FDI inflows constitute an important source of financing in almost all NMS (see Chart B3.1). They partly reflect re-invested earnings, which mechanistically increase the income deficit, and thus the current account deficit. Over the past four years, net FDI inflows have on average exceeded current account deficits in the Czech Republic, Poland and Slovakia. By contrast, in Hungary, Latvia and Lithuania over the same period, net FDI inflows only financed around half of their current account deficits, reflecting a combination of relatively subdued net FDI inflows and large current account deficits. In these cases, the financing gap was closed by higher inflows in portfolio investment and commercial bank borrowing.

By additionally taking into account the past evolution of a country's balance of payments, its net international investment or external debt position can be assessed. While the external debt situation varies between the NMS, it is noteworthy that the Czech Republic recorded a rather favourable external debt situation as a result of strong net FDI inflows which reduced debt-financing needs. In Hungary, gross external debt has risen strongly, and the i.i.p. is also strongly negative (see Chart B3.1), partly owing to the large fiscal deficit and the demand for foreign-denominated loans by the private sector. The boom in foreign currency-denominated mortgage lending has further increased balance sheet risks to the economy. In the Baltic countries, Estonia and Latvia experienced strongly negative and rising net i.i.p. and high levels of external debt-to-GDP ratios. In Estonia, the high level of gross external indebtedness seems to have been partly related to loans of commercial banks from their foreign parent banks, which appears to be less risky from a financial stability perspective. In Latvia, the high levels of gross external debt are mainly due to the special characteristics of the Latvian banking system, which attracts non-resident deposits and invests these funds in liquid assets abroad. Taking this aspect into account implies that Latvia's net i.i.p. is sizeably lower than its gross external debt position.

Summarising the examination of the external positions of NMS from all three dimensions does not suggest that external positions in this region are obviously excessive. For most countries, the current account position appears to be in line with the economic fundamentals of catching-up economies operating under the EU Single Market framework. Moreover, in many countries,

current account deficits are financed to a large extent by net FDI inflows, which are less prone to capital flow reversals. However, it is crucial that these countries maintain an investment-friendly macroeconomic environment so as to safeguard the positive market sentiment towards their economies. In addition, some closer monitoring of potential external vulnerabilities seems to be warranted in Estonia, Latvia and Hungary.

A high share of lending in many of the new Member States (NMS) has been extended in foreign currency in recent years (see Chart 1.7), which could have financial stability implications.[4] As borrowers typically either lack access to hedging instruments or do not have natural hedges such as revenues in foreign exchange, they bear the risk of currency mismatches. Banks for their part bear the credit risk stemming from borrowers' ability to service their debt should the local currency depreciate vis-à-vis the currency in which the loans were extended. In this context, the considerable volatility of the Hungarian forint, owing mainly to an unstable fiscal situation and uncertainty regarding the future euro adoption plans, has exposed vulnerabilities arising from households borrowing in foreign currency.

High sensitivity of capital flows to EMEs typically ranks high among potential triggers for episodes of market turbulence, notwithstanding the fact that the exposure of the euro area banking system to these regions remains limited, with EMEs (excluding offshore centres) accounting for only 17% of consolidated euro area banking exposures in Q4 2005 (see Table S6), and a mere 6% of total external asset holdings of euro area banks in Q1 2006 (see Chart 1.8).

In the period after the finalisation of the June 2006 FSR, economic activity in EMEs remained dynamic, underpinned by robust domestic demand in most regions and a still supportive external environment, including high commodity prices (see Section 1.2). Financing conditions remained favourable over the period in aggregate, as the turbulence in financial markets in May and June 2006 was largely temporary in nature (see Chart S32) and its effects on the real economy were in most cases negligible. Standard vulnerability indicators across EMEs have improved, coupled with a broad-based acceleration of economic activity, continued active debt management

4   See also ECB (2006), *EU Banking Sector Stability,* November.

**Chart 1.7 Share of foreign currency loans in total loans in non-euro area EU countries**

(2004 - 2006, %, maximum, minimum, inter-quartile distribution)

weighted average
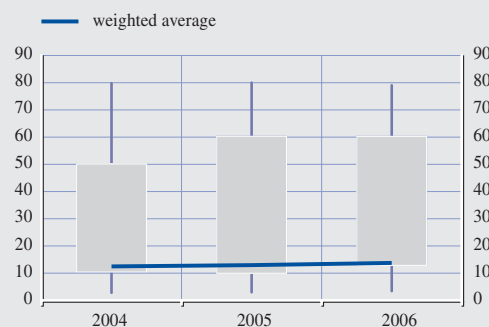
Source: ECB.
Note: 2006 data until July.

**Chart 1.8 Total external asset holdings by euro area banks in emerging regions**

(Q1 1997 - Q1 2006, USD billions)

all emerging regions
Latin America
emerging Asia

6% of total external asset holdings by euro area banks in Q1 2006
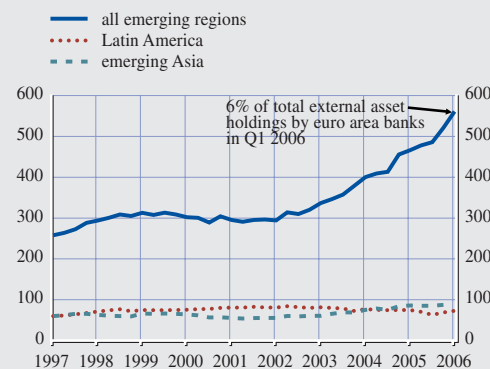
Source: Bank for International Settlements (BIS).

policies and healthy surpluses in external balances (except in south-eastern Europe) (see Table S1).

Notwithstanding the positive outlook which prevailed in early November 2006, EMEs remain vulnerable to a number of risks. In the near term, these include vulnerability to sudden and unanticipated shifts in global liquidity conditions, particularly regarding the expected path of monetary policy in mature economies and more sluggish external demand than currently anticipated (this is possibly related to lower than expected commodity prices as well). In addition, the possibility of a renewed upturn in oil prices could lead to a bout of inflationary pressures, which is particularly a concern for net oil-importing EMEs, as this would also be associated with deteriorating external balances. In the medium term, the main vulnerability for the EME outlook remains the possibility of an abrupt correction of global current account imbalances.

## 1.2 KEY DEVELOPMENTS IN INTERNATIONAL FINANCIAL MARKETS

### US FINANCIAL MARKETS
In the period after the finalisation of the June 2006 FSR, short-term interest rates in the US

rose steadily and somewhat unexpectedly, bringing the Federal funds rate to 5.25%. Looking forward, whereas markets initially seemed to expect that the Federal Open Markets Committee (FOMC) would raise rates further in the short term, they increasingly expected the FOMC to reduce rates to 5.0% by the second half of 2007.

Regarding money market counterparty credit risks, concerns increased in the first half of the year, and this was reflected in a widening of the TED spread (see Chart 1.9). This owed partly to market participants' uncertainty about the possibility of an adverse turn in the credit cycle as well as a temporary rise in market volatility in May and June. Nevertheless, issuance activity in commercial paper remained robust, indicating that the markets continued to intermediate funds smoothly (see Chart 1.10).

Contrasting with patterns in short-term interest rates, ten-year government bond yields in the US dropped from 5.2% in early May to 4.8% in early November (see Chart S18). The main explanation for this appeared to be downward revisions to expected future short-term interest rates in view of emerging investor concerns about weakening growth in the US economy. As a result, the yield curve slope between three-

**Chart 1.9 US six-month TED spread**

(Jan. 1999 - Nov. 2006, basis points)
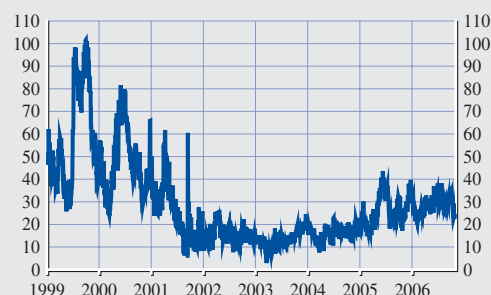


Source: Bloomberg.
Note: The TED spread is the difference between uncollateralised money market interest rates and risk-free Treasury bill rates of similar maturity.

**Chart 1.10 US commercial paper**

(Jan. 1991 - Sep. 2006, USD billions, total amount outstanding)

- total amount outstanding
- non-financial corporations
- financial corporations
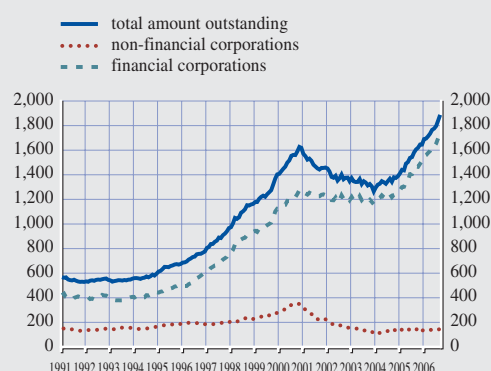


Source: US Federal Reserve Board.

**Chart 1.11 US long-term government bond yields and long-term nominal GDP growth expectations**

(Jan. 1990 - Oct. 2006; %)

- ten-year bond yield
- Consensus nominal GDP growth average one to ten years ahead
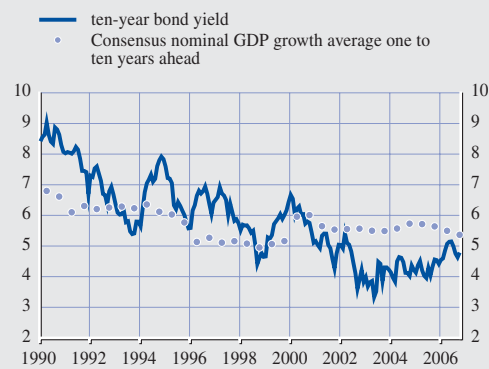


Sources: Reuters, Consensus Economics and ECB calculations.

(4.8% vis-à-vis 5.4%) (see Chart 1.11). However, investors continued to take positions, betting on further falls in the yields of long-term bonds (see Chart 1.12).

Factors that could drive US long-term bond yields upwards in the period ahead include the possibility of foreign and institutional investors becoming net sellers of US Treasuries, as well as upward pressures from the widening of the US non-financial corporate financing gap, as the financing needs of corporations have started to expand (see Chart 1.2). The risk remains that a rise in bond yields could involve some overshooting with regard to the levels that appear to be warranted by the macroeconomic fundamentals, thus impinging on borrowing costs, especially in markets where credit risks may have been assessed too positively.

month deposit rates (LIBOR) and ten-year government bond yields inverted further, thus reducing the attractiveness of carry-trades and putting pressure on the net interest incomes of banks operating in the US. This notwithstanding, US ten-year bond yields remained lower than could be expected from the macroeconomic fundamentals as reflected in Consensus nominal growth expectations over the same maturity

Against the backdrop of a flattening yield curve, and notwithstanding the sharp rise in risk aversion in May and June (see Box 4), financing conditions for the corporate sector remained favourable. Despite increasing somewhat after early May 2006, corporate bond spreads at the lowest end of the rating spectrum remained at fairly low levels (see Chart S29).

**Chart 1.12 Net non-commercial positions on futures and options, and the yield spread between ten and five-year government bonds**

(Jan. 1997 - Oct. 2006)

- 10-year (thousands of contracts, left-hand scale)
- 5-year (thousands of contracts, left-hand scale)
- yield spread (% points, right-hand scale)
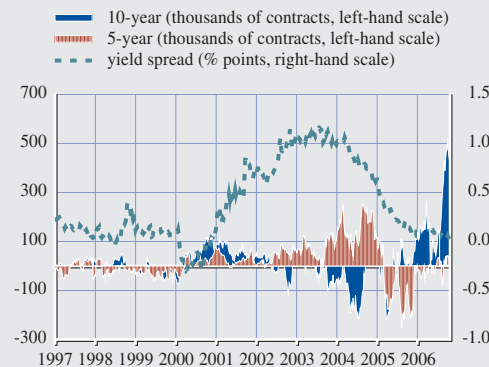


Sources: Commodity Futures Trading Commission (CFTC) reports and Bloomberg.

**Chart 1.13 Five-year US credit default swap (CDS) indices**

(Jan. 2005 - Nov. 2006, basis points)

- CDX Investment Grade 5 years
- CDX HighVol 5 years
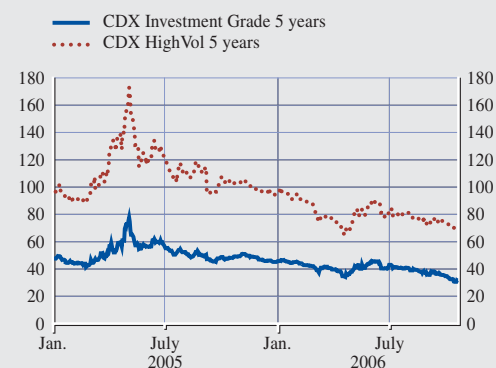


Source: Bloomberg.

Regarding the credit risk component of these spreads, both the CDX investment-grade and high-volatility indices had returned to early May levels by the beginning of November 2006 (see Chart 1.13). Hence, the impact of the May/June correction was quickly unwound – completely for the investment-grade index, and partially for the high-volatility index.

## FINANCIAL MARKET VOLATILITY – WHAT CAUSED THE RECENT SPIKE?

In early May 2006, a month-long correction in the financial markets took place. Most equity and commodity markets experienced price falls, and emerging countries' assets and currencies were adversely affected by significant outflows. At the same time, highly liquid and secure G7 government bond markets experienced strong inflows due to safe-haven buying. The sudden change in investors' positions can be broadly traced to three underlying factors: the immediately preceding sharp rise in most equity indices and commodities (see Chart B4.1); an unexpected reappraisal of risks, particularly in emerging markets (see Chart B4.2),[1] and concerns about the US economic outlook.[2] Whereas the net impact on prices was in the end limited,[3] these events could signal risks of volatility surges in the period to come, at least for some asset markets.

1  This type of investment had become increasingly attractive before the episode of turbulence in May/June owing to the pursuit of portfolio diversification, prospects of strong growth in most emerging countries, and higher yields. For instance, between 1 January 2004 and 1 May 2006 Saudi Arabia's Tadawul index rose by more than 200%, while Russia's RTS index rose by 190% and Turkey's National 100 index rose by 135%. There is some evidence, however, that some investors failed to make the necessary distinction between countries' risks and the fundamentals. Indeed, some episodes of investor nervousness had already emerged when, for instance, the Saudi stock market fell by 50% between February and May 2006, and a currency crisis affected the Icelandic króna in March and April 2006.
2  It is generally agreed that the correction began on 10 May, the same day that the FOMC raised the Federal funds rate by 25 basis points to 5.0%. Even though this decision was widely expected by market participants, the accompanying statement made it clear that further monetary tightening might be needed. Later in May, the release of stronger than expected US inflation data reinforced expectations of higher interest rates, and a growing number of market participants became fearful of the possible impact of the tightening on growth.
3  Most equity markets began to recover after mid-June, and most commodity and emerging market assets have since benefited from renewed interest from investors.

### Chart B4.1 Dow Jones EURO STOXX index

(index value)



Source: Bloomberg.

### Chart B4.2 Emerging market USD-denominated bond spreads

(EMBIG, basis points)
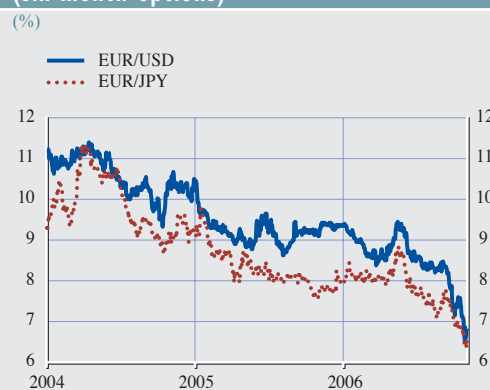


Source: Bloomberg.

Implied volatility in the main equity indices remained higher after May 2006, reflecting greater uncertainty among market participants about economic prospects in the US (see Chart B4.3). It is important to note that the rise in implied volatility in the main equity indices only led to a return to historical averages, and there was considerable diversity across other financial markets: bond market volatility remained contained, for example, while volatility continued to decline for the major currency pairs in the foreign exchange markets after a short-lived upturn (see Chart B4.4).

The general correction of May and June 2006 has given some evidence of the correlations that have developed between different financial markets. After the bursting of the technology equity bubble in 2000 and 2001, investors have tried to diversify their asset allocation, searching for instance for new opportunities in emerging markets and commodities. Investment and speculative inflows into these markets have increased, resulting sometimes in an excessive acceleration in prices. A correction beginning in supposedly "marginal" markets such as commodities or emerging markets could eventually affect the main equity and bond markets, as investors try to limit their global risk exposures.

While narrow credit spreads may partially reflect very low default rates (see Chart S42), the combination of a rise in short-term risk-free interest rates, a flattening of the yield curve and more downgrades than upgrades of industrial corporate credit ratings (which was also driven by M&A activity and share buybacks) suggest that some underpricing of credit risk cannot be excluded.

Whereas in the US the combination of an inverted yield curve – a negative growth signal – and fairly low corporate bond spreads – a positive growth signal – has not been uncommon in the past, a term spread as low as that in 2006 has – with only one exception – been followed by a recession (see Chart 1.14).[5]

---

5  This may in part relate to the fact that the term spread also depends on differences in long-term and short-term inflation expectations, whereas the corporate bond spread is a real premium, reflecting corporate credit risk.

**Chart 1.14 US financial spreads and recessions**

(Jan. 1955 - Oct. 2006, %, monthly averages of daily data)

― term spread (ten-year government bond yield minus three-month Treasury bill rate, left-hand scale)
···· corporate bond spread (Moody's Baa minus Aaa corporate bond yields, inverted, right-hand scale)
― NBER recession (shaded area)
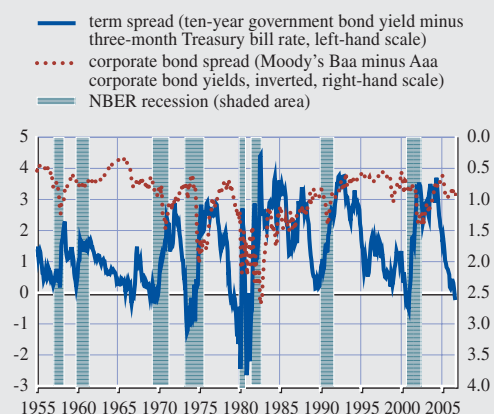


Sources: Board of Governors of the Federal Reserve System and Moody's.

**Chart 1.15 US net share purchases by the non-financial corporate business and household sectors**

(Q1 1975 - Q2 2006; USD billions, four-quarter moving averages of seasonally adjusted annual rates)

― non-financial corporations
···· households
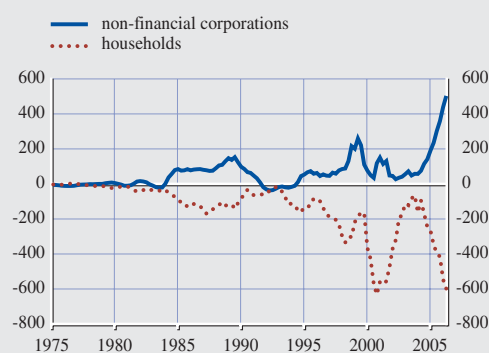


Source: US Flow of Funds Accounts.

A possible reappraisal of credit risk pricing – for instance if there were a (sharp) slowdown in profit growth and a (significant) rise in corporate sector defaults – would be aggravated by a large credit event.

By early November 2006, stock prices had reached somewhat higher levels than early May (see Chart S20). Several factors supported US equity markets, including a decline in long-term risk-free interest rates and expectations of continued robust corporate earnings growth. At the same time, however, a rise in risk aversion placed downward pressure on stock prices during the May/June correction (see Chart S19). After early May, the so-called defensive sectors – those which provide steady cash flow – performed well. In addition, the Securities and Exchange Commission's investigation into the backdating of employees' stock options also put downward pressure on the stock prices of over 100 US stock market-listed companies which had been targeted by these government investigations.[6]

One notable feature is that the exercising and selling of stock options by households are typically correlated with a large number of US companies buying back shares. In 2006 the net selling of shares by households was close to historical highs, and paralleled by all-time highs in firms' net share buybacks (see Charts 1.15 and S24)). An inflow into US equity funds (see Chart S25) suggests that households sold stock options on a very wide scale, while firms bought back more shares than they issued, despite strong gross equity issuance (see Chart S28). This may prove to be a vulnerability, as a slowdown in profit growth will most likely put an end to these extensive share buyback programmes, thereby removing potential support of stock prices. Another related issue of concern is the tendency for firms to borrow in order to buy back shares. These leveraged share buybacks might prove challenging in an environment of rising interest rates.

With regard to stock market valuations, the price-earnings ratio of the S&P 500 index,

6  See, among others, http://www.sec.gov/news/testimony/ ts090606lt.htm and http://www.sec.gov/news/testimony/2006/ ts090606cc.htm

based on ten-year trailing earnings, remained high (see Chart S21).[7]

Looking forward, similar levels of stock market volatility compared to early May suggest a stable near-term outlook for US stock prices. Risk-neutral density functions for US stock prices indicated in October that market participants were less concerned about the likelihood of abnormally large US stock price declines than they were in May (see Chart S23). Looking further ahead, risks include the possibility of an adverse turn in the corporate earnings cycle, earnings forecasts that could subsequently turn out to be excessively optimistic, and the possibility of rising risk-free long-term interest rates.

### FINANCING CONDITIONS IN EMERGING MARKETS
Emerging market financing conditions remained broadly benign in the six months after the finalisation of the June 2006 FSR, notwithstanding the May/June correction, which greatly affected some EME asset class segments – particularly equities (see Chart S32), local bonds and the local currency. The most affected economies were those that exhibited the greatest exposure to the commodities cycle (from the exporting side, related to profit-taking), the unwinding of crowded carry-trades (particularly from benchmark or large EME issuers, such as

Brazil and Turkey) or those showing traditional symptoms of vulnerability (such as current account deficits). In general, however, disruptions to real economy performance were minimal.

The May/June correction triggered considerable net outflows from dedicated EME fixed income and EME equity funds, which peaked by end-June 2006 at around 2% of total assets (see Chart 1.16). After reaching a trough by end-June, valuations however subsequently recovered to April 2006 levels, as there was a return to positive net inflows to dedicated EME funds.

Even in the case of Turkey, which was severely affected by the turbulence, there were subsequent signs of recovery in financial markets: fixed income funds had already raised their exposures by July 2006 to levels surpassing those seen in January (see Chart 1.17), and there was a rapid narrowing of Turkish bonds spreads following the correction.

With the exception of the mid-May to June period, bond issuance remained brisk across

7 This valuation indicator has been demonstrated as having highly significant long-run predictive power in J. Campbell and R. Shiller (1998), "Valuation Ratios and the Long-Term Stock Market Outlook", *Journal of Portfolio Management*, Winter.

**Chart 1.16 Net inflows into dedicated emerging market economy funds**

(Jan. 2005 - Sep. 2006, USD billions)

— dedicated emerging market fixed income funds
····· global emerging market equity funds
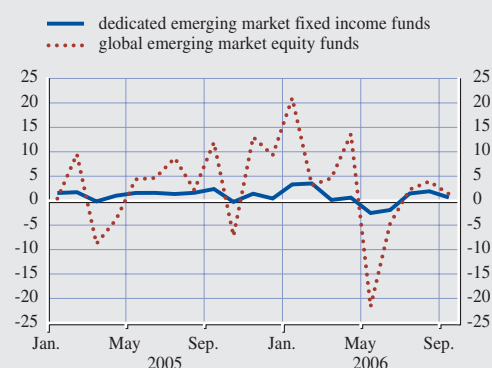


Source: EmergingPortfolio.com Fund Research.

**Chart 1.17 Exposure to Turkish assets by dedicated emerging market economy funds**

(% of total assets)

▮ EME fixed income funds
▯ EME equity funds
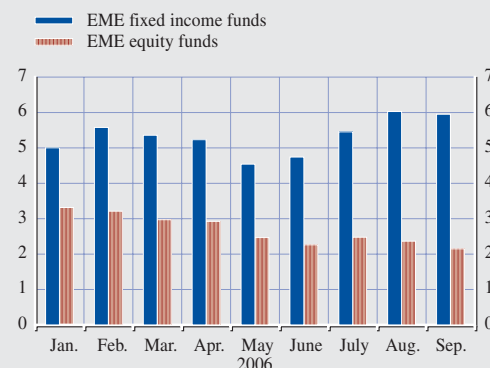


Source: EmergingPortfolio.com Fund Research.

EMEs, with many borrowers continuing to pre-finance obligations ahead of 2007 commitments and engaging in active debt management operations. The outlook for EME financing thus remains positive.

The May/June correction appeared to contain two main silver linings. First, the diverging fortunes of EME asset class segments suggests that the structural deepening and broadening of the EME asset class should not only afford international investors greater portfolio diversification, but should also benefit borrowers in the long term. Second, the fact that most EMEs have successfully weathered the financial market turmoil and emerged largely unscathed may be seen as a testament to their increased resilience to crises, in particular due to the shift toward domestic, local currency-denominated financing. At the same time, however, the impact of an abrupt upturn in mature economy long-term government bond yields or a disturbance in credit risk transfer markets remains to be tested. In addition, the correction in May/June also exposed the limits of the broad-based move toward domestic financing among EMEs, as well as the aggressiveness with which this strategy may be pursued.

## FOREIGN EXCHANGE MARKETS

Unlike in 2005, when concerns in financial markets about the magnitude of the US current account and fiscal deficits seemed to represent the main driving factor behind the movements in the US dollar, for the greatest part of 2006 developments in the main currencies seemed to have followed expectations about the path of future monetary policy rates. In addition, exchange rate developments in 2006 seem to have been more influenced by Asian authorities' intervention policies (see Section 1.1). Interest rate differentials moved strongly in favour of the euro in the second half of the year, supported by evidence of a strengthening of economic activity in the euro area, a decelerating US business cycle, more moderate increases in consumer prices and weaker housing market developments in the US. These factors also

**Chart 1.18 Speculative positions and the USD/EUR exchange rate**

(June 2005 - Oct. 2006)

USD/EUR non-commercial net position (thousands, number of contracts, left-hand scale)
USD/EUR exchange rate (right-hand scale)



Source: Bloomberg.
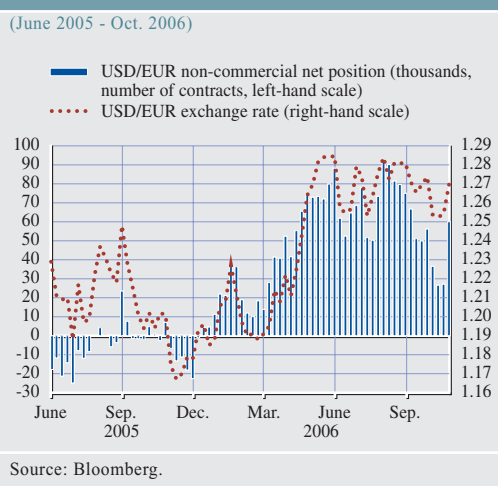
contributed to a noticeable depreciation of the Japanese yen with respect to the euro.

Looking forward, there was a significant shift in net speculative positions in 2006 compared to the year before.[8] After April 2006 some market participants positioned themselves for a weakening of the US dollar vis-à-vis the euro (see Chart 1.18). After mid-September, however, positions tended to revert, although they recorded a new surge in the last week of October.

As for all main currency pairs, the expected short-term exchange rate volatility of the US dollar/euro bilateral rate remained at very low levels, after peaking briefly in May 2006 (see Chart 1.19). In the last days of October, implied volatility fell significantly below the lower side of the confidence band for the first time since 1999.

While implied volatility fell quickly from the peaks of May, realised volatility tended to remain around these levels for a longer period of time. Consequently, between May and August

8  The net position equals the non-commercial long position minus the non-commercial short position.

implied volatilities remained below realised volatilities. This configuration indicated that market participants had not sought a large enough compensation for the risks associated with future fluctuations in the realised volatility, implying a very high risk appetite among market participants. This amplification of the global appetite for risk may have resulted from some classes of investors selling options at aggressive prices in order to generate additional revenue. After the beginning of September, implied volatility returned above realised volatility. However, as the average volatility level was also declining, the gap between the two measures remained rather contained, therefore still pointing to the presence of risk appetite in the market. Furthermore, the full term structure of implied volatilities was characterised by low values: between the beginning of June and end-October 2006 the implied volatility on the US dollar/euro exchange rate fell by 4 percentage points at the one-week horizon and by over 2 points at the one-year horizon, thus suggesting that market participants attached less and less likelihood to a near-term disruption in foreign exchange markets. In addition, between June and mid-October, risk reversal indicators reflected only mild expectations of a weaker dollar against the euro and a stronger yen vis-à-

vis the euro. Thereafter risk reversals pointed to expectations of a stronger dollar against the euro, consistent with economic data making markets more convinced that the deceleration in the rate of growth of the US economy was going to be less sharp than expected. However, despite indicating a change in the expected direction of the US dollar exchange rate vis-à-vis the euro in the near term, the level of these reversals remained rather subdued. After the finalisation of the June FSR, the shape of the one-month risk-neutral densities for the EUR/USD bilateral rate changed consistently with the reported fall in expected volatility at all horizons, displaying thinner tails and thus suggesting that, according to market participants, extreme movements in exchange rates were less likely to occur than six months before (see Chart 1.20).

**COMMODITY MARKETS**

Commodity markets, especially oil markets, are relevant for financial stability largely through indirect or macroeconomic channels, as high and volatile oil price levels can pose risks to general economic activity and inflation, and these can in turn adversely affect asset prices, especially if they persist, and could contribute to financial sector stress. More directly, there are indications that speculative activity in the

**Chart 1.21 Speculative positions on oil futures and oil prices**

(Jan. 2005 - Oct. 2006, net future commitments of non-commercials on the New York Merchandise Exchange)

net futures commitments (thousands, left-hand scale)
WTI oil price (USD per barrel, right-hand scale)
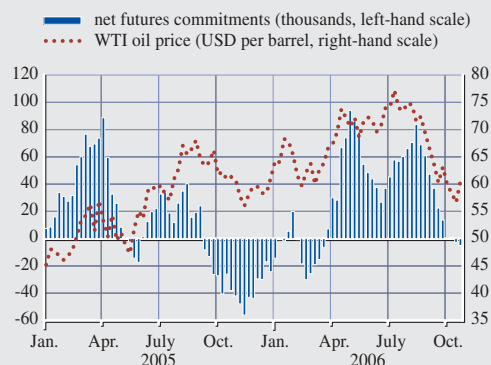


Source: Bloomberg.
Note: Net commitment = number of long-short contracts, where each contract represents 1,000 barrels. "Non-commercials" denotes entities not engaged in crude oil production or refining.

**Chart 1.22 Options-implied risk-neutral densities of oil prices**

(Jan. 2004 - June 2007, USD per barrel; 10%, 20%, 50%, 80% and 90% confidence intervals of estimation on 2 November 2006)
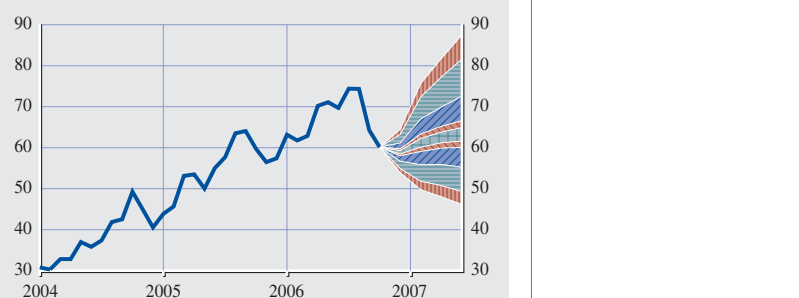


Sources: Bloomberg and ECB calculations.

markets for derivatives on oil has increased over time, so that direct exposures of financial institutions to oil price movements may have risen commensurately, as suggested by hedge fund events that occurred in September (see also Section 1.3). At the same time, there are indications that in recent quarters the correlation between net investment positions on oil and spot prices may have increased (see Chart 1.21).

Mainly driven by supply-side factors, oil prices rose sharply after the finalisation of the June 2006 FSR, reaching a new historical high of USD 78.2 per barrel of Brent crude oil in early August, but subsequently declined substantially. The recent fall in oil prices was mainly prompted by a noticeable decline in geopolitical tensions, the receding threat from hurricanes in the Gulf of Mexico and the easing of recent petrol market tightness. Looking forward, implied distributions for future oil prices, extracted from options contracts, indicate that the uncertainty surrounding near-term oil futures prices remains considerable, with very wide confidence intervals and with the balance of risks tilted towards the upside (see Chart 1.22).

The prices of non-energy commodities have likewise risen considerably since the finalisation of the June 2006 FSR, mainly driven by a strong increase of industrial raw material prices, especially in the case of metals. After reaching a peak in mid-May, non-energy commodity prices experienced some downward correction, but started to increase again at the end of June. Prices subsequently remained at elevated levels by historical standards, amid some volatility. The surge in metals prices was mainly supported by continued solid demand, limited production growth, higher energy costs and low levels of inventories – of which some are expected to ease in the medium term. Investment from significant investors such as pension funds in search of asset diversification also seems to have played a major role in recent price developments, particularly for precious metals such as gold and silver. As a result of the greater participation of investors in gold markets, the usual role of gold as a safe haven may have been affected by growing investment and speculative flows.[9]

9 For instance, when risk aversion rose across the financial markets in May, the price of gold dropped, in reaction to the liquidation of speculative trend-following positions.

**Chart 1.24 The silver price and the amount invested in ETFs**

(Jan. 2006 - Nov. 2006)

—— silver price (USD per ounce, left-hand scale)
····· amount of silver invested in ETFs (tons, right-hand scale)

Sources: Bloomberg and iShares.

The growing role of investment flows in the precious metals markets is also evident in the success of exchange-traded funds (ETFs), which enable private investors to enter these markets (see Chart 1.23).

Whilst ETFs provide private investors with access to a new investment class and are in themselves an efficient diversification tool, they can also contribute to raising financial stability risks if investors do not manage their risks adequately or if they affect the supply-demand equilibrium in the underlying assets. For instance, the launch of a silver ETF in April was anticipated by market participants, and contributed to a substantial rise in the price of silver (see Chart 1.24). In markets of limited liquidity and depth, ETFs may induce higher volatility.

## 1.3  CONDITIONS OF GLOBAL FINANCIAL INSTITUTIONS

### GLOBAL LARGE AND COMPLEX BANKING GROUPS

In the period after the finalisation of the June 2006 FSR, the profitability of global large and complex banking groups – the activities of which are important for financial intermediation in the euro area, and most of which are US-based – improved further from already high

levels.[10] The simple average return on equity (ROE) of a sample of 13 large global banks increased from 19.8% in 2005 to just over 21% by the end of the second quarter of 2006 (see Chart 1.25). The dispersion in performance reflects the somewhat differing business models followed by banks in this group. Some of the institutions concerned continued to benefit from conditions in capital markets and investment banking activities and posted a high ROE; other more diversified institutions that are less focused on capital market activities, with business lines spanning retail lending, asset management and securities services, increased their ROE by less but nevertheless posted solid gains compared with the same period last year.

While somewhat weaker demand for credit by US households may have dampened income growth from retail banking franchises, the rate of bankruptcy filings in the US, which had been rising, slowed down. This was due mainly to the acceleration in bankruptcy filings before a change in the bankruptcy law (see Section 1.1). This contributed to reducing credit costs and supported profitability.

10  The set of global large and complex banking groups applied in the analysis in this section was selected using methodology described in the Special Feature article "Identifying large and complex banking groups for financial system stability assessment" contained in this Review.

**Chart 1.25 Return on equity (ROE) for global large and complex banking groups**

(2004 - Q2 2006, %)
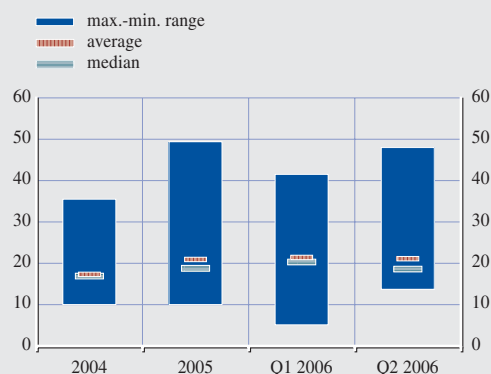
- max.-min. range
- average
- median



Sources: Annual reports, earnings releases and ECB calculations.
Note: The institutions included are Goldman Sachs, JP Morgan Chase & Co., Morgan Stanley, Merrill Lynch, Citigroup, Bank of New York, State Street, UBS, CSFB, Barclays, HBOS, RBS and HSBC.

**Chart 1.26 Trading revenues for global large and complex banking groups**

(2003 - Q2 2006, % of net revenues)
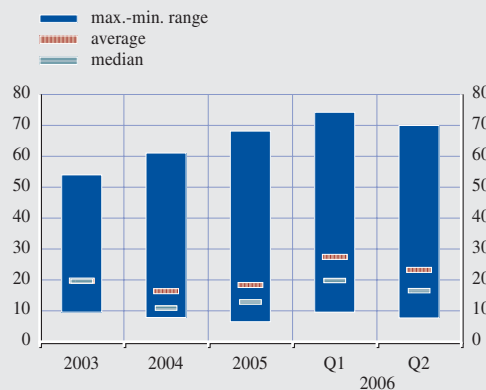
- max.-min. range
- average
- median



Sources: Annual reports, earnings releases and ECB calculations.
Note: The institutions included are Goldman Sachs, JP Morgan Chase & Co., Morgan Stanley, Merrill Lynch, Citigroup, UBS, CSFB, HSBC, Barclays and RBS. Their inclusion is based on the availability of comparable data.

The income growth of global banking groups in the first half of 2006 appears to have been driven by a strengthening of several sources of income. For banks with large diversified operations, including substantial retail banking operations in the US, income from the EU and emerging markets was strengthened by increases in interest income and trading income.[11] For large securities firms, the main increases included rising trading income and investment banking fees – especially for M&A activity – as well as improved debt and equity underwriting.[12] Cost controlling also contributed to increased profitability.

The trading revenues of these institutions, which had picked up in 2004-2005, continued to rise in the first half of 2006, despite the short-lived surge in volatility in some markets in May and June (see Chart 1.26). Whereas some institutions benefited from developments in various commodity and currency positions, others benefited through their hedge fund operations, including their prime brokerage relationships with this sector.

The exposure of large global banking groups to interest rate risk, as gauged using Value at Risk

(VaR) indicators, decreased between Q2 2005 and Q2 2006, both in terms of absolute percentage changes, and also when scaled by Tier 1 capital. Declines in this regard were very large for some institutions (see Chart 1.27). Interest rate and equity risk remained the largest sources of market risk, based on VaR models, for these institutions (see Table S2).[13] Notably, there was a significant increase in the amount of capital allocated to commodities and energy trading as well as to equity markets, including emerging markets.

While it cannot be ruled out that the increases in VaR figures for some asset classes may have been due, in part, to the volatility spike in some markets during May and June, it was notable

11 See Federal Deposit Insurance Corporation (2006), "Quarterly Banking Profile", second quarter.
12 See Fitch Ratings (2006), "2Q06 Peer Data for Securities Firms", Special Report, August.
13 It should be borne in mind that comparisons of VaRs across these institutions are not straightforward owing to differences in calculation methods, holding periods and underlying assumptions. Hence, they can only be regarded as very approximate indicators of the market risk profile of these institutions. See G. Levy-Rueff (2005) "Significance and Limitations of the VAR Figures Publicly Disclosed by Large Financial Institutions", *Banque de France Financial Stability Review*, November.
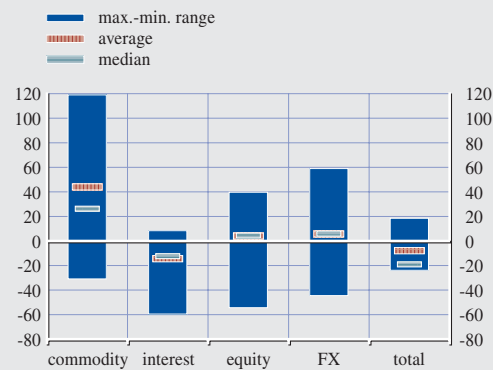
Sources: SEC filings, earnings releases and ECB calculations.
Note: The institutions included are JP Morgan Chase & Co., Morgan Stanley, Citigroup, Bank of New York, UBS, CSFB and HSBC. Their inclusion is based on the availability of comparable data.

**Chart 1.28 Changes in subordinated CDS spreads and equity prices for global large and complex banking groups in May-June**

(Q2 2006, cumulative % change)
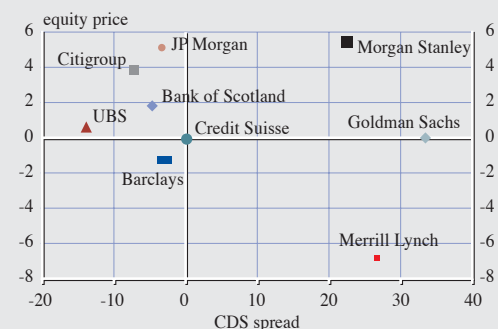


Sources: Bloomberg and ECB calculations.
Note: Cumulative % changes over the second quarter of 2006, based on daily data. Their inclusion is based on the availability of comparable data.

that total VaR figures showed on average no significant change. This would tend to suggest that trading patterns after the finalisation of the June 2006 FSR may have been aimed primarily at portfolio reallocation rather than greater overall risk-taking.

In the six months after the finalisation of the June 2006 FSR, the stock prices of these large global banking groups experienced some volatility, despite the fact that some private sector analysts revised their earnings forecasts for certain stocks upwards after the disclosure of first quarter earnings results. The main explanation for this volatility appears to have been a rise in risk aversion among investors, against a background of heightened equity market volatility in May and June.

Concerns may have existed in financial markets about the fact that many of these large global banks have considerable exposures – both direct and indirect – to capital markets. In certain cases, the credit default swap (CDS) premia of these institutions also widened when the equity price declined. Overall, however, this appeared to be differentiated across institutions and markets (see Chart 1.28). After the end of the

second quarter, the equity prices of these institutions rose and CDS spreads narrowed (see Charts S8 and S11).

Overall, market indicators as well as rating agencies' assessments point towards a generally positive assessment for global banking groups, although this rests on the assumption of broadly calm conditions in global capital markets.

**JAPANESE BANKS**

The financial conditions of Japanese banks continued to improve in FY 2005, which ended in March 2006. The profitability of the 12 major Japanese banks reached a record high of 3 trillion JPY, a significant year-on-year increase of 2.4 trillion JPY. This reflected strong operating revenues driven by the strengthening of the economic expansion, coupled with a further fall in loan losses.[14] The average non-performing loan (NPL) ratio – expressed as a percentage of total credit exposure – of the 12 major Japanese banks stood at 1.8% at the end of FY 2005, compared with 2.9% in FY 2004. The decrease in NPLs

14 According to data from the Financial Services Agency of Japan. See FSA Newsletter, July 2006.

reflects firms' improved business performance against the background of the ongoing economic recovery in Japan, together with progress made by major banks in restructuring struggling firms.

The solvency ratios of Japanese banks also improved in FY 2005: by the end of the period, the capital adequacy ratio of major Japanese banks had increased by 0.6 percentage points to 12.2%.[15] As a consequence of this renewed risk-taking capacity, combined with the corporate sector's business capital spending strength, the lending attitude of Japanese banks has become more positive. The resulting decrease in lending rates, coupled with a gradual rise in market interest rates, caused interest margins on loans to contract, raising some concerns about the ability of Japanese banks to assess accurately the balance of risk.

Looking forward, Japanese major banks' renewed efforts at expanding overseas, particularly into Asia, by providing financial services to companies operating abroad could contribute to improving profit levels as well as diversifying credit risks.

### HEDGE FUNDS

After the finalisation of the June 2006 FSR, some hedge funds, especially those with directional strategies, endured some financial losses, mainly as a consequence of turbulence in the financial markets during May and June. Later on, there were some highly publicised adverse developments in the hedge fund sector related to activities in the natural gas market in August and September. Nevertheless, the industry continued to deliver positive returns, and has benefited from increased investor demand. Moreover, various markets have continued to expand and benefit from active hedge fund participation.

Following net outflows during the final quarter of 2005, aggregate net inflows into hedge funds recovered in the first half of 2006, rising close to the peaks observed during 2004 (see Chart S13). After seven negative quarters in a row,

**Chart 1.29 Global hedge fund quarterly net flows by strategy**

(Q1 2005 - Q2 2006, USD billions)
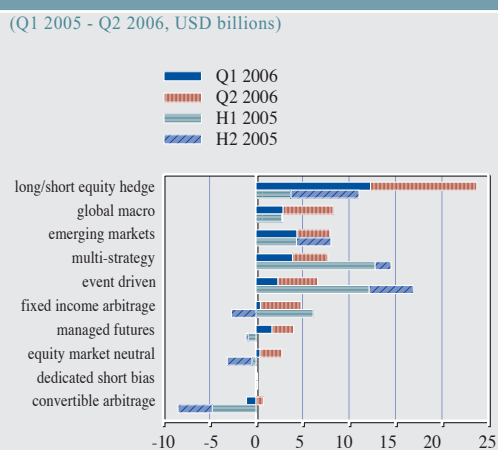


Source: Tremont Capital Management.

even convertible arbitrage funds recorded inflows in the second quarter of 2006 (see Chart 1.29). Directional hedge funds – particularly those pursuing long/short equity hedges, global macro and emerging market strategies – recorded the strongest inflows.

The amount of capital under the management of hedge funds can be decomposed into cumulative net flows – inflows less redemptions – and the cumulative returns on investment positions. Between end-June 2005 and end-June 2006, capital under management grew by almost 30%, of which roughly 10% was due to net flows and 20% to returns (see Chart S14). Around half of total capital under management globally can be attributed to accumulated returns (see Chart 1.30).

At the same time, the share of capital managed by the largest hedge funds has also grown. In fact, the sector can be seen as increasingly bifurcating into two groups: a smaller number

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15 The quality of capital also improved, as there was a substantial decline in the use of net deferred tax assets (DTAs) as a source of regulatory capital. As a result, banks were able to accelerate the repayment of public funds they had received in the past to boost their capital. By the end of March 2006, about half of the total 12 trillion yen received in public capital injections since 1998 had been repaid.

**Chart 1.30 Decomposition of global hedge fund capital under management**

(Q1 1994 - Q2 2006, USD billions)
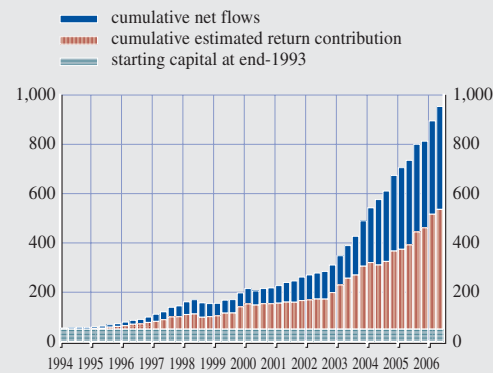
- cumulative net flows
- cumulative estimated return contribution
- starting capital at end-1993

Sources: Tremont Capital Management and ECB calculations.
Note: Excluding funds of hedge funds. Estimated quarterly return to investors equals the difference between the change in capital under management and net flows. In this dataset, capital under management totalled USD 954 billion at the end of June 2006.



**Chart 1.31 Global hedge fund returns in 2006**

(Jan. 2006 - Sep. 2006, %, monthly net of all fee returns in USD)

- Q1
- April
- May
- June
- Q3
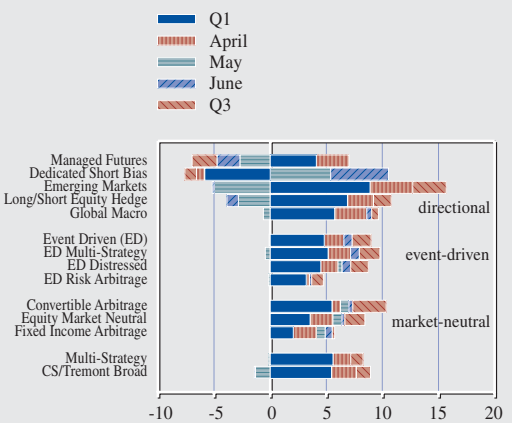
Source: Credit Suisse Tremont Index.

of large institutionalised firms – often backed by large financial groups – managing the bulk of capital, and a much larger number of smaller hedge fund managers with less developed business administration and risk management systems. The largest funds have also reportedly benefited from occasional "flight-to-quality" episodes, such as those of May/October 2005 and May/June 2006.

Although the turbulence in financial markets in May and June had a significant impact on performance, especially for directional strategies, hedge fund returns were broadly positive afterwards and year-to-date returns remained positive for all major hedge fund strategies by the end of September, with the exception of managed futures (see Chart 1.31). Moreover, market-neutral or arbitrage strategies weathered the May/June episode reasonably well, indicating that for these strategies, higher volatility, even if unexpected, can prove profitable. However, around half of investors' capital remained allocated to directional strategies, whereas the share of market-neutral (hedged) strategies has been falling since 2003 (see Chart S15).

Taking a somewhat longer-term perspective, a notable pattern over recent years has been the pronounced, and broad-based, drop in the volatility of hedge fund returns (see Chart 1.32). While the main explanation for this may have been a general decline in the degree of volatility across a host of asset classes, other hedge fund-specific factors may have also played a role. First, institutional investors – who have become increasingly important hedge fund investors – tend to prefer funds with good diversification properties and secure returns, thus making stable return performance an important competitive factor in attracting funds. Second, risk management systems, especially those of the largest funds, have been continually improving, allowing funds to dampen volatility. Third, intense competition and fewer profitable trading opportunities across common strategies have reportedly driven more funds into taking positions in less liquid assets, thereby dampening the overall volatility of hedge fund performance. This is because the prices of illiquid assets tend to move rather infrequently. Finally, many hedge fund managers may prefer a steady flow of management fees, calculated on the basis of capital under management,

**Chart I.32 Dispersion and volatility of global hedge fund monthly returns**

(Jan. 1994 - June 2006, %, net of all fee returns)

- 90th-10th percentile range
- interquartile range
- 12-month moving volatility of CS/Tremont Broad Index
- standard deviation of monthly changes of ten CS/Tremont indices
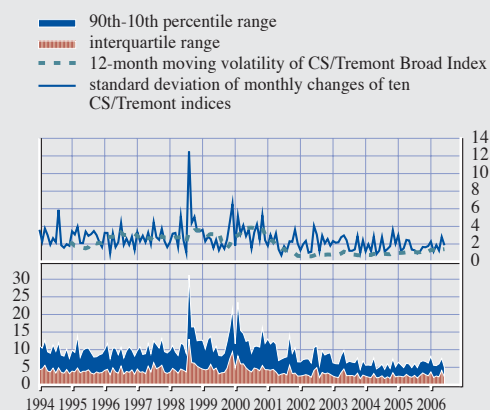


Sources: Lipper TASS database, Credit Suisse Tremont Index and ECB calculations.
Note: Excluding funds of hedge funds. The ten CS/Tremont hedge fund indices comprise Multi-Strategy, Equity Market Neutral, Convertible Arbitrage, Fixed Income Arbitrage, Event Driven, Managed Futures, Emerging Markets, Global Macro, Dedicated Short Bias, Long/Short Equity Hedge.

rather than performance fees which carry higher uncertainty. This is especially the case as unsuccessful efforts to earn high returns might unsettle investors and cause redemptions. This may explain why some funds of hedge funds are now looking to invest in younger hedge funds with insufficient capital under management and whose managers still need to build up a good investment track record.

Furthermore, lower volatility of hedge fund returns may not necessarily mean that hedge funds are taking less risk, since they may be just jumping out of risk earlier in order to prevent larger losses. As long as markets remain liquid, such actions do not pose an immediate risk, but could nevertheless prove damaging in the case of correlated exits amid sharply decreasing investor risk appetite.

**RISKS FACING THE HEDGE FUND INDUSTRY**
An important risk that hedge funds face is so-called redemption risk, whereby investors demand their money back. This risk, which plays an important role in determining the volatility of capital bases, can affect hedge

funds differently owing to factors such as varying subscription frequencies, redemption restrictions (e.g. initial lock-up periods, redemption frequencies, redemption notice and payout periods) and investor structures. If hedge funds do not have sufficient amounts of liquid assets on their balance sheets, unexpected and widespread withdrawals from hedge funds can result in forced liquidations of positions. If other institutions are unwilling to take the positions that hedge funds attempt to sell, ultimately the result could be volatility spikes and a drying up of liquidity in the affected markets. Hence, a stable capital base, consisting of both investor funds and financing provided by banks, is crucial for ensuring that hedge funds have the ability to act as risk-takers in times of stress and provide, rather than withdraw, liquidity from markets which might already be strained.

As information on gross flows is not available, one way of monitoring investor activity is to aggregate separately hedge funds that experienced net inflows or net outflows during an analysis period. The sum of net investments and absolute net redemptions would indicate the minimum level of gross flows. This lower boundary for quarterly gross flows ranged between 6 and almost 18% of capital under management by strategy during the six quarters to June 2006. However, net redemptions are more important from a financial stability perspective, since large outflows could cause sell-offs and disrupt affected financial markets. Since the beginning of 2005, hedge funds using market neutral strategies have been experiencing relatively larger and more volatile net redemptions, although none of the strategies experienced extreme redemption activity in the first half of 2006 (see Chart 1.33).

In addition to various hedge fund-specific factors and the general macro-financial environment,[16] net flows into individual hedge funds can also be affected by idiosyncratic risk

16  See Box 17 in ECB (2006), *Financial Stability Review,* June on funding liquidity risks for hedge funds.

**Chart I.33 Global hedge fund aggregate quarterly net redemptions and net investments by strategy since 2005**

(Q1 2005 - Q2 2006, % of capital under management at the end of the previous quarter)
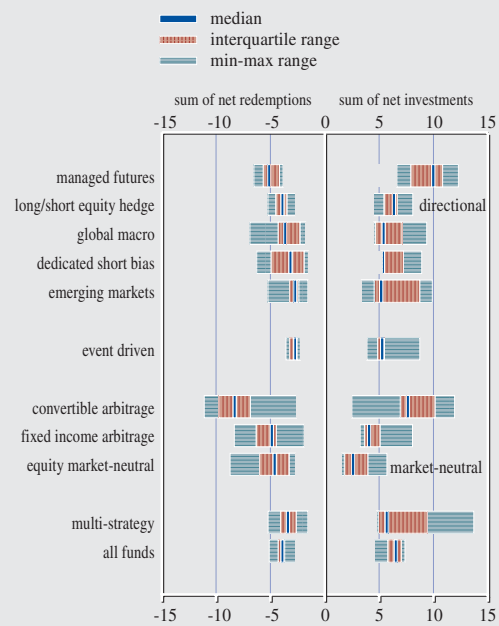
- median
- interquartile range
- min-max range

Sources: Tremont Capital Management and ECB calculations.
Note: Excluding funds of hedge funds. For each strategy and every quarter, "net redemptions" refers to the sum of outflows of managers experiencing net outflows, while "net investments" refers to the sum of the inflows of managers receiving net inflows, both divided by the total capital under management of the strategy at the end of the previous quarter.



**Chart I.34 Global hedge fund redemption frequency by strategy**

(June 2006, % of capital under management)

- up to 1 month
- 3 months
- 6 months
- 1 year
- other
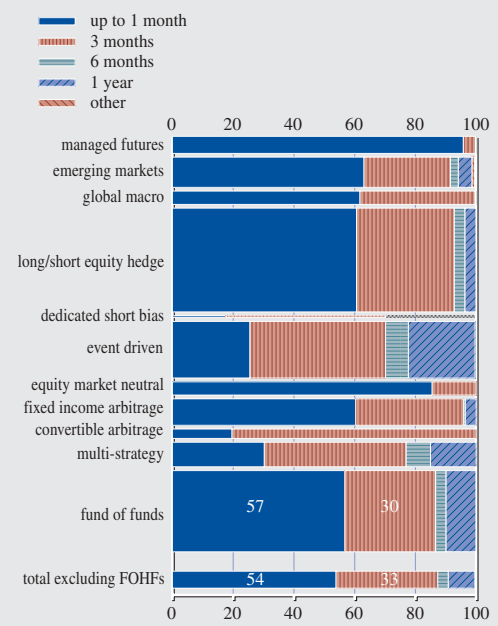
Sources: Lipper TASS database and ECB calculations.
Note: Except for the last bar, the size of the rectangles reflects the relative size of capital under management in the database.

stemming from funds of hedge funds (FOHFs). FOHFs resemble banks in that they perform a similar maturity transformation function, when they offer their investors more favourable redemption terms than underlying single-manager funds. The redemption frequencies of FOHFs appear generally higher than those of single-manager hedge funds (see Chart 1.34).[17] Thus, a mismanagement of funding liquidity risk, for example related to higher redemptions caused by the departure of a key FOHF manager or a badly constructed and underperforming investment portfolio, could lead to forced withdrawals from underlying single-manager hedge funds. FOHFs may also redistribute their allocations due to changing market conditions or other reasons that have nothing to do with underlying single-manager hedge funds, and are therefore difficult to foresee.

**RISKS POSED BY HEDGE FUNDS**

The degree of correlation of hedge fund returns across different strategies reflects both the degree of return correlations across the asset classes in which hedge funds invest, and the degree of homogeneity in the investment strategies pursued by the funds themselves. Hence, if the degree of correlation of hedge fund returns across different strategies is rising, it could reflect increasing correlation across asset classes or style drift by funds. However, rising correlations within a strategy are mostly

17 Account should also be taken of the fact that hedge funds which decide to advertise their performance in commercial databases generally aim at attracting new investors, and thus may generally offer more favourable redemption terms than funds which do not participate and are often closed to new investors. This difference is likely to be more relevant for single-manager hedge funds than for FOHFs.

a reflection of increasingly similar positioning across hedge funds, not necessarily achieved by using identical financial instruments, and it may indicate vulnerabilities such as the so-called crowding of trades, which can, if exposed by an adverse disturbance, ultimately pose the risk of simultaneous disorderly exits from the affected markets.[18]

During the first half of 2006, correlations among and within hedge fund strategies remained broadly stable (see Charts 1.35 and 1.36). Notably, however, correlations among convertible arbitrage funds[19] – frequently mentioned as using a crowded strategy – have declined markedly. Although this may have been a reflection of the end of a prolonged period of investor outflows from the strategy and higher convertible bond issuance, which together alleviated stretched capacity, it may also have reflected a diversification strategy,

involving a style drift with the aim of stemming an exodus of investors.

Correlations among multi-strategy hedge funds were rising, but still fell short of FOHFs, as multi-strategy funds have often evolved out from, and continue to be centred on, a core strategy.

It is noteworthy that the misfortunes of several hedge funds in the natural gas market in August and September have not led to wider turbulence. In September, the natural gas positions of Amaranth Advisors, a large multi-strategy fund, were successfully passed on to a few other large investors willing and able to sustain in their

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18 See also Box 2 in ECB (2005), *Financial Stability Review,* June on the crowding of trades by hedge funds.
19 A typical investment of convertible arbitrage funds is long in the convertible bond and short in the common stock of the same company.

**Chart 1.35 Medians of pairwise correlation coefficients of monthly hedge fund returns within strategies**

(Jan. 1995 - June 2006, monthly returns in USD, net of all fees, moving 12-month window)

fund of funds
convertible arbitrage      (3%)
multi-strategy              (13%)
long/short equity hedge  (32%)
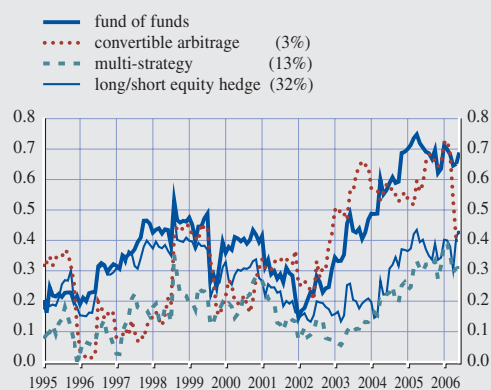


Sources: Lipper TASS database, Tremont Capital Management and ECB calculations.
Note: Numbers in parentheses after strategy names indicate the share of total capital under management (excluding funds of hedge funds) at the end of June 2006, as reported by Tremont Capital Management. Medians are probably slightly biased, since time series of hedge fund returns in the database were not adjusted for sub-fund structures, which represent counterpart onshore and offshore funds or different classes of shares with different fee structures, lock-up periods and other "technical" differences, and which basically correspond to the same pool of money managed in a highly correlated or nearly identical way.

**Chart 1.36 Correlations among hedge fund strategies**

(Jan. 1995 - June 2006, 12-month moving window, average pairwise correlation coefficients among ten CS/Tremont hedge fund indices)

weighted average (quarterly)
simple average (monthly)
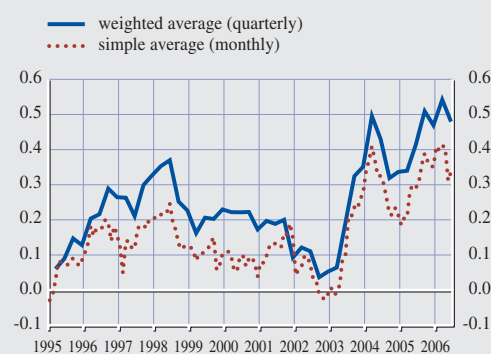


Sources: Credit Suisse Tremont Index, Tremont Capital Management and ECB calculations.
Note: The ten CS/Tremont hedge fund indices comprise Multi-Strategy, Equity Market Neutral, Convertible Arbitrage, Fixed Income Arbitrage, Event Driven, Managed Futures, Emerging Markets, Global Macro, Dedicated Short Bias, and Long/Short Equity Hedge. The weighted average correlation is calculated according to the formula:

$$weighted\ average = \frac{\sum_{i<j} corr_{ij} \times (w_i + w_j)}{\sum_{i<j}(w_i + w_j)}, where\ corr_{ij}$$

is a pairwise correlation coefficient between 12-monthly returns of strategies $i$ and $j$. Weights $w_i$ and $w_j$ refer to the shares of capital under the management of strategies $i$ and $j$ at the end of a 12-month window.

view temporary price declines, thus avoiding immediate large sell-offs. Another important mitigating factor was that forced liquidations of other parts of the fund's portfolio – which included leveraged loans and other assets – did not disrupt the functioning of seemingly unrelated markets, which proved sufficiently liquid to absorb the unexpected spillover. The total loss experienced by the fund was much larger than that incurred by LTCM in 1998, even though the level of leverage employed was reportedly significantly lower.[20] This occurred against a backdrop of rather benign market conditions, and it cannot be excluded that in a more turbulent environment, such as after the Russian crisis in August 1998, the impact could have been much more disruptive.

Obtaining more granular information on hedge fund portfolios is difficult, even for investors and prime broker banks, who as a consequence may not have an adequate picture of the overall risk profile of a hedge fund (see Box 5).

20 For more details on the episode, see for example H. Till (2006), "EDHEC Comments on the Amaranth Case: Early Lessons from the Debacle", 2 October.

### HEDGE FUND RISK TRANSPARENCY

Three important issues are frequently raised in public policy discussions concerning hedge funds: risks to financial stability, regulation, and transparency. There is an ongoing debate as to whether the solution to financial stability concerns lies in regulating these institutions or in enhancing their transparency. The general view is that direct regulation of hedge funds may be neither desirable nor feasible, and that so-called indirect regulation – through the regulation of counterparties and creditors of hedge funds as well as by raising investor awareness – may be the best way to manage hedge fund-related risks. The indirect approach places great emphasis on regulated entities (e.g. prime broker banks) applying prudent risk management and market discipline in their dealings with hedge fund clients.[1] As such, for the approach to work, the information disclosed to regulated counterparties by a hedge fund must be sufficient to allow them to monitor their risks effectively. A key concern in applying this approach is that banks are often not informed in a sufficiently detailed and timely fashion on the entire portfolio held by individual hedge funds (hereafter "the portfolio problem"), and are therefore unable to detect crowded (concentrated) trades across their hedge fund clients.[2] The portfolio problem carries with it the risk of building up excessive leverage, whereas crowded (concentrated) trades may threaten liquidity available in major financial markets. Both of these aspects were important during the near-collapse of LTCM, a large hedge fund, in September 1998. The purpose of this Box is to provide an overview and assessment of various proposals that have been made to enhance the transparency of hedge fund activities, and to shed some light on some potential market-based solutions to the portfolio problem.

1  It should be acknowledged that investors can also have their say, and have increasingly been doing so, by shying away from placing their funds with the most opaque hedge fund managers. For a broader discussion on counterparty risk management and related operational risk and transparency issues in particular, see also Counterparty Risk Management Policy Group (2005), "Toward Greater Financial Stability: A private Sector Perspective", July.
2  Banks can also face challenges in firm-wide aggregation of multiple trading, financing and investment exposures to individual hedge funds or groups of hedge funds with similar strategies. See ECB (2005), "Large EU Banks' Exposures to Hedge Funds", November.

Following the LTCM incident, many international investigations and initiatives were undertaken with the aim of preventing the reoccurrence of similar crises. Most of them underscored the need for enhanced transparency by highly leveraged institutions (HLIs), foremost among them hedge funds. In April 2000, the Financial Stability Forum (FSF) published a report[3] which analysed four basic measures for improving the information available on the activities of hedge funds and other HLIs.

The first measure relates to *enhanced reporting to supervisors and regulators by HLI counterparties*. This route has been followed by the UK's Financial Services Authority (FSA), which regularly collects information from selected prime brokers on their largest exposures to hedge funds.[4] According to the FSF report, a limitation of the approach is that such reporting and information exchange would be primarily directed at improving the supervision of the credit provider, and would also only be available to regulators. Hence, it would not directly strengthen the market discipline applied by hedge fund counterparties, although supervisors can also step up their oversight of counterparty risk management processes.

The second measure considered by the FSF was *confidential reporting by HLIs to authorities* without public disclosure of the reported information. Indeed, some of the largest hedge funds seem willing to share information with supervisors, including reporting information on their risk profiles. A drawback of this option, however, is that voluntary disclosure may yield only a fragmented picture of overall hedge fund activities. Moreover, the approach carries with it the possibility of regulatory moral hazard in that HLI counterparties might come to believe that the authorities are in a position to use the information they receive to prevent undesirable outcomes, thus reducing the incentive for these counterparties to carry out their own due diligence effectively.

The third measure analysed by the FSF as an efficient way of ensuring proper credit and market discipline was *public disclosure by all HLIs,* whether regulated or not. There is widespread acknowledgement that the nature of disclosures should not compromise the legitimate proprietary interests of the entities making them. For instance, according to the Investor Risk Committee of the International Association of Financial Engineers (IAFE), disclosures should minimise the possibility of adverse impacts on hedge fund returns.[5] It should also be recognised that hedge fund disclosures can become outdated very quickly in fast-moving markets, and there is no agreement among practitioners on what would constitute comprehensive risk disclosure.

In April 2001, the Multidisciplinary Working Group on Enhanced Disclosure[6] came up with proposals aimed at promoting a level playing-field in transparency among all financial intermediaries. It encouraged greater and more comparable disclosure, and identified possible areas for improvement in disclosure practices that should enhance the understanding of the risks borne by all financial intermediaries. For example, it concluded that a more complete view of an institution's exposure to risk would require information being disclosed about the variation of intra-period exposures – particularly in the form of high, median and low values.

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3  See FSF (2000), "Report of the Working Group on Highly Leveraged Institutions", April.
4  It should be noted that the FSA acknowledges that some large leveraged hedge fund portfolios would still go undetected if large positions were spread across several banks.
5  See IAFE Investor Risk Committee (2001), "Hedge Fund Disclosure for Institutional Investors", July.
6  See Multidisciplinary Working Group on Enhanced Disclosure (2001), "Final Report to BCBS, CGFS, IAIS and IOSC", April.

So far these proposals have not influenced the actual disclosure practices of either regulated or unregulated firms.

While existing sound practices for hedge fund managers tend to focus on disclosures to investors, regulators and counterparties,[7] a proposal was recently made along the lines of voluntary public disclosure, which encouraged hedge funds to seek external credit ratings.[8] The existence of credit ratings could help hedge funds to secure long-term financing, potentially eliminating funding uncertainties, for instance as to whether overnight lending will be made available by prime brokers. However, credit ratings are not free, which means that they might only be affordable for large funds. At the same time, credit ratings may not eliminate other potential sources of risks for financial stability, such as those arising from similar positioning across smaller hedge funds with less advanced risk management systems. Moreover, while credit ratings provide a measure of the long-term credit strength of a debtor, they may not be reflective of rapidly changing risk profiles, a characteristic of hedge funds which often pursue active investment strategies and have flexible mandates. Nonetheless, the main advantage of the proposal is that it is a market-based initiative. It is also important to note that for the proposal to succeed, it would require a critical mass of hedge funds seeking ratings, while it should be borne in mind that other proposed forms of voluntary public disclosure have not yet met with success.

The last measure discussed in the FSF report was to introduce an *international HLI credit register*. The effectiveness of such a measure depends on its design, particularly regarding a solution to the portfolio problem. A credit or position register would contain centralised information on the exposures of all significant regulated firms to HLIs, including not only exposures to hedge funds and other unregulated HLIs, but also to other reporting firms (e.g. prime broker banks). In addition to the potential regulatory moral hazard issue, this proposal immediately raises several practical questions.[9] First, how should HLIs, and hedge funds in particular, be defined? Second, who will collect such sensitive data given its proprietary nature and importance for the safeguarding of systemic liquidity in international financial markets? Third, who, in addition to regulators, would be granted access to the information gathered, and how would the surrounding legal issues be resolved? Fourth, given that data would need to be collected at least on a daily frequency and should include every on- and off-balance sheet position in order to account for offsetting positions, how should such information be aggregated and presented in a meaningful way without compromising proprietary interests? Moreover, the information summaries produced should enhance market discipline and provide market participants with early warning signals of looming financial stability risks.

