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Monetary Policy Transmission in Vector Autoregressions: A New Approach Using Central Bank Communication

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Abstract

In this paper, we study the role central bank communication plays in the monetary policy transmission mechanism. We employ the Swiss Economic Institute's Monetary Policy Communicator to measure the future stance of the European Central Bank's monetary policy. Our results indicate that, first, communication influences prices and output. Second, communication partly crowds out the effects of the short-term interest rate as the latter's influence is lower and its implementation lag increases compared to a benchmark model without central bank communication. Future work on monetary policy transmission should incorporate both a short-term interest rate and a communication indicator.

Keywords: Central Bank Communication, European Central Bank, Monetary Policy Shocks, Monetary Policy Transmission, Vector Autoregression

JEL: E52, E58

1. Introduction

Ever since Sims's seminal paper (1980), transmission of monetary policy typically has been studied using a vector autoregression (VAR) approach. In general, contractive monetary policy is found to decrease output and price level, with a maximum impact occurring after a time lag of 12–24 months (see, e.g., literature surveys by Leeper et al., 1996; Christiano et al., 1999). Several indicators of monetary policy stance have been tested over the past three decades: a monetary aggregate (Sims, 1980), an indicator based on minutes from meetings of the Federal Open Market Committee (Romer and Romer, 1989), non-borrowed reserves at the central bank (Eichenbaum, 1992), a surprise measure based on Federal funds futures (Faust et al., 2004), and the currently most widely accepted single indicator (Bernanke and Blinder, 1992)—the short-term interest rate (Sims, 1992).

Over the past 15 years, *central bank communication* has evolved as an important tool for central bankers. By providing regular information about its economic outlook and the future stance of monetary policy, a central bank can influence interest rate expectations.[1] Forward-looking agents alter their expectations before the interest rate changes. As a consequence, we observe fewer unexpected changes in monetary policy (Blinder et al., 2008) and studying actual policy shocks could thus paint a less than complete picture of the monetary transmission mechanism. In particular, VAR models that neglect the role of communication might overestimate the length of the implementation lag.

To date, however, this subject has not been studied in the context of monetary policy transmission mechanisms,[2] even though studying the dynamics of the short-term interest rate, output, and prices after (gradual) changes in communication could be insightful.[3] This paper aims at filling this gap in the literature and employs the Swiss Economic Institute's (KOF) Monetary Policy Communicator (MPC) as an additional variable measuring communication about the future course of the European Central Bank's (ECB) monetary policy. This indicator covers forward-looking information about risks to price stability in the ECB president's statement after each interest rate decision (KOF, 2007) and provides a quantitative assessment of the ECB's expected future interest rate plans. The indicator potentially helps explaining any transmission process *before* an actual interest rate move.

[1] Theoretically, central bank communication matters (i) in the absence of a stationary economy or monetary policy rule or (ii) in the presence of non-rational expectations (Blinder et al., 2008).

[2] Note that Romer and Romer (1989) use central bank communication (minutes) to identify exogenous shocks in monetary policy. However, it is not clear why central bank communication should be treated as exogenous from macroeconomic developments or the short-term interest rate (Bernanke and Mihov, 1998). Therefore, this paper treats communication in post-meeting statements as additional endogenous variable.

[3] As shown later in this paper, communication does capture information about monetary policy beyond the 3-month interest rate.

Our sample period begins at the inception of the ECB in January 1999 and ends in June 2011 (150 monthly observations). Econometrically, we use VAR models to address the following research question: Does central bank communication play any role in the transmission of ECB monetary policy to output and prices? Our prior is that communication leads short-term interest rates and that both variables jointly influence output and prices.

2. Data and Econometric Methodology

We utilize two variables to measure the monetary policy stance. In addition to the ‘classical’ 3-Month Euro Interbank Offered Rate (Euribor) we employ the KOF MPC. This indicator is based on a quantification of statements made by the ECB President at monthly press conferences.[4] As the ECB’s primary objective is to maintain price stability over the medium term, the indicator is based on statements which reveal the Governing Council’s assessment of developments which directly affect future price stability. It is constructed by balancing statements implying either (i) upside risks or (ii) downside risks to price stability against all statements on the topic of future price stability (KOF, 2007).[5] Therefore, changes in this indicator can be interpreted as changes in the ECB’s inflation expectations. Conrad and Lamla (2010) show that the EUR/USD exchange rate responds to ECB communication measured by the KOF MPC. Sturm and de Haan (2011) find this indicator useful in predicting the ECB’s next policy decision—even when the interbank rate is included in a Taylor (1993) rule model. Thus, this indicator appropriately captures ECB communication and is of relevance to financial agents. Figure 1 plots the 3-Month Euribor and the KOF MPC.

Although the KOF MPC does anticipate changes in the future target by two to three months (KOF, 2007), the correlation to the interbank rate—which should capture expectations about the future target rate over the next three months—is only 0.41 over our sample period. Communication does capture information in monetary policy beyond the 3-month interest rate and, as a consequence, by including ECB communication in our model we may gain some further insight into monetary policy transmission.

