

Money, credit, monetary policy and the business cycle in the euro area

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Abstract

This paper has two objectives. First, to develop a model suitable for the analysis of the transmission mechanism of monetary policy across real, nominal, credit and monetary variables in the euro area using the highest possible level of disaggregation and with the longest available sample of monthly data (sample). Second, analyze the cyclical behavior of disaggregated loans and monetary aggregates with a particular emphasis to the last recession.

JEL Classification: E32, E51, E52, C32, C51.

Keywords: Money, loans, non-financial corporations, monetary policy, euro area

PRELIMINARY DRAFT

1 Introduction

Characterizing the behavior of loans and monetary aggregates over the business cycle and the effect of monetary policy on their dynamics is a key step for understanding the role of financial markets in the real economy.

There are many studies for the Euro Area and the US using rich cross-sectional or panel information on credit variables which focus on this question, but only few studies are based on a sufficiently long sample so as to be able to assess cyclical features or impulse response functions to monetary policy shocks. On the other hands, dynamic macroeconomic studies are typically based on models of small dimension where the more detailed information of disaggregated data is lost.

In this paper we have constructed a data-set of monthly variables for the Euro Area containing information on real, nominal variables and, crucially, disaggregated loans variables and their corresponding interest rates as well as money aggregates and their own rate (a total of 31 variables). This data-set, although not as detailed as cross-sectional studies using disaggregated loans, is the richest attainable for a sample long enough to be suitable for dynamic analysis.

The paper develops an empirical model suitable for the analysis of this rich data-set and analyzes both the response of all variables to an identified monetary policy shock and the cyclical behavior of key credit and monetary variables as well as interest rates.

The first objective is to uncover stylized facts for the Euro Area on the transmission mechanism. Unlike as for the US, these stylized facts are far from being established. The second objective is to focus in particular on money aggregates and loans and analyze their cyclical behavior. Again, not much is known on this issue. Are loans to households behaving like loans to non financial corporation? Are loans pro or anti-cyclical? Do they lag or lead the cycle? For what concerns monetary aggregates, we want to understand the extent of the liquidity effects for money with different liquidity as well as to their cyclical behavior.

Similar studies focusing on loans have been performed on US data (see, for example Bernanke and Blinder, 1992; Bernanke and Gertler, 1995; Christiano, Eichenbaum, and Evans, 1996; den Haan, Sumner, and Yamashiro, 2007). In that literature the different response of loans to households and to the business sector to changes in interest rates has been used as an identification device to discriminate between different “stories” on the credit channel. This paper is the first attempt at deriving stylized facts for the euro area.

Our paper is also related to the literature on the pass-through of interest rates. This literature emphasized how the sensitivity of lending rates to the policy rate depends on determinants such as institutional sectors (firms, consumer, government), destination (e.g. consumer vs mortgages) and economic features like the competitiveness of the banking sector. For a recent study with an extensive survey of the literature, see Sorensen and Werner (2006).

For what concerns the transmission mechanism of monetary policy in the Euro Area, extensive studies have been conducted at the early stages of the euro (see, for example, the book edited by Angeloni, Kashyap and Mojon, 2003 and, in particular, the articles by Peersman and Smets on the euro area and Mojon and Peersman on individual countries) and a more recent study by Boivin, Giannoni, and Mojon (2008) which, however, is based on quarterly data and does not contain data on loans and money.

Our work has also a methodological content. The estimation of a model with so many variables is problematic as we are confronted with the issue of having to deal with too many parameters given the sample information. In this situation classical estimation methods are unstable and unreliable due to a tendency to overfit the data (this is known as the “curse of dimensionality” problem). To circumvent this problem, existing studies resort to a “marginal strategy”, that is, a strategy where one starts from a small core model and then compares results from different models, each including the core and a few different additional variables (see, for example, Christiano, Eichenbaum, and Evans, 1996). This is problematic because, in general, this strategy relies on the assumption that there is no omitted variables bias in the small core model, that is, the excluded variables do not improve on the accuracy of forecasts produced by the small core model.

In our approach, the “curse of dimensionality” problem is solved using Bayesian shrinkage as suggested in De Mol, Giannone, and Reichlin (2006) and Banbura, Giannone, and Reichlin (2007). The authors show that if the data are collinear, as is the case for macroeconomic variables, then the relevant sample information is not lost when over-fitting is controlled for by shrinkage via the imposition of priors on the parameters of the model to be estimated. Structural factor models could have been used as an alternative strategy to deal with large dimensional data, as for example in BGM’s study for the euro area. We believe, however, that, for this particular application, it is problematic to rely on models that require data transformation to induce stationarity. An advantage of the Bayesian VAR is indeed that can be estimated in levels and, as shown by Banbura, Giannone, and Reichlin (2007), it has similar or better forecasting performance than factor models.

The structure of the paper is the following. Section 2 describes the database, section 3 presents the

large VAR model and outlines the estimation procedure, section 4 describes results on the analysis of the cyclical features of key variables based on model based counterfactuals.

2 Data

The dataset includes 31 monthly variables; the sample ranges from January 1991 to August 2009. Table 1 below reports the variables in the dataset and the transformations.

