

C WHAT DRIVES EU BANKS' STOCK RETURNS? AN ANALYSIS BASED ON THE RETURN DECOMPOSITION TECHNIQUE

Information about the factors that drive bank-level stock return variability can provide useful input to financial stability analysis. In this Special Feature, the dynamic dividend-discount model is combined with an accounting-based VAR framework that decomposes EU banks' stock returns into cash flow and expected return components. The main findings are that while the bulk of the variability of EU banks' stock returns is due to cash flow shocks, the expected return shocks are relatively more important for large than for small banks. This suggests that large banks could be more prone to market-wide events that, in the literature, are associated with the expected return news component as opposed to the bank-specific news component, typically assumed to be incorporated in the cash flow component.

INTRODUCTION

The market prices of bank securities, such as equities, are of interest from a financial stability perspective for at least five reasons. First, a bank's equity price effectively summarises all the public information available from the bank, including potential risks, in one number. Second, when working under the efficient market hypothesis, securities prices at any point in time have a forward-looking component in that they incorporate expectations of both positive and negative future earnings prospects. Third, share price information is available at higher frequency compared with accounting information. Fourth, given that financial disturbances in one bank have the capacity to spread through the stock markets, it is important to know to what extent the variability in individual banks' stock prices is driven by common versus bank-specific components. Finally, as part of the implementation of Basel II, one of the pillars of the accord introduces market discipline to the supervisory and oversight process, thus accentuating the role of

market information in the prudential monitoring process.

For all these reasons, as part of its suite of financial stability monitoring indicators, the ECB uses information contained in banks' equity prices to calculate various macro-prudential indicators for the banking sector as a whole. A previous Special Feature in the December 2005 FSR analysed measures of banking sector profitability using both accounting-based and macroeconomic data.¹ The aim of this Special Feature is to complete that analysis and to provide a better understanding of the factors that may drive the unexpected variability of individual banks' equity prices by incorporating financial accounting data in a more thorough econometric model of bank stock returns. To this end, the empirical method that is applied in the analysis below explicitly distinguishes between changes in rational expectations of future dividends and changes in rational expectations of future returns. The literature frequently calls the former "news about future dividends", or "cash flow news", and the latter "news about future returns", or "expected return news." This Special Feature will interpret the EU banks' unexpected stock returns by breaking them down into components which are linked to these two types of news.

The analysis also investigates whether large banks' stock prices could be affected by different factors than small banks' stock prices. This could have important implications from the point of view of financial stability analysis, insofar as the relative importance of the stock markets as an indicator either of bank-specific distress or an indicator of contagion between banks may differ according to the type of the institution. The analysis also contributes to assessing market efficiency in that it investigates how the markets price in information about banks and how this process may differ across different types of banks.

¹ See ECB (2005), "What determines euro area bank profitability?", *Financial Stability Review*, December.

The main findings of the analysis are that, using bank-level data, news on cash flow fundamentals tends to dominate news on expected returns as a driver of stock return variability in the EU banking sector. Previous literature based on an approach that allows for time-varying expected returns has interpreted the two return news components so that the cash flow, or dividend, component is more likely to reflect firm-specific, or idiosyncratic, news. The expected return news component, in turn, is more likely to reflect systematic, macroeconomic news. Indeed, in an accounting-based model, cash flow news equals the expected changes in the bank's return on equity (ROE), while expected return news equals expected changes in the bank's excess log stock return and in the common discount rate.² Moreover, since unexpected changes in a bank's stock return are, by definition, associated with simultaneous offsetting movement in future expected returns, expected return news have a *transitory* impact on value. Cash flow shocks, conversely, have *permanent* effects on value as they do not result in a change in future expected returns.

