ECB Monetary Policy in the Great Recession: A New Keynesian (Old Monetarist)

Critique (Second Revision)

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The paper uses the New Keynesian model to disentangle monetary from credit-market shocks as the precipitating factor in the Great Recession in the Eurozone.

Since its inception, the Eurozone has undergone two recessions (Figure 1). Together, they constitute the Great Recession. Popular commentary explains these back-to-back recessions as debt crises. Households and governments had taken on excessive amounts of debt and the consequent deleveraging caused real growth to decline. Banks made possible the excessive accumulation of debt through risky lending.

This story raises the question, what was the precipitating factor that coordinated the decisions of individual households and firms to reduce spending significantly? Furthermore, what failure (friction) in the price system prevented the self-equilibrating properties of the price system from maintaining aggregate demand at potential?[1] The popular focus on banks suggests a financial shock that produced a widespread failure among banks to transfer resources from savers to credit-worthy borrowers. In addition, hard-wired inflexibility in nominal wages prevented labor markets from adjusting to maintain full employment.

In evaluating this "credit-cycle" view of the Great Recession, it is essential to separate money and credit and, similarly, monetary policy and credit policy.[2] What makes a central bank unique is its monopoly over the creation of the monetary base (commercial bank deposits with the central bank plus currency in circulation). Ultimately, financial assets offering payments services are settled through the exchange of base money. Although the empirical counterpart to money becomes increasingly difficult to define as financial markets endow a wide variety of financial instruments with liquidity, control over the monetary base gives the central bank its ability to control money (perhaps defined as a broad Divisia index) and the money price of goods (the price level).[3]

With the distinction between credit and money, one can distinguish between two explanations for the Great Recession. The "credit-cycle" explanation focuses on the disruption to financial intermediation caused by the need to reduce a level of private and public debt rendered excessive by a shift in investor sentiment from optimism to pessimism about the future. The monetary explanation focuses on the failure of the central bank to create money in an amount sufficient to assure long-run price stability (stable low inflation).

Section 1 presents the monetary explanation using a New Keynesian (NK) model with a monetary shock as the precipitating factor. It highlights the monetarist intuition behind the shock as interference by the central bank in the operation of the price system. Section 2 gives the model content in terms of the monetary policy of the European Central Bank (ECB). Section 3 examines the credit-cycle view. Section 4 puts the NK model into the general monetarist framework laid out by Milton Friedman.

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[1] A decline in wealth should make households work more in order to restore their previous status. Similarly, increased pessimism about the future, especially, fear of job loss, would make households save more in order to transfer resources from the present to a more uncertain future. A primary way of saving more is to work more at present. Only some failure of the price system can explain the decline in employment rather than a surge in employment in response to a debt crisis.

[2] Both money and credit serve to effect transactions. However, money creates finality of payment while credit (debt) ultimately requires settlement with money. Commercial banks issue debt (liabilities) to finance loans (assets). At the same time, their liabilities serve as media of exchange (offer liquidity services) to varying degrees.

[3] See Belongia and Ireland (2013).

1. The New Keynesian model

If the central bank follows a credible rule, the monetarist implication of the NK model is that the unemployment-inflation trade-offs of the Phillips curve are not a constituent part of its procedures for the control of inflation. Individual firms that set nominal (dollar) prices for multiple periods do so with the intention of preserving on average the optimal markup of price over marginal cost. This profit-maximizing incentive leads them collectively to set dollar prices in a way coordinated by the central bank's inflation target ($\overline{\pi}$). However, while credibility for an inflation target (as opposed to a price-level target) guarantees trend-stationarity in prices, the central bank must allow inflation shocks (concentrated changes in relative prices that pass through to the price level) and real aggregate-demand shocks to impart random drift to prices.

In contrast, the Keynesian view is that real aggregate demand shocks (in the first instance) produce deviations of output from potential while inflation shocks (in the first instance) produce deviations of inflation from target. The central bank possesses the ability to moderate extreme deviations in either variable by introducing some inverse variation in the other variable (by exploiting a Phillips curve trade-off). It can systematically reduce fluctuations in output by increasing fluctuations in inflation and vice versa.

Equations (1) and (2) constitute the standard abridged version of the NK model. McCallum (2001, 258) exposits the abridged model and comments that it represents a convergence "on a general framework for conducting analysis of monetary policy" but then notes that "crucial features of the framework are flexible enough to accommodate quite divergent views regarding the workings of the economy." In that spirit, this paper contrasts the divergent monetarist and Keynesian views on optimal procedures for the control of inflation.

(1) $y_t = -\varphi(R_t - \pi^e_{t+1}) + y^e_{t+1} + g_t$

(2) $\pi_t - \overline{\pi} = \beta(\pi^e_{t+1} - \overline{\pi}) + \lambda \ ygap_t$

Equation (1) is a log-linearized version of the Euler equation linking an optimizing consumer's intertemporal marginal rate of substitution to the real interest rate. The real interest rate is related to expected consumption growth (output in the simple model lacking investment). Output is y_t and the superscript e indicates an expectation made at time t of output at time $t+1$. R_t is the nominal interest rate, the central bank's policy variable. Inflation from period t-1 to period t is π_t so that π^e_{t+1} is expected inflation at time t. The term $(R_t - \pi^e_{t+1})$ is the real interest rate. The aggregate demand shock, g_t, is a portmanteau variable including shocks to government spending or the public's rate of time preference.

Equation (2) is the NK Phillips curve. The central bank's inflation target, which determines steady-state inflation, is $\overline{\pi}$. Unlike β, which is a discount factor; φ, which comes from consumer preferences; and λ, which reflects the cost of price adjustment; $\overline{\pi}$ is a parameter set by the central bank. The output gap (the difference between actual output and potential output measured as output

assuming perfect price flexibility) is $ygap_t$.[4] With rational expectations, made plausible by central bank credibility for maintaining trend inflation at $\bar{\pi}$, the model explains fluctuations in inflation around targeted inflation.

The "New" part of "New Keynesian" comes from the assumption that the behavior of private agents depends not only upon the contemporaneous actions of the central bank but also upon its expected future actions. The forward solution of equations (1) and (2), shown as equations (3) and (4), fleshes out the implications for policy.[5] A credible rule for the control of inflation by the central bank implies that the public will anticipate that the real interest rate will vary in a way that counters contemporaneous and future aggregate demand shocks (g_{t+i}). Fluctuations in the output gap, $ygap_t$ in (4), will then be transitory.

$$(3) \quad y_t = E_t \sum_{i=0}^{\infty} \left[-\varphi (R_{t+i} - \pi_{t+i+1}) + g_{t+i} \right]$$

$$(4) \quad \pi_t - \bar{\pi} = E_t \sum_{i=0}^{\infty} \left[\beta^i \lambda \, ygap_{t+i} \right]$$

With Calvo price setting by firms being the only nominal distortion, price stability eliminates the distortion caused by the interaction of price stickiness with inflation (Goodfriend and King 1997 and Goodfriend 2004). With price stability (or minimal inflation of $\bar{\pi}$), the operation of the economy is (basically) consistent with the underlying real-business-cycle (RBC) core of the NK model. Given credibility, the task of the central bank is to stabilize the output gap. In the monetarist spirit that the price system works well in the absence of monetary disturbances, the task of the central bank then becomes the implementation of a rule that causes output to track potential output. It does so as a consequence of a rule that causes the real interest rate implicit in its interest rate target R_t to track the natural real rate of interest turned out by the RBC core of the economy. Credibility allows the central bank to separate the determination of the price level from the determination of relative prices (the operation of the price system). In this spirit, equation (5) is the central bank's reaction function, with r_t^* the natural rate of interest (the real rate of interest assuming perfect price flexibility).

$$(5) \quad R_t = \bar{\pi} + r_t^*$$

Clarida et al (1999) endow the NK model with a Keynesian flavor by introducing an inflation shock (μ_t) into equation (2). Equation (2) becomes equation (6) and equation (4) becomes equation (7). With the addition of this inflation (cost-push) shock, the central bank can no longer simultaneously achieve price stability (keep inflation at $\bar{\pi}$) and keep the output gap at zero. Using a

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[4] Productivity shocks will cause fluctuations in potential output. The monetarist tradition assumes that the central bank does not possess real-time knowledge of the output gap and must turn over to the price system responsibility for minimizing its fluctuations. The Keynesian tradition, which measures potential output as a smooth trend line, assumes the central bank can make decisions based on knowledge of the output gap. See, for example, Orphanides (2003) and Orphanides and van Norden (2002).

[5] Because (1) is a first-order Taylor approximation to the Euler equation, all variables are expressed as logarithmic deviations from their non-stochastic, steady-state values. If, instead, the variables are simply in logs, then a constant term corresponding to the steady-state value would appear in (1).

loss function in which both inflation and output gaps impose costs, Clarida et al (1999) derive an equation displaying a trade-off between fluctuations in the output gap and in inflation around its steady-state value (Clarida et al 1999, 1668).

$$(6) \quad \pi_t - \overline{\pi} = \beta(\pi_{t+1}^e - \overline{\pi}) + \lambda \ ygap_t + \mu_t$$

$$(7) \quad \pi_t - \overline{\pi} = E_t \sum_{i=0}^{\infty} \left[\beta^i \lambda ygap_{t+i} + \mu_{t+i} \right]$$

However, the introduction of the inflation shock is ad hoc. As emphasized by Goodfriend and King (1997), the optimality of price stability in an NK model applies to firms in the sticky-price sector. An attempt by the central bank to offset inflation shocks due say to increases in commodity prices, that is, transitory inflation originating in the flexible-price sector, requires the central bank to create a negative output gap (raise firms' markups). Whether the central bank can exploit Phillips curve trade-offs in this way without destabilizing economic activity remains an open question. Friedman 1968 [1969] and Lucas 1972 [1981] contend that such interference introduces destabilizing output fluctuations, which create the empirical correlations of the Phillips curve.