An HLI position register, nevertheless, could help tackle the portfolio problem encountered by prime brokers when their hedge fund clients spread positions across multiple counterparties. This is because it would provide prime brokers with frequent and aggregated risk information on the whole portfolio of an individual hedge fund. However, in order to ensure a level playing-field, any contributing HLI, whether regulated or not, should be able to monitor aggregated risk

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7   See, for example, AIMA (2002), "Guide to Sound Practices for European Hedge Fund Managers", August; MFA (2005), "2005 Sound Practices for Hedge Fund Managers", August.
8   See, for example, M. Westlake (2006), "German Hedge Fund Scheme Wins 'Encouraging' Support", *Global Risk Regulator,* Vol. 4, No 7, July/August.
9   See also comments on this proposal by B. S. Bernanke (2006), "Hedge Funds and Systemic Risk", a speech at the Federal Reserve Bank of Atlanta's 2006 Financial Markets Conference, 16 May.

reports for any other HLI to which it has an exposure. This twist again highlights the issues of risk aggregation and access to gathered information.

Notwithstanding the sheer complexity of practically implementing the proposal for an international HLI position register, it is noteworthy that some of its useful features could perhaps be, and in some cases already are, provided by private market participants.[10] An illustrative product concept with associated information flows and reporting options is depicted in Figure B5.1. This figure shows that a hedge fund could supply information to an independent service provider, which would furnish customised aggregated information packages to various recipient groups based on their access level. The current market standard is at monthly reporting frequency, but hedge funds with liquid strategies would need to report on at least a daily basis. However some institutions administering investable hedge fund index platforms argue that even daily reporting is not sufficient in terms of providing full risk transparency of dynamic hedge fund strategies (e.g. to detect a strategy drift) and, therefore, information needs to be collected on every intraday transaction. Different parties may be allowed to see different information, although a substantial proportion of large hedge funds provide the same monthly risk reports

10 See, for example, C. Davidson (2005), "Clear Thinking Needed", *Risk,* March, pp. 18-20.
11 See Mercer Oliver Wyman (2006), "Risk Taking and Risk Management in the Hedge Fund Industry: Review of Market Practices", July.

**Figure B5.1 Risk aggregation and monitoring services: Information flows and possible reporting options**
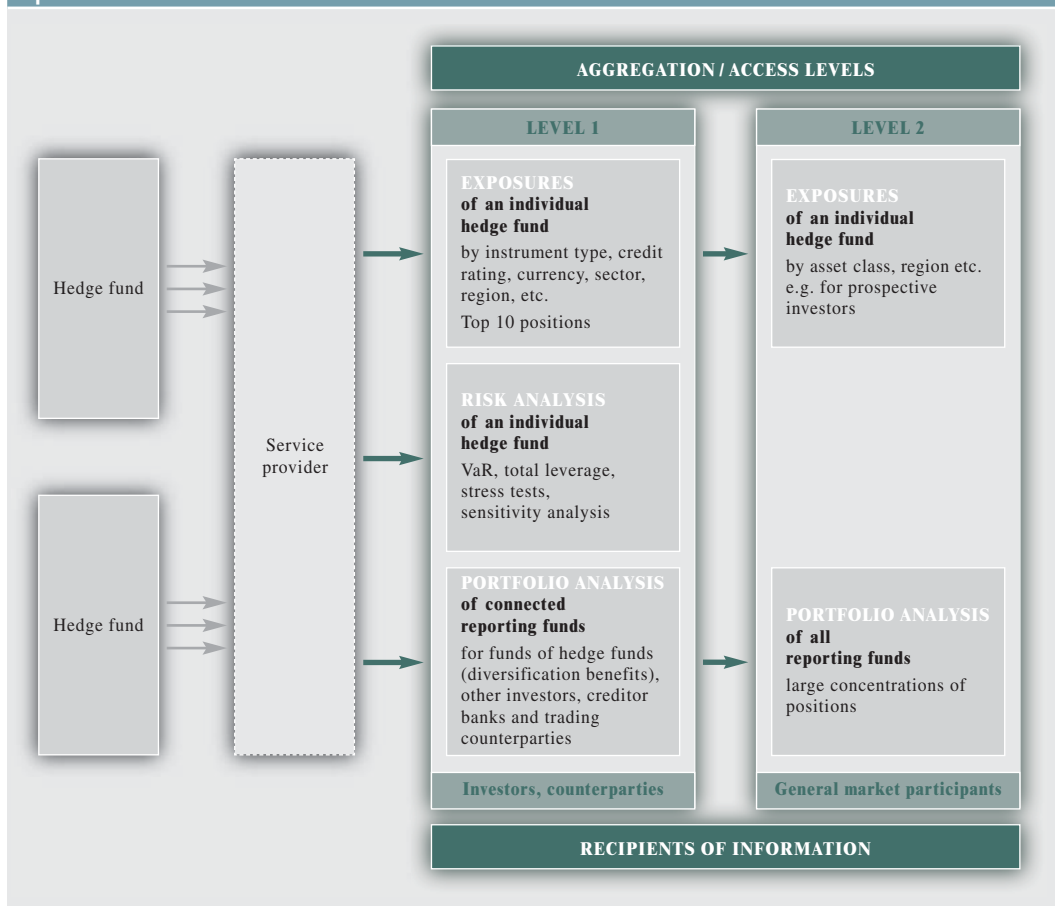
to both their investors and counterparties.[11] Investors could also be offered diversification analyses of their portfolios of reporting funds. To achieve all of this, the requirements for the risk aggregation and monitoring service provider would be enormous and, among others, would include historical and real-time data feeds, flexible software systems, up-to-date valuation methodologies, sophisticated risk calculation models and otherwise keeping abreast of financial and technological innovations. This is also an important reason why it is preferable, to the extent possible, to entrust such a task to competing private market participants.

If banks were to request their hedge fund clients to subscribe to such risk aggregation and reporting services, then they would be able to monitor the whole portfolio of a hedge fund and would perhaps be in a better position to detect some potentially risky concentrations of large exposures among and across their hedge fund clients. However, in order to ensure a level playing-field and to obtain a truly global picture, banks themselves would also need to report their positions. Then all service providers would essentially become position registers and would need to be encouraged to report regularly standardised market concentration data, perhaps with some coordination provided by the public authorities.

To sum up, enhanced transparency on the risk profiles of hedge funds is a necessary precondition for ensuring that efficient market discipline is applied by hedge fund counterparties. It could prove a viable alternative to direct regulation, especially if it were supported by undistorted incentives which prevent market discipline from occasionally breaking down. Of all the alternatives, an international HLI position register would theoretically offer the best solution for tackling the portfolio problem related to the lack of timely aggregate risk information on a hedge fund and hedge funds as a whole. However, it is also the most complicated measure. This notwithstanding, there are already some market products available which have features similar to a HLI position register and which could potentially evolve into market-based solutions.

In the absence of this information, indirect methods can be applied, such as applying statistical techniques (e.g. regression methods) to detect the various risk factors that generate hedge fund returns. In addition, the information reported by hedge funds to commercial hedge fund databases can help in assembling qualitative aggregate data for the markets and assets hedge funds tend to trade in. According to such data from one database, most single-manager hedge funds invested in equity rather than in fixed income markets, and only a few were active in commodity, currency and other markets (see Table 1.1). The detection of a high hedge fund presence in credit markets could be considered a vulnerability. This is because positions in credit markets tend to be more leveraged and less liquid than those in equity markets. At the same time and according to some market surveys, hedge funds have been an increasingly dominant trading presence in credit markets, some of which "could not function efficiently without them" and in some cases they are even reported to "have become the market".[21] Nevertheless, in equity markets the risk of hedge funds holding the same portfolio is also important and can lead to underperformance of stocks in these portfolios.[22]

21 See Greenwich Associates (2006), "Hedge Fund Fixed-Income Trading Volumes Soar", 13 September, press release.
22 See, for example, D. J. Kostin, R. Koyfman, J. Binder and C. Maasry (2006), "US Equity Views: Performance, Fundamentals, and Risk", Goldman Sachs, *Portfolio Strategy,* 9 June, which is based on an analysis of long equity holdings disclosed in 13-F filings by 550 hedge funds with USD 650 billion of equity assets. The report shows that from 9 May to 8 June 2006, stocks that appeared most frequently in hedge fund portfolios, or where hedge funds had large aggregate ownership interests, underperformed relative to the market.

## Table 1.1 Mapping hedge fund activities by strategy

(June 2006, % of capital under management)

| | Primary focus | | | | | Trade in | | | | Geographic focus | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Equities | Fixed income | Commod-ities | Cur-rency | Other | Equities | Fixed income | Commod-ities | Cur-rency | Global | US | Western Europe | Asia Pacific |
| Convertible arbitrage | 70 | 75 | – | 4 | – | 89 | 90 | 1 | 61 | 61 | 29 | 13 | 12 |
| Dedicated short bias | 69 | 10 | – | – | – | 89 | 10 | 2 | 1 | 1 | 97 | – | – |
| Emerging markets | 42 | 39 | – | 5 | – | 69 | 60 | 11 | 54 | 40 | 1 | 8 | 25 |
| Equity market neutral | 62 | 9 | – | … | – | 95 | 43 | 3 | 42 | 16 | 64 | 16 | 5 |
| Event driven | 41 | 36 | 3 | 4 | – | 75 | 70 | 8 | 46 | 23 | 52 | 39 | 12 |
| Fixed income arbitrage | 6 | 90 | – | 13 | … | 29 | 97 | 2 | 43 | 66 | 37 | 17 | 5 |
| Fund of funds | 38 | 22 | 10 | 10 | – | 68 | 57 | 29 | 41 | 75 | 22 | 19 | 13 |
| Global macro | 29 | 41 | 26 | 55 | – | 74 | 92 | 56 | 95 | 93 | 4 | 4 | 6 |
| Long/short equity hedge | 71 | 4 | 1 | 4 | … | 94 | 24 | 9 | 46 | 34 | 23 | 31 | 12 |
| Managed futures | 31 | 62 | 72 | 63 | – | 51 | 80 | 87 | 83 | 85 | 39 | 35 | 29 |
| Multi-strategy | 35 | 61 | … | 2 | – | 95 | 88 | 12 | 42 | 48 | 44 | 14 | 10 |
| TOTAL excl. FOHFs | 49 | 34 | 7 | 10 | … | 79 | 58 | 15 | 51 | 42 | 32 | 25 | 13 |

▉ equal or greater than 75
▉ equal or greater than 50 and less than 75
▉ equal or greater than 25 and less than 50

Sources: Lipper TASS database and ECB calculations.
Note: Data only refer to funds with capital under management. In this dataset, total capital under management of single-manager hedge funds amounted to USD 472 billion.

Overall, the performance of the hedge fund sector generally remained strong over the last six months. However, widespread losses in May/June and the financial distress of a large multi-strategy fund in September serve as reminders of their possible negative effects. Whereas risks faced by hedge funds arise mainly from their relatively high appetite for risk-taking and from funding liquidity management, their collective actions in times of stress could potentially undermine the smooth functioning of affected financial markets and cause losses for their creditors, foremost banks.

## 2 THE EURO AREA ENVIRONMENT

*Notwithstanding the sustained economic expansion in the euro area after the finalisation of the June 2006 FSR, macro-financial vulnerabilities related to corporate sector re-leveraging – financed at floating rates – and growing household sector indebtedness have either remained or grown over the past six months. Greater leverage in both of these sectors may have raised the interest rate sensitivity of their net worth. Although the financial stability risks may, to some extent, be mitigated in the short term by a favourable economic outlook with limited downside risks, an adverse turn in the credit cycle cannot be excluded looking further ahead, especially in the event of a renewed increase in oil prices. Finally, house prices remain dynamic in the euro area and some Member States continue to remain vulnerable to a correction in house prices.*

## 2.1 ECONOMIC OUTLOOK AND RISKS

Adverse macroeconomic shocks can trigger the unravelling of non-financial sector balance sheet vulnerabilities. By contrast, a stable macroeconomic environment can make an important contribution to financial system stability. In the first half of 2006, despite further rises in the price of oil and an appreciation of the euro in effective terms, the momentum of economic growth in the euro area picked up significantly: euro area real GDP expanded strongly in the first quarter, and the pace of activity accelerated further in the second, reaching the highest quarterly growth rate in the last six years. As a result, since the finalisation of the June 2006 FSR, and despite a slight deterioration in oil price and exchange rate expectations, Consensus Forecasts for GDP growth in 2006 were gradually revised upwards (see Chart 2.1).[1] Consistent with this, the ECB staff macroeconomic projections published in September 2006 point to real GDP growth of between 2.2% and 2.8% in 2006, up from a range of 1.7% to 2.5% in the March 2006 projections. The recent fall in oil prices, if it

were to prove lasting, could lead to somewhat stronger growth.[2]

Looking slightly further ahead, indications are that the pace of economic activity will remain robust over the next 12-18 months, but at a somewhat slower rate than in 2006, with GDP growing at around potential. Concerning external demand, euro area exports are expected to contribute to growth, benefiting from the strength of world demand despite some losses in competitiveness. Turning to domestic demand, investment growth should remain strong given robust foreign demand, still supportive financing conditions, high levels of corporate sector profitability and improved business confidence. Private consumption growth is expected to be supported by a pick-up in real disposable income and improvements in labour market conditions. However, growth is projected to decelerate owing to the planned VAT increase in Germany in 2007. Growth of

1 The annual average oil price for 2006 as expected by the markets stood at 66.1 USD per barrel in mid-February; by mid-June it had jumped to 70.3, and by mid-August to 71.0. On the same dates, the EUR/USD exchange rate stood at 1.21, 1.27 and 1.28 respectively.
2 Oil prices declined substantially after reaching a new historical high at the beginning of August. On 3 November Brent crude oil prices stood at USD 58.3 per barrel, which is approximately 25% below the peak in early August, and broadly similar to their level at the beginning of 2006.

**Chart 2.1 Consensus forecasts for average annual euro area real GDP growth in 2006 and 2007**

(Jan. 2006 - Oct. 2006, % per annum)
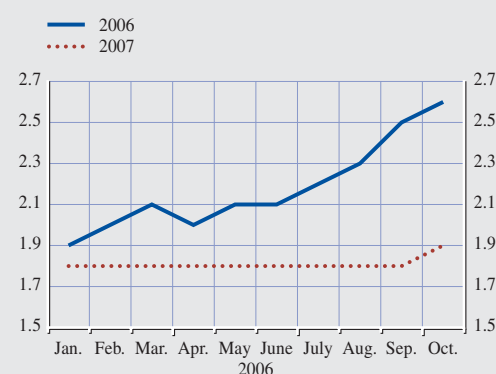


Source: Consensus Forecasts.

**Chart 2.2 Survey-based estimates of the four-quarter-ahead downside risk of weak real GDP growth in the euro area**

(Q1 1999 - Q3 2006, %)

— probability below 1%
···· probability below 2%
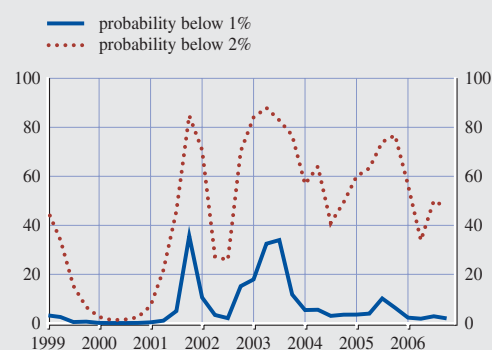


Sources: ECB Survey of Professional Forecasters (SPF) and ECB calculations.
Note: The indicators measure the percentage of the probability distribution for real GDP growth expectations over the following year below the indicated threshold. The horizon for growth expectations at Q3 2006 corresponds to the period Q2 2006 - Q1 2007; the survey was conducted on 22 July 2006.

between 1.6% and 2.6% is envisaged according to the ECB staff macroeconomic projections published in September 2006.

Overall, the risks to the euro area economic outlook appear to be broadly balanced over the short term, and the risk of low growth appears limited (see Chart 2.2). However, over the medium term there is greater uncertainty about the outlook, and downside risks have prevailed regarding the possibility of a renewed increase in oil prices, the disorderly unwinding of global imbalances and the risk of protectionist pressures, especially after the collapse of the Doha round of trade talks. Economic imbalances in the US in particular may foster protectionist pressures.

## 2.2 BALANCE SHEET CONDITIONS OF NON-FINANCIAL CORPORATIONS

Concerning the condition of the balance sheets of the euro area non-financial corporate sector, the main vulnerability is relatively high and increasing leverage. Although the condition of the sector's balance sheet has overall remained relatively healthy, the possibility of a credit

cycle downturn – entailing higher frequencies of defaults by firms on their loans and bonds – cannot be ruled out.

As discussed in the June 2006 FSR, the likelihood of a crystallisation of the risks posed by high and rising corporate sector leverage relates to uncertainties in the macroeconomic environment. These uncertainties include the possibility of commodity prices remaining high over a prolonged period, a larger than currently anticipated slowdown in the pace of economic growth, and an adverse change in the factors that determine the interest payment burden of firms (including the level and maturity composition of debt, as well as the level of interest rates). In this respect, corporate balance sheets could come under strain owing to the strength of debt-financed takeover activity, including a surge in leveraged buyouts (LBOs), coupled with the growing importance of other shareholder-friendly actions that raise leverage (such as share buybacks) over recent quarters. This would especially be the case if liquidity conditions and profitability were to deteriorate.

In the six months since the finalisation of the June 2006 FSR, the likelihood of strains emerging on the balance sheets of firms has increased: oil prices have remained at a relatively high level, and uncertainty has continued to linger about the medium-term sustainability of the high rates of profitability enjoyed by euro area firms in recent years. Furthermore, corporate sector leverage ratios have increased further and, as a result, measures of the sector's credit quality have deteriorated somewhat. Looking ahead, this deterioration may be further exacerbated as financing conditions begin to tighten, eventually raising the interest payment burden of firms. The effects of tighter financing conditions may be reinforced by euro area firms' increasingly making use of floating-rate debt in recent years which may, to the extent that firms have not converted floating-rate liabilities into fixed ones via the interest rate swaps market, have
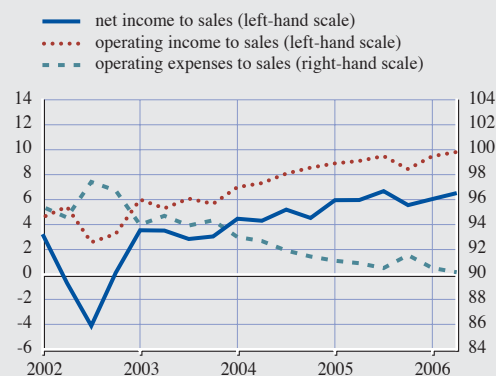
rendered the sector's balance sheet more sensitive to changes in short-term interest rates.[3]

Despite the strength of oil prices, euro area corporate sector profitability generally remained strong in the early part of 2006, thanks to strong revenue growth and cost containment (see Chart 2.3). This allowed firms to augment their cash balances further: between the first quarter of 2002 and the first quarter of 2006, the overall ratio of cash holdings to total assets increased by some 16% over the period, accounting for 11% of total assets at the end of the first quarter 2006.[4] There are some indications, however, that the earnings cycle may have begun to peak against a background of tighter monetary conditions, a prolonged period of high oil prices and the expected slowdown in the pace of economic activity. According to Thomson Financial Datastream, in July 2006 the 12-month-ahead expected growth in earnings per share stood at around 11% which, while remaining solid, is considerably lower than the levels observed in previous years.[5] Given relatively high and rising corporate sector leverage, a deterioration in the profitability of firms could expose vulnerabilities in the sector.

While persistently high oil and commodity prices do not appear to have dented corporate sector profitability at an aggregate level, there have been significant differences in profitability performances at the sectoral level. For instance, the energy-related sectors have strongly benefited from high oil prices, with reported earnings in the oil/gas and basic materials sectors growing in the third quarter of 2006 at annual rates of 29% and 25%, respectively.[6] By contrast, the consumer goods sector – including automobiles and parts, food and beverages, personal and household goods – declined by 5% over the same period. This seems to be in line with historical experience, whereby the oil/gas and basic materials sectors in particular tend to benefit from higher oil prices (as evidenced by a positive correlation of around 0.3 for both sectors over the period 1974-2006). By comparison, the consumer goods sector tends to suffer most from high oil prices, with a negative correlation of 0.2.

Despite increasing somewhat after the monetary tightening in the euro area began in December 2005, the debt financing costs facing firms have remained very low (see Chart S40), helping them to contain their debt servicing burdens.

Looking ahead, tighter monetary conditions can be expected to lead to a gradual rise in the corporate sector's interest payment burden. This could expose pockets of vulnerability in the corporate sector, especially among those highly leveraged firms which have a large proportion of short-maturity debt and face a deterioration in profitability. Indeed, euro area non-financial

3   In particular, the issuance of floating-rate notes (FRNs) by euro area firms grew markedly between mid-2004 and mid-2006. This continued even after short-term interest rates began rising. From the issuer point of view, despite the interest rate risk, it may be advantageous to issue FRNs if they are able to swap their floating-rate exposures for fixed-rate liabilities at a lower overall expected cost.

4   Source: Thomson Financial Datastream. See also Box 3 in ECB (2006), *Monthly Bulletin,* September.

5   This sentiment was also expressed in the recent Merrill Lynch Global Fund Manager Survey (15 August 2006), which reported a rising (declining) percentage of European fund managers expecting deterioration (improvement) in earnings per share (EPS) growth over the next 12 months.

6   Source: Thomson Financial Datastream.

corporations' interest payments to banks increased markedly after late 2005 (see Chart 2.4). A decomposition of the rise shows that it was due not only to increasing bank interest rates, but also to the accelerating pace of loan growth.

As discussed in previous editions of the FSR, euro area firms have in recent years shown an increasing tendency to have recourse to floating-rate debt (instead of fixed-rate debt) (see Chart S39). To the extent that this floating-rate debt has not been fully hedged, this is likely to have increased the sensitivity of the non-financial corporate sector to interest rate changes, as changes in the policy rate are likely to pass through to interest payments on debt fixed at floating rates relatively quicker than interest payments on fixed-rate debt.

After several years of balance sheet restructuring, from 2005 onwards the euro area corporate sector began to re-leverage their balance sheets. This resulted in a widening of the so-called financing gap (see Chart S35) between net lending and borrowing, and a rise in the debt-to-GDP ratio of the sector (see Chart S36). At

the same time, other debt ratios such as the debt-to-equity ratio and the debt-to-financial asset ratio remained relatively contained, in particular owing to favourable stock market developments, although significantly above the low levels observed around 2000. The rise in the leverage of the sector was mainly driven by a surge in debt-financed merger and acquisition (M&A) activity (see Chart 2.5).[7] Notably, the structure of debt-financed M&A transactions seems to have changed compared to previous periods. Traditionally, debt-financed M&A activity was financed by short-term bridge financing before long-term financing was secured in the corporate bond market. In the current M&A boom, however, net issuance of debt securities has remained relatively subdued, as firms have increasingly had recourse to long-term loans instead.[8] This substitution in favour

7   Compared to the previous M&A boom, which occurred around 1999-2000 and was largely financed by the exchange of shares, recent M&A transactions have been predominantly carried out through cash and debt payments. See also Box 4 in the July 2006 ECB Monthly Bulletin entitled "Recent trends in mergers and acquisition activity in the euro area".

8   In July 2006, the annual growth rate of long-term MFI loans to non-financial corporations reached 11%, while in the same period the annual growth rate of long-term debt securities issued by non-financial corporations stood at below 6%.

**Chart 2.4 Bank interest rate burden of euro area non-financial corporations, including changes due to price and volume effects**

(Jan. 2003 - Aug. 2006, EUR billions)
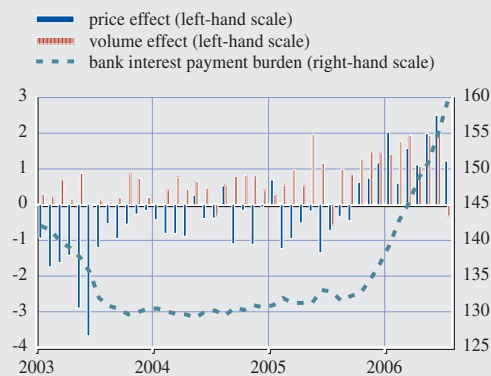


Sources: ECB and ECB calculations.
Note: The bank interest rate burden is calculated as the multiple of the volume and bank interest rates on the outstanding MFI loans to non-financial corporations. The "price effect" and "volume effect" reflect the monthly changes in the payment burden due to changes in bank interest rates and loan volumes, respectively.

**Chart 2.5 Loans to euro area non-financial corporations and M&A deal values where firms act as the acquirer**

(Jan. 2000 - Sep. 2006, EUR billions, 12-month moving sum)
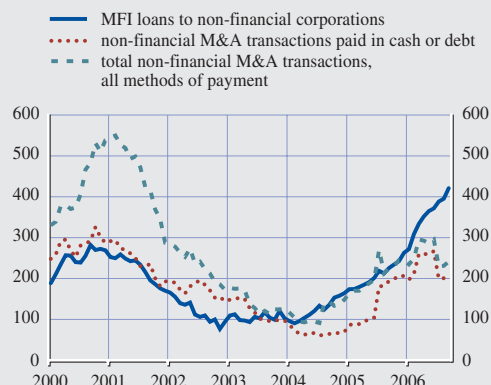


Sources: ECB and Bureau van Dijk (Zephyr).

of long-term bank financing may partly be the result of the broadly unchanged bank credit standards on new loans reported in the October 2006 Bank Lending Survey.[9] It cannot be excluded that this development could reflect an underlying shift in bank loan supply conditions caused by the enhanced use of credit risk mitigation instruments, such as credit derivatives and securitisation, which have made it easier for banks to grant credit at favourable conditions.

Apart from M&A financing, the acceleration of long-term loan growth has most likely been driven by the financing needs of firms for fixed investment,[10] and may furthermore reflect an effort to lock in low financing costs in the expectation of higher interest rates in the period ahead.

Although the increase in euro area corporate sector leverage has to be considered in conjunction with the continued strength of profitability, coupled with historically low default rates and favourable developments in the sector's financial assets (see Chart S37), it seems nevertheless to have contributed to a pronounced deterioration in some credit quality measures. This has been reflected in a higher proportion of rating downgrades than upgrades (see Chart S41), and a rising number of firms being placed on review for a rating downgrade vis-à-vis firms facing a possible rating upgrade (see Chart 2.6).[11] The deterioration in recent months of ratings agencies' credit quality assessments of euro area non-financial corporations seems to be at least part related to the emergence in recent years of shareholder-friendly actions such as LBOs and share buybacks, which can weaken the position of existing corporate debt holders, and increases the affected firms' vulnerability to changes in financing conditions.[12] In response to this activity, there is some evidence that bond and loan investors may have started to demand stronger covenants (i.e. protective provisions) on new debt issues.

**Chart 2.6 Balance between non-financial corporations placed on review for a credit rating upgrade/downgrade, leveraged buyouts and share buybacks**

(Jan. 2002 - Sep. 2006)
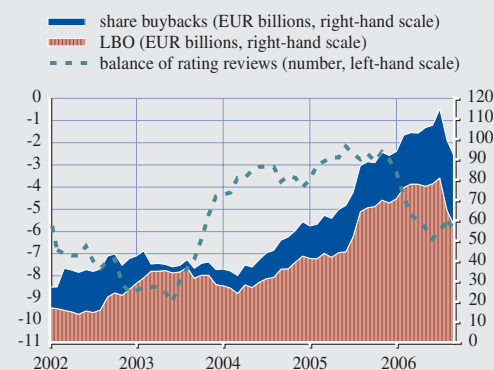
Sources: Moody's, Bureau van Dijk and Thomson Financial Datastream.
Notes: The balance of rating reviews is measured as a 12-month moving average. LBOs and share buybacks are measured as the 12-month moving sum in EUR billions.

**MARKET-BASED INDICATORS OF CORPORATE SECTOR FRAGILITY**

The prices of financial securities issued by non-financial corporations can provide useful information about the sector's credit quality against which analyses based on traditional balance sheet and income statement indicators can be cross-checked. After the finalisation of the June 2006 FSR, market-based credit risk indicators such as corporate bond spreads and credit default swap (CDS) spreads remained

9   The increasing importance of long-term loans in the financing of M&A activity is also reflected in data on syndicated lending from Thomson Financial, which show that the annual sum of syndicated loans related to M&A financing reached a record high of EUR 250 billion in the first quarter of 2006, compared to a historical average since 1990 of EUR 42 billion.
10  See also the October 2006 ECB Bank Lending Survey.
11  The credit rating data in Chart 2.6 refer to "Western Europe" which, apart from the euro area countries, includes the UK, Denmark, Sweden, Norway and Switzerland. Annual data from Moody's for the period 2003-2005 suggest that the euro area countries constitute around 50-55% of the total, and furthermore that developments in credit rating changes have been broadly similar for both the euro area and non-euro area countries.
12  A recent survey of senior institutional investors conducted by Fitch Ratings and the Fixed Income Forum shows that shareholder-friendly actions (including LBOs, M&As and share buybacks) have become a concern for fixed-income investors in the US credit markets (see Fitch Ratings (2006), "Shareholder-friendly actions biggest concern for fixed-income institutional investors", July).

**Chart 2.7 Expected default frequency of euro area non-financial corporations**

(Jan. 1995 - Sep. 2006, % probability)

- median
- 75th percentile
- 90th percentile
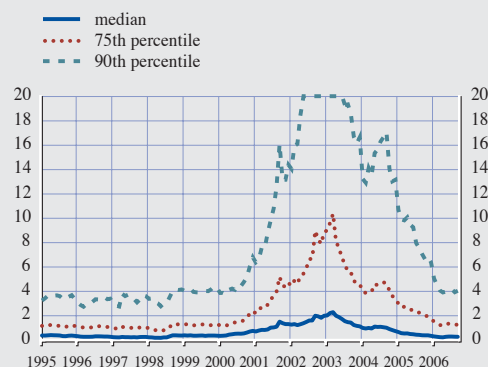


Source: Moody's KMV.
Note: The EDF provides an estimate of the probability of default over the following year. Due to measurement considerations, the EDF values are restricted by Moody's KMV to the interval between 0.02% and 20%.

broadly favourable. Although spreads widened during this period, such indicators still remained very tight (see also Section 3 on the euro area financial markets). Likewise, the median expected default frequency (EDF) – an equity market-based measure of the 12-month-ahead probability of default – on euro area non-financial corporations increased slightly in the second quarter of 2006, although it remained at a very low level by end-september 2006 (see Chart 2.7). The EDFs of the more risky firms (i.e. those in the 75th and 90th percentiles) displayed similar patterns. All in all, these market-based indicators of credit risk have continued to point towards a positive outlook, at least over the short term (see Charts S42-S44).

**OVERALL ASSESSMENT OF CORPORATE SECTOR VULNERABILITIES**

Overall, euro area non-financial corporate balance sheets remain solid. Several years of restructuring and cost-cutting efforts have helped the sector to improve profitability and liquidity ratios. As a consequence, the credit risk assessment implied in firms' securities prices has improved significantly and, more recently, banks have been relaxing their credit

standards to firms. Over the past six months, however, indications of a turn in the credit cycle, such as rating reassessments, have become more pronounced. This can be attributed to several factors, including rising leverage ratios driven primarily by a surge in debt-financed M&A activity, a pick-up in gross capital formation, as well as a further tightening of monetary conditions. At the same time, however, bank credit standards and market-based indicators of credit risk remain indicate a benign outcome over the year ahead. One potential factor causing this apparent disconnection between balance sheet-based assessments and bank and market-based assessments could be related to the continued high level of liquidity in the financial system as well as the surge in the use of certain new instruments, such as securitisation and credit derivatives, which have enabled banks and market participants to hedge and diversify more successfully their credit risk vis-à-vis the corporate sector. This is likely to have contributed to an increase in the supply of funds, hence exerting downward pressure on credit spreads.

Looking ahead, there are some expectations of a slowdown in the pace of euro area corporate earnings growth. This could affect companies in sectors that are relatively sensitive to high commodity prices and a continued tightening of monetary conditions. Moreover, a sharper slowdown than currently expected in the pace of general economic activity may further hamper corporate earnings.

The combination of rising leverage ratios and increasing interest rates may eventually impose strains on some firms' ability to repay their debt, especially given increasing recourse to floating-rate debt. This also leaves firms more vulnerable should there be a deterioration in profitability.

Overall, therefore, the overall balance sheet conditions of the euro area non-financial corporate sector still appear sound as of early November 2006, and any deterioration is likely

to occur only gradually. However, the vulnerability of firms to unexpected adverse disturbances has increased over the past six months.

## 2.3 COMMERCIAL PROPERTY MARKETS

As discussed in the June 2006 FSR, commercial property markets are important from a financial stability perspective for two main reasons. First, commercial property loans are an important component of financial institutions' assets. Second, commercial property lending has often proven to be the most volatile component in some bank loan portfolios, thus potentially exposing banks to higher credit risk.[13] This is because commercial property markets tend to be closely linked to business cycle conditions, and much more so than residential property markets. Vulnerabilities in commercial property markets can arise if property prices diverge from the net present value of the future earnings stream generated by the property, typically rents. Such vulnerabilities are often unearthed during economic downturns and, if sufficiently large, can generate property price declines and loan defaults that can ultimately create problems in banks' commercial property loan books. This may in turn increase impairment charges and ultimately reduce profitability.[14]

A high level of investor demand for commercial property saw euro area direct real estate investment volumes reach new record levels during the first half of 2006. The total euro area transaction volume stood at EUR 48 billion, representing an annualised increase of 38% over 2005. Cross-border activity, involving either non-domestic buyers or sellers of property, accounted for two-thirds of total turnover during the first half of 2006.[15]

Commercial property prices increased significantly during 2005 in several euro area countries. Underlying this development was continued strength in commercial property transaction volumes. This was mainly driven by persistently low interest rates, which spurred demand for alternative investments, such as

**Chart 2.8 Euro area country distributions of commercial property returns**

(2000 - 2005, total returns, % change per annum, minimum, maximum and inter-quartile distribution)
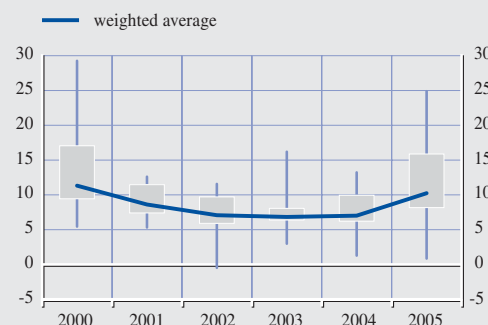


Sources: Investment Property Databank and ECB calculations.
Note: The data cover eight euro area countries (representing around 90% of euro area GDP). The coverage of the total property sector within countries ranges between 40% and 85%.

real estate, as part of a broadening of the hunt for higher yielding, and commensurately riskier, assets. At the same time, the low interest rates provided investors and real estate companies with access to cheap financing. The generally improving business climate in the euro area also favoured commercial property markets.

However, there were wide differences in commercial property price changes across euro area countries, ranging from -4% to 19% in 2005 (see Chart S45). There were also mixed patterns within the various commercial property market segments during 2005, with the retail segment experiencing increases of around 9%, whereas prices in the office segment only rose by around 1.5% (see Chart S46). The high transaction volumes, together with price

[13] Data of sufficient quality to be representative of commercial property market activity across euro area countries are lacking, hindering a comprehensive assessment of the financial stability risks arising from this sector.

[14] Changes in commercial property prices may also directly affect banks' fixed assets and capitalisation if they own property, and indirectly through their impact on the macroeconomic environment. See, for instance, E. P. Davies and H. Zhu (2005), "Commercial Property Prices and Bank Performance", *BIS Working Paper,* No 175.

[15] Source: Jones Lang LaSalle. For a description of the conditions in the European commercial real estate market, see Jones Lang LaSalle (2006), "European Capital Markets Bulletin 2006 H1", August.

increases during the year, led to higher returns on commercial property investments in most euro area countries in 2005 (see Chart 2.8).

## COMMERCIAL PROPERTY MARKET OUTLOOK AND RISKS

Against a background of generally favourable developments in the euro area commercial property market, there have been large increases in the stock prices of companies engaged in ownership, trading and development of income-producing real estate (see Chart 2.9). On average, euro area commercial property companies' stock prices outperformed the Dow Jones EURO STOXX. Even though there were large country differences in performance, the lowest increases reported were still greater than those of the Dow Jones EURO STOXX after 2005.

The high level of demand for stocks of commercial property companies has led to a reduction in the risk premia for this asset class in the euro area since the beginning of 2006 (see Chart 2.10). This compression of risk premia has been driven by both a reduction in dividend yields and higher real long-term government bond yields. However, this development could be reversed if, for example, demand for stocks of commercial property companies declines owing to less positive developments in the euro area commercial property market.

Looking ahead, the upcoming introduction of real estate investment trusts (REITs) in Germany during 2007, together with the possible introduction of REITs in Italy and Finland too, could contribute to sustaining the demand for real estate investments and stocks of commercial property investment companies, and may further facilitate cross-border activity. This is because REITs can improve investors' access to commercial real estate markets.[16] Their introduction can generally be seen as positive for the financial stability of the euro area since it opens up new avenues for investors to diversify investment. However, the growing REIT sector does pose one potential risk, namely the establishment of REITs that have a non-diversified property portfolio which could be sensitive to local market corrections.

16 REITs are publicly-traded real estate stock corporations which are exempted from both corporate income and trade income tax. They must derive at least 75% of their income from property investments, and pay at least 90% of the taxable income to shareholders. REITs have existed since the 1960s in the US but have only become popular in euro area countries in recent years. They already exist in Belgium, France, Greece and the Netherlands.

### Chart 2.9 Euro area commercial property stock prices

(Jan. 2001 - Oct. 2006, index: Jan. 2001 = 100)

euro area EPRA/NAREIT Global Real Estate Index Series
····· Dow Jones EURO STOXX
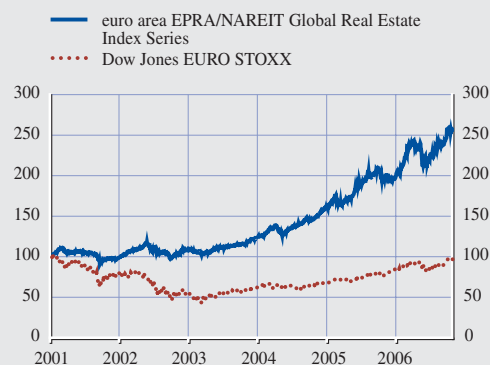


Source: The European Public Real Estate Association (EPRA).
Note: The Global Real Estate Index Series includes traded real estate stocks of closed-end companies engaged in ownership, trading and development of income-producing real estate.

### Chart 2.10 Euro area commercial property risk premia

(Feb. 2005 - Oct. 2006, % points)
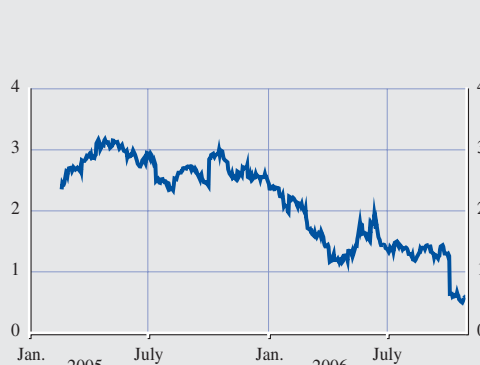


Sources: EPRA and ECB calculations.
Note: The risk premia is the difference between the EPRA/NAREIT property index dividend yield and the real long-term government bond yield (CPI-adjusted).

## Chart 2.11 Distribution of the euro area property market metric (PMM) score for office and retail property

(2004 - 2005, score between 1 (positive outlook) and 5 (negative outlook))

- 2004 (average score 3.11)
- 2005 (average score 3.06)
- polynomial distribution 2004
- polynomial distribution 2005



number of observations

PMM score
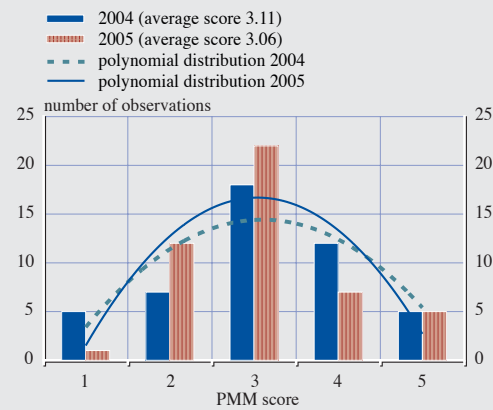
Sources: Fitch Ratings and ECB calculations.

The outlook for the commercial property market can be estimated using the Property Market Metric (PMM) indicator.[17] This indicator covers both historical rental volatility and the growth forecasts for the property markets, combining forecasts for the economic climate (GDP, unemployment, construction, etc.) with supply, demand and vacancy outlooks and projected rental values, in order to derive a single performance metric.[18] At the beginning of 2006, this indicator showed a slight improvement in the commercial property market outlook when compared with the outlook in late 2004 (see Chart 2.11). Nevertheless, the proportion of markets with very poor prospects remained the same. This was a result of the office markets in Barcelona and Madrid improving to a score of four, whereas the outlook for the office market in Milan and the retail market in Athens deteriorated to a score of five. The office markets in the La Défense area in Paris and in Lyon and Rome continued to be placed in the worst outlook category.

### OVERALL ASSESSMENT OF COMMERCIAL PROPERTY MARKET VULNERABILITIES

The overall outlook for the euro area commercial property markets remains uncertain. Prices could prove vulnerable, especially if high investor demand is not sustained. A potential slowdown in investment activity – potentially driven by higher interest rates, increasing energy costs and a deterioration in the business climate – could affect property prices as well as the volume and quality of lending extended by banks for commercial property.

17 The indicator was developed by Fitch, together with Property & Portfolio Research, Inc. and Property Market Analysis. See Fitch Ratings (2004), "European Property Market Metric", November and Fitch Ratings (2006), "European Property Market Metric – 2005 Update", January.

18 The indicator ranges between 1 and 5, where 1 indicates a very positive outlook and 5 a very negative outlook for the property market. The PMM exists for around 25 euro area cities for both the office and retail property markets.

### Box 6

### VULNERABILITIES IN OPEN-END REAL ESTATE MUTUAL FUNDS

In several euro area countries, a number of open-end real estate funds have experienced severe liquidity shortages in recent years, including most recently in Germany. These crises not only often resulted in the closure of individual funds, but also led to the disappearance of this type of investment in some countries. Open-end real estate funds may come under pressure when real estate prices move downwards. Some recent policy initiatives (especially in Germany) have been taken to deal with this fragility. Open-end real estate funds may be susceptible to financial fragility for two main reasons: (i) liquidity transformation, and (ii) revaluation policies.

(i) Liquidity transformation: Similar to closed-end property funds, the major part of open-end real estate funds' portfolios is invested in relatively illiquid assets (real estate). While closed-

end property funds issue a fixed amount of shares that are traded in the secondary market, open-end fund shares are (with minor exceptions) not listed on organised exchanges. Instead, they can continuously issue new shares and guarantee their redemption on a daily basis. The redemption price which investors receive if they withdraw their funds is determined by the respective daily market prices of the liquid assets and the book value of the property held by the fund. Since the property in general cannot (at least not at short notice) be sold at book value, the fund therefore bears a liquidity risk. If actual withdrawals exceed the fund's liquidity, the fund could be forced to sell off property below book value in order to obtain additional liquidity, or to freeze redemption temporarily where the sale of property below book value is, in general, not permitted. An imminent threat of such a scenario, obviously, would lead to an erosion of trust in this type of investment. As a consequence, self-fulfilling liquidity crises are possible in open-end funds.[1]

(ii) Revaluation policies: The valuation policies of properties in the funds may also contribute to the fragility of these financial intermediaries. Daily market prices for property do not exist, and assessing the value of commercial real estate is frequently extraordinarily costly. Hence, funds are generally required to assess the value of each property in the fund only once a year. In a phase of declining property prices, the lagged adaptation of the redemption prices to changes in market prices can generate arbitrage opportunities for investors. After a decline in real estate prices, investors can anticipate a reduction in the redemption price. Depending on their transaction costs, investors might therefore have an incentive to withdraw their funds shortly before the devaluation in order to reinvest them after it. Obviously, the arbitrage profits absorb liquidity held by the funds. Even investors initially not willing (or able) to realise arbitrage profits would expect large withdrawals of arbitrageurs – which may force the real estate fund to sell off property below book value or, where this is not permissible, to freeze redemption temporarily, leading eventually to an erosion of trust with respect to the redemption promise. Consequently, even those investors have an incentive to withdraw, thus aggravating the liquidity crisis.

The potential susceptibility of open-end real estate funds to crises raises the question why investment companies ever choose this structure in the first place. Viewed from an investor's perspective, the guaranteed redemption of fund shares at a redemption price determined by the book value of the fund's property provides investors with liquidity insurance and may seem to offer low volatility returns. This feature of the funds may for example have contributed to the boom in open-end property funds in Germany after the severe stock price slump of 2001. Furthermore, the staggered revaluation of the funds' property permits a gradual intertemporal smoothing of shocks to property prices, thereby further reducing the volatility of investors' returns. However, as already noted, the extent to which an open-end real estate fund can provide this insurance depends on the ability of investors to take advantage of arbitrage opportunities. In particular, if institutional investors, which typically have lower transaction costs, can hold a large fraction of a fund's shares, then they could in principle undermine this insurance. Nevertheless, from a policy perspective, the liquidity transformation of open-end real estate funds might also serve as a disciplining device, because investors' ability to withdraw their funds provides them with an effective measure to "vote with their feet" against poor performance. This ability to discipline is stronger than in closed-end mutual funds, since the redemption

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1 For the role of institutional investors in liquidity crises, see J. L. Peydró-Alcalde (2006), "The Impact of a Large Creditor and Its Capital Structure on the Financial Distress of Its Borrower", European Finance Association, Zurich.

price in open-end funds is essentially unaffected by significant withdrawals in the short run, whereas in closed-end funds, the stock price would only decline in the face of large sales.

Given the inherent fragility described above, it is not surprising that all crises in open-end real estate mutual funds have been preceded by a downward real estate price trend. This was the case in earlier episodes in the Netherlands, Switzerland and Australia. In Australia, property prices increased strongly after 1987 and the Australian real estate market enjoyed large inflows of capital. The real estate boom was further supported by exceptionally low interest rates on loans collateralised by real estate. When the central bank subsequently began tightening monetary policy, property prices dropped by around 60%. This, in turn, caused a run by investors in order to redeem their shares of open-end real estate funds. To prevent these investment vehicles from collapsing, the government decided to stop all redemptions for a period of 12 months and forced all funds to list themselves on the stock exchange, i.e. converting them to closed-end mutual funds.

In the Netherlands in the late 1980s, the Dutch fund Rodamco was one of the largest real estate funds in the world. It was owned by Robeco Group, at that time the largest independent European investment group managing funds. Robeco followed a policy of tacitly guaranteeing fund prices. Thus, for 11 years prior to September 1990, Robeco bought back shares of Rodamco at net asset value from any investor wishing to sell. Low interest rates in the late 1980s made an investment in Rodamco shares particularly attractive, since it offered a return of about 3% higher than a bank deposit. At this time, the fund had about three-quarters of its assets invested in the US and UK real estate markets. In 1990, however, rising interest rates caused a high outflow of capital. At the same time, the US market – and thus Rodamco's portfolio – was affected by a severe drop in real estate prices. This should have had an adverse impact on Rodamco's share price, because in an open-end structure the unit price is determined by dividing the total asset value of property and cash by the number of units. Based on the standard valuation rule in place in the Netherlands at that time, however, all fund properties were only appraised simultaneously once at the end of the fiscal year. Hence, investors could predict that the redemption price would suffer a severe decline at a future point in time – i.e., at the end of 1990. In that situation, it was individually optimal for investors to redeem their shares before and buy them back after the reappraisal. Hence, arbitrage had become possible, and indeed took place on a large scale in September 1990. Robeco reacted by suspending its traditional policy of buying back shares when asked to do so by investors. Eventually, severe liquidity problems forced the management to transform the fund into a stock-listed closed-end fund.

In Germany, average property prices and, in particular, commercial real estate returns declined after 2001.[2] Because several of the 31 German-based public open-end real estate funds managed by 16 investment companies purely focus on investments in Germany, this downward price trend put these funds under pressure. With a few exceptions, these investment companies are held by banks or financial conglomerates. It is possible that investors also expected that these fund owners would step in if these funds experienced liquidity shortages.

In December 2005, an open-end real estate fund announced a likely future reduction in the redemption price due to an expected downward revaluation of its real estate. The fund, as a

2  See C. Bannier, F. Fecht and M. Tyrell (2006), "Open-end Real Estate Funds in Germany – Genesis and Crisis", *Kredit und Kapital,* forthcoming.

**Chart B6.1 German real estate funds, quarterly net inflows**

(EUR billions)
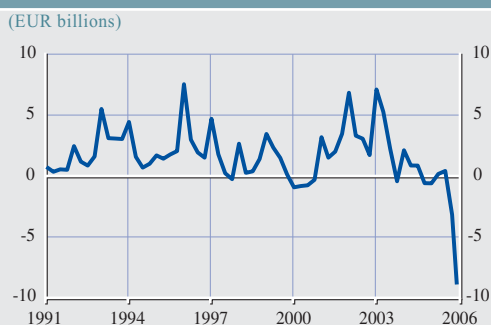


Source: BVI.

**Chart B6.2 German real estate funds, monthly net inflows**

(EUR billions)



Source: BVI.

consequence, was confronted with substantial withdrawals. As a response, redemption was temporarily frozen and the fund was closed until further notice. In the aftermath of this decision, a number of other open-end real estate funds experienced large liquidity outflows (see Charts B6.1 and B6.2). In light of the unstable market environment and the increased nervousness of investors, questionable sell recommendations for two other funds from a small rating agency triggered new turbulence in mid-January 2006. Meanwhile, all funds had been reopened again.

In response to these considerations triggered by these recent episodes, a variety of different contractual and regulatory measures have been put forward to enhance the stability of this market segment. The objective of these measures is, in general, to enhance the resilience of open-end real estate funds and to reduce contagion effects among different funds. In particular, the main objective of these measures is to increase the funds' liquidity, to improve their transparency, and to accelerate the adaptation of the redemption price to market values. Specifically, the following measures have been discussed: (i) the introduction of a notice period for large sales of units; (ii) an increase of the minimum liquidity ratio that funds must hold; (iii) the broadening of the fund share listing to improve exchange trading when redemption is suspended; (iv) the revaluation of properties at a higher frequency of properties' revaluation and strengthening of the independence of the experts assessing the property; and (v) the fostering of transparency of the fund value, of the funds' investor structure, of the level of their borrowing, and of information on the typical risks that funds face. Each of these measures should reduce open-end real estate funds' vulnerability to self-fulfilling liquidity crises. Enhanced transparency should also improve investors' ability to monitor management directly, diminishing the need for investors to exert control by withdrawing funds.

The fragility of this type of investment is inherent in its open-end structure and, therefore, the benefit of its flexibility needs to be weighed against the cost of a more stable closed-end structure in the context of real estate mutual funds.

## 2.4 BALANCE SHEET CONDITIONS OF THE HOUSEHOLD SECTOR

The main vulnerabilities facing the household sector continue to be questions about the sustainability of high and rising indebtedness and the level of house prices. From a financial stability viewpoint, the recent further increase in household sector leverage since the finalisation of the June 2006 FSR has increased the vulnerability of the sector to adverse shocks, although the potential financial stability risks posed by the condition of household sector balance sheets still remain low.

### HOUSEHOLD SECTOR LEVERAGE

In the first half of 2006, bank lending to euro area households remained very strong, with loans for house purchase still accounting for the bulk of lending activity (see Chart S49). Underpinning the strength of mortgage lending were still very low mortgage lending rates and robust housing market conditions in many euro area regions. Anticipated further increases in key ECB interest rates may also have supported demand for mortgages in recent months, as borrowers looked to lock in prevailing rates before the monetary policy stance is further rebalanced. Against this background, the annual growth rate of loans for house purchase, which stood at 12.1% in the second quarter of 2006, could decrease when the lock-in effect ceases. Some tentative evidence based on monthly data reveals a slight slowdown in housing lending activity from May to August 2006, but at still very high rates of growth.

At the same time, consumer credit growth remained strong, with annual rates of 8.2% in the first and second quarter of 2006. Although these developments are broadly in line with the upward movement of growth in retail sales of non-food items since mid-2003, the annual growth rate of consumer credit has been much higher.

Structural factors such as the increased use of debt financing and credit cards to finance private consumption spending in those countries where their use was more limited in the past may have contributed to this development. It also appears that the growth of consumer credit has been particularly vigorous in those economies where housing market activity has been particularly buoyant. This may suggest that households in these countries could have partly used consumer credit to pay for unplanned house purchase-related expenditure such as home improvements.

Consumer credit debt ratios have been increasing since the beginning of 2004, as illustrated by the consumer credit debt-to-GDP ratio, which stood at 6.9% in July 2006, compared with 6.3% in March 2004 (see Chart 2.12). However, from a historical perspective, higher levels have already been observed, as for instance at the end of 2002, when the ratio was 7.1%. Furthermore, the average maturity of consumer credit debt is about 4.5 years, which is quite short in comparison with the housing debt maturity.

The total amount of outstanding household sector debt increased again, reaching 58.3% of GDP in June 2006, up from 56.9% in December 2005 (see Chart S47). As this level of household leverage is unprecedented for the euro area, it is difficult to assess whether this will prove sustainable over the medium term. The experience so far of non-euro area countries such as the UK and the US – where debt-GDP ratios stand at about 100% and 80% respectively

**Chart 2.12 Euro area consumer credit debt-to-GDP ratio**

(Q1 1999 - Q2 2006, %)



Source: ECB.

– suggests that households can bear greater debt burdens. Nevertheless, some questions remain about the ability of households in certain euro area countries where leverage is considerably higher than the euro area average to bear their debt burdens over the course of future interest rate and business cycles.

In the same vein, the dispersion of indebtedness across households widely varies from one country to another. Consequently, a low level of leverage in a country can mask a debt burden which is concentrated on a small share of the population at serious risk of financial distress.

Lastly, from a financial stability viewpoint, the rise in the ratio between mortgage debt and the value of the collateral (loan-to-value ratio) that has been observed on new mortgages in some euro area countries[19] is also a source of concern, as banks could find it difficult to recover their funds in case of households struggling to meet repayment obligations.

Concerning the ability of households to repay their debts out of assets, the ratio of debt to liquid financial assets reached new heights in 2005, rising to 91.9%. However, the aggregate debt-to-financial asset ratios of the sector have levelled off compared with 2004 (see Chart S48). This means that at an aggregate level, households were still in a position to repay their debts in a worst-case scenario should their incomes deteriorate significantly. However, the picture could be different at the micro level, since the owners of financial wealth may not necessarily be indebted households.

Moreover, there are some indications that the financial asset side of household balance sheets is becoming increasingly exposed to market risk: the weight of shares in the composition of household financial wealth in the euro area rose from 16.7% at the end of 2004 to 20.0% by the end of 2005 (see Chart 2.13). This is entirely due to a valuation effect, since according to the national financial accounts and ECB estimates, the household sector was a net seller of equities in 2005. Evidence based on country-specific

**Chart 2.13 Composition of financial assets of the euro area household sector**

(1995 - 2005, %)

insurance
shares
mutual fund shares
debt securities
deposits and currency



Source: ECB.
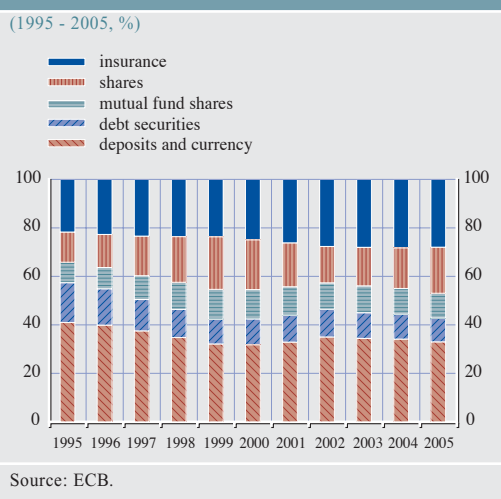
studies finds that financial wealth is usually concentrated in higher income segments, especially for bonds and shares. Therefore, a decrease in the value of these financial assets may be more easily absorbed than for lower income deciles.[20]

**HOUSEHOLD SECTOR RISKS**
Euro area household balance sheets face two main risks: interest rate risk and income risk. Interest rate risk for households refers to the possibility of higher repayment burdens, which may be induced by a rise in interest rates if debt is contracted at variable rates. Income risk refers to the ability of households to repay their debts out of their income and, therefore, depends on the sensitivity of their income to the economic environment.

**INTEREST RATE RISKS OF HOUSEHOLDS**
Since the finalisation of the June 2006 FSR, the ECB has increased key interest rates by 75 basis points, bringing the cumulative rise since

19 See, for instance, De Nederlandsche Bank (2006), *Overview of Financial Stability in the Netherlands,* p. 12, September.
20 See Banco de España (2005), "The Wealth of Spanish Households: A Macroeconomic Comparison with the United States, Italy and the United Kingdom", *Economic Bulletin,* July.

December 2005 to 125 basis points. Assessing the impact of rising short-term rates on household debt servicing costs requires various assumptions,[21] as only new loans and loans contracted at variable rates are affected by interest changes. Whereas the interest payments of the former are mainly sensitive to long-term interest rates, the interest payments of the latter are only sensitive to short-term interest rates.

As mentioned in previous FSRs, because the share of loans granted at variable rates in the euro area is low,[22] rising short-term interest rates only affect debt repayment burdens very gradually, with around half of the effect felt after two years. However, in those euro area countries in which the bulk of lending takes place at variable rates, the impact may be larger and faster, though this may depend on country specific developments (see the June 2006 FSR). Turning to the sensitivity to long-term interest rates, the full impact on household debt repayments tends to be staggered over several years, and this only has an impact on households taking on new loans at variable rates. Hence, the interest risk is essentially concentrated in those countries where loans are granted at variable rates.

However, it is important to bear in mind that there can be second-round effects: higher interest rates can adversely impact on economic activity in general, and on household income in particular. This may be particularly relevant for lower income households, which tend not to have collateral or financial reserves at their disposal, and consequently might not be able to liquidate assets to help repay debt.

### RISKS TO HOUSEHOLD INCOME

As the holders of the bulk of euro area mortgage debt belong to the highest income categories, income volatility, for example through increased unemployment, is one of the most important predictors of households' ability to meet their debt-servicing obligations. However, as pointed out by the ECB Survey of Professional Forecasters,[23] the risk of rising unemployment

**Chart 2.14 Euro area households' financial situation and employment expectations**

(Q1 1998 - Q3 2006, % balances, three-month averages)

expectations about employment prospects over the next 12 months (left-hand scale)
expectations about households' financial situation over the next 12 months (right-hand scale)



Source: European Commission Consumer Survey.
Note: Expectations about employment prospects are obtained as the inverse of the balance of answers to the question "How do you expect the number of people unemployed in this country to change over the next 12 months?". An increase in this indicator corresponds to more optimistic expectations overall.

at the macroeconomic level currently appears quite low.

Reflecting the improved labour market outlook, with the unemployment rate dropping slightly to about 7.9% in August 2006 from around 8.0% in March 2006, survey evidence collected by the European Commission reveals that euro area households have become less pessimistic concerning their 12-month-ahead employment prospects (see Chart 2.14). This notwithstanding, households remained pessimistic about their financial outlook. One reason for this might be that real income has only risen very slowly in recent quarters.

All in all, considering the growth outlook, the likelihood of a decrease in household income in the near term is low.

21 In particular, the average maturity of housing loans is assumed to be 20 years. The share of debt at variable rates with an initial rate fixation of up to one year is estimated to be 35%.
22 See Box 6 in ECB (2004), *Financial Stability Review,* December. For more information on the types of products that allow flexible repayment options, such as accordion loans, payment holidays or interest-only repayments, see Box 7 in ECB (2005), *Financial Stability Review,* December.
23 See Box 3 in ECB (2006), *Monthly Bulletin,* August.

**THE RISK TO RESIDENTIAL PROPERTY PRICES**

Based on data available at the time of finalising this Review, euro area residential property prices rose in 2005, increasing by 7.6% (year on year) compared with 7.2% in 2004 (see Chart 2.15). This strong overall growth is composed of diverse recent developments at the country level (see Table S4).

The latest figures for Greece and Ireland show accelerating house prices. However, there are tentative signs of house price moderation for several countries, such as Belgium, Spain, France and Italy. In Spain, house price inflation has continued to decelerate for the fifth consecutive quarter. While for 2005 as a whole, house prices in Germany declined (see Table S4).

The growth of house prices is explained by strong housing demand, which is underpinned by favourable financing conditions. Supply has only sluggishly adjusted to increased demand, which has also contributed to price increases. More recently, however, supply-side indicators such as building permits and residential investment have started to increase at a greater pace (see Chart S51). In the past, decreases in housing investment as supply caught up with demand have led to substantial declines in the vacancy rate, which could lead to more moderate house price increases in countries with a substantial private rental sector.

Valuation measures based on house price-to-rent ratios persistently point to some degree of overvaluation in a number of countries (see Chart S52). Looking ahead, it cannot be ruled out that Spain will witness further moderation in the future in view of the government's planned policy initiatives aimed at containing house price increases.[24]

However, a correction in house prices could, depending on the underlying shock, have serious implications for the financial system through weaker economic activity, which would inhibit households debt-servicing ability and/or wealth effects.

**Chart 2.15 The growth rates of residential property prices in the euro area**

(H1 1997 - H2 2005, % per annum)
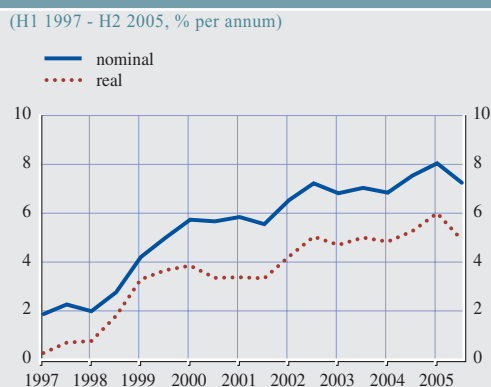


Sources: National sources and ECB calculations.
Note: The real price series has been deflated by the Harmonised Index of Consumer Prices (HICP).

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24 The Land Act reform (*Ley del Suelo*) currently under discussion consists of three pillars: (i) increased construction of subsidised housing, (ii) more rapid approval of urban planning, and (iii) revision of land price policy.

## BANK WRITE-OFFS/WRITE-DOWNS OF PRIVATE SECTOR LOANS IN THE EURO AREA

Bank write-offs/write-downs of loans (henceforth just write-offs) provide information about the creditworthiness of debtors and of losses incurred by banks in their lending.[1] So long as the information is sufficiently timely, it can help in assessing the quality of banks' assets, and therefore constitutes an additional yardstick of the soundness of the euro area banking sector. This Box reviews the nature of euro area bank write-offs vis-à-vis the private sector (households and non-financial corporations), and describes developments in recent years.

Because the final write-off of non-performing debt in MFI balance sheets may occur long after the event that caused the loan to default, write-offs can be considered a lagging indicator of the condition of private sector balance sheets. For instance, a bank may decide to maintain a potentially "bad" loan with specific provisions on its balance sheet as long as the debtor is in a position to redeem part of the loan, be it capital or purely interest. The bank is therefore likely to record a loan as "non-performing" (loans that are in arrears for some months) before it finally writes it off. It is only when the bank actually removes all or part of this bad debt from its balance sheet that the loan is deemed a write-off. In principle, write-offs can also occur in the context of securitisation activities, whereby banks sell their bad loans to third parties as a means of financial restructuring. The decision to write off a debt depends both on regulations and on corporate policies. Thus, there can be differences between banks and between countries in terms of the speed with which loans are written off. Cross-country comparisons should therefore be treated with caution.

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1 A loan is written off when it is considered to be totally unrecoverable, whereas a loan is written down when it is considered to be partly unrecoverable. The ECB collects and publishes monthly data on write-offs recorded in the consolidated MFI balance sheet. These data may be found in Table 2.7 of the "Euro area statistics" section of the ECB Monthly Bulletin.

**Chart B7.1 Write-off shares by sector and by purpose in total write-offs**

(average between Q1 2002 and Q3 2006, %)
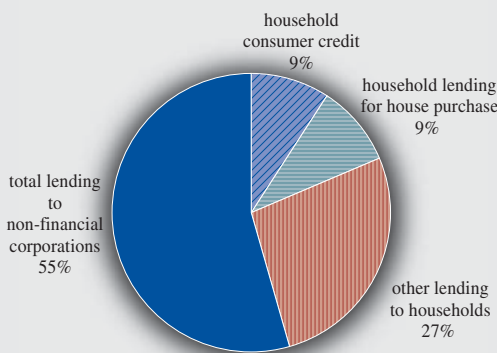


Source: ECB.

**Chart B7.2 Write-off rates by sector and by purpose**

(four quarter moving sums, % of the outstanding amount of loans)
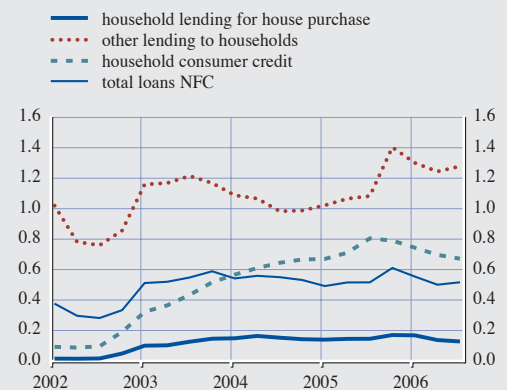


Source: ECB.

In the five and a half years since January 2001, the shares of write-offs in outstanding amounts of loans have been roughly evenly split between firms and households. During this period, 55% of write-offs were for loans to firms, while 45% were for loans to the household sector (see Chart B7.1). Write-off rates were higher for firms, which constituted about 45% of the total outstanding amounts to the private sector. Looking at the different categories of household borrowing, the highest amount of write-offs was on other loans.[2]

Looking at patterns over time, write-off rates on the total loan stock have remained relatively low since 2001. This mainly reflects favourable credit conditions, although it also suggests that banks had managed to contain credit losses (see Chart B7.2). Moreover, patterns have been very similar for firms and households. While write-off rates increased somewhat between 2001 and mid-2003, against a background of deteriorating economic activity, they have subsequently improved, especially after mid-2005.

**Chart B7.3 Write-off rates by original loan maturity**

(average between Q1 2002 and Q3 2006, % of the outstanding amount of loans)

- households
- non-financial corporations
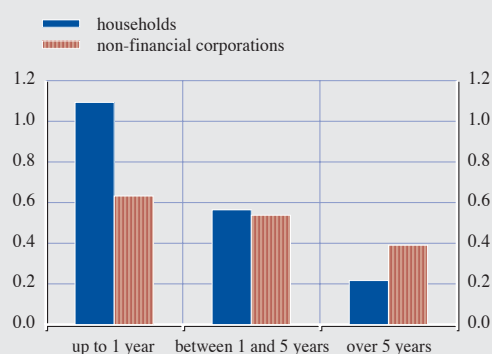


Source: ECB.

The somewhat lower level of write-off rates on loans to households mainly reflects the predominance of loans for house purchase in household borrowing, the write-offs of which are traditionally the lowest among the different loan categories. This can be explained by the fact that loans for house purchase are generally collateralised, so that in the event that households struggle to service their debt, banks may still keep non-performing loans on their balance sheets, especially if the environment is characterised by buoyant housing markets. Write-off rates on loans for other purposes have been the highest, probably reflecting both a lower degree of collateralisation and the generally lower creditworthiness of borrowers in this category.

As regards loan maturity, the highest write-off rates have been for short-term loans with maturities of up to one year both for households and firms (see Chart B7.3).[3] This may reflect the fact that banks have a tendency to limit the maturities of riskier loans, and that short-term loans are typically less collateralised than long-term ones.

To conclude, write-off rates have remained at fairly low levels in recent years, partly reflecting the very low levels of interest rates that have facilitated debt servicing by the private sector. In recent years, house prices have increased significantly in a number of euro area countries and corporate profits have been strong. While write-off rates have generally started to decline since mid-2005, an upturn cannot be excluded in the period ahead, given recent rises in short-term interest rates. Moreover, if house prices were to decline and/or if re-leveraging by firms were

2 "Other loans to households" are defined as "loans granted for purposes such as business, debt consolidation, education, etc." (Regulation ECB/2001/13), which also includes loans to non-profit institutions and sole proprietorships.
3 The maturity breakdown should be considered with some caution as full information about the distribution across maturity categories is not always available. Consequently, in some cases mechanical criteria for computing the breakdown of write-offs by maturity have been applied.

to prove unsustainable, a rise in write-off rates could be expected. Overall, their timeliness and detailed breakdowns by sector, purposes and maturity mean that these data can provide useful information about the vulnerability of households and firms and the losses incurred by MFIs. Being a backward-looking indicator, however, write-off rates should be assessed in parallel with other indicators of credit risk with regard to the banks' loan portfolios.

# III THE EURO AREA FINANCIAL SYSTEM

## 3 EURO AREA FINANCIAL MARKETS

*After the June 2006 FSR was finalised, euro area stock markets endured a short-lived bout of volatility, and the earlier rise in long-term bond yields came to a halt. At the same time, notwithstanding some volatility, euro area credit spreads and premia remained very low. Although the euro area financial markets successfully weathered the turbulence, partly because no important financial institution was significantly impacted, the risk of a reappraisal of risks remains, especially in credit markets, not least given the growing uncertainty about the likelihood and potential timing of an adverse turn in the credit cycle.*

## 3.1 KEY DEVELOPMENTS IN THE MONEY MARKET

The predictability of the ECB's monetary policy contributed positively to a smooth adaptation of agents to the increase in policy rates from December 2005 onwards.