Table 1. Database

Variables	Transformation
Industrial Production	log-levels
HICP	log-levels
Unemployment rate	levels
Producer Prices Index	log-levels
US Industrial Production	log-levels
US Consumer Prices Index	log-levels
US Federal Funds rate	levels
Euribor	levels
Consumer Confidence	levels
World price of raw materials	log-levels
Oil price	log-levels
US/Euro exchange rate	log-levels
Stock Prices	log-levels
2 years bond rate	levels
3 years bond rate	levels
5 years bond rate	levels
7 years bond rate	levels
10 years bond rate	levels
M1	log-levels
M2	log-levels
M3	log-levels
Own rate of return, M1	levels
Own rate of return, M3	levels
Loans to non-financial corporations up to 1 year	log-levels
Loans to non-financial corporations over 1 year	log-levels
Consumer loans	log-levels
Loans for house purchases	log-levels
Other loans	log-levels
Lending rate, loans to NFC up to 1 year	levels
Lending rate, consumer loans	levels
Lending rate, loans for house purchases	levels

The first seven variables in Table 1 (industrial production, HICP, unemployment, PPI, US industrial production, US consumer prices and the FED funds rate) together with consumer confidence, the world price of raw materials and oil prices capture current and expected euro area real activity and inflation pressures. The 3-months Euribor is the short-term interest rate included in the model and is our proxy for the policy rate. Stock prices and long term interest rates are included in order to capture the links between financial markets, interest rates and the real economy. The monetary block of the database includes the three monetary aggregates M1, M2 and M3 and the own rates of return of M1 and M3. The broad monetary aggregate M3 includes M1, short term time and saving deposits (M2 minus M1) and marketable instruments (M3-M2). Since M1, on average, earns a rather low and constant rate of return, while short term time and savings deposits and marketable instruments are less liquid and earn a higher and more volatile rate of return, it is to be expected that M1, M2 and M3 display heterogeneous responses to interest rate changes. For what concerns loans, we include the finer available disaggregation. In particular, loans to the private sector can be decomposed into loans to non-financial corporations and to households. The database includes loans to non-financial corporations up to one year and above one year. Loans to households, instead, are decomposed according to their purpose; we include the three sub-components of loans to households: consumer loans, loans for house purchases and other loans. Besides quantities, we also include in our database the lending rates for loans to non-financial corporations up to one year, consumer loans and loans for house purchases¹. The lending rates for other sub-components are not available in the sample under analysis. Again, different types of borrowers, purpose and time frame may suggest that the loan sub-components display heterogeneous elasticities with respect to monetary policy.

¹We thank Chistoffer Kok Sorensen for providing the data on the lending rates used in Sorensen and Werner (2006)

3 The Model and estimation procedure

Defining as X_t the vector including the variables defined in Table 1 (all variables are in log levels, except for variables expressed in rates or with negative levels that are in levels), we estimate a VAR model with p ($=13$) lags:

$$X_t = A_0 + A_1 X_{t-1} + A_2 X_{t-2} \dots + A_p X_{t-p} + \epsilon_t$$

The large dimension ($n = 31$) of our VAR model implies that we face an issue of over-fitting, which we address by using Bayesian shrinkage (see Banbura, Giannone, and Reichlin, 2007; De Mol, Giannone, and Reichlin, 2006). In practice we use a Litterman (random walk) prior whose tightness is set so that the in-sample fit of the interest rate equation in the 31 variables VAR model is fixed at the level achieved by a simpler eight-variables monetary VAR including only the first eight variables in Table 1. This particular choice is motivated in Giannone, Lenza, and Reichlin (2008) on the basis of the evidence that short-term interest rates are well described by linear functions of current and future inflation and real activity (Taylor rules).

More in detail, the selection of the prior entails three steps. First, we choose the tightness of the random walk/Litterman prior in the small 8 variables VAR (including variables from one to eight in Table 1) by maximizing the predictive likelihood; second, we compute the fit of the interest rate in the eight variables VAR estimated with the tightness chosen in step 1; third, we search for the degree of tightness in the 31 variables VAR that fits the interest rate as much as the eight variables VAR.

The VAR model is estimated in (log)levels, which allows us to take into account the adjustment dynamics to the equilibrium relationships, since, in the context of providing a longer-term nominal anchor to the economy, monetary analysis assigns an important role to the assessment of level relationships. In order to keep the exercise as general as possible, the estimation is achieved without imposing any prior considerations on the stability and/or nature of the eventual level relationship.

This is consistent with an approach intended to reveal "stylised facts" in the data by imposing a minimal structure on their inter-relationships, rather than imposing a more rigid structure *ex ante*. As a consequence, the model estimates are robust with respect to instabilities in the steady-state (or long-term) relationships.

However this comes at a cost, in the sense that the longer-term reactions of monetary variables to an interest rate innovation are not well-captured because wide error bands become very wide after a year-year and a half horizon. This is why we focus on the short - medium run horizon, reporting only impulse response functions up to 24 four months after the shock. Moreover, we follow Banbura, Giannone, and Reichlin (2007) and impose a sum-of-coefficients prior. Such prior shrinks the sum of the VAR coefficients towards zero, i.e.

$$\Pi = I_n - A_1 - \dots - A_p = 0$$

which is the restriction implied by a VAR in first differences. This is known as "inexact differencing".

4 The transmission mechanism of monetary policy

In this section we report results of impulse response functions to a monetary policy shock.

The monetary policy shock is identified by assuming a recursive (Choleski) structure (see Christiano, Eichenbaum, and Evans, 1999, for a discussion of this identification scheme).

The ordering is that of table 1. All variables ordered above the Euribor in the table are prevented from reacting contemporaneously to an innovation in the short-term interest rate, while those ordered below can react contemporaneously. Notably, we assume that US variables and euro area industrial production, unemployment, HICP and PPI do not contemporaneously respond to an exogenous shift in the policy interest rate.

Results are reported for the log-levels or the levels (for the variables expressed in rates) of the variables in our VAR to a one standard deviation monetary policy shock. In particular, we report the effects of an unexpected monetary policy tightening. Beside the median response (solid line), we also report the 68% confidence bands (dashed lines). We report all the IRF for 24 months after the shocks.

4.1 Real economic activity, policy rate and inflation

Figure 1: Effect of an unexpected increase in the short-term interest rate on Euribor

INSERT FIGURE 1 HERE

The monetary policy shock increases the Euribor on impact. It takes about two years for the Euribor to go back to its pre-shock level.