Econometrically, we employ a VAR model as pioneered by Sims (1980). In the benchmark case without central bank communication, we estimate the four-variable model,

(1) $y_t = \sum_{i=1}^{k} \alpha_i \, y_{t-1} + \mu_t$,

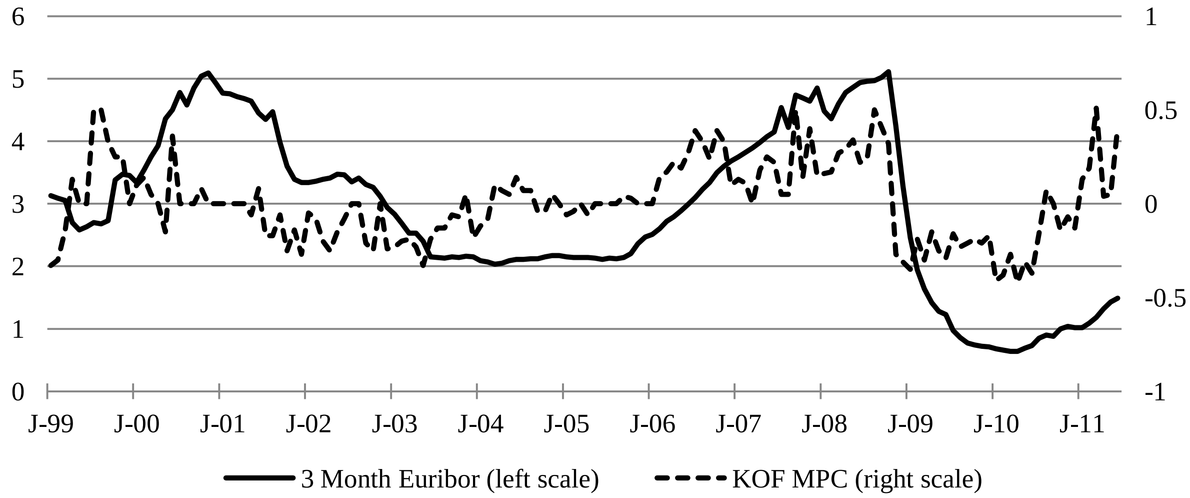
where y_t is a 4x1 vector of endogenous variables containing the industrial production index (IP), the harmonised index of consumer prices (CPI), and monetary aggregate M3 (in logs,

[4] Coding of the statements is provided by Media Tenor, a media research institute (http://www.mediatenor.de).

[5] Further information on the KOF MPC is provided here: http://www.kof.ethz.ch/en/indicators/monetary-policy-communicator.

respectively), as well as the 3-month Euribor interest rate.[6] All variables enter the system as level variables (Sims and Uhlig, 1991) with three lags.[7] To study the dynamic impact of monetary policy on prices and output, we simulate their reaction to shocks in the short-term interest rate. These impulse response functions are obtained using the Cholesky decomposition. Following the idea of Taylor (1993), we expect the ECB to react on shocks in output and prices. Accordingly, the Cholesky ordering in the benchmark model is as follows: IP, CPI, 3 Month Euribor, M3. However, given the emphasis of money in the ECB strategy, we provide a robustness test where the ECB reaction function also includes the monetary aggregate (Cholesky ordering: IP, CPI, M3, 3 Month Euribor; see Figure A1).

Figure 1: 3-Month Euribor and KOF MPC



Source: ECB and KOF.

In a second step, we add the KOF MPC to the vector of endogenous variables to test for its (additional) influence on the monetary policy transmission process.[8] We simulate the reaction of prices and output to shocks in the short-term interest rate and the KOF MOC. The ECB systematically uses communication to prepare for upcoming interest rate decisions (Sturm and de Haan, 2011). Therefore, the Cholesky ordering in the augmented case is as

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[6] Data source: ECB. As part of our robustness tests, we considered other variables in the VAR setup: EUR/USD exchange rate, euro nominal effective exchange rate, U.S. short-term interest rate, and price indicators for commodities, housing, and oil. The results presented in Section 3 of the paper are robust to the inclusion of these variables. To optimise the degrees of freedom in our estimations, we stick with the parsimonious specification. All omitted results are available on request.

[7] Out of a battery of lag-length selection criteria (sequential modified likelihood ratio test statistic, final prediction error, Akaike information criterion, Schwarz information criterion, Hannan-Quinn information criterion), we choose the lag length favoured by the majority of criteria.

