# Comments on Gali's "Hysteresis and the European Unemployment Problem Revised"

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# Starting Point: Euro Unemployment Rate Behaves Differently Than US

- **US: Substantial cyclicality with consistent reversion toward a roughly constant mean.**

- **Euro area unemployment:**
  - *Wanders around an upward trend*
  - *Can't reject a UNIT ROOT*
  - *Movements less volatile than US*
  - *Movements more persistent than US*
  - *No tendency to gravitate toward a long-run equilibrium value*

# My Discussion Raises More Questions than Answers

- **Questions about the Unit Root characterization**
  - **Euro Unemployment similarities to US**
- **Similarities US vs. Euro inflation process**
- **Reasons to study inflation behavior in preference to wage change behavior**
- **Brief update: Econometric model for US inflation**
- **How close can we come to using that model on Euro-area inflation?**
- **Brief comments on the paper's three models**

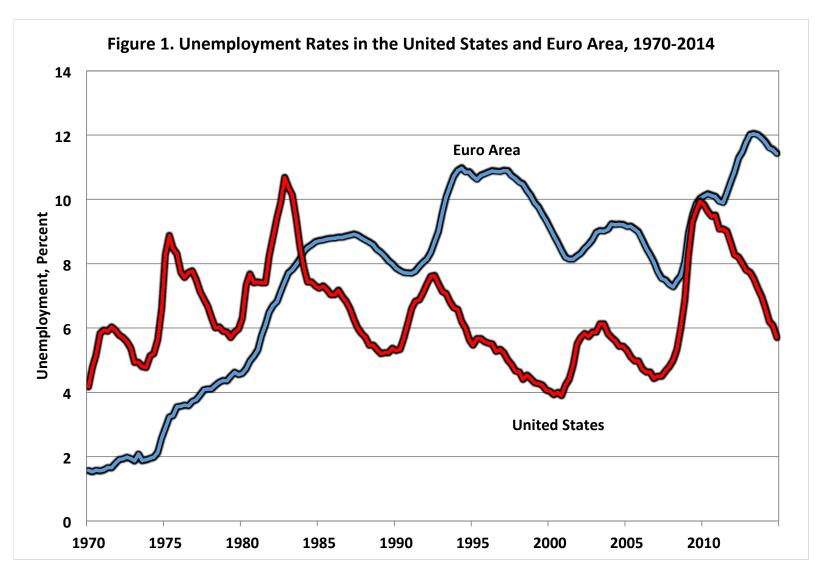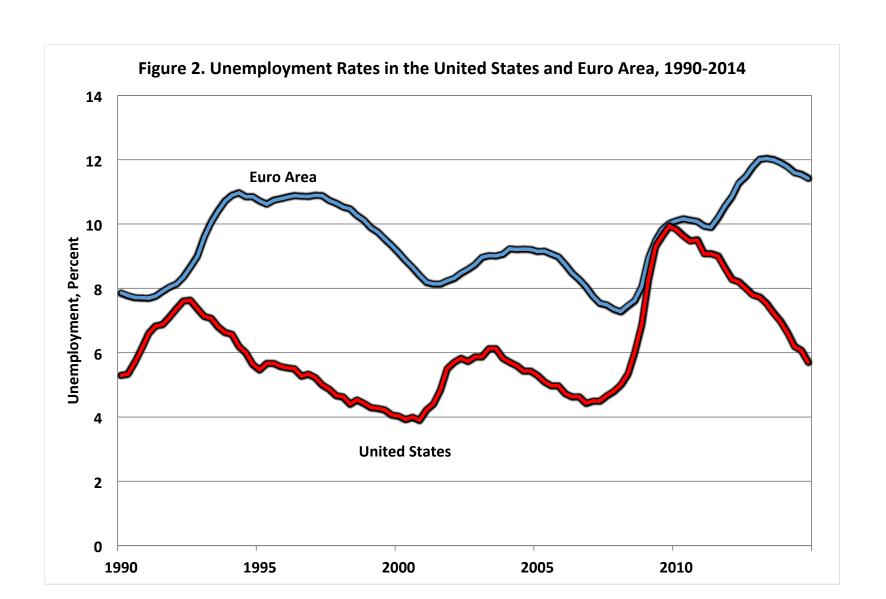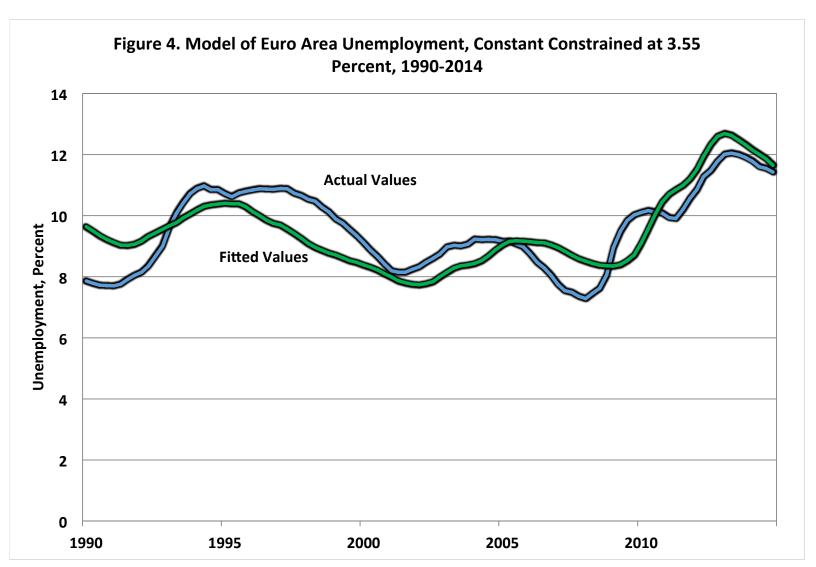# Indeed Euro and US Unemployment Series are Very Different, 1970-2014



