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The Risk-Taking Channel of Monetary Policy Transmission in the Euro Area

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The Risk-Taking Channel of Monetary Policy Transmission in the Euro Area^{*}

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March 16, 2017

Abstract

In this paper, we provide evidence for a risk-taking channel of monetary policy transmission in the euro area. Our dataset covers the period 2003Q1–2016Q2 and includes, in addition to the standard variables for real GDP growth, inflation, and the main refinancing rate, indicators of bank lending standards and bank lending margins. Based on vector autoregressive models with (i) recursive identification and (ii) sign restrictions, we show that banks react quickly and aggressively to an expansionary monetary policy shock by decreasing their lending standards. The banks' efforts to keep their lending margins stable are successful, as we find only an insignificant decrease in the margins over the medium-run.

JEL Codes: E44, E51, E52, E58, G28

Keywords: European Central Bank, Macroprudential Policy, Monetary Policy Transmission, Risk-Taking Channel, Vector Autoregression.

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1 Introduction

With the onset of the Global Financial Crisis in 2007–2008 researchers and policymakers became increasingly interested in analyzing and understanding interdependencies between the real economy and financial markets. Since “excessive” risk-taking behavior by commercial banks is considered to be one of the factors that led to the outbreak of the Global Financial Crisis, analyzing the effects of monetary policy on banks’ risk-taking behavior is of special interest.

The idea that a changing interest rate environment influences banks’ perception of risk can be traced back to Hancock (1985) and Aharony et al. (1986), who find that lower short-term interest rates are related to a decrease in the profitability of commercial banks. Asea and Blomberg (1998) point out that the credit market is subject to regular cycles. During bust episodes, competition for liquidity (Acharya et al., 2012) and customers (Beck et al., 2006) increases, thereby narrowing banks’ margins and increasing the temptation of more risk-taking. Azariadis and Smith (1998) support this finding with a dynamic model incorporating an adverse selection process in credit markets. Rajan (2006) connects a reduction in lending standards to low short-term interest rates and argues that increased competitive pressure on financial managers during a bust leads to herding behavior, thus producing irrational deviations from fundamentals and strongly increasing the costs of a downturn.

Borio and Zhu (2012) are the first to use the term “risk-taking channel,” and to explain its different facets. The first effect operates on the basis of valuations, incomes, and cash flows. Low policy rates and a high money supply tend to raise the prices of real and financial collateral, thereby reducing the banks’ risk perception and increasing leverage (Adrian and Shin, 2014), even if lending standards are held constant. Similarly, income and wealth increase, resulting in a higher risk tolerance of borrowers (Pratt, 1964; Arrow, 1970).

The second effect arises from the impact of monetary policy actions on the banks’ profitability. Nominal rate-of-return targets are relatively sticky. Negative deviations would trigger stock price declines and cause serious pressure. Lowering short-term rates drives banks to search for higher yields in order to maintain the trust of their investors (Rajan, 2006; Buch et al., 2014). Indirectly, a lower interest environment increases competition in the banking sector, which, in turn, also reduces the banks’ ability to generate profits (Maudos and de Guevara, 2004). A corresponding flattening of the yield curve, for instance, by supplementary asset purchasing programs, further compresses banks’ margins (Meaning and Zhu, 2011; Alessandri and Nelson, 2015).¹

¹Quantitative easing in Japan can be seen as an example of this effect (Goyal and McKinnon, 2003).

The third set of effects transmits through central bank communication. By increasing the degree of transparency of its actions, a central bank can remove uncertainty about the future and enforce the impact of future policy rate changes even before the actual interest rate decision (Neuenkirch, 2013). Borio and Zhu (2012) call this the “transparency effect.” This effect is accompanied by the “insurance effect” arising from the anticipation that central banks are able to cut off large downside risks. Hence, commercial banks do not fear an intensified crisis and expansionary interventions are assumed to be more effective. However, as a side effect, banks are encouraged to accept more risk.

Recent empirical papers provide evidence for the existence of a risk-taking channel in the United States. Lower interest rates result in decreased lending standards (Abbate and Thaler, 2015; Angeloni and Faia, 2013; Delis and Kouretas, 2011; Maddaloni and Peydró, 2011), higher leverage (de Groot, 2014; Adrian and Shin, 2014), and increased asset risks (Angeloni et al., 2015). In addition, Dell’Ariccia et al. (2014) provide a theoretical foundation for a link between the degree of risk-taking and a bank’s capital structure. Indeed, small and modestly capitalized banks are empirically found to take more risk (Altunbas et al., 2010, 2014; Buch et al., 2014; Dell’Ariccia et al., 2016; Ioannidou et al., 2015; Jiménez et al., 2014), a finding that can be explained by a relatively higher degree of competitive pressure and an inferior ability to adjust the capital structure.

However, to the best of our knowledge, there are no studies that examine the role of risk-taking in the monetary policy transmission mechanism for the euro area.² We aim at filling this gap and augment a standard vector autoregressive (VAR) monetary policy transmission model for the euro area and the period 2003Q1–2016Q2, with indicators of bank lending standards and bank lending margins. This makes our paper the first to consider the impact of monetary policy on both banking sector variables simultaneously. Based on (i) recursive identification and (ii) sign restrictions, we show that banks react quickly and aggressively to an expansionary monetary policy shock by decreasing their lending standards. The banks’ efforts to keep their lending margins stable are successful, as we find only an insignificant decrease in the margins over the medium-run. Consequently, our paper provides evidence for a risk-taking channel of monetary policy transmission in the euro area.

The remainder of this paper is structured as follows. Section 2 introduces the data set and the empirical methodology. Section 3 presents the empirical results. Section 4 concludes with some policy implications.

²Jiménez et al. (2014), as the only exception, present bank-level panel evidence for Spain.