It is also found that the size of the cash flow component relative to the expected return component is substantially stronger for small banks than for large banks. A possible reason behind this finding is that larger EU banks are more diversified across business lines and geographical regions, which could make them more sensitive to market-wide developments than smaller banks, which may be more exposed to local projects. This result suggests that, among other things, smaller banks could be less prone to systemic shocks transmitted via the stock market channel. Finally, in line with earlier work based on US firm-level stock market data, the results confirm that EU banks' stock returns exhibit a short-term momentum effect, while return gains tend to be reversed in the long term.

This Special Feature first discusses the relevant literature, then provides an overview of the data and the empirical methodology, and finally

presents the results and draws some conclusions from a financial stability perspective.

POTENTIAL DETERMINANTS OF BANKS' STOCK RETURNS

There is a growing literature that directly investigates the value of equity and bond market indicators for predicting distress in financial institutions.³ These studies find some indications that equity price developments help in predicting banking distress or supervisory downgrades. More recent work using both equity prices and subordinated debt spreads for EU banks has found that models that incorporate both debt and equity spreads are the most accurate at predicting distress episodes over various horizons.

Work assessing the effect of business cycle variables on bank stocks has concluded that returns can differ across countries and types of banks, and that better-capitalised banks produce higher stock returns during downturns.⁴ However, these results say little about how the bank-specific financial information is incorporated into the stock return.

The so-called dividend-discount model of equity pricing concludes that a bank's stock returns can be high either if its future earnings growth (the "fundamental", often measured by dividends) is high, if its expected returns are low, or in case of any combination of the two. This workhorse model for analysing equity

2 See J. Campbell (1991), "The variance decomposition of stock returns", *Economic Journal*, Vol. 101, No 405, and T. Vuolteenhao (2002), "What drives firm-level stock returns?", *Journal of Finance*, LVII, No 1, for an extensive discussion of these links. However, it could also be argued that it is not possible to make a one-to-one mapping from idiosyncratic events to cash flow news on the one hand and from macro events to expected return news on the other, as both news components could incorporate some elements of the other types of event.

3 For the US, see T. Curry, P. Elmer and G. Fissel (2001), "Regulator use of market data to improve the identification of bank financial distress", *FDIC Working Paper*, 2001/01. For EU banks, see R. Gropp, J. Vesala and G. Vulpes (2006), "Equity and bond market signals as leading indicators of bank fragility", *Journal of Money, Credit and Banking*, forthcoming.

4 See R. Van der Vennet, O. De Jonghe, and L. Baele (2004), "Bank risks and the business cycle", *University of Gent Working Paper*, No 264.

markets has lent itself to a substantial body of research on the determinants of firms' stock prices.

The literature based on applications of the dividend-discount model can be divided roughly into two main strands, although alternative classifications might also exist. The first line of research tries to relate bank stock returns to contemporaneous bank risk or some other bank-specific characteristics. This work on the empirical predictability of stock returns has produced several important and widely quoted results, of which the most prominent findings are that small firms' average stock returns tend to outperform large firms' returns (size effect), that past longer-term losers tend to outperform past longer-term winners (long-term reversal), and that past short-term winners tend to outperform past short-term losers (momentum).⁵ Other findings include the fact that firms with past high profitability generally have higher than average stock returns, and that firms with higher leverage tend to outperform firms with lower leverage.⁶

However, such analysis cannot tell whether a bank's stock return reacts to news because market participants' expectations of future dividends change, or because their expectations of future returns have changed. The second strand of the research tries to address this issue by explaining the empirical predictability of stock returns and then to decompose the returns into their components. To this end, the present value formulation of the dividend-discount model, where expected returns are assumed to remain constant, has had to be augmented by a log-linear approximation that is tractable even when expected returns vary through time.⁷

This method enables an analysis of the relative importance of the cash flow and expected return components as the drivers of aggregate stock returns. Previous work using aggregate market-level stock returns has found that the variability in expected returns accounts for about 50 to 60% of the variability in unexpected returns. By contrast, cash flow news only explains about

one-third of the variance in unexpected returns.⁸ Until recently, however, there has been little evidence of what determines stock returns at the firm level. The ability to categorise the news into firm-specific and market-wide components can, however, tell us whether individual banks are more sensitive to common, or systemic, shocks relative to shocks that are specific to their own cash flow fundamentals.