Figure 1. Unemployment Rates in the United States and Euro Area, 1970-2014

**Table 1. ADF Unit Root Tests**

| Euro area | | United States | |
|---|---|---|---|
| 1 lag | 4 lags | 1 lag | 4 lags |
| $-2.03$ | $-1.91$ | $-3.39^*$ | $-3.35^*$ |

Note: t-statistics of Augmented Dickey-Fuller tests (with intercept) for the null of a unit root in the unemployment rate. Sample period 1970Q1-2014Q4. Asterisks denote significance at the 5 percent level. Critical values (adjusted for sample size) for the null of a unit root are $-2.57$ (10%) and $-2.87$ (5%).
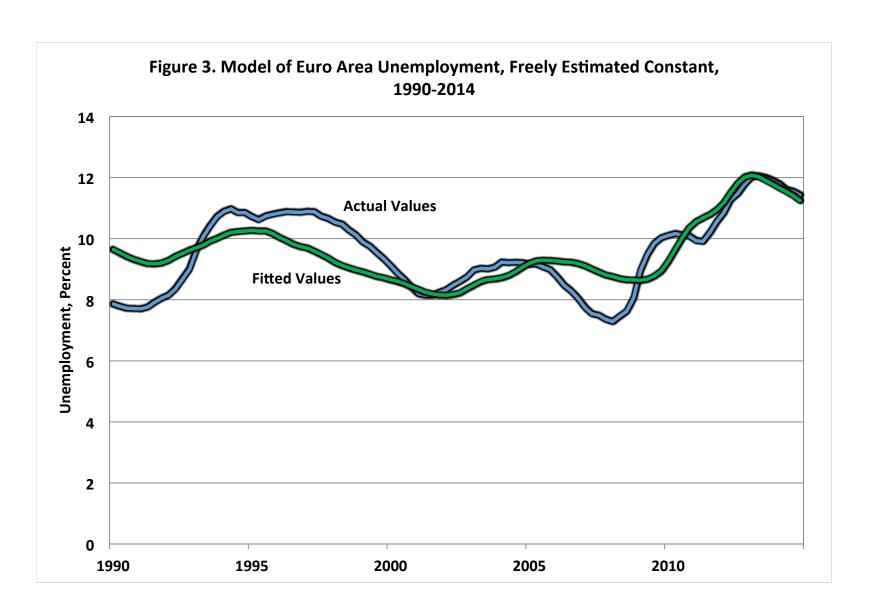
# Omit 1970-89



