Sentiment Regimes and Reaction of Stock Markets to Conventional and Unconventional Monetary Policies: Evidence from OECD Countries

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Abstract

In this paper, we investigate how conventional and unconventional monetary policy shocks affect the stock market of eight advanced economies, namely, Canada, France, Germany, Japan, Italy, Spain, the U.K., and the U.S., conditional on the state of sentiment. In this regard, we use a panel vector auto-regression (VAR) with monthly data (on output, prices, equity prices, metrics of monetary policies, and consumer and business sentiments) over the period of January 2007 till July 2020, with the monetary policy shock identified through the use of both zero and sign restrictions. We find robust evidence that, compared to the low investor sentiment regime, the reaction of stock prices to expansionary monetary policy shocks is stronger in the state associated with relatively higher optimism, both for the overall panel and the individual countries (with some degree of heterogeneity). Our findings have important implications for academicians, investors, and policymakers.

Keywords: Conventional and unconventional monetary policies, equity prices, sentiment, OECD countries, panel VAR, zero and sign restrictions.

JEL Classification: C32, C33, E30, E51, E52, G15.

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1. Introduction

There is widespread international evidence of the role of stock prices and/or returns in leading economic activity, and inflation as well (Stock and Watson, 2003; Plakandaras et al., 2017; Tiwari et al., 2019; Pierdzioch and Gupta, 2020), with major historical global slowdowns (such as the "Great Depression", the global recession of the early 2000s, the Global Financial Crisis (GFC) of 2007-2009, and the recent COVID-19 outbreak to name a few) associated with deep bearish phases of the equity market (Baker et al., 2020a). Naturally, from the perspective of policy-making, a pertinent question is analyzing the influence of monetary policy decisions in affecting the equity market. Theoretically, monetary policy shocks affect stock prices by changing investors' expectation about future cash flows and by affecting the cost of capital, i.e., the real interest rate, which is used to discount the future cash flows and/or the risk premium associated with holding stocks (Bernanke and Kuttner, 2005; Maio, 2014; Gertler and Karadi, 2015). Given these two channels and the importance of the issue, not surprisingly, a large empirical literature exists in this regard involving not only conventional, but also unconventional monetary policies (see, for example, recent studies by Kishor and Marfatia (2013), Haitsma et al., (2016), Simo-Kengne et al., (2016), Eksi et al., (2017), Caraiani and Călin (2018, 2020), Chebbi (2019), Paul (2020), Cepni and Gupta (forthcoming), and references cited therein for earlier works in this regard). In general, these studies confirm the significant influence of monetary policy on stock markets, with expansionary shocks increasing stock prices and/or returns and contractionary shocks reducing the same.

Besides, many of the papers indicate that the effect of monetary policy is in fact is state-dependent, whereby the states are associated with (bearish or bullish) phases of the stock market (Chen, 2007) and business cycles involving recessions or expansions (Basistha and Kurov, 2008), pre-or during-crisis periods (Kontonikas et al., 2013), uncertainty (Marfatia, 2014), and more recently, there has been a growing emphasis on regimes of the sentiment of economic agents (Kurov, 2010; Guo et al., (2019, 2021); Cepni and Gupta, forthcoming). The gain in popularity in analyzing the role of monetary policy in affecting equity markets contingent on the regimes of sentiment seems to be aligned with the growth in the area of behavioral finance, which states that stock markets are affected by overly optimistic or pessimistic judgments and choices of market agents (see for example, De Long et al., (1990), and as emphasized by Keynes (1936) more than five decades earlier). While there exists a massive literature that looks into the role of financial and

macroeconomic variables in predicting stock market movements (see, for example, Rapach et al., (2005, 2013); Rapach and Zhou, (2013); Aye et al., (2017); Jordan et al., (2017, 2018); Gupta et al., (2020) among others), the empirical studies associated with the behavioral theory of finance, following the seminal contributions of Baker and Wurgler (2006, 2007), confirm the existence of significant effects of sentiment on international stock market movements (see, Gebka (2014), Bathia and Bredin (2013, 2018); Bathia et al., (2016); Balcilar et al., (2018); Limongi Concetto and Ravazzolo (2019) for detailed reviews). Moreover, there seems to be widespread consensus that the variation in stock prices ever since the GFC has been significantly affected by sentiment (Baker et al., 2020b; Cox et al., 2020).

Against this backdrop, the objective of our paper is to analyze whether sentiment-based regimes affect the response of stock returns to both conventional and unconventional monetary policy shocks. Econometrically speaking, we address our question by estimating a panel vector auto-regression (VAR) with monthly data (on output, prices, equity prices, metrics of monetary policies, and consumer and business sentiments) from eight advanced the Organisation for Economic Co-operation and Development (OECD) economies (Canada, France, Germany, Italy, Japan, Spain, the United Kingdom (U.K.), and the United States (U.S.)) over a sample spanning the period since the onset of the global financial crisis, i.e., January 2007 till July 2020. Note that the choice of these mature equity markets is primarily motivated by their importance in the global economy, with these countries representing nearly two-thirds of global net wealth, and nearly half of world output (Das et al., 2019). The monetary policy shock in the panel VAR is identified through the use of both zero and sign restrictions along the lines of Gambacorta et al. (2014). Given the empirical model, we conjecture that the response of stock prices to monetary policy shocks is stronger during periods of high sentiment because of the so-called sentiment-mispricing mechanism. Intuitively, the stock market becomes less rational during high sentiment periods due to higher participation of noise traders (Stambaugh et al., 2012), which in turn boost animals spirits, belief perseverance, over-extrapolation, and related psychological biases (Abreu and Brunnermeier, 2003), causing to a prolonged period of market overvaluation that can not be explained by economic fundamentals. During these periods, stock prices diverge from the net present value of expected cash flows (De Long et al., 1990; Lee et al., 1991), either due to overestimation of the company's earnings or due to underestimation of risk (Mian and Sankaraguruswamy, 2012; Kaplanski et al., 2015). Con-

currently, sentiment-driven overpricing is known to be more prevalent than under-pricing due to the limits of arbitrage and short sale constraints (Chung et al., 2012). Therefore, an expansionary monetary policy shock is likely to cause a more substantial divergence from the equilibrium prices during periods of high-sentiment than when sentiment is relatively low.