Figures 2, 3, 4 and 5: Effect of the monetary policy shock on Industrial Production, HICP, PPI and unemployment

INSERT FIGURES 2, 3, 4 and 5 HERE

Industrial production starts declining significantly after 10 months and then declines steadily for about a year before flattening. HICP does not react significantly². Similar considerations as for HICP can also be done for PPI. Compatibly with the effects on industrial production, unemployment significantly increases in response to an unexpected monetary policy tightening with a delay of about ten months.

4.2 Surveys and Financial Variables

Figure 6 to 13: Effects of an unexpected increase in the short-term interest rate on Consumer Confidence, US dollar/EURO exchange rate, Stock prices and bond rates.

INSERT FIGURES 6 to 13 HERE

Consumer confidence drops after about a year with a dynamics remarkably similar to the hard data on real activity (i.e., industrial production and unemployment). Financial variables, instead, exhibit a much less sluggish adjustment. The euro appreciates on impact with respect to the dollar, although

²However, there is a lot of uncertainty around the response of HICP to a monetary policy shock. In fact, it is shown at the end of the paper that the response of HICP is one of the few responses that are not robust to data transformations. Notably, the so called price puzzle that HICP responds positively to a monetary policy shock is not robust to data transformations

significantly only for about a year, and stock prices decrease on impact and their level remains significantly below the pre-shock values for about a year and a half. For what concerns the yield curve (figures 9 - 13), we notice that all the bond rates exhibit similar dynamics, i.e. their level increases on impact in response to a monetary policy shock and returns to pre-shock levels after about a year. In figure 9 - 13 we also plot the impulse response of the Euribor (blue dots) in order to show that, as expected, longer term interest rates increase on impact by less than the three months Euribor. In fact, long term interest rates should reflect not only current monetary policy rates but also the future rates, that are expected to be lower than the Euribor at the time of the shock. Also, it is noticeable that the longer the bond maturity, the lower the response of the bond rate on impact. These results imply that term-spreads decrease on impact after a monetary policy shock.

4.3 Monetary aggregates and their rates of return

Figure 14 to 18: Effects of an unexpected increase in the short-term interest rate on M1, M2, M3 and own rates of return on M1 and M3

INSERT FIGURES 14 to 18 HERE

The reaction to a positive interest rate shock of the most liquid components of M3 included in M1 is, as expected, negative on impact. M2 does not significantly react. Remarkably, M3 reacts positively to an unexpected monetary tightening: the level of M3 is significantly higher than before the shock after two years from the shock. However, M3 stops growing after a year and a half. This heterogeneity in the reaction of the different monetary aggregates in the short-term can be explained by the heterogeneity in the degree of liquidity and rate of returns of their sub-components. In particular, the components of M2 and M3 that are not included in M1 react positively to an increase in the interest rate in the short-term, owing to the increase in their own rate of return following the shock to the market short-term rate. In fact, the degree of liquidity of the components of M3 is inversely related to the responsiveness of their rate of return to the monetary policy shock. Interestingly, all the rates of return in the components of M3 show a hump shaped response to the monetary policy.

4.4 Loans to non-financial corporations and households and their rate of return

Figures 19 to 21: Effect of an unexpected increase in the short-term interest rate on loans to non-financial corporations: loans to non-financial corporations up to 1 year, over 1 year and lending rate to non-financial corporations up to 1 year

INSERT FIGURES 19 to 21 HERE

Interestingly, the two components of loans to non-financial corporations increase on impact in response to a monetary policy shock. However, short-term loans are much more responsive than longer term loans.

Figures 22 to 26: Effect of an unexpected increase in the short-term interest rate on loans to households: consumer loans and corresponding lending rate, loans for house purchases and corresponding lending rate and other loans

INSERT FIGURES 22 to 26 HERE

Turning to loans to households, consumer loans do not seem to be responsive while loans for house purchases significantly and persistently decrease. Other loans, instead, slightly increase in the short run and then go back to pre-shock levels.

One interesting result of our analysis is that loans to non-financial corporations increase as a response to a monetary policy contraction. The same result has been found on US data by Christiano, Eichenbaum, and Evans (1996); Bernanke and Gertler (1995) and more recently by den Haan, Sumner, and Yamashiro (2007). The literature has suggested few alternative explanations for this behavior of loans in response to the monetary policy shocks. Bernanke and Gertler (1995) and Christiano, Eichenbaum, and Evans (1996) suggest that loans could increase in response to a monetary contractions since firms might increase their demand of loans to finance increased inventories or a reduced utilization of the workforce. In addition, loans might increase in response to a monetary tightening because of firms drawing from from recommitted credit lines locked at the previous lower interest rate (front-loading). The stickiness of the lending rates and the importance of relationship banking in the Euro Area are in line with this explanation. Finally, an explanation might be an endogenous shift of loans supply by banks. den Haan, Sumner, and Yamashiro (2007) for example, find evidence that banks, in response to a monetary tightening, shift their portfolio from long and risky loans like real estate loans towards short term loans earning a higher rate of return.

5 Cyclical characteristics of credit and monetary aggregates

In the previous section we studied the behavior of credit and monetary aggregates during an economic downturn generated by a tightening in monetary policy.

In this section, we widen our focus and study the cyclical properties of credit and money markets in response to the whole set of the shocks explaining the business cycle in the euro area.

5.1 Loans

Table 2 below reports the correlation at different leads and lags between the cyclical component of the loans variables with respect to IP. We report the posterior mode and the posterior standard deviation (in brackets) of the correlation for leads and lags equal to $0, \pm 3, \pm 6, \pm 12$ ³. We also report (in italics) the posterior mode of the correlations obtained by shutting down all shocks but the monetary policy shock.

³We filter out cycles of length above 6 years and below 2 years. The correlations are obtained by computing the inverse fourier transform of the spectral density matrix implied by the VAR.