Figure 2. Unemployment Rates in the United States and Euro Area, 1990-2014

# Regressions Euro U on US U, Lags 4 and 12, Constant Fixed at 3.55



Figure 4. Model of Euro Area Unemployment, Constant Constrained at 3.55 Percent, 1990-2014

# Freely Estimated Constant



Figure 3. Model of Euro Area Unemployment, Freely Estimated Constant, 1990-2014

# Augment Table 1 for 1980-2014, Unit Root Rejected for Europe

**Table 1. ADF Unit Root Tests, Revised**

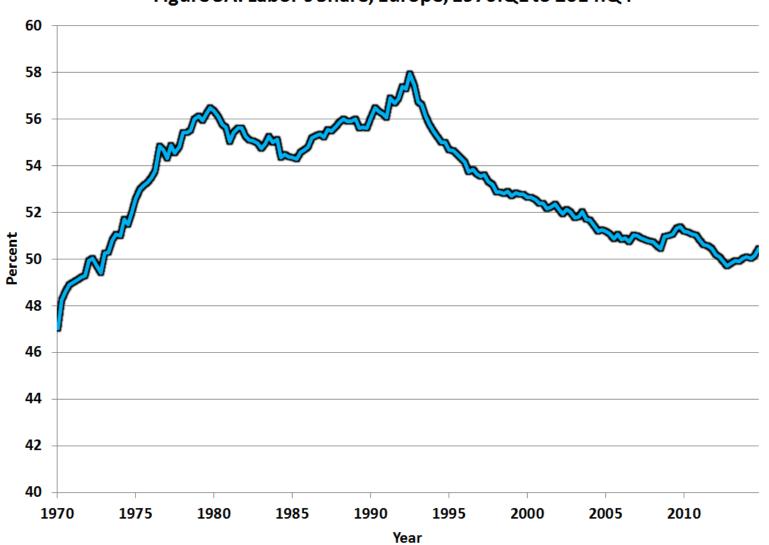| 1970 - 2014 | | | | 1980 - 2014 | | | |
|---|---|---|---|---|---|---|---|
| *Euro area* | | *United States* | | *Euro area* | | *United States* | |
| 1 lag | 4 lags | 1 lag | 4 lags | 1 lag | 4 lags | 1 lag | 4 lags |
| -2.04 | -1.92 | -3.41* | -2.97* | -3.28* | -2.73** | -2.83** | -2.42 |

Note: t-statistics of Augmented Dickey-Fuller tests (with intercept) for the null of a unit root in the unemployment rate. Sample period 1970Q1-2014Q4 and 1980Q1-2014Q4. Single asterisks denote significance at the 5 percent level, double asterisk at the 10 percent level. Critical values (adjusted for sample size) for the null of a unit root are -2.58 (10%) and -2.89 (5%).

# Reasons to Study Inflation (Change in Prices) Instead of Changes in Wages

- **Central banks have an inflation target, not a wage change target**

- **Time series on compensation per hour are noisy**

- **Productivity growth *(ϑ)* mediates effect of wage changes on inflation, *change in ULC = $\pi^w - \vartheta$***

- **Inflation equals change in unit labor cost only if labor's share is constant: *$\pi^p$ = change in ULC***

- **Reality: Euro's labor share exhibits persistent movement up and then down**
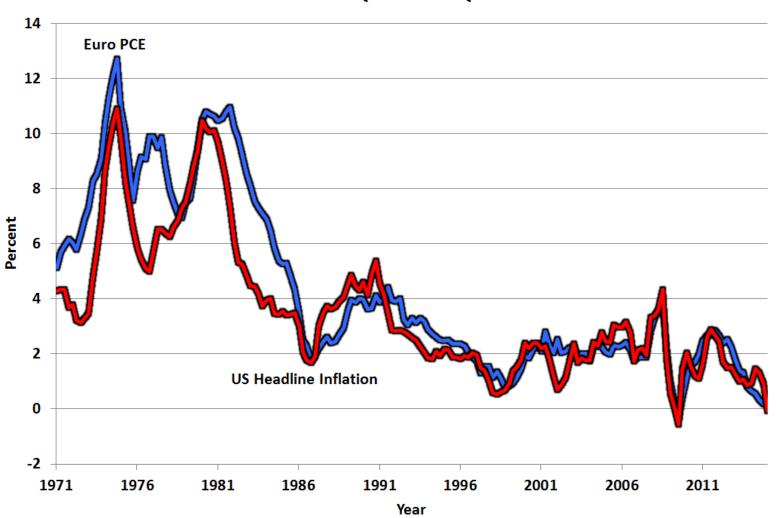
# Euro Level of Labor's Share