At this stage, it is crucial to highlight that our hypothesis adds a behavioral channel (besides the two above-mentioned theoretical ones) involving the transmission of monetary policy shocks to equity prices. Unsurprisingly, in the presence of rationality, the stock price reaction to monetary policy shocks should not differentiate across low- and high-sentiment regimes. Moreover, from the perspective of a policymaker, if the effect of the monetary policy is conditional on the level of investor sentiment, then policy authorities should take into account this information when formulating monetary policy decisions aimed at influencing the stock market to limit the arising of "bubbles", even though the primary goal of monetary policy is to stabilize fluctuations in output and inflation and keep these variables close to their desired targets (Gali and Gambetti, 2015). Thus, it is essential to investigate how monetary policy jointly affects the macro-economy and stock prices, depending on sentiment levels.

To the best of our knowledge, this is the first study to examine the effect of both conventional and unconventional monetary policy shocks on aggregate stock returns of eight advanced OECD stock markets, conditional on the regimes of the sentiment of market participants. In the process, we extend the existing U.S.-based related studies on this topic by Kurov (2010), Guo et al., (2019, 2021), and Cepni and Gupta (forthcoming). In this regard, Kurov (2010) has inter alia shown that monetary policy actions (in bear market periods) have a larger effect on (cross-section of) stocks that are more sensitive to changes in investor sentiment (and credit market conditions). In addition, in a (working) paper, Guo et al., (2019) indicate that the impact of Federal funds rate surprises negatively impacts stock returns only when sentiment is high for the period before the zero lower bound (ZLB). However, since this paper could only detect a low-sentiment regime over the unconventional monetary policy period (of 2009-2014), the authors could not provide a state-contingent impact of unconventional monetary policies on stock returns. Furthermore, Guo et al., (2020) show that the stock returns increase significantly over the pre-Federal Open Market Committee(FOMC) announcement window (known as the pre-FOMC announcement drift) only during periods of high investor sentiment (and low economic uncertainty). Finally, Cepni and

Gupta (forthcoming) use a recently developed estimator that uses high-frequency surprises as a proxy for the structural monetary policy shocks, which in turn is achieved by integrating the current short-term rate surprises, which are least affected by an information effect, into a VAR model as an exogenous variable. When allowing for time-varying model parameters, the authors find that, compared to the low investor sentiment regime, the negative reaction of stock returns to a contractionary monetary policy shock is stronger in the state associated with relatively higher investor sentiment. The remainder of the paper is organized as follows: Section 2 outlines the data, while Section 3 lays out the econometric methodology and the identification of the monetary policy shock. Section 4 presents the econometric results for the overall panel, as well as individual countries. Section 5 provides robustness checks of our results based on alternative monetary policy metrics and sentiment, and Section 6 concludes the paper.

2. Data

Our data set includes the consumer price index, industrial production index, national stock market index, monetary base and central banks' total assets for eight OECD countries: Canada, France, Germany, Japan, Italy, Spain, U.K., and the U.S. The panel VAR model is estimated over the sample period January 2007-July 2020, where unconventional monetary policies effectively became the main policy instrument in selected OECD countries due to the global financial crisis (GFC) and COVID-19 outbreak. The dynamics of economic conditions are captured with industrial production and consumer price indices. We use central banks' total assets and monetary base as unconventional monetary policy tools since central banks have used their balance sheets as a macroeconomic buffer during the crisis, performing a unique stabilization function. Furthermore, shadow short rates (SSR) of Krippner (2013) are used to represent conventional monetary policies for these eight economies since standard policy rates have approached zero lower bound during and post-GFC.[1]

The consumer sentiment index is based on the consumer confidence indicator (CCI) provided by the OECD.[2] The CCI index is a timely indicator of household's sentiment about unemployment,

[1]The data for SSRs is obtained from https://www.rbnz.govt.nz/research-and-publications/research-programme/additional-research/measures-of-the-stance-of-united-states-monetary-policy/.

[2]Data can be accessed from https://data.oecd.org/leadind/consumer-confidence-index-cci.htm.

general economic situation, and capability of savings. While the CCI values above 100 signal a boost in the consumers' confidence towards the future economic situation, values below 100 imply pessimistic expectations about future economic activity. All series are adjusted for seasonality (where relevant) and made stationary using the log-level transformation if needed. All data except for the CCI and SSR is downloaded from the Bloomberg terminal.

3. Methodology

3.1. Mean Group Estimation of Dynamic Heterogeneous Panels

To investigate the effects of unconventional and conventional monetary policy shocks on stock markets, we adopt a panel VAR approach to examine the cross-sectional dimension, which yields more efficient estimates by considering the correlation among the country residuals. This approach allows us to capture unobserved factors that have common impact on all countries. In particular, we utilize a mean group estimator to obtain consistent estimates without restricting heterogeneous coefficients across countries. As suggested by Pesaran and Smith (1995), a mean group panel estimator is applied using separate regressions for each cross-country. Then panel estimates are calculated based on averages of the cross-sectional estimated coefficients.

We consider the following panel VAR specification:

$$Y_{i,t} = \alpha_i + C(L)_i Y_{i,t-1} + D_i \varepsilon_{i,t} \tag{1}$$

where $Y_{i,t}$ denotes the vector of endogenous variables, α_i is a vector of constants for each country i, $C(L)_i$ is a matrix polynomial in the back-shift operator L, and the contemporaneous impact matrix of the mutually uncorrelated disturbances ε_i is denoted by D_i for $i = 1, \ldots, N$. The vector of endogenous variables $Y_{i,t}$ includes the log of central bank total assets, the log of national stock market index, the log of industrial production industrial production index and the log of consumer price index.

The unconventional monetary policy shock is defined as an exogenous shock to the central bank's total assets. This reflects the widely used unconventional monetary policies through the use of balance sheet expansion by central banks following the GFC. Having hit the lower bound after the crisis, the broad suite of unconventional monetary policies implemented by central banks including purchases of government securities, cheap longer term funding to banks, purchases of

private sector assets, and intervention in FX markets. The introduced array of measures and facilities aimed at supporting the economy and market functioning have resulted in a large increase in total balance sheet size of the central banks assets.

Although policy rates have been kept close to their effective bounds most of the time after the GFC, our sample period covers the limited number of policy rate cuts/hikes that occurred after the GFC as a continuation of conventional monetary policy when the transmission mechanism is blocked. In particular, the COVID-19 outbreak and its lingering economic aftermath have caused several central banks in OECD countries to use the conventional monetary policies, including cutting interest rates to below zero, the level previously believed to be the floor of nominal interest rates. Hence, we repeat our analysis by identifying conventional monetary policy shock as an exogenous shock to shadow short rate.