2 Data and Econometric Methodology

Our data set covers quarterly data for the euro area (changing composition) and the period 2003Q1–2016Q2, and consists of five variables.³ First, we include the standard indicator for the monetary policy stance, that is, the main refinancing rate (MRR). Second, we use the inflation rate based on the harmonized index of consumer prices excluding energy and food. Using a core inflation measure precludes exogenous price movements stemming from these two sources, allowing us to establish a parsimonious model without an exogenous oil price indicator. Third, we utilize the growth rate of real GDP as the measure of real economic activity.

In addition to these three standard variables, our fourth and fifth variables are two indicators for the banking sector. For our fourth variable, we use the banks' lending margin, defined by the European Central Bank (ECB) as the difference between interest rates on new business loans and a weighted average interest rate on new deposits from households and non-financial corporations. This variable reflects the banking sector's ability to generate profit in its core field of credit lending. Declining margins could trigger the aforementioned search for yield and are expected to be a key element in the risk-taking channel. The overall euro area lending margin is calculated as the weighted average of country-specific interest rate margins with the countries' contribution to the ECB's capital as a weighting scheme.⁴ Our fifth variable is a measure of lending standards that is taken from the ECB's bank lending survey of around 140 banks from all euro area countries. This indicator is calculated as the net percentage of banks reporting a tightening in credit standards (as opposed to an easing) in comparison to the previous quarter. The rationale behind using this variable is to measure the change of non-financial obstacles in credit lending, such as loan-to-value restrictions, collateral, or securities.

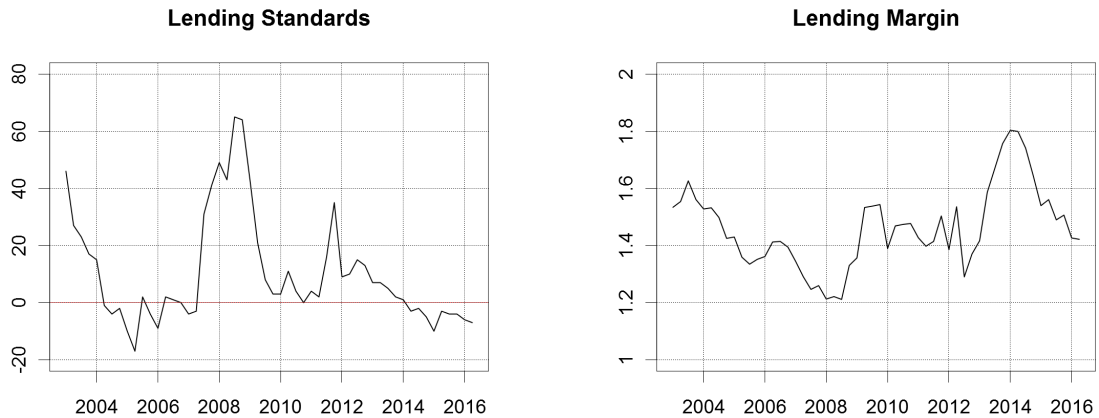
Figure 1 plots the two banking sector variables over time.⁵ Lending standards tend to decrease between 2003 and 2005 and remain more or less stable thereafter until the onset of the liquidity crisis in money markets (2007Q3). The indicator peaks at the time of the Lehman collapse (2008Q3), and returns towards neutral lending standards thereafter with the euro area sovereign debt crisis in 2011 being the only exception. Lending margins tend to decrease over time until the Lehman collapse. After 2009 they remain more or less constant with a strong peak in 2014Q1 being the only exception.

³The start date coincides with the introduction of the quarterly bank lending survey by the ECB.

⁴The weighting scheme can be found in Table A1 in the Appendix.

⁵The corresponding plots for the three standard monetary policy transmission variables can be found in Figure A1 in the Appendix.

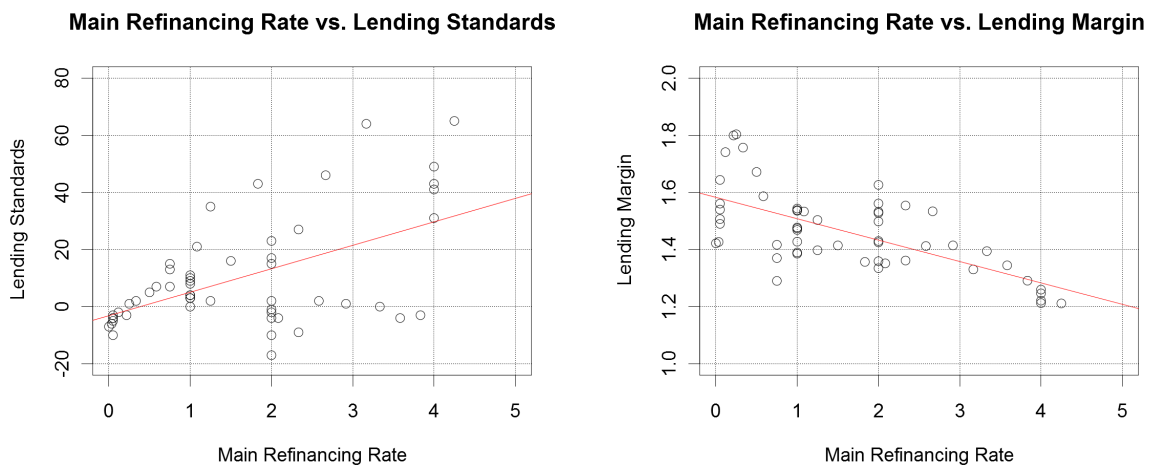
Figure 1: Lending Standards and Lending Margin in the Euro Area



Notes: Lending standards: Net percentage of banks reporting a tightening in credit standards (as opposed to an easing) in comparison to the previous quarter in the euro area bank lending survey. Lending margin: Difference between interest rates on new business loans and a weighted average interest rate on new deposits from households and non-financial corporations. *Source:* ECB.