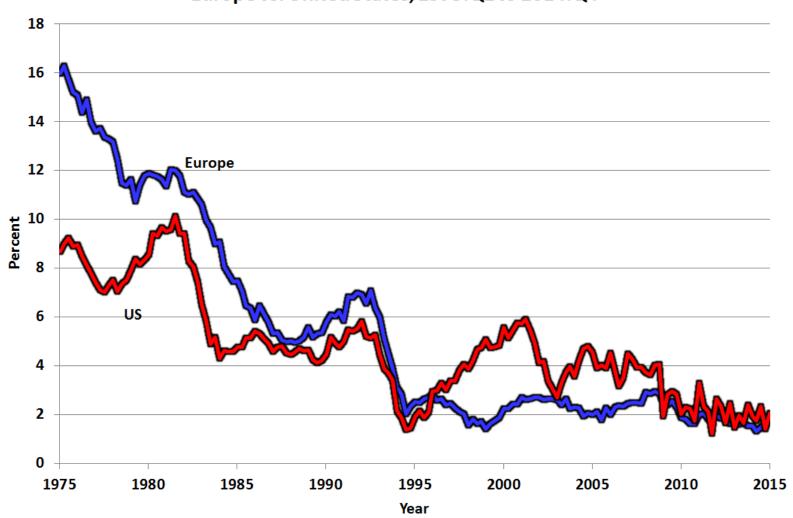Figure 3A. Labor's Share, Europe, 1970:Q1 to 2014:Q4

# US vs. Euro Inflation Rate, Can You Tell the Difference?



Figure 5. Annual Inflation Rate, Europe vs. United States, 1971:Q1 to 2014:Q4
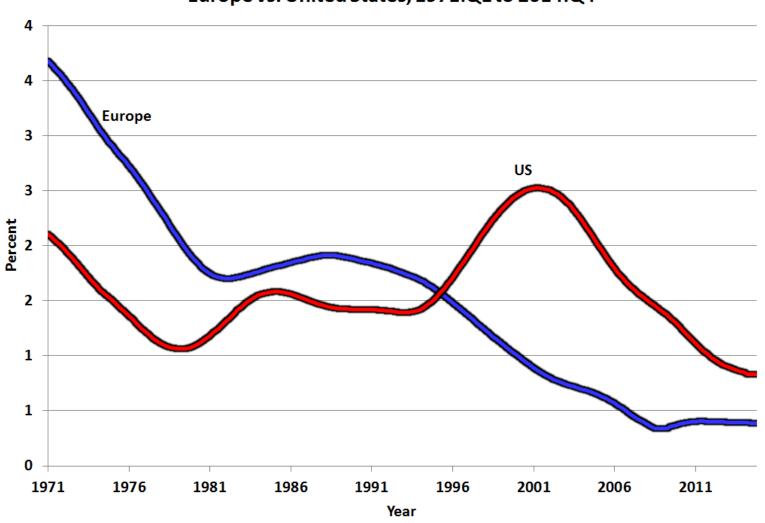
# US vs. Euro Wage Change, Major Differences, 1975-2014



Figure 6. Two-Year Growth Rate of Compensation per Hour, Europe vs. United States, 1975:Q1 to 2014:Q4
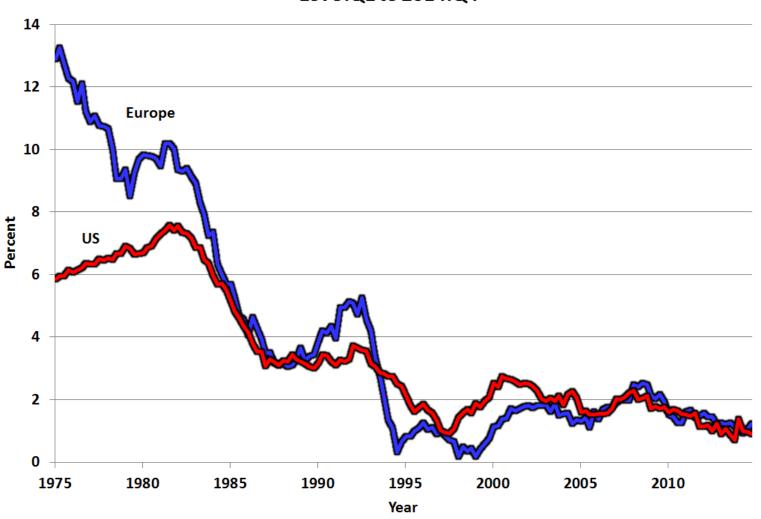
# Some of the Difference Explained by Productivity Trends