Together with steadily rising short-term interest rates through 2006, the degree of uncertainty about their likely future path declined, as gauged by implied volatility (see Chart 3.1). This occurred against the background of a notable increase in trading activity in both the over-the-counter (OTC) and exchange-traded markets.

Conditions on the euro interbank money market remained favourable, with the market continuing to function smoothly after early May 2006. For instance, the widening of spreads between uncollateralised and collateralised interbank lending rates with maturities of one week and one month mentioned in the June 2006 FSR was reversed, and spreads remained low by early November (see Chart S53). This reversal may have been due to technical measures adopted by the ECB to ensure that liquidity conditions remain ample throughout the maintenance period.[1] However, the one-year spread stabilised at a wider level, possibly reflecting some uncertainty about counterparty credit risks. Nevertheless, overall liquidity conditions in the euro money markets remained favourable, as gauged by bid-ask spreads on money market instruments (see Chart S54).

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1 Since October 2005, the ECB has followed an above-neutral benchmark allotment policy, with the aim of countering the widening of the spread between very short-term rates and tender rates on the one hand, and the minimum bid rate of the main refinancing operations on the other. As a result, these spreads narrowed.

**Chart 3.1 Volatility implied in options on three-month EURIBOR futures**

(Apr. 1999 - Nov. 2006, %, 60-day moving average)



Source: Bloomberg.

**Chart 3.2 Monthly gross issues of short-term securities (other than shares) by euro area non-financial corporations**

(Jan. 1999 - July 2006, EUR billions, maturities up to one year)
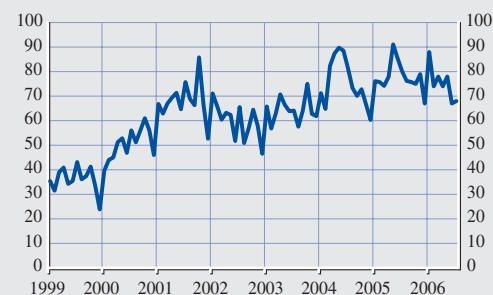


Source: ECB.

The pace of issuance of short-term securities by non-financial corporations slowed down slightly in 2006 (see Chart 3.2). Rather than indicating any inherent difficulties in issuing such securities, this mainly seemed to reflect the rise in short-term interest rates in the euro area.

## 3.2 KEY DEVELOPMENTS IN CAPITAL MARKETS

### GOVERNMENT BOND MARKETS

Notwithstanding a rise in short-term interest rates, ten-year government bond yields in the euro area decreased by 25 basis points after early May, when the June 2006 FSR was finalised, reaching a level of 3.8% in early November 2006 (see Chart S55). During the early part of this period long-term bond yields tended to fluctuate around their early May levels, and declined later. They were to some extent affected by flight to safety effects, as mentioned in Box 4. At the same time, as short-term interest rates increased, the euro area market yield curve flattened, thereby putting pressure on already narrow bank interest rate margins.

By early November 2006, the tightening of US monetary policy since mid-2004 had had little overall impact on long-term government bond prices either in the US or in the euro area (see Chart 3.3). This is in contrast to the experience of earlier US monetary policy tightening cycles of 1994-1995 and 1999-2000, when bond prices declined significantly after about one year in both the US and the euro area. Hence, large losses on euro-denominated fixed income portfolios were avoided in the most recent cycle of tightening US monetary policy.

The persistently low level of euro area long-term bond yields seemed in part to be due to very low levels of risk premia. This is because they remained very close to average ten-year nominal GDP growth expectations.

Several demand-related factors continued to play a role in keeping long-term bond yields, especially real long-term yields, at low levels. As shown in the June 2006 FSR, long-term bond yields have tended to co-move with net purchases of long-term bonds by euro area insurance corporations and pension funds, and

**Chart 3.3 Euro area and US ten-year government bond prices during times of US monetary policy tightening**

(Index: Oct. 1993, Sep. 1998, Aug. 2005 = 100)

- euro area October 1993 peak
- euro area September 1998 peak
- euro area August 2005 peak
- US October 1993 peak
- US September 1998 peak
- US August 2005 peak

months after the US bond market peak
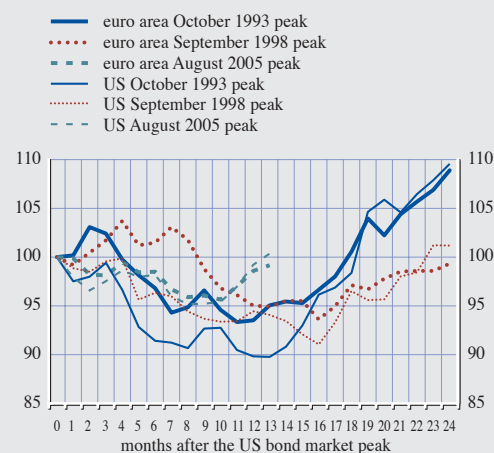
Sources: Global Financial Data and ECB calculations.
Note: The total return index is in terms of bond prices. The Chart shows bond market performances after peaks (i.e. when bond yields had reached a low point).

**Chart 3.4 Net sales of bond funds and long-term bond yields in the euro area**

(Q1 2004 - Q3 2006)

- ten-year government bond yield (%, left-hand scale)
- net sales of bond funds (EUR billion, one-year moving cumulative purchases, right-hand inverted scale)
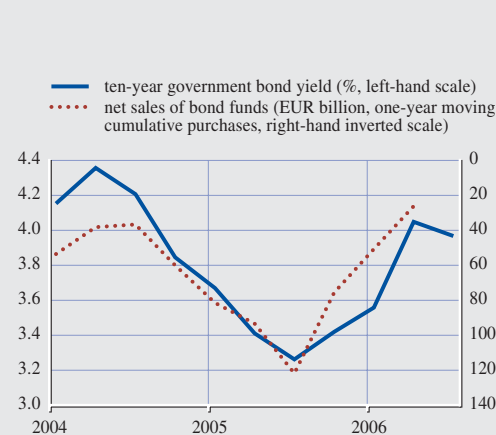
Sources: The European Fund and Asset Management Association (EFAMA) and Reuters.
Note: Net sales of bond funds refer to UCITS net sales, defined as new sales plus reinvested dividends less redemptions plus net exchanges, in at most ten euro area countries.

**Chart 3.5 Ten-year nominal bond yield and option-implied skewness coefficient for ten-year bond yields in Germany**

(Jan. 1999 - Sep. 2006)

― ten-year bond yield (%, left-hand scale)
⋯⋯ option-implied skewness coefficient of ten-year bond yield (average monthly skewness, inverted right-hand scale)
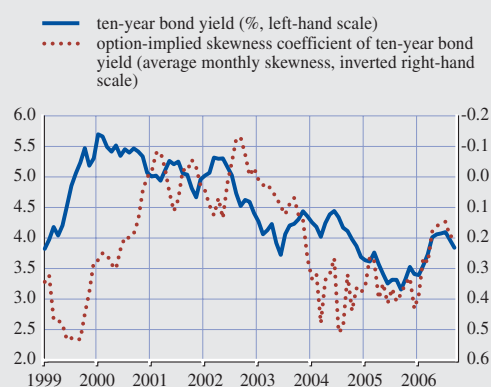


Sources: Eurex, ECB and ECB calculations.

**Chart 3.6 Co-movements between monthly changes in long-term bond yields in the euro area and in the US**

(Jan. 1994 - Oct. 2006, β coefficients, calculated using monthly averages of daily data)

― two-year rolling window
⋯⋯ 1994-2006
--- lower confidence band 1994-2006
― upper confidence band 1994-2006



Sources: Bloomberg, Reuters and ECB calculations.
Note: Estimates of β in $\Delta r^{EA} = \alpha + \beta \Delta r^{US}$ using ten-year government bond yields.

this factor appears to have continued exerting downward pressure on yields over the past six months. Additionally, demand from private investors for bond funds appears to have been closely associated with recent patterns in long-term bond yields (see Chart 3.4).

Even though several factors can be identified that could account for the very low long-term bond yields in the euro area by early November 2006, the option-implied skewness coefficient for German ten-year bond yields signalled that market participants saw a future rise as being much likelier than a decline in long-term bond yields (see Chart S56). The continued perceptions among market participants of possible future bond yield rises might, as suggested by the negative co-movement shown in Chart 3.5, be in part related to the continued low level of bond yields.

Looking ahead, the euro area bond market appears to be exposed to some pricing vulnerabilities, although the risk of an unexpected and significant rise in euro area bond yields would appear to be lower than in the US, at least based on the respective long-term economic outlooks for the two economies. This notwithstanding, a rise in yields could be

triggered by several factors. If long-term bond yields in the US were to rise abruptly, it seems likely that this would, to a large extent, spill over to the euro area bond markets, not least in view of the fact that co-movements between changes in ten-year government bond yields in the euro area and in the US rose significantly in the course of 2006 (see Chart 3.6). Furthermore, the high demand for euro-denominated bonds from institutional and private investors cannot be expected to provide unlimited ongoing support to bond prices. If this or demand from foreign investors were to wane, a sharp rise in long-term bond yields could crystallise. Patterns in market indicators of the balance of risk over the past six months would tend to suggest that the likelihood of such a scenario remains relatively high.

**CREDIT MARKETS**

During the six months after the finalisation of the June 2006 FSR, investment-grade corporate bond spreads in the euro area widened slightly, but by early November they had returned to similar levels as in early May (see Chart S63), whereas speculative-grade bond spreads had even narrowed (see Chart S64). Spreads remained very tight, in part because market participants continued to expect that default

**Chart 3.7 High-yield corporate bond spreads and stock market volatility in the euro area**

(Jan. 2002 - Oct. 2006)

— high-yield bond spread (basis points, left-hand scale)
····· stock market volatility (%, right-hand scale)
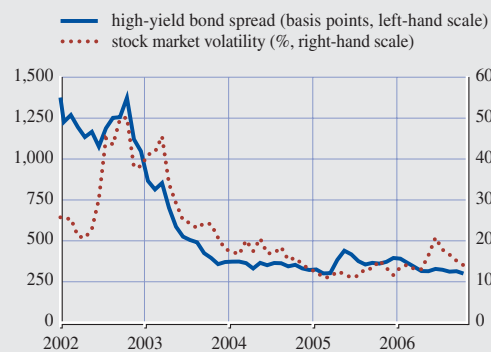
Sources: Bloomberg and Merrill Lynch.

**Chart 3.8 Euro area gross bond issuance by S&P rating classes**

(Q1 1998 - Q3 2006, EUR billions)

■ AAA
▥ AA
▤ A
▨ B-BBB
▧ high yield
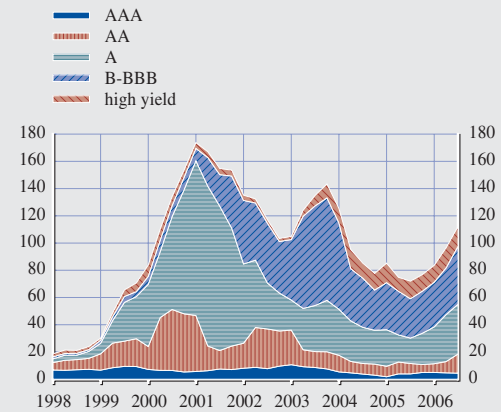
Source: Thomson Deals.

frequencies, which had been persistently low, would remain so at least over the short term (see Chart 2.7).

The further decline in euro area high-yield bond spreads, despite a flattening yield curve and rising corporate sector indebtedness, suggests that the search for yield continued unabated in the six months after the finalisation of the June 2006 FSR. Notably, spreads in the high-yield segment of the euro area bond markets also remained resilient to a significant, albeit temporary, spike in stock market volatility during May and June (see Box 4 and Chart 3.7). While a relationship between corporate bond spreads and stock market volatility, which reflects the degree of uncertainty about firms' assets and thus value, is to be expected, the lack of any discernible spillover to credit spreads might have been due to expectations that the eruption in equity market volatility would not prove lasting. Also the maturity of the options from which equity market volatility is derived is much shorter than that of corporate bonds.

To the extent that pricing in the high-yield segment of the euro area corporate bond market is vulnerable to reassessment, the potential

implications could be more far-reaching than in the past. This is because the result of sustained heavy issuance of high-yield bonds has been an increase in the amounts outstanding to a size equalling the AAA and AA rating classes put together (see Chart 3.8).

The most recent market survey by the International Swaps and Derivatives Association (ISDA) confirms substantial growth in notional principal outstanding on credit default swaps (CDSs), which had increased from USD 17.1 trillion in December 2005 to USD 26 trillion by June 2006 (see Chart 3.9). Two recent studies by the British Bankers' Association (BBA) and Fitch Ratings both confirm this trend (see Box 8). Fitch Ratings also highlights growth in four additional areas: i) the market share of synthetic credit risk portfolio instruments, and especially standard CDS indices (see Chart 3.10); ii) the activity of hedge funds; iii) the use of lower rated reference entities; and iv) the use of asset-backed securities (ABS) CDS indices. The growing importance of trading versus hedging activities among some European banks, which have moved from being net protection buyers to being flat or net protection sellers has also been noted by Fitch Ratings (see Box 8).

**Chart 3.9 The size and growth of the global credit default swap (CDS) market**

(June 2002 - June 2006, in terms of notional principal outstanding)

- ISDA (USD trillions, left-hand scale)
- BIS (USD trillions, left-hand scale)
- ISDA six-month growth rate (%, right-hand scale)
- BIS six-month growth rate (%, right-hand scale)



Sources: ISDA and BIS.

**Chart 3.10 Global collateralised debt obligation (CDO) issuance**

(Q1 2004 - Q2 2006, USD billions, notional amounts)

- cash flow CDOs
- funded bespoke tranches
- unfunded bespoke tranches
- standard index tranches
} synthetic credit risk transfer portfolio instruments (portfolio credit swaps)
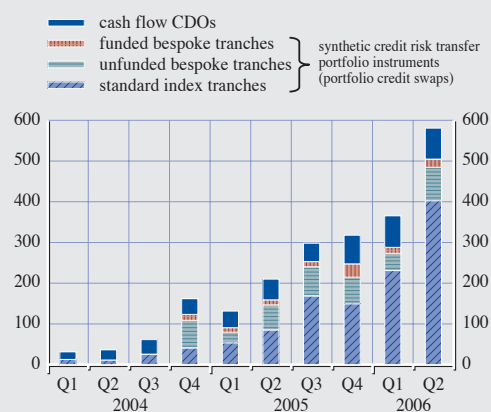


Sources: Bond Market Association and Creditflux.
Note: Notional amounts were not adjusted for the riskiness of different tranches. Portfolio credit swaps mostly consist of synthetic CDOs. The term "unfunded" implies that the principal amount is not transferred between the two parties, while "bespoke" denotes customised, tailor-made, non-index or non-standard tranches.

## Box 8

### GAUGING THE EXTENT OF CREDIT RISK TRANSFER THROUGH CREDIT DERIVATIVES

In September 2006, Fitch Ratings published its fourth annual global credit derivatives survey.[1] This survey captures the main market developments between end-2004 and end-2005. It covers 75 financial institutions (including banks and broker/dealers, insurance companies and reinsurers, and financial guarantors). The institutions covered in the survey are believed to represent the major players in the credit derivatives market. It contains attempts at quantifying the scale of the transfer of credit risk outside the traditional banking and insurance arena. This Box discusses some of the most relevant findings of the survey from a financial stability perspective.

The September 2006 survey found that the notional amount of outstanding credit derivatives contracts had risen, increasing from USD 5.3 trillion at the end of 2004 to almost USD 12 trillion at the end of 2005, an increase of 122%. This confirms the trends recorded in surveys conducted by other institutions and industry associations (e.g. ISDA, the BBA and the BIS). The survey stresses the growing importance of indices and index-related products, which grew tenfold during 2005 and, at USD 3.7 trillion, comprise almost one-third of gross positions. Single-name CDSs still comprise about half of the whole market, although their growth has

1 See Fitch Ratings (2006), "Global Credit Derivatives Survey: Indices Dominate Growth as Banks' Risk Position Shifts", September.

slowed down somewhat. While the banking sector's overall position still remains that of long protection (with the net exposure falling significantly from USD 427 billion in protection bought at the end of 2004 to USD 268 billion at the end of 2005), the report points out that, especially in Europe, there were banks whose net position turned to neutral or even became net protection sellers. The insurance/reinsurance and financial guarantors sector acted as a net protection seller with USD 645 billion net outstanding. The difference between these two numbers (USD 377 billion, up significantly from USD 128 billion at the end of 2004) represents positions accumulated by institutions not covered by the survey (e.g. institutional investors, hedge funds, some banks, etc.). It may provide a reasonable approximation of the amount of credit risk transferred through the CRT markets outside the traditional financial sector, a phenomenon which has been a matter of concern to regulatory authorities ever since the emergence of credit derivatives markets.

Other interesting highlights of the survey include further confirmation of increasing market concentration, with the top 15 banks and dealers responsible for 83% of sold positions (compared with 75% at the end of 2004); market-making, which has become the prime motivation for banks' involvement in the market (as opposed to risk mitigation, which was the main driving factor in previous surveys); gross protection sold on speculative grade and unrated entities, which grew to 31% of the total (up from 24% at the end of 2004), reflecting the continuing search for yield; and the success of ABS CDS indices, where volumes more than doubled, reflecting the volume of CDS on structured assets.

The Fitch Ratings surveys' attempts to analyse the structure of credit derivatives markets as well as the amounts of risk transferred through CRT instruments is welcome, as they contribute to better understanding of the financial stability implications of this rapidly growing market. In this regard, more and improved data on net credit risk exposures and on the concentration of positions could be of considerable benefit to both market participants and the competent authorities. Further work and market intelligence are however needed to understand and monitor investors' behaviour should market conditions deteriorate. As suggested in Box 5, it remains crucial that the industry should play a prominent role in any future initiatives to improve transparency, owing to the global dimension of credit markets, their complexity as well as the rapid pace of innovation.

In the European CDS market, premia were barely affected by the turbulence endured by financial markets in May/June 2006, and continued to decline (see Chart S65). At the same time, patterns in the CDS premium-term structure for the iTraxx Europe index indicate the subsequent degree of resilience to this period of market turbulence, with even short-maturity premia declining below their level of early May 2006 (see Chart S66).

Regarding sectoral performance, investors showed significant discrimination in the period after the May/June period of financial market turbulence (see Chart S67). For instance, whereas the CDS premia in most sectors fully retraced the rise that took place during this period, premia in the automobile sector remained higher, amid concerns over profitability, increased competition and higher default risks.

Information from implied iTraxx credit correlations can shed some light on credit traders' expectations about the role of systematic credit risk vis-à-vis firm-specific credit risk. As Special Feature B, "The information content of CDS index tranches for financial stability

analysis", in this Review shows, an assessment of the level of systematic risk in the credit market can be constructed from the market prices of CDS index tranches. In particular, this indicator shows whether traders in the iTraxx correlation market are more concerned about economy-wide credit risk or about firm-specific credit risk such as the default of a particular firm. In this context, the Special Feature also outlines some of the caveats in the interpretation of this indicator, such as the influence of demand/supply imbalances in the credit market. Overall, since summer 2005, the correlation estimate indicates a movement from systematic to firm-specific credit risk. The Special Feature also finds that most of the variation in the implied correlation is not linked to other financial market indicators.

Looking ahead, credit derivatives have quickly established themselves as a crucial instrument for euro area banks in managing their risk exposures and they could have a potentially significant longer-term impact on banks' traditional loan business and financing structures. It seems that these instruments have been facilitating a change in banks' basic business model away from an "originate and hold" to an "originate, price and trade" lending model (see Box 12). This notwithstanding, by early November 2006 the same vulnerabilities

existed in credit markets as those described in the June 2006 FSR. In particular, concerns remained about the vulnerability of the market to a reappraisal and repricing of credit risk. With rising corporate sector leverage financed at floating rates, higher short-term interest rates and a flatter market yield curve, the likelihood of credit spreads and premia in the euro area widening in the period ahead appear to have grown. In addition, a growing number of firms could experience deterioration in their debt-servicing capability should profit growth lose momentum.

In the credit derivatives market, concerns have been voiced not only about market liquidity risks (see Box 9) and the adequacy of the pricing of risk, but also about the distribution and concentration of risk facilitated by the market, the adequacy of risk management systems as well as the risks posed by settlement following credit events and confirmation backlogs. Moreover, it remains to be seen how the derivatives and cash credit markets would interact in a stress situation, especially if a large, widely referenced name in credit markets were to experience a credit event. Various measures and products are being developed to deal with post-credit event uncertainties. One potentially useful product that is less widely used is the recovery swap (see Box 10).

### Box 9

### IMPLICATIONS FOR CREDIT MARKET LIQUIDITY OF CREDIT RISK TRANSFER INSTRUMENTS

Measuring and understanding market liquidity is extremely challenging for all market participants. It is not just the level of liquidity that matters, but also its variability and how it evolves as a consequence of market-driven or regulatory-driven developments. Over the last few years, the creation of CRT instruments has been the main market-driven innovation in European credit markets. These instruments have had a major effect on the management of credit risk by banks and other financial institutions, and are playing an increasingly important role in the functioning of credit markets both in quiet and distressed market conditions. This Box considers the impact that CRT instruments may have on liquidity, especially under conditions of market stress.[1]

1 This Box draws heavily on M. Laganá, M. Peřina, I. von Köppen-Mertes and A. Persaud (2006), "Implications for Liquidity from Innovation and Transparency in the European Corporate Bond Market", *ECB Occasional Paper,* No 50, August.

Two types of market liquidity can be distinguished: search liquidity and systemic liquidity. The first of these, search liquidity, refers to the fact that during relatively quiet times, the liquidity premium, the additional yield that investors require for bearing the risk of being unable to liquidate a position immediately, is driven by so-called search costs, namely the costs incurred by a trader/market-maker in finding a willing buyer for an asset purchased while this trader/market-maker was making markets in this asset. Search liquidity is therefore asset-specific. The second type, systemic liquidity, is linked to the degree of stress, if any, in a market. Here the driver of the liquidity premium is the degree of homogeneity of investors' behaviour. If all investors attempt to take the same positions at the same time, then the homogeneity of their behaviour will result in liquidity disappearing. Systemic liquidity is therefore not asset-specific, but refers to liquidity conditions in the market as a whole. It tends to be ample when there is a high degree of heterogeneity in investors' behaviour.

It seems likely that the growth of credit derivatives markets has been reducing search costs, especially by reducing hedging and funding costs and risks, and thereby enhancing search liquidity. More importantly, from a financial stability viewpoint, credit derivatives also have the potential to boost systemic liquidity. For instance, there is a general consensus that the existence of these markets has led to much broader investment, trading, and hedging opportunities in the credit markets. As a result, there has been greater heterogeneity in the behaviour of participants, with different views and perception of valuations. Credit derivatives can also strengthen the resilience of the corporate bond market to adverse market events. A good example of this was the use of plain vanilla credit derivatives in the aftermath of the General Motors (GM) and Ford credit rating downgrades in May 2005, when corporate bond investors effectively unwound their exposures to these issuers.

In terms of systemic liquidity, the rapid growth of composite products – including bespoke (or customised) synthetic CDOs and standardised CDS index tranches – that transfer credit risk in portfolio form could also have a positive impact on systemic liquidity. Portfolio instruments increase systemic liquidity by allowing a more efficient dispersion of credit risk across a broadened and more diversified investor base. These instruments provide the flexibility to customise financial transactions to match the individual risk/return preferences of investors, and have become the main vehicle for transferring credit risk from banks to non-banks. Moreover, because of the common credit risk component, synthetic portfolio instruments also increase the interlinkages between different segments of the bond, loan and equity markets. To the extent that they help ensure a broader investor base in distressed market conditions, stronger interconnections between markets can therefore increase systemic liquidity.

While the above considerations may suggest that CRT instruments should make a positive overall contribution to systemic liquidity, there are nevertheless two main counterarguments regarding liquidity and its potential impact on price volatility. By providing potentially unlimited liquidity during quiet times, these synthetic instruments can reinforce herd-like behaviour, as their nature makes it more difficult to detect crowded trades. This differs from crowded trades in the corporate bond market, which would become increasingly apparent through quickly rising prices. Crowded trades in the credit derivatives market, however, are less visible and potentially larger, and therefore can cause greater systemic problems. It is important to note that the driver of the problem here is not the credit instrument itself, but rather the thinking behind the crowd.

In addition, these portfolio credit instruments could potentially amplify market volatility in four main ways. First, the more structured the products are, the narrower the potential investor base is likely to be. This makes the risk that liquidity could dry up much greater in times of stress. Pricing and risk measurement models routinely presume that market liquidity will be the same whether market conditions are calm or inclement. However, for complex credit products, assumptions about asset liquidity may not hold, especially in times of stress, thereby exacerbating price movements. Second, complex credit products tend to be highly leveraged. This means that the likelihood that positions taken in them would have to be liquidated in the event of an adverse market environment is greater, as is the potential market impact. Third, the risk that leveraged investors will find themselves in crowded trades seems to be quite pronounced for complex credit products, where often market risk itself is leveraged. A firm-specific or adverse market event could trigger simultaneous attempts to unwind crowded positions. Fourth, the move towards more mark-to-market derivatives accounting in Europe has resulted in high mark-to-market sensitivity, which may lead to forced selling in a downturn. In this respect, the potential for correlation-intensive products to dislocate parts of the credit markets, particularly from a liquidity perspective, was demonstrated following the GM/Ford downgrades in May 2005.

While it is too early to draw any firm conclusions, a subtle but important distinction between instruments and their uses needs to be made. Financial innovations such as CRT instruments have the clear capacity to enhance market resilience and facilitate risk-sharing. CRT instruments could also have a positive impact on systemic liquidity to the extent that they enhance hedging capabilities, keep trading strategies varied, broaden and diversify the investor base, and enhance efficient credit risk management opportunities. However, as there has not yet been a downturn in the credit cycle, it has not yet been possible to test this hypothesis sufficiently. Other concerns have been raised regarding the use of these instruments, as they may provide greater capacity for investors to crowd into trades than in the cash market, where such congestion would be more visible. Moreover, because these instruments have, to some extent, been shifted from the hands of banks (credit experts) to those of non-banks, they may have indirectly led to an increase in the use of common valuation and risk management tools, which typically encourage short-term investors to exit at the same time in a stress situation.

From a financial stability viewpoint, the focus of concern when monitoring CRT markets should therefore be on investor behaviour rather than the instruments themselves, as well as from institutions to risks and to their management, especially under stress conditions. In order to analyse the overall impact of CRT instruments on systemic liquidity, the following three collective behaviour issues deserve further investigation. First, a better understanding is needed on how different types of market participants change their risk exposure and react under increasingly stressed market conditions. Second, since CRT instruments expose participants to a variety of credit risks as well as to leveraged market and liquidity risks, a better understanding is needed of how structural differences (e.g. asset/liability management, capital requirements, investment strategy and horizons, accounting rules, cash-constraints, etc.) affect the way these risks are managed by market participants under increasingly stressed market conditions. Third, monitoring frameworks are needed to detect firm interdependencies, as well as any structural or cyclical factors that could lead to homogeneous investor behaviour. All in all, a better overview of net exposures and concentrations, common strategies, as well as harmonised valuation and risk management techniques may help market participants to value, manage and price the risks and opportunities that CRT instruments entail more effectively.

Box 10

## RECOVERY SWAPS

Product innovation seems to be a natural feature of the credit derivatives markets, resulting in new instruments being introduced and new risks and exposures being traded. While the life span of some of these innovations has been rather ephemeral, others have proven their value to market participants, becoming standard and sometimes overtaking their underlying cash markets in importance and liquidity. Prime examples of such innovations have been CDSs and CDOs, whose trading volumes and use in investment strategies have undergone exponential growth in recent years. This Box aims at describing one of the relatively new markets which has not been very extensively used but, depending on the development of the credit environment, has the potential to become more widely used in the future – the recovery rate swap.

In the relatively favourable environment that characterised global credit markets from 2003 onwards, where default rates first fell and then remained well below long-term averages, recovery rates – that is, the fraction of credit outstanding that a creditor would receive in final satisfaction of a claim on a defaulted credit – were not a subject of great interest to investors. The credit risk of corporate debt has two components: the likelihood of default and the recovery rate given default. Hence, in theory, recovery rates should be an important factor in determining the price of credit risk, and with interest rates rising and the likelihood increasing of general credit conditions worsening, more attention is likely to be paid to recovery rates. A CDS premium, which is an expression of market participants' views about the price of credit risk, should reflect both the probability of default of the reference entity and the expected recovery value should a credit event occur. However, protection buyers do not know in advance the amount they would receive following a credit event, leaving them exposed to uncertainty about the ultimate recovery rate. This tends not to be so important for investment-grade name CDSs as variations in their expected recovery rates tend to be low, and the standard recovery rate used by the industry in price calculations is 40%. However, recovery rates are likely to be cyclical, declining as economic conditions deteriorate, and changes in expected recovery values tend to be more relevant for lower credit quality names closer to default. This is because the actual recovery value of a defaulted security plays an important role in determining the actual returns earned by affected investors. One of the alternatives available to investors wishing to eliminate recovery rate uncertainty is the use of the recovery swap market.

Presently, two basic types of recovery products are available in the market:

– Fixed recovery CDSs, also known as digital default swaps. In a fixed recovery CDS, the counterparties to the contract agree upon a recovery rate that they will use after a credit event. Similar to ordinary CDSs, the fixed recovery CDS buyer makes periodic payments to the seller. In return, the seller provides protection to the buyer in case a credit event occurs. Whereas in an ordinary CDS contract the value of this protection is not known in advance, the payment received by the fixed recovery CDS buyer is known and equals the difference between 100% and the agreed recovery value, multiplied by the notional. By fixing the recovery rate, the uncertainty of not knowing the ultimate recovery value is removed. If the actual price of the defaulted security falls to lower levels than the agreed recovery rate, the fixed recovery CDS buyer effectively loses money because less money is received from the seller than if an ordinary CDS had been traded. On the other hand, if the actual price of the

security after the credit event is higher than the agreed rate, the buyer effectively makes profit as the security is delivered by the protection seller at the pre-set price, but can be sold in the market for the higher actual price.

– Recovery swaps, also called recovery locks. In a recovery swap no cash flows are exchanged prior to a credit event. If a credit event occurs, the seller delivers a defaulted obligation to the buyer in exchange for a pre-agreed fixed payment specified in the contract (the recovery value). Recovery swaps are quoted in terms of percentages of the notional, and express the fixed recovery value that is exchanged after a credit event.

The two types of instruments are closely linked, as a recovery swap can be created by simultaneously entering into a fixed recovery CDS and a standard CDS contract. Unlike traditional CDS contracts, recovery instruments allow investors to separate recovery and default risk. Both of these risks are contained in traditional CDS prices, and arbitrage possibilities would exist if the recovery expectations were priced differently in each market. If trading in recovery swaps were to grow significantly, the disaggregated pricing of the two parts of credit risk would be made more transparent and reliable, which could in turn attract further interest from investors.

The market turnover of recovery products has been fairly limited until recently, as their use was restricted to a few close-to-default or distressed names. However, there are three good reasons why their use may increase in the future. First, a deterioration in credit conditions is probable at some point in the future, even if its timing is uncertain. As default probabilities increase, recovery rates will depend on the severity of the credit cycle downturn. Second, the publication of the Recovery Lock Credit Derivative Template in May 2006 by ISDA, the derivatives industry association, provides standard documentation for recovery products, thereby answering one of the concerns voiced for some time by the industry. Third, recovery products are increasingly used as part of synthetic CDO transactions, which may foster further market growth. The fixed recovery rate can be assigned at the time the deal is arranged to some or all of the assets referenced in a CDO, determining in advance the cash settlement price for such assets should a credit event occur.

Although the recovery swaps market has existed for some time, its use to date has largely been restricted to a narrow group of troubled or distressed names. While it remains to be seen whether recovery swaps will develop further in a similar way to some of the successful innovations in the credit derivatives universe, their appropriate use by well-informed investors should have a positive impact on the credit markets. They allow investors to express more precisely their views on recovery values, and help achieve orderly solutions of situations following credit events. The improvements in certainty regarding the recovery value may also prove positive for market stability if overall credit conditions deteriorate.

## EQUITY MARKETS

Euro area stock prices sharply declined immediately after the finalisation of the June 2006 FSR, but later recovered, and by early November were slightly above the levels recorded back in early May (see Chart S57).

There were differences in performance across industry sectors, with less risky sectors, such as the utility sector, outperforming more risky sectors, e.g. technology. Among the factors that supported stock prices, were declining long-term risk-free interest rates and upward

**Chart 3.11 Stock market returns and earnings revisions in the euro area**

(Q1 2000 - Q3 2006)

— Dow Jones EURO STOXX
(annual return in %, left-hand scale)
······ ratio of earnings revisions by brokers (balance between up- and downward revisions in % of total number of earnings estimates, right-hand scale)
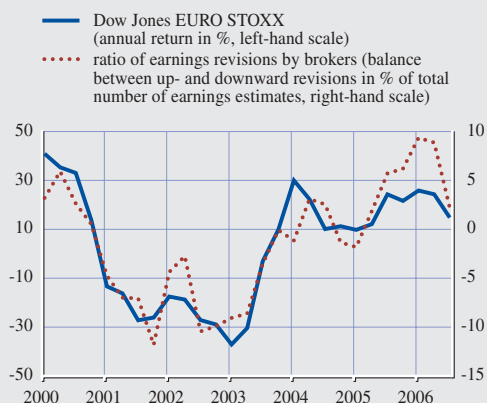
Source: Thomson Financial Datastream.
Note: The earnings revisions ratio refers to earnings forecasts by professional stock market analysts for the next twelve months.

**Chart 3.12 Stock market returns and corporate credit rating revisions in the euro area**

(Q1 1999 - Q3 2006, four-quarter moving averages)

— Dow Jones EURO STOXX (annual return in %, left-hand scale)
······ total upgrade balances (number, right-hand scale)
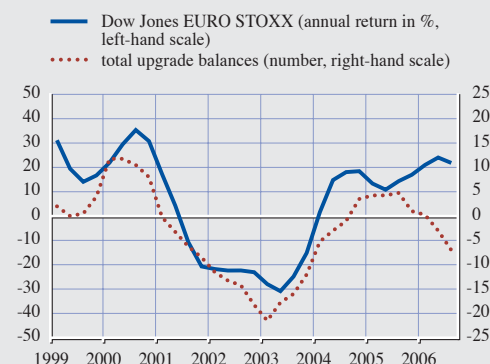
Source: Thomson Financial Datastream.
Note: This reflects the euro area balance between upgrades and downgrades of all bonds.

revisions to earnings expectations, which still exceeded downward revisions (see Chart 3.11).

Several valuation metrics suggested that euro area stock prices had become expensive given the underlying fundamentals by early November. For the stock market as a whole, the price-earnings (P/E) ratio, based on ten-year trailing earnings, remained historically rather high with levels well above 15, which has been the average for German and US P/E ratios for more than a century (see Chart S58). P/E ratios based on both 12-month trailing and projected earnings also remained high for the small and mid-cap segments compared to those for large caps. In addition, the price/cash flow ratio had reached very high levels,[2] both historically and compared to the P/E ratio. When P/E ratios are high, then a return to average levels can be achieved either through a strengthening of corporate sector profitability, which appears rather unlikely in the current stage of the (global) business cycle, or through a decline in stock prices.

High valuations in euro area stock markets might also provide some explanation for the continued rather buoyant initial public offering

(IPO) and secondary public offering (SPO) activity, despite the short-lived bout of stock market volatility (see Chart S62).

Looking at the risks facing equity markets, the perception of near-term risks, as reflected in implied stock market volatility, remained moderate (see Chart S59). Stock market uncertainty derived from the distribution of options prices had declined to some extent by October 2006 (see Chart S60). By contrast, the net flows into euro area equity funds fluctuated widely according to net sales statistics from the European Fund and Asset Management Association (EFAMA). The first quarter of 2006 recorded the highest net flows into euro area equity funds since the March 2003 stock price lows, whereas the net equity fund inflows of the second quarter of 2006 were the lowest since the third quarter of 2004.

Looking further ahead, by early November 2006 the risk of a reappraisal of pricing in euro area equity markets remained broadly unchanged compared to the assessment made in the June

2  See Chart 3.11 in ECB (2006), *Financial Stability Review,* June.

2006 FSR. Several factors continued to point towards downside risks. Short-term risk-free interest rates in the euro area had risen further. Profit growth seemed likely to lose momentum, and it cannot be excluded that earnings estimates by professional stock market analysts may be revised downwards on a net basis in the forthcoming quarters. Finally, it appears unlikely that the euro area equity markets would remain unaffected for a protracted by an adverse turn in the credit cycle (see Chart 3.12).

## 4 THE EURO AREA BANKING SECTOR

*Consolidating the steady and broad-based improvement that got underway in 2003, the profitability of large and complex banking groups (LCBGs) in the euro area was strengthened further in the first half of 2006. Underpinning the continued strengthening of profitability were continued growth in lending volumes which was strong enough to compensate for further lending margin erosion, strong revenues from non-interest income sources as well as further compression of loan impairment charges. At the same time, banks' solvency ratios remained comfortable. Regarding the central outlook for euro area LCBG profitability, despite a flatter market yield curve and thin lending margins, further improvement can be expected in the short-term. However, this broadly favourable outlook carries some risks. With the profit cycle for non-financial firms showing some signs of maturing and with higher interest rates, there is a risk of deterioration in credit quality. This notwithstanding, and despite the current very low levels of loan impairment charges, comfortable solvency positions together with improved risk management capabilities have enhanced the ability of these banking institutions to cope with unexpected adverse disturbances. Consistent with this, forward-looking information derived from the securities prices of these LCBG's suggests a positive near-term outlook.*

### 4.1 FINANCIAL CONDITIONS OF LARGE AND COMPLEX BANKING GROUPS[1]

The financial results of LCBGs in the euro area that were released after the June 2006 FSR was finalised continued to show that the euro area banking system remained in good shape. Profitability improved further, benefiting from the strength of a broad range of income sources. Meanwhile, loan impairment charges – formerly known as loan loss provisions – continued to be very moderate, and growth in recurring operating costs remained slower than growth in operating income. The continued strength of profitability also allowed banks to generate

capital internally, thereby further underpinning what were already healthy capital ratios. The consensus among private sector analysts and rating agencies is that figures for the full year of 2006 should – barring any unforeseen developments – show continued strength in the profitability of euro area LCBGs.

### PROFITABILITY ROSE FURTHER

As was discussed in detail in the June 2006 FSR, it cannot be ruled out that the implementation of the International Financial Reporting Standards (IFRS) has had a temporary impact on euro area LCBGs' financial results. Consequently, caution should be exercised when analysing any recent accounting information disclosed by banks reporting under IFRS.

Most LCBGs continued to post healthy and broad-based growth in profitability during the first half of 2006, building upon the strong financial performances seen in 2005. The weighted average return on equity (ROE)

[1]  The set of LCBGs in this section is based on the methodology described in the Special Feature article "Identifying large and complex banking groups for financial system stability assessment" contained in this Review. It includes IFRS reporting banks only.

**Chart 4.1 Frequency distribution of return on equity of large and complex banking groups in the euro area**
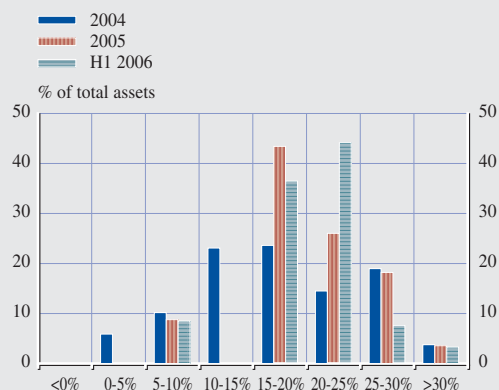
(2004 - H1 2006, %)

Sources: Individual institutions' financial reports and ECB calculations.
Note: The distribution is based on the financial results of 15 large euro area banks. Data for the first six months of 2006 are annualised.

**Chart 4.2 Frequency distribution of return on risk-weighted assets for large and complex banking groups in the euro area**
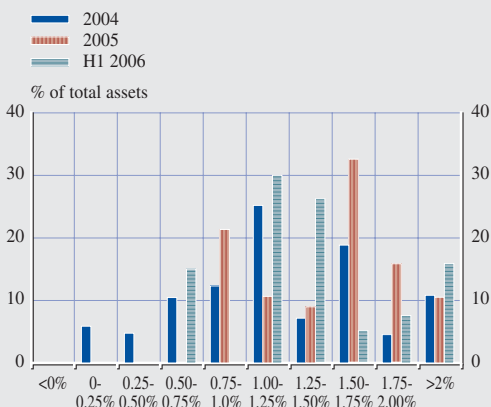
(2004 - H1 2006, %)

- 2004
- 2005
- H1 2006

% of total assets



Sources: Individual institutions' financial reports and ECB calculations.
Note: The distribution is based on the financial results of 15 large euro area banks. Data for the first six months of 2006 are annualised.

**Chart 4.3 Distribution of operating income by geographic area for large and complex banking groups in the euro area**

(2005, % of income)

- minimum-maximum range
- ▲ average
- median



home   other euro   US   Latin   ANZ/Asia-   other
        area/EU          America   Pacific

Sources: Individual institutions' financial reports and ECB calculations.
Notes: The calculations are based on disclosures made in the annual reports of 13 large euro area banks. The geographic regions are approximations, as the definition of geographical area in banks' publications may differ from institution to institution. ANZ denotes Australia and New Zealand.

increased from just below 20% in 2005 to about 21% in 2006; even those institutions that performed below the average on this measure had still improved their performance in the first half of 2006 relative to the previous year (see Chart 4.1).

When measured by the return on risk-weighted assets (RWAs),[2] which are used for calculating capital requirement ratios, the weighted average return of euro area LCBGs decreased slightly in the first six months of 2006 to 1.43%, down from 1.46% in 2005.[3] This was for the most part due to risk-weighted assets (RWAs) increasing more rapidly than annualised net income, which reflects the impact of a few large banking mergers and acquisitions (M&As) in the euro area banking sector in 2005.

**BROAD-BASED INCOME GROWTH**
As a result of past acquisitions both in home and foreign banking markets as well as the expansion of existing business activities, most LCBGs' operating income has become quite geographically diversified (see Chart 4.3). Indeed, many euro area banks have now built up

a significant presence in the non-euro area EU Member State markets, as well as in non-EU European markets such as Turkey. In addition, some LCBGs generate a significant part of their income in North and South America, as well as in Asia. This expansion presents opportunities in fast-growing retail markets where margins are typically higher after the start-up phase, which may help compensate banks for the more subdued interest and other income to be made in their home markets.[4]

Volume growth in lending to borrowers in the euro area remained robust after the publication

2  The return on risk-weighted assets is a profitability measure which takes account of both on- and off-balance sheet positions.
3  RWAs are calculated by assigning each of the bank's assets and off-balance sheet items to several broad risk categories, each of which has different weights that increase with the level of risk, in order to calculate the denominator for the capital requirement ratios. The numerator of the capital ratio is the euro amount of either Tier 1 capital or total capital.
4  For more detail on the types of indicators that can be used for gauging the international expansion of European banking, see D. Schoenmaker and S. Oosterloo (2005), "Financial Supervision in an Integrating Europe: Measuring Cross-border Externalities", *International Finance*, 8 (1), pp. 1-27.

of the June 2006 Review. This growth, in tandem with the expansion by euro area LCBGs into new markets offering both high margins and the potential for rapid volume growth, contributed to an increase in the net interest income of euro area LCBGs, which rose from 0.87% of total assets in 2005 to 0.91% in the first six months of 2006 (see Table S5 and Chart 4.4). This growth was notable since it occurred despite the fact that the gradual increase in short-term interest rates in the euro area meant that interest rate margins remained compressed. Moreover, with a flatter yield curve, the ability of banks to earn interest income on the spread between their interest-paying liabilities and their assets was hampered.

Continued strong loan demand but lower deposit inflows led to a rise in the loans-to deposit ratio. This rise remains one of the reasons behind the compression of banks' margins (see Chart S76). This is because it has meant that banks have had to fund new loan issuance either by selling existing loans in capital markets or by resorting to wholesale funding sources. Should market interest rates edge upwards in the period ahead, margin compression might

ease somewhat, given that the interest paid by banks on deposits tends to be repriced less frequently than the interest banks charge on new loans.

The most important source of operating income for euro area LCBGs has remained interest income. In the first six months of 2006 this source accounted for about 47% of operating income, a share that has remained roughly unchanged since 2004 (see Table S5). Regarding non-interest income, fees and commissions continue to be the most important source of non-interest income for LCBGs, amounting to 26% of total operating income in the first half of 2006. This income stream comprises retail banking fees for transactions as well as fees from banks' asset management and corporate finance activities. By contrast, banks' trading income increased further to reach almost 16% of total operating income in the first half of 2006. However, this average figure masks the fact that for some LCBGs with sizeable capital market operations, trading income accounts for a much higher share of operating income. The turbulent capital market conditions experienced in April and May did not seem to have much of an impact on LCBGs' overall trading revenues in the first half of 2006, as most of them had already recorded sizeable increases during the first quarter of the year.

### CREDIT AND OPERATING COSTS REMAIN CONTAINED

In the first half of 2006, euro area LCBGs' loan impairment charges remained extremely low by historical standards. This was mainly due to improved risk management by banks, coupled with a favourable external environment that underpinned a very benign credit environment. Although average annualised loan impairment charges remained at 0.08% of total assets, for some euro area LCBGs these charges actually increased, mostly owing to increased charges on retail lending in South America and Asia. Moreover, in the case of one or two institutions, the lower amounts of net impairments reflected the working out of loans that were previously

**Chart 4.4 Frequency distribution of net interest income for large and complex banking groups in the euro area**

(2004 - H1 2006, % of total assets)



Sources: Individual institutions' financial reports and ECB calculations.
Note: The distribution is based on the financial results of 15 large euro area banks. Data for the first six months of 2006 are annualised.

**Chart 4.5 Frequency distribution of net loan impairment charges for large and complex banking groups in the euro area**
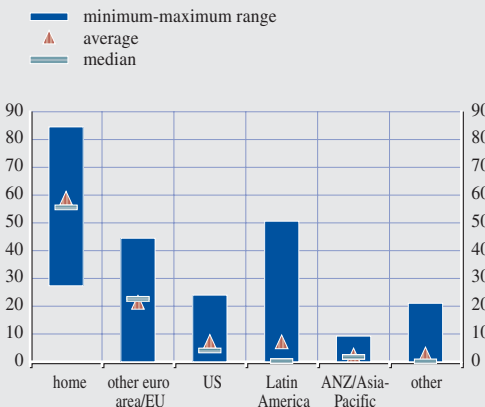
(2004 - H1 2006, % of total assets)

- 2004
- 2005
- H1 2006



Sources: Individual institutions' financial reports and ECB calculations.
Note: The distribution is based on the financial results of 15 large euro area banks. Data for the first six months of 2006 are annualised.

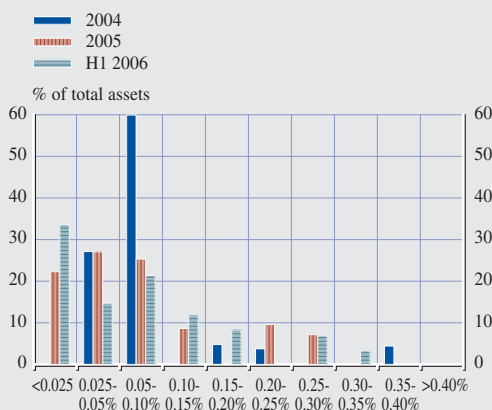**Chart 4.6 Frequency distribution of cost-to-income ratios for large and complex banking groups in the euro area**

(2004 - H1 2006, %)

- 2004
- 2005
- H1 2006



Sources: Individual institutions' financial reports and ECB calculations.
Note: The distribution is based on the financial results of 15 large euro area banks.

regarded by the institutions in question as impaired.[5]

For many LCBGs, overall credit costs remained at very low levels in the first half of 2006. This is illustrated by the concentration of the mass of the frequency distribution of net loan impairment charges towards the left tail (see Chart 4.5). In commentaries accompanying their financial statements, several institutions expect that the credit cycle will deteriorate over the course of the next 12 to 18 months, which should be reflected in a higher level of impairments going forward. However, most LCBGs in the euro area are in a comfortable position to absorb a gradual increase, especially as the base for these impairment charges remains very low.

As growth in operating income outstripped growth in operating costs, cost-to-income ratios remained overall contained for most euro area LCBGs. Indeed, the weighted average cost-to-income ratio decreased from about 64% in 2005 to around 61% for the first six months of 2006. Encouragingly, even institutions that recorded worse than average performance – such as those in the third quartile – managed to reduce their

cost-to-income ratios from 67% to 64% over the same period.

Despite this improvement, some LCBGs still remain in the far right tail of the distribution (see Chart 4.6). In the case of some institutions, this can be traced to unsuccessful previous attempts to reduce costs and generate more sustainable operating income. For one or two other institutions, persistently high cost-to-income ratios are related to the structure of the business model pursued, which involves substantial investment banking activities that are associated with relatively high levels of staff compensation and significant investment in Information Technology (IT).

**CAPITAL RATIOS REMAIN HEALTHY**

The sustained growth in income – sometimes in a challenging environment – throughout the past three to four years has, combined with low credit impairments and tight cost control, supported substantial internal capital generation

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5 Gross impairment data refer to the flow of new impairment charges. The net impairment figure is the sum of new impairments plus reversals of previously impaired loans. These are not available on a quarterly basis for the majority of euro area LCBGs.

**Chart 4.7 Frequency distribution of Tier 1 ratios for large and complex banking groups in the euro area**
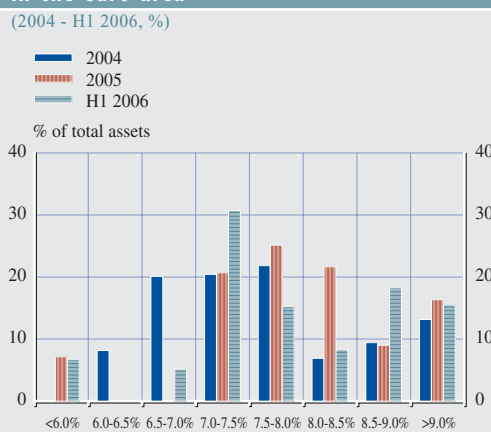
(2004 - H1 2006, %)

- 2004
- 2005
- H1 2006

% of total assets



Sources: Individual institutions' financial reports and ECB calculations.
Note: Based on a sample of 15 large euro area banks.

**Chart 4.8 Frequency distribution of overall solvency ratios for large and complex banking groups in the euro area**
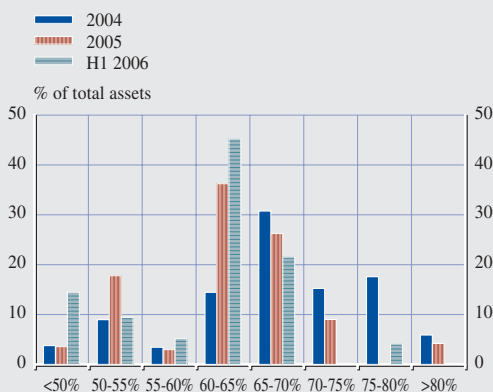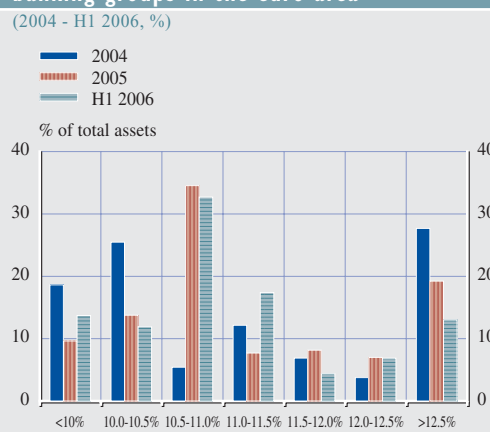
(2004 - H1 2006, %)

- 2004
- 2005
- H1 2006

% of total assets



Sources: Individual institutions' financial reports and ECB calculations.
Note: Based on a sample of 15 large euro area banks. Data for the first six months of 2006 are annualised and are preliminary.

by euro area LCBGs, with retained profits contributing positively to banks' capital ratios. This notwithstanding, due to a general increase in RWAs, the weighted average Tier 1 ratio declined slightly from 8.1% in 2005 to 8.0% in the first half of 2006 (see Chart 4.7). In most cases, RWAs expanded due to organic growth in loan books and in other exposures, but in some specific instances, they could have increased due to mergers with other banks, as the deduction of goodwill from core capital also tends to reduce Tier 1 capital.[6]

Overall solvency ratios also decreased slightly from 11.4% on average in 2005 as a whole to about 11.2% for the first six months of 2006.

Encouragingly, however, institutions with the lowest capital ratios saw an improvement over this period. By contrast, banks in the second-lowest quartile of the distribution saw their capital ratios decrease in the same period. All in all, similar to the Tier 1 ratio, the distribution of overall solvency ratios remains uneven (see Chart 4.8). While institutions in the left tails of these distributions could be more vulnerable to unanticipated adverse shocks disturbances, even these institutions comfortably exceed the regulatory minima for both capital ratios.

6 This effect was particularly pronounced in the case of one institution that recorded a Tier 1 ratio of less than 6%, although this still comfortably exceeded the regulatory minimum for this ratio of 4%.

**COMBINING INFORMATION ON BANK PERFORMANCE**

A common way of assessing the performance of an individual bank is to compare its accounting data or its share price with similar indicators computed for a peer group. For example, the set of indicators concerning banks' profitability that is regularly monitored in the ECB Financial Stability Review comprises a mix of both accounting-based and market-based indicators that are aggregated to form peer group averages and various measures of dispersion. The headline or main accounting ratios that are frequently used include return on equity (ROE) and return on risk-weighted assets (RORWA), as well as various other measures such as loan impairment

charges, cost-to-income ratios and capital ratios.[1] These indicators attempt to gauge various aspects of banking sector performance – including overall profitability, asset quality, efficiency and regulatory capital. To arrive at a more comprehensive assessment, this information is complemented with information extracted from market indicators such as banks' stock prices, price-earnings ratios as well as derived measures such as risk-neutral density functions and distance-to-default indicators. The main difference between the two sets of indicators is that accounting data are based on realised or actual outcomes, whereas market data are based on investors' expectations of future bank performance.[2] These expectations are formed by summarising all available information on the outlook for banks. This Box compares the information that can be gauged from these two sources, and it provides an example where they may be fruitfully combined. The main finding is that pooling information from both sources may provide useful insights for financial stability analysis.

One way of improving the information content of accounting-based indicators is to relate them to the volatility of banks' income sources. Indeed, raw accounting data may not fully incorporate the risks incurred by banks. This means that if individual banks take on different levels of risk, raw accounting data on returns will not be strictly comparable. One possible way of risk-adjusting the accounting return measures is to normalise them with the standard deviation of net bank income. Chart B11.1 plots the ROE of LCBGs against the RORWA where both have been normalised by the standard deviations of the ratio in an attempt to adjust for risk. If both of these risk-adjusted performance indicators reflected similar aspects of bank performance, they would be perfectly correlated and the observations would be distributed along a diagonal line. Although the relationship is close, for some LCBGs, it can be seen that there is less than a perfect correlation, indicating that the two indicators are measuring different aspects. For example risk-weighted assets, the numerator of RORWA – and a figure required for regulatory

1 This sample in this box is based on the methodology described in the Special Feature article "Identifying large and complex banking groups for financial system stability assessment" contained in this Review. The sample period is based on the availability of adequate data for all of the banks in the sample.
2 Various other measures such as Sharpe and Treynor ratios are possible. For a comprehensive review of performance measures, see J. W. B. Bos, J. A. J. Draulans, D. van den Kommer and B. Verhoef (2006), "An International Scorecard for Measuring Bank Performance: The Case of Dutch Banks", *De Nederlandsche Bank Occasional Paper*, 4 (2).

**Chart B11.1 Mean risk-adjusted ROE and RORWA for large and complex banking groups in the euro area**

(2000 - 2005, %)
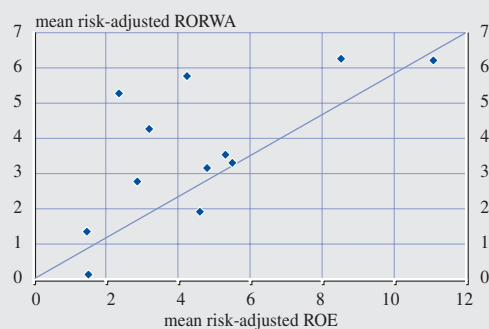


Sources: Individual institutions' financial reports and ECB calculations.
Note: Mean ROE and mean RORWA are risk-adjusted by dividing by their standard deviation over the period 2000-2005.

**Chart B11.2 Annual average beta and income diversity**

(2000 - 2005)
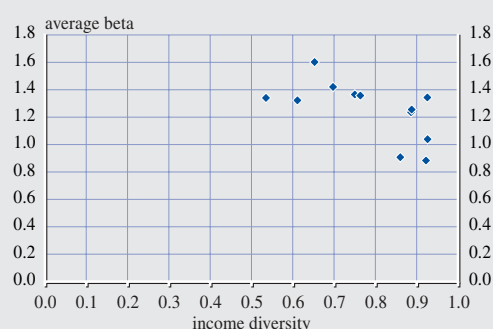


Sources: Individual institutions' financial reports and ECB calculations.
Note: Average beta is estimated annually and averaged. The income diversity measure is calculated as 1-abs(2X-1), where X equals the share of interest income in total operating income.

capital requirement calculations – may be a broader and more obvious measure of the credit and other risks facing banks than the numerator in the ROE. Here, RORWA is normalised to make it comparable with ROE.

Accounting data still suffer from the drawback that the obtained measure remains backward-looking. In addition, risk adjustments based on accounting data can be sensitive to the sample period chosen. This would suggest that no single profitability measure will capture all aspects, so that it may be useful to monitor trends in several profitability measures – some based on accounting data and others based on market information – in order to provide a more comprehensive picture of profitability performances. Since stock markets are forward-looking, have a long-run horizon, and incorporate information rather quickly, they may price-in changes or differences in diversification strategies very quickly, thereby providing timely indicators. Securities prices should in principle also incorporate a much wider information set than that available from of banks financial statements – including information on the sources of income growth and diversity – as well as information concerning the banks' strategy and business mode.

To illustrate how information from the two sources can be combined, it is of interest to consider how the income diversity of banks can affect their overall risk. As mentioned in Section 4.1, many LCBGs have attempted to reduce their income volatility by diversifying geographically and functionally (i.e. by expanding their non-interest income activities). This raises the issue of whether diversified financial institutions possess a better return-risk profile compared with less diversified banks.[3] Looking at headline accounting-based performance measures may not immediately reflect changes in diversification strategies owing to their backward-looking nature and to the fact that it may take time for benefits to accrue.

In order to determine the relationship between income diversity and risk, it is necessary to compute proxies for both. One way of measuring the risk of a bank is with a market model that distinguishes the effects on bank stock prices of firm-specific risk elements and those relating to the overall market environment, or macroeconomic risk. Such a model can provide a measure of systematic risk, which is commonly known as the equity beta.[4] Because changes in the state of the economy or in the banking sector environment, including the degree of leverage, geographic or functional diversification, or regulation may have a bearing on this systematic risk component, an empirical methodology which takes account of possible time variation may be particularly useful.[5] In order to allow for time-variation in the coefficients of LCBGs over the recent past, the factor exposures and bank-specific volatility were estimated for each individual year using daily bank stock returns, and then averaged to account for possible time-variation in the equity beta measure. Measures of income diversity can be calculated based on

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3  See K. J. Stiroh and A. Rumble (2005), "The Darkside of Diversification: The Case of US Financial Holding Companies", Journal of Banking and Finance, forthcoming.

4  Beta is a measure of systematic risk that describes the sensitivity of an equity security to movements in the overall market. A beta value of greater than one indicates that the stock price in question will ordinarily move by more than the market return. The estimation of the betas and the idiosyncratic risk components was carried out using a two-factor model. The factors used for explaining excess stock returns are the euro area stock market index and long-term (ten year) government bond prices, both of which were obtained from Datastream) This specification assumes that the macro-factors can be approximated by developments in the market index. In practice, for euro area banks, this seems to be the case as shown for example in Box 12 of ECB (2005), Financial Stability Review, June.

5  See L. Baele, O. De Jonghe and R. van der Vennet (2006), "Does the Stock Market Value Bank Diversification?", *Journal of Banking and Finance*, forthcoming; W. Ferson and C. Harvey (1991), "The Time Variation of Economic Risk Premiums", *Journal of Political Economy*, 99, pp. 385-415; and T. Santos and P. Veronesi (2004), "Conditional Betas", *NBER Working Paper*, No 10413.

the detail available in banks financial accounts. One advantage of combining both accounting and market measures can be seen from Chart B11.2. It shows that on the one hand, the average estimated betas tend to be higher than one and, on the other hand, that, for the banks under consideration there is a possible negative relation between average revenue diversity and the average estimated market betas i.e. higher income diversity is typically associated with lower systematic risk.

To sum up, both groups of performance indicators have their relative strengths. Since they measure different aspects of banking sector risk-return trade-offs, thereby complementing one another, it is useful to monitor trends in both.

## 4.2 RISKS FACING THE BANKING SECTOR

After the publication of the June 2006 FSR, the macro-financial environment for the euro area banking sector developed positively. Most notably, economic growth remained buoyant in most euro area countries, and even gained traction in those Member States where growth had been more subdued over the last three to four years. At the same time, the euro area market yield curve continued to exhibit a relatively flat shape. Against the background of the favourable financial performances of euro area LCBGs in the first half of 2006, financial analysts' forecasts of the banks' weighted

average profitability improved in the course of the year (see Chart 4.9).

The improvement in expected performances was also broad based across banks, including those with lower profit levels (see Chart 4.10). Factors that contributed to this positive reassessment of banks' future earnings performances included the improving macroeconomic environment, the strength of the creditworthiness of borrowers – including households and firms – in conjunction with expectations of continuing cost containment and a more effective use of capital.

**Chart 4.9 Earnings per share (EPS) and end-2007 forecasts for large and complex banking groups in the euro area**

(Q1 1999 - Q4 2007, weighted average, EUR)

- weighted average
- 10th percentile
- Q1 2006 forecast for end-2007
- Q3 2006 forecast for end-2007
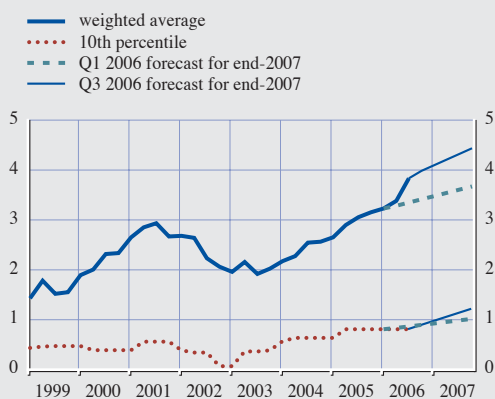


Sources: Thomson Financial Datastream, I/B/E/S and ECB calculations.

**Chart 4.10 Distribution of earnings per share (EPS) and end-2007 forecasts for large and complex banking groups in the euro area**

(EUR)

- Q3 2006
- Q3 2006 forecast for end-2007

number of banks



earnings per share
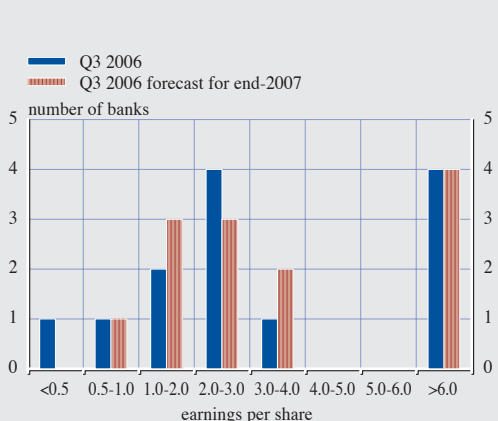
Sources: Thomson Financial Datastream, I/B/E/S and ECB calculations.

Notwithstanding the positive earnings outlook, some of the risks facing euro area LCBGs remain while others may have grown in importance. On the one hand, a global source of medium-term risk for the stability of financial systems continues to be large global financial imbalances, despite some rebalancing of global growth patterns and recent declines in oil prices. On the other hand, the potential for an adverse turn of the credit cycle may have increased as might the potential for abrupt unwinding of leveraged speculative positions. At the same time, euro area LCBGs' exposures to credit risks have grown further as bank lending has continued expanding but loan impairment charges continued declining, and credit standards have not been tightened. Persistently low financial market volatility could also have encouraged banks to take on greater market risk exposures across various asset classes.

A near-term issue related to the regulatory environment for euro area LCBGs is the adoption in the euro area of the Basel II Capital Accord in January 2007. Once it has been fully implemented, the new accord will substantially enhance the risk management environment where banks operate. A smooth transition to the

new environment will be enhanced by close cooperation between banks and their regulators during the implementation phase.

The balance sheet structure of LCBGs can shed some light on the size and nature of their potential exposure to various sources of risk (see Chart 4.11). Based on balance sheet information, the most important source of risk for euro area LCBGs is credit risk but they also have important counterparty risks via exposures in interbank markets, as well as various market risks from their financial asset holdings. However, off-balance sheet exposures can also be important, especially for these types of institutions which tend to be highly active in markets for financial derivatives.

## CREDIT RISK EXPOSURES AND WRITE-OFFS

### Household sector credit risks have increased

Continued rapid growth in lending by euro area LCBGs to households, in conjunction with declining impairment charges and some signs of loosening of credit standards being applied on new loans, contributed to an increase in LCBGs' exposure to household sector credit risks in the first two quarters of 2006, with subsequent stabilisation in the third quarter of 2006. The exposures of LCBGs may extend beyond pure credit risk arising from lending but also to non-interest sources of income. These growing exposures should, however, be seen against the fact that the bulk of euro area LCBGs' household loan portfolios are secured on property, which mitigates the overall credit risk.

In many euro area countries, the growth of banks' mortgage exposures was driven in part by structural changes in mortgage markets – including greater mortgage product diversity – that improved borrowers' access to credit. Moreover, euro area LCBGs' preparations for the implementation of the new capital requirements under Pillar I of the Basel II accord could have provided additional impetus for banks to extend their activity in the mortgage market. For instance, banks may have been

**Chart 4.11 Balance sheet structure of large and complex banking groups in the euro area**

(2005, %)

other assets
fixed assets
cash
securities
customer loans

other liabilities
equity
other funding
money market funding
deposits

Sources: Bureau van Dijk (Bankscope) and ECB calculations.
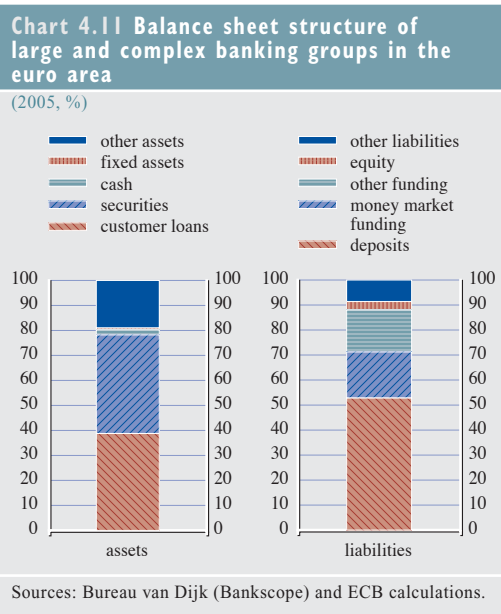
**Chart 4.12 Changes in bank credit standards applied to loans to households, and annual growth of loans to households**

(Q1 2003 - Q3 2006)
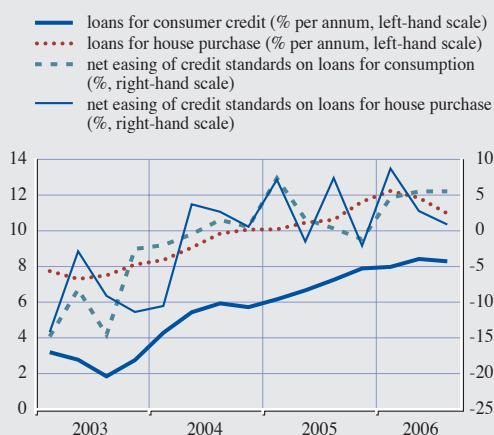
- loans for consumer credit (% per annum, left-hand scale)
- loans for house purchase (% per annum, left-hand scale)
- net easing of credit standards on loans for consumption (%, right-hand scale)
- net easing of credit standards on loans for house purchase (%, right-hand scale)



Source: ECB.
Note: "Net easing" is defined as the difference between banks reporting that credit standards were eased compared to the previous quarter and those banks reporting that credit standards were tightened, i.e. a positive figure indicates a "net easing".

encouraged to shift assets in their lending portfolios from lower-rated corporate loans to higher-quality mortgage loans that carry lower capital requirements. Exposures also grew as banks in several Member States aggressively pursued market share. The average loan-to-value (LTV) ratios of existing mortgage loan portfolios in the euro area are generally considered rather conservative, thus mitigating banks' vulnerability to adverse changes in credit quality. The rise in house prices in recent years in most euro area Member States has also increased the value of lenders' collateral, which reduces the risk of future loan write-offs by supporting recovery rates in the event of defaults. However, there is some concern that the LTVs being applied by some banks on new loans may not be sufficiently strict. At the same time, according to the ECB Bank Lending Survey (BLS) for October 2006 banks generally held their standards on mortgage lending to households unchanged compared to the previous quarter (see Chart 4.12). Notably, banks reported that, as in previous quarters, competition from other banks was a factor supporting looser credit standards (see Chart S70). However, concerns regarding housing

market prospects strengthened and became a contributor towards tighter credit standards.