The monetarist interpretation offered here of such attempts uses the central bank reaction function (8) from Goodfriend and King (2013, 191). With credibility, the central bank's inflation target $\overline{\pi}$ determines trend inflation. The term $\Omega(\pi_t - \overline{\pi})$ represents monetary shocks produced by interference of the central bank in the operation of the price system. That interference originates in an attempt by the central bank to control headline inflation, which includes transitory inflation shocks, as opposed to core inflation in the sticky-price part of the economy.

$$(8) \quad R_t = \overline{\pi} + r_t^* + \Omega(\pi_t - \overline{\pi})$$

2. Using the NK model to identify shocks

In the monetarist spirit, as summarized in (5), the optimal rule for the control of inflation possesses two characteristics. First, in order to avoid interfering with the price system, the central bank needs to control trend inflation through a credible rule that conditions the nominal expectational environment of firms setting prices for multiple periods. Second, it needs to stabilize fluctuations in the markup of firms around the optimal markup through a procedure for setting its policy rate in a way that tracks the natural rate of interest. Such a rule could in principle use the information in headline inflation; however, any purposeful attempt to create a negative output gap in order to reduce high headline inflation produced by transitory inflation shocks destabilizes the economy.[6]

With respect to the first characteristic articulated above, the ECB has continuously maintained credibility for its inflation target. As shown in Figure 2, measured by the inflation

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[6] Hetzel (2004, 2005, 2006, 2008a, 2008b, and 2012) terms such procedures lean-against-the-wind (LAW) with credibility and argues that they characterized the consistent part of FOMC procedures in the Volcker-Greenspan era following the Volcker disinflation. Under LAW with credibility, the FOMC raised interest rates in a moderate but persistent fashion when the economy grew at a rate fast enough to increase rates of resource utilization (reduce the unemployment rate), and analogously for economic weakness. It continually monitored bond markets for evidence that markets expected such rate increases to cumulate to a level high enough to prevent an increase in trend inflation (Goodfriend 1994). As reflected in its use of core measures of inflation, the FOMC did not respond to fluctuations in inflation perceived as transitory.

forecasts of professional forecasters, expected inflation has remained firmly anchored at the ECB's objective of somewhat less than 2%. With respect to the second characteristic articulated above, for most of its existence, the ECB followed procedures that allowed the price system to work.

Figure 3 plots changes in the ECB's main-refinancing-operations (MRO) rate. As a measure of economic activity, it also plots the growth rate in real retail sales.[7] The two periods of increases in the MRO rate (2/2000 to 10/2000 and 12/2005 to 6/2007) correspond to increases in the growth rate of retail sales. As shown by declines in the unemployment rate (Figure 4), the economy was growing above trend in these periods. The two periods of decreases in the MRO rate (5/2001 to 11/2001 and 12/2002 and 6/2003) correspond to decreases in the growth rate of retail sales. As shown by increases in the unemployment rate, the economy was growing below trend.

Figure 5 shows Eurozone inflation and the ECB's policy rate. There is no detectable relationship between the series. As shown in Figure 2, throughout its existence, the ECB has maintained credibility for its inflation target of 2% or somewhat less. As shown in Figure 5, inflation remained near 2% until end-2007 when it spurted upward. The behavior of inflation and ECB policy procedures are consistent with the implications of the NK model that the central bank maintains trend inflation equal to target through credibility for a rule that controls the price setting of firms in the sticky-price sector.

Aastrup and Jensen (2010) offer econometric support for this characterization of ECB procedures as LAW with credibility:

> We show that the ECB's interest rate changes during 1999-2010 have been mainly driven by changes in economic activity in the Euro area. Changes in actual or expected future HICP inflation play a minor, if any, role.

The ECB began in a benign inflation environment. That changed with a large inflation shock that began in 2004 and that continued with an unprecedented degree of persistence. Figure 6 graphs the CRB Commodity Spot Price Index. The euro price of oil measured by the Brent Crude Oil Price Index behaved similarly.[8] Figure 7 shows headline and core inflation, and Figure 8 shows goods and services inflation. The latter series, core and services inflation, which are relatively stable, are rough proxies for prices in the sticky-price sector. The additional variability in headline and goods inflation largely reflects the effect of inflation shocks on inflation in the flexible price sector.[9]

The jump from end-2007 to mid-2008 in CPI inflation from 2% to 4% reduced the real income of households. Figure 9 shows the cessation in 2007Q2 of the prior steady increase in real

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[7] Use of either the purchasing manager's index (PMI) or industrial production as measures of economic activity yields similar graphs.

[8] The growth of countries like China, India, and Brazil accounted for the increase in the relative price of commodities. For example, in 2000, China accounted for 12% of global consumption of copper. In 2012, the number had grown to 42% (*Financial Times*, 6/3/13). See Eickmeier and Kűhnlenz 2013.

[9] Initially, the inflation shock did not pass through to headline inflation (Figure 7). One explanation for this lack of pass through is an offsetting negative inflation shock in the form of an appreciation of the euro. From 2002 until mid-2008, the euro appreciated from less than .9 dollars/euro to almost 1.6 dollars/euro.

disposable income. Growth in real consumption peaked in 2007Q3.[10] Consumer confidence (Economic Sentiment Indicator) peaked in May 2007. The pessimism of households about their future income prospects required a reduction in the real interest rate in order to maintain aggregate demand.

Starting in late 2007, the ECB's concern for high headline inflation kept it from lowering its policy rate (R_t) as the economy weakened and the natural rate of interest (r_t^*) declined. In terms of the reaction function (8), the term $\Omega(\pi_t - \bar{\pi})$ became positive.[11] As late as July 2008, the ECB raised its policy rate (the MRO). As shown in Figure 5, it became willing to lower rates only when headline inflation fell. As shown in Figure 10, wage inflation (year-over-year in the business sector) increased from 3% over the interval 2003Q1 to 2006Q1 to 5.1% in 2008Q1. The result of maintaining a high level of interest rates while the economy weakened replicated the classic tight monetary policy of a stop phase of stop-go monetary policy (Hetzel 2008a, Chs. 23-25; Hetzel 2012, Ch. 8; Hetzel 2013).

The world economy began to recover in mid-2009. In the past, strong recoveries had followed deep recessions. It seems likely that optimism for a V-shaped recovery stimulated output. However, when the world economy revived, commodity price inflation also rose and raised CPI inflation (Figures 2, 5, 6, 7 and 8). Events then unfolded as they had in 2008. The second inflation shock exacerbated the ongoing decline in real disposable income. Consumption, which had been recovering slowly, again began to decline after 2010Q4 (Figure 9). Real retail sales peaked in September 2010 (Figure 3). The growth rate of real aggregate demand (final sales to domestic purchasers) began falling after 2011Q1.[12]

Concentrating on the increase in headline inflation, the ECB raised its policy rates twice in 2011 (Figure 11). In 2009, the Eonia rate began to follow the rate on the deposit facility rather than the MRO rate.[13] (The MRO became the rate at which banks with funding problems borrowed.) The ECB raised the rate on the deposit facility from .25% in early 2011 to .75 by July 2011.

The temporal relationship between money (M1) growth and GDP (nominal and real) growth conformed to monetarist generalizations (Friedman and Schwartz 1963).[14] The monetary aggregate

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[10] Over the interval 2004Q4 through 2007Q3, real personal consumption (PCE) expenditures grew at an annualized rate of 2%. Real PCE growth then declined as follows: 1.4% (2007Q4), .2% (2008Q1), -.3% (2008Q2), and -1.2% (2008Q3).

[11] One concern was that high headline inflation would exacerbate wage demands of German unions (Hetzel 2012, 221).

[12] Final sales to domestic purchasers is GDP minus the change in inventories minus exports plus imports. It is a measure of domestic demand while GDP is a measure of output. From 2010Q2 through 2011Q1, real final sales to domestic purchasers grew at an annualized rate of 2.3%. In 2011Q2, growth fell to -.9%.

[13] EONIA (Euro OverNight Index Average) is the interest rate on overnight unsecured lending transactions in the interbank market.

[14] The NK model summarized in equations (1) and (2) does not explicitly contain a money demand equation. As long as the central bank follows a rule that provides a stable nominal anchor and that allows the price system to determine real variables, given its interest rate target, real money grows in

M1 is a better measure of transactions demand than M3 because M3 includes a significant amount of debt instruments.[15] Banks issue debt to finance loan growth when loan demand is high. As shown in Figure 12, apart from 2002-2003 and 2012-2013 when banks made up for weak loan demand by holding more government securities, M3 growth and loan growth move together. For this reason, it is hard to disentangle causation between growth in M3 and in the economy. M3 is best viewed as a contemporaneous indicator of the economy.

Money (M1) growth slowed starting in 2006Q3 and slowed sharply starting in 2007Q4 (Figure 13). A decline in nominal GDP followed (Figure 13) accompanied by a decline in real GDP (Figure 1). Real GDP growth declined from an annualized growth rate of 2.2% in 2008Q1 to -1.5% in 2008Q2. After falling to near zero in 2008Q3, M1 growth revived. Real GDP growth reached a trough in 2009Q1 with annualized growth of -10.8%. M1 growth fell sharply starting in 2010Q3. Real GDP growth declined from an annualized growth rate of 2.9% in 2011Q1 to -1.2% in 2011Q4.

Unfortunately, the signal to noise ratio is low for the monetary aggregates. In a time of financial turmoil when market participants desire liquidity, they likely transfer out of the illiquid debt instruments in the non-M1 part of M3 into the liquid demand deposits of M1. In fall 2008 and in 2009 investors probably transferred out of illiquid deposits and debt instruments into demand deposits. Those flows inflated M1 without any implications for the stance of monetary policy. One is on firmer ground using M1 growth as a measure of the stance of monetary policy in the first half of 2008 when growth in M1 and M3 both declined and after May 2010 when M1 growth declined while M3 growth remained low (Figure 14).

Figure 15 shows M1 and M3 velocity. Over time, velocity declines for both aggregates. When money is a measure of the impact of monetary policy on nominal GDP growth, declining velocity makes a given level of money growth more restrictive. However, as noted, because of the low signal-to-noise ratio in the monetary aggregates and the difficult judgment as to when the central bank is maintaining a level of interest rates inconsistent with the natural rate of interest, money growth is usually uninformative as a predictor of nominal output growth.

3. Monetary vs. credit market shocks

Despite the assumption common in popular commentary that a credit-market shock caused the Great Recession, the evidence in favor of such a shock is weak. It is hard to point to a significant disruption in financial intermediation preceding the start of the Great Recession. The Lehman Brothers bankruptcy on September 15, 2008, precipitated a run of cash investors who ceased funding financial institutions with long-term, illiquid mortgage assets. However, the euro area economy had

line with the real quantity of money demanded. Money offers no additional information about the evolution of the economy. However, in episodes in which the central bank interferes with the operation of the price system and creates a difference between the natural rate of interest (the real rate consistent with perfect price flexibility) and the real rate of interest, the behavior of money becomes informative. In general, for forecasting purposes, the signal-to-noise ratio is very low for the monetary aggregates. Nothing in that fact, however, bears on the validity of the monetarist hypothesis that monetary control and a rule that allows the price system to work are inseparable.

[15] M1 includes currency in circulation and overnight deposits. M3 includes M1 plus time deposits with maturity up to 2 years, deposits redeemable given notification up to 3 months, repurchase agreements, money market fund shares, and debt instruments with maturity up to 2 years.

already entered into recession by then with real GDP falling at annualized rates of -1.5% and -2.4% in 2008Q2 and 2008Q3, respectively.