Figure 7. HP 6400 Trend of Productivity Growth, Europe vs. United States, 1971:Q1 to 2014:Q4
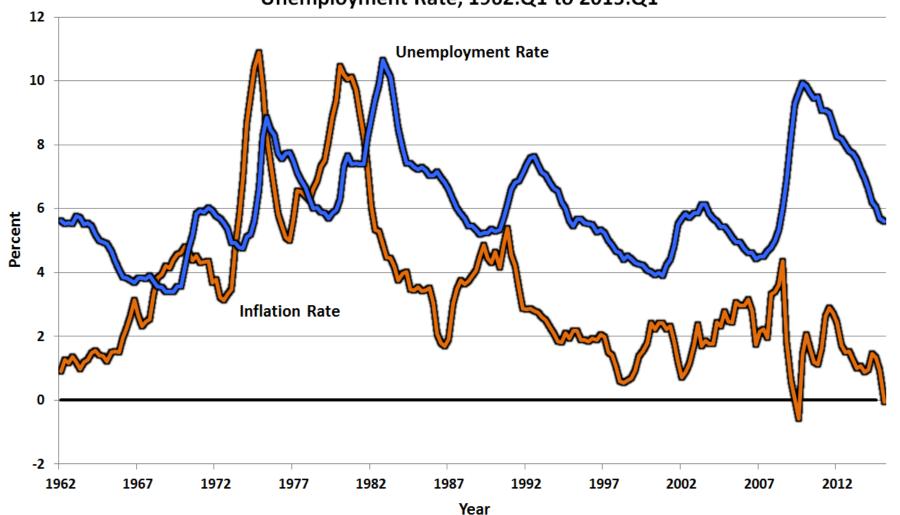
# US vs. Euro Change in Trend Unit Labor Cost



Figure 6A. Two-Year Growth Rate of TULC, Europe vs. United States, 1975:Q1 to 2014:Q4

# Explaining US Inflation:
# Demand in the 1960s, Supply in 1970s



Figure 1a. Four Quarter Changes in Headline Inflation Rate vs Total Unemployment Rate, 1962:Q1 to 2015:Q1
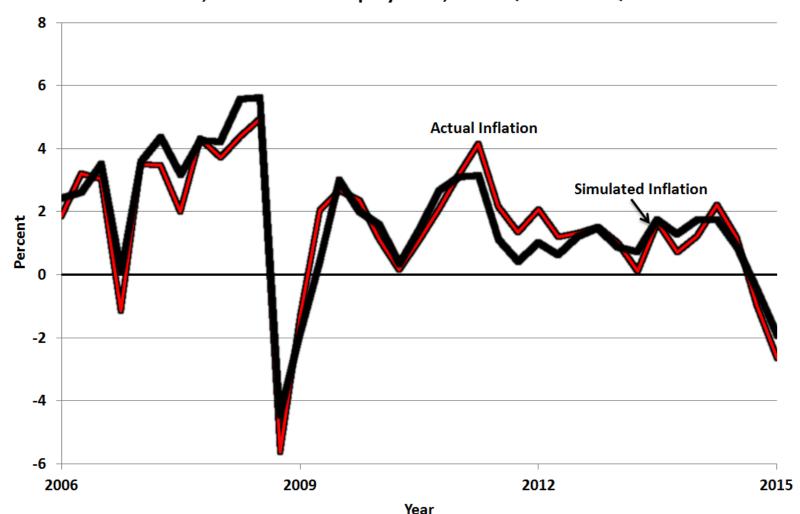
# Triangle Model
# Fit to 1962:Q1 to 2006:Q4