Table 2: Cyclical correlation with Leads and Lags of Industrial Production

	Leads (+) and Lags (-)								
	-12	-9	-6	-3	0	3	6	9	12
Loans to non-financial corporations up to 1 year	0.56 (0.15) 0.65	0.78 (0.09) 0.79	0.68 (0.10) 0.65	0.29 (0.13) 0.26	-0.22 (0.11) -0.32	-0.60 (0.08) -0.77	-0.73 (0.11) -0.90	-0.61 (0.15) -0.64	-0.27 (0.14) -0.17
Loans to non-financial corporations over 1 year	-0.17 (0.23) -0.06	-0.06 (0.30) -0.07	0.17 (0.22) 0.20	0.29 (0.18) 0.39	0.26 (0.21) 0.20	0.08 (0.18) -0.27	-0.08 (0.15) -0.51	-0.18 (0.16) -0.29	-0.19 (0.15) 0.07
Consumer loans	-0.08 (0.26) 0.09	-0.10 (0.24) -0.05	-0.08 (0.24) -0.20	-0.09 (0.20) -0.41	-0.09 (0.23) -0.48	-0.03 (0.23) -0.25	0.10 (0.15) -0.01	0.15 (0.17) 0.37	0.12 (0.17) 0.45
Loans for house purchases	-0.54 (0.11) -0.68	-0.46 (0.16) -0.73	-0.14 (0.21) -0.46	0.29 (0.18) 0.07	0.55 (0.18) 0.63	0.55 (0.15) 0.83	0.33 (0.19) 0.66	0.05 (0.21) 0.26	-0.18 (0.16) -0.16
Other loans	0.20 (0.16) 0.28	0.47 (0.18) 0.60	0.55 (0.20) 0.77	0.42 (0.16) 0.65	0.09 (0.16) 0.18	-0.23 (0.12) -0.35	-0.42 (0.15) -0.70	-0.45 (0.18) -0.73	-0.35 (0.19) -0.46

The most cyclical component of loans are the short-term loans to non-financial corporations for which the maximal correlation is about 0.8 at the lag of 9 months. This pattern of the correlations conditional exclusively on the monetary policy shock is very similar. This finding contrasts with den Haan, Sumner, and Yamashiro (2007) who find differences in cyclical characteristics of loans during monetary and non-monetary downturns. Notice, instead, that long-term loans to non-financial corporations do not show the same cyclicity and are more coincident with industrial production. Consumer loans are not cyclical while loans for house purchases are highly cyclical and slightly leading the cycle.

In order to gain further insight in the cyclical properties of credit aggregates, we identify the response of loans to the shocks that explain the euro area cycle. We perform this analysis by means of counterfactual exercises. The idea is the following.

We first estimate the model up to the end of 2006. Then, for each variable in the VAR, we construct an unconditional forecast from January 1999 onward (conditional on past observations only) and an alternative forecast for the same period conditional only on the past of all observations and on the future of variables capturing the business cycle (precisely, euro area industrial production and unemployment and US industrial production). The conditional forecasts can be seen as histories conditional to the structure of the economy as estimated up to December 2006 and to the shocks that have had an effect on business cycle fluctuations. The fluctuations that are due to shocks that have had no effects on the business cycles are instead removed. Notice that estimating the model until December 2006 allows us, were the actual behavior of a variable very much in line with the forecast conditional on the cycle, to conclude also on whether the recent behavior of, say, credit market is in line with historical experience.

For set of variables x_t the conditional forecast (\hat{x}_{t+h}) implied by the estimated VAR coefficients and the past, current and future path of one or more variables y_t is:

$$\hat{x}_{t+h} = E(x_{t+h} | x_0 \dots x_t; y_0 \dots y_t \dots y_{t+h} \dots y_T).$$

The conditional mean can be computed using the Kalman filter⁴ and the confidence bands are computed using the Carter and Kohn algorithm.

Results for loans aggregates are reported in Figures xx to xx. For comparison, we also report the unemployment rate as an indicator of Business Cycles conditions.

⁴The algorithm is developed in Banbura, Giannone, and Lenza (2009).

Figures 27 to 30: Counterfactual dynamics of loans conditional to the business cycle and the pre-2007 economic structure

INSERT FIGURES 27 to 30 HERE

Results indicate that the observed value for all categories of loans is quite in line with the expectations conditional on business cycles. This suggests that they are very cyclical. In addition, it is evident that historically loans to non-financial corporations are lagging the business cycle while other loans are rather coincident.

In the recent period, roughly from the collapse of Lehman, the decline of consumer loans and loans for house purchases is more pronounced than what expected on the basis of the pre-crisis structure of the economy and the observed dynamics of real variables. In addition, in the recent downturn, loans to non financial corporations have moved earlier than usual suggesting that in the recent conjuncture shocks to the credit market might have had a more pronounced impact with respect to historical standards.

5.2 Money aggregates

In this section we study the cyclical behavior of monetary aggregates by looking at the same counterfactual exercises described above. Results are illustrated in Figures 31 to 33.

Figures 31 to 33: Counterfactual dynamics of monetary aggregates conditional to the business cycle and the pre-2007 economic structure

INSERT FIGURES 31 to 33 HERE

For the monetary aggregates, we can identify a sharp difference between the behavior of M1 and that of M2 and M3. While M1 is perfectly tracked by the conditional forecasts, M2 and M3 are not. This suggests that these less liquid components of the money supply have an idiosyncratic dynamics that cannot entirely be explained by the shocks that drive the business cycle. In particular, these variables cannot explain the upsurge in growth rate observed from August 2006 and October 2007 and the subsequent sharp decline. Moreover, such atypical behavior in the current conjuncture is not related to shocks affecting inflation since results are basically unchanged if we condition also on HICP.

6 Conclusions

TO BE ADDED.

References

ANGELONI, I., K. A. KASHYAP, AND B. MOJON (eds.) (2003): *Monetary Policy Transmission in the Euro Area. A Study by the Eurosystem Monetary Transmission Network*. Cambridge University Press.