Figure 2 shows scatter plots between both banking sector variables and the MRR. In line with previous research, we find a positive relationship between lending standards and the MRR, that is, lower interest levels are associated with lower banking standards and vice versa (see left panel). The relationship between the lending margin and the MRR, in contrast, is negative, implying an increase in margins for lower short-term interest rates and vice versa (see right panel). However, it remains to be seen if the bivariate contemporaneous relationships hold in a multivariate VAR model that also incorporates dynamics in the connections across variables.

Figure 2: Scatter Plots for Banking Sector Variables and Main Refinancing Rate



Notes: Figure shows scatter plots between the main refinancing rate and (i) lending standards (left panel, $\rho = 0.54$) and (ii) the lending margin (right panel, $\rho = -0.67$).

Our empirical strategy builds on two different identification schemes. Both methods are based on a linear VAR model. In general, a VAR(p) model with n endogenous variables can be written in reduced form as follows:

$$y_t = v + \sum_{i=1}^p A_i y_{t-i} + u_t \quad (1)$$

y_t is the $n \times 1$ vector of endogenous variables including lending standards, the lending margin, real GDP growth, core inflation, and the MRR. v is the $n \times 1$ vector of intercepts, u_t is the $n \times 1$ vector of non-structural error terms, and the A_i are $n \times n$ parameter matrices.

Both the Bayesian information criterion and the Hannan Quinn information criterion favor a lag length of 1 for our five-variable VAR model. However, preliminary estimations show that a VAR(1) model does not sufficiently capture the dynamics in the system. In contrast, the use of two lags eliminates serial correlation in the error terms according to an asymptotic Portmanteau test. Consequently, we employ a VAR(2) model in the following.

To identify the effects of monetary policy shocks on the other variables in the system, we have to transform the reduced form VAR in Eq.(1) into a structural VAR. In a first step, we impose a recursive identification scheme. Following Buch et al. (2014), we order the credit variables first. They argue that credit contracts do not respond immediately to monetary policy interventions or shocks to output and inflation since renegotiations of lending rates or lending standards typically take time. In the extreme case, new lending rates and lending standards can only be applied to new contracts, implying an even longer outside lag. We order the lending standards before the lending margin, which is in line with the “search-for-yield” idea, as changing lending margins will set incentives for changes in lending standards.

The ordering of the remaining variables follows the standard setup of a monetary policy transmission VAR as real GDP growth is ordered third, core inflation is ordered fourth, and the MRR is ordered last. This reflects the well-known outside lag of monetary policy in its impact on prices and output and the possibility of the central bank to react instantaneously to macroeconomic shocks, that is, to preclude any inside lags in monetary policy.

As our second identification strategy, we apply a Bayesian estimation method with sign restrictions.⁶ We use a pure sign restriction approach and identify only a single impulse vector. We utilize two different sets of restrictions. First, we assume that an expansionary monetary policy shock leads to (i) a decrease in the MRR, (ii) an increase

⁶A detailed setup of the model is given in Uhlig (2005).

in core inflation, and (iii) an increase in real GDP growth. Second, we impose a fourth restriction for an expansionary monetary policy shock to sharpen identification. Based on the results for the recursively-identified VAR and the first sign-restricted VAR (see Section 3) we also assume lending standards to decrease after an expansionary monetary policy shock. Table 1 summarizes the restrictions for both models, which are assumed to hold on impact and for four quarters thereafter (Mountford and Uhlig, 2009).

Table 1: Sign Restrictions for Bayesian Estimation

| | Model 1 | Model 2 |
|-----------------------|---------|---------|
| Lending Standards | none | – |
| Lending Margin | none | none |
| Real GDP Growth | + | + |
| Core Inflation | + | + |
| Main Refinancing Rate | – | – |