| Table 2 | | |
|---|---|---|
| **Estimated Equations for Quarterly Changes in the Headline PCE Deflator, Short Term Unemployment Rate** | | |
| **Variable** | **Lags** | **1962:Q1 to 2006:Q4** |
| **Lagged Dependent Variable** | 1-24[a] | 1.00 ** |
| **Unemployment Gap** | 0-4 (or 0) | -0.71 ** |
|    **Four-Quarter Difference** | 0 | |
| **Relative Price of Imports, NFNO** | 1-4 | 0.02 |
| **Food-Energy Effect Full Period** | 0-4 | 1.18 ** |
| **Food-Energy Effect Late Period** | 0-4 | -0.40 * |
| **Productivity Trend Change** | 1 5 | -0.82 ** |
| **Nixon Controls "on"** | 0 | -1.62 ** |
| **Nixon Controls "off"** | 0 | 1.97 ** |
| | | |
| **Adj. R2** | | 0.95 |
| **S.E.E** | | 0.60 |
| **S.S.R** | | 54.88 |
| **Dynamic Simulations** | | |
| **Mean Error** | | 0.22 |
| **Error in 2015:Q1** | | 0.03 |
| **Root Mean-Square Error** | | 0.76 |
| a) Lagged dependent variable is entered as the four-quarter moving average for lags 1, 5, 9, 13, 17, and 21, respectively | | |
| b) *indicates coefficient or sum of coefficients is statistically significant at the 5 percent level, ** indicates significance at the 1 percent level. | | |

# Dynamic Simulation, 2007:Q1 to 2015:Q1



Figure 4. Actual vs Simulated Headline Inflation Rate, 2006:Q4 Sample End, Short Term Uemployment, 2006:Q4 to 2015:Q1
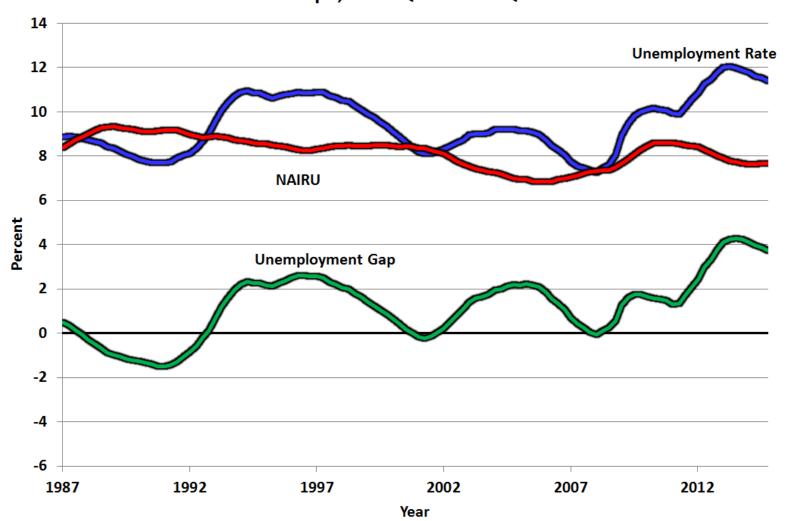
# Parallel Inflation Equations, Euro vs. US