Studies applying firm-level data using the return decomposition technique have produced two important results. The first is that while market-wide shocks ("expected return news") tend to drive aggregate stock indices, variability in firm-level stock returns is mostly associated with shocks to cash flow expectations ("cash flow news"). The second finding is that the dependence of firm-level returns tends to vary according to the size of the firm, with large firms being relatively more sensitive to firm-specific cash flow news.⁹

There are some reasons why banks' stock returns could be expected to behave differently than non-financial firms' stock returns. Indeed, the stock return literature sometimes excludes financial industry firms on the grounds that banks are in some way different. Banks indeed differ from most non-financial firms in two main respects.

- 5 See R. Banz (1981), "The relationship between return and market value of common stocks", *Journal of Financial Economics*, 9; W. De Bondt and R. Thaler (1985), "Does the stock market overreact?", *Journal of Finance*, 40; and N. Jegadeesh and S. Titman (1999), "Profitability of momentum strategies: An evaluation of alternative explanations", *Journal of Finance*, 56 (2).
- 6 See L. Bhandari (1988), "Debt/equity ratio and expected common stock returns: Empirical evidence", *Journal of Finance*, 43; and R. Haugen and N. Baker (1996), "Commonality in the determinants of expected stock returns", *Journal of Financial Economics*, 41. Similar results for European markets have been presented by K. Rowenhorst (1998), "International momentum strategies", *Journal of Finance*, 53 (1).
- 7 See J. Campbell and R. Shiller (1988), "The dividend-price ratio and expectations of future dividends and discount factors", *Review of Financial Studies*, 1.
- 8 See J. Campbell, (1991), *op. cit.*
- 9 See J. Campbell and R. Shiller (1988), *op. cit.*, J. Campbell (1991), *op. cit.*, T. Vuolteenaho (2002), *op. cit.* and R. Cohen, P. Gompers and T. Vuolteenaho (2003), "Who underreacts to cash-flow news? Evidence from trading between individuals and institutions", *Journal of Financial Economics*, 66.

First, the majority of banks' assets are long-term financial claims – such as loans – on households and firms. Banks finance these assets by selling their own debt and equity as well as by receiving the majority of their funds in the form of short-term deposits. The main difference between banks and non-financial firms in this case is that banks tend to be more leveraged. Second, because banks tend to hold their liquid deposits against relatively illiquid loans, and since they are highly leveraged, they are potentially vulnerable to bank runs. Since bank failures result in a high social cost, the banking industry is highly regulated – for example, by means of deposit insurance or minimum capital requirements – to reduce the risk of failure. These regulatory barriers to entry may increase the ability of firms in the industry to earn rents, and thus their stock returns could behave differently to those of non-financial firms.

Work using individual bank data needs to consider these factors. Given that the European regulatory framework for financial institutions, including deposit insurance, is harmonised at the EU level, and the Basel accord for capital requirements is widely applied, it is unlikely that regulatory factors can account for systematic differences in returns.¹⁰ This leaves leverage, size and diversification as the relevant variables to be considered in our analysis.

Research based on different methodologies and a cross-section of US banks has found that information about earnings, leverage and non-interest income can predict a cross-section of future bank stock returns.¹¹ Moreover, there is some evidence that bank stock returns may vary with the business cycle. Studies based on European data find evidence of cyclical variation in bank stock returns, and reveal that banks that are better capitalised (with higher equity-to-loan ratios) and more diversified have higher returns than poorly capitalised, less diversified banks.¹²

METHODOLOGY AND DATA

As discussed above, the stock return decomposition framework is based on the augmented dividend-discount model. Taken to the empirical level, the stock return regression is augmented by other regression equations that describe the evolution through time of the forecasting variables. The resulting VAR system, in combination with the log-linear asset pricing framework, can be used to calculate the impact that an innovation in the expected return will have on the stock price, holding expected future cash flow variables constant. This impact is the “expected return news” component of the unexpected stock return. The “cash flow news” is obtained as a residual.