The growth rate of real aggregate demand began falling after 2007Q4.[16] In contrast, loan growth remained healthy even while the economy entered recession. Loans to the private sector from banks (monetary financial institutions or MFI) averaged 10.7% year-over-year from May 2006 through May 2008 (Figure 12). Only in June 2008, did loan growth begin to fall below 10%.[17] Similarly, after the recovery took hold in 2009Q3, loan growth recovered steadily until peaking in 2011Q3 and then declining sharply. In contrast, the recovery in domestic demand aborted earlier. As noted in fn. 9, growth in real final sales to domestic purchasers fell from 2.3% over the 2010Q2 to 2011Q1 interval to -.9% in 2011Q2.

Figure 16, which shows Eurozone government debt as a percentage of GDP, does not support the idea of a credit cycle. Two sharp increases in this number occurred, one starting in 2008Q4 and the other in 2012Q1. Both came well after the weakening in economic activity. For the Eurozone, there is no evidence of an unwinding of speculative excess preceding the start of the Great Recession. Figure 17 shows real house prices for a number of countries. Nothing in the series for the Eurozone suggests any speculative excess conducive to a credit cycle.

What about the subprime crisis? In August 2007, cash investors ceased buying the commercial paper issued by banks to finance the holding of subprime mortgages in off-balance-sheet entities called structured investment vehicles or SIVs (Hetzel 2012, 179). European as well as American banks held many of these mortgages (Hetzel 2012, 242). Uncertainty over the extent to which individual European banks held such mortgages lessened the willingness of European banks to lend to each other in the interbank market. Instead of relying on short-term loans to meet liquidity needs, European banks began to hold additional excess reserves (Heider et al 2009). The ECB accommodated that increased demand. As shown in Figure 11, the Eonia rate remained fixed at the ECB's MRO rate. Through its swap lines, the Fed provided the dollars to the ECB that it relent to European banks to replace the dollar funding no longer supplied by cash investors (Hetzel 2012, 244 and 267). In short, central banks made certain that funding pressures on European banks did not affect their intermediation function.

Attribution of the Eurozone recession to a debt crisis received popular support from events occurring from mid-summer 2011 to mid-summer 2012 when investors fled the sovereign debt markets of Italy and Spain. The fear was of a negative, self-reinforcing cycle initiated by high interest rates on sovereign debt. Consider Italy whose debt/GDP ratio was 120%. In summer 2011, the fear was of a negative feedback loop setting in between a sovereign debt crisis and a banking crisis. Italian banks hold large amounts of Italian government debt. If the sovereign debt burden

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[16] From 2005Q4 through 2007Q4, real final sales to domestic purchasers grew at an annualized rate of 2.8%. In 2008Q1, the number was 1.4%; in 2008Q2, it was -.1%; and in 2008Q3, it was -.8%.

[17] In an environment of contemporaneously weakening economic activity and falling loan demand, it is hard to disentangle the causal impact on bank lending due to tightening lending standards. The July 2008 "Euro Area Bank Lending Survey" (European Central Bank 2008) reported:

> The most important factor in the net tightening continued to be a deterioration in expectations about the economic outlook…. Banks reported that net demand for loans to enterprises and households continued to be negative in the second quarter of 2008.

became unsustainable in the eyes of financial markets, the value of Italian bonds would fall. The possibility of sovereign default meant that Italian banks could become insolvent. Depositors then would flee. For small countries like Ireland, Portugal and Greece, the Troika (the European Commission, the ECB and the IMF) provided aid. However, Italy is the third largest country in the Eurozone. The willingness of the core countries, especially Germany, to backstop the issuance of Eurobonds to bail out a country as large as Italy was uncertain.

Attribution of the renewal of recession to this debt crisis, however, conflicts with the timing of events. Figure 18 shows sovereign credit default swap spreads for Italy and Spain. They start their climb to alarming levels in mid-2011. In early July 2011, the spread of two-year yields on Italian over German debt climbed above 2% and reached 7% in late November 2011. However, the Eurozone economy had already begun to weaken after 2011Q1. The timing suggests causation going from the economic weakness to a debt crisis rather than the other way around.

An argument for a debt crisis as a precipitating factor in the euro crisis is an assumed disruption of lending to small- and medium-sized enterprises. The *Financial Times* (6/5/13) wrote:

> It has been clear for some time that in parts of the currency union the monetary transmission mechanism is broken. Ultra-cheap interest rates engineered in Frankfurt do not reach businesses in countries like Italy and Spain…. The ECB now thinks that the best way to deal with the credit crunch is to ensure that the Eurozone banks are properly capitalized…. A more effective course of action might be for the ECB to purchase bundles of SME loans directly. While radical, this would be legal under the central bank's mandate, which prohibits monetary financing of sovereigns….

Figure 19 shows interest rates on loans made to corporations in Germany, France, Spain, and Italy along with the spread between the average on loans in France and Germany and the average on loans in Spain and Italy. The spread begins to widen steadily in July 2011along with, not prior to, weakening in the economy. Moreover, in 2011, the unemployment rate rose sharply in Italy and was already above 20% in Spain. It is not obvious that the spread shown in Figure 19 between German/French and Spanish/Italian loan rates exceeded a normal risk premium and was therefore indicative of a failure of financial intermediation.

4. Milton Friedman's long and variable lags

In *A Program for Monetary Stability*, Friedman criticized a reaction function entailing a direct response by the central bank to misses of a target for inflation. As expressed in the phrase "long-and-variable-lags," Friedman feared that such a reaction function would cause central banks to change the setting of their policy instrument without regard to the lags involved. Given these lags, he worried about cumulative mistakes. That concern caused him to argue for a policy of steady money growth.

Friedman (1960, 87-88) wrote:

> While the stock of money is systematically related to the price level *on the average*, there is much variation in the relation over short periods of time…. [M]onetary changes have their effect only after a considerable lag and over a long period and that … lag is rather variable…. [T]he price level … could be an effective guide only if it were possible to predict, first, the effects of non-monetary factors on the price level for a considerable period of time in the

future, second, the length of time it will take in each particular instance for monetary actions to have their effect, and third, the amount of effect of alternative monetary actions…. I find it virtually impossible to conceive of an effective procedure when there is little basis for knowing whether the lag between action and effect will be 4 months or 29 months or something in between (italics in original).

Later, Friedman (1984, 27) applied this critique to the cyclical inertia imparted to interest rates during the stop-go era of monetary policy:

The result was that the monetary aggregates tended on average to rise excessively, contributing to inflation. However, from time to time, the Fed was too slow in lowering rather than in raising the federal funds rate. The results were a sharp deceleration in the monetary aggregates and an economic recession.

As framed by Friedman, the issue is whether an inflation-targeting central bank can control inflation through a simple feedback rule running from misses in inflation from target to changes in the bank's policy instrument. In the specific context of monetary policy since 2008, can a central bank offset the effect of an inflation shock on headline inflation by allowing a negative output gap to emerge, that is, by maintaining the level of interest rates while the economy weakens? The answer bears on the issue of the optimal way for a central bank to control inflation. Should it implement a rule that conditions price setting in the sticky-price sector of the economy while allowing market forces to determine the real interest rate and, by extension, other real variables? Alternatively, should it exploit Phillips curve trade-offs in order to balance off fluctuations in inflation around target and output around potential?

This issue will remain relevant because of the increased importance of inflation shocks. Figure 20 shows for the United States PCE inflation for goods and for services. Inflation in the services sector is far more stable than inflation in the goods sector. Goods inflation increases relative to services inflation from 1987 until 1991 and from 1998 until 1999. The first increase reflects strength in commodity prices resulting from strength in the world economy due to the monetary expansion following the Louvre Accord. The second reflects the monetary expansion followed during the Asia/Russian crisis, which started in summer 1997 and continued through fall 1998 (Hetzel 2008a, Chapters 14 and 17). Overall, the message is that prior to 2004, inflation shocks are not a problem for central banks.

However, in the last decade with the emergence of new countries like China, India, and Brazil as world economic powers, cycles in world economic activity create inflation shocks that pass through to headline inflation in countries like the United States and in the Eurozone. Monetary policy makers will need to decide how to respond to this challenging inflation environment.

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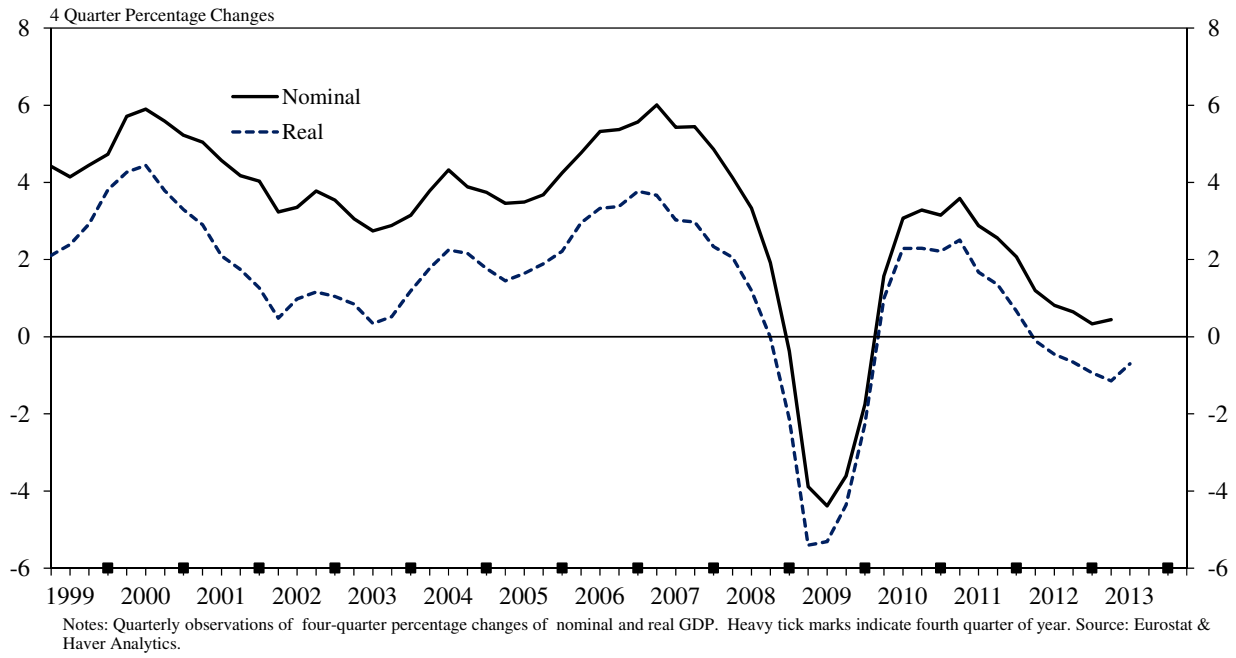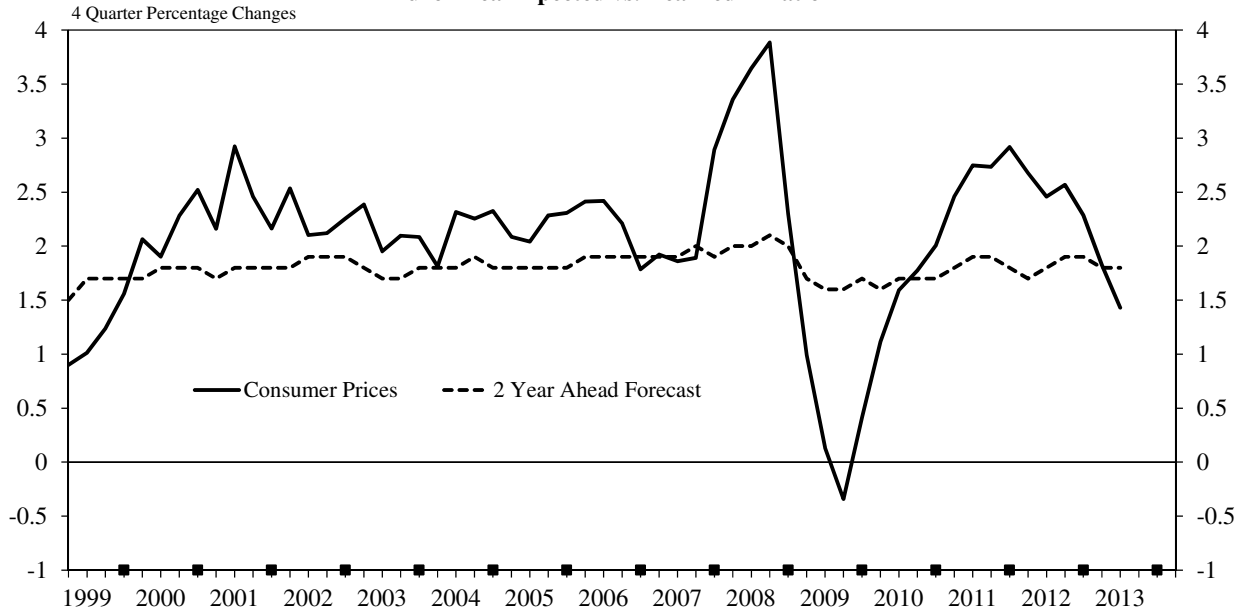
Figure 1
Euro Area Nominal vs. Real GDP