- BANBURA, M., D. GIANNONE, AND M. LENZA (2009): “A Large VAR for the euro area,” Discussion paper, ECB mimeo.
- BANBURA, M., D. GIANNONE, AND L. REICHLIN (2007): “Bayesian VARs with Large Panels,” CEPR Discussion Papers 6326, C.E.P.R. Discussion Papers, forthcoming in *Journal of Applied Econometrics*.
- BERNANKE, B. S., AND A. S. BLINDER (1992): “The Federal Funds Rate and the Channels of Monetary Transmission,” *American Economic Review*, 82(4), 901–21.
- BERNANKE, B. S., AND M. GERTLER (1995): “Inside the Black Box: The Credit Channel of Monetary Policy Transmission,” *Journal of Economic Perspectives*, 9(4), 27–48.
- BOIVIN, J., M. P. GIANNONI, AND B. MOJON (2008): “How Has the Euro Changed the Monetary Transmission?,” NBER Working Papers 14190, National Bureau of Economic Research, Inc.
- CHRISTIANO, L. J., M. EICHENBAUM, AND C. EVANS (1996): “The Effects of Monetary Policy Shocks: Evidence from the Flow of Funds,” *The Review of Economics and Statistics*, 78(1), 16–34.
- CHRISTIANO, L. J., M. EICHENBAUM, AND C. L. EVANS (1999): “Monetary policy shocks: What have we learned and to what end?,” in *Handbook of Macroeconomics*, ed. by J. B. Taylor, and M. Woodford, vol. 1 of *Handbook of Macroeconomics*, chap. 2, pp. 65–148. Elsevier.
- DE MOL, C., D. GIANNONE, AND L. REICHLIN (2006): “Forecasting Using a Large Number of Predictors: Is Bayesian Regression a Valid Alternative to Principal Components?,” CEPR Discussion Papers 5829, C.E.P.R. Discussion Papers, forthcoming in *Journal of Econometrics*.
- DEN HAAN, W. J., S. W. SUMNER, AND G. M. YAMASHIRO (2007): “Bank loan portfolios and the monetary transmission mechanism,” *Journal of Monetary Economics*, 54(3), 904–924.
- GIANNONE, D., M. LENZA, AND L. REICHLIN (2008): “Explaining The Great Moderation: It Is Not The Shocks,” *Journal of the European Economic Association*, 6(2-3), 621–633.
- MOJON, B., AND G. PEERSMAN (2003): “A VAR description of the effects of monetary policy in the individual countries of the Euro area,” in *Monetary Policy Transmission in the Euro Area. A Study by the Eurosystem Monetary Transmission Network*, ed. by I. Angeloni, K. A. Kashyap, and B. Mojon. Cambridge University Press.
- PEERSMAN, G., AND F. SMETS (2003): “The monetary transmission mechanism in the Euro area: more evidence from VAR analysis,” in *Monetary Policy Transmission in the Euro Area. A Study by the Eurosystem Monetary Transmission Network*, ed. by I. Angeloni, K. A. Kashyap, and B. Mojon. Cambridge University Press.
- SORENSEN, C. K., AND T. WERNER (2006): “Bank interest rate pass-through in the euro area: a cross country comparison,” Working Paper Series 580, European Central Bank.

Appendix 1: Figures

Figure 1: Euribor.

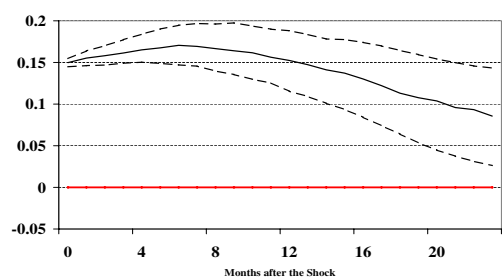


Figure 2: Industrial Production.

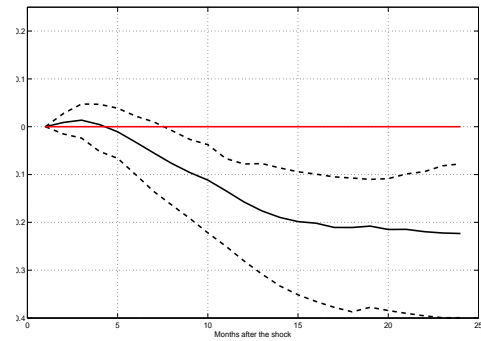


Figure 3: Hicp.

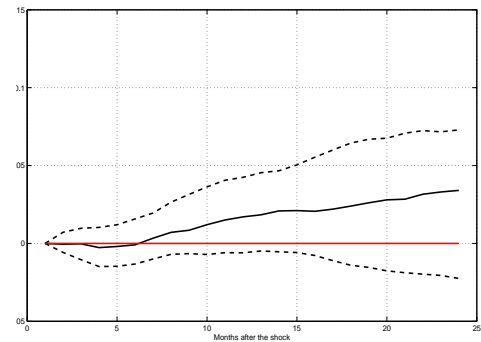


Figure 4: PPI.

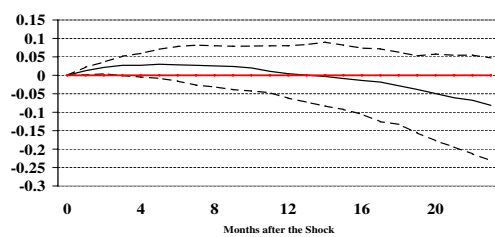


Figure 5: Unemployment rate.

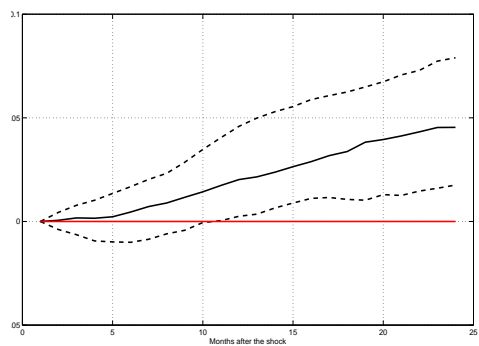


Figure 6: Consumer Confidence.