It is possible that the behavioral responses to unconventional/conventional monetary policies may depend on the level of consumer sentiment. Hence, we also control the sentiment regimes by constructing high and low consumer confidence states. The high consumer confidence regime is represented by the periods when the CCI is above the value of 100. By definition of CCI, values above 100 signal a boost in the consumers' confidence about the future economic activity and making consumers more inclined to spend money in the coming months. Contrarily, we identify the low consumer confidence regime when CCI values are below 100, which indicates pessimistic expectations about the future developments in the economic activity.

3.2. Identification

The model is identified through the use of both zero and sign restrictions on the contemporaneous impact matrix D. As suggested by Gambacorta et al. (2014), zero restrictions are imposed on the contemporaneous impact of shocks to central bank balance sheet (shadow short rates) on consumer prices and industrial production. On the contrary, the central bank balance sheet (shadow short rates) immediately reacts to innovations in consumer prices and industrial production. These restrictions allow us to disentangle the shocks to monetary policy from real economy disturbances such as demand and supply shocks without putting a constraint on macro variables to react in a particular direction.

We assume that expansionary conventional and unconventional monetary policy shocks do not

decrease the stock market index. Gupta and Jooste (2018) point out that innovations to central bank balance sheets reduce market uncertainty by mitigating economic instability concerns. Hence, our sign restriction allows us to disentangle exogenous innovations to unconventional and conventional monetary policies from their endogenous response to financial market disturbances. Furthermore, without posing zero restrictions, we allow for contemporaneous interaction between monetary policies and stock markets, as emphasized by Eickmeier and Hofmann (2013).

Finally, conventional and unconventional monetary policy shocks of each individual country are identified by using a mixture of sign and zero restrictions as described above. In particular, since the shocks defined as mutually orthogonal in equation (1), $E(\varepsilon_t \varepsilon_t') = I$, the var-cov matrix Ω of country specific VAR system can be denoted as $BQQ'B'$, where Q is an orthonormal maxtrix with $Q'Q = I$ and B is the Cholesky decomposition of Ω. Hence, the corresponding country-specific impulse responses are computed using the formula $A(L)^{-1}BQ\varepsilon_t$.[3]

4. Empirical Results

4.1. Mean Group Panel VAR Estimation Results

Figures 1-2 illustrate the impulse responses for unconventional monetary policy shock characterizing by the central bank balance sheet expansion under high and low consumer sentiment regimes. The reactions of industrial production and consumer prices show that unconventional monetary policy measures support the macro-economy, but the effect is more pronounced and long-lasting in high consumer sentiment regime. Although both industrial production and prices display a significant increase initially, the effects are temporary and return to baseline after a short period (5-months for industrial production; 9-months for consumer prices). Hence, unconventional monetary policy shocks have less effect on economic activity and inflation in low consumer sentiment regimes. This may owe to a range of factors, including rigidities in private consumption and fixed investment during low sentiment periods, as well as issues related to the impairment of the monetary policy transmission mechanism during the crisis periods characterized by low consumer sentiment. Interestingly, Figure 2 also shows that although all leading central banks have engaged in unconventional monetary policy actions because of the threat of deflation, the effect of

[3] See, Gambacorta et al. (2014) for more technical details.

unconventional monetary policy shocks on consumer prices is weak and transitory, indicating that monetary policy effectiveness is limited in low sentiment periods.

As can be seen from Figures 1-2, the impacts on stock prices are quite similar under both regimes, but the effect is more pronounced during high consumer sentiment regimes indicating that consumers are much likely to buy risky assets when they feel confident about the economy. The reason for the stronger reaction of stock prices in high sentiment regime is in line with the behavioral channel since high sentiment boosts "animal spirits," which makes investors overly optimistic in the precision of their predictions, sticking to their beliefs for too long even in light of new information, and over-extrapolating from recent data in forming their views on the future (Campbell and Sharpe, 2007; Deaves et al., 2010; Greenwood and Shleifer, 2014). Furthermore, high sentiment may increase the likelihood of near-term growth expectations or decrease equity risk premium which in turn boost to equity valuations. On the other hand, the responses of the stock market are positive and statistically significant under both regimes. The reason might be that since central banks' balance sheet expansions reduce the supply of and lower the return on 'safe' assets such as money and government bonds, households tend to shift from safe to riskier assets such as stocks to maintain their portfolio returns.

– Insert Figures 1-2 about here. –

Figures 3-4 present the impulse responses for conventional monetary policy shocks associated with a decrease in the shadow short rates. Compared to the unconventional monetary policy shocks, it appears that conventional monetary policy shocks have a relatively larger effect on consumer prices in both regimes than those of unconventional monetary policies. In particular, consumer prices' response is persistent and statistically significant even in the low sentiment regime. One potential explanation for the relatively lower reaction of consumer prices in the case of unconventional monetary policies might be that unconventional monetary policies are generally implemented over a recession where micro-economic frictions in the consumption of durable goods lead to a sluggish adjustment of price levels (Berger and Vavra, 2015). This finding also supports the view that the impact of monetary policy may vary more fundamentally over the business cycle to the degree that frictions influence expenditure decisions and price-setting behavior asymmetrically in expansions and recessions (Peersmann and Smeets, 2001).

– Insert Figures 3-4 about here. –

When we compared the magnitudes of the stock market reactions, it is apparent that conventional monetary policy shocks are relatively smaller effects than unconventional monetary policy shocks. The reason might be that although both monetary policy shocks fuel equity valuations as future cash flows translate into a higher net present value when lower discount rates are applied, the bank lending channel of monetary policy transmission might be weakened at the low policy rate environment, reducing the bank stock prices because of the decrease in banks' net interest margins (Borio et al., 2017; Altavilla et al., 2018). Any fall in bank earnings would weigh on credit expansion to non-financial corporations. This is also consistent with FED communication, such as President Powell highlighted the concern over interrupting the intermediation process and reducing bank profitability, thereby reducing the availability of credit in the economy.[4] Also, we find that conventional monetary policy shocks have more stronger effect under the higher values of sentiment than at lower values, implying that the evolution of sentiment plays an important role for monetary policy transmission mechanism (Lutz, 2015; Galariotis et al., 2018).