Notes: Quarterly observations of four-quarter percentage changes of nominal and real GDP. Heavy tick marks indicate fourth quarter of year. Source: Eurostat & Haver Analytics.

Figure 2
Euro Area Expected vs. Realized Inflation

Notes: Quarterly observations of four-quarter percentage changes in Harmonized Index of Consumer Prices. Inflation forecast is from Survey of Professional Forecasters Mean point estimates: Two Years Ahead. Heavy tick marks indicate fourth quarter of year. Source: Haver Analytics and ECB

Figure 3
Retail Sales and ECB Policy Rate
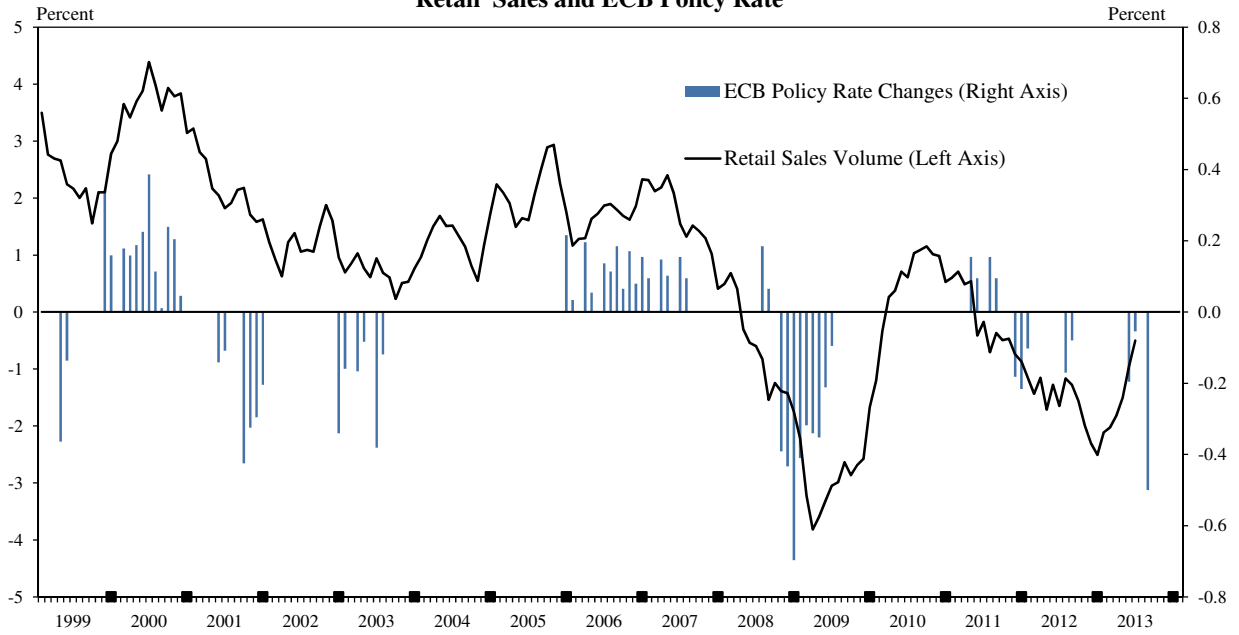
Notes: Retail Sales Volume is the three month moving average of the year over year percentage change in the EA 17: Retail Sales Volume Index (SA/WDA, 2010=100). ECB Policy Rate is the Main Refinancing Operations Rate. Heavy tick marks represent the fourth quarter of year. Source: Eurostat & Haver Analytics.

Figure 4
Euro Area Unemployment Rate

Notes: Heavy tick marks indicate fourth quarter of year. Source: Eurostat and Haver Analytics.
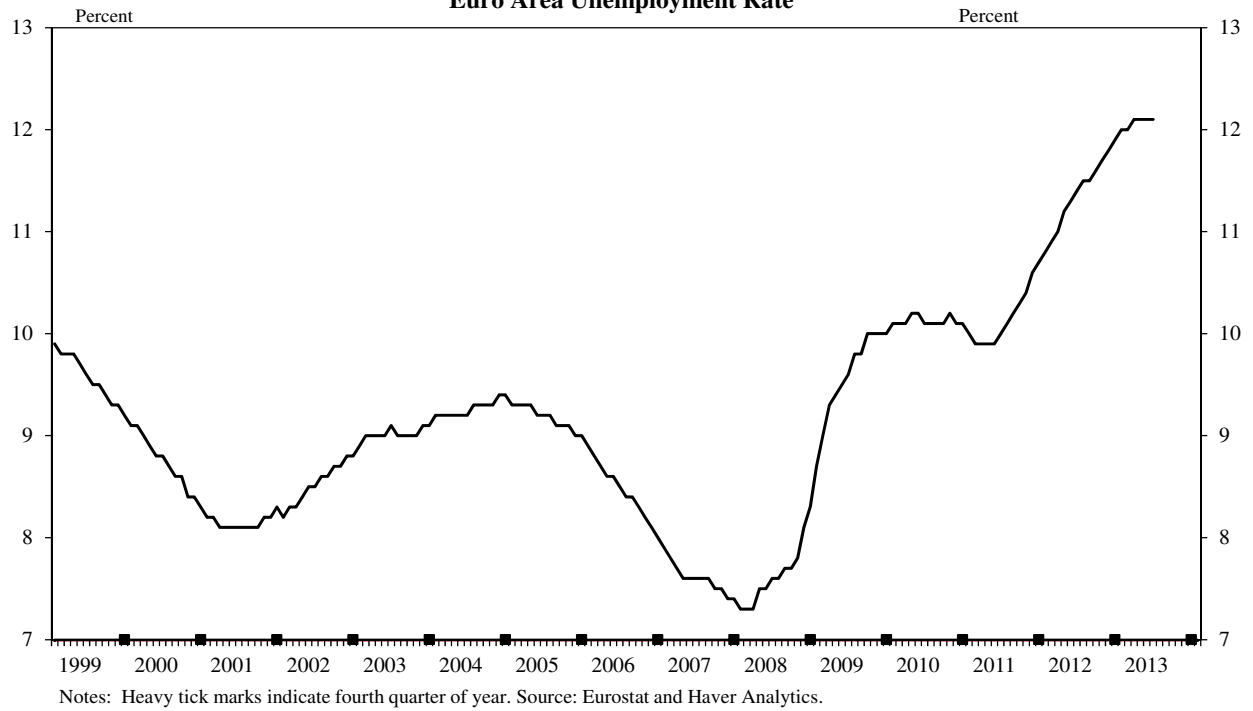
Figure 5
Inflation and ECB Policy Rate
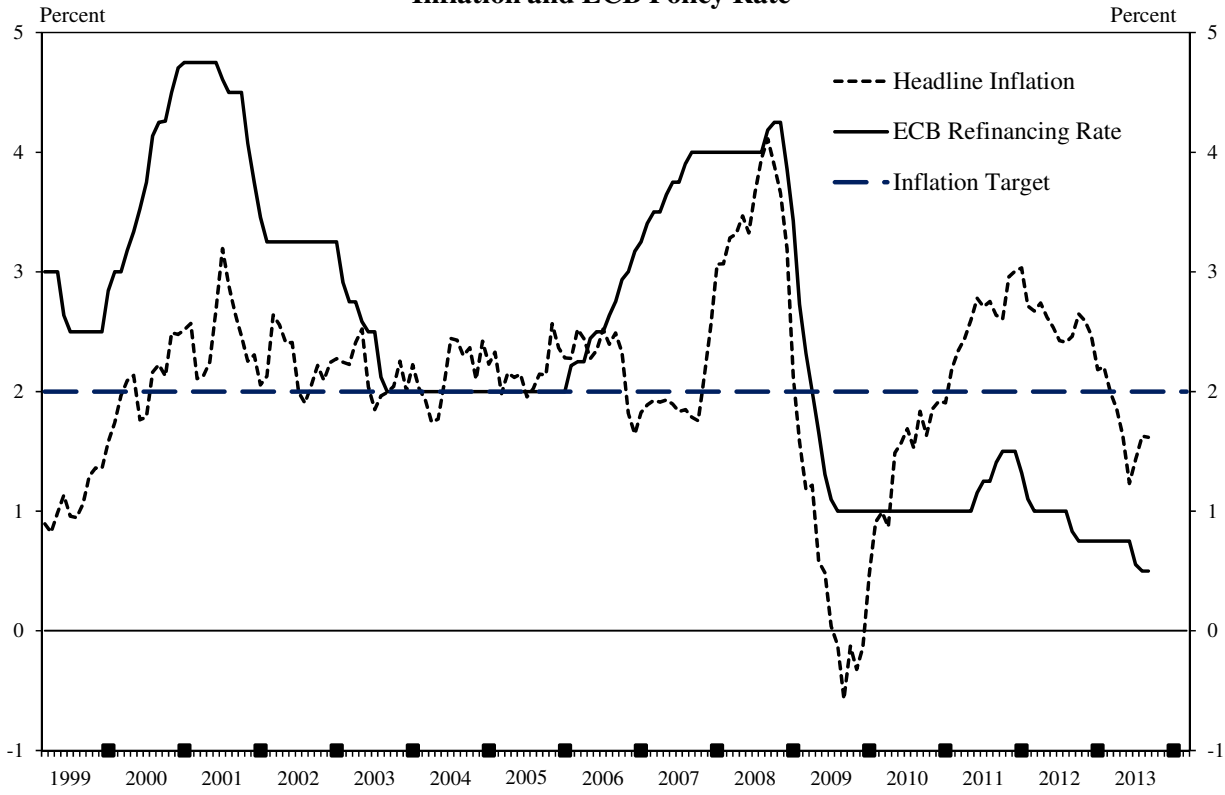
Notes: Monthly observations of 12-month percentage changes in the harmonized CPI. ECB refinancing rate is the Main Refinancing Operations Rate. Heavy tick marks indicate December. Source: ECB and Haver Analytics.