An accounting-based present-value model is needed to apply this at firm level. The model consists of a system of four equations. The left-hand-side variable is log excess stock returns; the right-hand-side variables are log excess ROE, log leverage and the log book-to-market ratio.¹³ Modelling corporate dividend policy is avoided by excluding any dividend-based variables from the VAR due to the lack of time series stability of a firm's dividend policy variable. From the VAR output, a set of impulse response functions and a variance decomposition can be generated. One lag is included in the four-equation VAR.¹⁴

10 For more on the introduction of deposit insurance in the EU, see R. Gropp and J. Vesala (2004), “Deposit insurance, moral hazard, and market monitoring”, *Review of Finance*, 8 (4).

11 M. J. Cooper, W. Jackson and G. Patterson (2003), “Evidence of predictability in the cross-section of bank stock returns”, *Journal of Banking and Finance*, 27.

12 L. Baele, R. Van der Vennet and A. Van Landschoot (2005), “Bank risk strategies and cyclical variation in bank stock returns”, mimeo.

13 Three assumptions are necessary to replace dividends by ROE in the return decomposition framework. First, ROE, book equity and market equity need to be strictly positive. Second, the difference between log ROE and log book equity, and the difference between log book equity and log market equity, have to be stationary. Third, the clean-surplus identity is assumed to be satisfied, i.e. book equity in the current year equals book equity in the last year, plus earnings less dividends.

14 Standard lag selection tests indicated one lag was optimal.

The banks selected for this study are listed EU banks that show a consistent time series of annual data from 1991 to 2004 for all variables used in the estimation. The dataset consists of accounting and market information for a pooled time series of 53 EU banks. The accounting data such as ROE, book value of equity, and book debt variables, as well as the equity price series and the earnings per share series, are taken from Datastream.¹⁵ The risk-free rate is the short-term rate taken from the BIS.

Various transformations are made to the data. The equity prices and the risk free rate are continuously compounded.¹⁶ The excess stock return is constructed as the difference between the two series. Owing to the panel estimation approach followed, the excess return series is then cross-sectionally demeaned and normalised by dividing by its standard deviation. In a last step, the series is annualised. The excess ROE variable is created by subtracting the compounded risk-free rate from the logged ROE. Leverage is defined as book equity divided by book equity plus book debt. The annual book-to-market ratio is defined as the ratio of book value of equity to market value of equity. The market value of equity is calculated by multiplying the monthly equity price with the monthly amount of shares outstanding; the series is annualised afterwards to ensure consistency with the annual balance sheet data.

RESULTS FROM THE VECTOR AUTOREGRESSION MODEL

Based on the chosen sample of EU banks, the results from the VAR analysis appear to be in line with several seminal studies of the determinants of firm-level stock returns as reported above.

The coefficient estimates are reported in Table C.1.¹⁷ The statistically significant estimates reveal that expected stock returns are high when past returns and past leverage are high. Banks' expected profitability is high when past profitability is high and the past book-to-market

Table C.1 VAR coefficient estimates

(1991 - 2004)				
	return	ROE	leverage	book to mkt
return (-1)	0.06 <i>0.09</i>	0.01 <i>0.83</i>	-0.01 <i>0.91</i>	-0.14 <i>0.00</i>
ROE (-1)	-0.03 <i>0.39</i>	0.57 <i>0.00</i>	0.02 <i>0.72</i>	-0.10 <i>0.00</i>
leverage (-1)	0.02 <i>0.08</i>	0.02 <i>0.12</i>	0.91 <i>0.00</i>	0.00 <i>0.85</i>
book-to-mkt (-1)	0.00 <i>0.77</i>	-0.04 <i>0.02</i>	0.03 <i>0.18</i>	0.89 <i>0.00</i>

Source: ECB calculation.
Note: T-probabilities in italics.

ratio is low. Expected leverage tends to be mainly driven by its past value, while the expected book-to-market ratio is high when past excess returns and past profitability are low and the past book-to-market ratio is high.