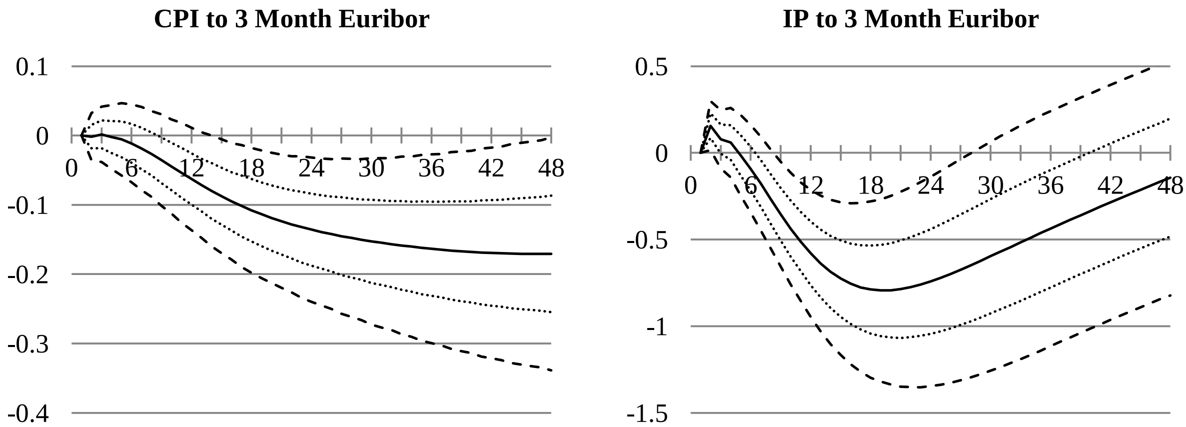
[8] Note that the correlation between the 3 Month Euribor residuals in the four-variable VAR and the KOF MPC is 0.2. Therefore, we can expect the communication indicator to capture something beyond the short-term interest rate.

follows: IP, CPI, KOF MPC, 3 Month Euribor, M3. Figures A2a–A2c in the Appendix provide robustness tests for a different ordering of the KOF MPC and the 3M Euribor in the Cholesky decomposition and, furthermore, allow for the inclusion of M3 in the ECB reaction function.

3. Results

Figure 2 shows the impulse responses for the benchmark model that includes the short-term interest rate, but no central bank communication variable. Error bands show one and two standard error (SE) deviations in each direction. A Cholesky one standard deviation (SD) shock in the short-term interest rate (14 basis points, bps) leads to a significant decrease in the price index after 9 months (after 15 months based on two SE bands). The maximum impact is found after 47 months: a hypothetical 25 bps hike lowers the price level by 30 bps. Industrial production is affected in a similar way. After seven months (9 months if using two SE bands), output decreases significantly; the maximum drop of 137 bps after a 25 bps shock manifests after 19 months. The results are in line with findings from the early years of the European Monetary Union (see, e.g., van Els et al., 2003; Mojon and Peersman, 2003; Peersman and Smets, 2003; Angeloni et al., 2003). ECB monetary policy affects prices and output significantly, and after a considerable implementation lag.[9] The results are robust to a different Cholesky ordering (see Figure A1 in the Appendix).

Figure 2: Benchmark Case—Impulse Responses

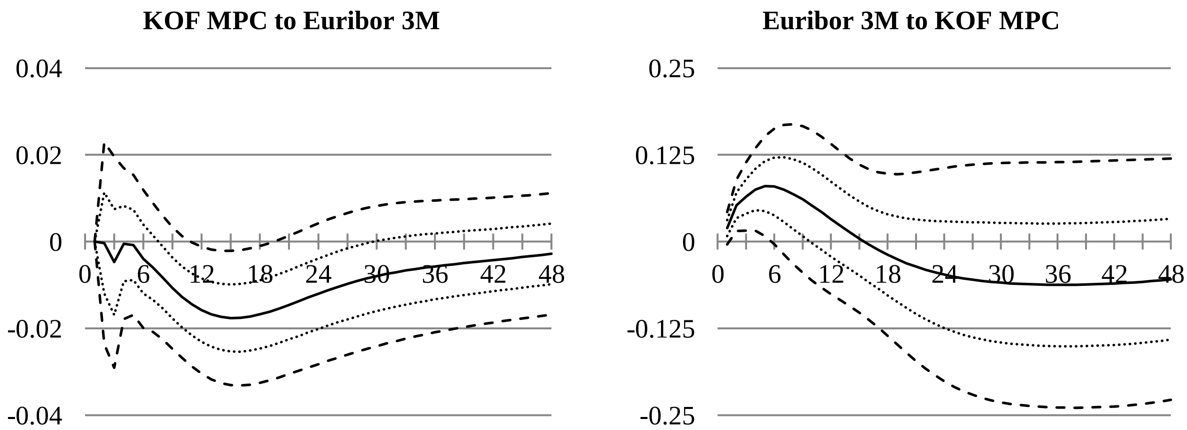


Note: The figure shows selected impulse responses to Cholesky one SD innovation in the 3-month Euribor. Cholesky decomposition is based on the ordering: IP, CPI, 3 Month Euribor, M3. Error bands are one and two standard error deviations. Full set of 16 impulse responses is available on request.