Figure 6
CRB Commodity Spot Price Index
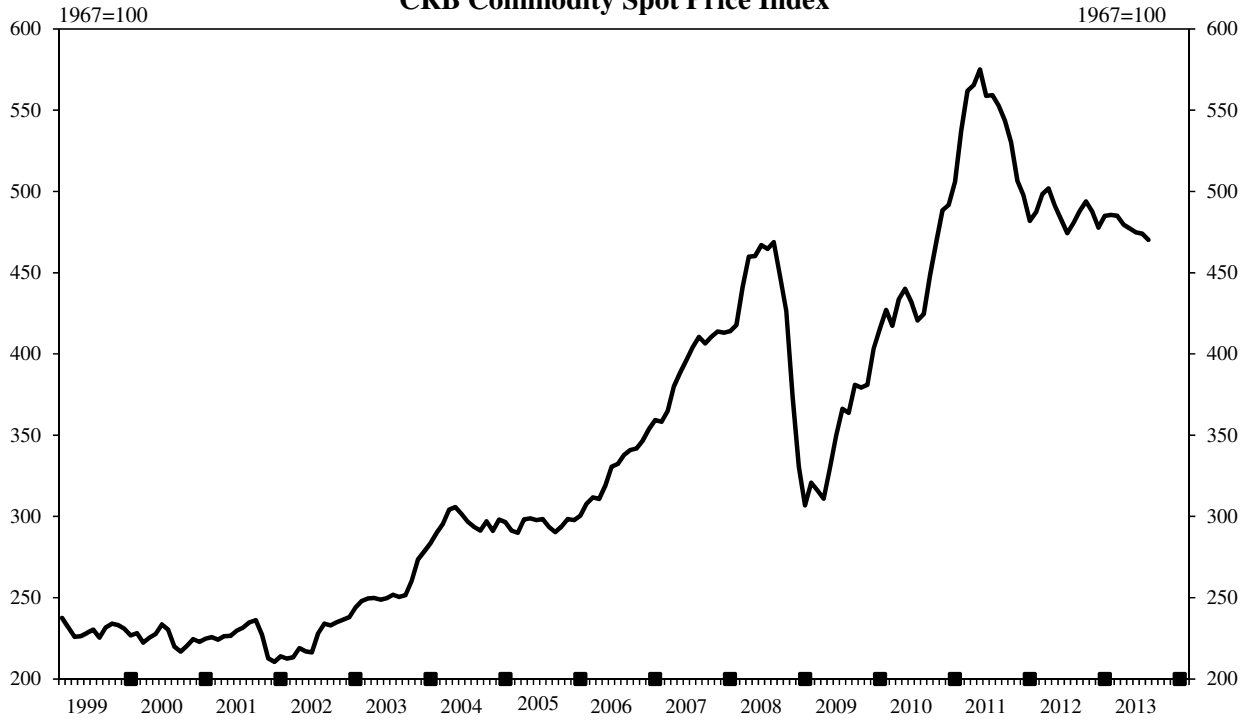
Notes: CRB Spot Commodity Price Index: All Commodities (AVG, 1967=100) . Heavy tick marks indicate December . Source: Reuters-CRB Commodity Index Report and Haver Analytics.

Figure 7
Euro Area Headline and Core Inflation
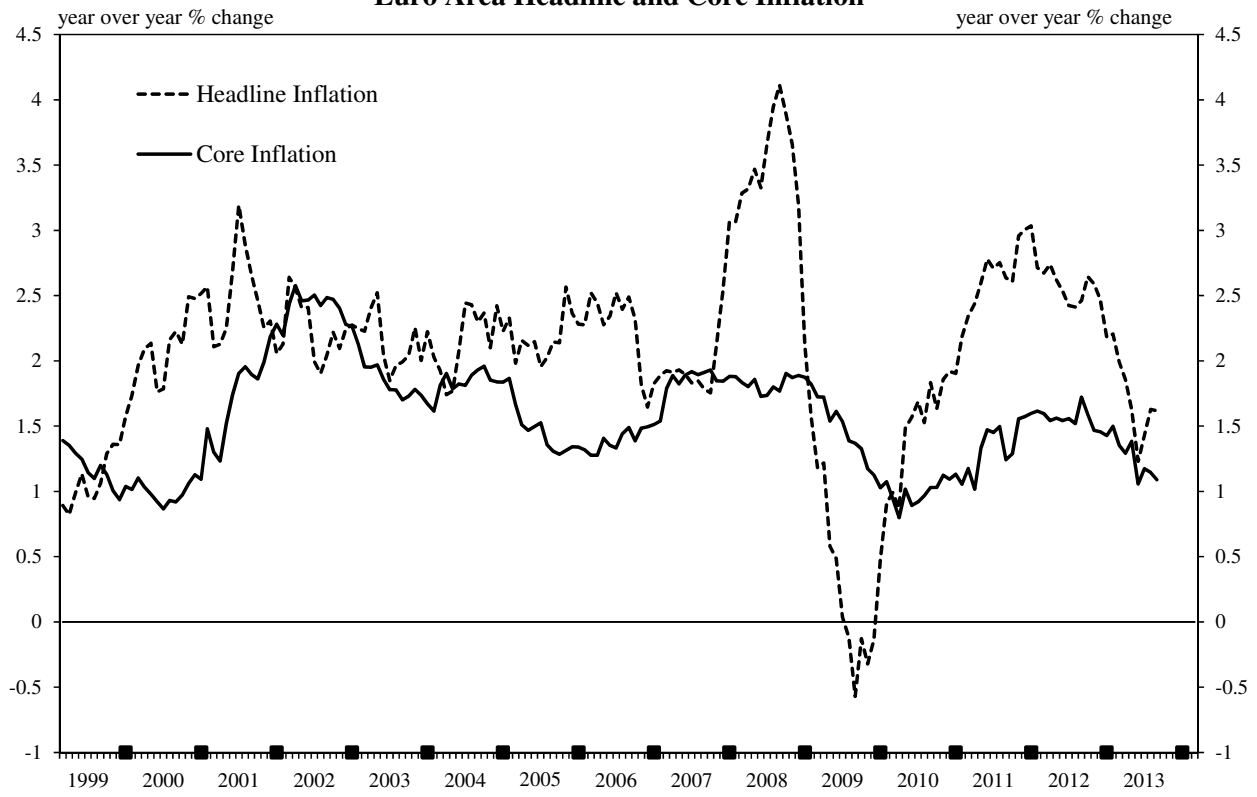
Notes: Headline inflation is the harmonized CPI. Monthly observations of 12-month percentage changes. Core inflation excludes energy, food, alcohol and tobacco. Heavy tick marks indicate December. Source: ECB and Haver Analytics.

Figure 8
Euro Area Inflation
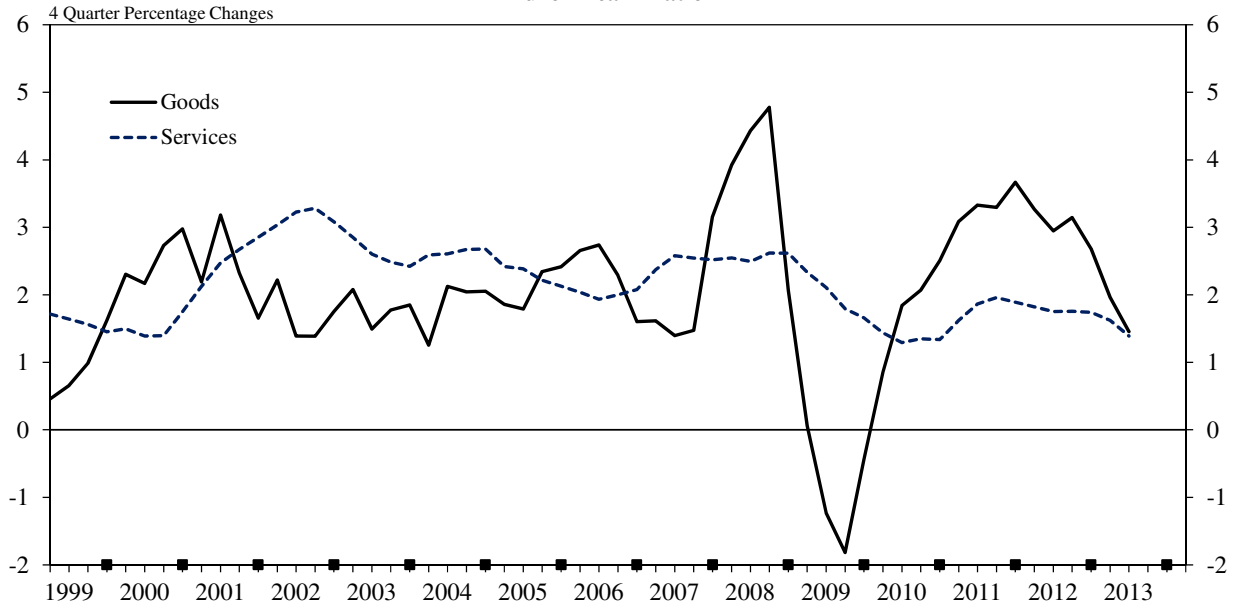
Notes: Quarterly observations of harmonized CPI. Heavy tick marks indicate fourth quarter of year. Source: Haver Analytics & Eurostat