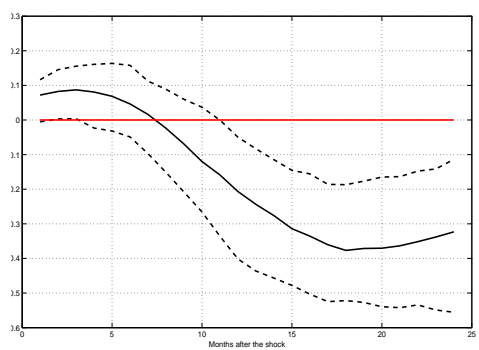


Figure 7: US Dollar/Euro exchange rate.

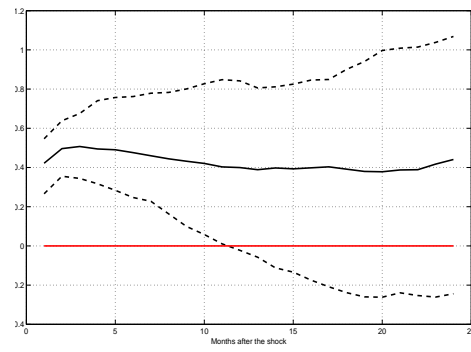


Figure 8: Stock Prices.

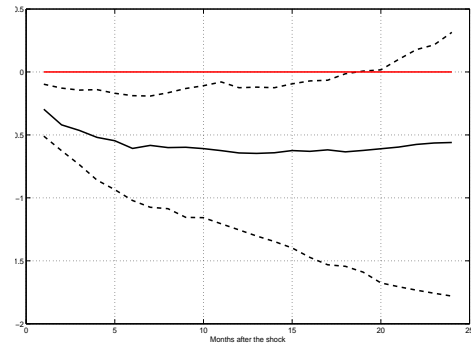


Figure 9: 2 years bond rate.

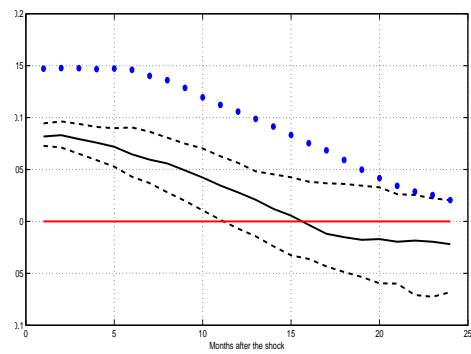


Figure 10: 3 years bond rate.

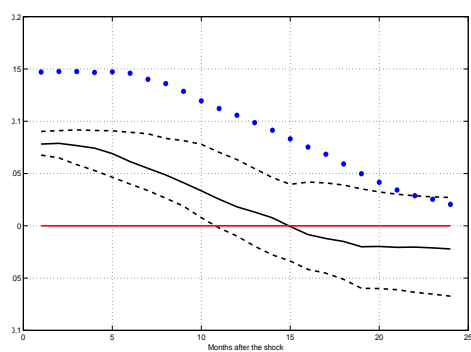


Figure 11: 5 years bond rate.

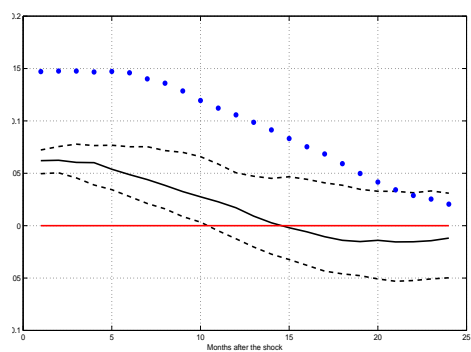


Figure 12: 7 years bond rate.

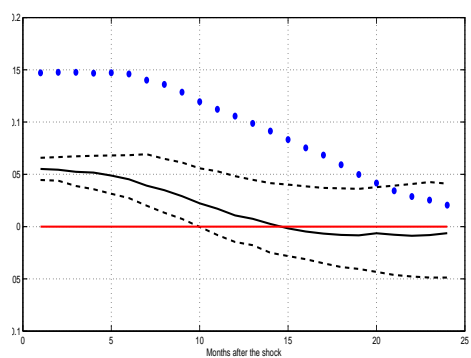


Figure 13: 10 years bond rate.

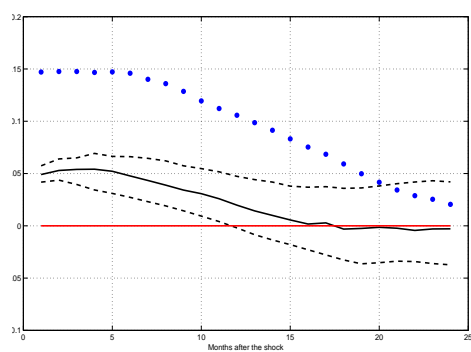


Figure 14: Monetary aggregate M1.

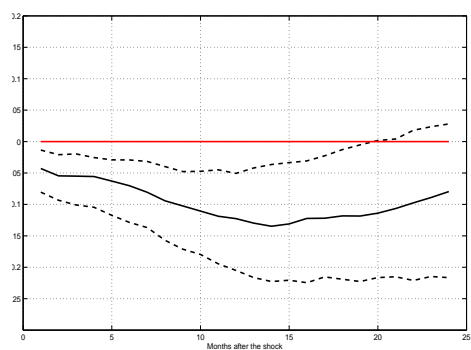


Figure 15: Monetary aggregate M2.