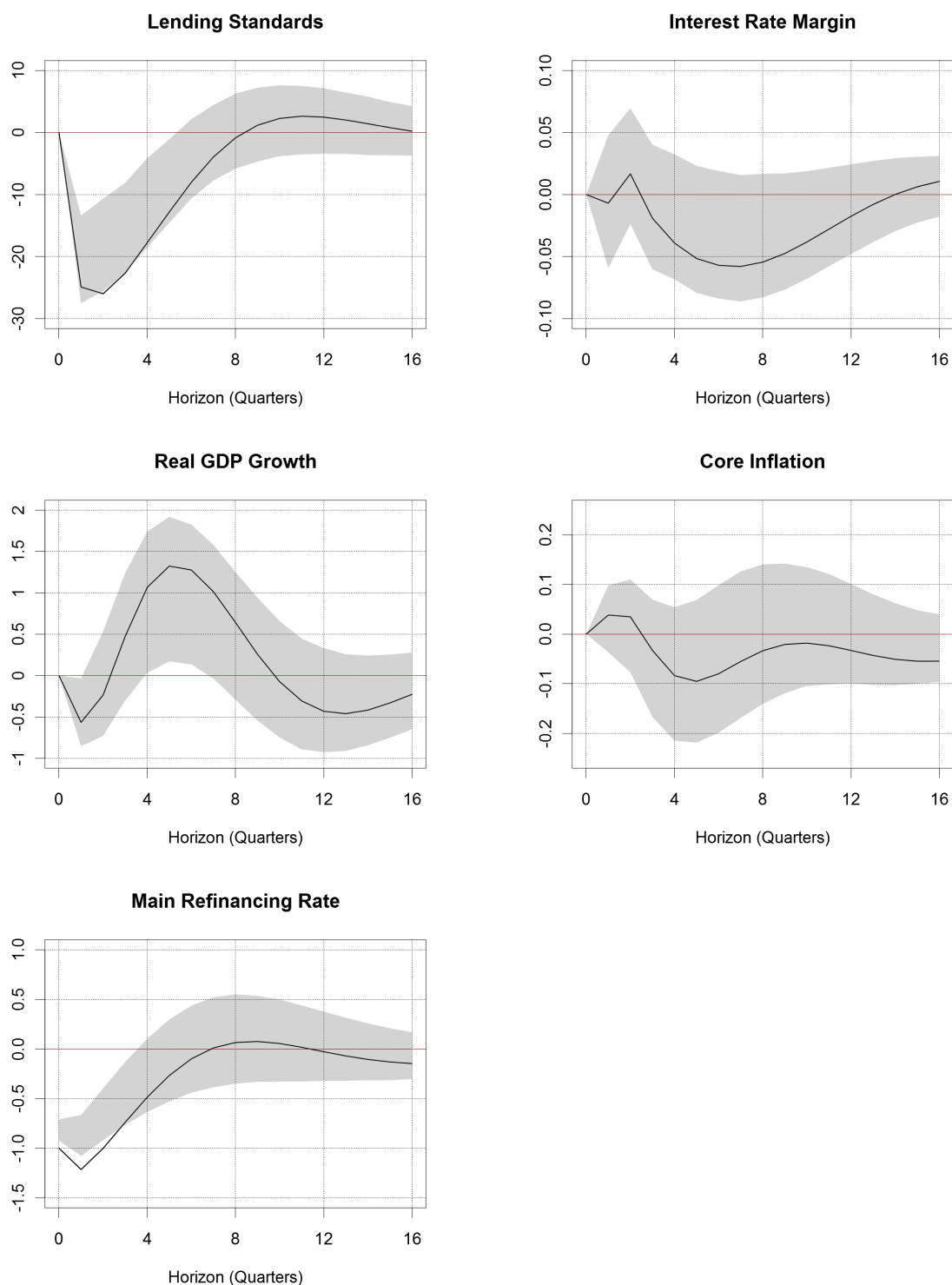
Notes: Table summarizes two sets of sign restrictions for an expansionary monetary policy shock in the Bayesian estimations. Restrictions are assumed to hold on impact and for four quarters thereafter.

3 Empirical Results

Figure 3 shows impulse responses based on recursive identification. Following an expansionary monetary policy shock of 100 basis points, real GDP growth increases after an outside lag of one year with a maximum impact of 1.32 percentage points (pp) after five quarters. Core inflation shows no significant effect, a result in line with Chen et al. (2012) and Joyce et al. (2012). Both papers conclude that inflation in the euro area is mainly driven by oil price shocks, which our measure of core inflation excludes.

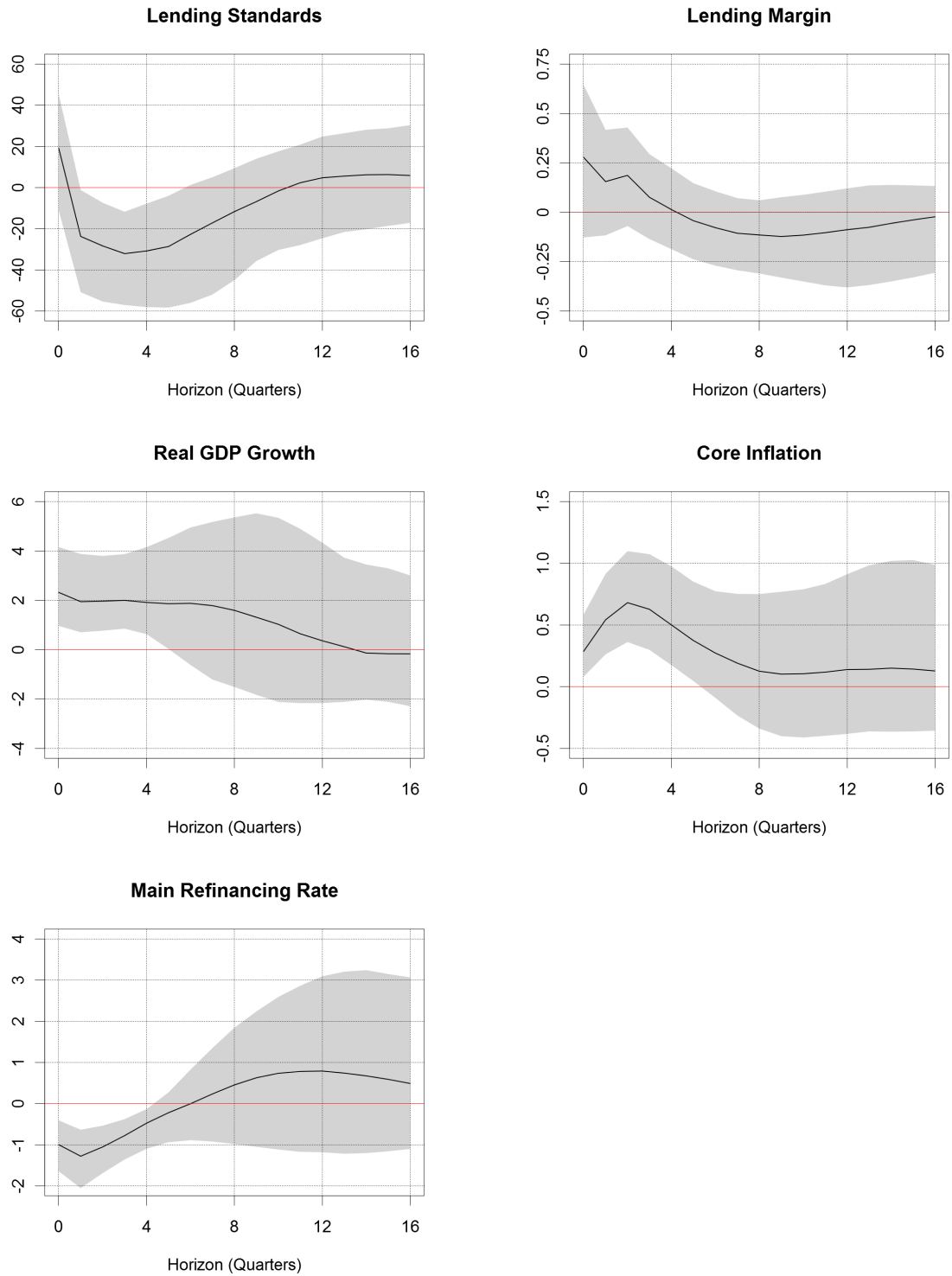
The responses of both credit variables are consistent with the findings of other VAR papers for the United States (Abbate and Thaler, 2015; Afanasyeva and Güntner, 2014). The impulse responses for lending standards show an immediate downward adjustment with a peak effect of –24.90 pp after one quarter, indicating that banks quickly adjust their lending behavior and accept more risk to prevent lending margins from falling. This adjustment becomes insignificant after five quarters. Lending margins tend to decrease after an expansionary monetary policy shock. However, this reaction is insignificant, indicating that banks are able to shield their lending margins from decreasing short-term interest rates and, hence, their profitability in conventional credit business.