4.2. Individual Country Results

In addition to panel group mean estimation results, our methodology also yields country-specific estimates presenting a chance to assess the degree of heterogeneity in response to monetary policy shocks across the countries. Country-specific results shed some light on the differences in the effectiveness of the different types of monetary policies. Reaching the lower bound after the crisis, central banks have used lots of unconventional measures, including asset purchases, lending to private sector entities, foreign currency purchases, etc. These different monetary policy measures have created a considerable degree of heterogeneity in central banks' balance sheet composition even though there has been a high degree of commonality in monetary policy responses.

– Insert Figures 5-6 about here. –

The country-specific results are presented in Figures 5-8 for both unconventional and conventional monetary policy shocks under low and high sentiment regimes. While the shaded areas

[4]The details of the speech can be found: https://www.courthousenews.com/stocks-sag-as-fed-resists-slashing-rates-below-zero/.

show the panel VAR model's impulse responses, the lines demonstrate the country-specific impulse response bands separately. Although the country-specific impulse responses and the panel VAR results overlap most of the time, there are some differences in response to monetary policies, especially for unconventional monetary policies. Examination of the impulse responses in Figures 5-6 in more detail shows that unconventional monetary policy shocks affect Euro area member states differently. For France and Germany, the stock market effects are somewhat more persistent and stronger than Italy and Spain, which is probably the result of differences in equity markets, as well as the size and structure of debt markets. Also, factors related to business leverage, the degree to which households are liquidity constrained, and the broader asset allocation of households and businesses are likely to result in differences in how monetary policy affects the stock markets. The picture is also evident for conventional monetary policy shocks. Figures 7-8 indicate that the dynamic effect of conventional monetary shocks is more powerful in Euro countries than in the US. The transmission of policy rate cuts as rates approached zero lower bound and fell further into negative territory may have been limited as banks' margins and profitability reduced. Such effects may be large in a bank-based economy such as the Euro area compared to the US.

– Insert Figures 7-8 about here. –

5. Robustness Checks

The immediate impact of unconventional monetary policies is to increase measures of the money base. This gives a way of judging possible orders of magnitude of the scale of operations. Shifting the stock of money supply is the most likely path to affecting growth and spending in the economy and also stock markets. Hence, to check the robustness of our results, we implement the same model using the monetary base as the unconventional monetary policy instrument instead of central bank assets.

– Insert Figures 9-10 about here. –

Figures 9-10 demonstrate impulse responses for the alternative model for high and low sentiment regimes. The effects of a shock to monetary base on stock prices, industrial production, and consumer prices are very similar to using the central bank's assets. This implies that our results are

robust to the use of the monetary base. A similar picture also holds for country-specific impulse responses. All results are essentially unaffected (see Figures 11-12).

– Insert Figures 11-12 about here. –

Furthermore, we assess the robustness of our results to the use of different sentiment indicator by replacing the consumer confidence index with the business confidence index (BCI). The BCI index provides useful leading information about the orders and stocks of finished goods and developments in the production volumes in the industry sector.[5] Figures A1-A4 of the appendix show that our results are qualitatively robust to the use of different sentiment indicator. However, the only difference is that the response of consumer prices (industrial production) is somewhat smaller (larger) compared to the estimation results when consumer confidence index is utilized.

6. Conclusion

In this paper, we conjecture that the impact of monetary policy shocks on stock prices is stronger during episodes of high sentiment relative to periods of comparatively lower values of the sentiment (i.e., consumer confidence), due to the so-called sentiment-mispricing mechanism. To test this hypothesis, we use a a panel VAR model applied to eight advanced OECD countries over the period of January 2007 to July 2020, with the monetary policy shock identified through both sign and zero restrictions. We find evidence in favor of our hypothesis for not only the entire panel, but also at the individual country-level, albeit with some degeree of heterogeneity. These results continue to hold under alternative measures of monetary policy and sentiment captured by business confidence.

Understandably our results have important implications for various economic agents. As far as an investor is concerned, we provide further evidence that advanced equity markets are not necessarily rational, and hence, behavioral factors need to be taken into account when pricing equities. Given this, purely from the perspective of an academician, our results add a behavioral channel through which monetary policy can impact equity prices. Finally, from the standpoint of

[5]The more detailed definition and data of the BCI index can be accessed from: https://data.oecd.org/leadind/business-confidence-index-bci.htm.

a policymaker, our analysis implies that, while bubbles are more likely to originate due to over-exuberance under higher investor sentiment, the central banks can prevent the stock market from deviating away from its fundamental value relatively easily under this state of higher optimism of market agents. In other words, stronger monetary policy response would be required to move the stock market to the desired level when sentiments are low.

As part of future research, it would be interesting to extend our analysis to emerging equity markets and provide a comparative analysis. Moreover, with some studies having analyzed the impact of fiscal policy shocks on stock market in the wake of the ZLB (see Marfatia et al., (2020) for a detailed literature review), an extension of our work would be to investigate the impact of fiscal policy shocks contingent on levels of sentiment.

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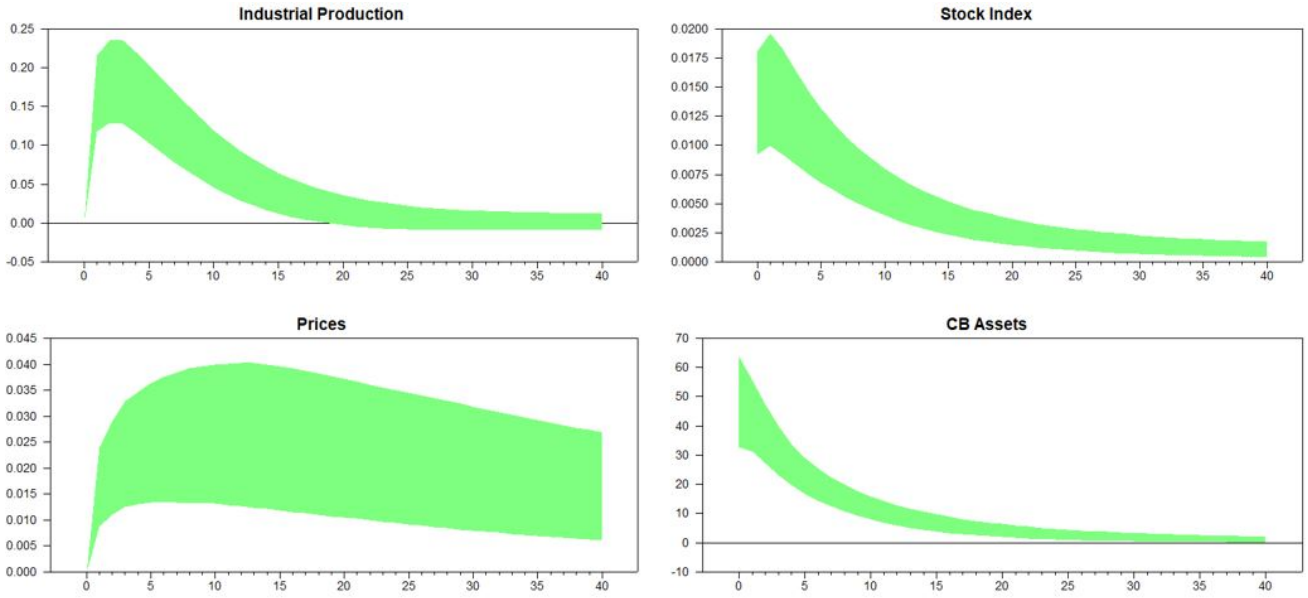
Figure 1: High Sentiment:Impulse responses to a Central Bank balance sheet shock- Mean group panel VAR estimation