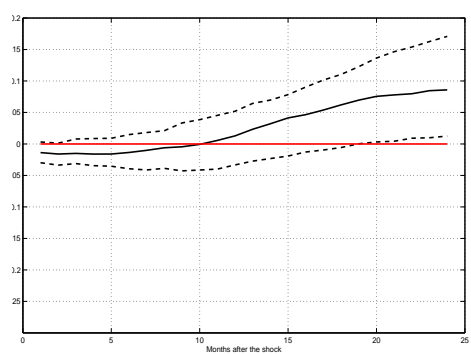


Figure 16: Monetary aggregate M3.

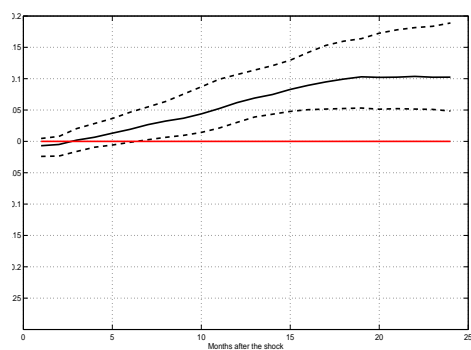


Figure 17: Own rate, monetary aggregate M1.

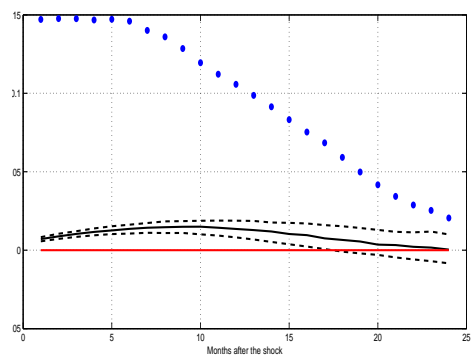


Figure 18: Own rate, monetary aggregate M3.

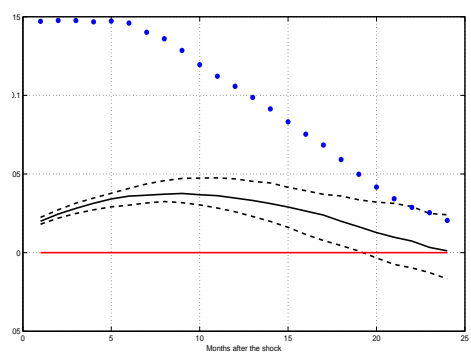


Figure 19: Loans to non financial corporations up to 1 year.

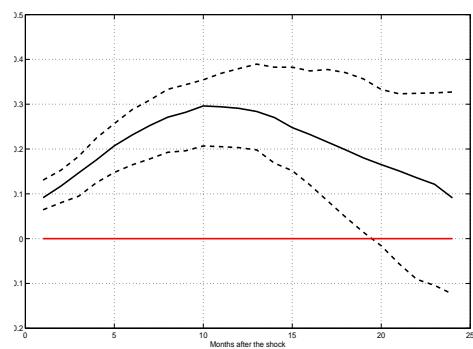


Figure 20: Loans to non financial corporations over 1 year.

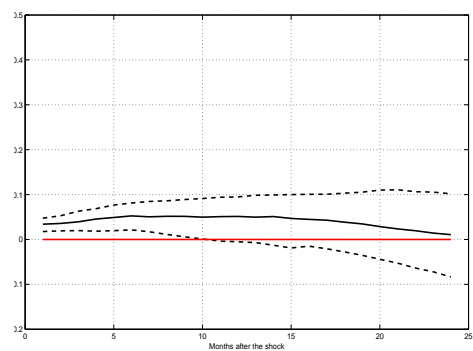


Figure 21: Lending rate, loans to non financial corporations up to 1 year.

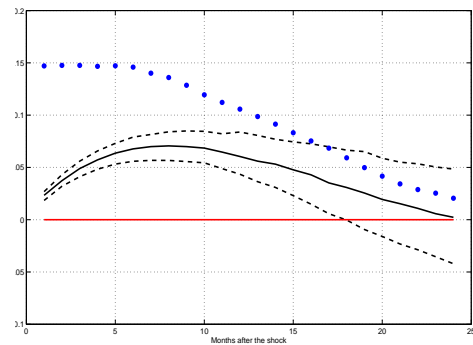


Figure 22: Consumer loans.

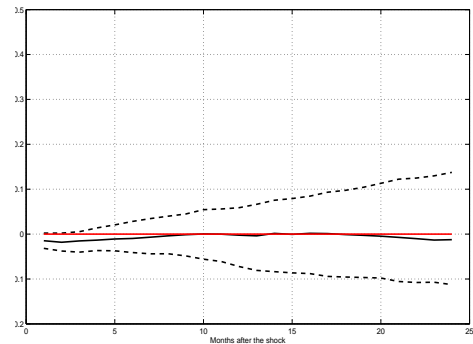


Figure 23: Lending rate, consumer loans.

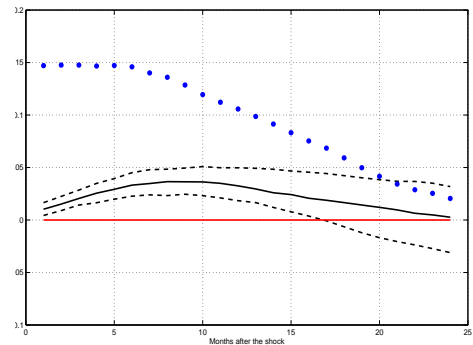


Figure 24: Loans for house purchases.

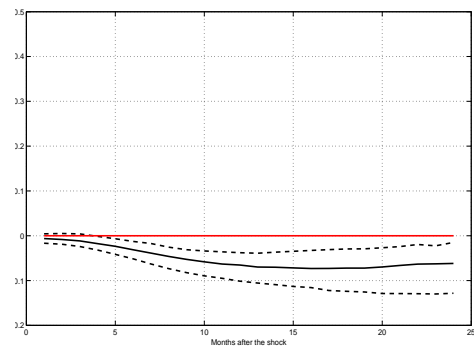


Figure 25: Lending rate, loans for house purchases.