Figure 3: Impulse Responses Based on Recursive Identification



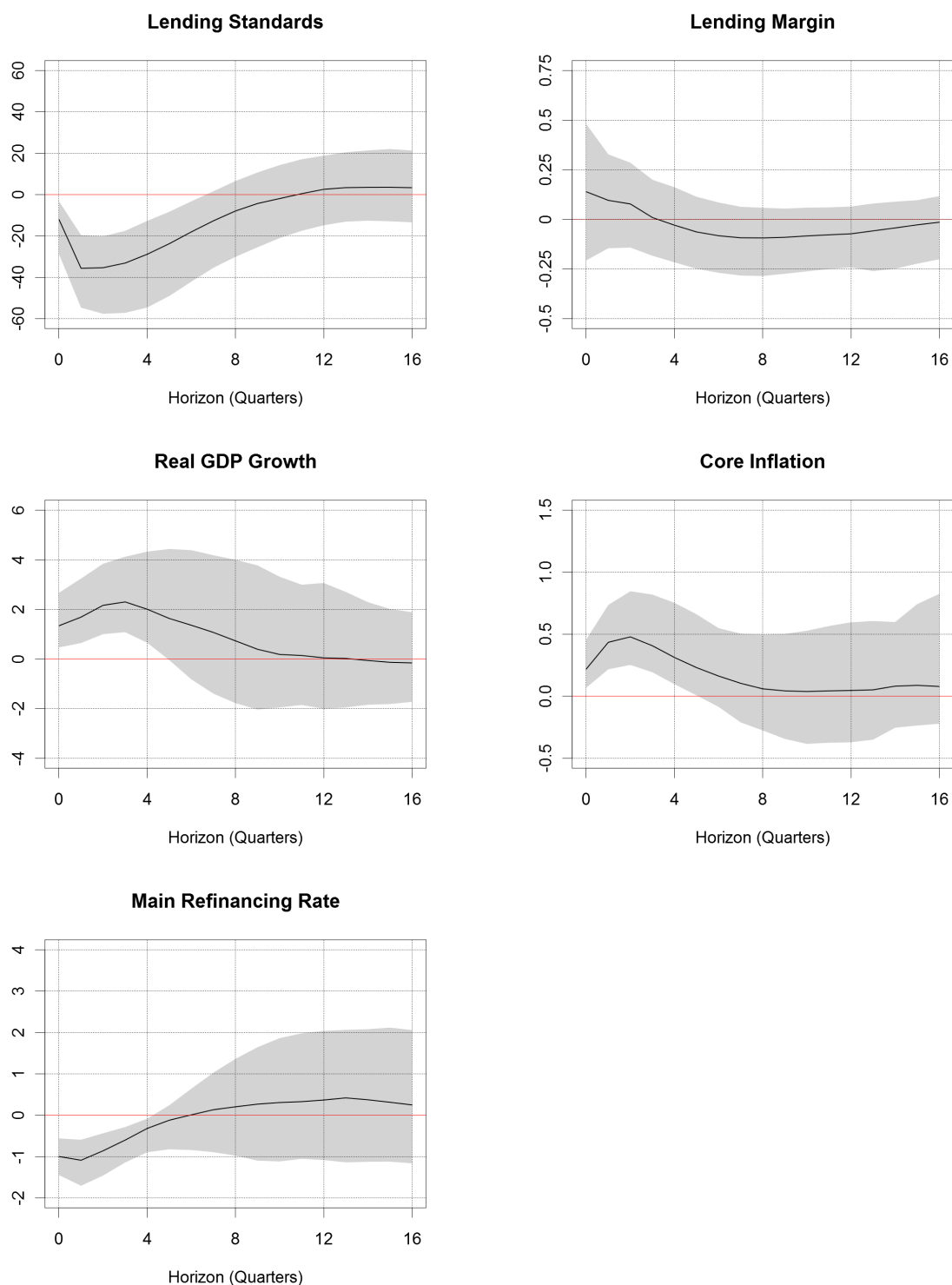
Notes: Solid lines represent mean impulse responses (in percentage points) to an expansionary monetary policy shock of 100 basis points based on recursive identification with the following ordering: Lending standards, lending margin, real GDP growth, core inflation, and MRR. Grey-shaded areas indicate 68% confidence bands derived by bootstrapping and 5,000 replications.

Figure 4: Impulse Responses Based on Sign Restrictions (Model 1)



Notes: Solid lines represent median impulse responses (in percentage points) to an expansionary monetary policy shock of 100 basis points based on sign restrictions for Model 1 (see Table 1). Grey-shaded areas indicate the 16% and 84% quantiles of the posterior distribution based on 5,000 accepted MCMC draws.