Unsecured consumer lending carries more credit risk than mortgage lending but it constitutes a far smaller share of the total lending stock. The exposure of LCBGs to this source of credit risk continued to grow during 2006 and the ECB BLS for October 2006 indicated that credit standards on consumer lending were eased further compared to the previous quarter. Among the factors contributing to the net easing in credit standards were competitive pressures from other banks and non-banks, as well as slightly more favourable expectations regarding general economic activity (see Chart S71). The net contributions of these factors were, however, less intense than in the previous quarter. At the same time, banks cited concerns regarding the creditworthiness of consumers as a factor supporting tighter consumer credit standards.

While competition in the banking sector should in principle contribute positively to financial system stability over the medium-term, not least by encouraging greater efficiency, there have been some concerns that the intensity of competition in lending to households may have pushed some banks into granting credit at easier terms than they might otherwise have done. This could leave them vulnerable should the condition of household balance sheets deteriorate unexpectedly, for instance if there were an adverse disturbance in housing markets.

Looking forward, the extent of household sector credit risks facing banks will ultimately depend on the ability of euro area households to service their debts in a more challenging environment. As discussed in Section 2.3, the euro area household sector does not appear to be especially vulnerable to unexpected interest rate rises, as debt-to-asset ratios remain relatively comfortable. Even though debt-to-income ratios have continued rising, on this measure indebtedness is low by international standards. Moreover, some countries outside the euro area have much higher household sector debt-to-

income ratios and have not encountered any balance sheet strains despite rising interest rates. That said, euro area aggregates do mask the fact that household sector credit risk is rather unevenly distributed across countries and income categories.[7]

As discussed in Box 7 in Section 2, household loan write-offs – measured on an unconsolidated basis as the percentage of amounts of monetary financial institution (MFI) loans outstanding – by banks have remained relatively stable. However, write-offs for consumer credit have shown some upward movement after having declined in the first few months of 2006. This may partly explain the low levels of impairment charges reported by LCBGs in the first half of 2006.[8] However, these average figures mask the fact that banks in some Member States have witnessed larger increases in write-offs in consumer credit, as debt-servicing burdens have gradually increased. Against this background, there have been concerns about continuing rapid credit growth in some countries and to lower income households. In several euro area countries regulatory authorities have been prompted to resort to various prudential measures – including both bank-specific regulations and more general moral suasion – to tackle the risks both from a financial stability and a consumer protection perspective.

Looking forward, the risk of a significant deterioration in the debt-servicing capacity of the household sector as a whole remains remote when taking the central macroeconomic outlook into account. Hence, notwithstanding further growth in household sector lending and country-specific differences, it would appear that the financial condition of the euro area household sector would have to deteriorate rather substantially before euro area LCBGs would be faced with losses from their exposures to the sector that were significant enough to pose a concern for financial stability.

**Downside risks for corporate sector creditworthiness have grown**

The credit exposures of euro area LCBGs to non-financial corporations continued rising after the finalisation of the June 2006 FSR. The recovery in lending may be seen in connection with the improvement in the general economic environment and the strength of investment activity. As discussed in Section 2.2 the concentration of new lending at shorter maturities appears to have been associated with an expansion of banks' mergers and acquisition (M&A) financing activities. With indications that the recent growth in M&As has centred around the leveraged buy-out (LBO) segment this would suggest that euro area LCBGs' credit risks arising from M&A could be higher than in previous M&A waves, which tended to be dominated by equity-financed deals. In addition, as the activity has spread down along the credit quality spectrum, the average credit ratings of target companies have deteriorated. Hence, all else being equal, there is a potential for an adverse turn of the credit cycle to have a more pronounced affect on banks than on earlier occasions.

As discussed in Section 2.2, the balance sheet condition of the euro area non-financial corporate sector does not give rise to significant concerns regarding the credit risk facing banks on their corporate loan portfolios. Regarding newly extended loans, the October 2006 BLS reported broadly unchanged credit standards on

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7  An additional issue that could particularly (if not exclusively) affect vulnerability among those euro area banks with substantial activities in the non-euro area EU countries is the rapid increase in the share of foreign currency-denominated mortgage loans over the past few years. See Section 5 of ECB (2006), EU *Banking Sector Stability*, November.

8  Caution is warranted when making direct parallels between the loan impairment charges as reported in Chart 4.5 and loan write-offs as reported in Box 7, for three reasons. First, impairment charges are measured on a consolidated basis and include loans to all sectors, while write-offs are measured sector by sector on an unconsolidated basis for MFI institutions. Second, past loan write-off rates or loan losses are only one determinant of impairment charges, particularly in countries where forward-looking measures are applied. Third, the data sources for the two indicators are different. Data on impairment charges come from the banks' financial reports, whereas write-off data originate from the ECB's euro area MFI statistics.

**Chart 4.13 Changes in bank credit standards applied to loans and credit lines to enterprises, and annual growth of loans to non-financial corporations**

(Q1 2003 - Q3 2006)
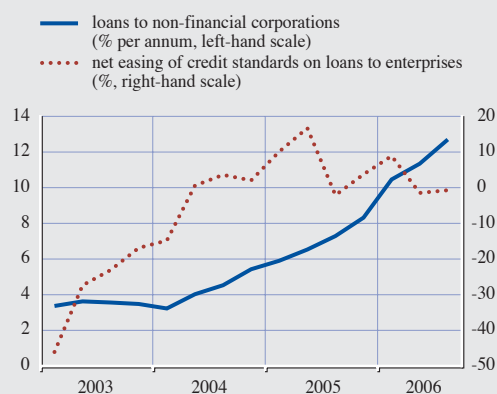
──── loans to non-financial corporations
(% per annum, left-hand scale)
·········· net easing of credit standards on loans to enterprises
(%, right-hand scale)



Source: ECB.
Note: "Net easing" is defined as the difference between banks reporting that credit standards were eased compared to the previous quarter and those banks reporting that credit standards were tightened, i.e. a positive figure indicates a "net easing".

loans and credit lines to large enterprises in the euro area (see Chart 4.13). At the same time, standards applied to SMEs eased substantially. Banks reported that competition from other banks was the main driver behind this easing, whereas more fundamental general economic factors tended to point in the other direction (see Chart S68). This may suggest that at least some banks may have loosened credit standards more than they would otherwise have done in a situation of less fierce competition.

Taking a forward-looking perspective, if credit standards have been eased too far, adverse disturbances to the quality of euro area banks' credit portfolios could result in loan losses that banks are not sufficiently prepared for. Possibly reflecting such concerns, banks reported in the October 2006 BLS that they had become more discriminating in their pricing of corporate credit risk in recent quarters. In particular, whereas margins on average loans to enterprises had narrowed, margins on riskier loans to enterprises had widened (see Chart S69).

In the third quarter of 2006, collateral requirements on loans to enterprises were broadly unchanged. The increasing tendency to

contract new corporate loans at variable-rate terms has helped shift interest rate risk away from banks, although in the medium term, the growing corporate debt-servicing burden could pose additional credit risks for banks, particularly if firms have not adequately hedged themselves against the risk of rising interest rates.

Indications that the quality of euro area LCBGs' corporate loan books have remained high since the publication of the June 2006 Review – despite increasing corporate sector leverage, rising short-term interest rates and intense competition among banks – are supported by the fact that write-offs on both short and long-term MFI loans fell sharply after the last quarter of 2005 (see Box 7). The low levels of corporate loan write-offs are a corollary to recent exceptionally low corporate default rates. To some extent, the low incidence of defaults could have been supported by favourable financing conditions that have allowed corporates easy access to credit and refinancing facilities.

The combination of better diversified income bases and low corporate sector default rates was a particularly welcome development for those euro area LCBGs that had become increasingly reliant on lending to the household sector in the recent past. However, as noted, several factors suggest that the credit cycle could deteriorate in the period ahead which could bring with it rising incidences of defaults by firms towards historical averages. As a consequence, the euro area banking sector could be faced with increasing loan impairment charges and write-offs which, depending on the severity of the deterioration, could quickly translate into a corrosion of the creditworthiness of LCBGs (see Chart 4.14). In this connection, an area of concern is that throughout 2006, an increasing amount of corporate lending was channelled to high-yielding/low credit rating borrowers which traditionally have greater than average rates of default over the cycle.

An important factor in the assessment of the credit risks that euro area LCBGs face in their

**Chart 4.14 Euro area BBB-rated corporate default rates and expected default frequencies (EDF) for large and complex banking groups in the euro area**

(Jan. 1999 - Sep. 2006, monthly data)

BBB-rated corporate default rate (%)

Sep. 2006

median EDF of LCBGs in the euro area (% probability)
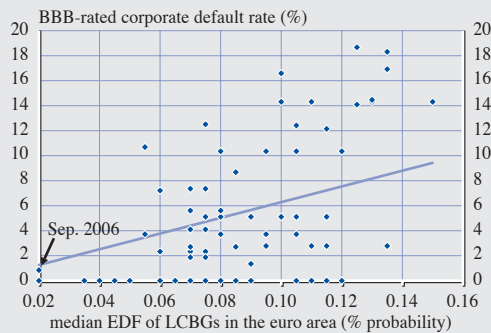
Source: Moody's.
Note: Due to measurement considerations, the EDF values are restricted by Moody's KMV to the interval between 0.02% and 20%.

lending to non-financial firms is that ongoing restructuring of loan books in the pursuit of more capital-efficient banking books, and in anticipation of the new Basel II capital requirements, has been having a mitigating effect. Anticipation of the new capital requirements could have provided banks with

incentives either to hedge or to securitise loans extended to lower-rated corporates, which will receive a less favourable risk weighting under the new capital adequacy rules (see Box 12).

To sum up, by late 2006 euro area LCBGs' risks stemming from their lending to corporations, although low, seemed to be growing on account of rapidly rising corporate sector leverage, increasing recourse by firms to short-term funding and because of further rises in short-term interest rates. In this connection, an area of concern is the rapid increase in exposures of banks to short-term leveraged financing since the assessment made in the June 2006 FSR. Nevertheless, expected default frequencies for non-financial corporations remained low as did impairment charges, suggesting a low likelihood of an abrupt deterioration in corporate sector credit quality. At the same time, banks' solvency ratios remained at very comfortable levels which would most likely be capable of enduring significant and unexpected deterioration in credit quality. That said, banks should remain vigilant in their pricing of risks on loans to lower-rated corporate sector borrowers.

**Box 12**

### CREDIT PORTFOLIO MANAGEMENT PRACTICES AND THEIR IMPLICATIONS

Financial institutions are increasingly measuring and managing the risk from their credit exposures at the portfolio level, in addition to the transaction level. A greater focus on so-called credit portfolio management (CPM) has occurred for a number of reasons. The first is a greater recognition of the fact that individual credit exposures can be highly correlated, leaving banks open to the possibility of facing multiple adverse credit events. CPM can help in lowering such undesirable credit risk concentrations. Additional driving factors have been greater emphasis on improving the risk/return profiles of credit portfolios, and making better use of regulatory capital. Furthermore, opportunities for managing credit exposures proactively, after they have been originated, have been facilitated by improved liquidity in the secondary loan market, the increased importance of syndicated lending, the availability of credit derivatives, and an increasing availability of sophisticated models for evaluating credit risk, as well as improved data, and information technologies that facilitate the management of credit risk on a portfolio basis. One implication of CPM is that banks are increasingly moving away from traditional buy-and-hold loan exposure management to an originate-and-distribute business model. This Box discusses recent advances in CPM practices and their implications.
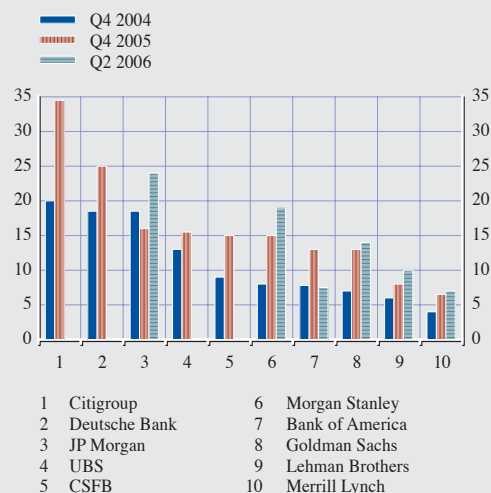
The main objective of modern CPM is to improve the ability of banks to identify risk-return optimal credit portfolios. Such identification is especially important in a market environment of intense competition which can leave banks exposed to greater risk and decreasing return margins. CPM provides banks with better tools for pricing and managing risks as well as for enhanced monitoring of the costs of their loan books. It also has the benefit that it promotes a more risk-adjusted and profit-focused culture in the loan origination business units of banks. It can also enhance the stability of banks' earnings and mitigate investor concerns on credit risk and profit drag from loan loss provisioning. Under active CPM, loan products are ultimately seen as strategic tools for optimising the risk/return trade-off in the banking book. CPM can also create capacity for new business by distributing credit risk more widely in the financial system and freeing up economic capital.

The implementation of CPM in banks is typically concentrated in specific business units that operate in-between the loan origination and loan portfolio hedging functions. The task of CPM business units is to create an internal "market" within the bank that marks loans to market and quotes internal transfer prices that match the shortfall between the revenues that the bank generates from a loan and the price it pays in the market to hedge that loan (for example in terms of the credit default swap (CDS) premium). These shortfalls are typically covered by the loan-originating business units, which receive partial ex post compensation out of the profits generated by the CPM unit from the transformation and sales of the credits. Given that the payment of this shortfall falls upon the loan originator, the pricing of loans at their origination should already take into account future hedging costs, thereby encouraging minimisation of the shortfall. In theory, loan origination will become an integral part of CPM, implying that all steps in the credit process are based on capital market prices.

Indications of growing CPM activity being undertaken by large global banks – where these activities tend to be concentrated – can be seen in increasing loan hedging via credit derivatives

**Chart B12.1 Credit default swap holdings by large international banks**

(EUR billions)



- Q4 2004
- Q4 2005
- Q2 2006

1  Citigroup
2  Deutsche Bank
3  JP Morgan
4  UBS
5  CSFB
6  Morgan Stanley
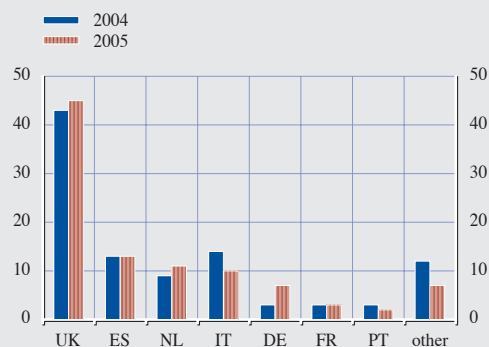7  Bank of America
8  Goldman Sachs
9  Lehman Brothers
10 Merrill Lynch

Source: Financial disclosures of banks.

**Chart B12.2 European securitisation issuance by country of collateral**

(% of total)



- 2004
- 2005

Source: European Securitisation Forum (ESF) Securitisation Data Report, Winter 2006.

(see Chart B12.1). Regarding the use of loan securitisation as a means of CPM, data available for EU banks shows substantial variation across Member States (see Chart B12.2).

Looking ahead, there are at least two reasons to expect that CPM will become an increasingly integral part of banks' credit activities. First, the development of instruments for credit risk transfer has substantially improved the ability of CPM business units to quote internal prices for hedging credits. For larger corporate clients, corporate bond spreads or CDS prices can be used as a reference price, while new product innovations such as collateralised loan obligations (CLOs) and loan credit default swaps (LCDSs) now allow banks to obtain prices for hedging loans to entities with no corporate debt outstanding (such as SMEs). However, considerable challenges still exist in the management of credit risks at the portfolio level. For example, the models commonly used for risk-adjusted pricing still rest on rather strong assumptions about the basic risk components of the credit portfolio, such as correlations between individual obligors' probabilities of default or banks' losses and exposures in the event of the default of an obligor. Second, because they will bind regulatory capital to credit quality and because of the recognition of risk mitigation, the new rules for calculating risk weighted assets (RWAs) under Pillar I of Basel II are likely to provide additional impetus for developing tools for CPM. This is because under the RWA rules, banks either need to support the riskier parts of their loan books with additional capital, or transfer the risk off their balance sheets by means of securitisation, in which case exposures can be deducted from RWA calculations.[1]

Notwithstanding the potential benefits of CPM, some risks for financial stability can be identified. First, as with all credit risk transfer (CRT) activity, CPM implies that banks will face agency problems. On one hand, increasing competitive pressure on loan pricing could contribute to adverse selection and a dilution of banks' credit standards. On the other hand, the fact that credit risks are being transferred off banks' balance sheets creates a moral hazard problem in that it can reduce banks' incentives to monitor their obligors. Although retaining the first-loss tranches of securitised loans, as well as the contractual arrangements of credit derivatives and potential reputational risks should in principle mitigate this possibility, it cannot be excluded that the quality of banks' loan books could deteriorate, particularly if the end-holders of credit exposures do not have the ability to monitor obligors as well as banks can.

Second, the broadening of the investor base for credit instruments, reflecting greater investor appetite for securitised assets, means that credit risk can increasingly be transferred outside the banking system. The growing presence of unregulated financial institutions such as hedge funds in the securitisation markets has been driven by the high yields offered by riskier loan tranches and because default rates have reached unprecedented lows. A key financial stability question that arises from the activity of such investors who take on credit risk via the securitisation market is their ability to absorb losses during periods of high market volatility, and the implications for the CRT process should these institutions fail, particularly if their investor lock-up periods are insufficiently long.[2]

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1 In terms of risk transfer it is important to distinguish between "synthetic risk transfer" – whereby only the credit risk is transferred by a bank through the purchase of CDSs while the loans remain on the banks' balance sheets – and "true-sale risk transfer", which involves securitisation and the sale of loans out of banks' balance sheets.
2 In addition, given that banks can have sizeable financing or investment exposures to hedge funds – either via their prime brokerage arms or via their fund-of-funds businesses – it cannot be ruled out that credit risks could "migrate" back to banks via their counterparty exposures.

Third, as a result of CPM activity, and also with the move to IFRS, increasing numbers of instruments purchased to provide credit risk protection are being placed in the banks' trading books as they are often unlikely to be held until maturity. The increasing concentration of instruments that carry credit risk into banks' trading books could gradually raise the correlation of returns between banking and trading books, thereby lowering overall income diversification. In addition, concerns have been expressed about the adequacy of existing risk management methods for monitoring such new instruments in the trading books, as these typically assume that positions can be liquidated at short notice. Although liquidity in credit derivatives markets has improved substantially in recent years, the market has not yet endured a situation where liquidity has dried up.

Finally, it is important to recall that recent advances in CPM have taken place in an environment of exceptionally benign credit and liquidity conditions. A gradual reduction of liquidity in the financial system and/or an adverse turn of the credit cycle could therefore constitute a challenge for banks with active credit portfolio management and loan securitisation processes. In particular, those banks that have become more dependent on the additional funding they have been able to gather from securitisation could see their funding costs increase if the functioning of the securitisation market was adversely affected.

All in all, from a financial system stability viewpoint, improved credit risk management should be seen as a positive development as it provides the banks the potential for additional funding and better diversification of their loan portfolios and for an optimal use of the capital in their balance sheets. Moreover, with the investor base for securitised credits widening, as institutional investors have been developing a greater appetite for high-yielding credit products, this should lead to a broadening and deepening of capital markets and a greater spread of credit risk through the financial system to those most willing to bear it. Nevertheless, there are some risks which will require monitoring in the period ahead.

## MARKET-RELATED RISKS

### Interest rate risks

Interest rate risks are the most important source of market risk facing banks. Banks are exposed to interest rate risks in several different ways, either directly via interest rate-sensitive asset holdings in their trading and banking books, or indirectly via potential impacts on their income from, among others, trading and loan origination businesses.

Regarding the interest rate risks facing euro area LCBGs from their lending activities, the increasing tendency of both households and non-financial corporations to borrow on variable-rate terms has shifted this risk, leaving banks better insulated against short-term interest rate volatility. Banks are also increasingly hedging against the interest rate risks in their lending either with interest rate derivatives or through securitisation.

As for the interest rate risks in the trading books of euro area LCBGs, although interest rates across the maturity spectrum remained at low levels and with volatility in the fixed income markets also low, a significant number of them, especially those with relatively large interest rate market exposures, scaled-back on these

**Chart 4.15 Interest rate Value at Risk (VaR) for large and complex banking groups in the euro area**

(% of Tier 1 capital)

- 2003
- 2004
- 2005

Source: Financial disclosures of euro area LCBGs which presented information on value at risk measures.

curves, possibly in conjunction with other shocks. Banks which have significant trading activities typically examine interest rate risk scenarios in great detail. For example, the effects of disorderly interest rate movements are often addressed through scenarios that are based on past episodes of abrupt bond market adjustments such as that witnessed in 1994. Stress scenarios can also embody increases in volatility, as well as reductions in liquidity and adjustments of swap and credit spreads. In Member States where banks use stress-testing extensively to assess their market risk exposures, banks have generally found their exposures to be manageable even under inclement stress scenarios. This could be a reflection of greater use of interest rate derivatives for hedging interest rate risk.

By early November 2006, one factor that was seen as having the potential to trigger a materialisation of interest rate risks was the possibility of heightened bond market volatility. Such a development could also set in motion processes that would correct some pre-existing financial imbalances.

**Exchange rate risks**

Net open foreign exchange rate positions of euro area LCBGs are very small across Member States, thanks to effective hedging of foreign exchange exposures. Considering on-balance sheet positions, the fraction of issuance of US dollar-denominated loans in total foreign currency denominated assets has remained broadly constant. Euro area banks have also adjusted their share of other US dollar-denominated assets, such as securities other than shares, to minimise potential direct impacts of large swings in the euro-US dollar exchange rate (see Chart S75). Moreover, banks regularly employ in-house stress tests for exchange rate risk, the findings of which indicate resilience against this risk, given comfortable solvency levels. This practice is likely to become increasingly common with the implementation of Basel II.

exposures in 2005. At the same time, a few banks with generally low levels of exposure raised their exposures (see Chart 4.15).

After the finalisation of the June 2006 FSR, long-term government bond yields broadly declined, despite the rise in short-term interest rates. As a result, the slope of the euro area market yield curve became considerably flatter. Several banks have reported that the flat yield curve environment has had an adverse impact on lending margins. Looking forward, if the narrowness of term spreads were to continue putting pressure on margins, there is a risk that banks could be tempted to dilute their credit standards on new loans or that they might seek out riskier income sources. However, and positive from a maturity transformation viewpoint, by October 2006, options prices on ten-year euro area government bond yields showed that market participants assigned a higher probability to bond yields rising rather than falling in the near term (see Chart S56).

It has become increasingly common for euro area LCBGs to use stress-testing for assessing the vulnerability of their banking and trading books to various interest rate shock scenarios, including parallel yield curve shifts and changes in the slopes of domestic and foreign yield

The VaR figures of euro area LCBGs provide an indication of how small foreign exchange rate exposures are (see Chart 4.16). Against a background of very low and relatively stable volatility in foreign exchange markets, the bulk of the banks in the sample reduced their foreign exchange exposure between 2003 and 2005.

Apart from direct exposures to foreign exchange risk, there are also indirect risks. For instance, a sharp swing in foreign exchange rates, perhaps driven by an abrupt correction of global financial imbalances, could have an adverse impact on the balance sheets of households and non-financial corporations. However, because euro area corporations and households are generally not significantly exposed to foreign exchange risk, the direct effects on their balance sheets would most likely be very small. An exception is the small and medium-sized enterprise (SME) sector where firms typically do not manage to hedge their exposures as well as large companies. Nevertheless, for a disturbance in foreign exchange markets to pose a material risk for banks, it would have to be sufficiently large to have an adverse affect on economic activity of sufficient severity to significantly impair the creditworthiness of banks' borrowers. The likelihood of such a

scenario materialising in the period ahead still seemed low by early November 2006.

**Equity market risks**
Bank-level information indicates that euro area LCBGs' direct equity market exposures remained broadly unchanged between 2004 and 2005 (see Chart 4.17). At the same time, notwithstanding the episode of equity market turbulence in May and June 2006, generally favourable developments in equity markets allowed banks to reap benefits in the form of higher fee and commission income from trading-related activities. Although equity prices quickly recovered the losses endured through May and June, the episode nevertheless served as a reminder of the risks of abrupt changes in investor appetite for risk and of the potential for market turbulence to spread wider in the financial system.

Despite the relatively low direct equity market exposures of euro area LCBGs, the vulnerability of their trading books to an upturn in equity market volatility could have grown. This is because persistently low levels of equity market volatility have allowed banks working with VaR models to expand their open interest positions without necessarily breaching their risk limits. In this connection it is notable that some euro

**Chart 4.16 Foreign exchange Value at Risk (VaR) for large and complex banking groups in the euro area**
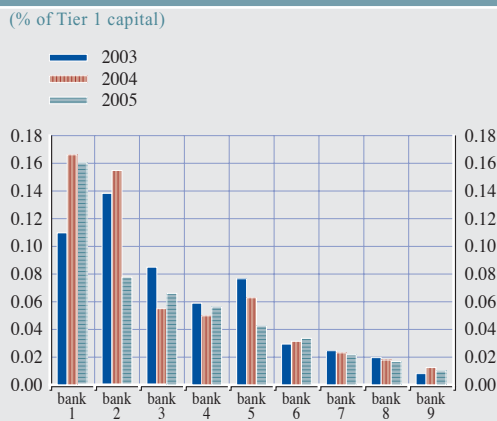
(% of Tier 1 capital)

- 2003
- 2004
- 2005



Source: Financial disclosures of euro area LCBGs which presented information on value at risk measures.

**Chart 4.17 Equity market Value at Risk (VaR) for large and complex banking groups in the euro area**
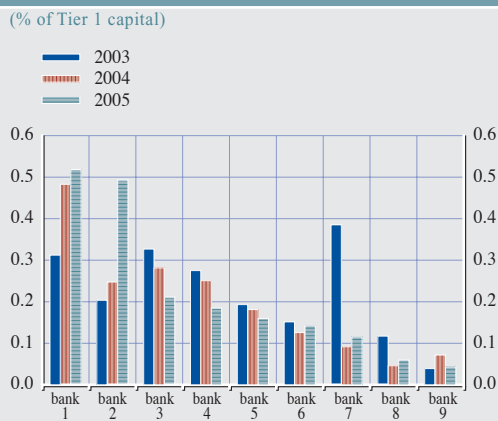
(% of Tier 1 capital)

- 2003
- 2004
- 2005



Source: Financial disclosures of euro area LCBGs which presented information on value at risk measures.

area LCBGs, especially those with the largest exposures to equity markets, raised their exposures further in 2005. Hence, there may be a risk that spikes in equity market volatility could suddenly push large amounts of positions simultaneously beyond their VaR limits, possibly triggering strong volatility feedback effects. This, however, may be mitigated by the fact that a significant number of banks with lower exposures reduced these and because the results of stress-testing exercises suggest that euro area banks have their equity market risks well under control.

### Exposures to credit risk transfer markets

The increasing use of credit derivative instruments by LCBGs has generally improved their risk management practices. At the same time, however, such products could also have introduced new risks for banks, foremost of which have been the long backlogs in settlement processes, which have featured prominently since the finalisation of the June 2006 FSR. Since banks are the largest buyers of credit protection, unsettled trades could become a problem if, in the event of a default of a large corporate bond issuer, banks were to discover that they were not covered against the default when the protection was most needed. If such a disruption were to occur, a substantial restating of banks' past earnings and hedging books could become necessary, with potential negative implications for their securities prices.

In September 2005 the US and some European regulators reacted proactively to these concerns by requesting the industry to address these problems without delay. Numerical targets were at this time agreed to bring the number of unconfirmed credit derivatives trades down to more reasonable levels. In February 2006 the dealer community was in a position to report substantial improvements in this field, achieving in most cases better results than the regulators had initially requested. At the end of September 2006, it was confirmed that the total number of delayed confirmations had been reduced by 70%, with confirmations delayed by more than 30 days down by 85%, and the share of trades confirmed on electronic platforms doubling to 80% of the total trade volume. However, despite the apparent successes achieved so far, further progress will be needed to mitigate this risk. In addition, since banks make the largest sellers of credit protection, a cyclical downturn could negatively affect those banks that have accumulated additional credit risk in the CRT market.

A latent problem that has remained present in the credit derivatives market is also the high concentration of origination and OTC trading among a handful of very large global financial institutions. In addition, in the structured part of the market, model risks remain given the increasing complexity of the products. Corporate sector-specific risks and the possibility of a clustering of defaults within a single industry are particular areas where current pricing models could be incomplete, thus increasing the probability of mispricing of risks.

### Exposures to hedge funds

The level of investment returns and the amount of capital under management are two extremely important and interdependent factors in determining the viability of a hedge fund. Poor returns may trigger redemptions, while an insufficiently large capital base – in the sense of not being sufficient to provide managers with adequate fee income flow[9] – may encourage aggressive risk-taking by hedge funds. To account for this, in their dealings with hedge funds banks use among other indicators two types of net asset value (NAV)[10] decline triggers, which allow them to terminate transactions with particular hedge fund clients and seize the collateral held. The first type, total NAV decline triggers, refers to the percentage decline of the fund's total NAV, and thus captures the joint impact of negative performance and investor

9 On the other hand, excessively high capital under management can also lower investment returns because it can lead to investment strategy capacity constraints.
10 The net asset value is the total value of a fund's investments less its liabilities. It is also referred to as capital under management.

**Chart 4.18 Share of hedge funds breaching triggers of NAV per share cumulative decline**
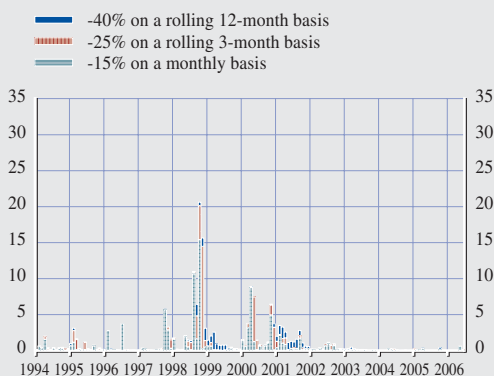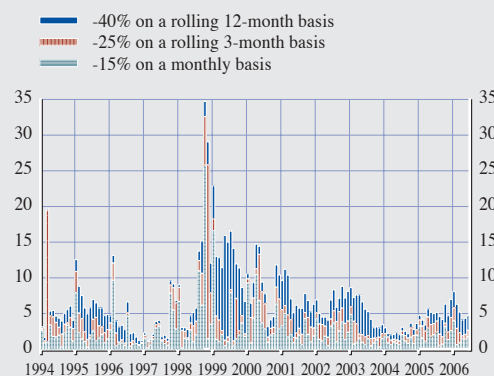
(Jan. 1994 - June 2006, % of total NAV)

- -40% on a rolling 12-month basis
- -25% on a rolling 3-month basis
- -15% on a monthly basis



Sources: Lipper TASS database and ECB calculations.
Note: Excluding funds of hedge funds. Net asset value (NAV) is the total value of a fund's investments less liabilities, also referred to as capital under management. If several assumed NAV per share decline triggers were breached, then the fund in question was only included into one group with the shortest rolling period.

**Chart 4.19 Share of hedge funds breaching triggers of total NAV cumulative decline**

(Jan. 1994 - June 2006, % of total NAV)

- -40% on a rolling 12-month basis
- -25% on a rolling 3-month basis
- -15% on a monthly basis



Sources: Lipper TASS database and ECB calculations.
Note: Excluding funds of hedge funds. Net asset value (NAV) is the total value of fund's investments less liabilities; also referred to as capital under management. If several assumed total NAV decline triggers were breached, then the fund in question was only included into one group with the shortest rolling period.

withdrawals. The second type of NAV decline triggers measures the NAV per share decline – i.e. it considers only the size of negative investment returns.

Recently, owing to high levels of competition among prime broker banks, hedge funds – particularly the larger ones – have been increasingly successful in negotiating NAV per share rather than total NAV decline triggers. A comparison of Charts 4.18 and 4.19 illustrates that NAV per share decline triggers are much more benevolent for hedge funds, and much fewer single-manager hedge funds breach NAV per share than total NAV decline triggers. Both types of trigger pointed only to a small increase in breaches during the episode of turbulence in equity markets in May and June 2006. The share of funds of hedge funds breaching total NAV decline triggers was slightly higher, although these funds can have a different set of trigger values to single-manager hedge funds.

The distribution of single-manager hedge fund returns in May 2006 also indicated an increased incidence of cases when banks' risk managers were confronted with higher counterparty risks

towards their hedge fund clients (see Chart 4.20).

The prime brokerage businesses of banks have continued to test the boundaries of their risk appetite and prudence in risk management. However, the business tends to be lucrative and it also stimulates banks to innovate and to provide their hedge fund clients with increasingly sophisticated products and services. For example, multi-asset trading platforms – which enable hedge fund clients to deal across a wide spectrum of financial assets worldwide – have become a more-or-less compulsory service in the highly competitive prime brokerage business. In addition, portfolio or VaR-based cross-product margining is becoming a common practice among prime brokers. Such margining practices can provide substantial margin savings for hedge funds if all trades are implemented with one prime broker. As such, they provide incentives for hedge fund managers to work with fewer prime brokers. However, there are also concerns that the persistently low levels of financial market volatility may artificially reduce VaR, thereby allowing much higher levels of leverage to build
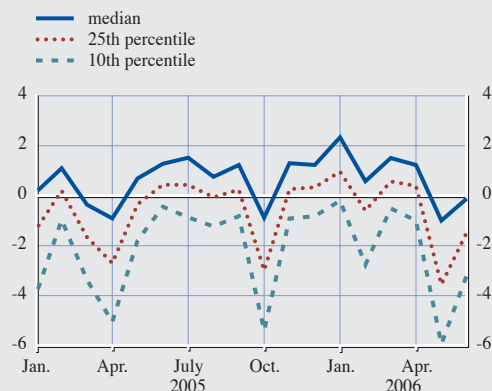
up among hedge fund clients. Finally, so-called principal prime brokerage, when prime brokers offer a full OTC intermediation service, is becoming more widely used. Under this model, prime brokers serve as a principal counterparty to both parties of the original transaction, thereby concentrating and usually also lowering counterparty risk for both transacting parties. By contrast, under "agency" prime brokerage, prime brokers merely facilitate the settlement of an original transaction conducted between two parties, but do not become directly involved themselves.

**Exposures to private equity funds**

The private equity business is composed of two broad categories: a venture capital segment that provides capital to entrepreneurial undertakings and less mature businesses with undeveloped or developing products or revenue, and a buyout segment that provides capital to mature companies to finance expansions, consolidations, turnarounds or sales of divisions or subsidiaries.

As mentioned elsewhere in this issue of the FSR, euro area banks' exposures to the buy-out business have grown substantially over recent years. LBOs in particular are debt-financed buyout transactions implemented through a special leveraged holding structure which owns the target company and consists of an equity part and various debt tranches (senior and subordinated debt in the form of loans or high-yield bonds). The equity part is typically provided by LBO funds, whereas debt financing can come from various other sources including banks, hedge funds, CLOs and other investors. Most LBO transactions involve investment in private companies, but LBO funds are increasingly targeting public companies too.

In the first half of 2006, European leveraged loan issuance had surpassed levels last seen in the late 1990s (see Chart 4.21). At the same time, the average degree of leverage – measured by debt-to-earnings before interest, taxes, depreciation and amortisation (EBITDA) ratios – in the loans extended had increased, approaching the six-multiple mark. In addition, the proportion of more subordinated loans in the financing structures had increased hand in hand with growing loan volumes.

Direct exposures of banks to LBO funds are constituted via credit, investment and income channels. Credit exposures in particular arise from banks' activity in lending and loan

underwriting activities, where the recent favourable market conditions and intense competition among banks could have resulted in a dilution of credit standards and, possibly, a mispricing of risks. To this end, leveraged loan arrangements have been increasingly adopting practices that are beneficial from the borrowers' point of view, such as "back-ended" payment structures where debt amortisation only takes place towards the end of the loan, and more lax loan covenant structures. Furthermore, banks also face several indirect exposures via the potential impact of LBO activity on their bond, loan and equity portfolios insofar as these contain debt or shares issued by target companies.

Although being exposed to highly leveraged corporations can to some extent be seen as normal banking business, disturbances to the leveraged loan syndication process imply additional risks to banks, as it is not always clear at the time of loan syndication whether all counterparties in the syndicates, such as hedge funds and investors with short-term investment horizons, will contribute their share if it becomes necessary to re-capitalise the project. Adverse disturbances to deal valuations that could affect general market sentiment and impair the loan syndication processes themselves have the potential to trigger a slowdown in activity which would affect banks' income and credit risks in different ways.

### Emerging market exposures

Although EMEs were particularly affected by the turbulence in global financial markets in May and June 2006, the credit spreads of most of these countries subsequently rapidly recovered to the levels seen at the beginning of the year, as discussed in Section 1. The generally positive economic performance of EMEs, supported by high commodity prices and historically low interest rates, contributed to keeping foreign banks' exposure towards the region broadly stable.

Concerning exposure to individual geographic areas, as measured by the size of cross-border financing flows from euro area banks to selected EMEs (stocks at period-end), exposure to the main Latin American EMEs continued expanding throughout 2005, apart from exposures to Argentina, which slightly decreased (see Chart S78). The increase was particularly noticeable in the case of Mexico and, to a lesser extent, Chile: for both countries, this may be at least partly explained by the rapid growth in the prices of commodities exported. For exposures to Brazil, the rapid growth experienced in 2004 was not sustained, possibly on account of political uncertainty. Overall, the relatively strong macroeconomic performance of these economies should have improved the quality of euro area banks' exposures.

Exposures to Asian EMEs remained considerably smaller than for Latin America, although exposure to the three largest economies in the region, South Korea, India and China, accelerated between mid-2002 and early 2005 (see Chart S79). On the other hand, exposures to other EMEs in the region either remained unchanged or fell slightly.[11] Economies of scale and potentially larger returns associated with larger domestic markets in India, China and South Korea are likely to continue attracting euro area banks to the area. Hence, efforts by Asian economies to continue expanding and strengthening their financial sectors are welcome from a euro area financial stability viewpoint

### 4.3 SHOCK ABSORPTION CAPACITY OF THE BANKING SECTOR ON THE BASIS OF MARKET INDICATORS

### MARKET INDICATORS IMPROVED FURTHER

Because they are forward-looking, indicators based on bank securities prices can provide information on how market participants assess the outlook and risks for the banking sector.

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11 For reasons of clarity, only exposures to Thailand are plotted. Regarding other countries in the region, the exposure of euro area banks fell towards Taiwan and Indonesia, and recorded very small changes in the case of Malaysia and the Philippines (see Table S6).

**Chart 4.22 Dow Jones EURO STOXX total market and bank indices**

(Jan. 1999 - Nov. 2006, index: Jan. 1999 = 100)

——— Dow Jones EURO STOXX 50 index
· · · · · Dow Jones EURO STOXX bank index



Source: Bloomberg.

**Chart 4.23 Risk reversal and strangle of the Dow Jones EURO STOXX bank index**

(Jan. 2003 - Nov. 2006, implied volatility, %, 20-day moving average)

——— risk reversal (left-hand scale)
· · · · · strangle (right-hand scale)



Sources: Bloomberg and ECB calculations.
Note: The risk-reversal indicator is calculated as the difference between the implied volatility of an OTM call with 25 delta, and the implied volatility of an OTM put with 25 delta. The "strangle" is calculated as the difference between the average implied volatility of OTM calls and puts, both with 25 delta, and the average at-the-money volatility of calls and puts with 50 delta.
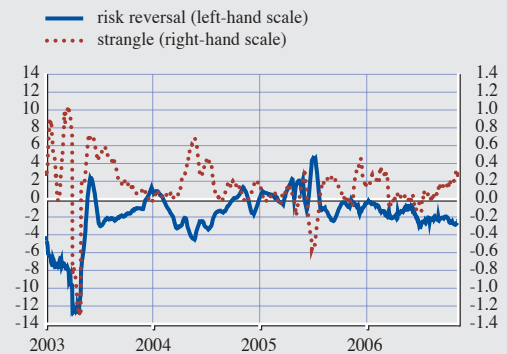
After the publication of the June FSR, market indicators continued to suggest a bright outlook for euro area banks, irrespective of the growing vulnerabilities outside the sector.

After the finalisation of the June 2006 FSR, the bout of financial turbulence through May and June also had an adverse impact on the securities prices of euro area banks. Most notably, the implied volatility of bank stock prices rose (see Chart S85), bank stock prices declined (see Chart 4.22) and price-earnings ratios fell back (see Chart S84). Bank stock prices were harder hit than the market (see Chart 4.22), perhaps suggesting concerns about greater exposures of the banking sector to affected regions and markets than the real economy. Nevertheless, the turbulence proved to be short-lived and, by the end of June, most indicators had reverted to early May levels. By early November, market indicators were suggesting that market participants viewed the banking sector outlook very positively. In particular, the strength of stock prices relative to recent earnings performance suggested that market participants expected that strong profitability would be sustained. This appeared to reflect not only

improvement in analyst forecasts for banking sector earnings, but also expectations of a pick-up in M&A activity in the banking sector.

Notwithstanding the fact that the euro area banking sector has proven resilient to heightened market volatility, some uncertainty remains about the future performance of banks. Using risk reversal quotes and strangles on the Dow Jones EURO STOXX banking stock index to gauge perceptions of the balance of risks and the likelihood of sizeable stock price changes, respectively,[12] the sign of the risk reversals remained negative (see Chart 4.23). This indicates that market participants continued to assign a higher probability to the risk of a fall in stock prices than of a rise. At the same time, positive values for strangles after mid-2006 indicate that the probability assigned to extreme events, either positive or negative, had increased. This increase in uncertainty since the early months of 2006 may point to the fact that even though market participants had improved their central outlook for banks, they did not exclude

12 See Box 16 in ECB (2006), *Financial Stability Review*, June, for a discussion of these indicators.

the possibility that a significant adverse disturbance to the profitability of banks could occur.

Other market indicators of euro area banks' credit risk support the broadly positive assessment by markets. For instance, notwithstanding the market turbulence, the distance-to-default of banks continued rising, especially for the strongest ones (see Chart S81).

All in all, patterns in market indicators imply a favourable outlook for euro area banks, irrespective of the growing vulnerabilities in non-financial sectors. While this may reflect the low probability assigned by market participants to the likelihood of risks identified in this review crystallising, it could also signify a favourable assessment of the shock-absorbing capacity of the banking system, supported by comfortable solvency and improved risk management.

## THE UPWARD MIGRATION IN CREDIT RATINGS STRENGTHENED IN 2006

The overall positive assessment of euro area banks is also reflected in actions taken by the three major rating agencies since the finalisation of the June 2006 FSR. Considering the euro area LCBGs, their average ratings and rating outlooks as of end-October 2006 painted a positive picture (see Table S7). This was notable, given that the majority of the long-term issuer ratings assigned to these banks had already stabilised at a relatively high level, with a median rating in the AA- category. As a result, although further positive rating actions cannot be ruled out, the generally high level of long-term ratings makes the scope for upgrades increasingly limited.

The outlooks for long-term ratings, which are considered to be a medium-term indicator of credit quality (between one to two years), remained stable after the finalisation of the June 2006 FSR. Standard & Poor's, which recorded the highest number of positive rating outlooks in the period under consideration,

reported six positive outlooks and did not assign a negative outlook to any bank. Across the sample of the three rating agencies, the balance of positive to negative outlooks remained high, with a ratio of 9 to 1. In general, the main drivers of the positive outlook were the improved earnings mix and diversification, stronger focus on efficiency, and improving sustainability of earnings in core markets.

The predominantly stable ratings outlook for euro area banks means that benign business and financial conditions are expected to balance out the challenges to generate new revenue and improve margins that rating agencies foresee following possible further increases in long-term interest rates and/or a deterioration in the credit cycle. In the long run, rating agencies consider the recent pace of loan growth to be unsustainable, and expect some deterioration in asset quality, albeit from a low base. Further challenges for banks will derive from their ability to consolidate their financial positions through organic growth or external growth. The former is likely to be hindered by the expected decline in loan growth and a potential deterioration in the operating environment. As for the latter, acquisition risk remains a major consideration for some of the larger banks looking to make acquisitions in order to boost shareholder value. Although the rating agencies do not exclude further major pan-European deals, they consider that major banks are increasingly likely to look beyond Europe for external growth, especially in emerging markets.

Overall, rating agencies consider the major euro area banks' ratings unlikely to be revised downwards, provided that a prolonged economic downturn does not materialise. The healthy condition of the financial sector, coupled with positive structural trends within the banking sector, such as improvements in risk management and the growing focus on cost control, are expected to improve banks' ability to withstand cyclical economic shocks.

Box 13

## BANKS' HYBRID CAPITAL INSTRUMENTS: FINANCIAL STABILITY IMPLICATIONS

The purpose of banks' core capital is to absorb unexpected losses in order to safeguard the solvency of the institution and to enable it to continue operating as a business. Regulatory core capital consists of an unlimited amount of equity and a limited amount of other instruments that may include certain types of financial instruments known as hybrids.[1] Generally speaking, hybrid instruments have both equity and debt characteristics. For example, one type of hybrid may pay a regular dividend based on a par value (just like a bond coupon), but may be treated in a similar way to equity for regulatory purposes in that it can also be used for absorbing unexpected losses.[2] For euro area banks, a significant amount of these instruments are now included in Tier 1 capital and are increasingly being used as non-core capital funding for further lending or financing acquisitions. This reflects the development of this market globally as well as increased issuance by non-financial firms. This Box concentrates on the increasing use of this type of capital instrument by banks, and the possible financial stability implications.

Banks can issue hybrids for various reasons. Firstly, there may be cyclical explanations. Expansion of risk-weighted assets (RWAs) made it necessary for banks to find additional sources of longer-term capital. Given their debt-like characteristics, declines in long-term interest rates coupled with increasing investor appetite for higher yielding securities supported increased issuance of hybrids after 1999 (see Chart B13.1). Secondly, there may have been structural reasons for stronger issuance, as issuing these instruments provides a cost-efficient way of raising high-quality (loss-absorbing) capital for banks. In most European countries, dividends on equity are paid out of post-tax profit, whereas the coupon payments on bonds are tax-deductible. Therefore, if a bank can structure a security transaction so that it is treated as debt for tax purposes (and equity for regulatory purposes), then it is more cost-efficient than direct issuance of preferred stock.[3] Thirdly, hybrid capital instruments have become attractive to a wider range of investors since the introduction of the euro eliminated a major source of foreign exchange risk. This has the advantage of broadening a bank's capital base through access to different groups of investors, thereby diversifying its sources of capital funding. Furthermore, it may support banks' in their asset and liability management. Issuance in a non-euro currency (i.e. USD) also provides a hedge for RWA exposures against adverse movements in exchange rates when these exposures are denominated in the same currency as the hybrid instrument. Finally, recent changes in the way that rating agencies rate hybrids has also encouraged issuance by banks, as well as insurers and non-financial corporates. Essentially,

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1 Briefly, as outlined in the Basel II accord, bank regulatory capital consists of three tiers: Tier 1, Tier 2 and Tier 3. The most important component in terms of its loss-absorbing capacity is Tier 1. Its capital consists of shareholder equity such as common stock, preferred stock (non-cumulative and non-redeemable) and retained earnings. Hybrid instruments – referred to as innovative capital – can be part of Tier 1 but are currently limited to 15% of total Tier 1 capital for individual institutions, as outlined in the Basel Committee Press Release of October 1998 (the so-called Sydney Release). Debt-like hybrids can also be part of Tier 2 if they are subordinated. Tier 3 capital covers market, foreign exchange and commodities risk, and does not usually contain hybrids. In the EU, Basel II is being implemented under the Capital Requirements Directive, in which core capital is essentially defined as original, additional and ancillary own funds. These roughly correspond to Tier 1, 2 and 3 respectively, but with certain technical differences. A survey of the implementation of own funds across Member States has been carried out by the Committee of European Banking Supervisors (CEBS). The results of this survey, together with the technical advice provided by the CEBS, are available on the CEBS website at www.c-ebs.org.
2 Common stock by contrast pays a dividend that may vary with the banks' earnings. Another example of a hybrid security is a bond convertible into equity.
3 One example is the issuance of Trust Preferred Securities (TPS) by US and European institutions.

**Chart B13.1 Gross issuance of hybrid instruments by banks**

(EUR billions)

- euro area
- US
- Denmark, UK and Sweden
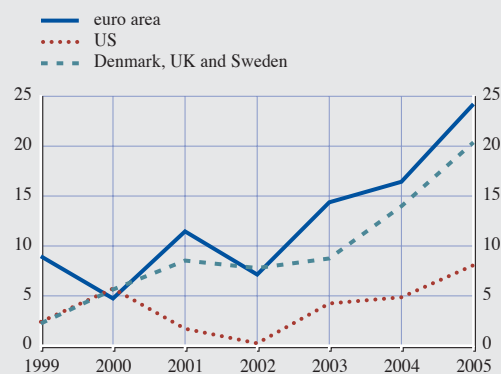
Sources: Bondware and ECB calculations.
Note: Data are hybrid issues by public and private banks (and their associated financing vehicles). Data are in euro-equivalent amounts.

**Chart B13.2 Euro area bank hybrid issuance, by purpose**

(1999 - 2005)

- EUR billion
- % of total outstanding
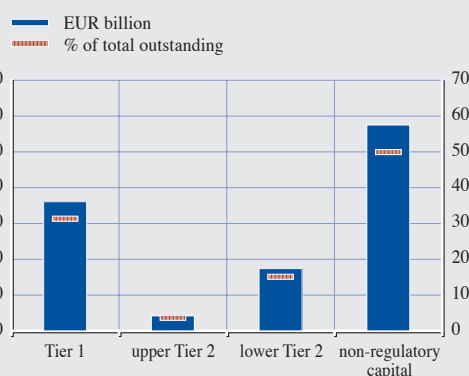
Sources: Bondware and ECB calculations.
Note: Tier 1, upper and lower Tier 2 are hybrid issues identified on the basis of the individual security data in Bondware. These data are non-called issues outstanding on 31 December 2005. These data include non-domestic issues and issues by funding vehicles. Data are in euro-equivalent amounts.

the overall result of this is more favourable treatment by rating agencies regarding the equity-like component of these securities for banks.[4]

Hybrid capital instruments that are part of banks' capital structure have become comparatively important as capital instruments since 1999 (see Chart B13.2). Given the cost-efficient advantage over equity, banks may be encouraged to include more of this type of capital instrument in regulatory capital. Their inclusion depends on the decision of the local regulator concerning the loss absorption capacity and the permanence of the instrument. If it is deemed to be equity then it can be included in Tier 1; while if it is deemed to be more debt-like, it will be placed in Tier 2.

From a financial stability viewpoint, it is preferable that these securities behave like equity in that they should be capable of absorbing losses and providing a practically permanent source of capital. Some market participants have argued that in the case of an episode of financial turbulence that was sufficiently strong to push a bank into distress, the inbuilt flexibility of hybrids could make it easier for the bank to trade its way out of difficulty by deferring payments, normally subject to regulatory approval, for several years of dividends on trust-preferred securities. However, deferral of payments can have a negative impact on a bank's reputation, which may have an adverse bearing on its future ability to raise funds in this and other debt markets.[5]

4  See, for example, Moody's (2005), "Refinements to Moody's Tool Kit: Evolutionary, Not Revolutionary, Rating Methodology", February; and Fitch Ratings (2005), "Bank Hybrid and Preferred Securities: Evaluating Their Role in Capital Analysis", Criteria Report, July. There are also some accounting-related reasons why banks may issue hybrids; however, these implications lie outside the scope of this Box.
5  There are also some divergent views among regulators on how exactly bank hybrids should be treated when it comes to core capital. In the US, for example, the Federal Deposit Insurance Corporation (FDIC) and the Board of Governors of the Federal Reserve have different views on whether they should be included in Tier 1 or not (see the letter to Alan Greenspan, Chairman, Board of Governors of the Federal Reserve System from Donald E. Powell, Chair of FDIC, dated 2 July 2004).

Overall, while investor appetite may exhibit some signs of the hunt for yield phenomenon in the corporate hybrid market generally, the bank-issued hybrid debt market is comparatively well-established. This, combined with regulatory and rating agency oversight, means that the quality of banks' capital funding is unlikely to be compromised given the current market conventions and regulations.

## 4.4 OVERALL ASSESSMENT

Consolidating on the steady and broad-based improvement in profitability that got underway in 2003, the financial condition of euro area LCBGs continued improving in the first half of 2006. The strength of lending growth both to households and to the non-financial corporate sector played an important role in supporting banks' net interest income and thus compensated for further erosion in lending margins due to competitive pressures. On the non-interest income side, fees and commissions and trading revenues benefited from the favourable economic environment and relatively buoyant financial market developments. The favourable performance of euro area LCBGs in the first half of 2006 was also driven by continued cost containment and by a further decrease in impairment charges, which reached new historic lows. Although the solvency positions of banks deteriorated slightly it remained strong, comfortably exceeding regulatory requirements.

Regarding the central outlook for euro area LCBG profitability, despite a flatter market yield curve and thin lending margins, further improvement can be expected in the short-term. However, this broadly favourable outlook carries some risks. Euro area LCBGs' credit risks remain low but the downside potential could have increased, given the strong pace of lending growth, coupled with some signs of lowered credit standards on new loans and all-time lows in impairment charges. With the profit cycle for non-financial firms showing some signs of maturing and with higher interest rates, there is a risk of deterioration in credit quality. At the same time, the vulnerability of households to possible adverse income and unexpected interest rate disturbances might have increased for some countries, even if the average level of indebtedness remains low by international standards. Nevertheless, euro area banks' growing credit risk exposures should be seen against a background of improved risk management capabilities.

Among the different sources of market risk, interest rate risks are the most prominent facing banks. The euro area market yield curve slope flattened considerably after the finalisation of the June 2006 FSR, placing negative pressure on income derived from maturity transformation. While equity market risks and risks stemming from emerging market exposures remain moderate, counterparty risk could be rising, especially given growth in short-term lending to finance LBO activity, and increasing competition among banks in the hedge fund prime brokerage business.

Notwithstanding growing risks, comfortable solvency positions together with improved risk management capabilities have enhanced the ability of euro area LCBGs to cope with unexpected adverse disturbances. Consistent with this, forward-looking information derived from the securities prices of these LCBG's suggests a positive near-term outlook.

## 5 OTHER EURO AREA FINANCIAL INSTITUTIONS

### 5.1 THE EURO AREA INSURANCE SECTOR

*Greater focus of insurance firms on risk management, risk-adjusted pricing and core profitability have continued to underpin a positive outlook for the sector as a whole, especially for large firms. Improvements in asset-liability management, together with better capital structures – resulting from rising levels of issuance of hybrid capital and subordinated debt – have bolstered generally positive views implied in the securities prices of insurance firms. As large firms in the sector have been implementing international accounting standards and bringing their portfolios into line with the requirements of Solvency II, some increased volatility may occur, although this is likely to be dampened by the clear benefits to market participants resulting from greater transparency and improved management of risk in firms' balance sheets. The challenges for small firms identified in the June 2006 FSR remain, as the potential pressure for consolidation stemming from regulatory developments is expected to continue in the short to medium term.*

The euro area insurance industry is – by the very nature of its business of providing coverage for idiosyncratic and systemic risks – both large and highly concentrated: gross premium written amounted to over 8% of GDP in 2005[1] and in 2004 the ten largest life (non-life) insurance undertakings received 83.1% (75.2%) of the total life (non-life) premium written in the euro area.[2] At the same time, 27% of the turnover of the top 20 operators in Europe was realised outside Europe.[3] The high degree of concentration and extensive international-level reach of large insurance undertakings make the sector particularly important for financial markets, as the financial conditions or investment decisions of major players can have a major impact on the markets as a whole.

### FINANCIAL CONDITIONS IN THE INSURANCE SECTOR[4]

As in 2004, the financial condition of the euro area insurance sector continued to improve in 2005. Total premium – the standard measure of turnover – grew by 6.2% on average in real terms in 2005, primarily reflecting aggregated real premium growth of 9.7% in the life insurance market (compared to real aggregated premium growth of just 1.4% in the non-life market). Growth was primarily driven by strong sales of unit-linked products by the life insurance market, against a background of rising stock prices (see Section 1.2 and Section 3), as well as increases in other product sales. Important factors in this regard were the substantial transformation of the euro area life insurance market, mainly owing to ongoing tax reforms and a longer-term and sustained rise in the penetration rate of insurance in the economy which is linked – among other factors – to the strength of consumer lending.[5] In the non-life sector, premium rate hikes, which had been important in driving premium growth in previous years, came to a halt in 2005, largely reflecting intense competition in this sector.[6]

Considering individual euro area composite insurance undertakings reporting under IFRS,[7]

1   According to calculations by the European Insurance and Reinsurance Federation (CEA) and the ECB. The balance sheet of the insurance sector is also significant, with investment assets of the euro area sector amounting to about 49% of euro area GDP in 2005.
2   See CEA (2006), "European Insurance in Figures", June.
3   See *Argus de l'assurance* (2005), December.
4   For the first time, information on large composite euro area insurers has become available on a wide basis for two consecutive years. The analysis of large composite insurance undertakings in this section is based on comparable IFRS data for 2004 and 2005 (source: Bureau van Dijk, ISIS database). Information on the life and non-life sectors is based on unconsolidated accounts.
5   See Sigma (2006), "World Insurance in 2005", Swiss Re, Issue 5/2006, September.
6   See Committee of European Insurance and Occupational Pensions Supervisors (CEIOPS) (2006), "Interim Report on Financial Conditions and Financial Stability in the European Insurance and Occupational Pensions Sector", August.
7   The sample comprises of active euro area insurers with total consolidated assets in excess of USD 1 billion, with high or unknown independence as assessed by Bureau van Dijk and reporting under IFRS by September 2006. It comprised of 26 companies, representing about 65% of the 2005 euro area insurance sector in gross premium terms, but not all figures were available for all.

**Chart 5.1 Distribution of changes in key liability and income components of large euro area composite insurers**

(2004 - 2005, % per annum, maximum, minimum, inter-quartile distribution)

—— median



Sources: Bureau van Dijk and ECB calculations.

**Chart 5.2 Distribution of investment yield of large euro area composite insurers**

(2004 - 2005, %, maximum, minimum, inter-quartile distribution)

—— median
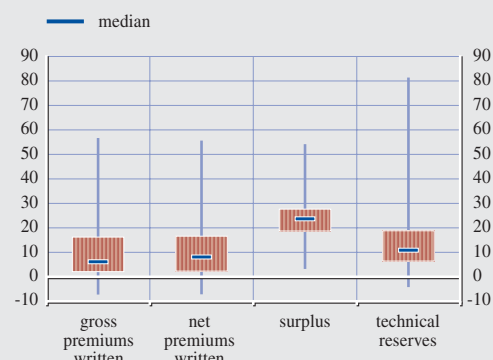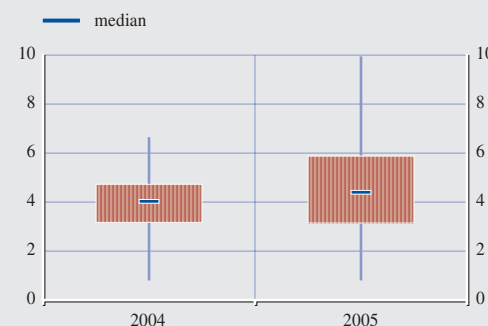


Sources: Bureau van Dijk and ECB calculations.

there was a general broad-based improvement in profitability in 2005 relative to 2004 (see Chart S87). The profitability of the weakest performers of 2004 improved in 2005, and the distribution of profit performances became more skewed to higher values, both of which are important from a financial stability viewpoint. Underlying this overall improvement, net investment income in particular and realised gains continued to outgrow underwriting as well as other income growth.

On the liabilities side of large composite insurance undertakings' balance sheets, the growth of premium written resulted in a marked accumulation of capital (surplus) and of technical reserves (see Chart 5.1).[8] As a result, the shock-absorbing capacity of the sector improved.

Notably, the share in total net technical reserves of large composite euro area insurers' reserves set aside for linked products increased for the sample of composites as a whole from 19.6% in 2004 to 23.4% in 2005. This reflected expectations both of higher losses tied to linked products as well as more overall underwriting of linked contracts. As for the composition of surplus capital, the positive results in the income statement also led to an increase in the share of both non-distributable reserves and profit and loss.

The investment income performance of large composite insurance undertakings recovered in 2005 after recording a poor result in 2004. This largely reflected improvements in investment yields, although there was considerable diversity of performance (see Chart 5.2).

The improvement of investment returns was also coupled with significant and broad-based growth in investment assets. All in all, investment assets increased by 9.9% in real terms in 2005, with real rises of 10.4% and 8.2% respectively recorded for the life and non-life sectors.[9] The composition of assets also changed somewhat, with the share of liquid assets – i.e. cash and deposits – declining, while equities and linked assets increased markedly (see Chart 5.3). The increase in the latter – most likely a result of the favourable equity market conditions – may have continued in early 2006, given still favourable conditions.

As a result of a growing financial surplus in terms of capital and other reserves for

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8 Technical reserves and surplus capital are the two main components of the liabilities side of an insurance company – reflecting technical or "expected" and "unexpected" losses of underwritten business respectively.

9 See CEA (2006), op. cit.

**Chart 5.3 Distribution of asset shares of large euro area composite insurers**

(2004 - 2005, %, maximum, minimum, inter-quartile distribution)
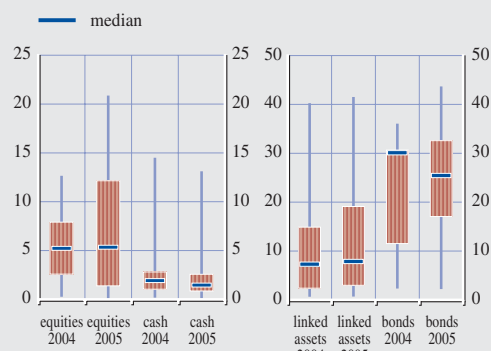


Sources: Bureau van Dijk and ECB calculations.

unexpected losses, large euro area composite insurers' solvency buffers generally improved in 2005 (see Chart S88).[10] In light of the fact that the retention ratio (net over gross premium written) of large euro area composite insurers remained virtually unchanged, the overall risk retention capacity of the sector appears to remain unaffected.

### Life insurance sector

The continued growth of premium written disclosed in the financial statements of euro area life insurers for 2005 stemmed primarily from the strength of sales of unit and index-linked products rather than from sales of more traditional guaranteed return products, although the latter still represented the bulk of outstanding contracts.[11] The gradual shift away from guaranteed return to unit-linked products has implied a shift of market risk to policyholders, albeit at a cost for life insurers in the form of thinner margins. The growing penetration of euro area undertakings into central and eastern European countries may also have been an important factor in driving sales growth for euro area life insurers, although this process appears to be tapering off.

As the shift of large euro area life insurers to reporting under IFRS has been gradual, the assessment of individual undertakings'

disclosures has been complicated in 2005 vis-à-vis 2004.[12] However, there are indications that favourable operating conditions in 2005 supported strong performance. Buoyant stock markets resulted in lower write-downs and realised losses on equity, which had a positive impact on investment yields (see Chart S89). The rises in interest rates at the end of 2005 and again in early 2006 are likely to have further supported investment returns, which had been dampened by persistently low interest rates. This impact, however, is only likely to materialise over the medium term, given the length of time it will take life insurers to accumulate sizeable holdings of higher-yielding fixed income assets.

On the cost side of life insurers' income statements, the combined ratio remained comfortably below 100% for most of the undertakings in the sample, and there was a decline in the degree of diversity across them (see Chart S90).[13] By and large, the distribution of expense ratios also became tighter, suggesting that increased operational efficiency was also a factor underlying the improvement in profitability. In this respect, continued pressure on margins also prompted many insurers to announce far-reaching changes to their organisational structures in order to realise revenue and cost synergies, and to drive business efficiency.

By raising the net present value of life insurers' liabilities, the drop in long-term interest rates

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10 Solvency is measured by "surplus" capital (the sum of capital, non-distributable reserves, profit and loss and other reserves) as a percentage of total assets.
11 See CEIOPS (2006), op. cit.
12 The number of large euro area life insurers with unconsolidated account information within the Bureau van Dijk ISIS database by the end of September 2006 for 2005 was almost half that of the number for 2004. Despite this, information about the distribution of key indicators for the remaining, mostly very large, population provides an indication of developments in the sector.
13 The combined ratio allows the sources of profitability to be highlighted – cost-cutting and/or loss reductions. For life insurance this is calculated as the sum of net claims and the expense ratio, which provides information about commission and management expenses. Typically, a combined ratio of more than 100% represents an underwriting loss for the life insurer.

in recent years exposed balance sheet vulnerabilities resulting from asset-liability maturity mismatches. Life insurers continued to respond to this by increasingly resorting to lengthening the duration of their fixed income assets and to reducing the value of in-force guarantees. Some of them also used derivative instruments such as receiver forward swaps and long receiver swaptions in Germany, which allow the locking in of a specific interest rate level in the future, thereby reducing reinvestment risk. Life insurers also increasingly resorted to product innovation with the aim of reducing or hedging the risk stemming from guaranteed return contracts and/or bundling of products, so as to widen the exposure to various risk factors.

Despite efforts aimed at strengthening their capital bases by increasing regulatory capital and issuing hybrid capital instruments, the continued decline in the duration of investment assets relative to technical reserves further eroded the capital bases of large euro area life insurance undertakings (see Chart 5.4). Possibly higher solvency requirements under Solvency II could pose challenges for financially weaker companies in terms of building up internal risk models. This may coerce them into raising further equity, issuing debt or restructuring their balance sheets further.

## Non-life insurance sector

Although growth in premium written by the euro area non-life insurance sector was slow in 2005, it was generally accompanied by a slowdown in the growth of claims, with loss ratios declining slightly (see Chart S91).[14] In combination with a broad-based decline in the expense ratio, this resulted in an overall compression of the combined ratio distribution across non-life insurers.

Non-life insurance undertakings generally benefited from favourable equity market conditions in 2005, which supported investment results. Overall, there was a general improvement in profitability in the sector, especially at the lower end of the distribution (see Chart S92).

Much of the improvement in profitability fed into raising the capital bases of non-life insurers, thereby enhancing overall solvency. At the same time, there was a broad-based improvement in liquidity ratios in this sector (see Chart 5.5). Looking forward, this is likely to sustain competition in the sector in the medium term.

14 In addition to net claims (for life insurers), the loss ratio for non-life insurers includes movements in insurance funds.

## Chart 5.4 Distribution of free reserve ratios of large euro area life insurers

(2004 - 2005, %, maximum, minimum, inter-quartile distribution)
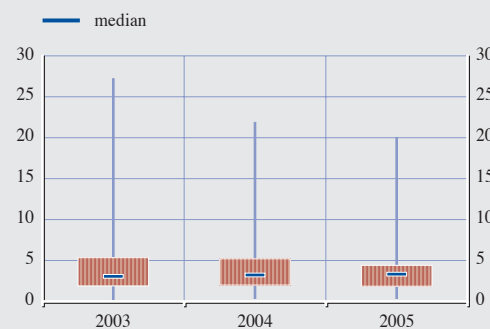


Sources: Bureau van Dijk and ECB calculations.

## Chart 5.5 Distribution of liquidity ratios of large euro area non-life insurers
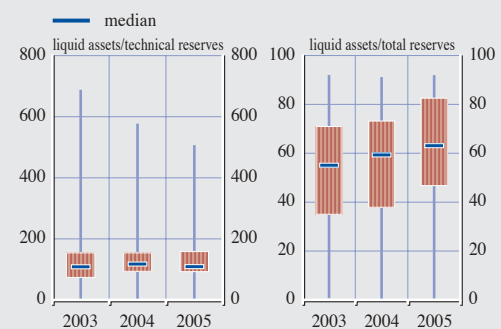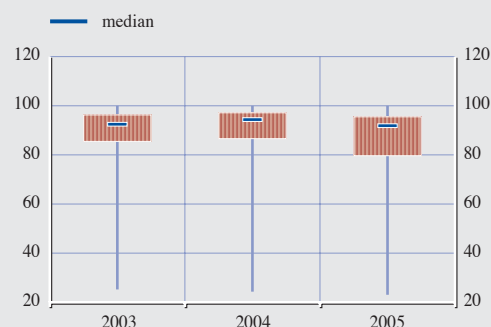
(2004 - 2005, %, maximum, minimum, inter-quartile distribution)



Sources: Bureau van Dijk and ECB calculations.

**Chart 5.6 Distribution of the retention ratio of large euro area non-life insurers**

(2003 - 2005, % per annum, maximum, minimum, inter-quartile distribution)

median



Sources: Bureau van Dijk and ECB calculations.

In addition to strengthening their balance sheet positions, the skewing to the left of the retention ratio indicates that non-life insurers have channelled a significant amount of risk off their balance sheets (see Chart 5.6).

**Reinsurance**

The financial condition of the reinsurance sector is important from a financial stability viewpoint not only because reinsurers, as large institutional investors, have an important presence in financial markets, but also because they provide a financial safety net for the primary insurance industry. Notwithstanding record loss payments in 2005 reported in the June 2006 FSR, there were new entrants to the markets, with hedge funds and private equity firms becoming increasingly prominent.[15]

European reinsurers control a significant share of the global reinsurance business: four of the top five reinsurers are domiciled in Europe, of which the top and fifth largest are located in the euro area.[16] There have been indications that some of these reinsurers have taken steps to reduce the share of their investment portfolios allocated to equity, reflecting a greater focus on risk-adjusted, rather than nominal investment, returns.[17]

**RISKS FACING THE INSURANCE SECTOR**

Notwithstanding its improved performance, the euro area insurance sector still faces several risks and vulnerabilities in the period ahead. The most significant risk facing life insurers is longevity risk, as liabilities could increase significantly as a result of unexpected improvements in life expectancy. By contrast, catastrophe risk is the main risk facing the non-life insurance business.