[9] Other impulse responses (not shown here) are in line with *a priori* expectations. The short-term interest rate reacts positively to CPI and IP shocks, implying that the ECB is following a Taylor (1993) rule, and to M3 shocks (with a short time lag); CPI (with a short time lag) and IP increase after M3 shocks; finally, we have evidence for the liquidity effect as M3 goes down after shocks to the short-term interest rate.

In a next step, we examine whether central bank communication plays any role in the transmission of ECB monetary policy to output and prices. We add the KOF MPC to the benchmark model and, first, explore the joint dynamics of both monetary policy indicators. Figure 3 shows the impulse responses for both variables. Error bands show one and two standard error (SE) deviations in each direction. A Cholesky one SD shock in the KOF MPC (13 bps) leads to a significant increase in the short-term interest rate, with a maximum impact of 8 bps after five months. Changes discussed in communications precede changes in the short-term interest rate by about nine months, which implies that the ECB systematically uses communication to prepare the financial world for its upcoming interest rate policy. In contrast, a shock in the 3-month Euribor (14 bps), that is, an unexpected change in monetary policy, has no significant impact on communication during the first seven months. However, after making an interest hike for which it provided no preparation, the central bank corrects its communication about future monetary policy significantly downward after eight months (11 month when using 2 SE bands).

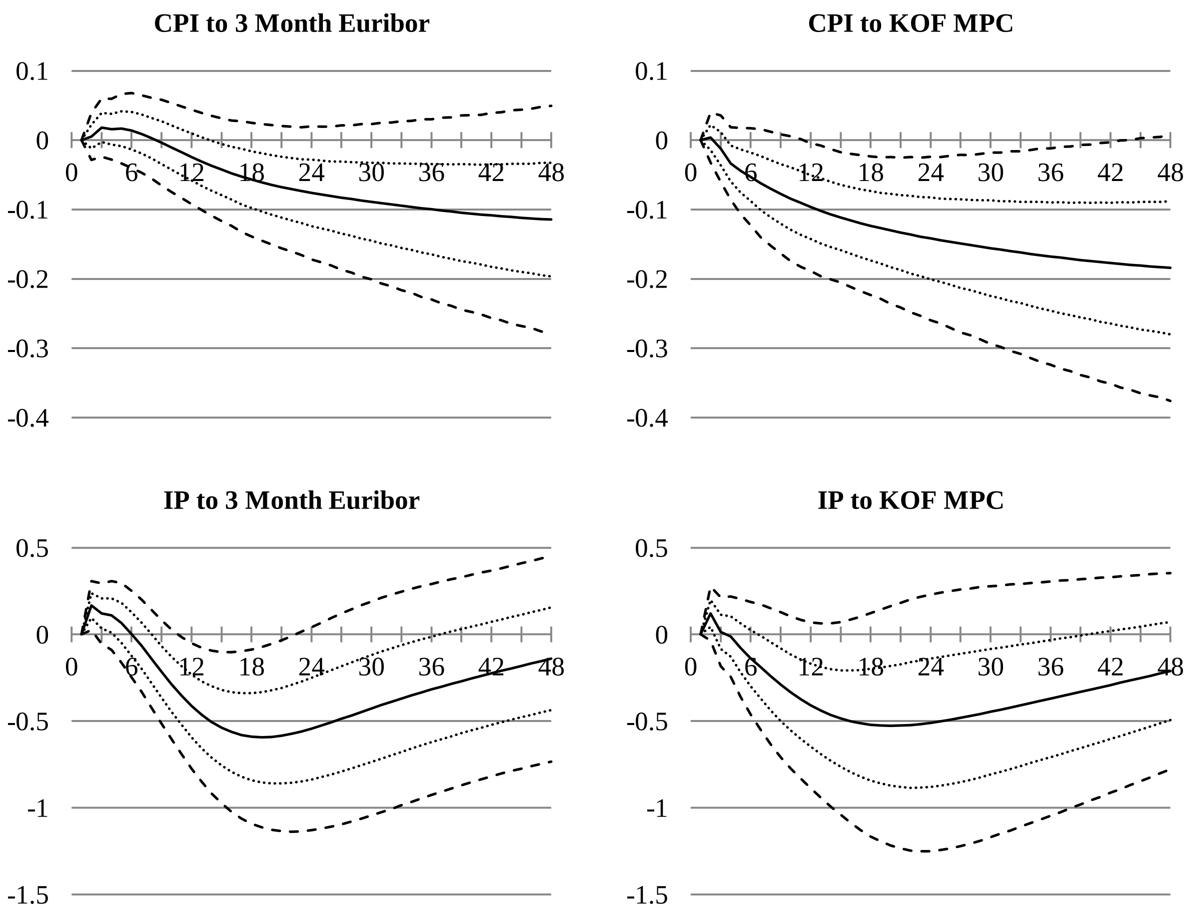
Figure 3: Augmented Case—Joint Dynamics of 3-Month Euribor and KOF MPC



Note: The figure shows selected impulse responses to Cholesky one SD innovation in the 3-month Euribor and the KOF MPC. Cholesky decomposition is based on the ordering: IP, CPI, KOF MPC, 3 Month Euribor, M3. Error bands are one and two standard error deviations. Full set of 25 impulse responses is available on request.