Figure 5: Impulse Responses Based on Sign Restrictions (Model 2)



Notes: Solid lines represent median impulse responses (in percentage points) to an expansionary monetary policy shock of 100 basis points based on sign restrictions for Model 2 (see Table 1). Grey-shaded areas indicate the 16% and 84% quantiles of the posterior distribution based on 5,000 accepted MCMC draws.

The main disadvantage of recursive identification is that the contemporaneous responses of lending standards and lending margins to the monetary policy shock are restricted to zero. This could only be avoided by ordering these variables after the MRR, which is economically not reasonable. The sign-restricted VAR solves this issue by leaving the impact responses of both variables open.⁷ Consequently, Figure 4 present impulse responses of an expansionary monetary policy of 100 basis points for Model 1.⁸ Similar to the results in Figure 3, lending standards quickly fall after an expansionary monetary policy shock. The reaction is significant for a period of one to five quarters after the shock with a peak effect -32.12 pp after three quarters. Again, the lending margin is not significantly affected by a monetary policy shock.

As mentioned in Section 2, we further sharpen identification by imposing a fourth restriction. Based on the results for the recursively-identified VAR (see Figure 3) and the first sign-restricted VAR (see Figure 4), we also assume that lending standards will decrease after an expansionary monetary policy shock. Figure 5 presents the corresponding impulse responses of an expansionary monetary policy of 100 basis points for Model 2. Our key results for lending standards and the lending margin remain robust. The impulse responses for lending standards show an immediate downward adjustment that lasts for six quarters with a peak effect of -35.65 pp after one quarter. Lending margins tend to decrease after an expansionary monetary policy shock as well. However, this reaction is insignificant, confirming the notion that banks are able to shield their lending margins.

4 Conclusions

In this paper, we augment a standard monetary policy transmission model for the period 2003Q1–2016Q2 with measures of lending standards and lending margins to investigate the risk-taking channel of monetary policy in the euro area. Based on VAR models with (i) recursive identification and (ii) sign restrictions, we show that commercial banks react quickly and aggressively to an expansionary monetary policy shock by decreasing their lending standards for five to six quarters. The banks' efforts to keep their lending margins stable are successful, as we find only an insignificant decrease in the margins over the medium-run. Consequently, our paper provides evidence for a risk-taking channel of monetary policy transmission in the euro area. Our findings are in line with previous results for the United States. However, we are not able to signif-

⁷Note that this comes at some cost; Uhlig (2005) states that sign restrictions can be seen as more restrictive than a recursive scheme.

⁸Note that the results for the other variables are qualitatively the same if we do not impose a restriction on the reaction of core inflation.

icantly verify the theoretical idea of a credit margin compression due to expansionary monetary policy in the euro area.

Our paper has several policy implications. First, central bankers should keep the risk-taking channel in mind when setting monetary policy. The case of Japan has shown that prolonged periods of low interest rates may lead to the build-up of risk in the credit system. The supporting effect of expansionary monetary policy is, if significant at all, only present in the short-run. Excessive risk-taking, however, might provide the foundation for another financial crisis. At the time of this writing, the euro area is facing the longest and most pronounced era of expansionary monetary policy interventions. However, almost all euro area countries show a moderate economic upswing and inflation rates in line with the ECB's goal, making the ongoing expansionary monetary policy measures questionable. Worse, the massive liquidity surplus led to a period of ever decreasing lending standards and the build-up of extreme balance sheet risks in the banking sector. As demonstrated by the Federal Reserve's interest rate increase in December 2015, a minor adjustment of the policy rate might dampen this unwanted risk-taking.

Second, we provide some implications for macroprudential policy. The German Financial Stability Committee recently proposed the implementation of several prudential policy instruments to prevent credit misallocation, in particular in the real estate sector (Financial Stability Committee, 2015). The proposal includes four main instruments: (i) loan-to-value restrictions, (ii) amortization requirements or maximum maturities, (iii) debt service coverage ratios, and (iv) debt-to-income ratios. Such instruments attempt at counteracting the banks' risk-taking behavior. Nevertheless, lowering interest rates while restricting lending standards at the same time will come at some costs. If banks cannot shield their interest rate margins by taking more risk, profits will fall, ultimately making the financial system more unstable. Another consequence might be a restructuring of financial intermediaries away from interest-based activities. Hence, macroprudential policy interventions accompanied by low interest rates may even amplify a negative shock on banks' balance sheets, in case tougher regulations are implemented in a procyclical fashion.

Our analysis focuses on the risk-taking channel in the euro area as a whole. It might be the case that there are asymmetries in the risk-taking channel across euro area countries, or there might be differences in the impact of monetary policy on small versus large banks, in particular with respect to the lending margin. Allowing for asymmetries in the transmission across countries and small versus large bank, therefore, would be an interesting task of future research.