Owing to the limited availability of long-dated bonds in the market and the prevailing process towards market valuation of technical provisions, the duration of liabilities in life insurance has remained higher than that of assets and insurers have increasingly hedged the associated market risks, often at the expense of taking on higher risk. In addition to equity market risk, the growing proportion of corporate bonds and credit derivatives on life insurers' balance sheets has extended the credit risk exposure of the insurance sector: the insurance sector is now the largest net taker of credit risk from the banking system.
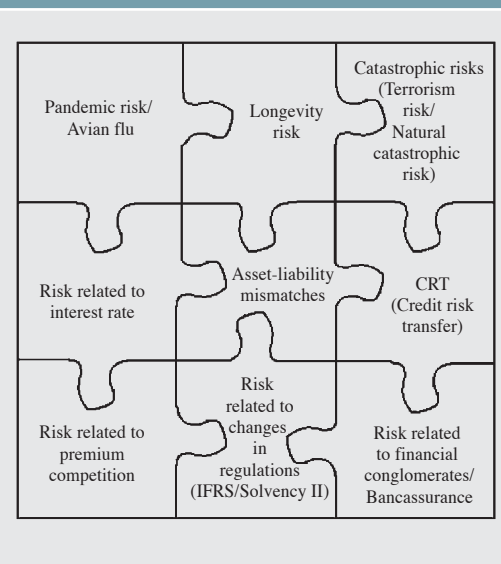
Tight competition among non-life insurers seems to have increased their willingness to take on more risk, while at the same time transferring some of this risk to reinsurers, who in turn may pass it on to the capital market. As the potential group of buyers may include banks, the interlinkages between the banking and insurance industries are increasing (see Figure 5.1).

15 This was especially the case in the funding of catastrophe bonds and sidecars – a special-purpose reinsurance company that assumes business from a limited number of ceding companies (sponsors) for a limited period. In a typical structure, the sidecar issues equity and debt, and places the proceeds in a trust as collateral for its reinsurance obligations. At the same time, the sidecar enters into a quota share contract with the sponsor(s). Sidecars have assumed a range of relatively short-tail business, including property catastrophe, marine and energy risks.
16 The share in the total net premium written by the top 25 global reinsurance companies in 2005 of the top five reinsurance companies was 58%. (Data source: Moody's.)
17 See Moody's (2006), "Global Reinsurance Industry Outlook", September.

**Figure 5.1 Current challenges and vulnerabilities facing the insurance sector**

Pandemic risk/ Avian flu

Longevity risk

Catastrophic risks (Terrorism risk/ Natural catastrophic risk)

Risk related to interest rate

Asset-liability mismatches

CRT (Credit risk transfer)

Risk related to premium competition

Risk related to changes in regulations (IFRS/Solvency II)

Risk related to financial conglomerates/ Bancassurance

For the life insurance industry, guaranteed return annuities are a common saving product offered to households. In issuing these products, life insurers face two main risks. First, if interest rates decline, the net present value of the future stream of annuity payments rises, thereby increasing liabilities. Second, if life expectancy increases – commonly referred to as longevity risk – beyond actuarial expectations at the time of sale, the number of payments to be made to the annuity holder increases, which in turn raises liabilities.

Several risk mitigation actions have been taken to manage these risks.[18]

The interest rate risk facing life insurers can be managed in several ways. In a number of euro area countries, life insurers reduced the maximum guaranteed return on their products, although this applied only to new contracts. Furthermore, in an effort to earn higher returns needed to finance existing annuities contracted at higher interest rates than those prevailing in the market, some life insurance companies have increasingly taken on market and credit risk. While equities remained popular in the investment portfolios of insurers, there was an increasing tendency to increase credit risk exposures through investments in corporate bonds. At the same time, pressure on life insurers to close asset-liability mismatches encouraged them to invest in long-term bonds. Nevertheless, because the amounts outstanding of long-dated bonds in the market were insufficient, the duration of liabilities remained higher than that of assets.

Concerning longevity risk, the ability of life insurers to reinsure this risk depends on both the capacity and willingness of the reinsurance sector to bear the risk (see Box 14).

18 See CEIOPS (2006), "Spring 2006 Report on Financial Conditions and Financial Stability in the European Insurance and Occupational Pension Fund Sector", May.

**Box 14**

**HEDGING LONGEVITY RISK**

Providers of annuities, such as life insurance companies and pension funds, face the risk that the duration of their assets can become mismatched from that of their liabilities, and that the mortality rates of policyholders could fall at a faster rate than anticipated in their pricing and reserving calculations. As profit margins in the provision of annuities tend to be low, reflecting competition, the profit margin of annuity providers will be squeezed if the mortality assumptions built into the prices of annuities turn out to be overestimated. Indeed, some life insurance companies have been claiming that their annuity businesses have been producing losses because annuitants have been living longer than expected. Some companies have sought to cover themselves against this longevity risk by only quoting prices for annuities on uncompetitive

terms. This Box discusses the challenges posed by longevity risk, and examines ways in which life insurers can manage their exposure to this risk.

With pension reforms in many countries shifting the standard formulae of pension plans away from defined benefit to defined contribution plans, longevity risk in pensions is being gradually shifted to individuals. Since individuals may not want to bear this risk, this shift has been creating greater demand for individual annuities sold by life insurance companies. Hence, while the pension fund industry may be facing less longevity risk, the mirror of this is increasing longevity risk being borne by life insurers. Practically, two options are available to life insurers to mitigate this risk: using new mortality tables,[1] or hedging longevity risk with risk management tools.

Longevity risk is difficult to diversify, thus life insurers turn to the financial markets as an alternative for institutional risk-pooling. For instance, Swiss Re[2] decided to issue mortality-linked securities to manage adverse mortality risk, with products known as Vita I and Vita II. In December 2003, a three-year bond worth USD 400 million was issued by Swiss Re and Vita Capital in the form of a floating-rate bond linked to a mortality index. The repayment of principal was linked to a mortality index of mortality rates experienced in five countries (France, Italy, Switzerland, the UK and the US). The spread was set at 135 basis points over LIBOR, and the bond effectively covered catastrophic mortality risk such as a severe pandemic, a major terrorist attack or a natural catastrophe.

Blake and Burrows (2001) suggest that the potentially most effective and appropriate way of addressing longevity risk would be for governments to issue "survivor bonds" or "longevity bonds".[3] The role of governments in providing such bonds is however still debated.[4] For instance, King (2004) notes that members of a particular cohort cannot insure themselves against the risk of an unexpected rise in the overall level of life expectancy for that cohort.[5] Only governments can spread risk across future generations: whereas no financial company can sell instruments to the unborn, governments can run up debts to be paid by future taxpayers.

In 2004, the European Investment Bank (EIB) took the initiative of creating a new capital instrument to assist life insurance companies and pension funds in addressing the challenges of ageing populations. Although the EIB was the issuer of the proposed bond, the ultimate recipient of the longevity risk embedded in the bond was PartnerRe, a Bermuda-based reinsurance company. The EIB undertook a swap with BNP Paribas, with the EIB receiving floating-rate sterling funding. In turn, BNP Paribas reinsured the longevity risk with PartnerRe, leaving BNP Paribas with the interest rate exposure and PartnerRe insuring the longevity risk. The payments on the latter bond were linked to a survivor index based on UK males aged 65. The total value of the issue was to be GBP 540 million, and it was primarily intended for

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1  For instance, the German life insurers introduced new tables and made significant adjustments to their reserves for the annuity contracts they had already sold. A similar development also took place in the UK. Source: H. Grundl, T. Post and R. N. Schulze (2006), "To Hedge or Not Hedge: Managing Demographic Risk in Life Insurance Companies", *Journal of Risk & Insurance,* 73/1, pp. 19-41.
2  See O. S. Mitchell, J. Piggott, M. Sherris and S. Yow (2006), "Financial Innovation for an Aging World", Reserve Bank of Australia, G20 meetings.
3  See J. R. Brown and P. R. Orszag (2006), "The Political Economy of Government-issued Longevity Bonds", *Journal of Risk & Insurance,* forthcoming and D. Blake and W. Burrows (2001), "Survivor Bonds: Helping to Hedge Mortality Risk", *Journal of Risk and Insurance*, 68/2, pp. 339-348.
4  See D. Miles and M. Capleton (2005), "Funding Issues and Debt Management", in: R. Chote, C. Emmerson, D. Miles and Z. Oldfield (eds) (2006), *The Green Budget,* produced by the IFS/Morgan Stanley, Chapter 5.
5  See M. King (2004), "What Fates Impose: Facing up to Uncertainty", Eighth British Academy Annual Lecture.

purchase by UK pension funds. The issue was announced in November 2004, but it was subsequently withdrawn in late 2005 without ever being issued. Precisely why the pension funds and life insurers were reluctant to subscribe for this bond remains unclear, but many possible reasons can be advanced. For example, one problem with the EIB/BNP bond was that it was capital-intensive, requiring a high degree of upfront capital commitment for the degree of protection it offered. Another problem was related to basis risk, in that the bond seemed to provide a relatively poor hedge for a typical annuity book as its reference population was insufficiently correlated with the population underlying a typical annuity book. Furthermore, the mortality experience of life insurers may be different from that of the reference UK population. On top of this, the bond only provided a hedge for the longevity of males, even though pension funds and life insurers are also exposed to significant longevity risk from females too.

The key determinant regarding the future issue of longevity bonds is the availability of sufficient reinsurance capacity. It should be underlined that neither a UK-based nor an EU-based reinsurer was willing to provide cover for the bond. Furthermore, Partner Re was not prepared to offer cover above the issue size of GBP 540 million. This raises the question of whether sufficient reinsurance capacity really exists. A further issue is whether this capacity problem might be related to the EU's solvency requirements, which make reinsurance cover within the EU prohibitively expensive.[6]

There is another aspect that is relevant for financial stability. In the case of the EIB longevity bond, the investors' main credit risk was borne by the EIB itself. However, as the EIB is AAA rated, it might not have been felt necessary for the contract to include a credit-enhancement agreement. Nevertheless, with other mortality-linked securities, the first point of contact for the investor might be with a lower-rated institution. In such circumstances, it would presumably be essential that a credit-enhancement agreement be put in place: without such an agreement, potential investors might be discouraged from subscribing to the issue. It should be recalled that the primary role of longevity bonds and other mortality-linked securities is to provide holders with the opportunity to hedge their systematic longevity risks.[7]

The failure of the EIB bond draws attention to the fact that new initiatives and capital market solutions are needed. Broadly speaking, there are several theoretical options including mortality swaps, mortality futures or mortality options.

In recent years, a market for mortality swaps has been developing. A mortality swap is an agreement to exchange one or more cash flows in the future based on the outcome of at least one (random) survivor or mortality index. Mortality swaps appear to have certain advantages over longevity bonds. They can be arranged at a lower transaction cost than bond issues, and are more easily cancelled. They are in addition more flexible and can be tailor-made to suit diverse circumstances. They do not require the existence of a liquid market, simply the willingness of counterparties to exploit their comparative advantages or trade views on the development of mortality over time. Mortality swaps may also have advantages against traditional insurance arrangements as they entail lower transaction costs and are more flexible than reinsurance treaties.
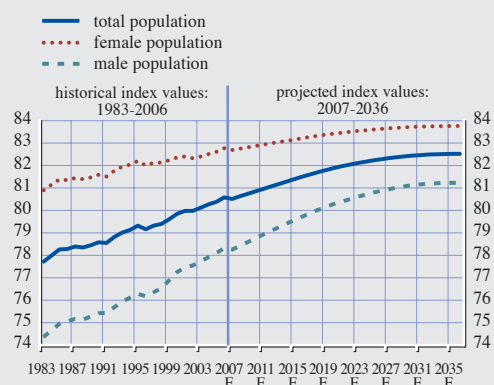
6 See Barnett Waddingham LLP (2005), "Longevity Bond to be Issued by the EIB", February.
7 See D. Blake, A. J. G. Cairns and K. Dowd (2006), "Living with Mortality: Longevity Bonds and Other Mortality-linked Securities", paper presented to the Faculty of Actuaries, January.

## Chart 14.1 Expected average lifetime by gender

(historical and projected index values, genders)

total population
female population
male population

historical index values:
1983-2006

projected index values:
2007-2036



Source: Credit Suisse (Credit Suisse Longevity Index).
Note: Historical index values for 1983 through 2006 are derived using the respective reference years (1980 through 2003) mortality and population weighting by gender. Projected index values for 2007 through 2036 are derived using the projected mortality data for 2004 through 2033, and the 2003 population weightings by gender in each of those years.

## Chart 14.2 Expected average lifetime by age

(historical and projected index values, ages)
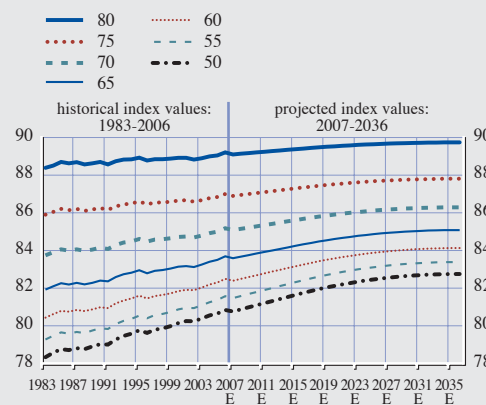
| 80 | 60 |
| 75 | 55 |
| 70 | 50 |
| 65 | |

historical index values:
1983-2006

projected index values:
2007-2036



Source: Credit Suisse (Credit Suisse Longevity Index).
Note: Historical index values for 1983 through 2006 are derived using the respective reference years (1980 through 2003) mortality and population weighting by gender. Projected index values for 2007 through 2036 are derived using the projected mortality data for 2004 through 2033, and the 2003 population weightings by gender in each of those years.

In December 2005, Credit Suisse announced the launch of the CS Longevity Index[8], which provides an objective mortality and longevity index for investors and institutions exposed to longevity risk (see Charts B14.1 and B14.2). However, basis risk remains an issue for insurers and pension plans. Securities to offset longevity risk based on such an index have lower overall longevity risk. These developments notwithstanding, the hedging of longevity risk remains a challenge for the foreseeable future.

8   Concerning details, this index is a standardised measure of the expected average lifetime for general populations based on publicly available statistics. It includes both historical and forward values, and will be released annually. At present, the index only references US population data, but data on other selected countries will be forthcoming. In addition to the Composite Index representing the total population, there are also gender and age-specific sub-indices. The calculation is made and updated annually by Milliman, a leading global actuarial firm. The index is available at http://www.csfb.com/institutional/life_finance/assets/EAL_Data_Graphs.pdf or from Bloomberg terminals: LIFF GO.

Another indirect risk mitigation approach that life insurance companies have been increasingly adopting is through the selling of unit-linked products, whereby the investment risk is passed on to the policyholders. However, this raises some concerns regarding the capacity of households to understand and manage the risks they bear.

One potential, albeit somewhat remote, risk that could impose significant financial strains on the life insurance industry is a global pandemic. Greater awareness of the possible

implications of this risk has been prompted by concerns about the possibility of avian influenza spreading widely. In such a scenario life insurers would probably face risks on at least two fronts. First, a significant contraction of economic activity could be expected, leading to substantial asset price declines. Second, insurers would be faced with greater than normal cash outflows resulting from increased death claims. Hence, asset-liability mismatches would more than likely grow, thereby straining the solvency of firms in the absence of changes to asset-

liability management strategies and risk-mitigation actions.[19]

Non-life insurers also face risks from the possibility of pandemic events. In such a scenario they would be confronted with higher than normal claims arising from business interruptions, travel and medical insurance policies. However, a more important trend over recent years for the non-life sector has been the increase in the magnitude and frequency of natural or man-made catastrophes. The traditional method for non-life insurers to mitigate this risk is through reinsurance. There are, however, some concerns that reinsurance premia have been rising, largely because of a general tightening in reinsurance capacity. At the same time, intense competition in the non-life insurance sector has made it difficult for insurers to pass on rising costs of reinsurance to their policyholders, thereby increasing the non-life sector's vulnerability to adverse disturbances.

In order to control or reduce risk, the reinsurance industry increasingly resorts to the use of alternative risk transfer arrangements, such as securitisation and financial reinsurance.[20] In this regard and despite limitations of its (re)insurance contract definition, the EU Reinsurance Directive[21] fits well into a principles-based prudential approach and encompasses the entire EU.[22] Also in relation to IFRS, financial reinsurance will (in Phase 2[23]) be recognised as a financing instrument without its present positive effects on liabilities held by the insurer, thus increasing the capital requirements of insurers to replace the existing financial reinsurance arrangements. It is expected that reinsurers will become more active in providing securitisation-based solutions in order to substitute existing financial reinsurance agreements.[24]

Structured securitisation transactions can have favourable effects on balance sheets by reducing required reserves and enabling insurers to recover prepaid expenses and emerging profits. Such transactions thus have the potential to reduce leverage by decreasing liabilities and increasing equity capital. Risk premia paid to special purpose reinsurers (SPRs) and expenses incurred in structuring securitised transactions are deductible for tax purposes. In the case of risk hedging transactions, such as catastrophe risk and mortality risk bonds, the release of funds from the SPR on the occurrence of the covered event provides funds needed to pay for losses, and hence prevents financial dislocation and potential rating downgrades. Accordingly, securitisation can significantly contribute to maintaining and enhancing the financial health of the issuing (re)insurer. In this regard, catastrophe bonds are the prevalent risk transfer strategy.[25]

Reinsurers have been making significant progress in transfering risk further to the capital market via securitisation. At the same time, the insurance sector is now the largest net taker of credit risk from the banking system. Insurers are demonstrating a growing appetite for credit

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[19] See D. Knapp (2006), "Avian Flu: Bracing for a Pandemic", *Risk Management,* 07/06, Vol. 53, No 7, p. 42.

[20] The EU Reinsurance Directive was not designed to develop a rule-based definition that distinguishes between traditional and non-traditional (re)insurance arrangements. The difference between non-traditional (so-called financial) reinsurance and traditional reinsurance principally rests in the nature of the individual client's reinsurance needs. Contrary to traditional reinsurance, where the sole concern is the unlimited risk transfer between insurer and reinsurer in the context of a single portfolio or various lines of business, in financial reinsurance the risk transfer is accompanied by a financing component with the primary emphasis being on optimising the client's overall balance sheet situation.

[21] The EU Reinsurance Directive came into force on 10 December 2005. Member States are required to implement it no later than 10 December 2007.

[22] See CEA (2006), "Guidance Paper on Reinsurance: Including Finite Reinsurance", June.

[23] The International Accounting Standards Board (IASB) has foreseen a separate introduction of IFRS for insurance companies. IFRS implementation is now scheduled in two phases: Phase 1 became operational in 2005, while Phase 2 should become operational in 2007-2009 at the earliest.

[24] See P. Walhof, A. Dorsman and A. E. Thibeault (2005), "Life Insurance Securitisation in Europe: An Overview on the Effects of Alternative Capital Resources and Its Relation to Regulator and IFRS Guidelines", NRG Working Paper No 05-05, November.

[25] Global issuance of catastrophe bonds reached USD 2 billion in 2005, up from USD 1.7 billion in 2003. The pace of issuance quickened in 2006, with approximately USD 2 billion of issuance in the first half of the year. Source: Guy Carpenter & Co. and MMC Securities Corp.

risk exposure by investing in credit instruments that match better their liabilities. However, this exposure is limited by investment regulations in many euro area countries, while at the same time there are no explicit capital/solvency requirements for credit risk. This will change with the introduction of Solvency II, which aims to improve the matching of the true risk profile and the solvency requirements of each insurance company.

An important channel through which risks in the insurance industry can spill over into other parts of the financial system is through linkages with the banking sector. Theoretically, the dispersion of risk across different parts of the financial sector should have a positive impact on overall financial stability and efficiency. Nevertheless, the concentration of risks on the balance sheets of financial conglomerates – that is, financial institutions that combine banking, securities and insurance activities within one organisation – can generate new challenges for financial stability. In recent years, the emergence of very large bancassurance undertakings has been important in this regard. Not only does the complexity of such financial groups make supervisory oversight more difficult, potentially raising possibilities for regulatory arbitrage, but they also introduce new challenges for the safeguarding of financial stability. These include the possibility that capital allocations within insurers may prove to be inappropriate or that the banking and insurance sectors aggregate their risk exposures rather than hedge risk.

**MARKET-BASED INDICATORS OF THE INSURANCE SECTOR'S SHOCK-ABSORPTION CAPACITY**

The wide dispersion in the relative performance of the insurance sectors observed in early 2006 continued after the finalisation of the June 2006 FSR (see Chart S94). Improved discipline in risk-pricing by euro area non-life insurance firms helped the stock index outperform the EURO STOXX. This pattern was also supported by the shift to more efficient operations, as depicted in the improved performance of the

**Chart 5.7 Dow Jones EURO STOXX insurance index and its implied volatility relative to the overall EURO STOXX index**

(Jan. 2003 - Nov. 2006, %)
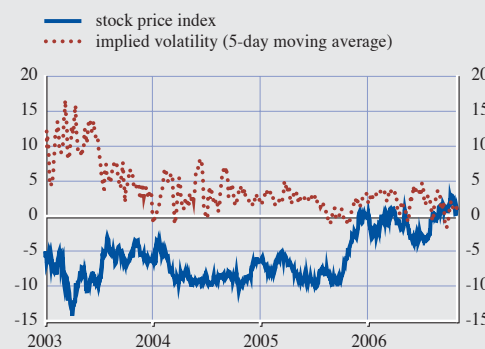


Source: Bloomberg.

combined ratio, as well as the positive investment spillover from buoyant financial markets. The reinsurance sector also profited from these factors, recovering rapidly after mid-2006. Other important factors supporting the swift recovery of the sector included a reduced incidence of natural catastrophes in the summer of 2006, as well as the growing use of derivatives instruments for more tailored risk management within the sector.

Euro area insurance stock price indices were strongly affected by the May/June 2006 market turbulence (see Section 1.2 and Section 3). However, both stock price levels and implied volatility had returned to early May levels by early November 2006 (see Chart S93), indicating that the uncertainty about future prospects for stock indices and/or rising risk premia attached to the insurance sector had fully dissipated.

Even though the insurance sector was considerably more affected than other sectors, the recovery from the turbulence was swift, and it outstripped that of other sectors (see Chart 5.7). Notably, the euro area insurance stock index surged above the overall index, while its volatility dropped below the overall index. Both of these developments started in the period after the finalisation of the June 2006 FSR and attest to the resilience of the sector.

Source: Bloomberg.

Sources: Bloomberg and ECB calculations.
Note: The risk-reversal indicator is calculated as the difference between the implied volatility of an OTM call with 25 delta and the implied volatility of an OTM put with 25 delta. The strangle is calculated as the difference between the average implied volatility of OTM calls and puts, both with 25 delta, and the average at-the-money volatility of calls and puts with 50 delta.

The euro area life insurance industry stock market performance – which, in contrast to the insurance sector as a whole, was largely unaffected by the May/June market turbulence – started to reflect the improving growth outlook for life policies sales and the strong premium growth reported for 2005.

Whereas an overall positive outlook for the euro area insurance sector appeared to be priced into EDFs, a general and sustained increase in subordinated debt spreads indicated that some uncertainty remained at the lower grading of the credit quality spectrum (see Chart S95). This distinction across grading levels was also evident in the distribution of EDF values (see Chart S96). This notwithstanding, the outlook implied in the spread between senior and subordinated insurance debt returns was more balanced (see Chart 5.8).

Risk reversal quotes and strangles of the Dow Jones Euro STOXX insurance stock index – measuring the expectation of large insurers' stock prices direction and variability in the market[26] – provide yet another angle on the risk outlook. The sign of the risk reversals has remained negative and continued its downward

trend after June 2006, despite having largely recovered from the impact of the May/June market turbulence (see Chart 5.9). This indicates that market participants continued to assign a higher probability to the risk of a fall in insurance stock prices than to a rise of the same magnitude. Furthermore, the recent increase in the value for strangles indicates that the probability assigned to extreme events, either positive or negative, has increased. Such an increase in uncertainty indicates that the markets' confidence in the ongoing sustainability of the performance of the euro area insurance sector remains fragile.

**OVERALL ASSESSMENT**
Greater focus on risk management, risk-adjusted pricing and core profitability continue to underpin a positive outlook for the insurance sector, especially for large firms. Improvements in asset-liability management, together with better capital structures – resulting from growing issuance of hybrid capital and subordinated debt – have bolstered generally positive market-based indicators. As large firms

26 See Box 16 in ECB (2006), *Financial Stability Review,* June, for a presentation of these indicators.

in the sector have been implementing international accounting standards and bringing their portfolios into line with the requirements of Solvency II, some increased volatility may occur, although this is likely to be dampened by the clear benefits to market participants from greater transparency and a better management of risk in firms' balance sheets. The challenges for small firms identified in the June 2006 FSR remain, as the potential pressure for consolidation stemming from regulatory developments is expected to continue in the short to medium term.

The shift of core business profitability in the euro area non-life sector away from a reliance on investment income as the main source of income should support the outlook for the sector. This shift should also keep combined ratios contained in the period ahead, thus supporting investor confidence. Taking a broader perspective, to the extent that risks are increasingly spread and that the regulatory framework is becoming increasingly harmonised, increased competition is likely to continue to exert downward pressure on underwriting income. This is likely to prompt further consolidation within the non-life sector. At the same time, tight competition among non-life insurers may increase their willingness to take on more risk and transfer some of this risk to reinsurance sector, which in turn may pass it on to capital markets.

For the life insurance industry, 2005 proved to be a very positive year, despite the relatively low long-term interest rate environment. Given the strong underwriting results, the outlook for this sector in 2006 is skewed towards a positive outcome, grounded firmly on increasing volumes in unit-linked products and rising life margins as long-term rates have continued to rise. Looking further forward, wide-ranging changes are expected in the life insurance business environment, owing to the combined effect of demographic changes, an increasingly competitive landscape, and fundamental regulatory changes. The resulting transformation will over time lead to a greater differentiation

between market participants which is likely to favour financially strong competitors who have an integrated risk management approach, good risk selection criteria, a strong capacity for innovation and a powerful distribution network. This should thus strengthen profitability in the sector and reinforce the resilience of the sector to adverse conditions. This notwithstanding and owing to the limited availability of long-dated bonds in the market and the prevailing process towards market valuation of technical provisions, the duration of liabilities in life insurance has remained higher than that of assets. Insurers increased their efforts to hedge such market risks, but this may have come at the expense of taking on higher risk. For instance, the growing proportion of corporate bonds and credit derivatives on life insurers' balance sheets has extended the credit risk exposure of the insurance sector (the insurance sector is now the largest net taker of credit risk from the banking system).

Despite the severe losses experienced by the reinsurance sector in 2005 and the impact on euro area reinsurance companies' earnings, their capital position has been positively supported by relatively few natural catastrophes and other large-scale events in 2006. As the sector continues to refine financial instruments to manage risks more effectively, as well as to widen the investor's base for diversifying those risks, the medium-term outlook of the sector should remain positive. From a systemic risk perspective, it remains important to identify where the risks being shed by this sector through hybrid securitisation instruments are accumulating, as the ability to service contractual agreements in the situation of a major shock remains to be tested.

## 6 STRENGTHENING FINANCIAL SYSTEM INFRASTRUCTURES

*The key euro area financial infrastructures have remained operationally robust since the finalisation of the June 2006 FSR, and continue to facilitate a smooth allocation of financial resources. Although ensuring the safety and efficiency of these financial infrastructures is primarily the responsibility of their operators, the overseers contribute to the soundness of these systems with a view to avoiding systemic risk through the setting and enforcement of oversight standards. As far as the oversight of payment systems is concerned, the most important development over the past six months was the approval of the Eurosystem's "Business continuity oversight expectations for systemically important payment systems (SIPS)" by the Governing Council of the ECB. These expectations for the systemically important payment systems that process euro payments focus on business continuity strategy, planning, testing and crisis management. This section also summarises the ECB's position on the new legal framework for payment services in the EU. Regarding the securities clearing and settlement systems, no significant developments with an impact on financial stability have emerged over the last 12 months.*

### 6.1 PAYMENT SYSTEMS

The smooth functioning of payment systems, in particular those that process very large amounts, is paramount for the stability of the financial system. A major disturbance in such a system – for instance, as a result of insufficient business continuity arrangements to deal with operational failures – could undermine the safety of these systems. In a worst-case scenario, the occurrence of such events could lead to systemic risk spreading to other participants in the system and/or, more widely, other payment and settlement systems, financial markets or even the financial system as a whole.

### OVERSIGHT OF EURO LARGE-VALUE PAYMENT SYSTEMS

From an oversight perspective, the Eurosystem considers all large-value payment systems that settle the euro and some retail payment systems to be systemically important payment systems (SIPS). From a financial stability perspective, the two most important SIPS are TARGET, the real-time gross settlement system operated by the Eurosystem, and EURO1, the largest privately operated payment system for euro credit transfers, which works on a multilateral net basis and is operated by the CLEARING company of the Euro Banking Association (EBA CLEARING). TARGET offers immediate finality of payment in central bank money, thus eliminating credit exposures between participants. As regards EURO1, the end-of-day positions of EURO1 participants are ultimately settled via the TARGET system. EURO1 is much smaller than TARGET in terms of both value and volume of payments processed (see also Box 15).

In addition, there is the Continuous Linked Settlement (CLS) system operated by CLS Bank International, a single-purpose bank which provides settlement services for foreign exchange (FX) transactions in 15 major currencies around the globe. The CLS system settles both legs of FX transactions simultaneously, i.e. on a payment-versus-payment (PVP) basis, as soon as sufficient funds are available. CLS Bank is regulated by the Federal Reserve system, which is also the lead overseer since CLS Bank is located in the US. The Federal Reserve System cooperates with the central banks of all eligible currencies. Within this cooperative oversight framework, the ECB is the overseer for the settlement of euro in CLS. The CLS system is the most important system settling euro transactions which is operated outside the euro area.

Box 15

## OVERVIEW OF THE FINANCIAL MARKET INFRASTRUCTURE

The European financial market infrastructure – which is composed of payment systems, securities clearing and settlement systems and payment instruments – is in the middle of a development process. The pace of the creation of an internal market for financial services in the various financial market infrastructure components has been uneven, and the provision of services to an ever-larger number of international market participants and markets poses increasing challenges. Over the longer term, the efficiency of the EU-wide infrastructure must be enhanced, and the efficiency of EU financial markets must be promoted in many ways. Improving the efficiency and integration of payment systems and financial systems more generally are important objectives of the ECB. When the infrastructure operates reliably, it fosters financial stability as well. This Box provides an overview of the most important infrastructural developments.

### Payment systems

TARGET and EURO1 are still the most crucial payment systems within the euro area in terms of number and value of payments handled, and the bulk of large-value payments continue to be concentrated in these systems. TARGET is used for processing intra-Member State and inter-Member State interbank and customer payments. In 2005, the daily average number of payments processed by the system as a whole was almost 300,000, representing a value of €1.9 trillion. TARGET's operational reliability has improved continuously since its launch, and its availability rate[1] was 99.89% in the first half of 2006. EURO1 is the most important privately owned and EU-wide operated payment system for large-value payments, and its turnover figures have been steadily increasing. In 2005 the average number of transactions stood at close to 160,000 payments per day with a total value of €166.7 billion. As well as offering EURO1 for large-value payments, EBA CLEARING offers STEP2 arrangements for the processing of small-value payments in euro. The smooth functioning of STEP arrangements depends on the EURO1 system, through which settlement is made.

The CLS system is an FX settlement system aimed at reducing banks' risks in the settlement of foreign exchange trades. It achieves this by applying a strict risk management regime and by settling trades on a PVP basis in its own books. The number of transactions settled through it has risen significantly, and by late 2006 CLS was settling on average over 200,000 payment instructions each day with an average gross value of more than USD 2 trillion. The euro is the second most settled currency in the system after the US dollar, with a settlement value of 20% of all FX trades. The smooth functioning of the CLS system ultimately depends on continuous operation of the TARGET system and on the corresponding RTGS systems of all the currencies handled in it.

The authorities support market integration by several means. The European Commission has, for example, prepared a new legal framework for payments in the internal market to harmonise EU legislation. In addition, the Eurosystem actively supports banks' efforts to create a Single Euro Payments Area, or SEPA, which should be well advanced by the end of 2010. The common payment instruments included in the initiative are credit transfers, direct debits and card

1 This is the ratio of the time when TARGET is fully operational to the total TARGET opening time.

payments. The use of modern technology promotes the efficiency of the entire payment system. In parallel, the Eurosystem has continued its work towards developing a new large-value payment system, with the second generation of TARGET, TARGET2, planned to be launched in the second half of 2007. According to the implementation schedule, TARGET users will migrate to TARGET2 in different waves on different predefined dates starting on 19 November 2007.

### Securities clearing and settlement systems

The introduction of the euro has accelerated the existing process of consolidation in securities market infrastructures. This process has continued both in terms of the integration of systems and ownership arrangements. However, although progress has been made with stock exchange integration, the integration of post-trade processes has been slower, and the operating field is still fairly fragmented. The consolidation of regional stock exchanges into increasingly larger entities is important from the point of view of enhancing their competitiveness. In addition to traditional stock exchanges, several alternative trading systems such as new electronic communication networks (ECNs) have been introduced in the euro area, offering similar functionality and services to traditional exchanges.

Integration via ownership arrangements is a more difficult process in which progress is much slower. As a result of the consolidation process, the number of euro area central counterparties halved from 14 to seven in the period from January 1999 to May 2006; the number of central securities depositories (CSDs), by contrast, diminished by only five, from 23 to 18. However, it should be noted that most CSDs operate as parts of holding companies (i.e., the Euroclear Group, Clearstream International, the Bolsas y Mercados Españoles (BME) group in Spain, etc.). So far the number of CSDs has only slightly fallen, but efficiency gains have been sought by developing common systems and concentrating operations. In this respect, achieving straight-through processing (STP) and system interoperability (e.g. through the application of common standards) are the key challenges to be addressed in both national and international markets.

A recent example of consolidation was the Letter of Intent regarding the acquisition of Eignarhaldsfelagid Verdbrefathing hf (EV) signed by the OMX[2] and EV, the owner of the Iceland Stock Exchange (ICEX) and the Iceland Securities Depository.[3] With the EV joining the OMX Group, OMX now comprises the exchanges of Stockholm, Helsinki, and Copenhagen, Iceland and partly of Tallinn (62%), Riga (93%) and Vilnius (93%), as well as the CSDs of the Baltic countries and Iceland.

In addition to the consolidation process, two different solutions have emerged in response to demands from securities market participants to rationalise the securities settlement industry: cross-border links, and the relayed links solution. Concerning the first of these solutions, links between the securities settlement systems (SSSs) have been established to facilitate cross-border transfers of securities. To be eligible for use in the Eurosystem's credit operations, the links are assessed according to the Eurosystem's standards.[4] The relayed links solution allows two SSSs to transfer securities through an account with one SSS acting as an intermediary.[5]

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2 An exchange operator and technology provider in the Nordic and Baltic region.
3 The Letter of Intent was signed on 19 September 2006.
4 EMI (1998), *Standards for the Use of EU Securities Settlement Systems in ESCB Credit Operations*.
5 In January 2005, the ECB's Governing Council decided that relayed links between SSSs may be used for the cross-border transfer of securities to the Eurosystem.

Relayed links are however only eligible after an assessment has been carried out to ensure that certain conditions have been met. At the beginning of 2006, a total of 59 links were eligible. So far, however, the use of links has been more modest than expected, with the correspondent central banking model (CCBM) currently being used more widely than the links between SSSs. The CCBM was established to facilitate the cross-border use of collateral in the Eurosystem's monetary policy operations and intraday credit operations. As no comprehensive market alternative to the CCBM service has yet emerged, which was designed as an interim arrangement in the absence of a market solution throughout the euro area, the ECB has begun to analyse possible paths for the evolution of the operational framework for collateral management in the Eurosystem. Turning to the second of these solutions, the implementation of new models such as relayed links could increase the use of links in the future. Some central counterparties (CCPs) have already established links amongst themselves, for instance between LCH.Clearnet SA and the Italian CCP CC&G.

By overseeing payment systems settling in euro, the Eurosystem contributes to ensuring that these systems continuously achieve a high degree of observance with the Core Principles for systemically important payment systems, which were adopted in January 2001 by the ECB's Governing Council as the minimum standards of the Eurosystem's common oversight policy on payment systems.

### SETTLEMENT OF LARGE-VALUE PAYMENTS IN EURO

#### Developments in TARGET

Since its launch on 4 January 1999, an increasing number and amount of payments have been settled through TARGET.

In the six months of data that have become available since the June 2006 FSR was finalised (April-September 2006), TARGET settled an average daily value of €2.1 trillion. In comparison, EURO1 settled an average daily value of €191 billion over the same period. Overall, around 90% of the value of all euro payments was processed through TARGET during this period (see Chart 6.1). The share in total payment volumes was much lower on account of the high frequency of small-value payments made in euro through other systems.
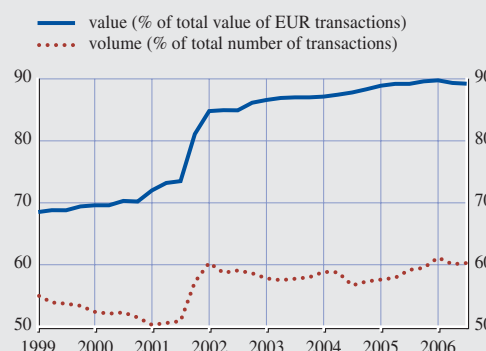
In general, the bulk of TARGET traffic continues to be concentrated in five national RTGS systems, namely those of Germany, France, Spain, Italy and the UK. In the second and third quarters of 2006, these systems had a combined share of 83% in terms of volume and 83% in terms of value of all transactions sent via TARGET (see Chart 6.2). The German RTGSplus system remains the most important component of the TARGET system.

Given the criticality of the TARGET system for the implementation of the Eurosystem's monetary policy and for the safe and reliable execution of inter and intra-Member State euro payments, it is a strict requirement that all national RTGS systems are well protected

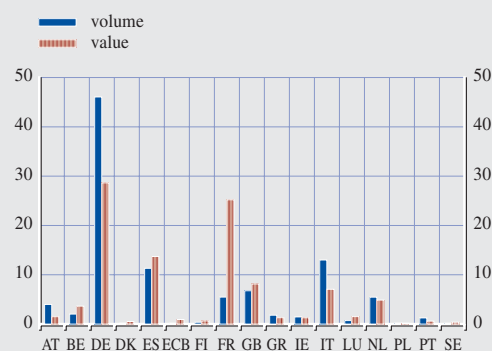**Chart 6.1 Large-value payments processed via TARGET**

(Q1 1999 - Q3 2006)

value (% of total value of EUR transactions)
volume (% of total number of transactions)



Source: ECB.
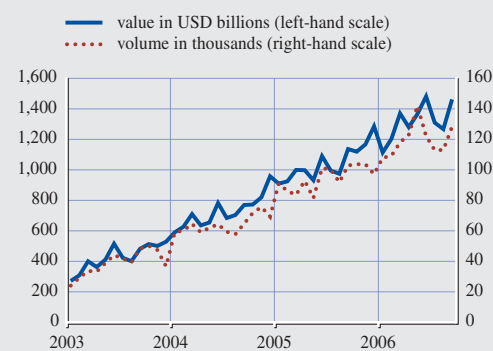
Source: ECB.

Source: ECB.

against financial and non-financial risks, as any severe disturbance to the soundness of these systems could ultimately have large-scale adverse effects on trade and on financial and economic activity.

It is imperative that every extension of TARGET beyond its current geographical scope is subject to an oversight review, in order to ensure that the system continues to be secure and reliable. In the run-up to the connection of Eesti Pank's euro RTGS system to the TARGET system via Banca d'Italia and the latter's BIREL system on 20 November 2006, the Eurosystem carried out an in-depth oversight assessment of Eesti Pank's euro RTGS system, as well as an analysis of the potential impact of the connection on the BIREL system. This assessment concluded that the connection of Eesti Pank's euro RTGS system to TARGET would not have an adverse impact on the smooth functioning of TARGET.

### Continuous Linked Settlement (CLS)
The continuous stability of CLS is of prime importance for the Eurosystem, because any major disturbances in the safety and efficiency of the system could have severe implications throughout the euro area and beyond.

The CLS multi-currency system is, in terms of value, the second-largest payment system settling euro transactions after TARGET. The settlement values of FX transactions processed via the CLS system have continued to increase since the finalisation of the June 2006 FSR. In September 2006, CLS settled the equivalent of USD 2.9 trillion daily, thus eliminating FX settlement risk of an equivalent USD 2.8 trillion. The euro values settled via CLS amounted to €443 billion in September 2006, eliminating FX settlement risk of approximately €426 billion.[1]

### THE EUROSYSTEM'S OVERSIGHT POLICY ON BUSINESS CONTINUITY
Market participants and public authorities in many countries have been reconsidering their business continuity policies and the adequacy of their business continuity planning in the light of the vulnerabilities revealed by terrorist acts (notably the events of 11 September 2001 in the US), as well as owing to natural disasters and major power outages. In the euro area,

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[1] The reduction of FX settlement risk is smaller than the values actually settled in CLS because participants can trade down their positions in CLS via so-called Inside/Outside swaps ("I/O swaps"), whereby two participants conclude two opposite trades, one to be settled in CLS (the inside leg of the swap) and the other one (the outside leg of the swap) to be settled outside CLS, e.g. via correspondent banking. Because the latter reintroduces FX settlement risk, the value of these "I/O swaps" is deducted from the values settled in CLS to obtain the real reduction in FX settlement risk.

various in-depth and fruitful discussions have taken place, and a range of initiatives have been carried out with regard to business continuity. However, until recently, these had largely only taken place at the national level, and had not sufficiently taken into account the fact that the euro financial system operates as a euro area-wide network of interrelated markets, market infrastructures and participants.

Given the nature of the financial system and the need to coordinate business continuity policies and plans at the euro area level, the Eurosystem carried out a public consultation in 2005 on a proposed set of business continuity expectations with a view to ensuring a sufficiently robust and consistent level of resilience across all SIPS operating in euro.[2] After the public consultation, the Eurosystem finalised the "Business Continuity Oversight Expectations for Systemically

Important Payment Systems (SIPS)" which were adopted by the ECB's Governing Council in May 2006, and form an integral part of the Eurosystem's oversight framework.

These expectations identify the four key elements of business continuity management (see Box 16), and should be implemented by all SIPS by June 2009. Certain aspects of these elements also apply to critical participants of SIPS and their third-party providers of critical functions and/or services, both of which have a slightly later implementation deadline of June 2010. It is envisaged that the Eurosystem, in its oversight capacity, will perform regular reviews to measure the progress made in implementing expectations and to assess the risk of any possible delays.

2   See also ECB (2006), *Financial Stability Review,* June.

**KEY ELEMENTS OF BUSINESS CONTINUITY MANAGEMENT**

The "Business Continuity Oversight Expectations for Systemically Important Payment Systems (SIPS)" identify the following elements as key to business continuity management:[1]

1. Systems should have a well-defined business continuity strategy and monitoring mechanism endorsed by the Board of Directors. Critical functions should be identified and processes within these functions categorised according to their criticality. Business continuity objectives for SIPS should aim at the recovery and resumption of critical functions within the same settlement day.

2. Business continuity plans should envisage a variety of plausible scenarios, including major natural disasters, power outages and terrorist acts affecting a wide area. Systems should have a secondary site, and the latter's dependence on the same critical infrastructure components used by the primary site should be kept to the minimum necessary to enable the stated recovery objectives for the scenarios concerned to be met.

3. System operators should establish crisis management teams and well-structured formal procedures to manage a crisis, as well as internal/external crisis communication channels.

4. The effectiveness of the business continuity plans needs to be ensured through regular testing of each aspect of the plans. System operators should consider performing whole days of live

1   Detailed implementation guidelines with respect to these elements are provided in ECB (2006), "Business Continuity Oversight Expectations for Systemically Important Payment Systems (SIPS)", June.

operations from the secondary site, and the latter should also be tested periodically using the participants' contingency facilities. Systems should participate in industry-wide testing organised and coordinated by a commonly agreed financial authority. System operators' business continuity plans should be periodically updated, reviewed and audited to ensure that they remain appropriate and effective. Operators should consider the partial disclosure of business continuity plans to external stakeholders such as other SIPS, overseers and banking supervisors.

However, each SIPS remains responsible for its own business continuity management and, in particular, should endeavour to achieve high resilience objectives for the system, its critical participants and its third-party providers of critical functions and/or services.

### DEVELOPMENTS IN THE LEGAL ENVIRONMENT FOR PAYMENT SYSTEMS

With the aim of establishing a comprehensive set of rules applicable to all payment services in the EU, on 1 December 2005 the European Commission published its proposal for a Directive on payment services in the internal market. The preparatory discussions and consultations for this proposed Directive had been ongoing since December 2003, when the Commission published its consultative document on a New Legal Framework for Payments in the Internal Market.

According to the proposal, payment services can only be carried out by authorised payment service providers. These include existing credit institutions, post office giro institutions, and a new category of payment service providers which is introduced in the proposed Directive, the so-called payment institutions. The proposal also sets out standardised rights and obligations for providers and users of payment services in the EU, and enhances consumer protection by making the payment provider liable for incorrect execution, and by introducing a guarantee of full and timely payment.

On 26 April 2006, the ECB issued an Opinion on the proposed Directive welcoming it, as it establishes a comprehensive legal framework for payment services in the EU. Currently, the wide variety of national legislation related to payments makes the implementation of the SEPA[3] problematic. The harmonisation of legal requirements for payments is therefore a vital measure that will assist the banking industry in its efforts to establish the SEPA. The introduction of the concept of payment institutions is also welcomed as a way of harmonising access rules to the market for payment services. Requirements regarding payment institutions need, however, to be set in accordance with the scope of activities and the risks perceived.

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3   The SEPA is a European banking industry project under the leadership of the European Payments Council, strongly supported by the ECB. The aim of SEPA is to enable European users to make payments in the euro area as easily, efficiently and safely as payments within national borders. The migration to SEPA payments with the same level of service for domestic and cross-border payments should be well advanced by end-2010.

# IV SPECIAL FEATURES

## A IDENTIFYING LARGE AND COMPLEX BANKING GROUPS FOR FINANCIAL SYSTEM STABILITY ASSESSMENT

*For the purposes of financial system stability assessment, it is important to identify and monitor the activities of banking groups whose size and nature of business is such that their failure and inability to operate would most likely have adverse implications for financial intermediation, the smooth functioning of financial markets or other financial institutions operating within the system. A simple and common approach for identifying such institutions – often grouped under the heading large and complex banking groups (LCBGs) – is to rank them by the size of their balance sheets. However, asset size alone may fail to shed much light on the importance and complexities of the interconnections that a banking group may have within a financial system, especially given the growing importance of banks' off-balance sheet activities. Knowledge about such interconnections is important because it can help in mapping how, or if, strains in a large banking group could spread to other institutions or markets. Based on a multiple indicator approach, this Special Feature takes a first step towards statistically identifying banking institutions that meet certain "largeness" characteristics that go beyond balance sheet size.*

### INTRODUCTION

Thanks to mergers, acquisitions and organic growth, a relatively small number of banking groups in the euro area now control a significant and growing share of total banking sector assets (see Chart A.1). Because of their importance from a financial system stability perspective, this Special Feature considers a framework for identifying LCBGs. The "largeness" of a banking group clearly depends on the size of its balance sheet. Indeed, the most rudimentary method for identifying large banking groups is to rank institutions by their total assets. In practical terms, however, this approach has at least two shortcomings for financial system stability assessment. First, there is no commonly agreed

**Chart A.1 Cumulative banking sector asset shares of the 25 largest euro area banking groups**

(% of total euro area banking sector assets)
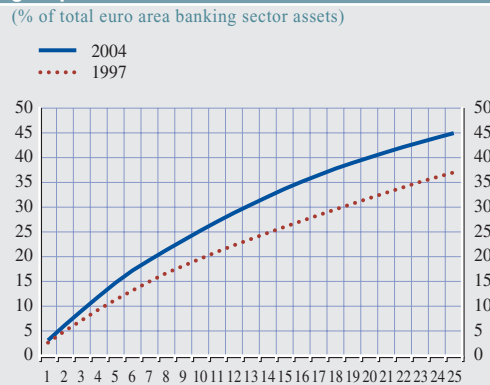


Sources: Bureau van Dijk (Bankscope) and ECB calculations.

threshold for the percentage of banking sector assets, or the number of large banking groups, that should be monitored. Second, given the growing importance of off-balance sheet activity, the size of a financial institution's balance sheet may not necessarily accurately reflect its complexity or the importance of the role it plays in the various forms of financial intermediation, risk transformation and management processes that take place within the financial system.[1] For instance, should a banking group fail that is relatively large, but which has few linkages with other parts of the financial system, it may have little impact on the functioning of other financial institutions. By contrast, a smaller bank with few but important linkages could have a disproportionately larger adverse impact on the functioning of financial markets or other financial institutions. This could occur, for instance, in the case of a bank offering brokerage services in derivatives markets, or acting as a custodian in security settlements. Neither of these activities is necessarily associated with a bank's portfolio size.

To assess how important a banking group is for the smooth functioning of the various

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[1] See, for example, I. W. Marsh and I. Stevens (2003), "Large Complex Financial Institutions: Common Influences on Asset Price Behaviour", *Bank of England Financial Stability Review,* December.

intermediation, risk transformation and management processes that take place within the system, a wide set of key business activity characteristics is needed. Clearly, the wider the set of activities that are considered to be important for the stable functioning of the financial system, the more complex the conceptual and technical challenges to ranking – or even selecting – large banking groups become. In addition to technical difficulties related to making league table comparisons (i.e. lists of banking groups ordered by the relative size of the different indicators), or the fact that indicators of different banking activities will inevitably be measured using different scales, two essential problems arise. First, without a weighting of the importance of different activities that take place within a financial system, there is no natural prescription for aggregating what might be conflicting rankings for the same institutions across league tables of different indicators. Second, league table rankings offer no information on magnitude, as the ordering obscures the measure of the "largeness" of a banking group in a particular banking activity.

This Special Feature explores a methodology for data analysis that aims at addressing these issues. While the procedure is simple, transparent and lends itself to dealing with expanding information sets, it is by no means unique or even necessarily the best among all available procedures. What it does represent, however, is a clear improvement on simply selecting banks on the basis of asset size and arbitrarily choosing a threshold asset value or number of institutions, and in this regard should be seen as a first step.

The remainder of this Special Feature is organised as follows: the following section discusses banks' presence and linkages. This is followed by a section describing the data and data processing and a section describing the methodology and the main findings. Conclusions and implications for financial stability monitoring are provided in the final section.

## BANKS' PRESENCE AND LINKAGES

Large and complex banking groups can be considered as institutions whose size and nature of business is such that their failure and inability to operate would most likely spread and have adverse implications for the smooth functioning of financial markets or other financial institutions operating within the system. If the disturbance were large enough to threaten financial system stability it could be transmitted through various channels – including payment systems and markets – but would most likely originate from an institution being unable to meet its payment and settlement obligations.[2]

With a view to selecting suitable business activity variables for identifying LCBGs, conceptual work on systemic risk can be helpful when it comes to pinpointing potential contagion channels though which adverse disturbances could be transmitted throughout the financial system. The literature distinguishes between contagion channels that are "pure" (resulting from either idiosyncratic or systemic shocks), those that are information-based (stemming from information asymmetries among investors and/or depositors), and those that are a combination of both.[3] Of these two potential channels, case studies of systemic banking crises have not found information-based channels to be important, and in any case they pose significant challenges in terms of monitoring.[4] By contrast, pure contagion channels are more amenable to surveillance as they are based on measurable quantities. Two types of pure shocks to a banking system can be distinguished: systemic and idiosyncratic. At the core of financial stability monitoring are systemic (common, and often macroeconomic) shocks that affect all banks in the system simultaneously. A common finding in the

2 For an overview of systemic banking crises since the late 1970s, see G. Caprio and D. Klingebiel (2003), "Episodes of Systemic and Borderline Financial Crises", World Bank.
3 For a review of this literature, see O. De Bandt and P. Hartmann (2000), "Systemic Risk: A Survey", *ECB Working Paper,* No 35.
4 See C. W. Calomiris and J. R. Mason (1997), "Contagion and Bank Failures during the Great Depression: The June 1932 Chicago Banking Panic", *American Economic Review,* Vol. 87.

empirical literature is that the level of banks' exposure to systemic shocks tends to determine the extent and severity of a systemic crisis. However, an individual bank can – through failure or inability to operate – also be a source of systemic risk. The transmission channel of the idiosyncratic shock can be direct – for example if the bank was to default on its interbank liabilities – or indirect, whereby a bank's default leads to serious liquidity problems in one or more financial markets where it was involved.

The degree to which individual banking groups are "large" in the sense that this could be a source of systemic risk would therefore seem to depend on the extent to which they can be a conduit for diffusing systemic and idiosyncratic shocks through a banking system. Attempts at estimating the degree of interconnectedness of banking groups can be divided into two main strands: one which measures the degree of co-movement of indicators based on security prices, and the other which is based on simulation exercises using interbank lending data.[5] Both approaches have some shortcomings. Clearly the first approach can only be followed for banking groups that are listed on stock exchanges. Moreover, using co-movement measures to make inferences about probable behaviour in times of distress often offers only limited insight into the nature of the relationship.[6] Simulation exercises, on the other hand, are less than ideal as they ignore remaining shock transmission channels and only provide a "lower bound" of the potential degree of spillover from one banking group to another following the crystallisation of a shock.[7] A shortcoming common to both types of studies is that they lack criteria for selecting which indicators of banks' interconnectedness are useful for identifying relevant banking groups from a financial system stability assessment viewpoint. Typically, total assets – or a combination of balance sheet items – serve as *a priori* criteria for sample pre-selection.[8]

The methodologies explored in this study aim at both expanding the set of possible indicators

as well as quantifying the degree to which a bank is interconnected with the rest of the banking system, so as to determine endogenously a bank's "size" in the financial system.

## DATA DESCRIPTION AND PROCESSING

As the purpose of this study is to identify those banking groups active in the euro area that play important roles in various forms of financial intermediation, risk transformation and management processes, the key business activity characteristics of around 260 banks, both domiciled within and outside the euro area, were examined. The analysis was restricted by the availability and comparability of publicly available information.[9] Hence, it does not include off-balance sheet positions, even though these are often important sources of interconnectedness. The business characteristics of banks were pre-screened and they were included in the analysis if they met one or more of the following three criteria in 2005:

– domiciled in Europe and with total assets in excess of one billion euro; or

– included in the top 30 bookrunners in the European equity, bond and syndicated lending markets; or

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5  An approach using both methodologies is taken by H. Elsinger, A. Lehar and M. Summer (2006), "Using Market Information for Banking System Risk Assessment", *International Journal of Central Banking,* March. For an application based on payment systems data, see E. Amundsen and H. Arnt (2005), "Contagion Risk in the Danish Interbank Market", *Danmarks Nationalbank Working Papers,* No 29.

6  See for example G. De Nicolo and M. L. Kwast (2002), "Systemic Risk and Financial Consolidation: Are They Related?", *Journal of Banking and Finance,* Vol. 26, No 5, May.

7  Furfine provides a seminal study of interbank positions determining banks' systemic relevance (C. H. Furfine (2003), "Interbank Exposures: Quantifying the Risk of Contagion", *Journal of Money, Credit and Banking,* Vol. 35, No 1).

8  See for example P. Hartmann, S. Straetmans and C. G. de Vries (2005), "Banking System Stability: A Cross-Atlantic Perspective", *NBER Working Papers,* No. 11698. Furfine (2003) uses interbank federal funds exposures, while Elsinger et al. (2004) focus on total interbank positions (assets and liabilities) on banks' balance sheets. A notable exception is Marsh and Stevens (2003), who also recognise the importance of proxies of off-balance sheet items such as foreign exchange trading revenues or assets held in custody.

9  The data sources included Bureau van Dijk's Bankscope, Thomson Financial's Thomson ONE Banker – Deals and GlobalCustody.net.

– among the top 48 worldwide custodian banks according to Global Custody.

All banking groups domiciled in Europe – and not just euro area banking groups – that met at least one of the criteria above were included in the analysis, in order to permit the identification of large banking groups domiciled outside the euro area which could be seen as being important for euro area financial stability assessment. Similarly, banking groups domiciled outside Europe were included in the analysis if they were among the top 30 bookrunners in the European equity, bond or syndicated lending markets or among the top 48 worldwide custodian banks.

For the purpose of financial system stability assessment, the banking activity indicators selected for identifying LCBGs should ideally encompass relevant dimensions of importance with regard to various aspects of financial intermediation, as well as the degree of interconnectedness of the institution within the system. In this respect, the scale of a given banking group's activities in different banking market segments, in interbank markets and of its total assets are essential dimensions of its size. For instance, if a banking group has a particularly large share of the residential mortgage market, then the smooth functioning of that market segment may depend on the financial condition of the intermediary concerned, which would call for it to be included in the set of LCBGs. Other variables for selecting LCBGs might include a bank's activity level (gauged, for instance, by revenues – which might not be correlated with entries on the balance sheet, but which may be an important measure of size), as well as the institution's role and importance as a bookrunner in the issuance of equities, bonds and syndicated loans and its role as a custodian bank. The indicators used in the analysis conducted for this Special Feature can be grouped as follows:

– Traditional banking balance sheet items: loans, mortgages, other earning assets, deposits and contingent liabilities;

**Table A.1 Correlation of indicators with total assets**

(2005, cross-sectional correlations)

| | |
|---|---|
| Assets under custody | 0.24 |
| Contingent liabilities | 0.36 |
| Interbank assets | 0.45 |
| Interbank liabilities | 0.49 |
| Net interest revenue | 0.50 |
| Proceed amount from equity issuance | 0.51 |
| Deposits | 0.54 |
| Customer loans | 0.57 |
| Net non-interest revenue | 0.68 |
| Proceed amount from syndicated loan issuance | 0.68 |
| Other assets | 0.70 |
| Proceed amount from bond issuance | 0.79 |
| Mortgages | 0.84 |

Sources: Bureau van Dijk (Bankscope), Thomson ONE Banker-Deals, GlobalCustody.net and ECB calculations.

– Traditional indicators of banking activity: net interest revenue and net non-interest revenue;

– Interbank assets and liabilities;

– Bookrunner role: proceed amount in European equity, bond and syndicated loans markets; and

– Custodian role: worldwide assets under custody.

As previously mentioned, these indicators are used because a banking group's total assets may not necessarily provide an indication of the institution's complexity or of the importance of the role it plays in various forms of financial intermediation, risk transformation and management processes. Indeed, many of the indicators used in the analysis display rather low correlations with total assets (see Table A.1).

For the non-euro area banking groups, the indicators analysed were re-scaled to approximate the share of their business that was carried out in the euro area. The variables were scaled down to 50% if the banking group is domiciled in a non-euro area EU country, 40% if in a non-EU European country, and 10% if located outside Europe. While this scaling is to some extent rather arbitrary, some form of scaling is nevertheless needed to approximate

the share of the business conducted by non-euro area banking groups in the euro area, since the purpose is to identify large banking groups which are important from a euro area perspective. It should, however, be borne in mind that the scaling does not affect the identification of LCBGs that are domiciled in the euro area. Proceed amounts from bookrunner activity and worldwide assets under custody were not scaled down since these markets are generally internationally integrated.

A common approach to dealing with the aggregation of quantitative information measured in different units is to construct so-called league tables. The advantage of this approach is that rankings are measure-independent and therefore comparable.[10] However, league table rankings do not take magnitude into account. For instance, a bank that is ranked second in a league table may indeed have an absolute indicator value that is almost as large as the one ranked above it; however, this value could also be considerably smaller.

In order to utilise information on the magnitude of indicators, when both a variable metric and a cross-variable comparison are needed, it is necessary to standardise the variables in such a way that the relative sizes are preserved and are, at the same time, independent of the measurement unit. In this Special Feature, indicators are divided by the indicator's largest value (i.e. the value of the indicator for the banking group with the highest value of the indicator). Accordingly, all standardised indicators range between zero and one, and the

relative distances between banking groups' indicator values are retained.

## METHODOLOGY AND FINDINGS

### THRESHOLD SELECTION BY MEANS OF CLUSTER ANALYSIS

One relatively simple way to address the threshold selection issue for either the percentage of banking sector assets or the number of large banking groups that need to be monitored when assessing the stability of the financial system is to conduct cluster analysis. This is a statistical method that separates a sample population into natural groups according to measures that define the characteristics of the population (see Box A.1). The business activities of banking groups are natural dimensions for grouping banks into clusters. When assessing a bank's size and importance, three broad types of banks are distinguished:

1. Banks with low values across all characteristic indicators – generally small banks.

2. Banks with one or a few medium-sized indicator values – generally medium-sized banks.

3. Banks with one or several high indicator values – large banks.

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10 Marsh and Stevens (2003), op. cit., for instance, select their sample on the basis of those banks that appear in more than a threshold number of league table rankings.

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## CLUSTERING METHODS

The term "cluster analysis" encompasses a number of different algorithms and methods for grouping similar objects into respective categories. In other words, it is an exploratory data analysis tool which aims at sorting different objects into groups in such a way that the degree of association between two objects is maximal if they belong to the same group and minimal otherwise. The approach simply discovers structures in data without explaining why they exist.

Because it lacks the formal distribution models required for statistical analysis, it is typically used as a complement to other data analysis methods.[1]
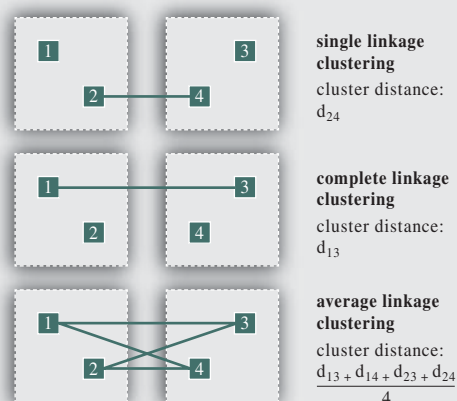
There are two basic clustering algorithm techniques: partitioning and hierarchical. With partitioning techniques a certain number of final clusters have to be assumed in advance. This is not the case with hierarchical techniques, where a series of successive merges or divisions are produced. Because the number of clusters is a priori unknown in this study, a hierarchical technique is used.

The hierarchical techniques are further divided into two main methods: agglomerative and divisive. With divisive methods an initial single group of objects is divided into two subgroups that are as dissimilar as possible. These subgroups are then further divided into dissimilar subgroups. Agglomerative methods, on the other hand, start with individual objects, so that there are initially as many clusters as objects. Objects are then grouped and merged according to their similarities until all objects have been grouped. This Special Feature uses an agglomerative method, which is also more commonly used and widely implemented in software solutions.

There are three main agglomerative hierarchical clustering methods: single linkage, complete linkage and average linkage. They differ in the way that they measure the Euclidean distance – that is, the geometric distance in a multidimensional space – between the clusters. In the single linkage method, the distance between two clusters is determined by the distance of the two closest objects (nearest neighbours) in the different clusters (see Figure B.A.1). This approach effectively strings objects together to form clusters that resemble long chains. This "chaining" can however be misleading if items at opposite ends of the chain are, in fact, quite dissimilar. The advantage of the complete linkage method is that the distances between clusters are determined by the greatest distance between any two objects in the different clusters (i.e. by the so-called furthest neighbours). This method usually performs quite well in cases when the objects actually form naturally distinct clumps, but is inappropriate if the clusters tend to be somewhat elongated or of a chain-type nature.

This Special Feature uses the so-called average linkage method, which combines the single and complete clustering methods by measuring the average distance between clusters as the average distance between all objects in the different clusters. This method reduces some of the problems encountered when using the single and complete linkage methods on their own, and can therefore be seen as a compromise solution.

**Figure B.A.1 Intercluster distance**



single linkage clustering
cluster distance:
$d_{24}$

complete linkage clustering
cluster distance:
$d_{13}$

average linkage clustering
cluster distance:
$$\frac{d_{13} + d_{14} + d_{23} + d_{24}}{4}$$

---

1   See, for example, R. A. Johnson and D. W. Wichern (1998), *Applied Multivariate Statistical Analysis,* Upper Saddle River: Prentice-Hall; B. S. Everitt (1993), *Cluster Analysis*, 3rd edition, London: Arnold; B. S. Everitt and T. Hothorn (2006), *A Handbook of Statistical Analyses Using R,* Boca Raton: Chapman & Hall/CRC; and W. N. Venables and B. D. Ripley (2002), *Modern Applied Statistics with S,* New York: Springer-Verlag.

A typical hierarchical cluster analysis procedure starts out by considering each of n banks as a separate group in a p-dimensional space, where p is the number of relevant characteristics. For example, if the only measure desired is the size of total assets, then p=1. The natural distance between banks in this p-dimensional space is the Euclidian distance. Therefore, the Euclidean distance gives a measure of the banks' (dis)similarity – as more similar banks are characterised by shorter distances. An iterative procedure is then run to group the banks hierarchically in terms of the distance between them. For example, banks with the lowest Euclidean distance are combined into one group, resulting in n-1 groups after the first step, and so forth until only one group is left. Looking at the ranking of the distances between groups then allows distinct jumps in the grouping process to be selected using a pre-specified criterion, creating a natural separation between groups. These distinct jumps can then be analysed using so-called stopping-rules to determine the number of groups which, statistically, represents the most significant division of a population's sample.

The cluster analysis applied to data for 2005 categorises the 260 banks into 50 different hierarchical clusters (see Chart A.2). The cluster groups permit a relatively clear demarcation of the line distinguishing large banks from the rest by looking at 13 to 23 clusters which contain a stable set of 33 banking groups. This is the most stable set identified during the clustering procedure, and all banks in this set share the characteristics of being both large and complex (i.e. they are important players in a range of banking activities).

By looking at 24 hierarchical clusters, the set of banking groups is extended to 35 by adding two banks that have a fairly high indicator value in

only one of the three bookrunner markets considered; these are not considered to be LCBGs in this Special Feature. If the number of clusters is extended to 27, the set of banks increases to 50, adding 15 banks with medium-size balance sheets but that have no role as bookrunners or custodian banks, and are therefore also not deemed to be LCBGs.

Among the 33 banking groups identified as large in this analysis, 20 are located in euro area countries, seven in the US, four in the UK and two in Switzerland.

**ROBUSTNESS OF THE CLUSTER ANALYSIS**

The robustness of the analysis to the indicators used to identify LCBGs needs to be analysed further in light of the need for possibly more expanded coverage of indicators over time. Periodic financial system stability assessment requires a relatively stable set of institutions to be monitored so as to ensure continuity. However, as the euro area banking landscape is likely to be transformed over time, primarily – but not only – through the consolidation of the banking sectors in EMU participating states, some changes in the way that large banking groups are identified are to be expected. As the sources of risk and vulnerability for financial system stability can change over time thanks to financial innovation, along with the development of new markets and the changing strategic emphasis given by banks to different activities,

**Chart A.2 Number of banks per number of clusters**

(2005)
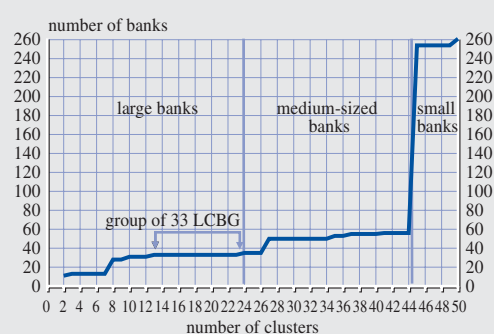


Sources: Bureau van Dijk (Bankscope), Thomson ONE Banker – Deals, GlobalCustody.net and ECB calculations.

**Table A.2 Large and complex banking groups excluded when excluding indicators**

| | variable excluded from the cluster analysis | | | | | | |
|---|---|---|---|---|---|---|---|
| | balance sheet items | | | | | activity | |
| | customer loans | mortgages | other earning assets | deposits | contingent liabilities | net interest income | net non-interest income |
| Number of banks excluded | 1 | 3 | 0 | 0 | 0 | 3 | 0 |

| | variable excluded from the cluster analysis | | | | | |
|---|---|---|---|---|---|---|
| | interbank positions | | bookrunner activity | | | custodian role |
| | interbank assets | interbank liabilities | bond issuance | equity issuance | loan issuance | custody assets |
| Number of banks excluded | 0 | 9 | 0 | 3 | 0 | 2 |

it is also to be expected that the set of indicators will change too. Nevertheless, adding or removing indicators judged relevant would ideally only marginally affect the composition of the group, which would make this a good measure of robustness.

Adding or removing indicators from the cluster analysis can also shed light on the dependence of size on the available indicators. Applying the clustering analysis to the sample of banks after

dropping a given indicator also suggests that the procedure is fairly robust to variation in the availability of variables. It turns out that seven of the 13 variables do not affect the "largeness" demarcation (see Table A.2). Often only one to three banking groups are excluded from the selection when excluding one variable, with the exception of the omission of the "interbank liabilities" variable, which excludes eight euro area banks and one non-euro area bank.