Notes: The 16th and 84th bootstrap percentiles.

Figure 2: Low Sentiment:Impulse responses to a Central Bank balance sheet shock- Mean group panel VAR estimation

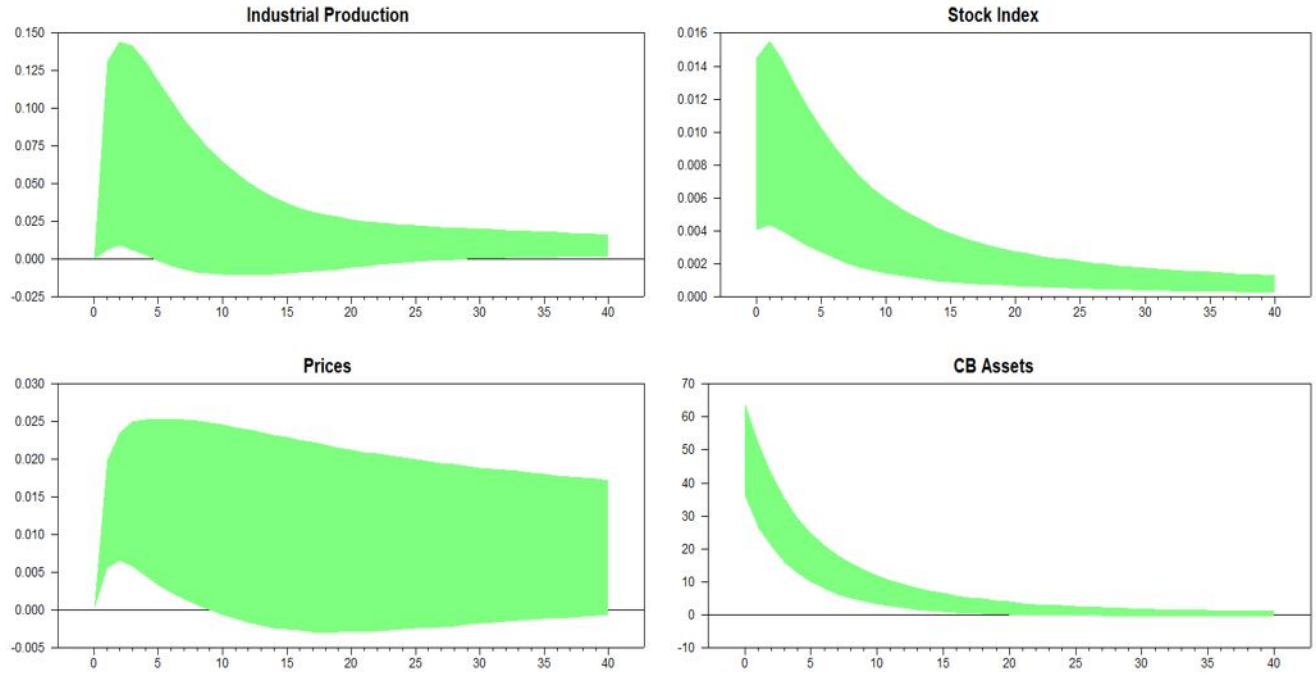
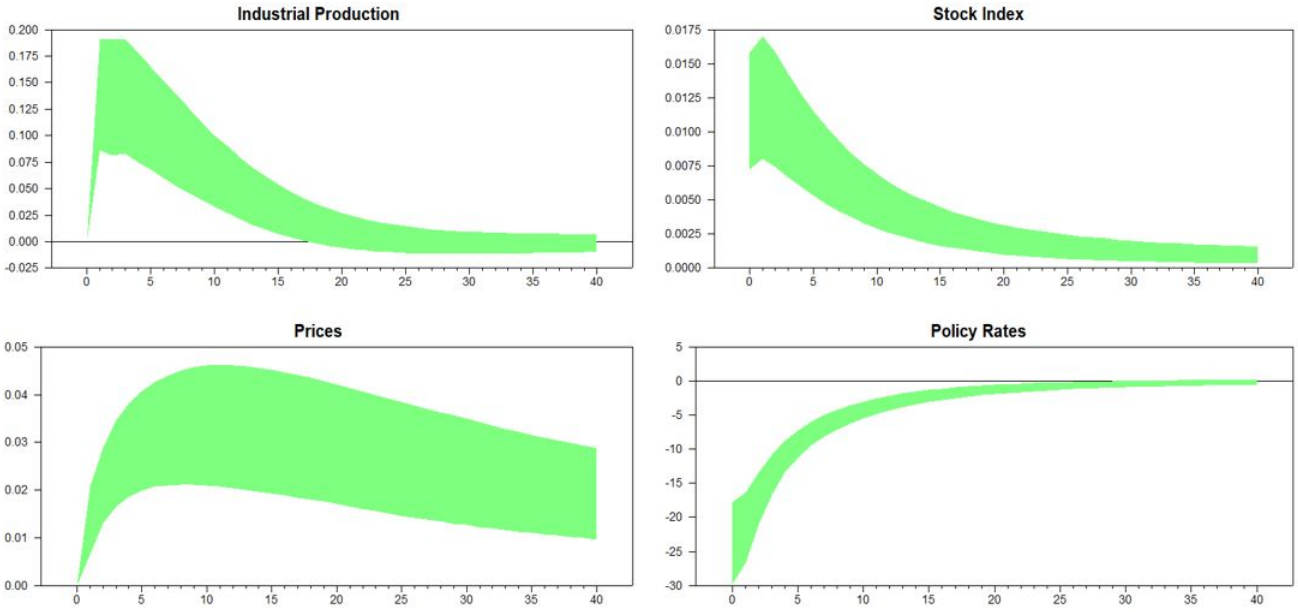


Figure 3: High Sentiment:Impulse responses to a shadow short rate shock- Mean group panel VAR estimation



Notes: The 16th and 84th bootstrap percentiles.