References

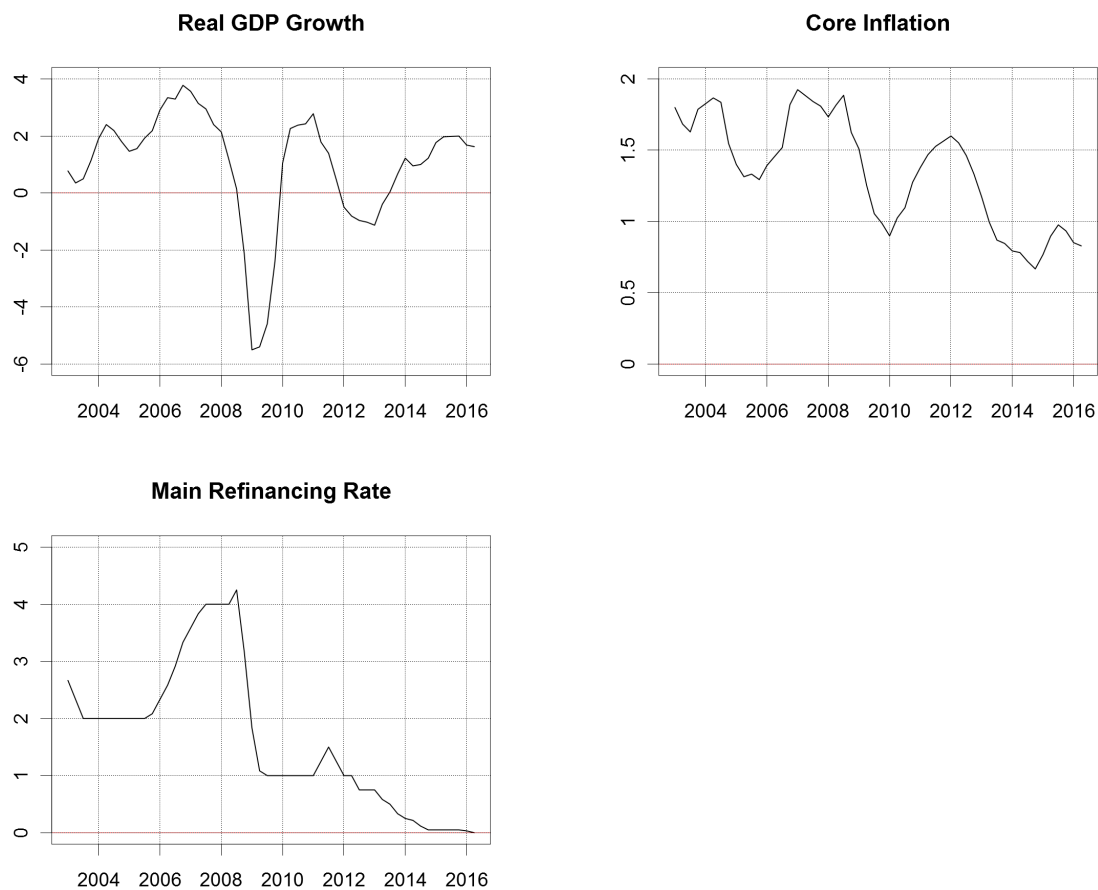
- Abbate, A., Thaler, D., 2015. Monetary Policy and the Asset Risk-Taking Channel. Deutsche Bundesbank Discussion Papers 48/2015.
- Acharya, V. V., Gromb, D., Yorulmazer, T., 2012. Imperfect Competition in the Interbank Market for Liquidity as a Rationale for Central Banking. *American Economic Journal: Macroeconomics* 4 (2), 184–217.
- Adrian, T., Shin, H. S., 2014. Procyclical Leverage and Value-at-Risk. *Review of Financial Studies* 27 (2), 373–403.
- Afanasyeva, E., Güntner, J., 2014. Lending Standards, Credit Booms and Monetary Policy. University of Linz Working Paper 1411.
- Aharony, J., Saunders, A., Swary, I., 1986. The Effects of a Shift in Monetary Policy Regime on the Profitability and Risk of Commercial Banks. *Journal of Monetary Economics* 17 (3), 363–377.
- Alessandri, P., Nelson, B. D., 2015. Simple Banking: Profitability and the Yield Curve. *Journal of Money, Credit and Banking* 47 (1), 143–175.
- Altunbas, Y., Gambacorta, L., Marques-Ibanez, D., 2010. Bank Risk and Monetary Policy. *Journal of Financial Stability* 6 (3), 121–129.
- Altunbas, Y., Gambacorta, L., Marques-Ibanez, D., 2014. Does Monetary Policy Affect Bank Risk? *International Journal of Central Banking* 10 (1), 95–136.
- Angeloni, I., Faia, E., 2013. Capital Regulation and Monetary Policy with Fragile Banks. *Journal of Monetary Economics* 60 (3), 311–324.
- Angeloni, I., Faia, E., Duca, M. L., 2015. Monetary Policy and Risk Taking. *Journal of Economic Dynamics and Control* 52, 285–307.
- Arrow, K. J., 1970. *Essays in the Theory of Risk-Bearing*. Amsterdam: Elsevier.
- Asea, P. K., Blomberg, B., 1998. Lending Cycles. *Journal of Econometrics* 83 (12), 89–128.
- Azariadis, C., Smith, B., 1998. Financial Intermediation and Regime Switching in Business Cycles. *American Economic Review* 88 (3), 516–536.
- Beck, T., Demirguc-Kunt, A., Levine, R., 2006. Bank Concentration, Competition, and Crises: First Results. *Journal of Banking and Finance* 30 (5), 1581–1603.