**Chart A.3 Size measure vs. adjusted total assets**

(2005)
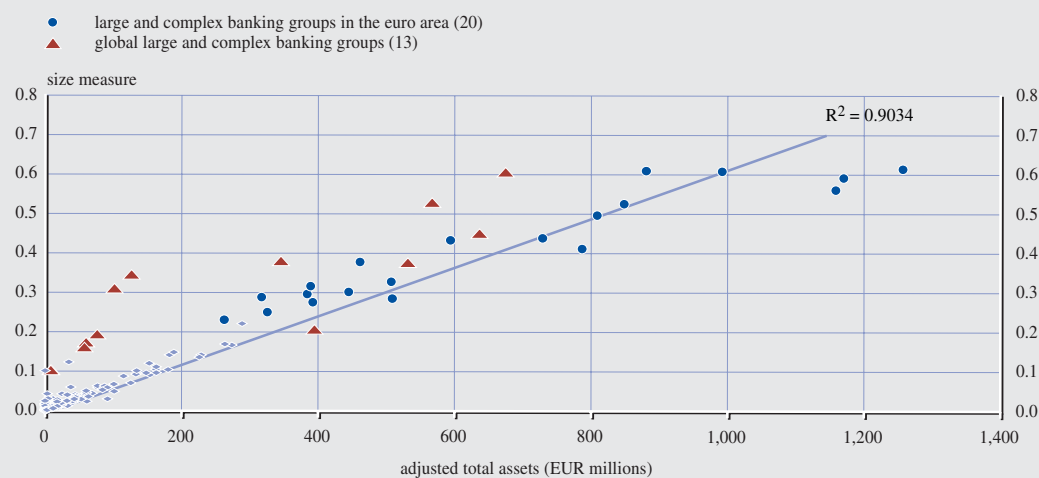
● large and complex banking groups in the euro area (20)
▲ global large and complex banking groups (13)



Sources: Bureau van Dijk (Bankscope), Thomson ONE Banker – Deals, GlobalCustody.net and ECB calculations.
Note: The size measure ranges between 0 and 1 and is the average of the 13 balance sheet, activity, interbank positions, bookrunner and custodian indicators used in the cluster analysis. The adjusted total assets is total assets scaled down to 50% if the bank is domiciled in a non-euro area EU country, 40% if in a non-EU European country, and 10% if located outside Europe.

**A COMPARISON WITH SOME MEASURES OF SIZE**

To shed some light on the characteristics of the 33 large banks identified above, it is useful to correlate total assets – the traditional variable employed for selecting large banks – with some other measures of importance. The relationship between an adjusted total assets measure and a composite size measure, based on the 13 indicators used in the cluster analysis, is tight but imperfect (see Chart A.3). The fact that the correlation is less than one suggests that this methodology adds value over and above a selection based simply on total assets. The reason why the correlation is imperfect is because some banking groups with relatively low levels of total assets have other characteristics that make them important for the financial system.

**CONCLUDING REMARKS**

Despite the fact that cluster analysis is best characterised as an explanatory data analysis technique, it can provide a robust identification of LCBGs for periodic analysis of financial system stability. It should be emphasised that such banking groups are not necessarily those that are often called "systemically relevant institutions". Rather, they are banking groups whose size and nature of business is such that their failure and inability to operate would most likely have adverse – albeit not necessarily severe – implications for various forms of financial intermediation, the smooth functioning of financial markets or other financial institutions operating within the system. Judging their systemic relevance would however require far more information, especially on off-balance sheet positions. In that respect, supervisory knowledge and information can further enhance the assessment of an institution's importance for financial system stability.

As shown, the importance of a banking group in the financial system can go beyond traditional measures of size: the role it plays in specific banking activities, or the interconnections it has with other parts of the financial system, are also important considerations that need to be

taken into account. Some of this information is publicly available, but there are important gaps in information – for example on the off-balance sheet positions of banks, the degree of their participation in relatively new financial markets (e.g. structured finance, traditional credit issuance, etc.), or on cross-border activities – that leave room for further refinement of the filtering procedure. The variables used in this study represent natural choices given the paucity of publicly available data for a large number of banks. The methodology would benefit greatly from expanding and refining the set of variables used. Fortunately, a very positive feature of the methodology used is that it can easily accommodate a growing number of indicators and banking groups, thus allowing for future enhancements in the availability of quantitative information. The set of banking groups identified is therefore likely to change over time.

*Information extracted from credit default swap (CDS) index tranches can provide an important contribution to a forward-looking assessment of banking system risk. The market prices of CDS index tranches provide the basis for constructing an indicator of the level of systematic risk in the credit market. In particular, this indicator describes traders' views on the future relative development of systematic and idiosyncratic portfolio credit risk. Thus, it shows whether traders are more concerned about economy-wide credit risk or about firm-specific credit risk such as the default of a particular firm. This Special Feature constructs an estimate of the implied correlation for the euro credit market and describes its use in financial stability analysis. The three main results of this analysis are as follows. First, after January 2006, there was evidence that the focus of credit traders had moved from firm-specific credit risk towards systematic credit risk. This finding can be linked to a number of fundamental determinants of credit market valuation, all of which point in the same direction. Second, the implied correlation provides detailed information about how the credit markets functioned during the May 2005 market turbulence. Third, most of the variation in the implied correlation is not linked to other financial market indicators.*

**INTRODUCTION**

A major structural innovation in the financial system has been the development of a market for credit risk transfer. This market offers a rapidly increasing number of instruments to deal with different aspects of credit risk. Besides providing default protection for individual firms through CDSs, the credit risk in entire credit portfolios can now be traded by means of collateralised debt obligations (CDOs). Essentially, a CDO represents a set of claims or tranches of varying exposure to the cash flows from a portfolio of credit instruments.

A major step in the development of the CDO market was the introduction of the iTraxx credit index in summer 2004. The launch of this commonly accepted benchmark has created an active market for standardised iTraxx tranches in Europe. Hence, firm-specific credit risk is traded through CDSs, and the correlation of credit risk within the underlying credit portfolio is traded through credit index tranches. As tranche prices depend on credit correlation, the CDO segment is also known as the "correlation market". Market quotes for iTraxx tranches therefore contain information about market expectations with respect to the credit correlations of European corporates.

The interpretation of this correlation estimate is however subject to some important caveats. First, changes in risk aversion and the corresponding risk premia provide some limitations in the interpretation of the empirical findings. Furthermore, the impact of liquidity shocks, for example due to demand for specific tranches, may temporarily have adverse effects on the information content of the implied credit correlation.

Correlated credit risk can have strong effects on the value of a bank's loan book. For instance, a bank may have extended loans to two individual firms with low probabilities of default. However, if their default probabilities are positively correlated, then the portfolio risk posed by the two firms is significantly higher than if their default probabilities are uncorrelated.

Other important channels for the impact of correlated credit risk are the sensitivity of individual borrowers to economic conditions or contagion effects. The importance of correlated credit risk is also acknowledged by banking supervisors. In particular, the internal ratings-based approach of the Basel II framework for banks' calculation of their regulatory capital requirements takes into account the fact that systematic risk may have a material effect on loan quality.

This Special Feature seeks to describe how information on the expected co-movement in the euro credit market can be extracted from the market prices of iTraxx tranches. The first section briefly reviews the functioning of the iTraxx CDS index. The second section describes the information contained in iTraxx tranche premia since summer 2004. The third section describes the linkages between iTraxx tranche premia and credit correlation. The fourth section documents the patterns in iTraxx credit correlation in the last two years and discusses the interpretation of this indicator in a financial stability context. The last section summarises the main conclusions.

## THE ITRAXX CDS INDEX

CDSs are the most commonly traded credit derivatives and function like a traded insurance contract against the losses arising from a firm's default. They transfer the risk that a certain individual entity could default from the "protection buyer" to the "protection seller" in exchange for the payment of a premium. Should the reference entity default, the buyer is compensated, for example by receiving the difference between the notional amount of the corporate bond and its recovery value from the protection seller. In a CDS transaction, the premium paid by the protection buyer to the protection seller is expressed as an annualised percentage of the transaction's notional value, and constitutes the market quote for the CDS.

In June 2004, a harmonised global family of CDS indices was launched, namely iTraxx in Europe and Asia and CDX in North America. The launch of this credit index family has provided a commonly accepted benchmark for credit markets. The indices represent the average CDS premium of the most liquid firms, and are calculated daily. Based on a semi-annual poll of the main CDS dealers, the index composition is updated twice a year to reflect changes in liquidity and credit quality.[1]

The iTraxx Main index is designed to represent the investment-grade segment of the European credit market. It contains energy firms, industrial entities, consumer cyclical and non-cyclical firms, insurance companies, banks, telecommunications companies as well as automobile firms. The CDS premium on the iTraxx Main index is calculated as the average CDS premium of the 125 member firms.[2] This premium represents the price of credit protection on the entire pool of firms, i.e. a portfolio CDS covering all the 125 firms in the index.

Index CDSs essentially trade like CDSs on a single firm. In case of a firm's default, the firm in question is removed from the index portfolio, and the nominal value of the contract declines by 1/125, i.e. by 0.8%. According to market information, most activity is concentrated in the five-year maturity; this instrument is therefore the focus of the following analysis.[3]

Chart B.1 shows the development of the iTraxx main index with a maturity of five years since summer 2004. In this period, the average CDS index premium was 35 basis points. Thus, it cost 0.35% annually to obtain insurance for a horizon of five years against defaults among the 125 firms in the index. The lowest premium, at around 0.26%, was observed in May 2006 and the highest during the turbulence in credit markets in May 2005 at 0.60%. In this period, S&P's downgrade of Ford and General Motors from investment-grade to the high-yield segment led to a sharp but temporary rise in CDS premia. This had an adverse impact on the functioning of the credit derivatives market, reportedly causing large losses among some

1 For a more detailed description, see J.-P. Calamaro, T. Nassar, K. Thakkar and J. Tierney (2004), "Trading Tranched Index Products: The First Steps", *Deutsche Bank Global Markets Research – Quantitative Credit Strategy;* J. Amato and J. Gyntelberg (2005), "CDS Index Tranches and the Pricing of Credit Risk Correlations", *BIS Quarterly Review,* March 2005, pp. 73-87; and T. Belsham, N. Vause and S. Wells (2005), "Credit Correlation: Interpretation and Risks", *Bank of England Financial Stability Review,* December 2005, pp. 103-15.

2 In practice, there is a small difference between the portfolio CDS and the average across the 125 firms' CDSs. This difference is known as the "basis", and is caused by contractual differences and supply/demand effects.

3 The following analysis focuses on the "on-the-run" series, which is rolled over every half year to the new index composition according to the current poll ranking.

hedge funds (see the December 2005 FSR for a more detailed discussion).

Given the iTraxx index composition, the corresponding CDO comprises instruments with varying degrees of exposure to the joint loss distribution of the 125 firms. These tranches therefore provide claims to the cash flows of the iTraxx CDS portfolio, and in parallel serve as protection for a certain range of defaults in the portfolio. The equity tranche serves as the first level of protection against any defaults among the firms in the index and is therefore also called the "first loss piece". The subsequent levels of default protection are provided by mezzanine and senior tranches, where investors' exposure to default risk in the portfolio is quite small.[4] Specifically, the six iTraxx Main index tranches are Equity (ranging from 0% to 3% of the joint loss distribution), Low Mezzanine (3-6%), Mid Mezzanine (6-9%), High Mezzanine (9-12%), Super Senior (12-22%) and High Super Senior (22-100%).[5]

Collectively, the six tranches cover all the possible losses arising from defaults in the CDS index portfolio. In parallel, all cash flows from the CDS index portfolio are paid out, starting with the senior tranches and ending with the equity tranche. Tranches can be interpreted as options on the joint loss distribution. This option characteristic is reflected in the non-linear dependence of the individual tranches' payoffs on the underlying CDS index. Tranche trading takes place in the over-the-counter market among banks and brokers. Because the instruments are constructed as synthetic single-tranche CDOs, all tranches can be bought or sold individually.

In the case of a default, the procedure is as follows.[6] After the first firm in the index has defaulted, the buyer of the equity tranche, i.e. the seller of protection, has to pay compensation to the buyer of equity protection. After six defaults,[7] the equity tranche records a total loss and hence its 3% upper limit becomes effective. Consequently, protection against any additional defaults until the maturity of the instrument is now provided by the holder of the Low Mezzanine tranche, which covers the 3-6% segment of the joint loss distribution. In the absence of defaults during the five-year horizon, the tranche holders receive their premia for the entire period, and no insurance payments are necessary.

### ITRAXX TRANCHE PREMIA SINCE 2004

Table B.1 provides a snapshot of the tranche premia for 1 August 2006.[8] There were large differences in individual tranche premia due to the variation in their inherent sensitivity to portfolio credit risk. The Super Senior tranche, which provides exposure from 12-22% of the loss distribution, pays 3.75 basis points

### Chart B.1 iTraxx index

(iTraxx Europe main five-year maturity, basis points)



Source: JP Morgan Chase & Co.

4   According to market terminology, the buyer of a tranche, i.e. the buyer of credit portfolio risk, is selling protection to the counterparty.
5   In addition to the standardised synthetic CDOs discussed here, banks frequently use other types of CDO structures to transfer credit risk from their own loan books, for example in their loans to small and medium-sized enterprises (SMEs).
6   This discussion refers to the simplest instrument, namely a synthetic unfunded CDO, where no exchange of principal takes place and the portfolio consists of CDS.
7   This calculation proceeds as follows: assuming a loss-given default of 40%, six defaults – each of which has an exposure of 1/125% – lead to a total loss of 2.88%. This value is therefore just below the equity tranche's upper limit of 3%.
8   Given the high degree of riskiness, the investor in the equity tranche receives an upfront premium as well as a running premium. For the purpose of comparability, these two equity-specific premia are converted to a regular spread by assuming a duration of four years.

annually, the Mid Mezzanine tranche pays 21.25
basis points, while the Equity tranche pays
around 990 basis points. Thus, in exchange for
taking on the largest amount of risk in the
capital structure, the buyer of the first piece of
default insurance for the iTraxx portfolio would
be compensated with an expected annual
payment of close to 10%.

A major benefit of CDOs is that they complete
the range of instruments traded in financial
markets by offering new risk-return profiles
that would otherwise not be available. This
property can be observed in the table: from the
CDS index portfolio with an annual premium of
around 30 basis points, six new instruments are
created, with premia ranging from 0.65 basis
points to 990 basis points. To assess the risk in
each tranche, the implied leverage, defined as
the tranche premium divided by the index
premium, provides a simple indication. By
definition it equals unity for the CDS index,
and ranges from a ratio of 32 (Equity) to a ratio
of 0.02 (Super Senior).

Premia on investment-grade tranches are
comparable to other credit instruments of similar
credit quality. For instance, the premium of the

Low Mezzanine tranche is similar to the credit
spread on euro BBB-rated corporate bonds.

From a time series perspective, the movements
of the five premia are rather heterogenous.[9]
Chart B.2 shows the time series of the premia
for the tranches covering the loss distribution
from 0-22% for the sample from summer 2004
to summer 2006. Overall, a decline for less
risky tranches and a sideways movement for the
equity tranche can be observed. Among the
main factors behind the decline in premia were
a benign macroeconomic environment, low
equity market volatility and the so-called hunt
for yield, a phenomenon that describes
institutional investors' strong demand for higher
yielding assets in the aftermath of the collapse
of stock prices, which started in March 2000.
This search for higher yielding assets in the
fixed income market manifested itself in many
asset classes. In the credit market, this demand
pressure, together with low equity market
volatility, contributed to a sharp decline in
credit spreads, which is clearly visible in the
majority of series plotted. For instance, in
summer 2004, the premium for the 6-9% tranche
was around 60 basis points, whereas in summer
2006 it stood at below 20 basis points. The
behaviour of mezzanine and equity tranches
was influenced by the impact of arbitrage
trading designed to exploit relative value
potential between the riskier components of the
tranche market.

Regarding the May 2005 episode, a sharp
increase in premia is particularly distinct in the
case of the equity tranche. The background to
this episode is that many credit market investors
were trading equity vs. mezzanine tranches by
buying protection on the former and selling it on
the latter. The sudden decline in the correlation,
however, forced traders to rebalance their
relative value positions. This renewed pressure
may then have prolonged the turbulence.

**Table B.1 Capital structure and tranche premia of iTraxx Main index**

(attachment points (AP) of iTraxx tranches, premia as of
1 August 2006)

| Designation | Lower AP (%) | Upper AP (%) | Premium (Basis points) | Leverage indicator |
|---|---|---|---|---|
| High Super senior | 22 | 100 | 0.65 | 0.02 |
| Super Senior | 12 | 22 | 3.75 | 0.12 |
| High Mezzanine | 9 | 12 | 10.5 | 0.34 |
| Mid Mezzanine | 6 | 9 | 21.25 | 0.70 |
| Low Mezzanine | 3 | 6 | 72.5 | 2.38 |
| Equity | 0 | 3 | 990.62 | 32.48 |
| *Memo: Index* | *0* | *100* | *30.5* | *1* |

Sources: ECB and JP Morgan Chase & Co.
Note: Leverage is computed as the ratio of the tranche premium
to the index premium.

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9   Given its very low return, the 22-100% tranche is rarely traded
    and is therefore omitted from the following discussion.

## Chart B.2 iTraxx tranche premia

(basis points)

**Tranche 0-3%**



**Tranche 3-6%**



**Tranche 6-9%**



**Tranche 9-12%**



**Tranche 12-22%**
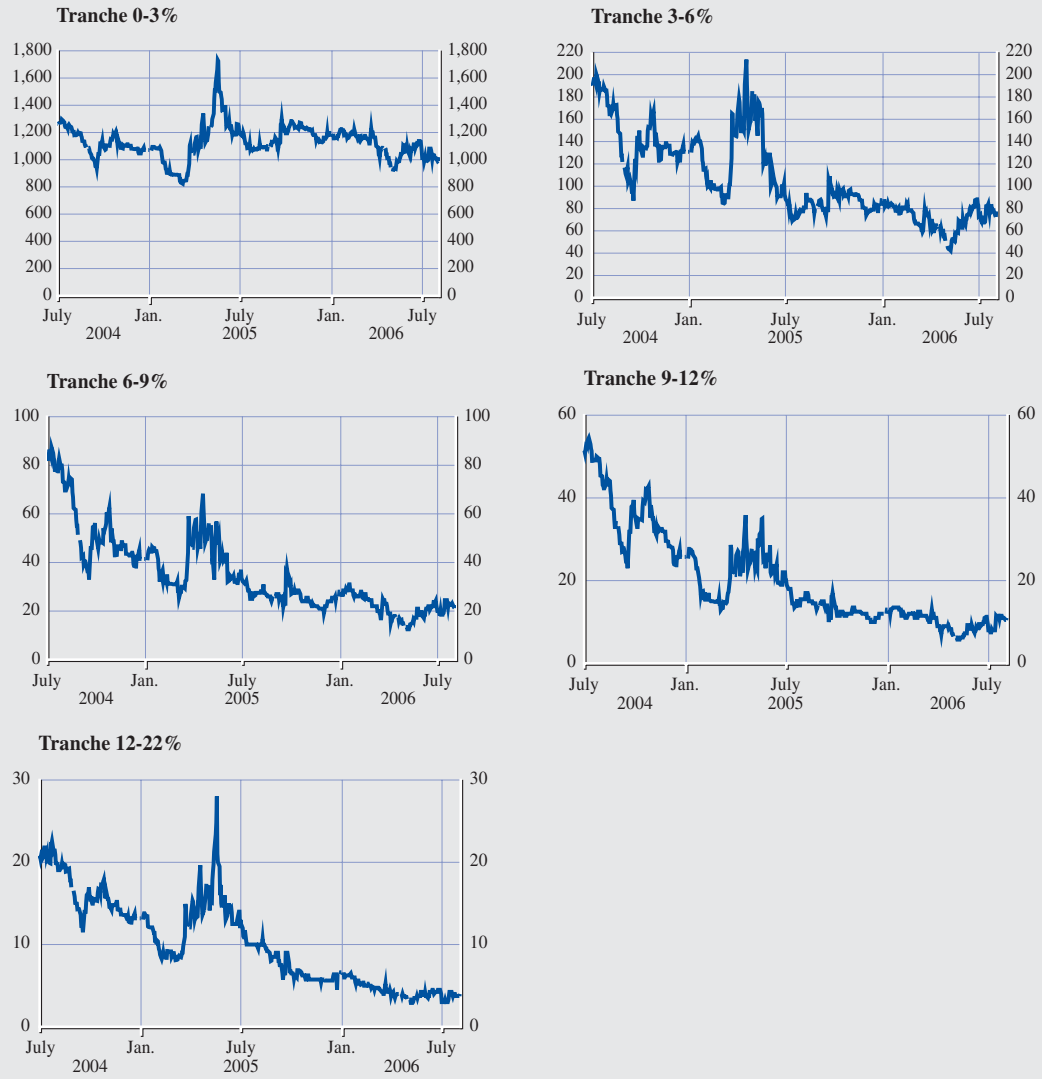


Sources: JP Morgan Chase & Co. and ECB calculations.

According to a comprehensive academic study on the North American CDS index,[10] overall market pricing of tranches is efficient in the sense that firm-specific, industry-wide and economy-wide aspects, i.e. systematic credit risk factors, together account for a large part of tranche premia. The study also finds that even during the market turbulence in May 2005, there was no significant deterioration in market pricing.

## TRANCHE PRICING AND THE CREDIT CORRELATION

Tranche premia are very sensitive to the credit correlation between firms in the portfolio because this correlation directly influences the distribution of risk across the tranches. In

10 See F. Longstaff and A. Rajan (2006), "An Empirical Analysis of the Pricing of Collateralized Debt Obligations", *NBER Working Paper,* No 12210.

particular, tranche premia depend on the joint loss distribution of the underlying portfolio and, given all other parameters, the credit correlation determines the shape of this distribution. As the credit correlation changes, the corresponding movement in the shape of the joint loss distribution is directly transmitted to the relative allocation of portfolio credit risk between equity, mezzanine and senior tranches.

To analyse the linkages between correlation and tranche premia, we describe the impact of increasing credit correlation. Such a rise in credit correlation represents a scenario of increasing systematic and therefore decreasing firm-specific risk in the credit portfolio. Thus, it can be interpreted as increasing risk of a general downturn in the economy rather than the default of a particular firm or a sector. In this scenario, the probability mass moves from the centre to the tails of the joint loss distribution of the iTraxx portfolio. These fatter tails imply that the likelihood of the realisation of multiple credit events has increased. Under this scenario, the overall shape of the joint loss distribution leads to a decline in the equity tranche premium, because the buyer of the equity tranche is not required to make a payment in the absence of a default.[11] This mechanism explains why market participants equate buying an equity tranche to taking a long position in credit correlation: rising correlation lowers the equity tranche premium and therefore raises the mark-to-market value of the position.

The opposite effect of rising correlation is in place for the premia of the senior tranches: this raises their premia and thus lowers their market value. Senior tranches can therefore be seen as "short" correlation positions. With regard to the mezzanine segment of the CDO capital structure, correlation generally has an ambiguous effect on premia.

Estimation of the implied correlation from tranche premia essentially requires a portfolio credit risk model. Based on this model's specification of the joint loss distribution, the individual tranches can then be priced. To estimate the implied correlation, the reverse approach is used: in an iteration procedure; the correlation is adjusted until the calculated premium from the theoretical pricing model equals the market quote for the specific tranche.

In the market for CDS index tranches we observe a modelling convention similar to the options markets, where the Black-Scholes-Merton model has become the standard methodology to link implied volatilities to quoted option prices.[12] Given that all other input parameters are already known, equity index options can be traded through the metric of implied volatilities. Analogously, CDS index tranches are traded through the metric of the implied credit correlation. To extract this parameter from tranche prices, market participants use a one-factor portfolio credit risk model, namely the Gaussian copula model. By means of this procedure, market participants' forecast of average pairwise credit correlation can be "implied" from index tranches (see Box B.1).

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11 This result follows from the general characteristics of the joint loss distribution and does not depend on the market environment.

12 See for example J.-P. Calamaro, T. Nassar and K. Thakkar (2004) "Correlation: Trading Implications for Synthetic CDO Tranches", *Deutsche Bank Global Markets Research-Quantitative Credit Strategy;* and L. McGinty, E. Beinstein, R. Ahluwalia and M. Watts (2004), "Credit Correlation: A Guide", *JP Morgan Chase and Co. Research.*

## ESTIMATING IMPLIED CORRELATIONS FROM CDS INDEX TRANCHES

Three components are required to evaluate the CDO tranches:[1]

– Probability of default (PD): Estimate of the likelihood of the firm defaulting on its obligations within a given horizon, e.g. one year. The PD is commonly estimated from the iTraxx firms' CDS premia.

– Loss-given default (LGD): Loss on the position following default, commonly expressed as a percentage of the debt's nominal value. The LGD is usually assumed to equal a constant percentage, e.g. 40%.

– Correlation: Estimate of the simultaneous link between the defaults of several firms.

The basis of the model is to establish the likelihood of an individual firm being unable to repay its debt, as determined by the distance between the value of its assets and the nominal value of its debt. The value of the firm's assets is modelled as a stochastic process, and default is assumed to occur when a firm's assets are insufficient to cover its debt. Thus, the asset value represents a measure of a firm's ability to repay its liabilities.

The standard CDO valuation model extends this firm-specific approach to a multivariate setting by means of a single factor, which describes the co-movement of firms' asset values. This common factor can be interpreted as a variable representing the state of the business cycle. Hence the model assumes that firms default owing to a deterioration in the systematic factor or to idiosyncratic, firm-specific shocks. Specifically, in the copula model, firm-specific default risk is "coupled" together through a Gaussian copula model.

One of the key advantages of the Gaussian copula model is that it separates the univariate (i.e. firms' default risk as measured by their PDs) from the multivariate analysis (i.e. the structure of credit risk correlation). Key assumptions in this model are that a single common factor drives firms' asset values and that the underlying portfolio, i.e. the portfolio of iTraxx firms, is sufficiently large and homogeneous. This single factor structure significantly reduces the computational burden.[2] Instead of the (125 * 125) correlation matrix, the computation procedure is reduced to a factor analysis. From the correlation with this factor, the pairwise correlation is computed by multiplying both firms' correlations with the index.

From the tranche premia and the CDS premia for the iTraxx index, an average pairwise asset correlation for the iTraxx firms in the index is estimated by inverting the Gaussian Copula model described above. The resulting implied correlation can be interpreted as the single bivariate correlation of asset returns which is consistent with the observed market price for a

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1 See D. Duffie and N. Garleanu (2001), "Risk and Valuation of Collateralized Debt Obligations", mimeo, Stanford University; C. Bluhm (2003), "CDO Modeling: Techniques, Examples and Applications", mimeo, HypoVereinsbank; M. Gibson (2004), "Understanding the Risk of Synthetic CDOs", *Federal Reserve Board Finance and Economics Discussion Series,* 2004-36; L. Andersen and J. Sidenius (2005), "CDO Pricing with Factor Models: Survey and Comments", *Journal of Credit Risk,* 1/3, pp. 71-88; and N. Tarashev and H. Zhu (2006), "The Pricing of Portfolio Credit Risk", *Bank for International Settlements Working Paper* No 214.
2 Given the large number of firms in the iTraxx index, the implementation of multi-factor models is rather rare due to numerical issues.

tranche. Thus, each tranche delivers a separate implied correlation. A simple functional transformation then leads from the implied asset correlation to the implied default correlation. However, applying this correlation concept is problematic in that it frequently leads to multiple correlations for mezzanine and senior tranches. Therefore, a base correlation is now commonly used instead. The base correlation curve is obtained by a bootstrapping and iteration process.[3]

3 Some of the caveats of the base correlation approach are discussed in S. Willemann (2005), "An Evaluation of the Base Correlation Framework for Synthetic CDOs", Journal of Credit Risk, 1/4, pp. 181-90.

In this context, it is important to point out that the Gaussian copula is not chosen because it is the portfolio credit risk model with the best pricing performance, but because it is the most commonly accepted approach to extract the correlation. Furthermore, the theory behind the Gaussian copula approach shows some commonalities to the one-factor set-up used in the internal ratings-based approach of the Basel II framework for banks' calculation of their regulatory capital requirements.[13]

**THE IMPLIED CREDIT CORRELATION OF THE ITRAXX INDEX**

Applying this approach, the resulting time series of implied correlations for the equity tranche as plotted in Chart B.3. The interpretation of this graph can be explained by the last value of the implied credit correlation. Based on the quoted premium of the equity tranche for 1 August 2006, the 125 firms in the iTraxx set had an average pairwise implied credit correlation of 11.6%. Rising correlation reflects market participants' increased emphasis on systematic credit risk, whereas a decline shows that market participants put more emphasis on firm-specific credit risk.

After summer 2004, implied correlation moved between 0.09 and 0.22. The slight increase in implied credit correlation from January 2006 onwards indicates that investors attached a greater likelihood to systematic than to firm-specific credit risk. This assessment can be linked to two factors in the prevailing environment for the euro credit market. First, the relatively low number of defaults indicated that the stage of the credit cycle still provided

support for credit investors, although concerns about an eventual downturn started to increase. Second, investors started to focus on credit risk among a specific number of firms, owing to specific ongoing concerns regarding the auto segment of the credit market and continuing event risk in the form of LBO activity.

The implied credit correlation also provides detailed information about credit market functioning during the May 2005 episode. The graph indicates the observation of a correlation breakdown,[14] when the implied credit correlation abruptly dropped from 0.22 to 0.08. This sudden change in expected correlation adversely affected the hedging strategies that many market

13 See for example M. Gordy (2003), "A Risk-factor Model Foundation for Ratings-based Bank Capital Rules", *Journal of Financial Intermediation,* 12, pp. 199-232.
14 See for example G. Venizelos (2005), "Correlation Correction", *ABN AMRO Credit in Focus.*

**Chart B.3 iTraxx implied credit correlation**

(iTraxx Europe main five-year maturity, 0-3% tranche correlation)



Source: JP Morgan Chase & Co.

participants had been using for a considerable time. During summer 2005, implied correlation temporarily rose again, but remained below the levels reached during the market turbulence in May 2005. This increase in perceived systematic credit risk at least partly reflected a decrease in the premia of the equity tranche as well as a decline in the CDS index.

In interpreting the implied credit correlation, several caveats need to be mentioned. To start with, inference has to be cautious because of the still rather limited sample period. In particular, the new market has not been through a full credit cycle. Furthermore, some technical factors unrelated to credit risk may affect the information content of market prices. For instance, investors' changing demand for specific tranches plays a non-negligible role, leading to potentially large temporary liquidity premia. This effect may also have played a role during the period of market turbulence. More generally, the credit risk transfer market is evolving rapidly and thus has not yet reached a steady state. In this context, the changing population of market participants as shown by the increasing role of hedge funds also needs to be taken into account.

Risk premia are another important determinant of the implied credit correlation. Given that the implied correlation is calculated from market prices, it does not necessarily equal the credit correlation estimated from historical data, even in the absence of technical factors. Implied credit correlation, which is conceptually similar to the implied volatility derived from equity index options, represents market participants' expectations of future realised credit correlation. Therefore, it contains not only the traders' correlation forecasts, but also a risk premium, which is in part driven by traders' degree of risk aversion.[15]

To evaluate the information content of the implied credit correlation, it is necessary to identify its main determinants. Therefore, we analyse how the implied credit correlation is related to four key financial market indicators: the credit risk premium, the slope of the term

structure, equity market risk, and equity market returns. First, the credit risk premium as represented by the level of the iTraxx CDS index determines the central tendency of the joint loss distribution. Second, the slope of the term structure reflects how market participants assess the economic climate because of the linkage of the term structure to investors' portfolio decisions. If investors expect the business climate to deteriorate, they will shift some of their assets from short-maturity instruments into long-term bonds. This change in the portfolio composition will lead to a flatter slope of the term structure. A poorer outlook for the economy could also raise credit correlation, because investors may react to the increased likelihood of multiple defaults. In other words, a negative relation may be expected between the two. Third, equity market risk as measured by the implied equity index volatility is an indicator of market-wide uncertainty and should have a positive effect on the implied credit correlation since greater market risk may imply a greater likelihood of multiple adverse credit events. Finally, a sharp decline in stock prices may generally reflect the perception of increasing systematic risk implying a negative relation between these two variables.[16]

The effects of these factors are evaluated by means of a standard regression approach using the first differences of correlation as the dependent variable. Thus, the regression tests how a change in, for example, the slope of the term structure changes the implied credit correlation. In the simultaneous estimation with four explanatory variables, only one factor is statistically significant (see Table B.2). The change in the iTraxx CDS premium enters the equation with a negative coefficient: a rise in the CDS premium reduces the implied credit

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15 See for example M. Scheicher (2003), "What Drives Investor Risk Aversion? Daily Evidence from the German Equity Market", *BIS Quarterly Review,* June 2003, pp. 67-74.

16 The slope of the term structure is defined as the ten-year swap rate minus the three-month money market rate. To measure equity market risk, the VDAX series of implied volatility for the DAX index is used. For the stock market, the EURO STOXX 50 index is used.

**Table B.2 Determinants of implied credit correlation**

| Variable | Coefficient | t-Statistic | Prob. |
|---|---|---|---|
| C | -0.02 | -0.76 | 0.45 |
| CDS Index | -0.15 | -2.96 | 0.00 |
| VDAX | -0.04 | -0.97 | 0.33 |
| Slope | -0.88 | -1.34 | 0.18 |
| EURO STOXX | -1.64 | -0.44 | 0.66 |
| Adjusted R-squared | 0.09 | | |

Sources: ECB and JP Morgan Chase & Co.
Note: Method = least squares regression with a constant, the CDS index, the VDAX implied volatility, the slope of the term structure and stock returns as explanatory variables; Sample = 1 September 2004 - 2 August 2006, White standard errors and covariance, all variables are in first differences, EURO STOXX in log first differences.

correlation. There are no significant effects from the equity market or from the term structure.

Overall, the explanatory value of these four variables is rather low, as the adjusted R-square is less than 10%. The information contained in the set of four factors is only weakly related to the implied credit correlation, so that a large part of its variation can be seen as idiosyncratic. This empirical finding indicates that the implied credit correlation contains specific information not available in other indicators. Part of this idiosyncratic component may also be related to the technical factors mentioned earlier.[17] These results are also obtained if the financial market factors are orthogonalised by means of a principal components analysis. Thus the finding of weak explanatory power is robust to multicollinearity among the explanatory variables.

**CONCLUDING REMARKS**

This Special Feature has described how the market prices of CDS index tranches can be used to analyse market expectations regarding the degree of credit correlation among European corporates. This indicator slightly increased after January 2006, suggesting that investors attached a greater likelihood to systematic rather than to firm-specific credit risk. This

finding can be linked to a number of determinants of credit market valuation, all of which point in a similar direction.

The methodology in this Special Feature can be extended in a number of directions, of which two particular ones may be highlighted. First, the implied correlation from mezzanine and senior tranches can be analysed. As the correlations of these tranches differ from the correlation implied from the equity tranche, there is a correlation "skew". Second, the scope of the CDS index can be extended in the dimensions of maturity and credit risk, i.e. towards longer maturities and towards the high-yield segment. In particular, the latter index category, which is represented by the iTraxx Crossover Index, may be interesting for an assessment of banking system risk, because many banks' loan books are exposed to the high-yield segment of the credit market through loans to small and medium-sized enterprises or via leveraged loans.

17 For an empirical demonstration of the importance of supply/demand shocks in US credit spreads, see P. Collin-Dufresne, R. Goldstein and J. S. Martin (2001), "The Determinants of Credit Spread Changes", *Journal of Finance,* 56, pp. 2177-2207.

## C EXPLAINING EPISODES OF DYNAMIC CREDIT GROWTH IN CENTRAL AND EASTERN EUROPE

*Credit growth has accelerated in recent years in some central and (south-) eastern European countries (CEECs).[1] While low starting levels of financial intermediation help explain the speed of credit growth, its fast pace could raise concerns from a financial and macroeconomic stability perspective. This Special Feature suggests a methodology for analysing these episodes that explicitly accounts for both macroeconomic developments and the catching-up process associated with the transition from planned to market economies that countries in the region have been undergoing. However, even if both factors are taken into account evidence is still found in some countries of higher credit growth than the empirical model would suggest. In these cases the dynamics of credit growth are nevertheless not markedly different for foreign or domestic currency lending, or for lending to households and corporations. Given the limited available data, however, these results must be interpreted with caution, and further research is called for to address issues such as the mechanisms through which the exchange rate regime, the presence of foreign banks and the range of lending products on offer may impact credit developments in the region.*

### INTRODUCTION

Domestic bank credit to the private sector has increased significantly in many CEECs in recent years. However, the speed of credit growth across the region and over time has been far from homogeneous. From 1996 to 2000 credit grew at a relatively moderate pace, with annual rates generally at below 20%. However, after the beginning of the current decade credit growth accelerated beyond 20% per annum in a number of CEECs, while a few other countries experienced average annual real growth rates above 10%. In contrast, after 2000 credit growth was low in Poland, the Czech Republic and Slovakia.

While real GDP growth has also been particularly rapid among the countries that have experienced very fast expansions in credit, there has nevertheless been a notable increase in the GDP ratio of credit to the private sector in most CEECs.[2]

To what extent can these episodes of dynamic credit expansion be explained by the rapid transition from centrally planned to market-based economies in just over a decade? To answer this question, it is important to recall the path that these countries followed after the beginning of the transition period. In the early years of the transition, most countries experienced a significant slump in GDP followed by a period of rapid economic growth. In some cases, rapid privatisation of the banking sector and expansion of underdeveloped financial markets resulted in lending booms followed by credit crunches, bank runs, and crises that spilled over to the entire economy. Financial liberalisation during the first phase of transition thus may have in some cases undermined real sector development.[3]

This turbulent recent history, together with low levels of financial intermediation at the beginning of the transition process, helps to explain why the CEECs still exhibit significantly lower levels of lending in terms of GDP compared not only to developed countries, but also to countries at a similar stage of economic development. Controlling for the level of GDP per capita, private credit to GDP in all CEECs

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1 The CEEC region is defined here as including Bulgaria, Croatia, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia. The data sample covers the period 1996-2004 so as to exclude the early years of transition in which data, when available, are particularly difficult to interpret. While data are provided for all these countries, this Special Feature focuses on those CEECs that have experienced episodes of rapid domestic credit growth since the beginning of the decade.

2 See P. Backé and T. Zumer (2005), "Developments in Credit to the Private Sector in Central and Eastern European EU Member States: Emerging from Financial Repression – A Comparative Overview", *Focus on European Economic Integration,* 2/05, Oesterreichische Nationalbank, October.

3 See E. Berglöf and P. Bolton (2002), "The Great Divide and Beyond: Financial Architecture in Transition", *Journal of Economic Perspectives,* 16 (1), Winter, pp. 77-100.

(with the exception of Croatia) was in 2003 below the average across all countries in the world for which data were available (see Chart C.1).

This evidence suggests that there may be sound reasons to expect credit growth in CEECs to be faster than in both developed countries and other emerging regions of the world. While in the early and mid-1990s banks were at times engaged in connected lending to a rather restricted number of corporate borrowers, or lending into arrears to state-owned enterprises that faced soft budget constraints, such practices have since mostly disappeared owing to progress made in the transition process.[4]

Assuming that incomes continue to catch up, and that this will be accompanied by financial deepening, as suggested by the simple correlation shown above, credit will necessarily have to grow faster than GDP in the CEECs. In addition, there may be a number of other related factors that could help explain the recent acceleration of credit growth in the region, including macroeconomic stabilisation, the entry of foreign banks (which may have brought both improved risk management techniques as well as increased access to funding from parent banks), a more competitive banking sector environment (which may have contributed to declining interest rates), improvements in the institutional environment, increased creditworthiness of borrowers on the back of improved economic prospects, as well as increasing property prices (which may have led to higher financing needs). Banking sector reform also represents a key development in these transition countries. Privatisation may have led to faster financial deepening through the entry of foreign banks, but this is not the only channel through which banking sector reform may affect the pace of financial deepening. Banking sector reform has also led to the emergence of new market segments and brought about increased competition, thus increasing the range of products available to potential borrowers, and at the same time reducing costs. However, while credit growth

**Chart C.1 Private sector credit to GDP ratio and per capita GDP**

(2003, data for 124 countries)



Source: IMF.
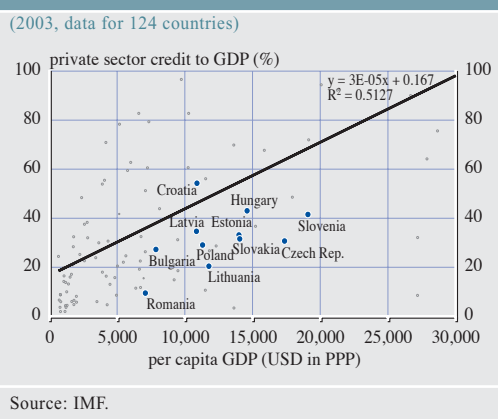
can be seen as a natural adjustment owing to recent banking system reforms, improved bank efficiency and capital inflows from western European countries, some concerns have been raised with regard to the speed of these adjustments. As Borio and Lowe (2002) put it, "one of the relatively few robust findings to emerge from the literature on leading indicators of banking crisis is that rapid domestic credit growth increases the likelihood of a problem".[5]

This Special Feature seeks to explore how much of the recent credit growth may be explained by this catching up both in real incomes and in financial deepening, which as we have seen is a key characteristic among CEECs. In doing so, it builds upon the limited existing literature on lending booms, which is discussed briefly below. Two methods are proposed to address the question and then cross-check the results obtained from these methods, explore a number of themes highlighted by the results, and finally provide some concluding remarks.

4   See A. Mehl, C. Vespro and A. Winkler (2006), "Financial Sector Development in South-Eastern Europe: Quality Matters", in: K. Liebscher, J. Christl, P. Mooslechner and D. Ritzberger-Grünwald (eds), *Financial Development, Integration and Stability – Evidence from Central, Eastern and South-Eastern Europe,* Cheltenham: Edward Elgar, pp. 186-203.
5   See C. Borio and P. Lowe (2002), "Asset Prices, Financial and Monetary Stability: Exploring the Nexus", *BIS Working Paper,* No 114, July.

## OVERVIEW OF THE EMPIRICAL LITERATURE ON LENDING BOOMS

The empirical literature on lending booms faces the enormous challenge of providing a working definition of what precisely should be considered to be a problematic rate of credit growth. In theory, an episode of credit growth can be thought of as problematic if it either (i) endangers financial stability by financing undeserving projects that will eventually turn into bad loans; or (ii) leads to unsustainable macroeconomic developments, such as a deteriorating external position resulting in an unsustainable build-up of external debt. Neither of these two effects can easily be measured or forecast.

Despite this intrinsic difficulty, policymakers and market participants alike need to assess credit growth developments. From an operational point of view, an episode of rapid credit growth is typically a cause for concern when the observed growth rates exceed a given threshold. This threshold is often estimated on the basis of the country's trend credit growth, using, for instance, a Hodrick-Prescott filter. For example, IMF (2004) labels a credit expansion a "credit boom" if it exceeds 1.75 times the standard deviation of the country's average credit fluctuation around the trend.[6] The threshold value in this case is selected because, assuming the observations of credit growth were drawn from a normal distribution, there is only a 5% probability that they would lie more than 1.75 times outside the standard deviation. While the specific thresholds may differ, it is common in this literature to focus on deviations from an estimated trend.[7] However, in the context of transition countries this may be inappropriate because of the short time series and the likely structural breaks in the series.[8]

There is a growing literature on credit developments in European transition economies. However, most of these papers remain descriptive, and do not provide an econometric analysis of the growth of the credit-to-GDP ratio.[9] Cottarelli et al. (2005), for example,

explicitly refrain from exploring this question and instead model the expected credit-to-GDP ratio on the basis of economic fundamentals. They conclude that many countries in the region exhibited credit-to-GDP ratios below the level that their economic fundamentals warrant, which only serves to underscore the importance of studying the different paths followed by these countries towards their credit-to-GDP equilibrium levels.

Schadler et al. (2004) provide a useful approach to the question of the path of credit growth.[10] Acknowledging the challenges posed by the transition process, their approach draws on the experience of existing euro area countries to infer likely trends in the new Member States, which they justify on the grounds that "historical data from the CECs would not be relevant to predicting future credit developments" (p. 4). Their paper estimates a vector error correction model (VECM) on quarterly euro area data for the period 1991-2002. The VECM of the demand for credit includes three variables: (i) the credit-to-GDP ratio; (ii) a proxy for the cost of credit (the long-run real interest rate on government bonds); and (iii) per capita income. A cointegrating relationship between these variables is then found which can be used to draw some inferences about likely future developments in the CEECs. For example, a 10% increase in per capita income raises the credit-to-GDP ratio by around 3 percentage points in the long run. Building on this contribution, use is made here of an error

6  See IMF (2004), *World Economic Outlook,* April.
7  See, for example, P. Gourinchas, O. Landerretche and R. Valdes (2001), "Lending Booms, Latin America and the World", *NBER Working Paper,* No 8249.
8  See C. Duenwald, N. Gueorguiev and A. Schaechter (2005), "Too Much of a Good Thing? Credit Booms in Transition Economies: The Cases of Bulgaria, Romania and Ukraine", *IMF Working Paper,* No 05/128.
9  See C. Cottarelli, G. Dell'Ariccia and I. Vladkova-Hollar (2005), "Early Birds, Late Risers, and Sleeping Beauties: Bank Credit Growth to the Private Sector in Central and Eastern Europe and in the Balkans", *Journal of Banking & Finance,* 29 (1), pp. 83-104.
10 See S. Schadler, Z. Murgasova and R. van Elkan (2004), "Credit Booms, Demand Booms, and Euro Adoption", paper for the Conference on Challenges for Central Banks in an Enlarged EMU, Oesterreichische Nationalbank, February.

correction framework to explain episodes of rapid credit growth among the CEECs.

## EXPLAINING CREDIT GROWTH DYNAMICS

The focus of analysis here is on the question of how much credit growth can be explained by macroeconomic fundamentals, as well as on the gap between the actual credit-to-GDP ratio and its equilibrium level. The latter is important for the analysis as countries in the region have been experiencing major structural changes related to the transition process. Credit growth is modelled as a simple function of its main macroeconomic determinants, namely GDP growth and the interest rate, as well as the gap between the observed credit-to-GDP ratio and its equilibrium level. This allows the elasticity of credit with regard to those variables to be estimated and estimates of expected credit growth for the countries in the region can be derived. The comparison between observed and expected credit growth provides a measure of so-called unexplained credit growth. While omitted variables may explain part of that difference, the analysis is kept as parsimonious as possible given the limited time series, and to focus on the extent to which the dynamics of credit growth can be explained in simple catching-up terms. Two key steps in this simple approach are the determination of the equilibrium credit-to-GDP ratio, and the estimation of credit elasticities.

## THE EQUILIBRIUM CREDIT-TO-GDP RATIO

The equilibrium credit-to-GDP ratio of the CEECs is difficult to measure because it has to account for the effects of the transition from a centrally planned to a market-based economy. Credit not only depends on its traditional macroeconomic determinants, but also on the new circumstances arising from financial liberalisation during the transition process. These new circumstances may affect the banking sector and credit supply in various ways. For example, a variety of factors have contributed to increasing the credit supply and to lowering lending rates, such as free entry into the banking sector, the possibility for foreign banks to

purchase local banks or create local branches, and the gradual expansion of these banks into the retail credit markets.[11]

The formal definition of the equilibrium level of credit builds on the basic credit demand/supply nexus, which links the actual volume of credit to real GDP, the real interbank interest rate, and other factors which capture the effects of financial liberalisation on credit supply. The equilibrium credit-to-GDP ratio is defined as the ratio that would be observed in the absence of short-term shocks, given the interbank interest rate and the position of the economy towards becoming market-based. This path is modelled as a deterministic and non-linear time trend, so that the gap between the actual credit-to-GDP ratio and its equilibrium level is mean stationary, allowing use to be made of an error correction model.

## ESTIMATION OF CREDIT ELASTICITIES
Elasticities are estimated on the basis of a standard dynamic error correction model of credit growth, in which the error correction term is the gap between the actual credit-to-GDP ratio and its equilibrium level as defined above.

The estimated short-run dynamic equation includes as a dependent variable the growth rate of real credit and, as independent variables, the lagged real growth rates of credit and GDP, the lagged variation of the real interbank interest rate, and the lagged error correction term. In addition, a dummy variable equal to one over the period 2001-2004, and to zero otherwise is included. A positive coefficient on the dummy reveals credit growth that cannot be explained by the catching-up process as defined here. The period 2001-2004 was chosen because, as seen above, credit growth accelerated during this period in a number of CEECs.

11 See R. De Haas and I. Naaborg (2005), "Foreign Banks in Transition Economies: Small Business Lending and Internal Capital Markets", *International Finance Working Paper*, 0504004, Economics Working Paper Archive at WUSTL.

However, the limited availability of data poses a challenge when seeking to estimate these elasticities for each of the countries in the region. To circumvent this issue, and to ensure that the results are not driven exclusively by the choice of methodology, two sets of elasticities are estimated.

First, credit elasticities are estimated for a number of benchmark countries where the credit-to-GDP ratio had been relatively stable over a long period of time, and where long time series are available. As countries with stable credit-to-GDP ratios are used in the analysis lower elasticities are likely to be obtained than might be expected for catching-up countries. Since these elasticities are used to derive the expected credit growth in the CEECs, the results are likely to be biased towards making the detection of credit growth that cannot be explained by the catching-up process more likely. This gives an upper bound for the measure of "unexplained" credit growth adopted here. The use of benchmark countries outside the region also implies that the results will be independent of the composition of the panel of countries and, in particular, irrespective of whether or not large countries such as Poland are included in the analysis.

Second, the credit elasticities are estimated using data for those CEEC countries that have experienced episodes of dynamic credit growth. In contrast with the benchmark countries, most of the countries in the panel have experienced rising credit-to-GDP ratios. Therefore, higher elasticities are likely to be obtained than with the benchmark countries. This will give a lower bound for the measure of unexplained credit growth used here, with the true value lying in-between.

## TEST STRATEGY

The test for unexplained credit growth during the period of recent credit growth acceleration (2001-2004) focuses on the coefficient of the dummy variable in the error correction model, which is the only country-specific parameter in the regression. As mentioned above, a strictly

positive coefficient means that credit grew faster during the period 2001-2004 than what its standard determinants would have implied.

## DATA

Throughout the sample period (1996-2004) the CEECs had significantly lower credit-to-GDP levels than the EU average. In 1996 most of the countries considered in the study had total outstanding loans-to-yearly GDP ratios below 40%. Despite the high speed of credit growth, this ratio was still below the EU average at the end of the sample period. In terms of composition, less than half of total private loans were loans to households or short term loans in 2004 (see Table C.1).

## TEST USING BENCHMARKS FROM OUTSIDE THE REGION

The first test suggests that total private credit has grown below what our model would suggest in three countries (Poland, the Czech Republic and Slovakia); has grown in line with its main determinants in two (Slovenia and Romania), and was on average higher in the remaining six countries (Bulgaria, Croatia, Estonia, Hungary, Latvia and Lithuania) than what would be

### Table C.1 Lending to the private non-financial sector and its currency, maturity and sectoral structure

(2004)

| | Loans to private sector (% of GDP) | Domestic currency loans (as a % of total loans) | Long-term loans (as a % of total loans) | Loans to households (as a % of total loans) |
|---|---|---|---|---|
| Bulgaria | 36.7 | 53.5 | 86.5 | 32.1 |
| Croatia | 57.5 | 88.0 | – | 54.5 |
| Czech Rep. | 32.2 | 87.2 | 75.0 | 29.6 |
| Estonia | 43.3 | 20.0 | 91.4 | 47.0 |
| Hungary | 46.0 | 56.0 | 62.3 | 44.6 |
| Latvia | 45.4 | 40.8 | 85.3 | 35.4 |
| Lithuania | 25.6 | 36.5 | – | – |
| Poland | 27.7 | 75.7 | 67.2 | 48.6 |
| Romania | 10.0 | 39.1 | 49.9 | 46.2 |
| Slovakia | 30.6 | 78.5 | 67.9 | 22.4 |
| Slovenia | 46.3 | 69.3 | 69.1 | 28.9 |

Sources: Hilbers et al. (2005) and ECB calculations.
Note: Data are non-harmonised.

implied by the evolution of GDP, interest rates and financial liberalisation using benchmark elasticities from outside the region. Hence in the following the focus is on the latter six countries where the first test using benchmark elasticities cannot rule out that credit may have grown faster than what can be explained by the model specification used.[12]

## TEST USING CEEC DATA

For these six countries we now turn to our second test on the basis of data from the countries themselves, and not from benchmarks outside the region. A panel of quarterly observations for the countries in the region starting in 1998 is used, rather than 1996, owing to data availability. Further refinement of the analysis is made by considering various credit aggregates, in particular total lending (the outstanding stock of total loans of MFIs to non-MFIs), loans broken down by currency denomination (domestic and foreign), maturity (short-term and long-term) and by type (to households or corporations). Table C.2 below summarises the results.

Overall, unexplained credit growth is found to amount to around 2-6% per quarter. Moving on to the disaggregated analysis, lending in foreign currency has been particularly strong in only three countries, whereas lending in domestic currency has been driving credit growth in all countries except Hungary. With regard to the maturity breakdown, there is some evidence that long-term lending has grown at lower rates than short-term lending in a number of countries. Similarly, lending to corporations appears to have grown more slowly than credit to households.

These developments have driven most countries to take policy measures to contain credit growth, including a tightening of supervisory and prudential policies, moral suasion, administrative measures and binding limits on credit growth.[13] Obviously, the sample studied here is too short to take into account the success that such recent measures have had in bringing down credit growth.

**Table C.2 Average quarterly credit growth that cannot be explained by the model**

(2001 - 2004, %)

| | | Average unexplained credit growth | | | | | |
| | Total | Foreign currency | Domestic currency | Short term | Long term | House-holds | Cor-porates |
|---|---|---|---|---|---|---|---|
| Bulgaria | 5.6*** | 6.4*** | 5.6*** | 3.4** | 2.1* | 4.8*** | 5.5*** |
| Croatia | 2.2*** | 0.9 | 3.3*** | - | - | 0.9 | 1.0 |
| Estonia | 2.9*** | 2.5*** | 3.8*** | 2.1 | -3.1 | 2.5*** | 1.6 |
| Hungary | 2.0*** | 0.1 | 0.6 | 0.3 | 0.4 | 3.1** | 0.0 |
| Latvia | 5.4*** | 5.2*** | 5.1*** | 4.8*** | 0.5 | 4.5*** | 5.0*** |
| Lithuania | 4.0*** | 2.0 | 6.0*** | - | - | - | 4.9*** |

Source: ECB calculations.
Note: ***, ** and * denote significance at the 1%, 5 % and 10% levels, respectively.

## AREAS FOR FURTHER RESEARCH

The analysis suggests a number of potential areas for further research, the most interesting of which concerns the relationship between exchange rate regimes and the pace of credit growth.

While this question lies beyond the scope of this Special Feature, some observations are worth noting. Bulgaria, Estonia and Lithuania all operate currency boards whereby their exchange rates are fixed to the euro.[14] In addition to these countries with hard pegs, both Croatia and Slovenia have experienced limited real exchange rate fluctuations. One possible mechanism through which the exchange rate regime may lead to higher credit growth is by encouraging lending in foreign currency. However, no clear trend in the share of loans in foreign currency can be observed based on the available data.

12  Note that excluding the CEECs for which the model can explain credit growth may bias the results of the second test towards making it more likely that our model specification can explain credit growth.
13  For an overview of policy responses in selected CEECs, see I. Ötker, P. Hilbers, G. Johnsen and C. Pazarbasioglu (2005), "Assessing and Managing Rapid Credit Growth and the Role of Supervisory and Prudential Policies", *IMF Working Paper,* No 05/151, July.
14  The Lithuanian litas was pegged to the US dollar prior to 2002, and Latvia re-pegged its currency to the euro in January 2005.

A related area for further research is the role that foreign-owned banks may have played in contributing to the dynamism of credit growth among a number of CEECs. For example, foreign-owned banks differ from domestic ones in that they may have access to additional sources of finance, typically from their parent bank. They are also widely seen as bringing with them valuable know-how. Empirical studies have shown, for example, that bank privatisation leads to efficiency gains, especially in the case of privatisation to foreign strategic investors. A more efficient banking sector will increase financial intermediation. In fact, as shown in Chart C.2.a, there are some indications that foreign bank presence in these countries is associated with higher credit growth.

Chart C.2.b shows how, with the exception of Slovenia, the average share of banking assets owned by foreign bank subsidiaries or branches stands at above 50% for all countries in the region. It is also worth highlighting the relatively limited foreign bank penetration of the Slovenian banking system since, if it were to be confirmed that foreign bank entry is associated with a faster pace of financial deepening, this would help explain why of all the CEECs with relatively fixed exchange rate regimes, only

Slovenia stands out as having experienced very weak credit growth.[15]

The countries with the highest penetration rate of foreign banks are Croatia and Estonia. In the case of Croatia, the other CEEC with a relatively fixed exchange rate that has not witnessed such fast credit growth, it is worth noting that the Croatian National Bank (CNB) has already made use of binding credit ceilings to curb credit growth back in 2003. In particular, banks were made to hold CNB paper bearing low interest rates if their asset growth exceeded 4% in a given quarter. While these measures were repealed as from 2004, banks were then obliged to hold liquid foreign exchange assets equal to at least 35% of their total foreign exchange liabilities. Turning to Estonia, a wave of privatisation and consolidation in the mid-1990s meant that by 1998 there were only five private banks left in the country, down from 42 in 1992. Indeed, Estonia has the largest foreign bank presence of the CEECs, and has

15 An additional factor that could help explain the slow growth of credit in Slovenia is the base effects stemming from the fast rate of credit growth observed in the first half of 1999, when total loans to the non-banking sector expanded by 30% as domestic demand surged in anticipation of the introduction of VAT in July.

Chart C.2.a Credit growth and foreign ownership of the banking system – pooled data

(1999 - 2003)
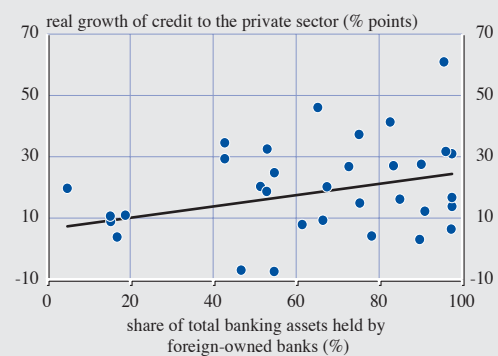
real growth of credit to the private sector (% points)



share of total banking assets held by foreign-owned banks (%)

Sources: The European Bank for Reconstruction and Development (EBRD) and ECB calculations.

Chart C.2.b Credit growth and foreign ownership of the banking system – a cross-section

(1999 - 2003)

change in credit to GDP ratio (% points)



average share of total banking assets held by foreign-owned banks (%)
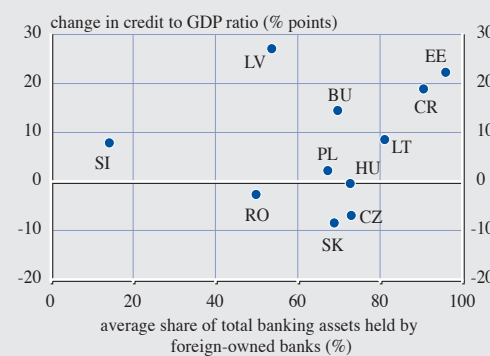
Sources: The European Bank for Reconstruction and Development (EBRD) and ECB calculations.

profited from one of the largest increases in financial deepening.

## CREDIT COMPOSITION

A second area for further research is suggested by our disaggregated analysis of credit to households and credit to corporations. Our findings suggest that, for countries exhibiting high credit growth at the aggregate level, this result also typically applies to both credit to households and credit to corporations. This is the case for both Bulgaria and Latvia, for example. In Estonia, however, our model provides different results for credit to households and to corporations. While the latter can be explained by our simple model, lending to households has taken place at a much faster pace than our model suggests. However, this result could be influenced by the high and changing share of Estonian corporate borrowing directly from abroad, which has had an impact on the demand for domestic borrowing. Overall, the emergence of consumer credit and the introduction of new products such as mortgages deserve more detailed attention, in particular in connection with rapidly rising house prices.[16]

It would also be very interesting to explore the effect of including non-bank credit to the private sector in the analysis: this has grown very rapidly in some countries, but is much less important in others. Future research could notably consider a broader definition of "unexplained credit growth" based on both bank and non-bank lending. Looking at total lending rather than just bank lending would for example make it possible to control for the potential biases that may arise in the analysis owing to substitution effects between bank and non-bank loans or other structural changes in the composition of total lending.

## CONCLUDING REMARKS

The experience of many emerging market economies (EMEs) suggests that episodes of rapid credit growth should be closely monitored from a financial stability perspective as in the

past they have been associated with the emergence of financial and currency crises. Given the high costs of such crises, policymakers in CEECs have been paying increasing attention to developments in credit to the private sector in the region. This increased attention has also resulted in a number of policy measures aimed at slowing down the pace of credit growth. It should be emphasised that the policy choices are by no means easy, as curbing credit growth is not without welfare costs, even though financial deepening is in principle associated with increased economic growth and efficiency.

This Special Feature suggests a relatively simple methodology for analysing episodes of dynamic credit growth in the region, one which can also account for the catching up in incomes associated with the transition process currently underway in the region.

A key result is that recent total credit growth can be fully explained by a simple empirical model that takes into account a few key macroeconomic developments (namely rising trends in the equilibrium credit-to-GDP ratio, GDP growth, and interest rates) for five of the 11 CEECs studied. However, our model was unable to explain fully the recent growth in total credit for the other countries. Tests on disaggregated data for these countries suggest that credit growth is generally driven by both foreign and domestic currency lending. We also find no detectable difference in lending to households and corporations.

Given the limited available data, these results must be interpreted with caution, and further research is needed to examine how issues such as the mechanisms through which the exchange rate regime, the presence of foreign banks and the range of lending products on offer may have

16  See L. Papademos (2005), "Financial Structures, Credit Growth and House Prices in the New EU Member States: Policy Challenges on the Road to the Euro", speech at the conference held by Latvijas Banka in Riga, 19 September 2005, available at www.ecb.int.

an impact on credit developments in the region. While the results from this exercise necessarily depend on our narrow set of variables and model specification, they do provide a new perspective that can help explain episodes of dynamic credit growth in a number of countries in the region.

# D    ASSESSING SYSTEMIC RISK IN THE EUROPEAN INSURANCE SECTOR

*If very large changes in the stock prices of individual insurance undertakings tend to occur simultaneously, it can be said that extreme-value dependence is present. If such dependence is found to be present, it can indicate that these firms are exposed to common sources of risk. With a focus on gaining insight into systemic risk within the insurance sector, this Special Feature examines the incidence of extreme-value dependence across different types of insurance undertakings and it goes on to examine the main drivers of such co-movement, to the extent that it is present. A key finding is that extreme-value dependence is evident among larger composite insurers. In addition, two important drivers of extreme-value dependence between insurance companies are found: exposure to extreme financial market events, and to non-life underwriting.*

## INTRODUCTION

Individual firms' equity returns do not move independently from one another, mostly owing to common industry and market factors. This Special Feature looks at a particular type of such dependence among insurance undertakings, namely under extreme scenarios. By analysing the co-movement of insurance companies' equity returns during extreme events, it is possible to obtain an insight into the systemic risk dimension of this important financial sector.

The literature on extreme-value dependence is extensive and has recently also been applied to bank returns.[1] Extreme co-movements in the stock returns of financial institutions are likely to be driven by exposures to common observed and unobserved shocks. Insurance companies individually take on event risk either by absorbing it, or by passing it on in some repackaged form (e.g. through securitisation). Therefore, it is necessary from a financial stability perspective to examine whether extreme events could impact on the entire industry as a whole, or whether the exposure

to extreme-event risk is diversified away at the industry level. Clearly, if extreme-event exposure is not diversifiable at the industry level, then a catastrophic event could potentially affect the stability of the insurance sector. Conversely, if exposure to extreme events is sufficiently idiosyncratic, the insurance sector is likely to be able to cope better with such catastrophic events.

In contrast to the interbank market, the insurance sector lacks a direct channel of financial interaction between insurance companies other than through reinsurance, and thus unobserved common shocks are likely to be minimal. As the focus of this Special Feature is on the "pure" dependence between direct insurers, insurance companies that are also active as reinsurers are not included in the sample. The pure form of extreme-value dependence among insurers is likely to stem from their common exposure to financial market risk – as financial market downturns can potentially erode capital buffers dramatically – and from their underwriting activities, particularly in the case of non-life business, where shocks are likely to be more widespread and/or larger.

The findings from an empirical analysis suggest that insurers exhibit extreme-value dependence, particularly those with large non-life activities. This dependence is therefore likely to stem from common exposures resulting from underwriting activities. This finding is in line with the view that the degree of extreme-value dependence between insurance companies is to some extent sector-specific.[2] In addition to sector-specific factors, a country-specific

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1   See for instance S.-H. Poon, M. Rockinger and J. A. Tawn (2004), "Extreme Value Dependence in Financial Markets: Diagnostics, Models and Financial Implications", *Review of Financial Studies,* Vol. 17, pp. 581-610; and P. Hartmann, S. Straetmans and C. de Vries (2005), "Banking System Stability: A Cross-Atlantic Perspective", *ECB Working Paper,* No 527 and references therein. For a detailed discussion of extreme-value dependence, see the Special Feature on "Assessing Banking System Risk with Extreme Value Analysis", in ECB (2006), *Financial Stability Review,* June.

2   See J. F. Slijkerman, D. Schoenmaker and C. G. de Vries (2005), Risk Diversification by European Financial Conglomerates, *Tinbergen Institute Discussion Paper,* No 2005-110/2.

component may also be expected to be an important driver of extreme-value dependence among insurance companies.

This Special Feature first tests the incidence of extreme-value dependence between the different types of insurance undertakings – composite, life and non-life – and reveals differences in extreme-value dependence across the three types of insurers. The subsequent sections look into the potential factors underlying such differences. The last section concludes.

## OCCURRENCE OF EXTREME-VALUE DEPENDENCE

The data set consists of 1,568 daily equity returns per company between 1 December 1999 and 30 November 2005 covering 66 insurance companies (32 composite, 22 non-life insurance and 12 life insurance) in 13 different countries.[3] Composite insurers which were active in the reinsurance market were not included in the sample.

The extreme-value dependence of pairs[4] of companies by type – composite insurers (496), non-life insurance companies (231), and life insurers (66) – is estimated through a standard three-step procedure (see Box D.1). The presence of extreme-value dependence for each of the three types of insurers is represented by the percentage of pairs of firms for which extreme-value dependence cannot be rejected (see Chart D.1). Extreme-value dependence

**Chart D.1 Sample averages for the occurrence of extreme-value dependence**

(% of pairs with extreme-value dependence)



Source: ECB calculations.

appears least frequently among non-life insurers, and more often among composites and life insurers.

## FACTORS UNDERLYING THE EXTREME-VALUE DEPENDENCE OF INSURERS

Whereas exposure to financial market risk and non-life underwriting risk may both be important drivers of extreme-value dependence between insurers, life-underwriting risk should not be expected to be an important factor in driving extreme-value dependence among insurance undertakings: while non-life underwriting potentially exposes an insurer to catastrophic losses, mortality risk is unlikely to expose life-underwriting to catastrophic losses.

Financial market risk is modelled through two variables: the extreme-value dependence with both the domestic and the overall European stock price indices. As national stock price indices are in general not extreme-value dependent, extreme-value dependence on a European index is included to avoid underestimating this type of dependence.

Four underwriting variables – the non-life premium, its share in total premium, the retention rate and the asset multiplier – are included in order to capture the underwriting risk. Non-life underwriting would be expected to have a positive scale effect on extreme-value dependence because insurers with more sizeable non-life businesses might be able to underwrite more risky contracts. Furthermore, as underwriting activity typically extends beyond national boundaries, the geographic distance between two insurers reduces their overlap in exposure to some types of non-life risks, particularly weather-related risks (e.g. flooding). Therefore, the absolute size of the non-life premium is likely to be a contributing factor to extreme-value dependence.
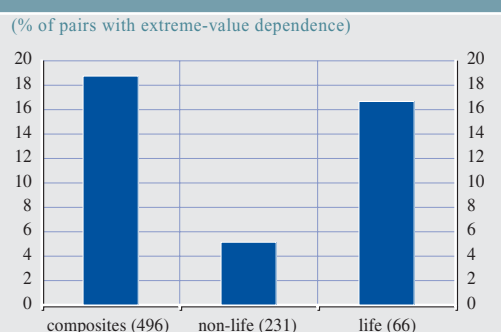
3 The 13 countries are Austria, Belgium, Denmark, France, Finland, Germany, Greece, Ireland, Italy, the Netherlands, Portugal, Sweden and the UK.
4 Only non-identical pairs of insurers were of interest for the analysis: a group of n insurers leads to n(n-1)/2 of such pairs.

At the same time, the smaller the life business of an undertaking is, the more its non-life business will dominate – irrespective of its absolute size. Therefore, the share of life premium in total premium income might have a negative impact on extreme-value dependence.

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**Box D.1**

### ESTIMATING EXTREME-VALUE DEPENDENCE

Testing for extreme-value dependence, and estimating its strength, is performed by means of a procedure well-known in the literature.[1] Data on individual insurers are first transformed into a common marginal distribution, thus filtering out any effect of the marginal distributions. Typically, bivariate returns (X,Y) are transformed into unit Fréchet marginals (S,T) as follows:

$$S = -1/\log(F_X(X)) \text{ and } T = -1/\log(F_Y(Y)),$$

with $F_X$ and $F_Y$ the respective marginal distributions of X and Y.