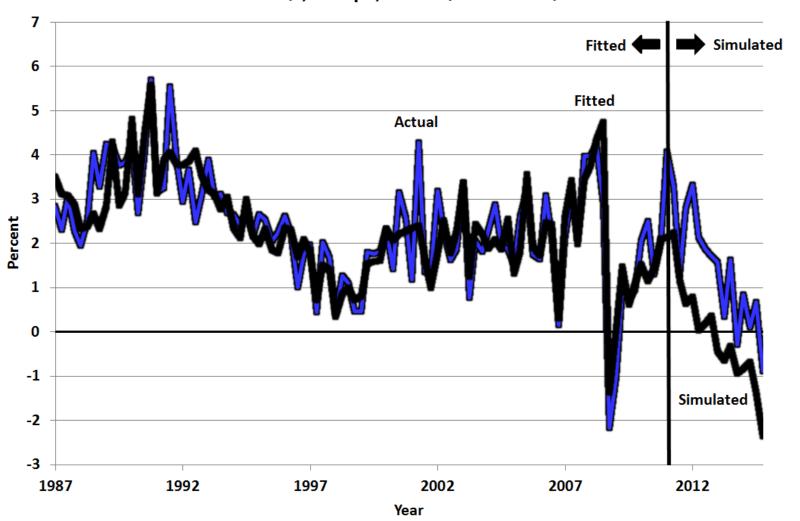| Table 3 | | | | | |
|---|---|---|---|---|---|
| **Estimated Equations for Quarterly Changes in** | | | | | |
| **the Headline PCE Deflator, Europe vs. United States** | | | | | |
| **1987:Q1 to 2014:Q4** | | | | | |
| | | | | | |
| **Variable** | **Lags** | **EU** | | **US** | |
| | | | | | |
| **Lagged Dependent Variable** | 1-9[a] | 1.00 | ** | 1.00 | ** |
| **Unemployment Gap** | 0 | -0.17 | ** | -0.24 | ** |
| **Food-Energy Effect** | 0-4 | 0.80 | ** | 0.51 | ** |
| | | | | | |
| **Adj. R2** | | 0.71 | | 0.91 | |
| **S.E.E** | | 0.69 | | 0.50 | |
| **S.S.R** | | 49.49 | | 25.79 | |
| a) Lagged dependent variable is entered as the four-quarter moving average for lags 1, 5, and 9, respectively | | | | | |
| b) *indicates coefficient or sum of coefficients is statistically significant at the 5 percent level, ** indicates significance at the 1 percent level. | | | | | |

# Euro Actual Unemployment, NAIRU, and Unemployment Gap



Figure 8. Unemployment Rate, NAIRU, and Unemployment Gap, Europe, 1987:Q1 to 2014:Q4

# The Only Way to Test an Inflation Equation: Dynamic Simulation



Figure 9A. Actual Inflation Rate vs Simulated Inflation Rate, Sample End 2006:Q4, Europe, 1987:Q1 to 2014:Q4
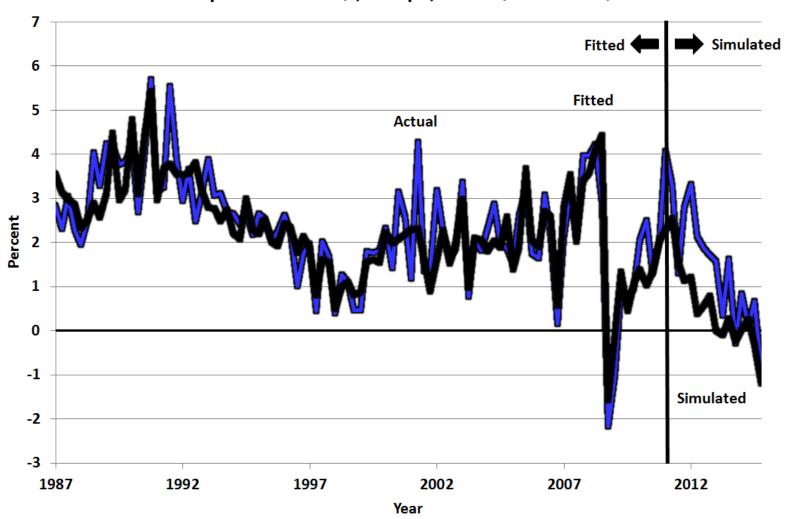
# Add the Hysteresis Effect, 4-Quarter Change in Unemployment

| Table 3A | | | |
|---|---|---|---|
| **Estimated Equations for Quarterly Changes in** | | | |
| **the Headline PCE Deflator, Europe vs. United States** | | | |
| **1987:Q1 to 2014:Q4** | | | |
| | | | |
| **Variable** | **Lags** | **EU** | **US** |
| | | | |
| **Lagged Dependent Variable** | 1-9[a] | 1.00 ** | 1.00 ** |
| **Unemployment Gap** | 0 | -0.13 ** | -0.22 ** |
| Four Quarter Difference | | -0.19 | -0.09 |
| **Food-Energy Effect** | 0-4 | 0.66 ** | 0.47 ** |
| | | | |
| **Adj. R2** | | 0.72 | 0.91 |
| **S.E.E** | | 0.68 | 0.50 |
| **S.S.R** | | 47.77 | 25.55 |
| a) Lagged dependent variable is entered as the four-quarter moving average for lags 1, 5, and 9, respectively | | | |
| b) *indicates coefficient or sum of coefficients is statistically significant at the 5 percent level, ** indicates significance at the 1 percent level. | | | |