- Borio, C., Zhu, H., 2012. Capital Regulation, Risk-Taking and Monetary Policy: A Missing Link in the Transmission Mechanism? *Journal of Financial Stability* 8 (4), 236–251.
- Buch, C. M., Eickmeier, S., Prieto, E., 2014. In Search for Yield? Survey-Based Evidence on Bank Risk Taking. *Journal of Economic Dynamics and Control* 43, 12–30.
- Chen, H., Curdia, V., Ferrero, A., 2012. The Macroeconomic Effects of Large-Scale Asset Purchase Programmes. *Economic Journal* 122 (564), 289–315.
- de Groot, O., June 2014. The Risk Channel of Monetary Policy. *International Journal of Central Banking* 10 (2), 115–160.
- Delis, M. D., Kouretas, G. P., 2011. Interest Rates and Bank Risk-Taking. *Journal of Banking and Finance* 35 (4), 840–855.
- Dell’Ariccia, G., Laeven, L., Marquez, R., 2014. Real Interest Rates, Leverage, and bank Risk-Taking. *Journal of Economic Theory* 149 (C), 65–99.
- Dell’Ariccia, G., Laeven, L., Suarez, G., 2016. Bank Leverage and Monetary Policy’s Risk-Taking Channel: Evidence from the United States. *Journal of Finance*, forthcoming.
- Financial Stability Committee, 2015. Recommendation on new Instruments for Regulating Loans for the Construction or Purchase of Residential Real Estate. <http://www.bundesfinanzministerium.de/Content/EN/Downloads/2015-06-30-FSC-Recommendation.pdf>.
- Goyal, R., McKinnon, R., 2003. Japan’s Negative Risk Premium in Interest Rates: The Liquidity Trap and the Fall in Bank Lending. *World Economy* 26 (3), 339–363.
- Hancock, D., 1985. Bank Profitability, Interest Rates, and Monetary Policy. *Journal of Money, Credit and Banking* 17 (2), 189–202.
- Ioannidou, V., Ongena, S., Peydr, J.-L., 2015. Monetary Policy, Risk-Taking, and Pricing: Evidence from a Quasi-Natural Experiment. *Review of Finance* 19 (1), 95–144.
- Jiménez, G., Ongena, S., Peydró, J.-L., Saurina, J., March 2014. Hazardous Times for Monetary Policy: What do Twenty-Three Million Bank Loans say About the Effects of Monetary Policy on Credit Risk-Taking? *Econometrica* 82 (2), 463–505.
- Joyce, M., Miles, D., Scott, A., Vayanos, D., 2012. Quantitative Easing and Unconventional Monetary Policy an Introduction. *Economic Journal* 122 (564), 271–288.

- Maddaloni, A., Peydró, J.-L., 2011. Bank Risk-taking, Securitization, Supervision, and Low Interest Rates: Evidence from the Euro-Area and the U.S. Lending Standards. *Review of Financial Studies* 24 (6), 2121–2165.
- Maudos, J., de Guevara, J. F., 2004. Factors Explaining the Interest Margin in the Banking Sectors of the European Union. *Journal of Banking and Finance* 28 (9), 2259–2281.
- Meaning, J., Zhu, F., 2011. The Impact of Recent Central Bank Asset Purchase Programmes. *BIS Quarterly Review* December 2011, 73–83.
- Mountford, A., Uhlig, H., 2009. What are the Effects of Fiscal Policy Shocks? *Journal of Applied Econometrics* 24 (6), 960–992.
- Neuenkirch, M., 2013. Monetary Policy Transmission in Vector Autoregressions: A new Approach Using Central Bank Communication. *Journal of Banking and Finance* 37 (11), 4278–4285.
- Pratt, J. W., 1964. Risk Aversion in the Small and in the Large. *Econometrica* 32 (1/2), 122–136.
- Rajan, R. G., 2006. Has Finance Made the World Riskier? *European Financial Management* 12 (4), 499–533.
- Uhlig, H., 2005. What are the Effects of Monetary Policy on Output? Results from an Agnostic Identification Procedure. *Journal of Monetary Economics* 52 (2), 381–419.

Appendix

Figure A1: Macroeconomic Variables for the Euro Area



Notes: Core Inflation: Harmonized index of consumer price inflation excluding energy and food. *Source:* ECB.

Table A1: Weighting Scheme of Lending Margins

| | 03Q1–06Q4 | 07Q1–07Q4 | 08Q1–08Q4 | 09Q1–10Q4 | 11Q1–13Q4 | 14Q1–14Q4 | 15Q1–16Q2 |
|-------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| Austria | 2.88 | 2.87 | 2.86 | 2.82 | 2.82 | 2.81 | 2.79 |
| Belgium | 3.63 | 3.62 | 3.61 | 3.56 | 3.56 | 3.54 | 3.52 |
| Cyprus | 0.00 | 0.00 | 0.22 | 0.22 | 0.22 | 0.22 | 0.21 |
| Estonia | 0.00 | 0.00 | 0.00 | 0.00 | 0.28 | 0.28 | 0.27 |
| Finland | 1.84 | 1.83 | 1.83 | 1.81 | 1.80 | 1.80 | 1.78 |
| France | 20.80 | 20.70 | 20.63 | 20.40 | 20.34 | 20.26 | 20.14 |
| Germany | 26.40 | 26.27 | 26.19 | 25.89 | 25.82 | 25.72 | 25.57 |
| Greece | 2.98 | 2.97 | 2.96 | 2.93 | 2.92 | 2.91 | 2.89 |
| Ireland | 1.70 | 1.69 | 1.69 | 1.67 | 1.67 | 1.66 | 1.65 |
| Italy | 18.06 | 17.97 | 17.91 | 17.71 | 17.66 | 17.59 | 17.49 |
| Latvia | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.40 | 0.40 |
| Lithuania | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.59 |
| Luxembourg | 0.30 | 0.30 | 0.30 | 0.29 | 0.29 | 0.29 | 0.29 |
| Malta | 0.00 | 0.00 | 0.09 | 0.09 | 0.09 | 0.09 | 0.09 |
| Netherlands | 5.87 | 5.84 | 5.82 | 5.76 | 5.74 | 5.72 | 5.69 |
| Portugal | 2.56 | 2.54 | 2.54 | 2.51 | 2.50 | 2.49 | 2.48 |
| Slovakia | 0.00 | 0.00 | 0.00 | 1.11 | 1.11 | 1.10 | 1.10 |
| Slovenia | 0.00 | 0.50 | 0.50 | 0.50 | 0.50 | 0.49 | 0.49 |
| Spain | 12.97 | 12.90 | 12.86 | 12.72 | 12.68 | 12.63 | 12.56 |

Notes: Weights are based on the member countries' contribution to the ECB's capital.