Figure 9
Euro Area Real Gross Disposable Income & Private Consumption
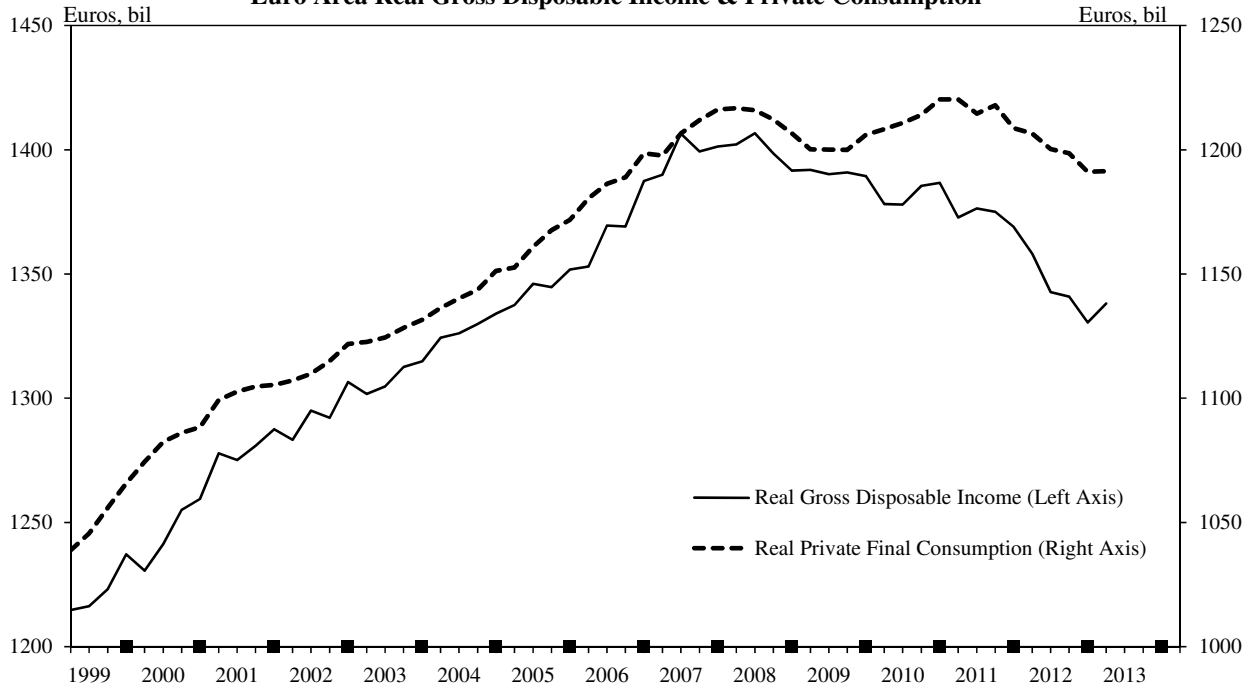
Note: Real Gross Disposable Income is defined as Gross Disposable Income divided by Harmonized Consumer Prices times 100. Heavy tick marks indicate the fourth quarter of year. Source: Eurostat and Haver Analytics.
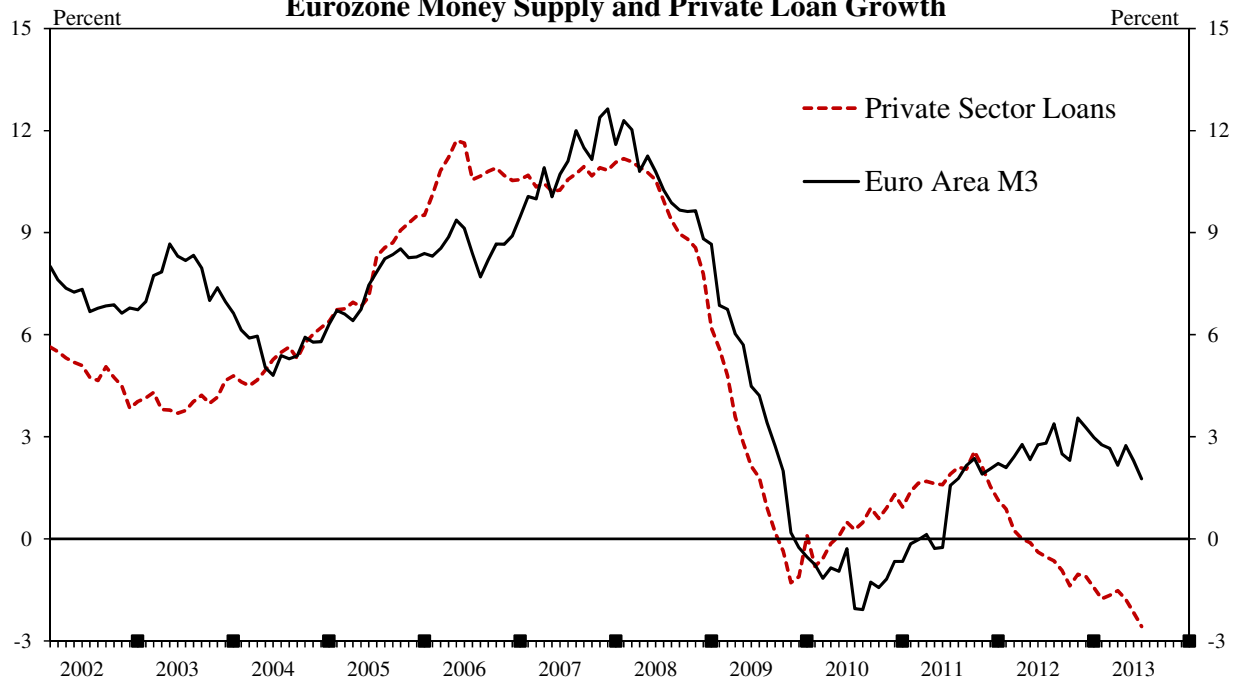
Figure 10
Wage Inflation
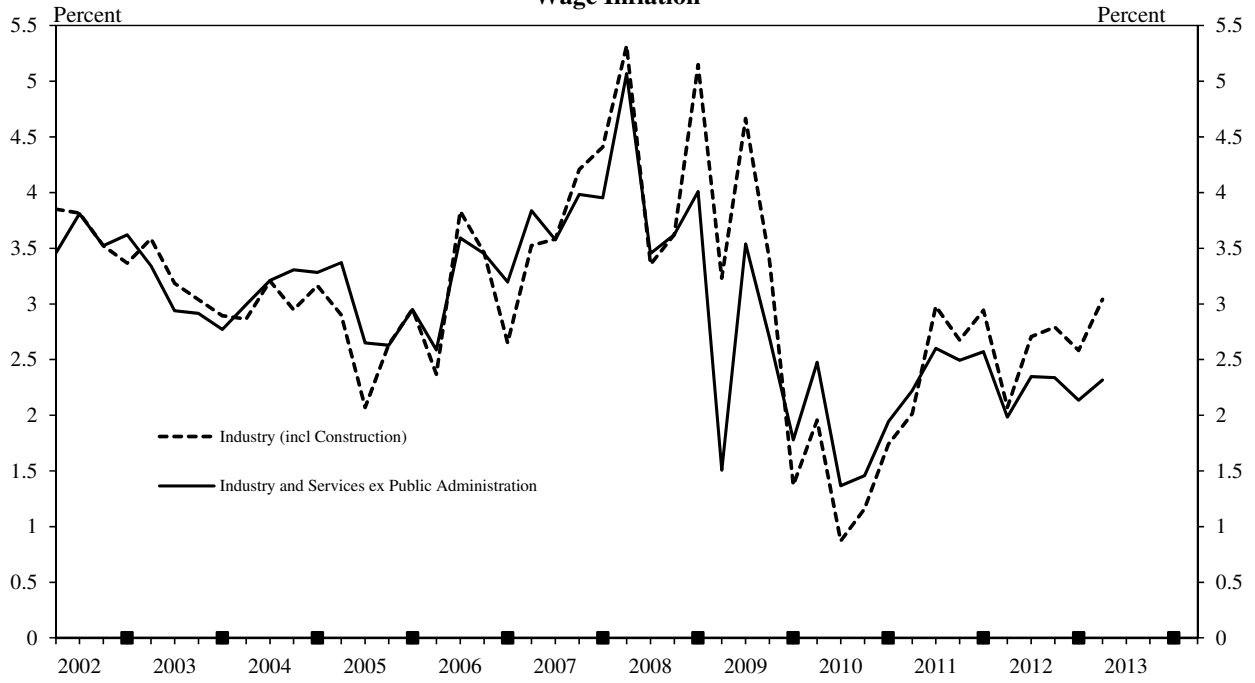
Notes: Nominal hourly wages and salaries- labor cost indicies. Quarterly observations of four-quarter percentage changes. Seasonal and Working Day Adjusted. Heavy tick marks indicate fourth quarter of year. Source: Eurostat and Haver Analytics.
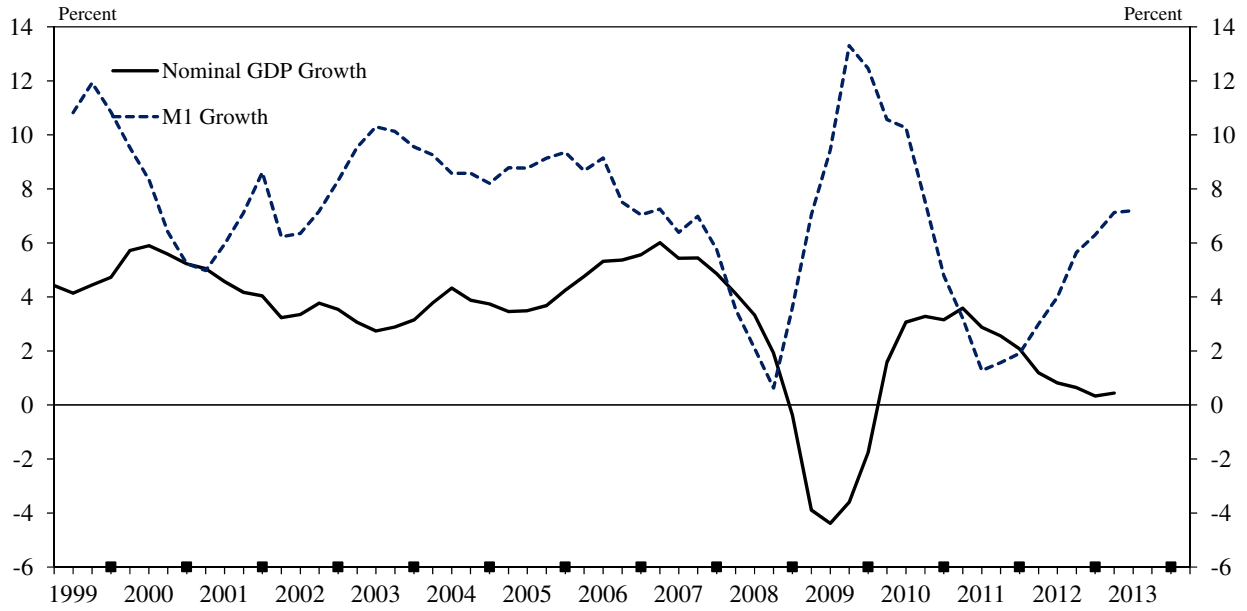
Figure 11
ECB Policy Rates
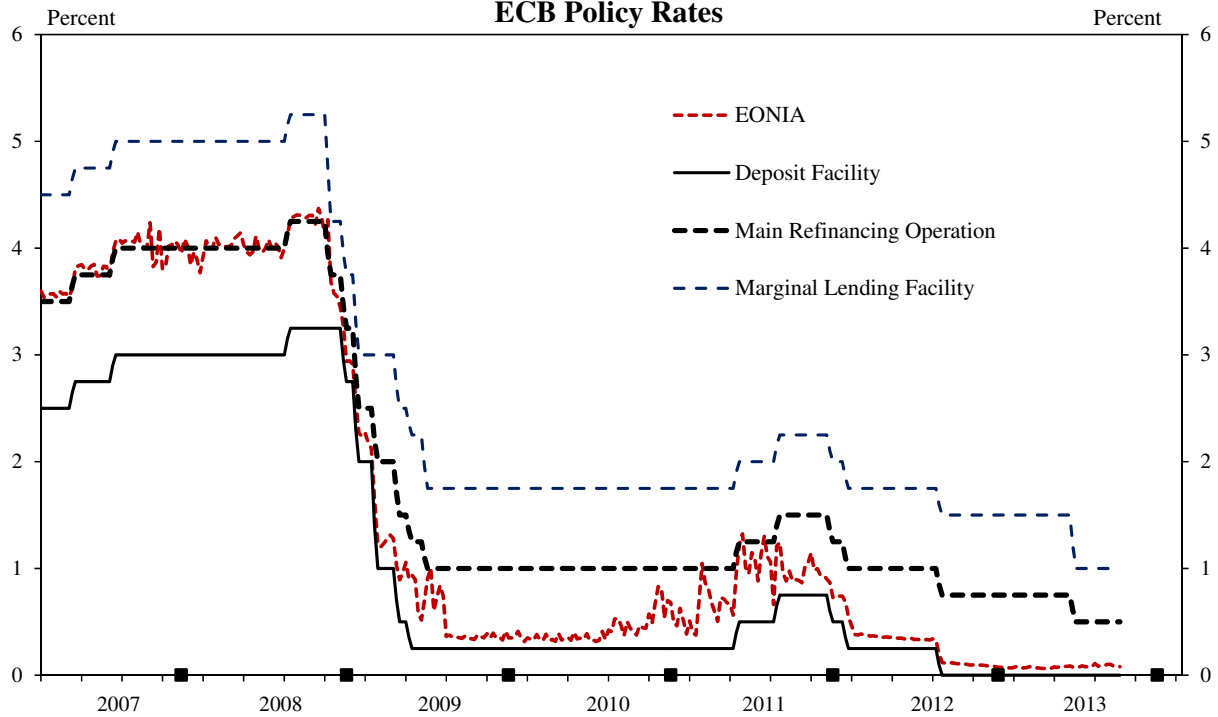
Notes: Heavy tick markers indicate middle of November. Source: ECB and Haver Analytics