Figure 4: Low Sentiment:Impulse responses to a shadow short rate shock- Mean group panel VAR estimation

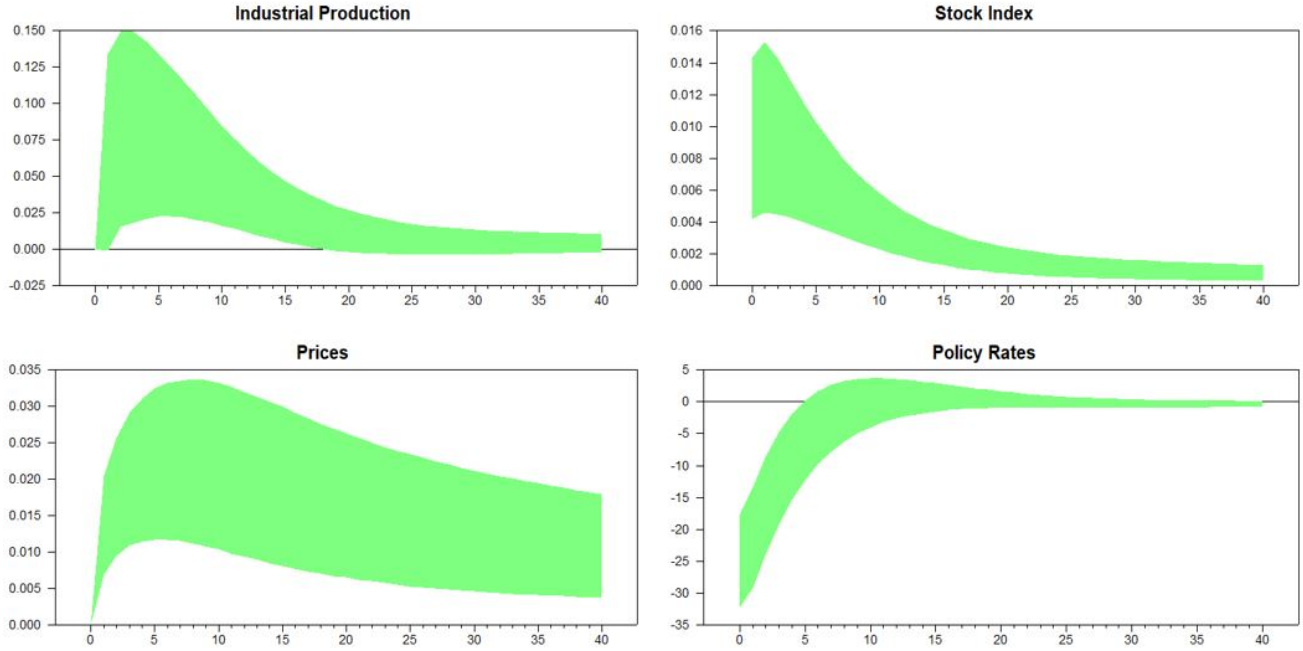
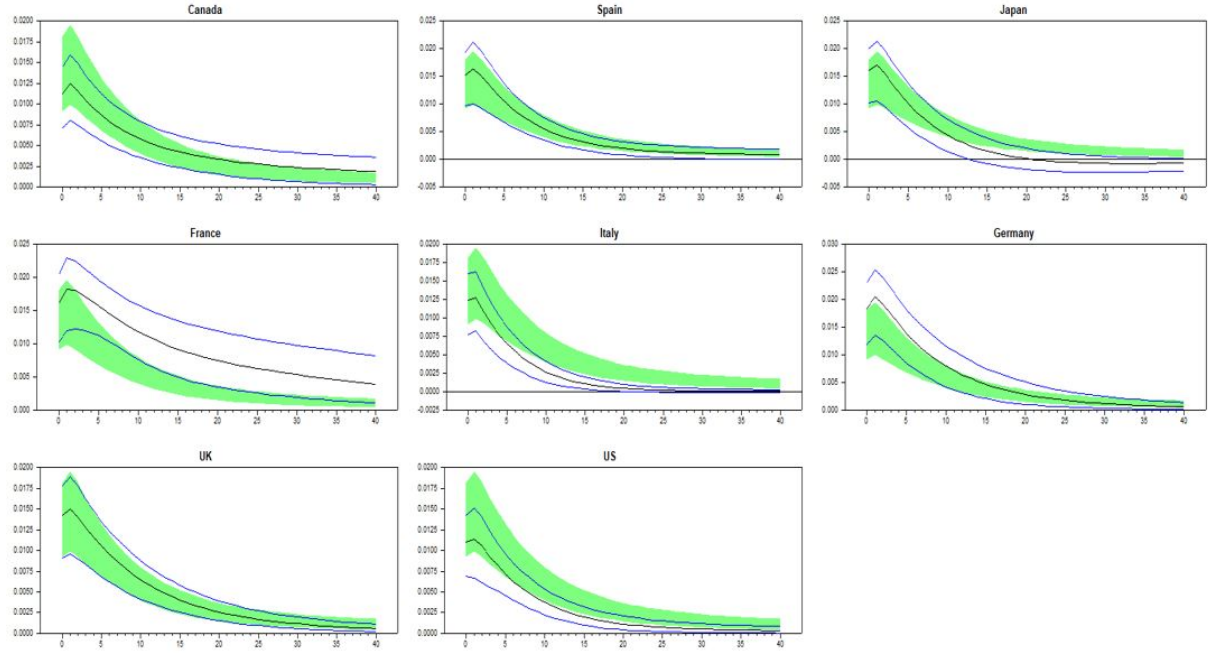


Figure 5: High Sentiment:Impulse responses to a Central Bank balance sheet shock- Individual country estimation



Notes: The 16th and 84th bootstrap percentiles. Shaded area represent the mean group panel VAR estimation results.