In a next step, we analyse how prices and output react to both monetary policy indicators. The impulse responses are shown in Figure 4. Communication about future monetary policy influences CPI and IP. It significantly lowers prices after four months (12 months when using two SE bands) and exerts a lasting effect on the price level, with the maximum impact occurring after 48 months. To provide a quantitative figure, we translate the Cholesky one SD shock in communication into a change in communication that leads to an interest rate hike of 25 bps. Such a change in communication decreases the price level by a maximum of 58 bps. Communication partly crowds out the effects of monetary policy shocks in the augmented setup: the influence of the 3-month Euribor becomes significantly negative after 14 months (using one SE bands), which marks an increase in the implementation lag. Furthermore, the maximum impact of a 25 bps hike in the short-term interest rate is lower (21 bps) than without central bank communication (30 bps). Industrial production's reaction to communication again takes place with a marginally shorter time lag than for the 3-month Euribor (7 months vs. 8 months, one SE bands). The maximum contraction of output is found after 20 months (165 bps for the equivalent of a 25 bps hike) in the case of communication. An actual interest rate hike of 25 bps reduces the IP index by 106 bps after 19 months.[10]

Figure 4: Augmented Case—Impulse Responses



Note: The figure shows selected impulse responses to Cholesky one SD innovation in the 3-month Euribor and the KOF MPC. Cholesky decomposition is based on the ordering: IP, CPI, KOF MPC, 3 Month Euribor, M3. Error bands are one and two standard error deviations. Full set of 25 impulse responses is available on request.

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[10] Other impulse responses (not shown here) are in line with *a priori* expectations. The short-term interest rate and the KOF MPC react positively to CPI and IP shocks, implying that the ECB is following a Taylor (1993) rule in monetary policy actions and communications, and to M3 shocks (with a short time lag); CPI (with a short time lag) and IP increase after M3 shocks; finally, we have evidence for the liquidity effect as M3 goes down after shocks to the short-term interest rate and the KOF MPC.

Communication successfully manages expectations about future interest rates. By engaging in communication, the ECB can steer inflation and output before an actual interest rate change take place. However, a VAR model using communication as the sole indicator of monetary policy performs much worse than our benchmark model (results not shown). The reaction of prices and output shows the correct sign, but is not statistically significant. Thus, communication is a complement to the short-term interest rate in monetary policy transmission.

Our results are robust to different Cholesky orderings (see Tables A2a–A2c in the Appendix) and different maturities (overnight, 6- month, and 12-month) for the short-term interest rate. Furthermore, the short-term interest rate employed here is the average of daily interest rates during a particular month and also captures information after the ECB's decision, which usually takes place early in the month. In contrast, the KOF MPC includes information only up to this decision day and, thus, the timing aspect is not favouring the results for central bank communication.

4. Conclusions

In this paper, we study the influence of central bank communication in the monetary policy transmission mechanism using a VAR model. We employ the Swiss Economic Institute's Monetary Policy Communicator as a variable (along with the short-term interest rate) measuring the European Central Bank's future monetary policy stance. Our sample covers the period January 1999–June 2011.

First, communication about future monetary policy influences CPI and IP more than does the actual short-term interest rate. Communication implying a future interest hike of 25 bps decreases the price level significantly after four months and by a maximum of 58 bps after 48 months. Industrial production is significantly reduced after seven months, with a maximum impact of 165 bps after 20 months. In contrast, a 25 bps shock in the short-term interest rate lowers prices (output) significantly after 14 (10) months, with a maximum impact of 21 (106) bps after 48 (19) months.

Second, communication partly crowds out the effects of monetary policy shocks; the influence of the short-term interest rate is lower and the time lag longer (in particular for inflation) in a model containing central bank communication than in a benchmark model without it. However, a VAR model using communication as the sole indicator of monetary policy performs much worse than the benchmark model. Thus, communication complements the short-term interest rate in the process of monetary policy transmission.

Our results indicate that prices and output react to a change in the inclination of future monetary policy more than to actual shocks in the target rate. Systematic central bank communication—as engaged in by the ECB—successfully manages expectations about future interest rates. Changes in communication precede changes in the short-term interest rate by about nine months. Thus, by using this channel of monetary policy, the ECB can steer inflation and output before actual interest rate changes take place.

We show that studying monetary policy transmission mechanisms these days needs to involve more than just analysing rare shocks in the short-term interest rate. Future work on monetary policy transmission should take note of our findings and employ an indicator for central bank communication. An assessment of communication by the Federal Reserve in this context would be a fruitful avenue for future research. Facing the zero lower bound of interest rates, the Federal Reserve uses communication to keep expectations of the future target rates low.[11] Employing the traditional short-term interest rate as the single indicator would fail to represent this 'easing' bias.

[11] *'The Committee currently anticipates that economic conditions … are likely to warrant exceptionally low levels for the federal funds rate at least through mid-2013'* (Federal Open Market Committee, 2011).