These results suggest that investors in EU bank stocks tend to be trend-followers in the short run, as bank stock returns show persistence. Moreover, the result that higher past leverage tends to be associated with higher returns is interesting in the case of banks, as banks are "special" in the way that they are, in fact, highly leveraged firms.

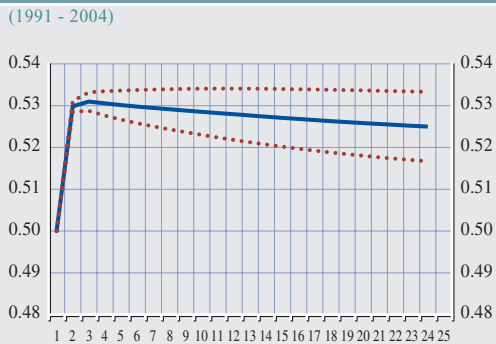
The finding that EU banks' expected returns are high when past stock returns are high is also confirmed by the impulse response function, which shows the response of cumulative returns to a 50 basis point return shock (see Chart C.1). Indeed, the returns continue to rise for roughly

15 A total of seven observations were missing: two for ROE, two for book equity, and three for book debt. These missing observations were linearly interpolated.

16 The data for the UK, Sweden and Denmark were converted into euro using the relevant market exchange rate. Data for the UK were also converted to euro units as they are quoted on Datastream in GBP pence. The compounding for the UK data was done on an April to April rather than a calendar year basis in order to coincide with the UK fiscal year.

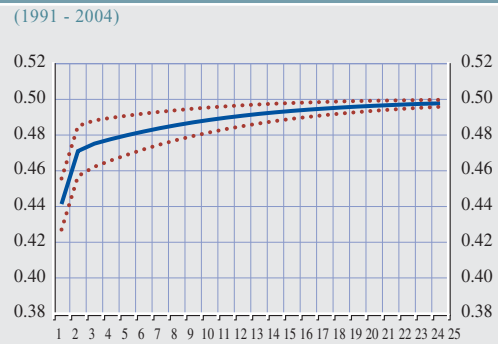
17 The fact that some of the T-probabilities (which are comparable to P-values) are relatively high indicates that the model could be over-specified. This is often characteristic of panel data estimations, and should therefore not necessarily be taken as a sign of low predictive power. On the other hand, the limited data in our sample could also affect the results.

**Chart C.1 Shock to expected return
(50 basis points)**



Source: ECB calculations.
Note: The band around the mean shows the Jackknife standard errors.

**Chart C.2 Shock to cash flows
(50 basis points)**



Source: ECB calculations.
Note: The band around the mean shows the Jackknife standard errors.

three years after the shock, showing a considerable momentum effect. However, after that the returns first level off and then slowly decline, confirming that EU banks' stock prices demonstrate some long-run mean reversion.

The second impulse response function plots the reaction of banks' stock returns to a 50 basis point cash flow shock (see Chart C.2). If expected returns were constant, the shock would result in exactly a 50% increase in realised returns. Instead, the analysis based on the dynamic dividend-discount model reveals that the initial response is only 44%, increasing only gradually towards 50%. This suggests that investors initially under-react to news, and that it could typically take the market several years to incorporate fully the positive fundamental shock into banks' stock prices.¹⁸

RESULTS FROM THE RETURN DECOMPOSITION ANALYSIS

The main focus of the analysis is, however, on the relative importance of cash flow, or firm-specific, versus expected return, or macroeconomic, news. The variance decomposition resulting from the VAR model reveals that the cash flow component is the main driving force of EU banks' stock returns. Indeed, the coefficient of the bank-specific cash flow component is more than ten times

larger than the coefficient of the expected return component (see Table C.2). Moreover, there is a relatively strong positive covariance between the two return components. The previous literature has shown that this positive interrelation between the two return components is in fact driving the observed under-reaction by markets to the positive fundamental news. This is because part of the impact of cash flow shocks to returns is offset by the instantaneous opposite movement in the expected return component as prescribed by the underlying theoretical model.