Figure 6: Low Sentiment:Impulse responses to a Central Bank balance sheet shock- Individual country estimation

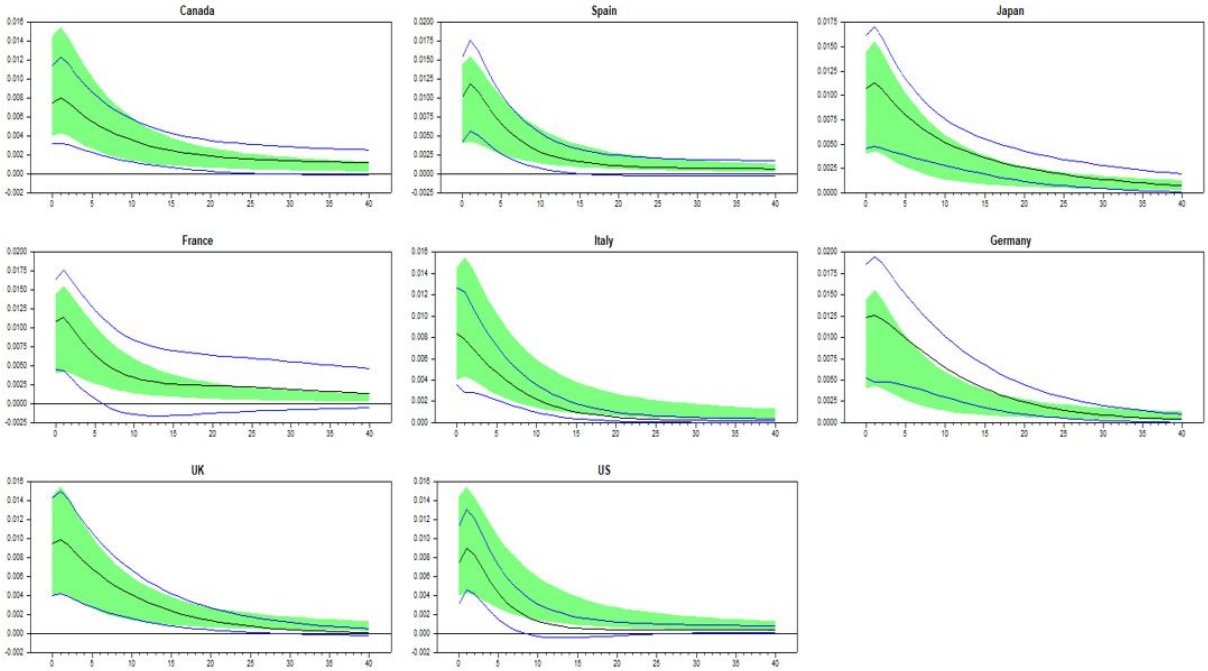
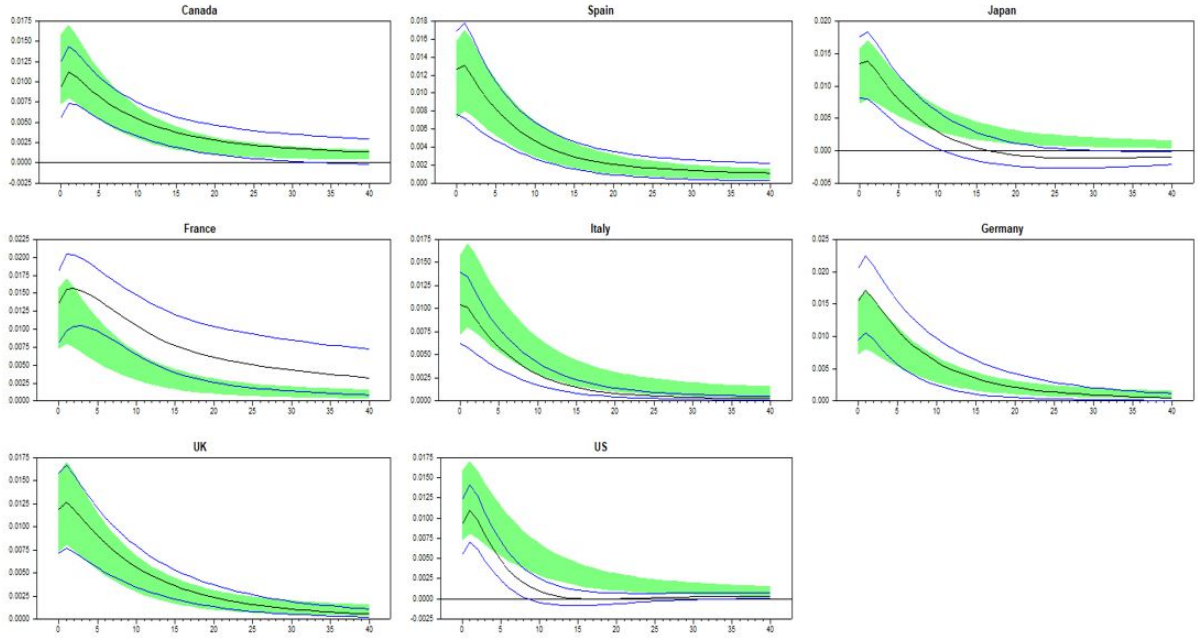


Figure 7: High Sentiment:Impulse responses to a shadow short rate shock- Individual country estimation



Notes: The 16th and 84th bootstrap percentiles. Shaded area represent the mean group panel VAR estimation results.

Figure 8: Low Sentiment:Impulse responses to a shadow short rate shock- Individual country estimation