A useful measure for tail dependence is given by conditional probability $P(s)$:

$$P(s) = \Pr\left(T > s \mid S > s\right) = \Pr\left(T > s, S > s\right) / \Pr(S > s).$$

If S and T (or equivalently X and Y) are independent, then P(s) = Pr(T>s) for all s and P(s) converges to 0 if s increases to infinity. In contrast, if S and T are extreme-value dependent, then P(s) converges to a non-zero limit. This leads to the following non-parametric measure $\chi$ of tail dependence:

$$\chi = \lim_{s \to +\infty} P(s).$$

It follows that $0 \leq \chi \leq 1$. If for S and T $\chi > 0$, then S and T are extreme-value dependent and the value of $\chi$ is a measure of the strength of the extreme-value dependence. However, the test of whether $\chi$ is significantly different from zero leads to an overestimation of the occurrence of extreme-value dependence, and therefore the following measure[2] $\bar{\chi}$ is typically used to test for extreme-value dependence:

$$\bar{\chi} = \lim_{s \to +\infty} \frac{2 \log \Pr(S > s)}{\log \Pr(S > s, T > s)} - 1,$$

where $0 \leq \bar{\chi} \leq 1$. The statistic $\bar{\chi}$ is a measure for the rate at which P(s) approaches zero.

This gives us the following three-step procedure used in this Special Feature:

1. Estimate $\bar{\chi}$.

2. Test whether $\bar{\chi} < 1$, i.e. to see whether extreme-value dependence can be rejected.

1  See S. Coles, J. E. Hefferman and J. A. Tawn (1999), "Dependence Measures for Extreme Value Analyses", *Extremes,* Vol. 2, No 4, pp. 339-65; and S.-H. Poon, M. Rockinger and J. A. Tawn (2004), op. cit.
2  See A. Ledford and J. A. Tawn (1996), "Statistics for Near Independence in Multivariate Extreme Values", *Biomatrika,* 83, pp. 169-87.

3. If extreme-value dependence cannot be rejected, estimate $\chi$.

Clearly, as $\bar{\chi}$ is used to test for extreme-value dependence between two insurers, it is the central variable in the above procedure. For a pair of insurers, $\chi$ is only estimated after extreme-value dependence has already been found.

The retention rate may also explain extreme-value dependence across pairs of composite insurers. Although a higher retention rate may ex post reflect less risky non-life business (in which case the impact of retention on extreme-value dependence would be negative), it could also reflect an ex ante willingness to absorb risk, whereby the relationship with extreme-value dependence could be positive.

Asset holdings are unlikely to be a driver of extreme-value dependence, as there is no scale effect on the investment side. However, the ratio of total assets over total premium (the asset multiplier) might be important. A higher asset multiplier may on the one hand reflect more risky (fat-tailed) underwriting contracts requiring larger buffers, although on the other it could equally reflect a more prudent holding of reserves or more long-term business. In the case of the former the relationship with extreme-value dependence would be positive, while for the latter it would be negative or insignificant.

In addition to these factors, three other factors may affect the extreme-value dependence between insurance companies: 1) geographical proximity (affecting non-life business), 2) co-movement between stock markets across countries, and 3) idiosyncratic behaviour across countries, such as investment. Bi-country dummy variables are added to capture such effects.

The explanatory power of these factors can be tested by regressing an indicator – with a value of zero if extreme-value dependence can be rejected for a pair of insurers and one otherwise – on the set of explanatory variables.

For composite undertakings, the coefficient for the size of the non-life business – measured by the size of the non-life premium – is positive and highly significant, confirming the prior assumption that a scale effect in non-life underwriting is a driver of extreme-value dependence (see Table D.1). The fact that the relative size of the life business – the life premium expressed as a percentage of the total premium income – is highly statistically significant whereas the size of the total life premium is not (results not shown) suggests that the life business itself does not give rise to a scale effect. Therefore, the more an insurer focuses on life insurance, the smaller the impact of non-life business will be on the total firm.

### Table D.1 Probit regression for the occurrence of extreme-value dependence between composite insurers

| Variable | Coefficient | | t-Stats |
|---|---|---|---|
| NON-LIFE | 0.1183 | | 6.9543 |
| PERC LIFE | -2.5171 | | -2.7680 |
| RETENTION | 0.0714 | | 2.3223 |
| ASSET MULT | -0.1945 | | -4.0621 |
| CHIBAR IND | -0.1473 | | -0.2330 |
| DOM RES | 5.1564 | | 4.9317 |
| 43 DUMMIES | | | |
| Log likelihood | -100.9591 | Akaike | 0.6047 |
| Av. log likelihood | -0.2035 | Schwarz criterion | 1.0202 |

Source: ECB calculations.
Note: The extreme-value of dependence indicator for a pair of insurance companies is regressed on the various explanatory variables. Except for the country combination dummies, each pair of two insurers is assigned the average of the values of this variable for the two insurance companies. Non-life premium is measured in millions of euro. "CHIBAR IND" is the estimate for $\bar{\chi}$ between an insurer's equity and the European stock index FTSE Local Europe. "DOM RES" contains the residuals of a regression of the (average for each pair) estimate for $\bar{\chi}$ for the domestic stock index on the $\bar{\chi}$ for the European stock index. The reason for this substitution is the high correlation between the last two variables. The Huber/White standard errors are robust for clustering of the error terms. Finally, as the regression includes a full set of dummies for the country combinations, no intercept is included.

The fact that the retention rate is also statistically significant provides further evidence that underwriting is one of the drivers of extreme-value dependence between insurance undertakings. The estimated positive coefficient suggests that a higher retention rate should indicate that an insurance company is retaining more of the risks it underwrites, thus becoming more exposed to extreme events on the liability side.

The asset multiplier of an insurance firm is also found to be highly statistically significant in the probit regression, further supporting the hypothesis that underwriting is a driver of extreme-value dependence. A significant and positive coefficient indicates that insurance undertakings with a higher asset multiplier may underwrite more fat-tailed risks.

Turning to the financial market variables, the measure for extreme-value dependence with the European-wide index is not found to be statistically significant, whereas the coefficient for extreme-value dependence with the domestic stock index – unrelated with the European-wide index – is highly statistically significant. This suggests that extreme-value dependence with a domestic stock index may stem from sub-optimal investment behaviour, and that such insurers might be hit harder during a period of financial market upheaval.

Finally, the dummy variables for the country combinations are jointly statistically significant

in the regression, suggesting that the factors they account for (geographical proximity, co-movement between stock markets across countries, and idiosyncratic behaviour across countries, such as in terms of investment) are jointly significant.

Comparing the results of the composite insurers with those of life insurers provides further insight. As only non-life underwriting appears to affect extreme-value dependence for composites, an underwriting effect for life insurers would not be expected (whereas the direct opposite would be the case for non-life insurers). As expected, there is no evidence of a size effect for life undertakings. Furthermore, the asset multiplier also adds no explanatory power to the probit regression (see Table D.2). As these two variables turn out to be jointly insignificant, they are not included.

As for financial market-related risks for life insurance, the results are basically identical to those for composite insurers, i.e. the measure for extreme-value dependence is highly statistically significant for the domestic stock price index, but not significant for the European-wide index. As suggested for composite insurers, this could indicate that sub-optimal investment behaviour increases the exposure of an insurer to the risk of extreme shocks on financial markets.

Finally, the nine dummies for the country combinations are also jointly significant,

**Table D.2 Probit regression for the occurrence of extreme-value dependence between life insurers**

| Variable | Coefficient | | t-Stats |
|---|---|---|---|
| CHIBAR IND | 2.7953 | | 1.2098 |
| DOM RES | 6.2753 | | 2.5074 |
| 9 DUMMIES | | | |
| Log likelihood | -12.7881 | Akaike | 0.7209 |
| Av. log likelihood | -0.1938 | Schwarz criterion | 1.0865 |

Source: ECB calculations.
Note: Details as per Table D.1.

**Table D.3 Probit regression for the occurrence of extreme-value dependence between non-life insurers**

| Variable | Coefficient | | t-Stats |
|---|---|---|---|
| C | 0.3655 | | 0.2357 |
| RETENTION | -0.0399 | | -2.1825 |
| CHIBAR IND | 2.8974 | | 1.8586 |
| DOM RES | 0.2438 | | 0.2178 |
| COUNTRY_ID | 0.7238 | | 2.4637 |
| Log likelihood | -43.1640 | Akaike | 0.4170 |
| Av. log likelihood | -0.1869 | Schwarz criterion | 0.4915 |

Source: ECB calculations.
Note: Details as per Table D.1.

leading to a similar interpretation as with the non-life regression.

The size effect of non-life underwriting and the effect of the asset multiplier both disappear for non-life undertakings and are not included (see Table D.3). Moreover, the dummies for the country combinations are only marginally significant, which contrasts to the findings for the non-life business of composite undertakings. One possible explanation for this is that non-life companies are quite small in comparison with composite insurers – the average gross non-life premium for a composite insurer in the sample is more than five times the average gross premium of non-life insurers – and therefore too small for a significant overlap in geographical markets to occur.

Possibly for the same reason, size (as a proxy for international activity) is less significant in the various regressions. Although these results are quite different from those for composite insurers, they do not invalidate those of the size effect of non-life business.

However, these results do not imply that underwriting risk has no impact on the extreme-value dependence between non-life insurers, as the retention level is still highly significant in explaining the occurrence of extreme-value dependence between non-life companies.

The results for the two variables capturing the effect of exposure to financial market risk are also different, as neither of the two variables used is significant.[5] Insurance undertakings without life business typically suffer their worst drops in equity value as a result of extreme losses on the underwriting side, as opposed to losses on the investment side, which thus explains the insignificance of the financial market variables.

### CONCLUDING REMARKS

The results indicate that exposure to financial market shocks and non-life underwriting affect the occurrence of extreme-value dependence

between European insurance undertakings. Several measures of non-life underwriting appear to have an impact on extreme-value dependence among composite undertakings, but this relationship is much weaker for non-life undertakings, for which only the retention ratio remains important in explaining extreme-value dependence. This suggests that whereas non-life underwriting characteristics in general are important in explaining the incidence of extreme-value dependence, the size effect of non-life underwriting is only significant for composite insurers, which are typically very internationally active. Owing to their lack of – or very limited – international business, non-life insurers show no evidence of a size effect of non-life underwriting on extreme-value dependence. Rather than size itself, international exposure to the risk of large losses seems to be a driver of extreme-value dependence between composite insurers.

At the same time, whereas the extreme-value dependence between composite undertakings increases with the size of their non-life business, they do not become less risky individually, thus possibly indicating that further concentration could make the insurance sector more volatile and more exposed to extreme event risk.

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5   At the 5% level, however, a Wald test rejects the hypothesis that they are jointly insignificant.

## E    THE EU ARRANGEMENTS FOR FINANCIAL
##      CRISIS MANAGEMENT

*Since the introduction of the euro, the progress
made in the integration of financial markets
and market infrastructures in the EU, the
growing number of internationally active
institutions and the diversification of financial
activities have increased the liquidity and
efficiency of the relevant markets. At the same
time, however, such developments have also
increased the likelihood that systemic
disturbances could affect more than one Member
State, and possibly increase the scope for cross-
border contagion. In this context, the specific
arrangements for handling crises at the EU
level between the authorities responsible for
safeguarding financial stability have been
considerably enhanced since the introduction of
the euro. The enhancements include legislative
initiatives in the framework of the Financial
Services Action Plan (FSAP), the implementation
of the Lamfalussy framework for regulation and
supervision in all financial sectors, the adoption
of agreements on voluntary cooperation between
responsible authorities, and the development of
practical arrangements, such as the organisation
of financial crisis simulation exercises. This
Special Feature provides a structured overview
of the progress made in the specific arrangements
for financial crisis management between central
banks, banking supervisors and finance
ministries. Arrangements involving other
authorities, such as other sectoral financial
supervisors or deposit-insurance schemes, are
not dealt with in this Special Feature.*

### INTRODUCTION

The EU – and the euro area in particular –
displays the features of a single financial
market, given the increasing degree of financial
integration at the level of markets, market
infrastructures, and financial institutions
including the large and complex financial
institutions operating across Member States.
These developments are significantly improving
market liquidity and efficiency, while at the
same time leading to broader and deeper

systemic interlinkages between Member States.
This suggests that potential financial
disturbances are more likely than before to
spread across borders, thus potentially affecting
more than one Member State. Accordingly, the
EU's arrangements for financial stability
increasingly have to take into account the cross-
border spillover potential of a financial
disturbance.

The EU's financial stability framework is
largely based on the exercise of the statutory
responsibilities of central banks, financial
supervisors and finance ministries. The
enhancements of the specific arrangements for
dealing with potential crisis situations have
focused on the coordination and wider
cooperation processes, both between the
different sets of authorities and across Member
States. The overall objective of such
enhancements is to support the effectiveness of
the performance of financial stability tasks in
the single financial market by facilitating the
exchange of information and the consistency of
potential policy actions between the responsible
authorities.

This Special Feature is organised into six
sections as follows. First, it recalls the
initial impetus to the enhancement of EU
crisis management arrangements, via
recommendations endorsed by the Economic
Financial Committee (EFC) in 2000 and 2001.[1]
Second, it reviews the implementation of these
recommendations, notably regarding the
adoption of voluntary cooperation agreements
between authorities. Third, it addresses those
legislative initiatives at the EU level that have
a specific bearing on financial crisis
management arrangements. Fourth, the Special
Feature completes its overview of the EU's
framework for crisis management with a
reference to central banking arrangements.

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1   The EFC is established by the Treaty to provide advice to the
    ECOFIN Council and to the Commission. In an ad-hoc
    composition dealing with financial stability related-issues
    (Financial Stability Table), it comprises high-level
    representatives from finance ministries and central banks.

Fifth, it refers to the initiatives taken to enhance the effectiveness of the arrangements to address cross-border financial crises, which include the organisation of financial crisis simulation exercises at the EU level. Finally, this Special Feature concludes with an assessment of the progress achieved in the enhancement of the EU's arrangements for financial crisis management.

## THE EFC RECOMMENDATIONS REGARDING FINANCIAL CRISIS MANAGEMENT ARRANGEMENTS

Following the introduction of the euro on 1 January 1999, the arrangements for financial stability at the EU level were reviewed, taking into account the increasing level of financial integration in the EU and the euro area. The aim was to assess whether these arrangements were still able to accommodate changes in the financial markets and to provide sufficient safeguards of financial stability. In April 2000 the EFC issued a "Report on Financial Stability", which concluded that the institutional arrangements provide a coherent and flexible basis for safeguarding financial stability in increasingly integrated markets, but that their operational functioning needed some enhancements. The recommendations endorsed by the EFC and subsequently by the EU Council of Ministers of Economic Affairs and Finance (the ECOFIN Council), included (i) strengthening cross-sectoral cooperation, (ii) enhancing exchanges of information between the responsible authorities, (iii) reinforcing cooperation between supervisors and central banks to tackle crisis situations, and (iv) working on the convergence of supervisory practices.[2]

As a key component of the broader financial stability framework, the EFC examined the specific arrangements for financial crisis management in a special report issued in April 2001.[3] While considering that the first line of defence should remain within financial institutions themselves, the major conclusion of the report was the need to strengthen cross-border cooperation and coordination still

further between the responsible authorities in order to ensure the effective safeguarding of financial stability.

Accordingly, the EFC and subsequently the ECOFIN Council endorsed the following four main recommendations to improve the practical functioning of the EU's financial crisis management arrangements.

First, supervisory authorities should take measures to ensure that large financial groups produce accurate information at short notice, have adequate contingency procedures in place, and perform stress-testing exercises on a regular basis.

Second, Member States should remove any remaining legal or practical obstacles which could prevent the timely exchange of necessary information, both cross-border and cross-sector, among supervisors, central banks, overseers of payment systems and bodies administering deposit-guarantee schemes. In addition, each authority should develop its own checklist, which should identify the main issues to be addressed in a crisis as well as specify which other authorities have to be informed.

Third, the development of clear ex ante agreements was recommended to deal with information-sharing issues and the assignment of responsibilities among competent authorities in the event of a crisis, especially for the major financial groups, preferably on a multilateral basis.

Finally, competition authorities were called upon to maintain timely and robust procedures for considering the competitive implications of crisis management measures.

Following the 2001 recommendations, the EFC was invited by the ECOFIN Council to continue to give high priority to crisis management in

2 Available at http://ue.eu.int/ueDocs/cms_Data/docs/pressdata/en/misc/ACF16BD.htm
3 Available at http://www.consilium.europa.eu/ueDocs/cms_Data/docs/pressdata/en/misc/Brouwerreport.html

following up its reports. As a result, new priorities for enhancing the EU framework for financial stability and crisis management were set by the EFC in 2004. In particular, special attention was paid to the extension of the arrangements on crisis management to finance ministries and to the organisation of an EU-wide financial crisis simulation exercise involving the relevant authorities. These specific developments are described below.

## THE FRAMEWORK FOR VOLUNTARY COOPERATION BETWEEN THE AUTHORITIES

Enhancements for cooperation among EU authorities in the area of crisis management are to a large extent based on voluntary agreements between various authorities, which set out procedures for cooperation and information-sharing in potential crisis situations. These agreements have been adopted at the EU, regional and domestic levels.

## MEMORANDA OF UNDERSTANDING ON COOPERATION IN CRISIS MANAGEMENT AT THE EU LEVEL

The Memoranda of Understanding (MoUs) on crisis management are now important components of the EU's institutional framework for safeguarding financial stability. They are generally designed to provide basic principles and practical arrangements for cross-border cooperation between authorities in the case of cross-border and systemic financial disturbances. Systemic implications can materialise through disturbances in individual banks, banking groups or banking components of financial groups, as well as in disturbances in the financial markets, payment systems or other market infrastructures.

There are currently two multilateral MoUs on crisis management in force which have been adopted by the responsible authorities of all EU Member States. The MoUs are not legally binding and are based on the principle of voluntary cooperation, as they are without prejudice to the exercise of statutory responsibilities by the relevant authorities.

Following up on the 2001 EFC recommendations, the first EU-wide MoU on cooperation in crisis management situations was adopted under the auspices of the ESCB's Banking Supervision Committee (BSC) in March 2003, entitled the "Memorandum of Understanding on High-Level Principles on Co-operation between the Banking Supervisors and Central Banks of the EU in Crisis Management Situations".[4] This MoU was designed to contribute to effective crisis management by ensuring smooth interaction between the authorities concerned, thus facilitating an early assessment of the systemic scope of a crisis both at the domestic and EU levels. For this purpose the aforementioned MoU sets out specific principles and procedures for the identification of the authorities responsible for crisis management in the EU, the required flows of information between banking supervisors and central banks, and the practical conditions for sharing information at the cross-border level. It also establishes an infrastructure for cross-border communication between banking supervisors and central banks, including a list of emergency contacts.[5]

Following up on the priorities set by the EFC in 2004 mentioned above, the second MoU on cooperation in financial crisis situations, entitled a "Memorandum of Understanding on Co-operation between the Banking Supervisors, Central Banks and Finance Ministries of the EU in Financial Crisis Situations", was adopted by the 76 EU banking supervisors, central banks and finance ministries under the aegis of the EFC in May 2005.

This MoU consists of a set of principles and procedures for sharing information, views and assessments, in order to assist these authorities

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4   The ESCB Banking Supervision Committee contributes to the macro-prudential and structural monitoring of the EU financial system, to the cooperation and exchange of information between banking supervisors and central banks on issues of common interest, and to the analysis of the impact of regulatory and supervisory requirements on financial stability.

5   See the related press release available at http://www.ecb.int/press/pr/date/2003/html/pr030310_3.en.html. The authorities of the new Member States adhered to this agreement in June 2004.

in pursuing their respective policy functions and to preserve the overall stability of the financial system of individual Member States and of the EU as a whole. In particular, the authorities concerned should be in a position, if needed, to engage in informed discussions amongst themselves at the cross-border level through existing networks and committees, for example following the emergence of a crisis situation that affects the financial system of more than one Member State or the EU as a whole.

To support further the enhanced cooperation between authorities, the 2005 MoU also includes arrangements for the development of contingency plans for the management of crisis situations, along with stress-testing and simulation exercises.[6]

Lastly, the MoU includes an explicit statement that it should not be construed as representing an exception to (i) the principle of the firm's owners'/shareholders' primary financial responsibility, (ii) the need for creditor vigilance, and (iii) the primacy of market-led solutions when it comes to solving crisis situations in individual institutions.

In addition to the MoUs on crisis management, an MoU is also in place regarding cooperation between banking supervisors and central banks in their capacity as overseers of the payment system, which entered into force in January 2001.[7] Although this agreement does not specifically focus on crisis management, it does contain a number of relevant provisions dealing with the transmission of information in case of liquidity or solvency problems. This relates to the risk that the inability of a market participant to meet its obligations in a large-value payment system could jeopardise its counterparties' ability to meet their obligations at short notice, which therefore represents a relevant source of contagion.

## BILATERAL OR REGIONAL AGREEMENTS

The EU-wide MoUs on crisis management provide a broad framework for voluntary cooperation between the authorities responsible for safeguarding financial stability at the EU level and at the domestic level. This broad framework was and still is in the process of being specified at the bilateral and regional levels.

In line with the recommendations of the 2001 EFC report on crisis management, the authorities from individual Member States may require closer cooperation structures, for instance as a result of specific systemic interlinkages stemming from banking groups with significant presence in their respective Member States. These enhanced cooperation structures have been set up in the form of bilateral or regional agreements, although it is likely that many of the older bilateral MoUs may need to be updated to fully reflect recent thinking on crisis management.

One of these regional agreements consists of the MoU on the "Management of a Financial Crisis in Banks with Cross-border Establishments", which was adopted by the central banks of the Nordic region – Denmark, Finland, Iceland, Norway and Sweden.[8] This agreement is based on two principles. First, the cooperation between the central banks will be facilitated by the establishment of a structure for crisis management and the dissemination of relevant information. Second, the non-legally binding nature is considered an appropriate way for facilitating cooperation between central banks without curtailing their flexibility as independent institutions. On the basis of these principles, the central banks of the Nordic region have drawn up an agreement addressing the significant cross-border activity of one particular Nordic banking group which may have repercussions for financial stability in more than one of these countries.

6 See the related press release available at http://www.ecb.int/press/pr/date/2005/html/pr050518_1.en.html
7 See the related press release available at http://www.ecb.int/press/pr/date/2001/html/pr010402.en.html
8 Available at http://www.riksbank.com/

The MoU between the Nordic central banks specifies the provisions of the 2003 MoU between EU banking supervisors and central banks as mentioned above. While the EU-wide MoU provides a broad framework, the Nordic MoU sets more specific and detailed arrangements for cooperation and information exchange concerning the management of crises affecting banking groups. It includes conditions for measures regarding liquidity and solvency, practical arrangements with regard to the operational mechanism for the coordination of central banks (in the form of a crisis management group), specifications on the necessary contacts and information-gathering, and the coordination of public communication.

The Nationale Bank van België/Banque Nationale de Belgique, the Commission Bancaire, Financière et des Assurance and De Nederlandsche Bank have also recently adopted a regional agreement.[9] As in the case of the Nordic countries, the adoption of this agreement is based on the assumption that the financial systems of Belgium and the Netherlands are so closely intertwined that they require further reinforcing cooperation in the area of supervision and in the case of a possible financial crisis.

To this purpose, this agreement aims at facilitating cross-border cooperation also by setting up a crisis management committee composed of the three authorities, which would deal with consultation and coordination practices, collect information, prepare decisions and maintain contacts with the institution and market participants. In addition, the MoU aims at making specific information available in a crisis. Lastly it also acknowledges the need for closer cross-border cooperation, as required by the new EU Capital Requirements Directive.

### DOMESTIC AGREEMENTS

The domestic arrangements for financial crisis management also form an important component of the EU's overall financial stability framework. Effective communication and policy actions at the cross-border level depend to a large degree

on the smoothness of the interactions between authorities in the domestic setting.

In certain Member States domestic agreements have been reached between the authorities responsible for safeguarding financial stability with the aim of facilitating the interaction between the different policy functions at the national level in potential crisis situations. A relevant example is the MoU in the UK, which establishes a framework for cooperation in the field of financial stability between the Treasury, the Bank of England and the Financial Services Authority. It sets out the role of each authority, and explains how they work together towards the common objective of financial stability in the UK.[10]

### EU COMMITTEES

A number of committees organise cooperation and information-sharing at the EU level between the authorities responsible for safeguarding financial stability. The relevant committees include the EFC, the BSC and the Committee of European Banking Supervisors (CEBS),[11] whose membership comprises banking supervisors and central banks; and the Financial Services Committee (FSC), whose membership comprises representatives of finance ministries.

These committees play an important role in enhancing the arrangements for financial crisis management, as was the case with the existing MoUs. In cases where EU-wide multilateral cooperation among the authorities might be needed, the existing EU committees may, within the scope of their role and tasks, be used to

9   See the related press release available at http://www.nbb.be/, http://www.dnb.nl/, and http://www.cbfa.be/.
10  The MoU is available from the Bank of England's website: http://www.bankofengland.co.uk/financialstability/mou.pdf
11  According to the Commission decision 2004/5/EC of 5 November 2003, the role of the CEBS is to: advise the Commission, in particular as regards the preparation of draft implementing measures in the field of banking activities; contribute to the consistent implementation of Community Directives and to the convergence of Member States' supervisory practices throughout the Community; and enhance supervisory co-operation, including the exchange of information.

facilitate the process of exchange of information, views and assessments.

## THE EU'S LEGISLATIVE FRAMEWORK ON CRISIS MANAGEMENT

The FSAP, which was completed in 2005, led to a number of legislative acts which reinforced the regulatory and supervisory frameworks at the EU level. Some of these acts introduced provisions which have a direct bearing on crisis management situations, notably in terms of defining information flows between the authorities potentially involved in the management of cross-border crises, including supervisors and central banks.

### THE CAPITAL REQUIREMENTS DIRECTIVE

The Capital Requirements Directive (CRD), which transposes the Basel II Framework into EU legislation, sets forth requirements in Articles 129 to 132 concerning the division of labour and the coordination and cooperation between home and host supervisors relating to the monitoring and supervision of banking groups, both in normal times and in emergency situations. In particular, the Directive assigns a coordinating role to the consolidating supervisor, which is as a rule from the Member State where the credit institution or the financial holding company heading the group is based. The Directive also strengthens and clarifies the requirements for information-sharing and cooperation between all the authorities responsible for the supervision of the entities comprising the banking group. Moreover, it requires the competent supervisory authorities to have written coordination and cooperation arrangements in place.

Regarding the provisions of the CRD which are relevant for crisis situations, Article 130 of the CRD requires the consolidating supervisor to alert central banks and ministries of finance as soon as is practicable in the event of an emergency which threatens the stability of the financial system of a Member State. Article 132 sets out a number of provisions which impose the obligation for the competent supervisory

authorities to cooperate closely and to share information which is essential or relevant for the exercise of their respective tasks. In particular, information shall be regarded as essential if it could materially influence the assessment of the financial soundness of an institution in another Member State. Furthermore, adverse developments in credit institutions or in other group entities that could seriously affect the credit institutions will be considered as essential information to be shared between the supervisory authorities.

The practical application of the CRD provisions is also supported by the development of guidelines by the CEBS.[12] These guidelines provide concrete guidance for the effective and consistent implementation of the revised legal framework for cross-border banking groups, and enhance the practical operational networking of national supervisors. They have been developed following a risk-based and proportional approach. For instance, the degree of information exchange and cooperation between supervisors should be related to the systemic relevance of the entities, both in relation to the host local market and the group as a whole.

The concrete application of the CRD provisions in the area of crisis situations will benefit from as well as complement the procedures envisaged in the 2003 and 2005 MoUs described above. These provisions support the overall interaction between all the authorities potentially involved in a crisis situation.

Regarding the specific context of crisis management, currently the BSC and the CEBS are jointly working on the central banking and supervisory practices for handling financial crises at the cross-border level, in order to enhance the operational effectiveness of the existing arrangements.

12 The guidelines are available from the CEBS website: http://www.c-ebs.org/

## THE FINANCIAL CONGLOMERATE DIRECTIVE

The intensification of cross-sectoral links in the European financial landscape is also reflected in the emergence of financial conglomerates, which combine regulated entities from the insurance sector and either the banking or securities sectors. Financial conglomerates are subject to a specific regulatory framework with the adoption of the Financial Conglomerates Directive (FCD) in December 2002, which introduces the *supplementary* supervision of the regulated entities comprising a financial conglomerate operating in the EU.[13]

The FCD sets out requirements for information sharing and cooperation among the supervisors of the regulated entities in a financial conglomerate. In particular, the Directive provides for the identification of a supervisory authority as coordinator of the supplementary supervision of the financial conglomerate, to manage these tasks. The Directive also includes provisions organising the way in which this coordinator supervisor exercises its responsibilities, which is similar in some aspects to the concept of the consolidating supervisor as set out in the CRD, but falls short of full consolidation across sectors.

The FCD also introduces a number of provisions that are relevant to crisis management. In particular, in accordance with Article 11 of the Directive, the tasks to be carried out by the coordinator supervisor include the coordination of the gathering and dissemination of relevant or essential information in going-concern and emergency situations, including the dissemination of information which is of importance for a competent authority's supervisory task under sectoral rules.

Furthermore, as in the CRD provisions mentioned above, the competent authorities responsible for the supervision of regulated entities in a financial conglomerate are obliged to cooperate closely with each other. This entails in accordance with Article 12 of the Directive the gathering and the exchange of information with regard to adverse developments in regulated entities or in other entities of the financial conglomerate which could seriously affect the regulated entities, among other aspects. Information may also be shared with central banks, as it may be needed for the performance of their respective tasks.

## CENTRAL BANKING ARRANGEMENTS

In the case of a potential crisis situation, central banks may play an important role in the context of their responsibilities as monetary authorities and overseers of payment systems, as well as in their overall responsibility for contributing to the stability of the financial system as a whole.

In particular, the exercise of these responsibilities allows central banks to detect warning signs or disturbances at the level of liquidity in money markets and payment systems that could materialise into crisis situations. In addition, central banks may assess the systemic implications of a financial disturbance or crisis in terms of its impact and potential spillovers to financial institutions, markets and infrastructures.

The responsibilities of central banks also allow for the deployment of certain tools which may contribute to the management of a crisis situation. These tools include actions concerning general liquidity conditions, the functioning of market infrastructures, and other possible interventions which could help restore orderly market conditions.

One of the specific tools available to central banks in a crisis situation is the provision of emergency liquidity assistance (ELA) to individual banks. Generally, this tool consists of the support given by central banks in

13 Directive 2002/87/EC of the European Parliament and of the Council of 16 December 2002 on the supplementary supervision of credit institutions, insurance undertakings and investment firms in a financial conglomerate; this amended Council Directives 73/239/EEC, 79/267/EEC, 92/49/EEC, 92/96/EEC, 93/6/EEC and 93/22/EEC, and Directives 98/78/EC and 2000/12/EC of the European Parliament and of the Council.

exceptional circumstances and on a case-by-case basis to temporarily illiquid institutions and markets. This support may be warranted to ease an institution's liquidity strains, as well as to prevent any potential systemic effects, or specific implications such as disruption of the smooth functioning of payment and settlement systems. However, the importance of ELA should not be overemphasised. Central bank support should not be seen as a primary means of ensuring financial stability, since it bears the risk of moral hazard. Furthermore, ELA rarely needs to be provided, and is thus less significant than other elements of the financial safety net, which have increased in importance in the management of crises.

The cooperation between EU central banks in crisis situations at the cross-border level will be facilitated, where warranted, by the framework set out in the EU-wide MoU and in some of the regional MoUs described above. In particular, such procedures will support the sharing of information about emerging financial disturbances, the assessment of potential systemic implications, and the coordination, if deemed necessary, of policy actions between central banks, as well as between central banks and other involved authorities.

Within the specific setting of the Eurosystem, the necessary mechanisms to tackle a financial crisis are in place.

First, the Eurosystem has set up the appropriate operational procedures to contain within the scope of its functions the potential implications of a financial disturbance. This includes procedures for the conduct of monetary policy operations, the oversight of payment systems also considering potential consequences for the operation of market infrastructures, and the safeguarding of financial stability. In this context, the committees established under the Eurosystem to assist its work and advise the decision-making bodies may also support the operational handling of a potential disturbance.[14]

Second, the Eurosystem also has procedures in place regarding the provision of ELA by the individual Eurosystem NCBs. Since ELA is not a Eurosystem function, the decision concerning its provision lies with the competent NCB regarding an institution operating in its jurisdiction. The Eurosystem procedures ensure an adequate flow of information so that any potential liquidity impact can be managed in a manner consistent with the maintenance of the appropriate single monetary policy stance. These procedures on ELA are internal to the Eurosystem, but their smooth functioning is also linked to the wider arrangements at the EU level for dealing with the cross-border implications of financial crises.[15]

## SIMULATION EXERCISES

This Special Feature has provided an overview of the EU arrangements for addressing potential financial crisis situations, which may involve cross-border spillovers in more than one Member State. In particular, the arrangements include a number of tools which support the cooperation between authorities in such situations. Like any tool, these arrangements are likely to become more effective as authorities become more familiar with their functioning.

To enhance understanding of the practical implementation of the EU arrangements, the authorities have organised financial crisis simulation exercises. The basic aim of these simulation exercises is to replicate, to the extent possible, crisis scenarios that will help them understand how the arrangements will assist in practice with the management of a real-life crisis situation. In this sense, crisis simulation exercises may also develop the preparedness of authorities for cooperation in crisis management. In line with the scope of the arrangements described in this Special Feature, financial

14 Among the committees assisting the work of the decision-making bodies of the ECB, the Market Operations Committee (MOC), the Payment and Settlement Systems Committee (PSSC) and the BSC are those which could be more directly involved in financial crisis management.
15 See ECB (1999), *Annual Report.*

crisis simulation exercises have taken place at the domestic, regional and EU levels.

At the EU level, financial crisis simulation exercises have been organised to test the effectiveness of the overall financial stability arrangements. The first such exercise took place in September 2003 under the aegis of the BSC, and aimed at testing the provisions of the 2003 MoU. This exercise provided useful insights into the different aspects of cross-border cooperation between banking supervisors and NCBs in the event of a systemic financial crisis.

A recent EU-wide financial market crisis management simulation exercise took place in April 2006 under the aegis of the EFC, and aimed at testing the 2005 MoU mentioned above. The exercise involved representatives from all the EU banking supervisors, central banks and finance ministries. Generally, the exercise indicated that relevant Member State authorities were able and willing to cooperate in managing cross-border systemic financial crises. The exercise also provided a number of useful insights on how to improve further the management of cross-border crises increasing

the overall level of stability in the single European financial market. To this end, the ECOFIN Council agreed on further work for enhancing cooperation among Member State authorities responsible for financial market stability.[16]

In the context of the Eurosystem arrangements for financial stability, the Eurosystem central banks have also carried out financial crisis simulation exercises relating to the ability of the Eurosystem to address effectively a financial crisis with the potential for systemic implications across several countries in the euro area. The most recent exercise took place in May 2006.[17]

The exercises involved all the relevant central banking functions, including the conduct of monetary policy operations, the oversight of payment systems also considering potential consequences for the operation of market infrastructures, and the safeguarding of financial stability. Given the high degree of financial integration within the euro area, the exercises placed particular emphasis on the

16  http://www.eu2006.fi/calendar/vko36/en_GB/1129708439336/
    ?calYear=2006&calMonth=8

17  See the related press release available at www.ecb.int

### Table E.1 Overview of the EU framework for financial crisis management

|  | Authorities responsible for financial stability | | |
|---|---|---|---|
|  | Central banks | Banking supervisors | Finance ministries |
| Regulatory arrangements | Capital Requirements Directive (CRD) | | |
|  | Financial Conglomerate Directive (FCD)[1] | | |
| Voluntary cooperation arrangements | 2005 MoU on crisis management | | |
|  | 2003 MoU on crisis management | | |
|  | 2001 MoU on payment systems | | |
|  | Regional and bilateral MoUs[2] | | |
|  | Domestic MoUs[2] | | |
| Central banking arrangements | Eurosystem | | |
| EU committees | BSC and CEBS | | FSC |
|  | EFC | | EFC |
| Tools for practical implementation | Financial crisis simulation exercises | | |
|  | Development of practices by EU Committees | | |

1) The exchange of information between supervisory authorities and finance ministries regarding the regulated entities of a financial conglomerate is subject to the sectoral rules in EU legislation for credit institutions, insurance companies and securities firms.
2) Regional and domestic MoUs may involve different sets of authorities, including either or both central banks and banking supervisors. In some Member States, finance ministries are also parties to MoUs.

systemic interlinkages between the components of the financial system, including institutions, markets and market infrastructures, both on a national and on a cross-border basis. The conduct of the exercises confirmed the preparedness of the Eurosystem to deal with potentially systemic events that could affect the financial system of the euro area.

## CONCLUDING REMARKS

Since the introduction of the euro, the debate regarding the adequacy of EU institutional arrangements for financial stability has focused on the capability of a setting mostly based on the exercise of national responsibilities to prevent and manage crises in increasingly integrated financial markets. The reflections undertaken by the relevant fora, notably the EFC, have led to a series of recommendations which provided the basis for a significant enhancement of the EU's framework for financial crisis management.

Overall, it may be concluded that, since the introduction of the euro, the EU arrangements for financial crisis management have been subject to a comprehensive review. The guiding principle was acknowledging the potential of the current institutional set-up for handling crises effectively, while introducing procedures aimed at supporting the interaction between the different sets of authorities. These procedures also take account that authorities, in the context of their responsibilities, should retain the necessary discretion and flexibility to tackle the specific aspects of a potential crisis situation. The particular enhancements consisted of a number of initiatives aiming at further strengthening co-operation and co-ordination between the responsible authorities in order to ensure the effective safeguarding of financial stability in the single financial market. This involved measures of different nature, including legislative initiatives, voluntary cooperation agreements, and the reinforcement of the practical application of the overall framework for financial crisis management. Moreover, the enhancements were implemented

taking account of the different dimensions of cooperation, namely at the domestic, regional and EU levels.

In this context, the approach followed thus far has the merit of providing a comprehensive multi-layered and flexible framework at the EU level, which has the potential to adapt swiftly to the specific challenges that a crisis situation may raise for the responsible authorities, particularly in terms of coping with potential cross-border spillovers. In addition, such a framework is also open to further practical refinements in particular areas, as it may be considered necessary in view of developments in the financial landscape. In addition, the periodic assessment of the effective functioning of the institutional arrangements for crisis management – also through the conduct of further financial crisis simulation exercises at EU level – may also provide the basis for such refinements. In this direction, the recent conclusions of the Ecofin Council in Luxembourg of 10 October 2006 underlined that efforts should be continued to further deepen the co-operation among relevant authorities and ensure that EU arrangements for financial stability correspond with the developments in the financial markets. Accordingly, the Ecofin Council invited the EFC to further develop procedures and, as appropriate, general principles for resolving cross-border financial crises in the EU and to report back to the Ecofin Council on these issues semi-annually.

# STATISTICAL ANNEX

# I EXTERNAL ENVIRONMENT

## Chart S1 US non-farm, non-financial corporate business liabilities

(Q1 1980 - Q2 2006, %)

- —— liabilities to financial assets
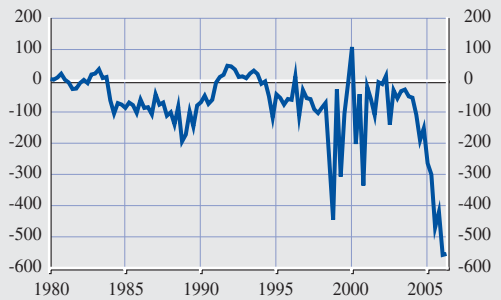- ······ liabilities to GDP
- -- -- credit market liabilities to GDP

Sources: US Federal Reserve Board and Bureau of Economic Analysis.

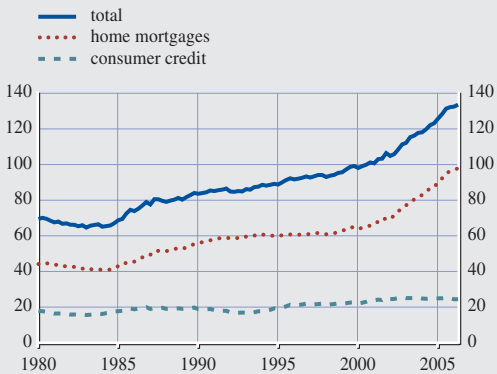## Chart S2 US non-farm, non-financial corporate business net equity issuance

(Q1 1980 - Q2 2006, USD billions, seasonally adjusted quarterly annualised data)

Source: US Federal Reserve Board.

## Chart S3 US household debt-to-disposable income ratio

(Q1 1980 - Q2 2006, % of disposable income)

- —— total
- ······ home mortgages
- -- -- consumer credit

Source: US Federal Reserve Board.

## Chart S4 US household debt burden

(Q1 1980 - Q2 2006, % of disposable income)

- —— financial obligations ratio
- ······ debt servicing ratio
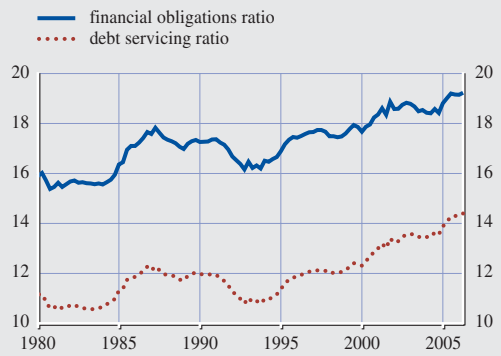
Source: US Federal Reserve Board.

**Chart S5 Share of adjustable rate mortgages in the US**

(Jan. 1998 - Oct. 2006, % of total new mortgages)

number of loans
dollar volume
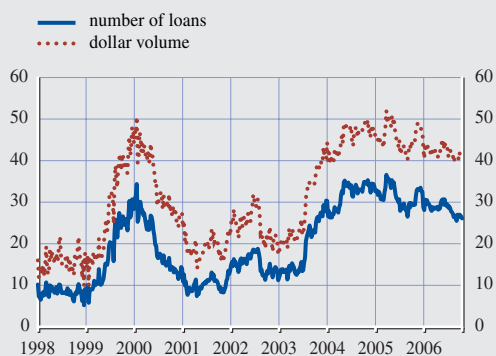


Source: Mortgage Bankers Association.

**Chart S6 US general government and federal debt-to-GDP ratio**

(Q1 1980 - Q2 2006, %)

general government gross debt
federal debt held by the public
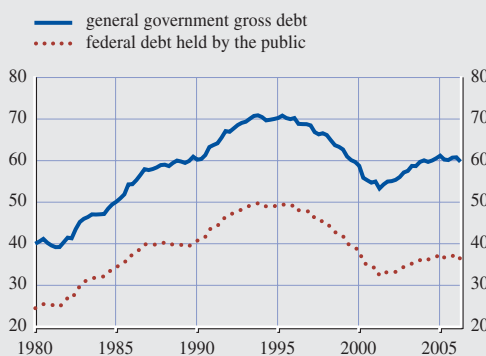


Sources: US Federal Reserve Board and Bureau of Economic Analysis.
Note: General government gross debt comprises federal, state and local government gross debt.

**Chart S7 International positions of all BIS reporting banks vis-à-vis emerging markets**

(Q1 1999 - Q1 2006, USD billions)

loans and deposits (left-hand scale)
holdings of securities (right-hand scale)
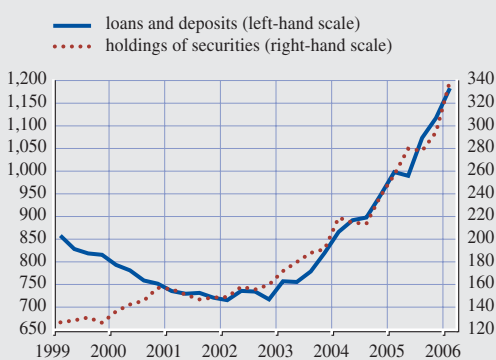


Source: Bank for International Settlements (BIS).

### Table S1 Selected financial vulnerability indicators for some of the main emerging market economies

| | Current account balance (% of GDP) | | | External debt (% of GDP) | | | Short-term external debt (% of reserves) | | | Foreign reserves (in months of imports) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2004 | 2005 | 2006(f) | 2004 | 2005 | 2006(f) | 2004 | 2005 | 2006(f) | 2004 | 2005 | 2006(f) |
| **Latin America** | | | | | | | | | | | | |
| Argentina | 2.3 | 3.1 | 2.8 | 114 | 75 | 64 | 76 | 52 | 50 | 5.9 | 7.5 | 7.2 |
| Brazil | 1.9 | 1.8 | 1.1 | 36 | 24 | 19 | 36 | 36 | 25 | 6.1 | 5.1 | 6.0 |
| Chile | 1.7 | 0.6 | 2.6 | 46 | 39 | 31 | 41 | 41 | 41 | 4.9 | 4.0 | 3.3 |
| Colombia | -1.0 | -1.6 | -1.9 | 41 | 31 | 31 | 18 | 17 | 17 | 6.5 | 5.7 | 5.8 |
| Mexico | -1.0 | -0.6 | -0.1 | 24 | 23 | 19 | 54 | 46 | 46 | 3.3 | 3.4 | 3.0 |
| Venezuela | 12.6 | 18.3 | 16.8 | 36 | 27 | 21 | 30 | 23 | 23 | 7.6 | 8.2 | 6.5 |
| **Asia** | | | | | | | | | | | | |
| China | 3.6 | 7.2 | 8.7 | 13 | 13 | 12 | 17 | 16 | 14 | 11.7 | 13.3 | 14.8 |
| India | -0.8 | -1.3 | -1.5 | 20 | 19 | 19 | 13 | 12 | 12 | 10.3 | 8.6 | 7.5 |
| Indonesia | 0.6 | 0.3 | 0.8 | 54 | 46 | 37 | 53 | 64 | 59 | 5.0 | 3.9 | 4.4 |
| Malaysia | 12.6 | 12.2 | 8.5 | 56 | 39 | 33 | 27 | 12 | 10 | 6.2 | 6.0 | 6.0 |
| South Korea | 4.1 | 2.1 | 0.3 | 25 | 24 | 24 | 28 | 31 | 38 | 8.6 | 7.8 | 7.0 |
| Thailand | 4.2 | -2.1 | 1.5 | 33 | 31 | 27 | 26 | 29 | 27 | 5.2 | 4.3 | 4.7 |
| **Emerging Europe** | | | | | | | | | | | | |
| Russia | 8.1 | 10.4 | 8.4 | 35 | 32 | 27 | 37 | 34 | 29 | 11.6 | 12.7 | 13.8 |
| Turkey | -5.2 | -6.4 | -7.4 | 53 | 49 | 50 | 121 | 117 | 104 | 3.9 | 4.6 | 4.3 |

Source: Institute of International Finance.
Note: Data for 2006 are forecasts.

### Table S2 Value at risk (VaR) amounts by category of risk for global large and complex banking groups

(USD million, 99% confidence, 10-day holding period)

| | Commodities | Equities | Interest rate | Foreign exchange |
|---|---|---|---|---|
| Q2 2005 average | 48.5 | 92.8 | 216.6 | 38.1 |
| Q2 2005 median | 42.2 | 117.0 | 196.1 | 37.9 |
| Q2 2006 average | 70.7 | 105.8 | 191.8 | 48.0 |
| Q2 2006 median | 56.6 | 110.7 | 183.4 | 49.0 |

Sources: SEC and institutions quarterly reports.
Note: The institutions included are JP Morgan Chase & Co, Morgan Stanley, Citigroup, Bank of New York, UBS, CSFB and HSBC.

**Chart S8 Expected default frequencies (EDFs) for global large and complex banking groups**

(Jan. 1999 - Sep. 2006, % probability)
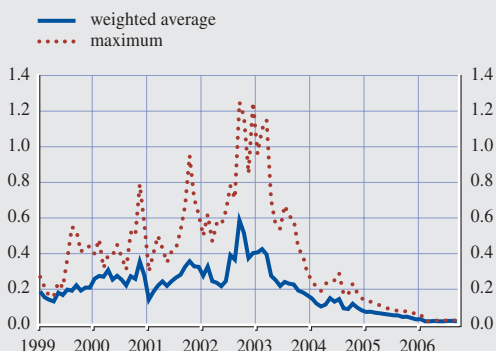
——— weighted average
········· maximum



Sources: Moody's KMV and ECB calculations.
Note: Due to measurement considerations, the EDF values are restricted by Moody's KMV to the interval between 0.02% and 20%. The sample includes Goldman Sachs, JP Morgan Chase & Co, Morgan Stanley, Merrill Lynch, Citigroup, Bank of New York, State Street, UBS, CSFB, Barclays, HBOS, RBS and HSBC.

**Chart S9 Distance-to-default for global large and complex banking groups**
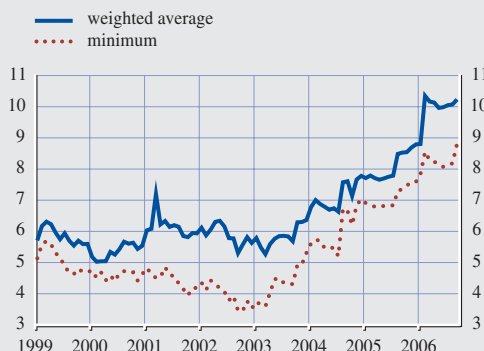
(Jan. 1999 - Sep. 2006)

——— weighted average
········· minimum



Sources: Moody's KMV and ECB calculations.
Note: An increase in the distance-to-default reflects an improving assessment. The sample includes Goldman Sachs, JP Morgan Chase & Co, Morgan Stanley, Merrill Lynch, Citigroup, Bank of New York, State Street, UBS, CSFB, Barclays, HBOS, RBS and HSBC.

**Chart S10 Equity prices developments for global large and complex banking groups**

(Jan. 2002 - Nov. 2006, USD)
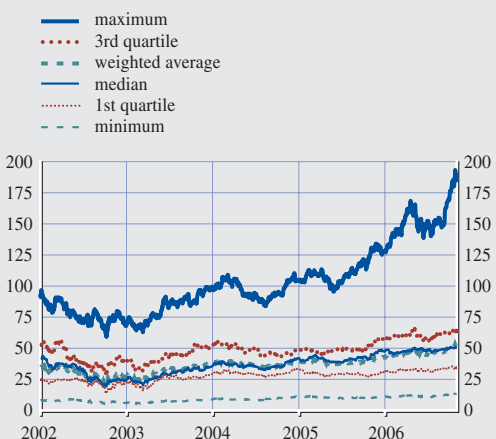
——— maximum
········· 3rd quartile
– – – weighted average
——— median
········· 1st quartile
– – – minimum



Sources: Bloomberg and ECB calculations.
Note: The sample includes Goldman Sachs, JP Morgan Chase & Co, Morgan Stanley, Merrill Lynch, Citigroup, Bank of New York, State Street, UBS, CSFB, Barclays, HBOS, RBS and HSBC.

**Chart S11 Subordinated credit default swap spreads for global large and complex banking groups**

(Jan. 2002 - Sep. 2006, basis points)
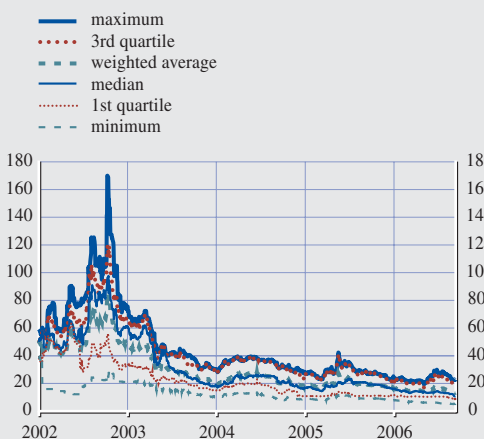
——— maximum
········· 3rd quartile
– – – weighted average
——— median
········· 1st quartile
– – – minimum



Sources: Bloomberg and ECB calculations.
Note: The sample includes Goldman Sachs, JP Morgan Chase & Co, Morgan Stanley, Merrill Lynch, Citigroup, Bank of New York, State Street, UBS, CSFB, Barclays, HBOS, RBS and HSBC.

**Chart S12 Global consolidated claims on non-banks in offshore financial centres**

(Q1 1996 - Q1 2006, USD billions)

— all reporting banks
···· euro area banks
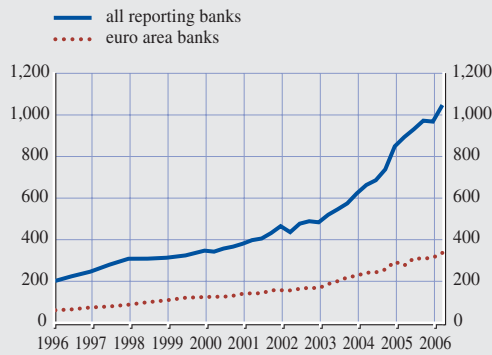


Source: BIS.

**Chart S13 Global hedge fund net flows**

(Q1 1994 - Q2 2006, USD billions)

— multi-strategy
▬ event-driven
— market-neutral
▨ directional
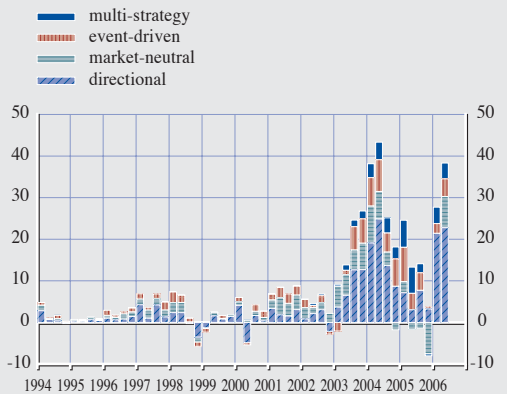


Source: Tremont Capital Management.
Note: Excluding funds of hedge funds.

**Chart S14 Decomposition of the annual rate of growth of global hedge fund capital under management**

(Q4 1994 - Q2 2006, %, 12-month changes)

— return contribution
— net flows contribution
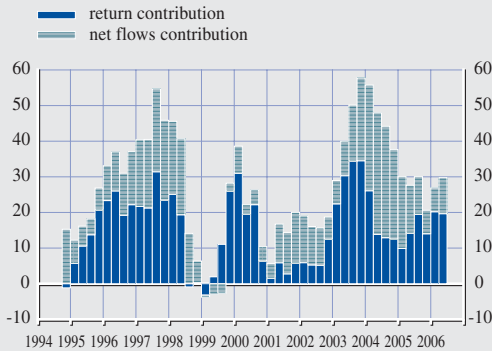


Sources: Tremont Capital Management, Credit Suisse Tremont Index and ECB calculations.
Note: Excluding funds of hedge funds. The estimated quarterly return to investors equals the difference between the change in capital under management and net flows. In this dataset, capital under management totalled USD 954 billion at the end of June 2006.

**Chart S15 Structure of global hedge fund capital under management**
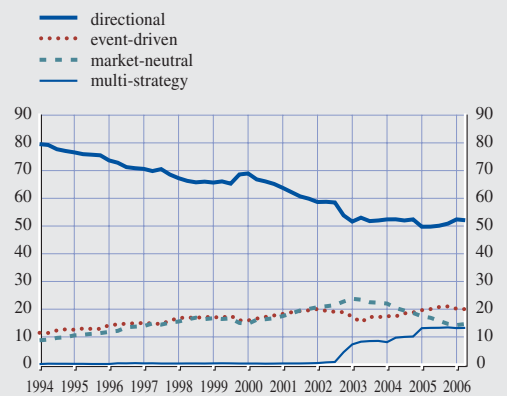
(Q1 1994 - Q2 2006, %)

— directional
···· event-driven
– – market-neutral
— multi-strategy



Sources: Tremont Capital Management and ECB calculations.
Note: Excluding funds of hedge funds. The directional group includes long/short equity hedge, global macro, emerging market, dedicated short bias and managed futures strategies. The market-neutral group consists of convertible arbitrage, fixed income arbitrage and equity market-neutral strategies.

# 2 INTERNATIONAL FINANCIAL MARKETS

## Chart S16 Nominal broad USD effective exchange rate index

(Jan. 2002 - Oct. 2006, index: Jan. 2002 = 100)



Source: US Federal Reserve Board.

## Chart S17 Three-month implied volatility for USD/EUR and JPY/USD

(Jan. 2004 - Nov. 2006, %)

USD/EUR
JPY/USD
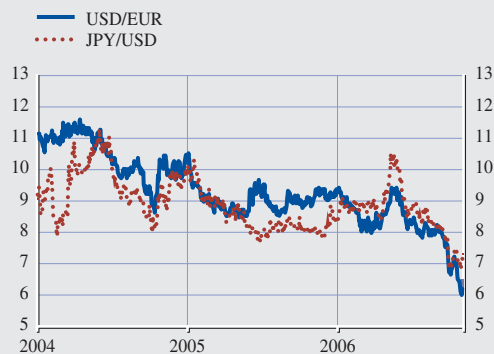


Source: Bloomberg.

## Chart S18 Government bond yields and term spreads in the US and Japan

(Jan. 1999 - Oct. 2006)
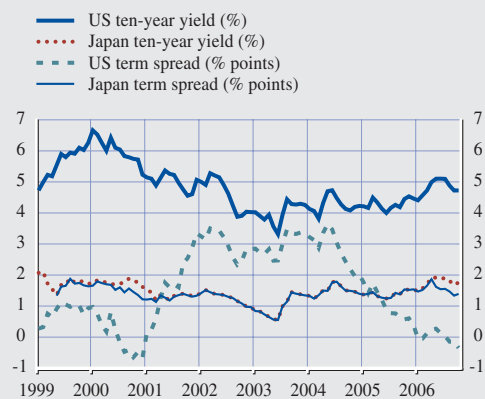
US ten-year yield (%)
Japan ten-year yield (%)
US term spread (% points)
Japan term spread (% points)



Sources: ECB and Bloomberg.
Note: The term spread is the difference between the ten-year bond yield and the three-month T-bill yield.

## Chart S19 Global risk aversion indicator

(Jan. 1992 - Oct. 2006)
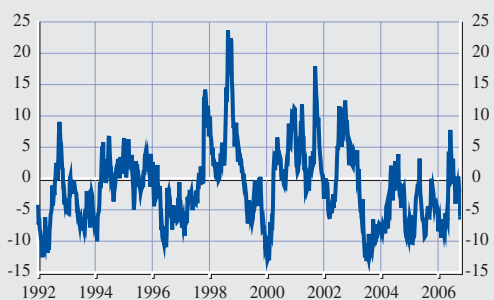


Source: Merrill Lynch.
Note: An increase in the risk aversion indicator reflects an increase in risk aversion. The indicator is based on eight indicators that have historically been sensitive to swings in risk appetite. Each component is expressed in terms of the number of standard deviations from its 52-week moving average, and the eight standard deviations are combined to generate a composite indicator.

**Chart S20 Stock prices in the US**

(Jan. 2002 - Nov. 2006, index: Jan. 2003 = 100)

— S&P 500
····· NASDAQ
- - - Dow Jones Wilshire 5000
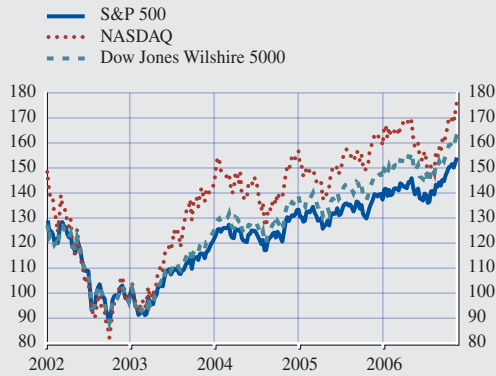


Source: Bloomberg.

**Chart S21 Price-earnings (P/E) ratio for the US stock market**

(Jan. 1985 - Oct. 2006, %, ten-year trailing earnings)



Sources: Thomson Financial Datastream and ECB calculations.
Note: The P/E ratio is based on prevailing stock prices relative to an average of the previous ten years of earnings.

**Chart S22 Implied volatility for the S&P 500 index**

(Jan. 2002 - Nov. 2006, %, CBOE Volatility Index (VIX))
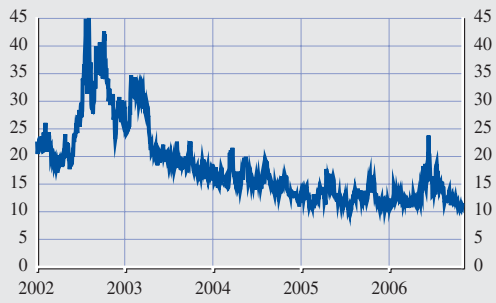


Source: Thomson Financial Datastream.
Note: Data calculated by the Chicago Board Options Exchange (CBOE).

**Chart S23 Option-implied probability distribution function for the S&P 500 index**
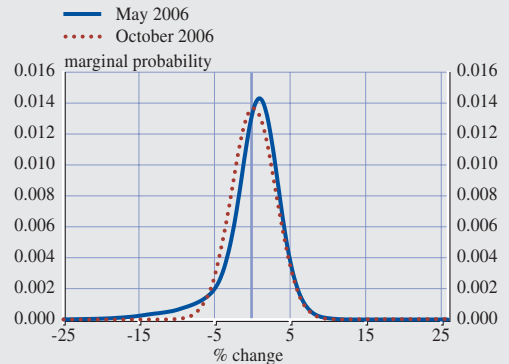
— May 2006
····· October 2006



Sources: Bloomberg and ECB calculations.
Note: Based on options with one-month maturities.

**Chart S24 Earnings, dividends and share buybacks of companies listed on the S&P 500 index**

(Q1 1998 - Q2 2006, USD billions)

 ━━━ share buybacks
 ▬▬▬ dividends
 ┅┅┅ operating earnings
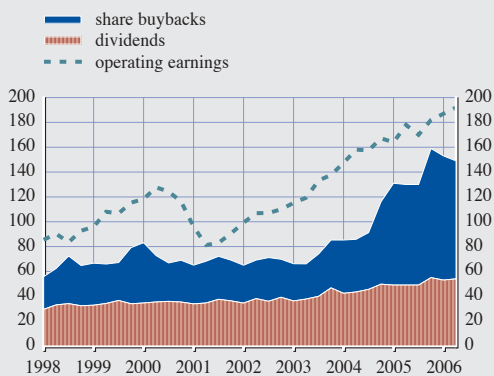


Source: Standard and Poor's.

**Chart S25 US mutual fund flows**

(Mar. 1998 - Sep. 2006, USD billions, three-month moving average)

 ━━━ stock funds
 ••••• government bond funds
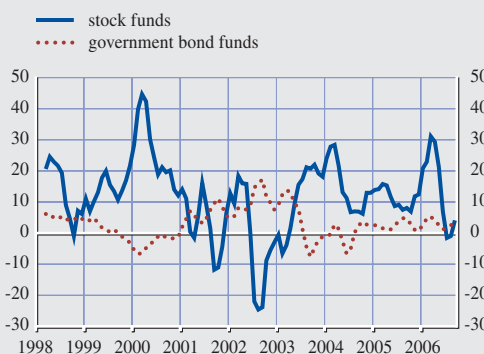


Source: Investment Company Institute.

**Chart S26 Debit balances in New York Stock Exchange margin accounts**

(Jan. 1992 - Sep. 2006, USD billions)



Source: New York Stock Exchange (NYSE).
Note: Borrowing to buy stocks "on margin" allows investors to use loans to pay for up to 50% of a stock's price.

**Chart S27 Open interest in options contracts on the S&P 500 index**

(Jan. 1999 - Oct. 2006, millions of contracts)



Source: Chicago Board Options Exchange (CBOE).

## Chart S28 Gross equity issuance in the US

(Jan. 2000 - Oct. 2006, USD billions, 12-month moving sums)

- Secondary Public Offerings – pipelines
- Secondary Public Offerings – realised
- Initial Public Offerings – pipelines
- Initial Public Offerings – realised
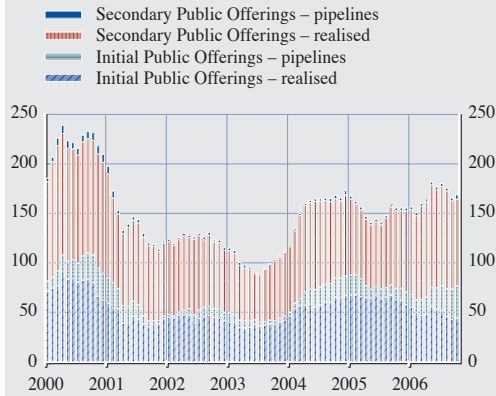
Source: Thomson Financial Datastream.

## Chart S29 Spreads on US high-yield corporate bonds

(Jan. 1999 - Nov. 2006, basis points)

Source: JP Morgan Chase & Co.
Note: The spread is between the yield to maturity of the US domestic high-yield index (BB+ rating or below, average maturity of 7.7 years) and the US ten-year government bond yield.

## Chart S30 Emerging market sovereign bond spreads

(Jan. 2002 - Nov. 2006, basis points)

- EMBI Global
- EMBIG Asia
- EMBIG Europe
- EMBIG Latin America
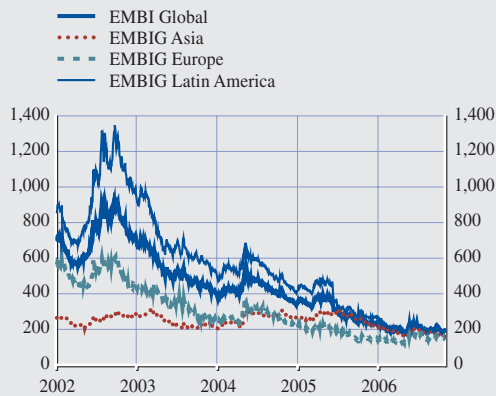
Source: JP Morgan Chase & Co.

## Chart S31 Emerging market local currency sovereign bond yields

(Jan. 2002 - Nov. 2006, basis points)

- GBI emerging markets
- GBI emerging Latin America
- GBI emerging Europe
- GBI emerging Asia
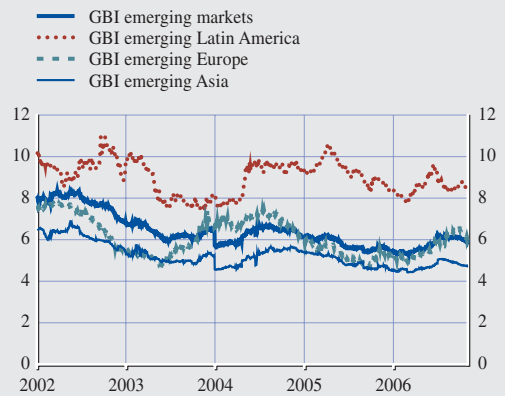
Source: JP Morgan Chase & Co.
Note: GBI stands for Government Bond Index.

## Chart S32 Emerging market stock price indices

(Jan. 2002 - Nov. 2006, index: Jan. 2002 = 100)

— MSCI emerging markets
···· MSCI Asia
- - - MSCI eastern Europe
— MSCI Latin America
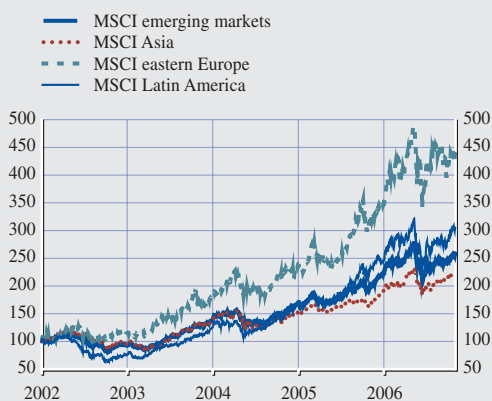


Source: Bloomberg.