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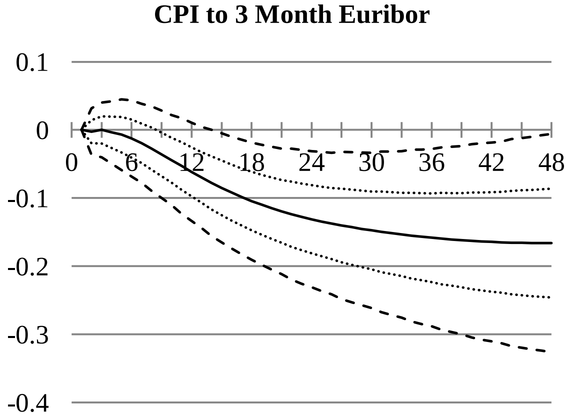
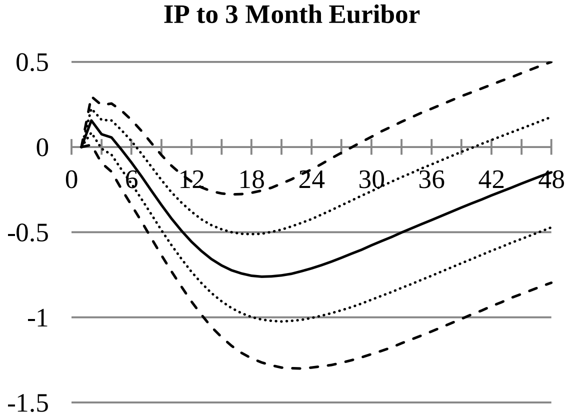
Appendix

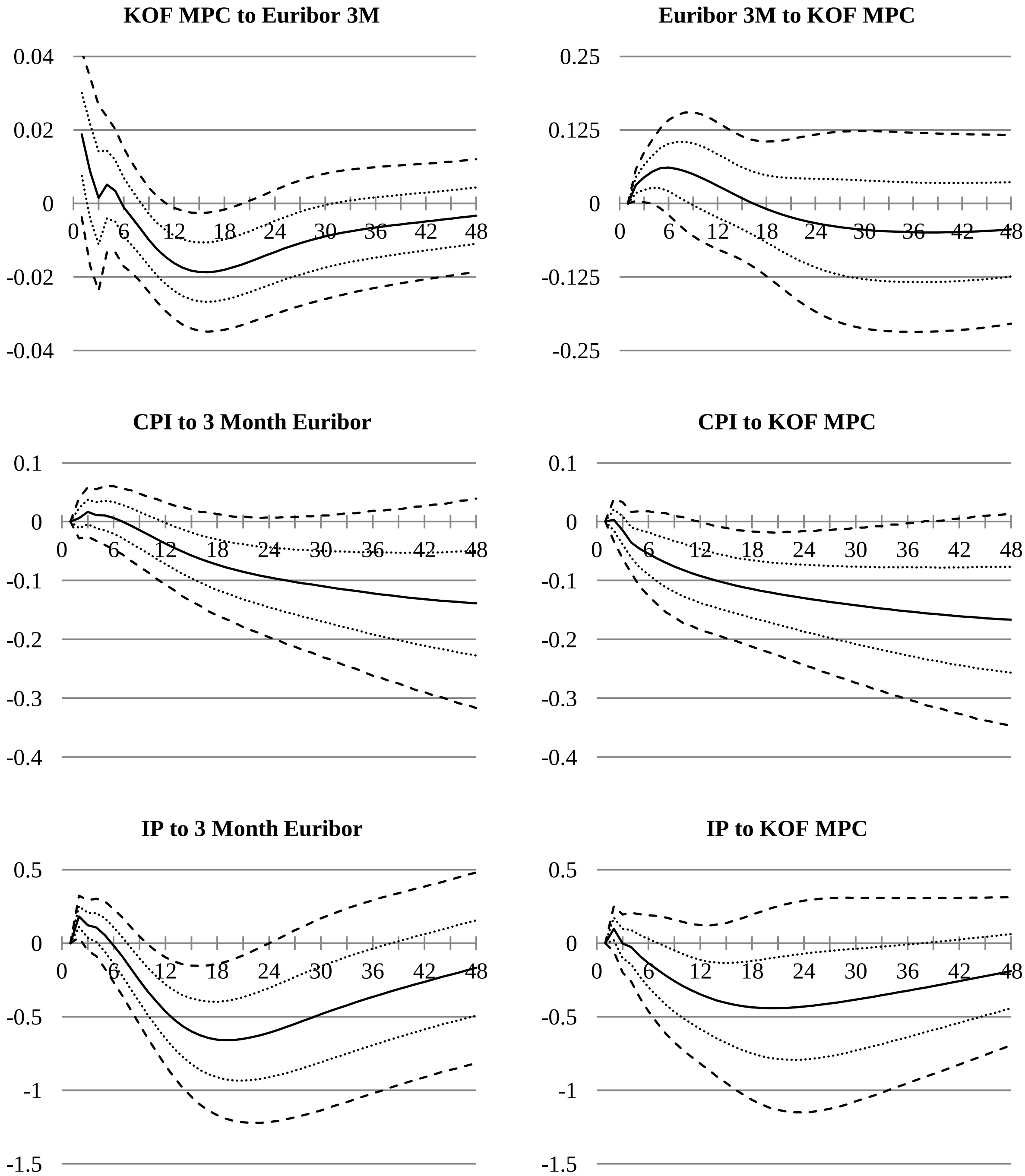
Figure A1: Benchmark Case—Impulse Responses Based on Different Cholesky Ordering