Figure 12
**Eurozone Money Supply and Private Loan Growth**

Notes: Monthly observations of twelve-month percentage changes in M3 and loans to private sector by Monetary Financial Institutions. Heavy tick marks indicate December. Source: Haver Analytics and Eurostat

Figure 13
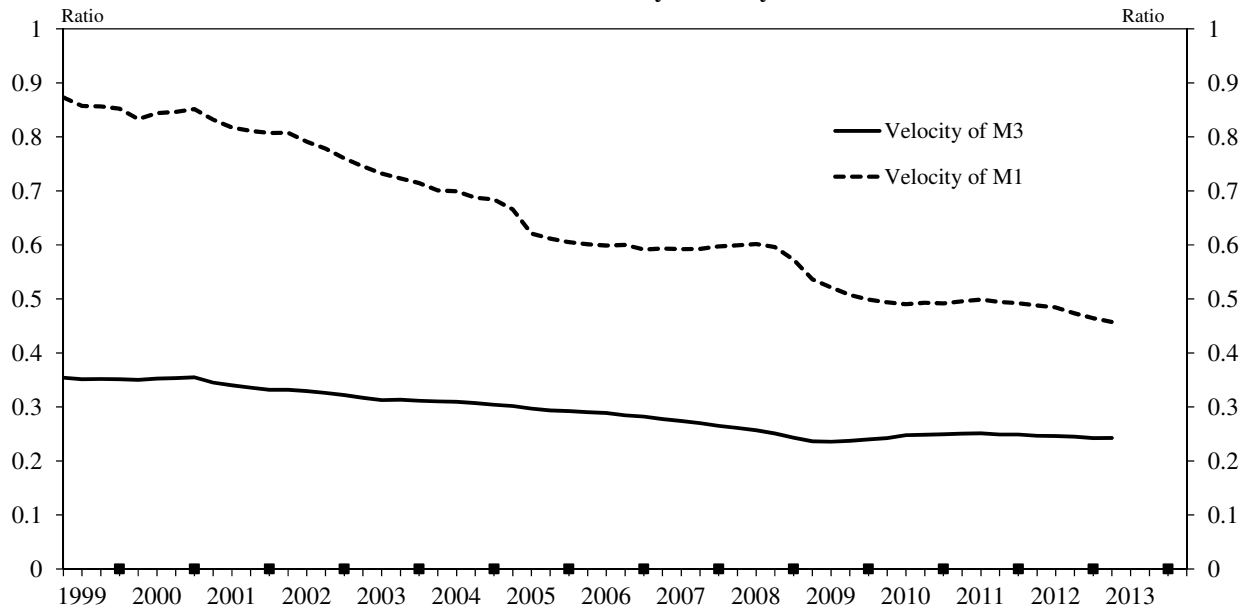**Euro Area M1 and Nominal GDP Growth**

Notes: Quarterly observations of four-quarter percentage changes. Heavy tick marks indicate fourth quarter of year. Source: Eurostat & Haver Analytics.

Figure 14
Eurozone Money Supply
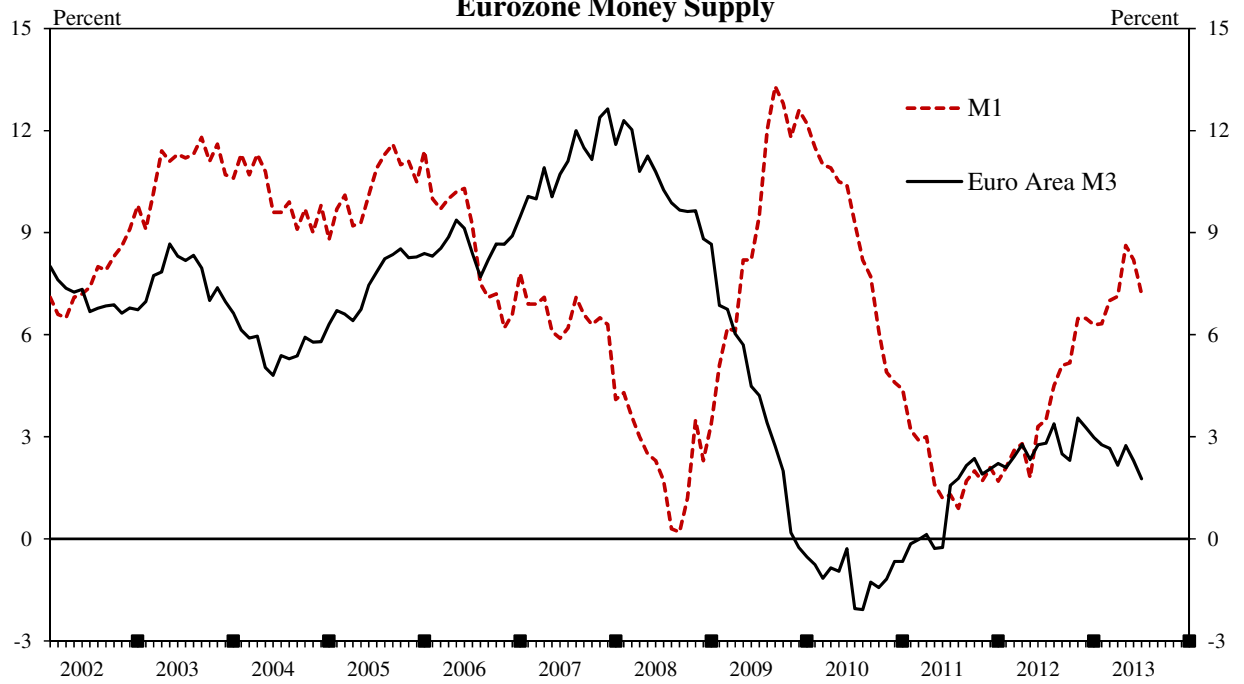
Notes: Monthly observations of twelve-month percentage changes in M1 and M3.
Heavy tick marks indicate December. Source: Eurostat & Haver Analytics.

Figure 15
Euro Area Velocity of Money

Notes: Quarterly observations of M1 and M3 velocity. Velocity is equal to nominal GDP divided by M1 and M3. Heavy tick marks indicate fourth quarter of year. Source: Eurostat & Haver Analytics.