# Dynamic Simulation Nails the Actual Values in 2014

## Figure 9B. Actual Inflation Rate vs Simulated Inflation Rate, Alternate, Sample End 2010:Q4, Europe, 1987:Q1 to 2014:Q4
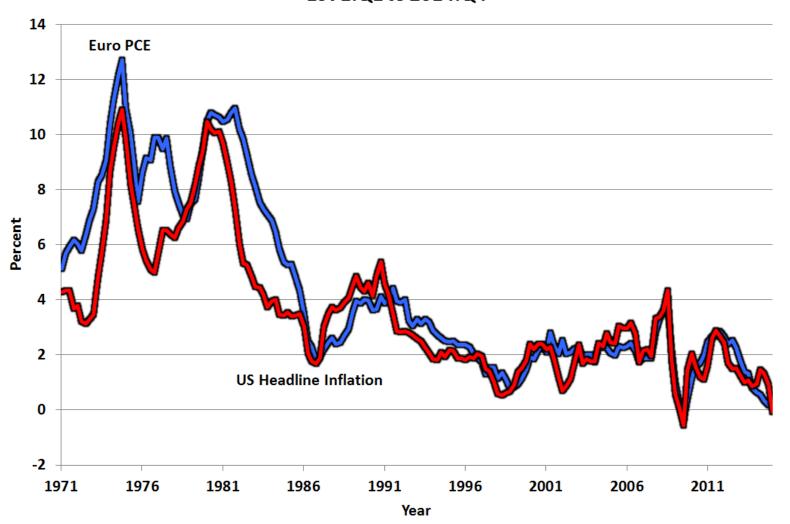
# Comments on Natural Rate Model

- **Natural Rate model generates increased unemployment through an exogenous shock to wage markup**

- **Operates like an oil shock, raising inflation and unemployment, reducing output**

- **Is wage markup shock a plausible event in data covering the entire Euro area when wage bargaining is still done at the national level?**

- **In principle the wage mark-up shock is a plausible explanation of the increase in labor's share in the 1970s that contributed to inflation and disinflation**

# Long-Run Tradeoff Model

- **Now the shock is to price target of central bank**

- **Price adjusts immediately, output and unemployment react slowly**

- **This is the opposite timing sequence of the real world, where the instrument of the central bank is the interest rate, not the price level.**

- **A long, slow slog to change inflation rate. Think of the Volcker disinflation of 1980-81. Interest rates rise, AD declines, unemployment rises, and only then does inflation respond**

# Disinflation 1981-86: High Interest Rates Followed by Decline of Inflation



Figure 5. Annual Inflation Rate, Europe vs. United States, 1971:Q1 to 2014:Q4

# Hysteresis Model

- **Standard definition: dependence of wage and price change on *CHANGE* in unemployment rate, not the LEVEL of the unemployment rate**

- **The model makes wage change depend on the change in employment, not unemployment**

- **But wage change was roughly constant 1992-2014, whereas employment growth was 0.4 1989-1998, 1.1 1999-2008, then -0.6 2009-2014.**

- **No significance test of level effect vs. change effect**

- **Despite these caveats, I think hysteresis in the form of insider-outsider effects and downward wage rigidity is a big part of the European unemployment story**

# Conclusion:  Puzzles About Euro Inflation-Unemployment Process

- **Puzzle #1, why was U rate so low pre-1975?**
  - **This was the period of rebuilding and catching up.  Excess demand, rapid productivity growth**
  - **Rapid labor supply growth from farm to city migration**
- **Puzzle #2, why U rate rose so much 1975-85?**
  - **Potent trio of oil shock, labor share wage markup shock, wage indexation ➔ regime of disinflation.**
- **Puzzle #3, why U rate so high compared to US?**
  - **Rephrase question.  Why is March 2015 U rate 4.8 percent in Germany and 11.3 in Euro area?**
  - **Answer?  Some mix of insider-outsider and structural maladjustment.  The Italians were still raising wages in 2011-2012.**