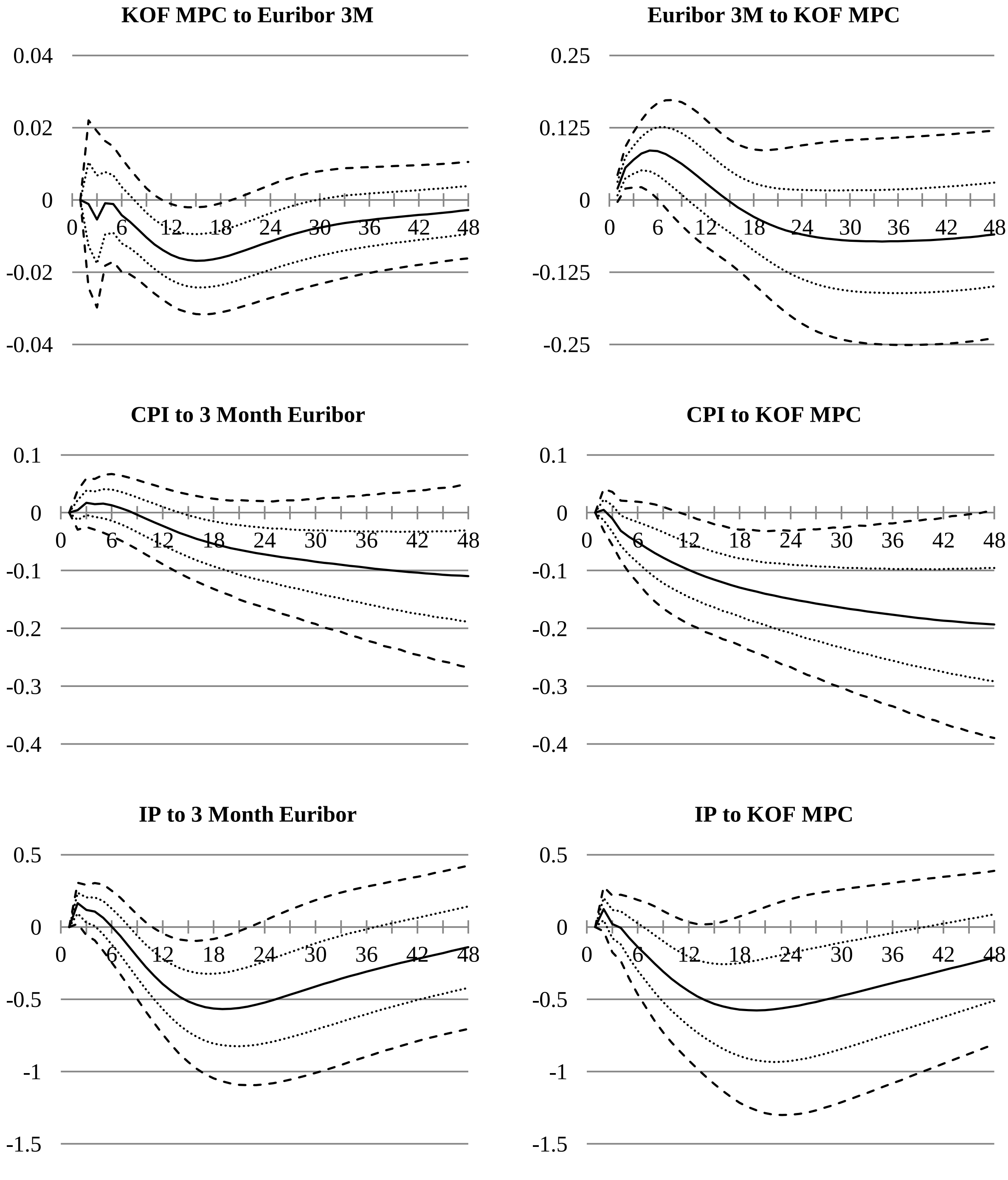
Note: The figure shows selected impulse responses to Cholesky one SD innovation in the 3-month Euribor. Cholesky decomposition is based on the ordering: IP, CPI, M3, 3 Month Euribor. Error bands are one and two standard error deviations. Full set of 16 impulse responses is available on request.