Figure 16
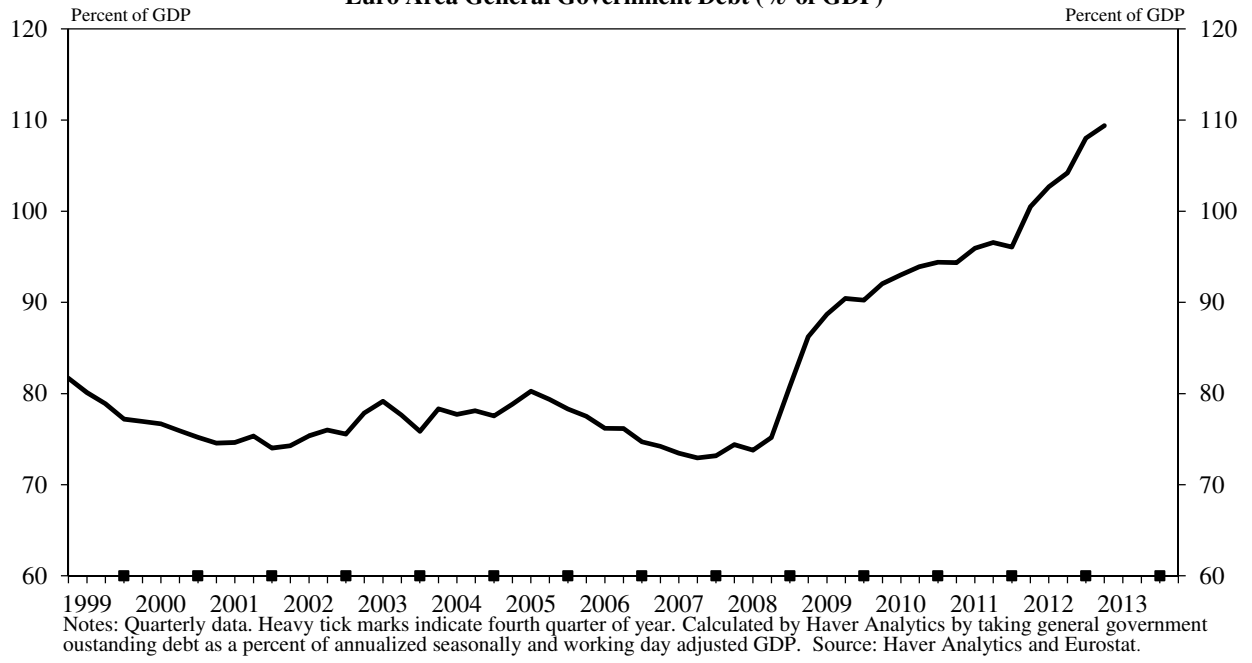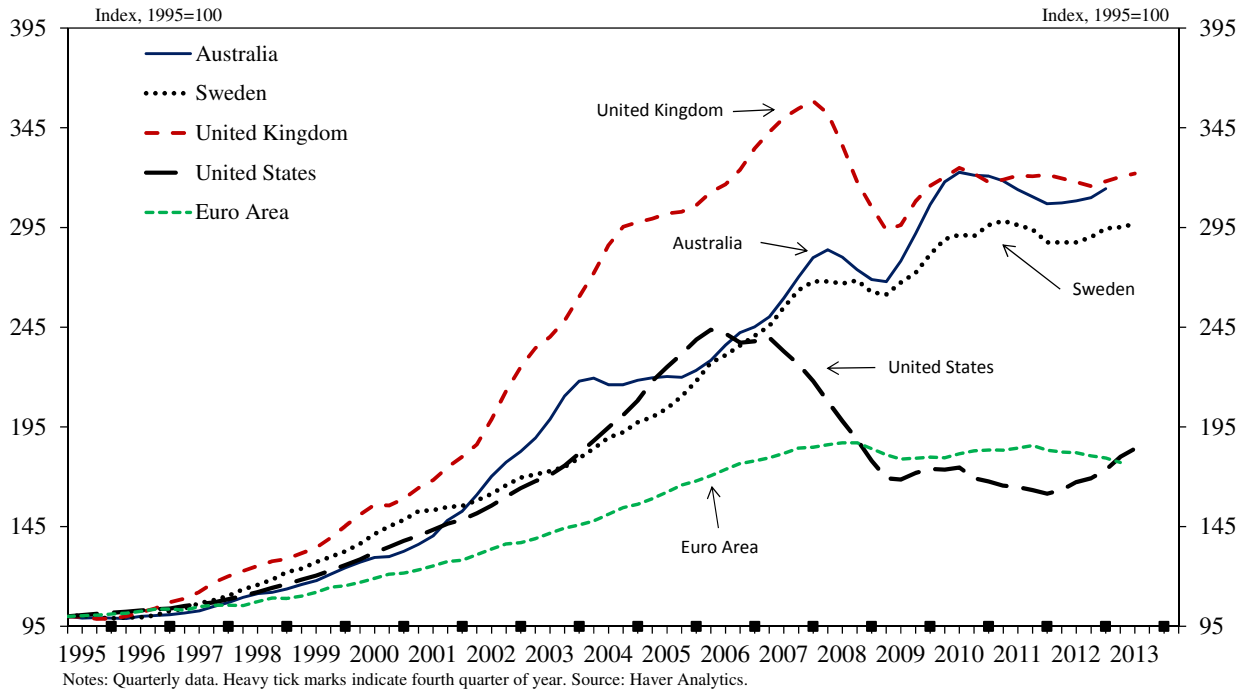**Euro Area General Government Debt (% of GDP)**

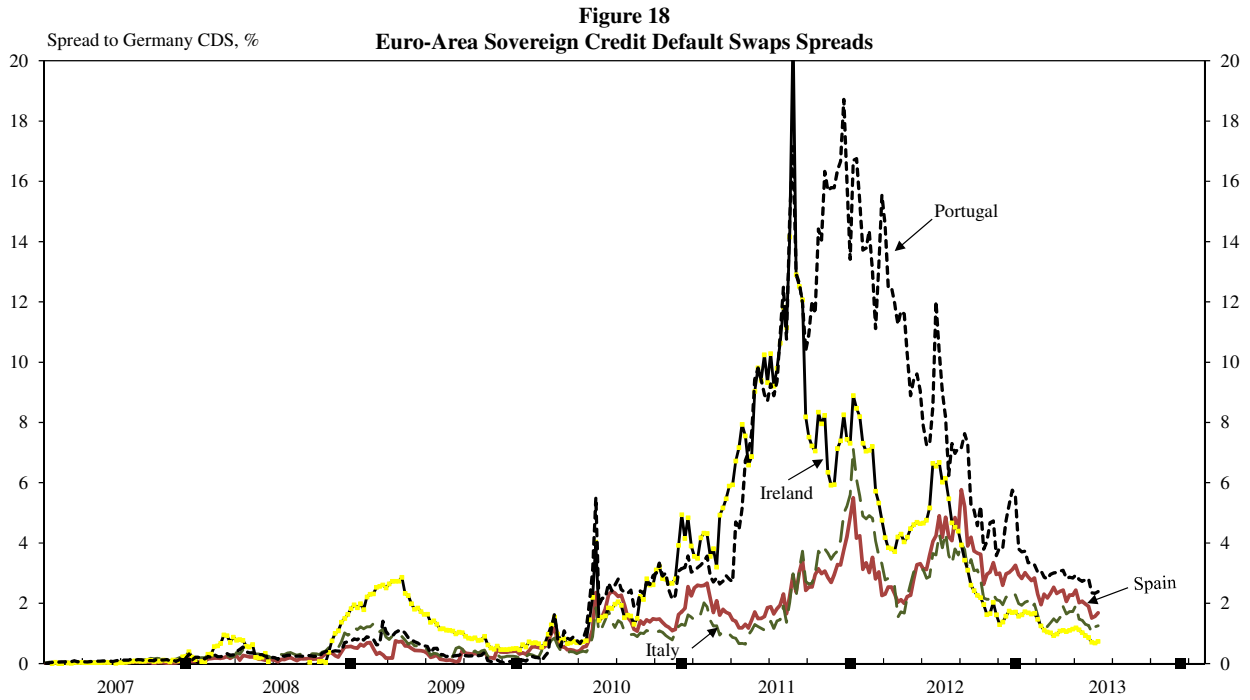Notes: Quarterly data. Heavy tick marks indicate fourth quarter of year. Calculated by Haver Analytics by taking general government oustanding debt as a percent of annualized seasonally and working day adjusted GDP. Source: Haver Analytics and Eurostat.

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Figure 17
Real House Prices

Index, 1995=100   Index, 1995=100

Notes: Quarterly data. Heavy tick marks indicate fourth quarter of year. Source: Haver Analytics.

Figure 18
Euro-Area Sovereign Credit Default Swaps Spreads

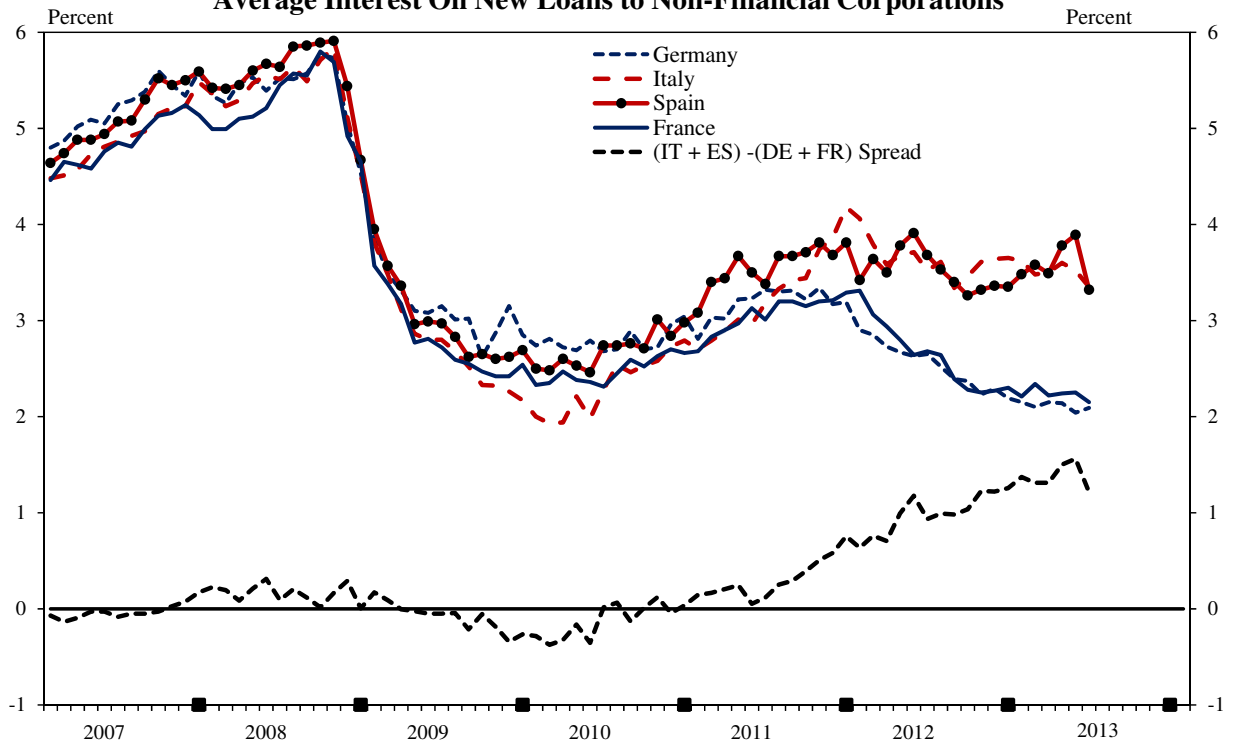Spread to Germany CDS, %

Notes: Weekly observations of 2 Year Credit Default Swaps on soverign debt as a spread to Germany soveriegn debt 2YR CDS. Heavy tick marks indicate mid-November. Source: Bloomberg

Figure 19
Average Interest On New Loans to Non-Financial Corporations

Notes: Heavy tick marks indicate fourth quarter of year. Spread is between the average of Italy + Spain and Germany + France. Source: ECB and Haver Analytics.

Figure 20
Goods and Services PCE Inflation

Notes: Heavy tick marks indicate fourth quarter of year. Source: Haver Analytics & Census Bureau