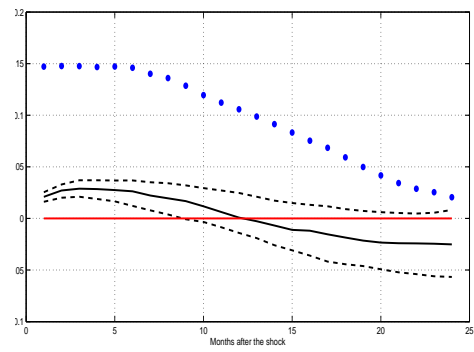


Figure 26: Other loans.

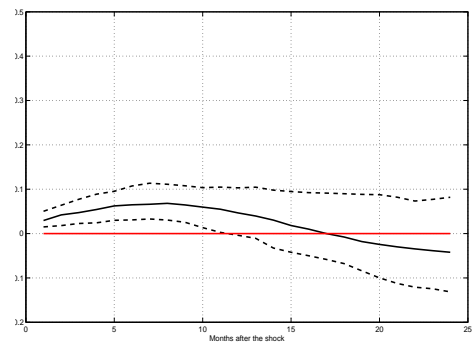
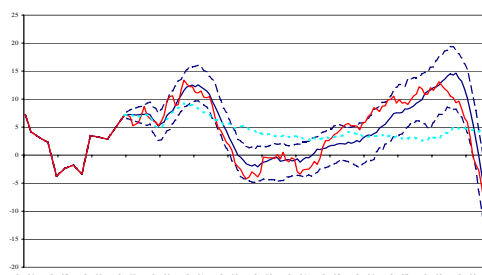
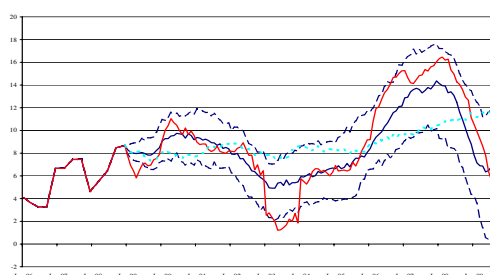


Figure 27: Short-term loans to non-financial corporations



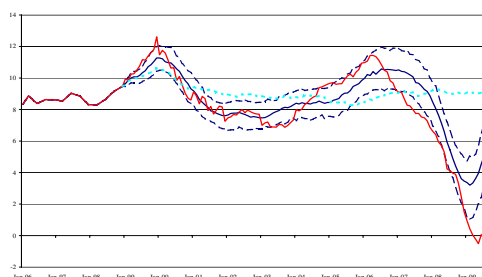
The figure plots the observed annual growth rates of the variable (red solid lines), the conditional forecast and related 68% confidence bands (dark blue solid and dashed lines) and the unconditional forecast (light blue dotted line)

Figure 28: Long-term loans to non-financial corporations



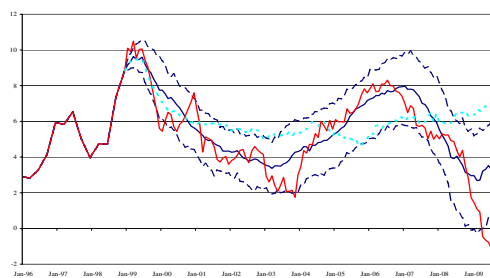
The figure plots the observed annual growth rates of the variable (red solid lines), the conditional forecast and related 68% confidence bands (dark blue solid and dashed lines) and the unconditional forecast (light blue dotted line)

Figure 29: Loans to households: loans for house purchases



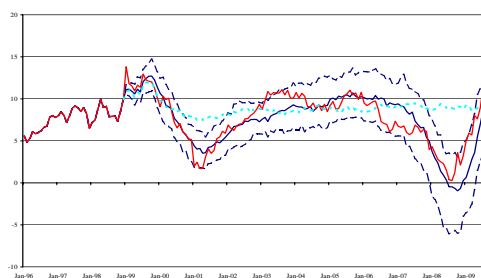
The figure plots the observed annual growth rates of the variable (red solid lines), the conditional forecast and related 68% confidence bands (dark blue solid and dashed lines) and the unconditional forecast (light blue dotted line)

Figure 30: Loans to households: consumer loans



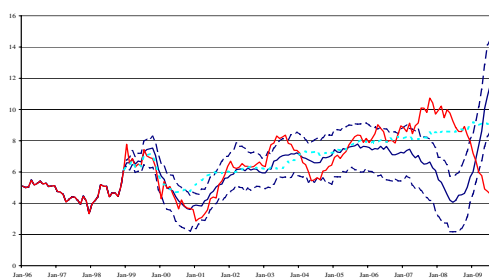
The figure plots the observed annual growth rates of the variable (red solid lines), the conditional forecast and related 68% confidence bands (dark blue solid and dashed lines) and the unconditional forecast (light blue dotted line)

Figure 31: M1



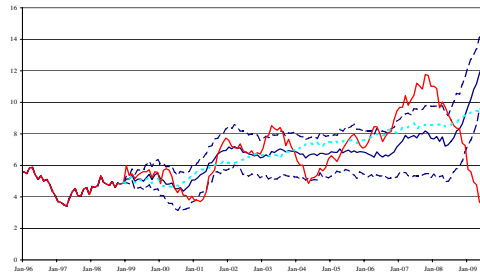
The figure plots the observed annual growth rates of the variable (red solid lines), the conditional forecast and related 68% confidence bands (dark blue solid and dashed lines) and the unconditional forecast (light blue dotted line)

Figure 32: M2



The figure plots the observed annual growth rates of the variable (red solid lines), the conditional forecast and related 68% confidence bands (dark blue solid and dashed lines) and the unconditional forecast (light blue dotted line)

Figure 33: M3



The figure plots the observed annual growth rates of the variable (red solid lines), the conditional forecast and related 68% confidence bands (dark blue solid and dashed lines) and the unconditional forecast (light blue dotted line)