Finally, as discussed above, it is possible that the results of the variance decomposition could differ depending on bank size. Tables C.3 and C.4 below confirm that this indeed is the case for EU banks, although the outcome is somewhat

¹⁸ This is in line with the findings from US stock markets by T. Vuolteenaho (2002), op. cit.

Table C.2 VAR return decomposition: all banks

(1991 - 2004)			
stock variance	ER variance	cash-flow variance	ER cash-flow covariance
1.23	0.12	1.45	0.34
<i>0.08</i>	<i>0.02</i>	<i>0.10</i>	<i>0.05</i>

Source: ECB calculations.
Note: Jackknife standard errors in italics.

**Table C.3 VAR return decomposition:
large banks**

(1991 - 2004)

stock variance	ER variance	cash-flow variance	ER cash-flow covariance
1.18	0.30	1.60	0.72
<i>0.10</i>	<i>0.05</i>	<i>0.14</i>	<i>0.12</i>

Source: ECB calculations.

Note: Jackknife standard errors in italics.

**Table C.4 VAR return decomposition:
small banks**

(1991 - 2004)

stock variance	ER variance	cash-flow variance	ER cash-flow covariance
1.26	0.15	1.63	0.52
<i>0.14</i>	<i>0.03</i>	<i>0.17</i>	<i>0.07</i>

Source: ECB calculations.

Note: Jackknife standard errors in italics.

different than what has been reported for non-financial firms. While both large and small banks are more substantially affected by the cash flow news component, the ratio of cash flow to expected return news is twice as high for small banks as for large banks. This suggests that the common, or macroeconomic, component could actually be relatively more important for large banks.

Why is the bank-specific component relatively more dominant for small rather than large listed EU banks? One possible explanation is that, owing to the more widespread activities of large banks both across borders and across business lines. Market-wide information has become more relevant for large banks, whereas bank-specific information could still be relatively more valuable for smaller banks that are more specialised, both geographically and regarding their business model.

Small banks are also more often characterised by an ownership structure whereby investor portfolios are less diversified. In such cases, news that is more typically associated with bank-specific fundamentals could have a more profound impact on banks' stock returns via investor reactions. Moreover, the typically less frequent disclosure of financial results by small banks could increase the relative role of such bank-specific information for determining their stock prices. Finally, from time to time banks' stock returns also tend to be affected by perceptions of future takeover activity, which is typically a bank-specific factor. Insofar as M&A activity among EU banks has tended to be more (although by no means exclusively)

concentrated among the smaller banks, it could also explain the relative sensitivity of these types of banks' stock returns to firm-specific news.

The financial stability implications of this finding are interesting. It suggests that under standard distributional assumptions, smaller banks could in fact be less prone to systemic shocks spreading through the stock market channel than large banks. This finding also interestingly complements the results reported in Box 16 in this Review, namely that the tail dependence between banks, and therefore their sensitivity to extreme shocks, tends to be relatively higher for larger rather than smaller EU banks.

CONCLUDING REMARKS

This Special Feature combined the dynamic dividend-discount model with an accounting-based bank-level VAR framework to analyse the driving forces of EU banks' stock returns. It finds that while in the short term, expected returns are mainly driven by the momentum of past returns and past leverage, over the longer term, returns show some mean reversion to shocks.

At the same time, the positive covariance between the return news components means that the markets initially tend to under-react to positive news on bank-specific fundamentals, and only gradually incorporate such information into prices. Such cash flow news is, however, found to be the main driving force of bank-level stock returns. Finally, it is found that the

expected return news component is relatively more important for large banks than for small banks. Several explanations potentially account for this result, with the key implication that large banks could in fact be more prone to market-wide shocks that spread through the stock market channel.