## Table S3 Total international bond issuance (private and public) in selected emerging markets

(USD millions)

| | 2001 | 2002 | 2003 | 2004 | 2005 Q1 | 2005 Q2 | 2005 Q3 | 2005 Q4 | 2005 Total | 2006 Q1 | 2006 Q2 | 2006 Q3 | 2006 Q4 | 2006 Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Total Major EMEs** | 66,167 | 65,273 | 99,488 | 115,031 | 28,926 | 61,696 | 35,180 | 37,679 | 163,481 | 30,926 | 22,225 | 25,628 | 12,941 | 91,720 |
| **Latin America** | 29,154 | 18,963 | 32,635 | 36,782 | 9,087 | 42,569 | 12,573 | 10,049 | 74,278 | 11,154 | 2,230 | 7,337 | 2,126 | 22,848 |
| *of which:* | | | | | | | | | | | | | | |
| Argentina | 3,328 | - | - | 915 | 150 | 35,879 | - | 150 | 36,179 | 100 | 250 | 76 | - | 426 |
| Brazil | 7,417 | 5,736 | 11,803 | 9,426 | 3,402 | 2,735 | 9,262 | 2,423 | 17,823 | 4,924 | 1,010 | 2,924 | 829 | 9,688 |
| Chile | 2,150 | 1,399 | 1,000 | 1,307 | - | - | - | - | - | 428 | 200 | 200 | 500 | 1,328 |
| Colombia | 4,004 | 1,000 | 1,265 | 1,544 | 447 | - | 1,000 | 650 | 2,097 | 238 | 170 | 2,300 | - | 2,708 |
| Mexico | 7,552 | 6,098 | 11,226 | 15,501 | 3,363 | 1,475 | 800 | 1,216 | 6,853 | 3,000 | 100 | 150 | - | 3,250 |
| Venezuela | 1,729 | 1,049 | 4,478 | 4,380 | 1,325 | 1,604 | 150 | 3,000 | 6,079 | - | 100 | 250 | - | 350 |
| **Non-Japan Asia** | 31,616 | 35,782 | 50,148 | 58,117 | 12,154 | 11,558 | 16,426 | 18,629 | 58,766 | 13,527 | 13,017 | 13,550 | 4,713 | 44,807 |
| *of which:* | | | | | | | | | | | | | | |
| China | 2,552 | 860 | 2,979 | 6,188 | 526 | 195 | 1,500 | 1,546 | 3,766 | 161 | 682 | 425 | 257 | 1,526 |
| Hong Kong | 9,267 | 2,269 | 12,631 | 6,268 | 1,678 | 2,280 | 650 | 2,745 | 7,353 | 996 | 1,473 | 1,635 | 96 | 4,201 |
| India | 99 | 153 | 450 | 4,167 | 958 | 500 | 1,347 | 1,484 | 4,289 | 3,205 | 1,595 | 1,019 | 440 | 6,259 |
| South Korea | 6,385 | 11,843 | 11,028 | 16,018 | 3,744 | 2,913 | 3,566 | 6,536 | 16,759 | 2,517 | 3,981 | 5,254 | 905 | 12,658 |
| Malaysia | 1,766 | 5,965 | 1,364 | 3,440 | 1,053 | 1,095 | 900 | 200 | 3,248 | 1,450 | - | 1,022 | 970 | 3,442 |
| Singapore | 7,400 | 812 | 3,885 | 7,388 | 425 | 1,025 | 3,337 | 756 | 5,543 | 144 | 2,860 | 1,486 | 325 | 4,815 |
| Thailand | - | 48 | 300 | 1,400 | 150 | 650 | 650 | 350 | 1,800 | 270 | 320 | 110 | 220 | 920 |
| **Emerging Europe** | 5,397 | 10,529 | 16,706 | 20,132 | 7,685 | 7,570 | 6,182 | 9,001 | 30,438 | 6,245 | 6,977 | 4,741 | 6,102 | 24,065 |
| *of which:* | | | | | | | | | | | | | | |
| Russia | 1,503 | 3,713 | 8,585 | 10,490 | 3,531 | 4,072 | 4,438 | 5,283 | 17,324 | 3,085 | 5,283 | 3,407 | 4,122 | 15,898 |
| Turkey | 2,159 | 3,460 | 5,454 | 6,477 | 3,794 | 2,775 | 1,468 | 1,809 | 9,847 | 2,713 | 1,293 | 792 | 1,879 | 6,677 |
| Ukraine | - | 399 | 1,250 | 2,058 | 100 | 109 | 275 | 1,323 | 1,808 | 447 | - | 350 | 100 | 897 |
| Bulgaria | 223 | 1,248 | 62 | 10 | 260 | - | - | - | 260 | - | 401 | - | - | 401 |
| Romania | 794 | 1,062 | 814 | - | - | 614 | - | 585 | 1,199 | - | - | - | - | - |
| Croatia | 718 | 647 | 541 | 1,098 | - | - | - | - | - | - | - | 192 | - | 192 |

Source: Dealogic (Bondware).
Note: Regions are defined as follows. Latin America: Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Panama, Paraguay, Peru, Uruguay and Venezuela. Non-Japan Asia: Brunei, Burma, China, Special Administrative Region of Hong Kong, Indonesia, Laos, Macau, Malaysia, Nauru, North Korea, the Philippines, Samoa, Singapore, South Korea, Taiwan, Thailand and Vietnam. Emerging Europe: Bulgaria, Croatia, Romania, Russia, Turkey and Ukraine.

## Chart S33 Precious metals prices

(Jan. 1999 - Oct. 2006, index: Jan. 1999 = 100, prices in USD)

- gold
- silver
- platinum
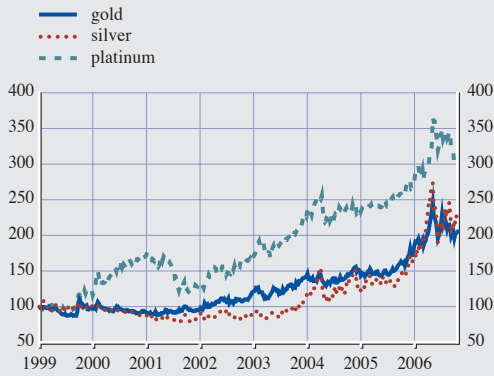


Source: Bloomberg.

## Chart S34 Crude oil futures contracts

(Jan. 2001 - Oct. 2006, thousands of contracts)

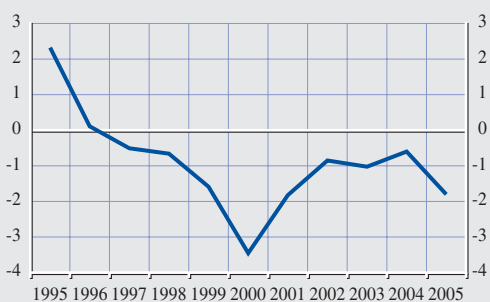- total futures contracts
- non-commercial futures contracts



Source: Bloomberg.
Note: Futures traded on the New York Mercantile Exchange. Non-commercial futures contracts are contracts bought for purposes other than hedging.

# 3 EURO AREA ENVIRONMENT

## Chart S35 Net lending/borrowing of non-financial corporations in the euro area

(1995 - 2005, financing gap, % of GDP)



Source: ECB.
Note: Data for 2005 are estimates using flow-of-funds projections.

## Chart S36 Total debt of non-financial corporations in the euro area

(Q1 1998 - Q3 2006, %)

— debt-to-GDP ratio (left-hand scale)
······ debt-to-equity ratio (right-hand scale)
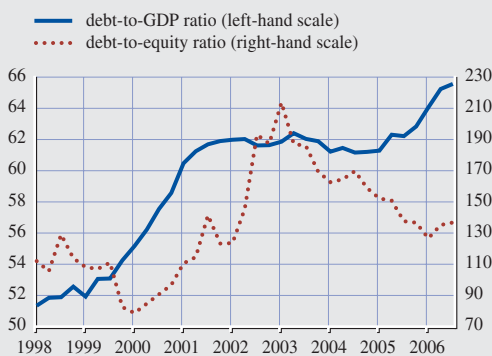


Source: ECB.
Note: Data for Q4 2005 and Q1 2006 are partly based on estimates.

## Chart S37 Total debt-to-financial assets ratio of non-financial corporations in the euro area

(Q1 1998 - Q1 2006, %)
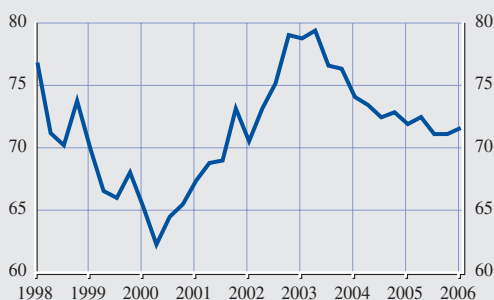


Source: ECB.
Note: Data for 2005 and Q1 2006 are partly based on estimates.

## Chart S38 Annual growth in loans to non-financial corporations in the euro area for selected maturities

(Q1 1999 - Q3 2006, % per annum)

— up to 1 year
······ over 1 and up to 5 years
– – – over 5 years
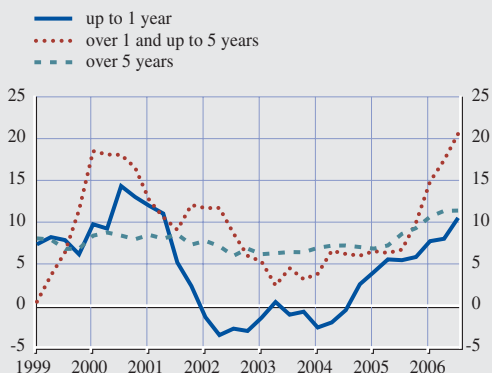


Source: ECB.
Note: Data are based on financial transactions of MFIs' loans.

**Chart S39 Annual growth in debt securities issued by non-financial corporations in the euro area**

(Jan. 2000 - Aug. 2006, % per annum)

— fixed-rate long-term debt securities
· · · variable-rate long-term debt securities
- - - short-term debt securities
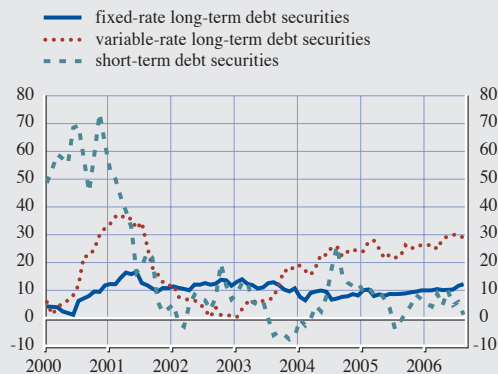


Source: ECB.

**Chart S40 Real cost of external financing of euro area non-financial corporations**

(Jan. 1999 - Aug. 2006, %)

— overall cost of financing
· · · real short-term MFI lending rates
- - - real long-term MFI lending rates
— real cost of market-based debt
· · · · real cost of quoted equity
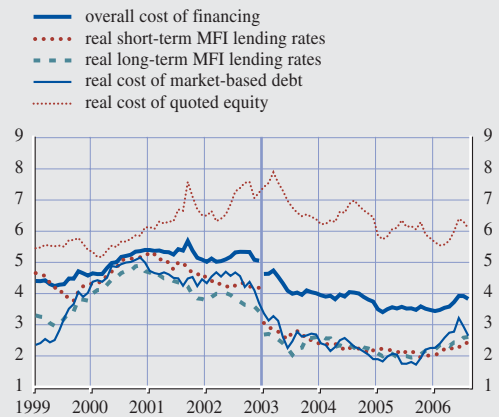


Sources: ECB, Thomson Financial Datastream, Merrill Lynch, Consensus Economics Forecast and ECB calculations.
Note: The real cost of external financing is calculated as a weighted average of the cost of bank lending, the cost of debt securities and the cost of equity, based on their respective amounts outstanding and deflated by inflation expectations. The introduction of the MFI interest rate statistics at the beginning of 2003 led to a statistical break in the series.

**Chart S41 Euro area non-financial corporations' rating changes**

(Jan. 1999 - Sep. 2006, number)

— upgrades
▦ downgrades
- - - balance
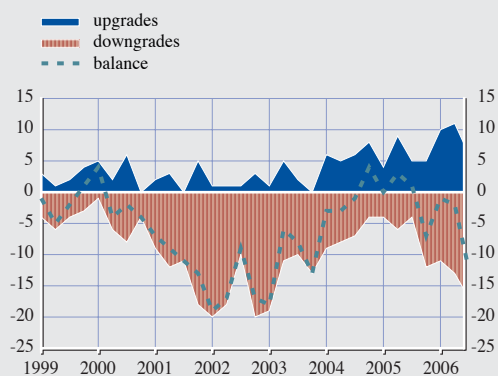


Source: Moody's.

**Chart S42 Euro area non-financial corporations' and global speculative-grade default rates**

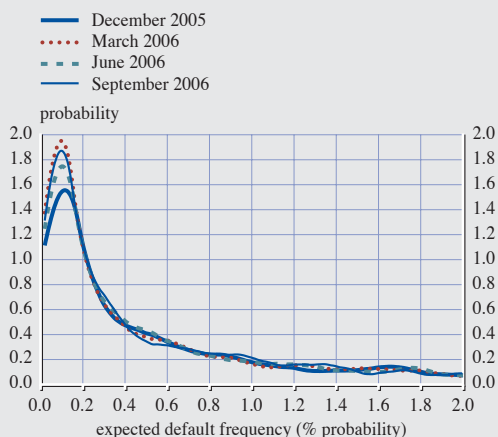(Jan. 1999 - Sep. 2007, %, 12-month trailing sum)

— euro area non-financial corporations' default rate
· · · global default rate
- - - global default rate, Sep. 2006 forecast
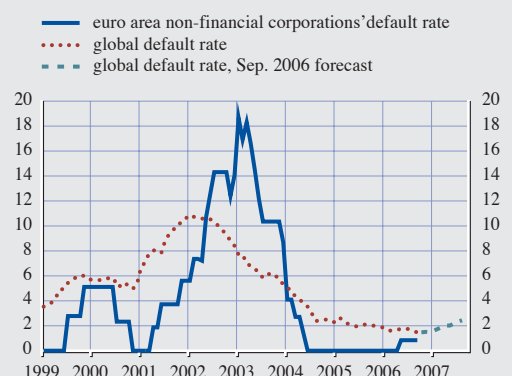


Source: Moody's.

**Chart S43 Euro area non-financial corporations' expected default frequency (EDF) distributions**

- December 2005
- March 2006
- June 2006
- September 2006



Sources: Moody's KMV and ECB calculations.
Note: The EDF provides an estimate of the probability of default over the following year.

**Chart S44 Expected default frequency (EDF) distributions for large and small euro area non-financial corporations**
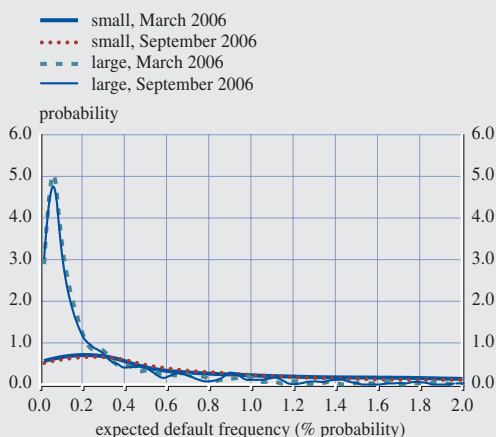
- small, March 2006
- small, September 2006
- large, March 2006
- large, September 2006



Sources: Moody's KMV and ECB calculations.
Note: The EDF provides an estimate of the probability of default over the following year. The size is determined by the quartiles of the value of liabilities: small if in the lower and large if in the upper quartile of the distribution.

**Chart S45 Euro area country distributions of commercial property price changes**

(2000 - 2005, capital values, minimum, maximum and inter-quartile distribution, % change per annum)
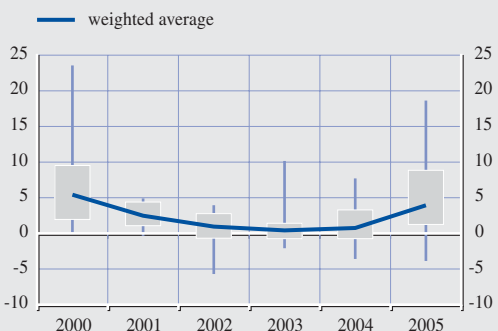
- weighted average



Sources: Investment Property Databank and ECB calculations.
Note: The data cover eight euro area countries (representing around 90% of euro area GDP). The coverage of the total property sector within countries ranges between 40% and 85%.

**Chart S46 Euro area commercial property prices in different sectors**

(2000 - 2005, capital values, % per annum)
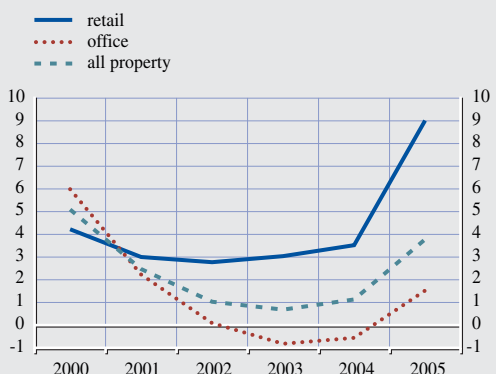
- retail
- office
- all property



Sources: Investment Property Databank and ECB calculations.
Note: The data cover eight euro area countries (representing around 90% of euro area GDP). The coverage of the total property sector within countries ranges between 40% and 85%.

## Chart S47 Household debt-to-GDP ratio in the euro area

(Q1 1998 - Q2 2006, %)
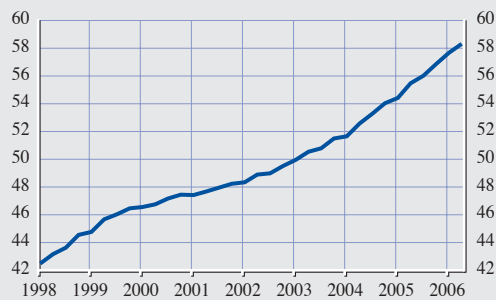


Sources: ECB and Eurostat.
Note: Data for Q1 and Q2 2006 are estimated on the basis of monetary data.

## Chart S48 Ratio of household debt to financial assets and liquid financial assets in the euro area

(1995 - 2005, %)

— household debt-to-financial assets ratio (right-hand scale)
···· household debt-to-liquid financial assets ratio (left-hand scale)
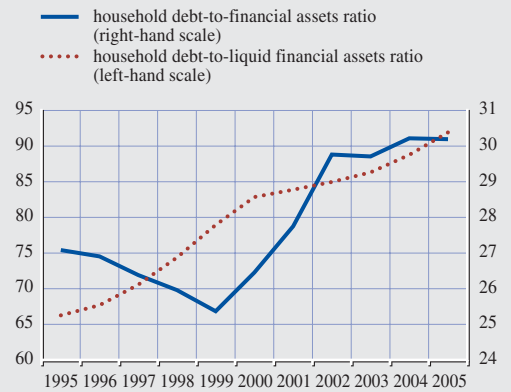


Source: ECB.

## Chart S49 Annual growth in loans to households in the euro area

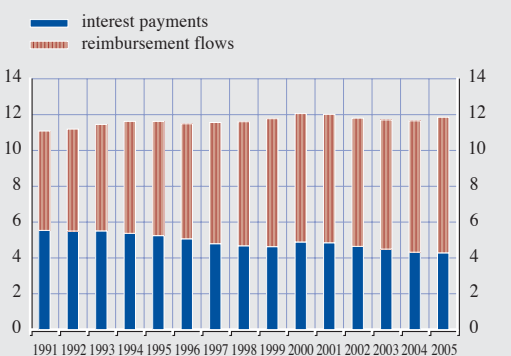(Q1 1999 - Q3 2006, % per annum)

— consumer credit
···· house purchase
-- other lending
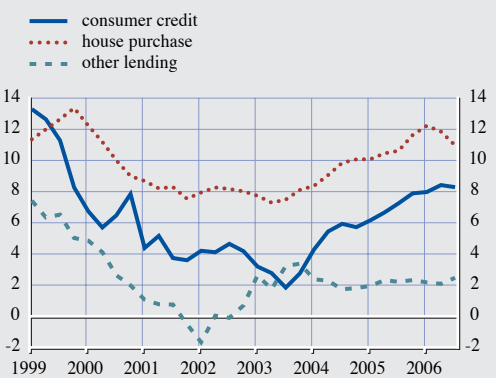


Source: ECB.
Note: Data are based on financial transactions of MFIs' loans.

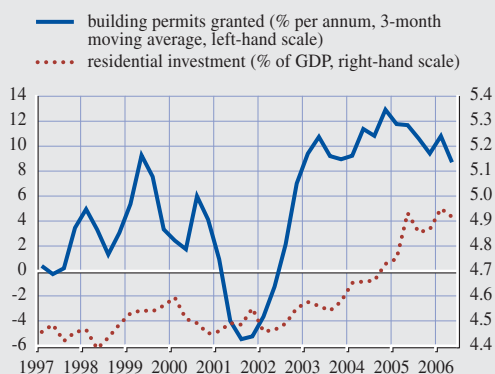## Chart S50 Total debt-servicing burden of the euro area household sector

(1991 - 2005, % of disposable income)

■ interest payments
▥ reimbursement flows



Source: ECB calculations.

## Chart S51 Building permits and residential investment in the euro area

(Q1 1997 - Q2 2006)

——— building permits granted (% per annum, 3-month moving average, left-hand scale)
········ residential investment (% of GDP, right-hand scale)
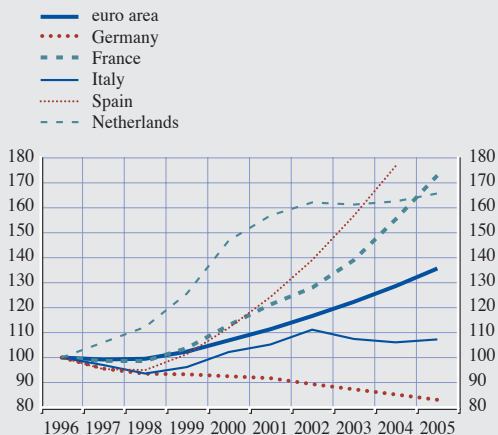


Sources: ECB, Eurostat and ECB calculations.
Note: Germany is excluded owing to the effects of reunification on aggregate residential investment.

## Chart S52 House price-to-rent ratio for the euro area

(1996 - 2005, index: 1996 = 100)

——— euro area
········ Germany
– – – France
——— Italy
········ Spain
– – – Netherlands



Source: ECB.

## Table S4 Residential property price growth rates in the euro area countries

(% per annum)

| | 2001 | 2002 | 2003 | 2004 | 2005 | 2005 H1 | 2005 H2 | 2006 H1 | 2006 H2 | 2005 Q1 | 2005 Q2 | 2005 Q3 | 2005 Q4 | 2006 Q1 | 2006 Q2 | 2006 Q3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Belgium [1] | 6.7 | 7.7 | 6.1 | 10.7 | 17.2 | 18.4 | 16.0 | - | - | 17.9 | 18.9 | 16.1 | 15.9 | - | - | - |
| Germany [2] | 0.2 | -1.2 | -1.3 | -1.5 | -1.6 | - | - | - | - | - | - | - | - | - | - | - |
| Greece [2] | 14.5 | 13.0 | 5.7 | 2.6 | - | 8.9 | - | - | - | 7.3 | 10.4 | - | - | - | - | - |
| Spain [2] | 9.9 | 15.7 | 17.6 | 17.4 | 13.9 | 14.8 | 13.1 | 11.4 | - | 15.7 | 13.9 | 13.4 | 12.8 | 12.0 | 10.8 | - |
| France [3] | 7.9 | 8.3 | 11.7 | 15.2 | 15.3 | 15.5 | 15.1 | 13.6 | - | 15.7 | 15.3 | 15.5 | 14.8 | 14.8 | 12.5 | - |
| Ireland [2] | 8.1 | 10.1 | 15.2 | 11.4 | 11.5 | 10.8 | 12.1 | - | - | 11.1 | 10.5 | 11.5 | 12.7 | 13.6 | - | - |
| Italy [2] | 7.4 | 13.7 | 10.6 | 9.2 | 9.7 | 11.6 | 7.9 | 6.4 | - | - | - | - | - | - | - | - |
| Luxembourg [1] | 13.8 | 11.7 | 12.9 | 10.0 | - | - | - | - | - | - | - | - | - | - | - | - |
| Netherlands [3] | 11.2 | 8.5 | 4.9 | 4.2 | 4.8 | 4.9 | 4.8 | 4.7 | - | 4.9 | 4.8 | 4.9 | 4.7 | 4.7 | 4.7 | 4.2 |
| Austria [2] | 2.1 | 0.2 | 0.3 | -2.1 | 5.1 | 6.8 | 3.4 | 4.1 | - | 9.5 | 4.2 | 3.8 | 3.1 | 4.1 | 4.1 | - |
| Portugal [2] | 3.6 | 1.1 | 1.6 | 0.4 | - | 1.9 | - | - | - | 0.5 | 3.2 | - | - | - | - | - |
| Finland [2] | 0.7 | 6.1 | 6.3 | 7.3 | 6.1 | 4.6 | 7.6 | 8.3 | - | 4.4 | 4.8 | 6.8 | 8.4 | 8.8 | 7.8 | 6.9 |
| euro area | 5.7 | 6.9 | 6.9 | 7.2 | 7.6 | 8.0 | 7.2 | - | - | - | - | - | - | - | - | - |

Sources: National sources and ECB calculations.
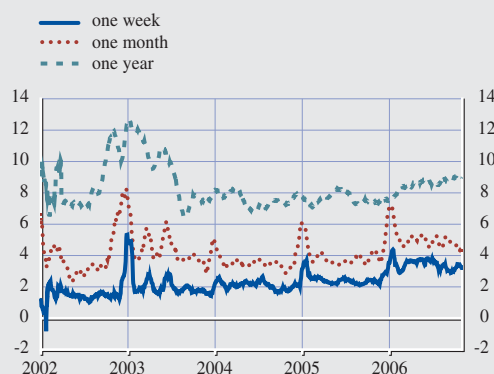1) New and existing houses, whole country.
2) All dwellings (new and existing houses and flats), whole country.
3) Existing dwellings (houses and flats), whole country.

# 4 EURO AREA FINANCIAL MARKETS

**Chart S53 Euro area spreads between interbank deposit and repo interest rates**

(Jan. 2002 - Nov. 2006, basis points, 20-day moving average)

— one week
···· one month
– – one year



Source: ECB.

**Chart S54 Bid-ask spreads for EONIA swap rates**

(Jan. 2003 - Oct. 2006, basis points, 20-day moving average, transaction weighted)

— one month
···· three months
– – one year



Source: ECB.

**Chart S55 Euro area government bond yields and term spread**

(Jan. 1999 - Oct. 2006)
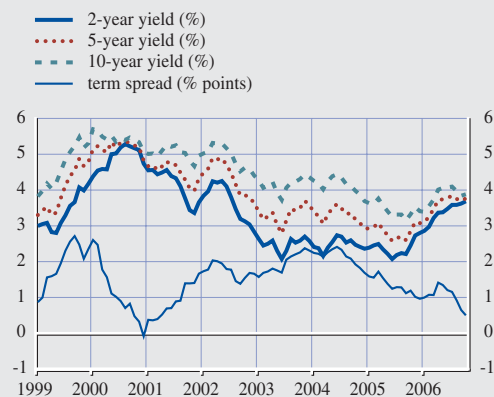
— 2-year yield (%)
···· 5-year yield (%)
– – 10-year yield (%)
— term spread (% points)



Sources: ECB and Bloomberg.
Note: The term spread is the difference between the ten-year bond yield and the three-month T-bill yield.

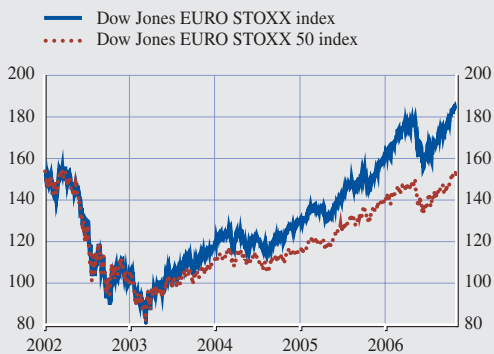**Chart S56 Option-implied skewness coefficient for ten-year bond yields in Germany**

(Jan. 1999 - Sep. 2006, average monthly skewness)
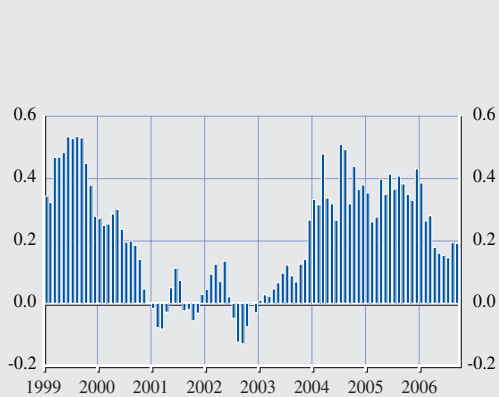


Sources: Eurex and ECB calculations.

## Chart S57 Stock prices in the euro area

(Jan. 2002 - Nov. 2006, index: Jan. 2003 = 100)

——— Dow Jones EURO STOXX index
········ Dow Jones EURO STOXX 50 index

Source: Bloomberg.

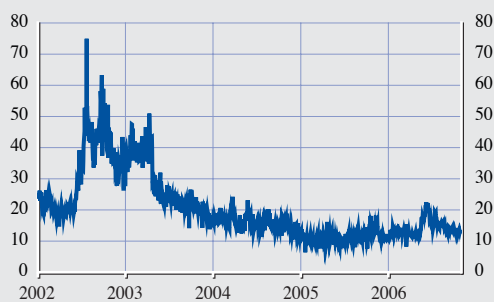## Chart S58 Price-earnings (P/E) ratio for the euro area stock market

(Jan. 1985 - Oct. 2006, %, ten-year trailing earnings)

Source: Thomson Financial Datastream.
Note: The P/E ratio is based on prevailing stock prices relative to an average of the previous ten years of earnings.
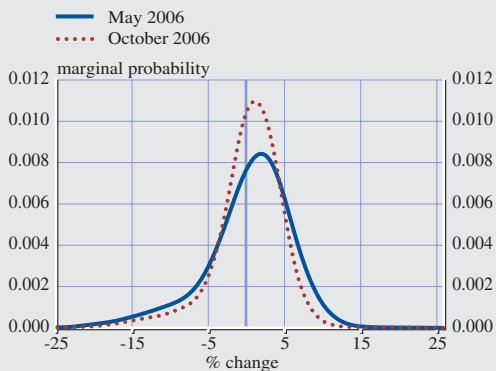
## Chart S59 Implied volatility for the Dow Jones EURO STOXX 50 index

(Jan. 2002 - Oct. 2006, %)

Source: Bloomberg.

## Chart S60 Option-implied probability distribution function for the Dow Jones EURO STOXX 50 index

——— May 2006
········ October 2006

marginal probability

% change

Sources: Bloomberg and ECB calculations.
Note: Based on options with one-month maturities.

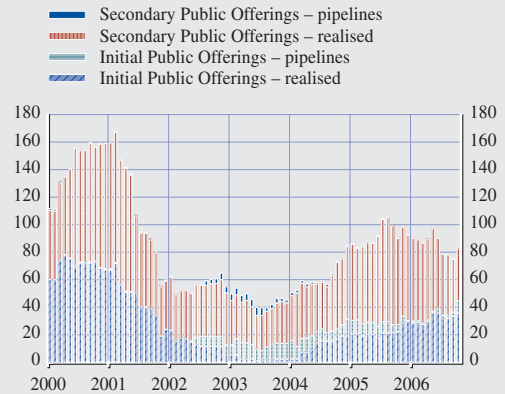## Chart S61 Open interest in options contracts on the Dow Jones EURO STOXX 50 index

(Jan. 1999 - Sep. 2006, millions of contracts)



Source: Eurex.

## Chart S62 Gross equity issuance and pipeline deals in the euro area

(Jan. 2000 - Oct. 2006, EUR billions, 12-month moving sums)

- Secondary Public Offerings – pipelines
- Secondary Public Offerings – realised
- Initial Public Offerings – pipelines
- Initial Public Offerings – realised



Source: Thomson Financial Datastream.

## Chart S63 Corporate bond spreads in the euro area

(Jan. 1999 - Nov. 2006, basis points)

- BBB
- A
- AA
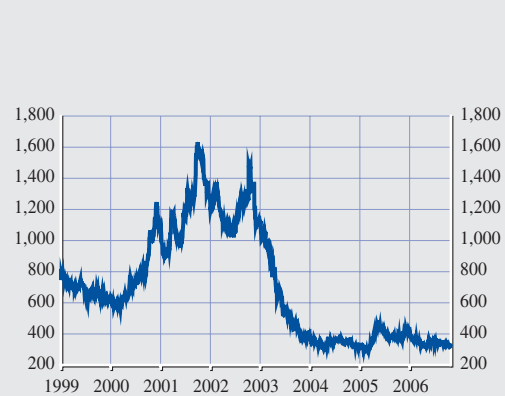- AAA
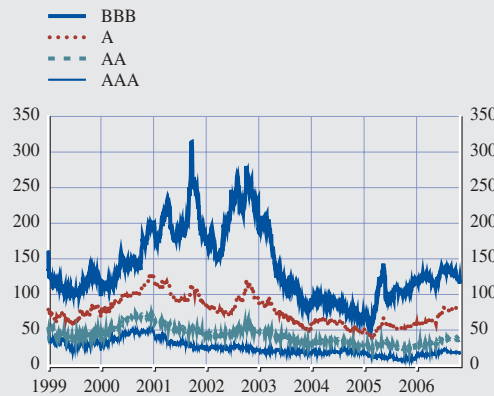


Source: Thomson Financial Datastream.
Note: Spread between the seven to ten-year yield to maturity and the euro area seven to ten-year government bond yield.

## Chart S64 Spreads on euro area high-yield corporate bonds

(Jan. 1999 - Nov. 2006, basis points)



Source: JP Morgan Chase & Co.
Note: Spread between the yield to maturity of the euro area high-yield index (BB+ rating or below, average maturity of 5.5 years) and the euro area five-year government bond yield.

## Chart S65 iTraxx Europe and HiVol five-year indices

(Jan. 2005 - Nov. 2006, basis points)

iTraxx Europe 5 years
iTraxx HiVol 5 years



Sources: iTraxx and Bloomberg.
Note: The iTraxx Europe index is composed of the top 125 names in terms of CDS volume. Its composition is renewed every six months. The iTraxx HiVol index consists of 30 reference entities from the iTraxx Europe index with the highest 5-year CDS premiums.

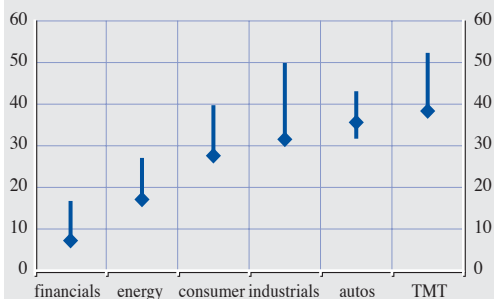## Chart S66 Term structures of premiums for iTraxx Europe and HiVol

(basis points)

iTraxx Europe 2 Nov. 2006
iTraxx Europe 5 May 2006
iTraxx HiVol 2 Nov. 2006
iTraxx HiVol 5 May 2006
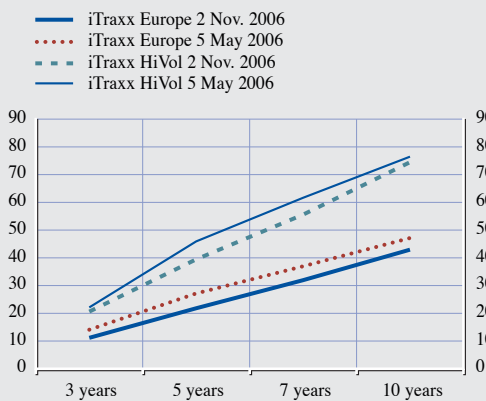


Sources: iTraxx and Bloomberg.

## Chart S67 iTraxx sector indices

(May 2006 - Nov. 2006, basis points)



Sources: iTraxx and Bloomberg.
Note: The diamonds show the most recent observation and the bars show the range of variation over the six months to the cut-off date.

# 5 EURO AREA FINANCIAL INSTITUTIONS

## Table S5 Financial conditions of large and complex banking groups in the euro area
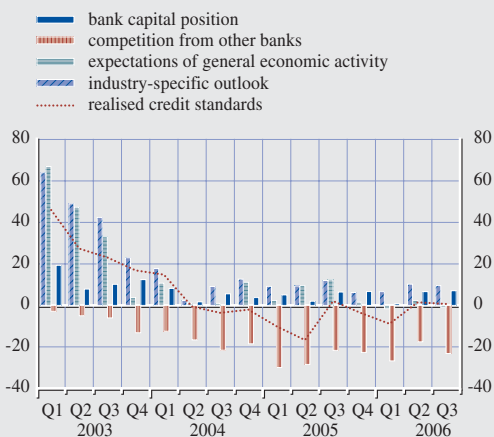
(2004 - H1 2006)

| | min. | 1st quartile | median | average | weighted average | 3rd quartile | max. |
|---|---|---|---|---|---|---|---|
| **Return on equity (%)** | | | | | | | |
| 2004 | 4.30 | 10.27 | 17.00 | 17.17 | 17.32 | 20.85 | 33.20 |
| 2005 | 9.00 | 16.22 | 17.60 | 19.56 | 19.87 | 23.25 | 37.00 |
| H1 2006 | 9.10 | 18.07 | 22.20 | 20.78 | 20.77 | 23.75 | 35.80 |
| **Return on risk-weighted assets (%)** | | | | | | | |
| 2004 | 0.20 | 1.11 | 1.14 | 1.14 | 1.17 | 1.50 | 2.26 |
| 2005 | 0.81 | 1.11 | 1.51 | 1.44 | 1.46 | 1.75 | 2.26 |
| H1 2006 | 0.72 | 1.15 | 1.44 | 1.51 | 1.43 | 1.85 | 2.78 |
| **Net interest income (% total assets)** | | | | | | | |
| 2004 | 0.43 | 0.68 | 0.90 | 1.04 | 0.93 | 1.31 | 1.87 |
| 2005 | 0.48 | 0.60 | 0.72 | 0.94 | 0.87 | 1.30 | 1.84 |
| H1 2006 | 0.49 | 0.69 | 0.80 | 0.97 | 0.91 | 1.12 | 2.08 |
| **Net interest income (% total income)** | | | | | | | |
| 2004 | 24.07 | 38.89 | 52.32 | 47.85 | 47.85 | 56.51 | 69.54 |
| 2005 | 23.53 | 35.22 | 50.36 | 48.12 | 46.04 | 59.88 | 68.70 |
| H1 2006 | 25.50 | 39.58 | 49.12 | 47.41 | 46.99 | 53.68 | 72.57 |
| **Trading income (% total income)** | | | | | | | |
| 2004 | 2.69 | 7.37 | 9.59 | 11.98 | 12.98 | 15.68 | 28.73 |
| 2005 | 2.58 | 6.86 | 9.66 | 12.73 | 14.16 | 15.35 | 37.14 |
| H1 2006 | 0.00 | 7.39 | 13.47 | 14.26 | 15.84 | 18.39 | 32.87 |
| **Fees and commissions (% total income)** | | | | | | | |
| 2004 | 15.90 | 20.67 | 29.34 | 29.27 | 28.96 | 36.84 | 44.15 |
| 2005 | 17.12 | 21.69 | 30.00 | 28.40 | 27.92 | 34.80 | 40.02 |
| H1 2006 | 12.85 | 17.91 | 27.02 | 26.51 | 26.42 | 34.14 | 39.84 |
| **Other income (% total income)** | | | | | | | |
| 2004 | -3.07 | 2.51 | 4.25 | 5.81 | 5.95 | 6.88 | 26.70 |
| 2005 | -0.76 | 2.74 | 4.71 | 5.75 | 6.35 | 2.74 | 16.73 |
| H1 2006 | -0.70 | 2.69 | 4.61 | 9.09 | 8.43 | 2.69 | 16.73 |
| **Net loan impairment charges (% total assets)** | | | | | | | |
| 2004 | 0.03 | 0.06 | 0.07 | 0.11 | 0.09 | 0.09 | 0.40 |
| 2005 | -0.02 | 0.02 | 0.05 | 0.08 | 0.08 | 0.11 | 0.29 |
| H1 2006 | -0.01 | 0.02 | 0.05 | 0.09 | 0.08 | 0.13 | 0.34 |
| **Cost-income ratio (%)** | | | | | | | |
| 2004 | 48.60 | 60.00 | 67.50 | 66.50 | 68.48 | 70.90 | 85.30 |
| 2005 | 46.70 | 57.40 | 63.40 | 63.40 | 63.84 | 67.00 | 89.40 |
| H1 2006 | 38.50 | 52.85 | 61.60 | 59.10 | 60.52 | 64.00 | 77.70 |
| **Tier 1 ratio (%)** | | | | | | | |
| 2004 | 6.32 | 7.04 | 7.70 | 8.03 | 7.87 | 8.45 | 10.90 |
| 2005 | 5.53 | 7.55 | 8.10 | 8.38 | 8.14 | 9.10 | 11.60 |
| H1 2006 | 5.94 | 7.31 | 7.60 | 8.18 | 8.00 | 9.00 | 11.40 |
| **Overall solvency ratios (%)** | | | | | | | |
| 2004 | 8.46 | 10.40 | 11.10 | 11.34 | 11.02 | 12.77 | 13.30 |
| 2005 | 8.50 | 10.74 | 11.30 | 11.70 | 11.39 | 12.48 | 16.30 |
| H1 2006 | 9.50 | 10.50 | 10.92 | 11.31 | 11.19 | 11.45 | 15.70 |

Sources: Individual institutions' financial reports and ECB calculations.

**Chart S68 Changes in bank credit standards applied to loans and credit lines to enterprises and contributing factors**

(Q1 2003 - Q3 2006, net %)

- bank capital position
- competition from other banks
- expectations of general economic activity
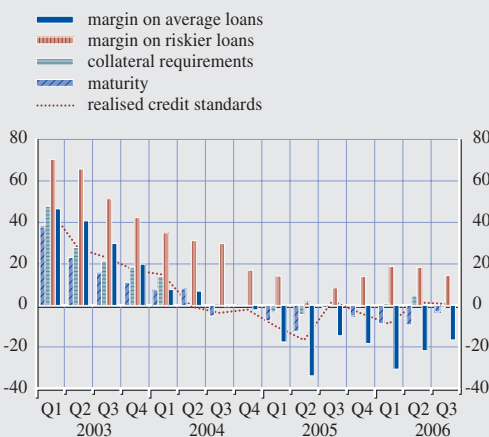- industry-specific outlook
- realised credit standards



Source: ECB.
Note: The net percentages refer to the difference between banks reporting that credit standards tightened and given factors contributed to tightening of credit standards compared to the previous quarter and those banks reporting that they were eased.

**Chart S69 Changes in bank credit standards applied to loans and credit lines to enterprises, including terms and conditions**

(Q1 2003 - Q3 2006, net %)

- margin on average loans
- margin on riskier loans
- collateral requirements
- maturity
- realised credit standards



Source: ECB.
Note: The net percentages refer to the difference between banks reporting that credit standards, terms and conditions tightened compared to the previous quarter and those banks reporting that they were eased.

**Chart S70 Changes in bank credit standards applied to loans to households for house purchase and contributing factors**

(Q1 2003 - Q3 2006, net %)

- expectations about general economic activity
- housing market prospects
- competition from other banks
- competition from non-banks
- realised credit standards



Source: ECB.
Note: The net percentages refer to the difference between banks reporting that credit standards tightened and given factors contributed to tightening of credit standards compared to the previous quarter and those banks reporting that they were eased.

**Chart S71 Changes in bank credit standards applied to consumer credit loans to households and contributing factors**

(Q1 2003 - Q3 2006, net %)

- expectations about general economic activity
- creditworthiness of consumers
- competition from other banks
- competition from non-banks
- realised credit standards



Source: ECB.
Note: The net percentages refer to the difference between banks reporting that credit standards tightened and given factors contributed to tightening of credit standards compared to the previous quarter and those banks reporting that they were eased.

**Chart S72 Cross-border activity of euro area MFIs**

(Q1 1999 - Q2 2006, % of total domestic outstanding amounts)

— cross-border non-bank securities
···· cross-border interbank loans
– – cross-border loans to non-banks
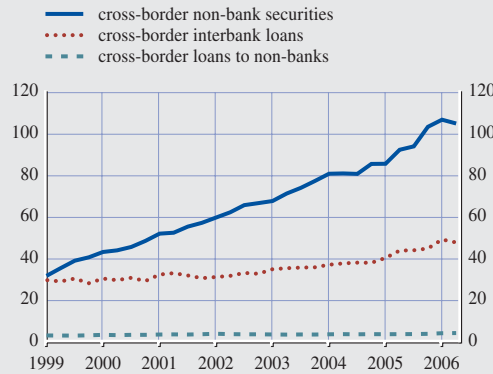
Source: ECB.
Note: Cross-border activity refers to cross-euro area activity (i.e. it excludes international activities outside the euro area and in third countries), and is based on unconsolidated data (i.e. a loan by a euro area MFI to its foreign branch or subsidiary is classified as cross-border).

**Chart S73 Annual growth in euro area MFI loans extended by sector**

(Q1 1999 - Q3 2006, % per annum)

— households
···· non-financial corporations
– – MFIs
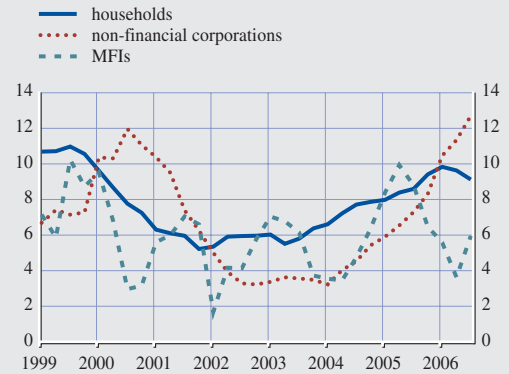
Source: ECB.
Note: Data are based on financial transactions of MFI loans.

**Chart S74 Annual growth in euro area MFIs' securities and shares issuance**

(Jan. 2003 - Aug. 2006, % per annum)

— securities other than shares (all currencies)
···· securities other than shares (EUR)
– – quoted shares
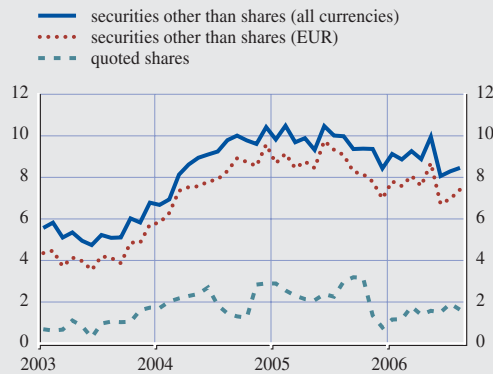
Source: ECB.

**Chart S75 Euro area MFIs' foreign currency-denominated assets, selected balance sheet items**

(Q1 1998 - Q2 2006)

— USD securities other than shares (% of total foreign currency-denominated securities other than shares)
···· USD loans (% of total foreign currency-denominated loans)
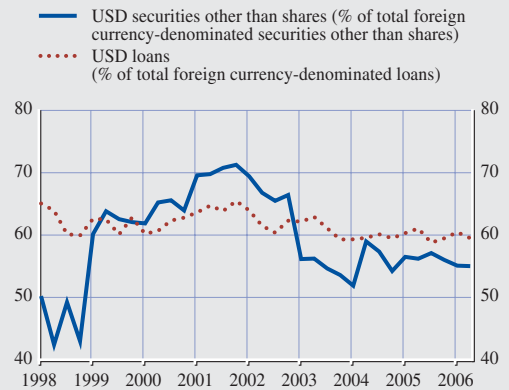
Source: ECB.

## Chart S76 Lending margins of euro area MFIs

(Jan. 2003 - Aug. 2006, % points)

── household lending
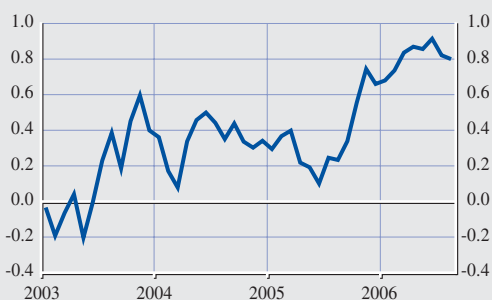······ lending to non-financial corporations
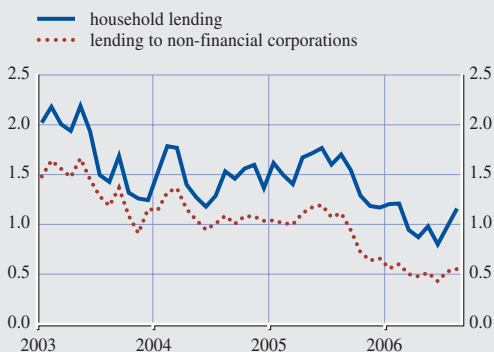


Source: ECB.
Note: The weighted lending margins are the difference between the interest rate on new lending and the interest rate swap rate, where both have corresponding initial rate fixations/maturities.

## Chart S77 Deposit margins of euro area MFIs

(Jan. 2003 - Aug. 2006, % points)



Source: ECB.
Note: The weighted deposit margins are the difference between the interest rate swap rate and the deposit rate, where both have corresponding initial rate fixations/maturities.

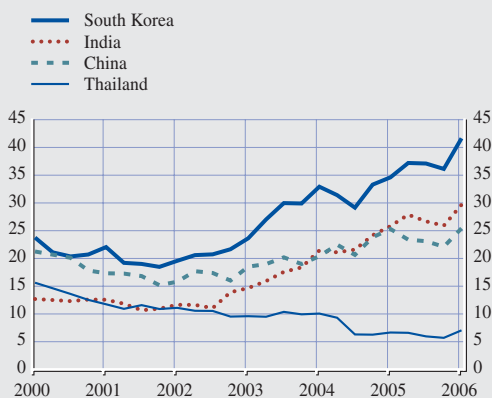## Chart S78 International exposure of euro area banks to Latin American countries

(Q1 2000 - Q1 2006, USD billions)

── Mexico
······ Brazil
─ ─ Chile
── Argentina
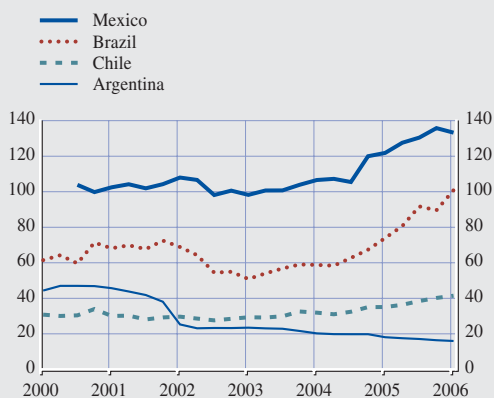


Source: BIS.

## Chart S79 International exposure of euro area banks to Asian countries

(Q1 2000 - Q1 2006, USD billions)

── South Korea
······ India
─ ─ China
── Thailand



Source: BIS.

(USD billions)

| | 2004 | | | | 2005 | | | | 2006 |
| | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 |
|---|---|---|---|---|---|---|---|---|---|
| **Total all countries** | 4,823.7 | 4,815.5 | 4,900.4 | 5,586.7 | 5,786.2 | 5,996.0 | 6,107.6 | 5,892.6 | 6,434.1 |
| **Total non-developed countries (incl. offshore centres)** | 1,184.8 | 1,208.7 | 1,238.5 | 1,408.8 | 1,436.1 | 1,552.4 | 1,599.3 | 1,572.9 | 1,684.7 |
| Hong Kong | 35.3 | 36.3 | 36.7 | 41.1 | 35.9 | 48.1 | 54.2 | 46.9 | 44.9 |
| Singapore | 34.8 | 34.1 | 34.2 | 36.2 | 35.8 | 38.7 | 39.7 | 37.5 | 43.3 |
| **Total offshore centres** | 331.6 | 343.6 | 364.7 | 417.0 | 425.9 | 446.1 | 446.6 | 436.0 | 470.0 |
| China | 20.4 | 22.5 | 20.6 | 23.8 | 25.3 | 23.4 | 23.1 | 22.1 | 25.4 |
| India | 21.4 | 21.1 | 21.6 | 24.2 | 25.8 | 27.9 | 26.7 | 25.9 | 29.7 |
| Indonesia | 15.2 | 14.4 | 15.5 | 15.8 | 15.4 | 15.0 | 14.2 | 12.9 | 14.4 |
| Malaysia | 8.4 | 7.9 | 8.1 | 9.9 | 10.1 | 10.9 | 9.7 | 8.7 | 10.6 |
| Philippines | 8.8 | 8.7 | 9.0 | 8.4 | 9.2 | 8.6 | 8.7 | 8.6 | 9.2 |
| South Korea | 32.9 | 31.4 | 29.2 | 33.3 | 34.6 | 37.2 | 37.1 | 36.1 | 41.6 |
| Taiwan China | 22.1 | 23.7 | 20.5 | 23.6 | 20.9 | 18.7 | 17.1 | 17.5 | 18.7 |
| Thailand | 10.1 | 9.3 | 6.3 | 6.3 | 6.7 | 6.6 | 6.0 | 5.7 | 7.1 |
| **Total Asia and Pacific EMEs** | 160.2 | 162.0 | 151.5 | 168.6 | 172.1 | 173.1 | 168.3 | 163.7 | 184.2 |
| Cyprus | 30.4 | 33.7 | 33.7 | 37.8 | 37.4 | 40.1 | 41.6 | 42.1 | 44.7 |
| Czech Republic | 40.4 | 41.1 | 39.1 | 46.0 | 45.5 | 63.0 | 65.8 | 56.7 | 59.4 |
| Hungary | 37.2 | 39.5 | 41.4 | 49.8 | 50.4 | 61.9 | 63.0 | 58.0 | 60.1 |
| Poland | 62.9 | 65.2 | 69.4 | 87.2 | 88.5 | 93.6 | 97.7 | 83.1 | 88.0 |
| Russia | 37.1 | 34.2 | 34.2 | 40.7 | 40.0 | 49.2 | 53.4 | 57.6 | 62.2 |
| Turkey | 22.7 | 23.3 | 23.7 | 26.2 | 26.8 | 28.3 | 29.5 | 30.3 | 35.2 |
| **Total European EMEs and new EU Member States** | 330.1 | 342.0 | 354.4 | 419.6 | 428.0 | 513.1 | 543.4 | 519.4 | 557.9 |
| Argentina | 20.3 | 19.8 | 19.8 | 19.8 | 18.1 | 17.5 | 17.1 | 16.4 | 16.0 |
| Brazil | 58.8 | 58.4 | 62.7 | 67.4 | 73.9 | 80.7 | 91.7 | 89.5 | 100.9 |
| Chile | 31.9 | 31.0 | 32.5 | 35.0 | 35.1 | 36.4 | 38.5 | 40.2 | 41.5 |
| Colombia | 6.8 | 6.7 | 6.9 | 8.1 | 7.4 | 8.1 | 8.1 | 9.8 | 10.2 |
| Ecuador | 0.8 | 0.8 | 0.9 | 0.9 | 0.9 | 0.8 | 0.9 | 0.9 | 0.7 |
| Mexico | 106.6 | 107.2 | 105.5 | 120.0 | 121.9 | 127.6 | 130.5 | 135.8 | 133.3 |
| Peru | 9.3 | 9.5 | 9.6 | 10.0 | 9.9 | 10.3 | 10.4 | 11.1 | 7.0 |
| Uruguay | 1.9 | 2.0 | 2.0 | 2.0 | 2.3 | 2.1 | 2.2 | 2.4 | 2.5 |
| Venezuela | 12.1 | 12.5 | 12.8 | 14.7 | 14.3 | 15.6 | 16.6 | 18.7 | 18.6 |
| **Total Latin America** | 257.5 | 256.5 | 261.3 | 288.2 | 294.4 | 309.4 | 326.4 | 335.8 | 341.3 |
| Iran | 9.5 | 9.5 | 10.1 | 11.7 | 12.0 | 12.5 | 12.8 | 11.8 | 11.9 |
| Morocco | 10.5 | 11.0 | 11.4 | 12.6 | 12.6 | 11.0 | 12.7 | 12.5 | 13.1 |
| South Africa | 11.3 | 11.2 | 11.6 | 13.5 | 12.5 | 11.8 | 12.2 | 11.4 | 14.9 |
| **Total Middle East and Africa** | 105.3 | 104.5 | 106.6 | 115.4 | 115.6 | 110.7 | 114.6 | 117.9 | 131.3 |

Source: BIS.

**Chart S80 Expected default frequencies (EDFs) for large and complex banking groups in the euro area**

(Jan. 1999 - Sep. 2006, % probability)
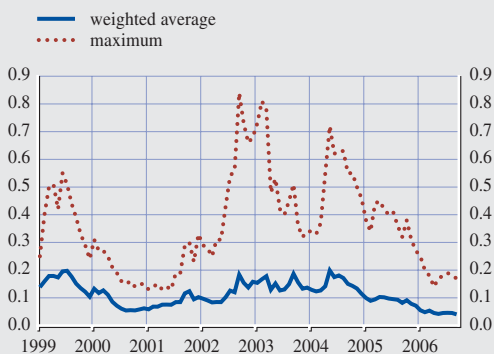
—— weighted average
· · · · · maximum



Sources: Moody's KMV and ECB calculations.
Note: Due to measurement considerations, the EDF values are restricted by Moody's KMV to the interval between 0.02% and 20%.

**Chart S81 Distance-to-default for large and complex banking groups in the euro area**
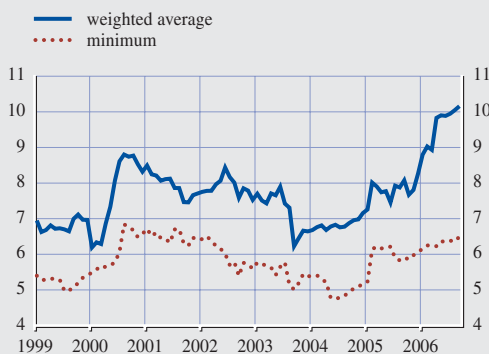
(Jan. 1999 - Sep. 2006)

—— weighted average
· · · · · minimum



Sources: Moody's KMV and ECB calculations.
Note: An increase in the distance-to-default reflects an improving assessment.

**Chart S82 European financial and non-financial institutions' credit default swaps**

(May 2002 - Nov. 2006, basis points, five-year maturity)

—— financial institutions' senior debt
· · · · · financial institutions' subordinated debt
– – – non-financial corporations



Source: JP Morgan Chase & Co.
Note: European financial institutions and non-financial institutions correspond to the definitions of JP Morgan Chase & Co.

**Chart S83 Earnings per share (EPS) for large and complex banking groups in the euro area**
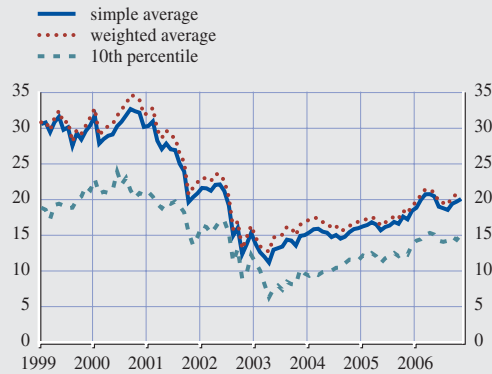
(Q1 1999 - Q3 2006, EUR)

—— simple average
· · · · · weighted average
– – – 10th percentile
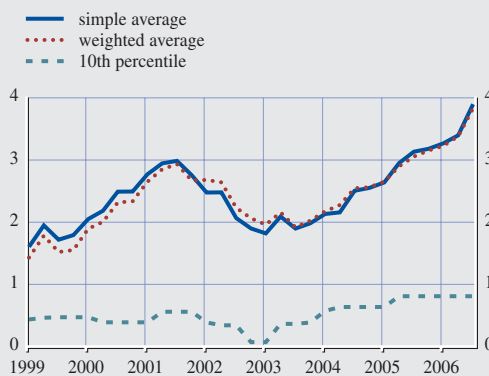


Sources: Thomson Financial Datastream and ECB calculations.

**Chart S84 Price-earnings (P/E) ratios for large and complex banking groups in the euro area**

(Jan. 1999 - Oct. 2006, %, ten-year trailing earnings)

— simple average
···· weighted average
– – 10th percentile



Sources: Thomson Financial Datastream and ECB calculations.
Note: The P/E ratio is based on prevailing stock prices relative to an average of the previous ten years of earnings.

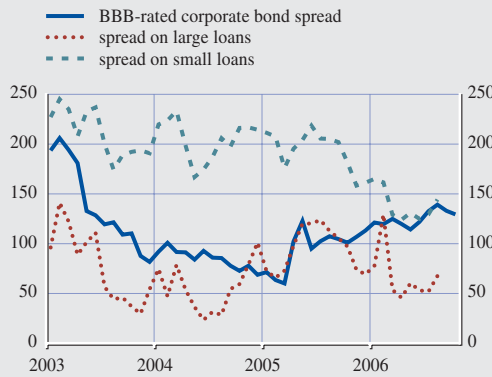**Chart S85 Implied volatility for Dow Jones EURO STOXX total market and bank indices**

(Jan. 2002 - Nov. 2006, %)

— Dow Jones EURO STOXX 50 index
···· Dow Jones EURO STOXX bank index
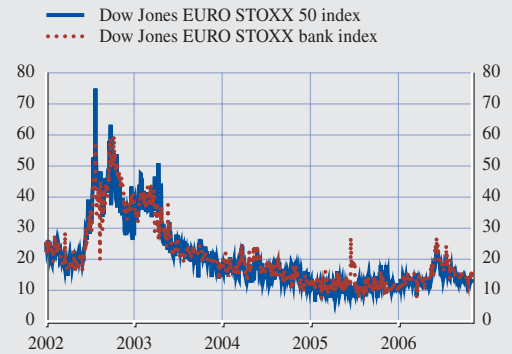


Source: Bloomberg.

**Chart S86 Euro area corporate bond and bank loan spreads**

(Jan. 2003 - Oct. 2006, basis points)

— BBB-rated corporate bond spread
···· spread on large loans
– – spread on small loans



Sources: ECB and Thomson Financial Datastream.
Note: The spread is between the rate on loans to non-financial corporations with one up to five years of initial rate fixation below (small) and above (large) 1€ million, and the three-year government bond yield.

## Table S7 Rating averages and outlooks for large and complex banking groups in the euro area

(Oct. 2006)

|  | Moody's | S&P | Fitch | Total |
|---|---|---|---|---|
| Ratings available out of sample | 19 | 20 | 20 | 59 |
| Outlook/watch available | 20 | 20 | 20 | 60 |
| Rating average | 3.53 | 4.40 | 4.15 | 4.03 |
| Outlook/watch average | 0.00 | 0.30 | 0.10 | 0.13 |
| Number of negative outlooks | 1 | 0 | 0 | 1 |
| Number of positive outlooks | 1 | 6 | 2 | 9 |

| Rating codes | Moody's | S&P | Fitch | Numerical equivalent |
|---|---|---|---|---|
|  | Aaa | AAA | AAA | 1 |
|  | Aa1 | AA+ | AA+ | 2 |
|  | Aa2 | AA | AA | 3 |
|  | Aa3 | AA- | AA- | 4 |
|  | A1 | A+ | A+ | 5 |
|  | A2 | A | A | 6 |
|  | A3 | A- | A- | 7 |
|  | Baa1 | BBB+ | BBB+ | 8 |
|  | Baa2 | BBB | BBB | 9 |
|  | Baa3 | BBB- | BBB- | 10 |
|  | Ba1 | BB+ | BB+ | 11 |
|  | Ba2 | BB | BB | 12 |
|  | Ba3 | BB- | BB- | 13 |

Sources: Moody's, Fitch Ratings and Standard and Poor's.

## Chart S87 Distribution of profitability ratios of large euro area composite insurers

(2004 - 2005, %, maximum, minimum, inter-quartile distribution)

── median
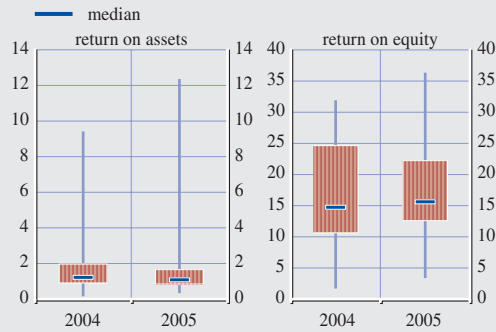


Sources: Bureau van Dijk and ECB calculations.

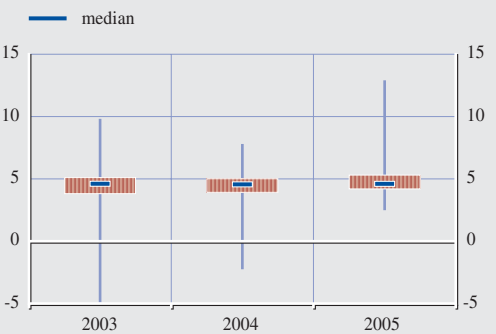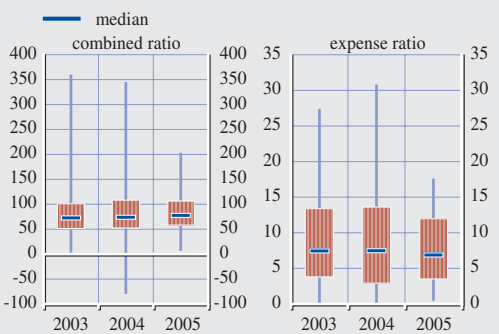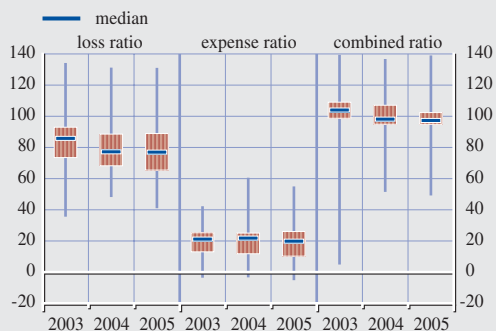## Chart S88 Distribution of solvency ratios of large euro area composite insurers

(2004 - 2005, %, maximum, minimum, inter-quartile distribution)

── median
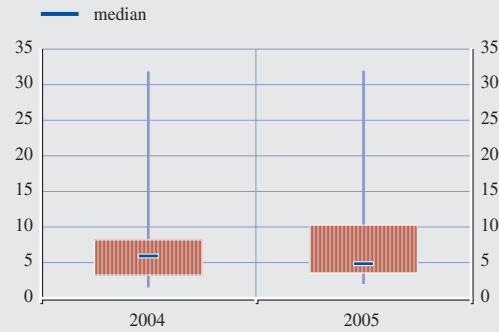


Sources: Bureau van Dijk and ECB calculations.

## Chart S89 Distribution of investment yields of large euro area life insurers

(2004 - 2005, %, maximum, minimum, inter-quartile distribution)

── median



Sources: Bureau van Dijk and ECB calculations.

## Chart S90 Distribution of combined and expense ratios of large euro area life insurers

(2004 - 2005, %, maximum, minimum, inter-quartile distribution)

── median



Sources: Bureau van Dijk and ECB calculations.

**Chart S91 Distribution of combined, loss and expense ratios of large euro area non-life insurers**
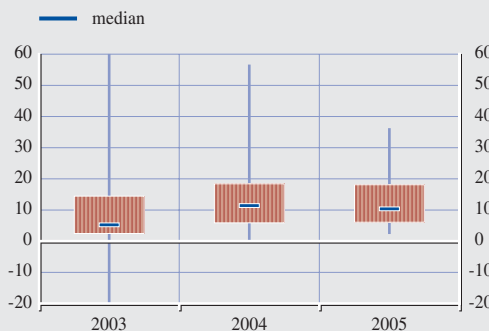
(2004 - 2005, %, maximum, minimum, inter-quartile distribution)



Sources: Bureau van Dijk and ECB calculations.

**Chart S92 Distribution of ratios of non-life profit before taxes to surplus capital of large euro area non-life insurers**
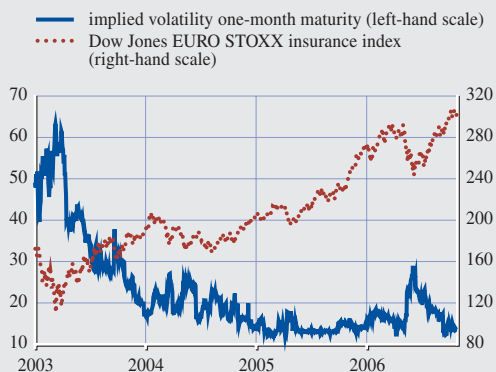
(2004 - 2005, %, maximum, minimum, inter-quartile distribution)



Sources: Bureau van Dijk and ECB calculations.

**Chart S93 Dow Jones EURO STOXX insurance index and its implied volatility**

(Jan. 2003 - Nov. 2006)



Source: Bloomberg.
Note: The Dow Jones EURO STOXX insurance index comprises the 19 largest insurance companies in the euro area. The implied volatility is the average of the volatility extracted from call and put options with a 50 delta.

**Chart S94 Cumulative change in the euro area insurance stock indices relative to the Dow Jones EURO STOXX**
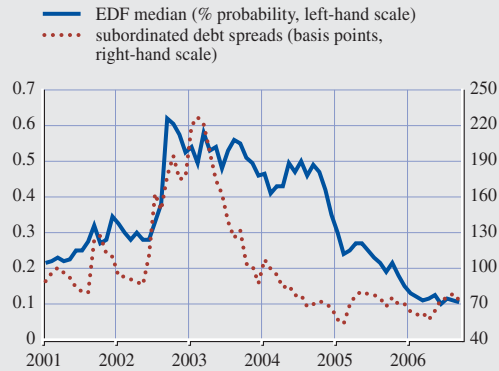
(Jan. 2004 - Nov. 2006, % points, base: Jan. 2005 = 0)
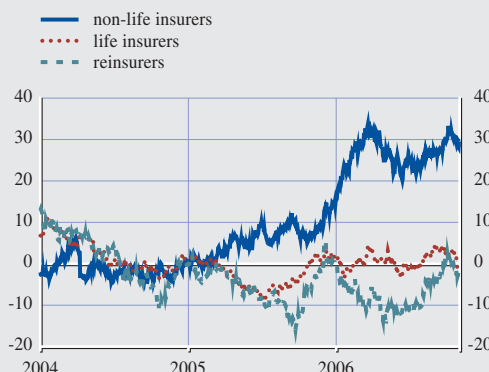


Source: Thomson Financial Datastream.

**Chart S95 Subordinated bond spreads and expected default frequencies (EDFs) for the euro area insurance sector**

(Jan. 2001 - Sep. 2006)

— EDF median (% probability, left-hand scale)
····· subordinated debt spreads (basis points, right-hand scale)



Sources: Moody's KMV and JP Morgan Chase & Co.
Note: Due to measurement considerations, the EDF values are restricted by Moody's KMV to the interval between 0.02% and 20%.

**Chart S96 Expected default frequencies (EDFs) for the euro area insurance sector**

(Jan. 1992 - Sep. 2006, % probability)

— median
····· 75th percentile
– – – 90th percentile
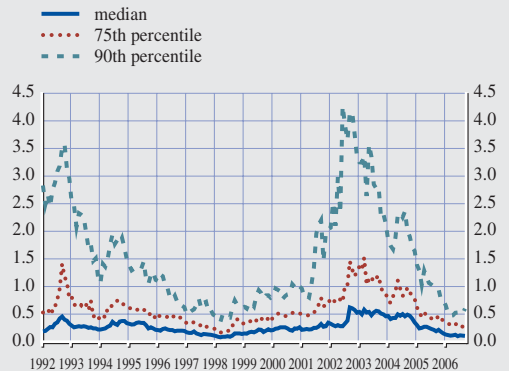


Source: Moody's KMV.
Note: Due to measurement considerations, the EDF values are restricted by Moody's KMV to the interval between 0.02% and 20%.