Figure A2a: Augmented Case—Impulse Responses Based on Different Cholesky Ordering



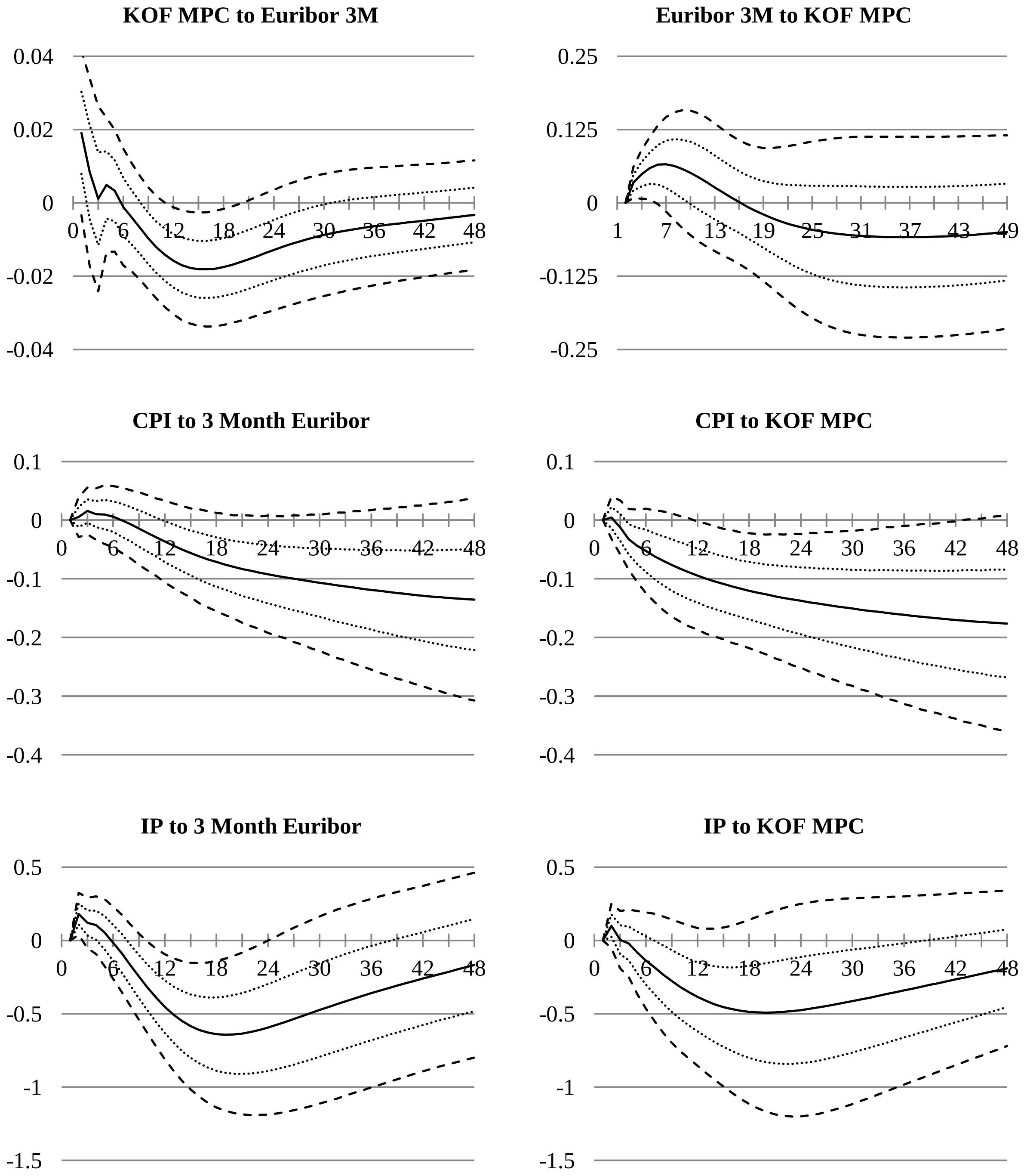
Note: The figure shows selected impulse responses to Cholesky one SD innovation in the 3-month Euribor and the KOF MPC. Cholesky decomposition is based on the ordering: IP, CPI, 3 Month Euribor, KOF MPC, M3. Error bands are one and two standard error deviations. Full set of 25 impulse responses is available on request.

Figure A2b: Augmented Case—Impulse Responses Based on Different Cholesky Ordering



Note: The figure shows selected impulse responses to Cholesky one SD innovation in the 3-month Euribor and the KOF MPC. Cholesky decomposition is based on the ordering: IP, CPI, M3, KOF MPC, 3 Month Euribor. Error bands are one and two standard error deviations. Full set of 25 impulse responses is available on request.

Figure A2c: Augmented Case—Impulse Responses Based on Different Cholesky Ordering



Note: The figure shows selected impulse responses to Cholesky one SD innovation in the 3-month Euribor and the KOF MPC. Cholesky decomposition is based on the ordering: IP, CPI, M3, 3 Month Euribor, KOF MPC. Error bands are one and two standard error deviations. Full set of 25 impulse responses is available on request.