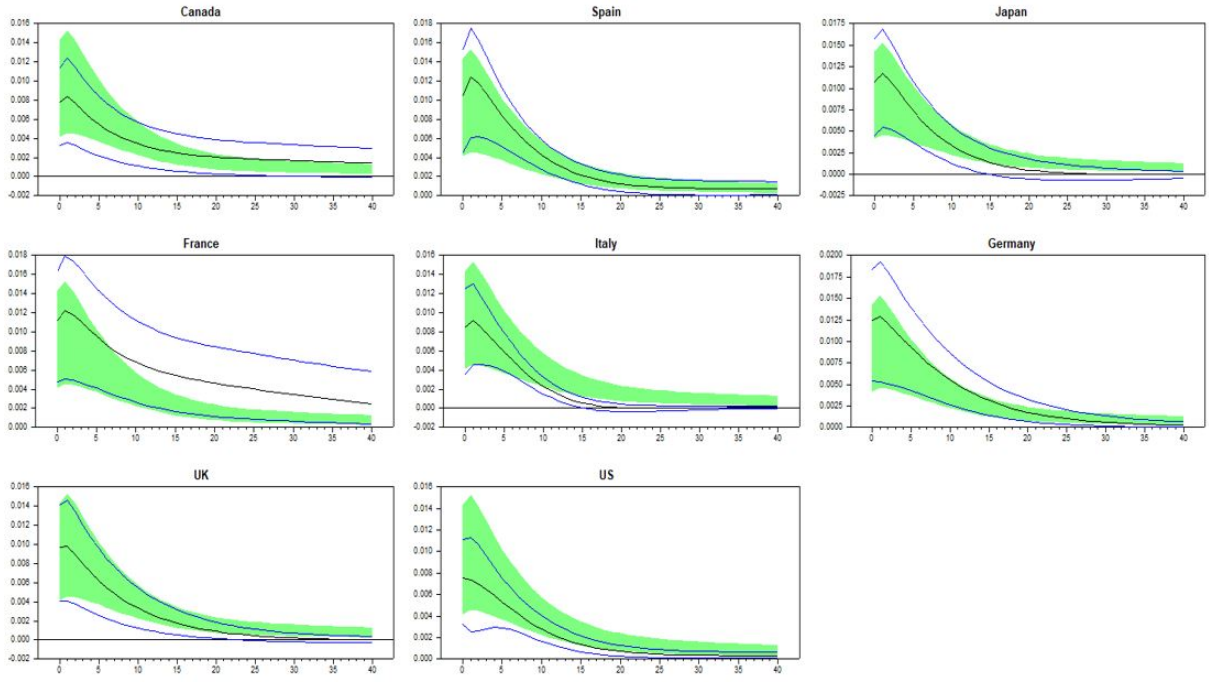
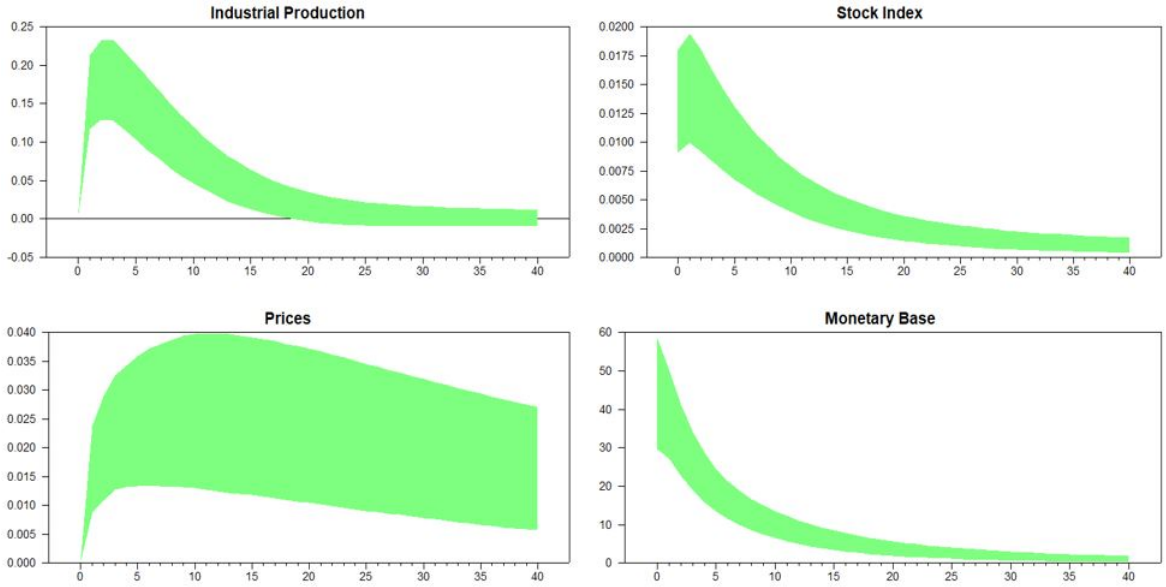


Figure 9: High Sentiment:Impulse responses to a monetary base shock- Mean group panel VAR estimation



Notes: The 16th and 84th bootstrap percentiles.

Figure 10: Low Sentiment:Impulse responses to a monetary base shock- Mean group panel VAR estimation

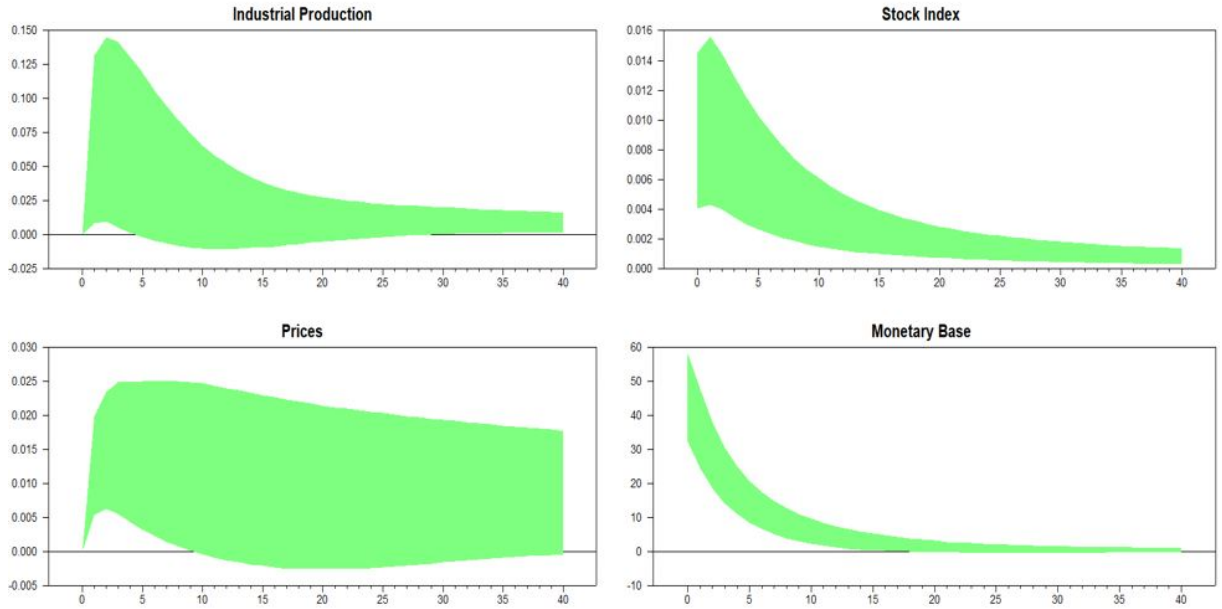
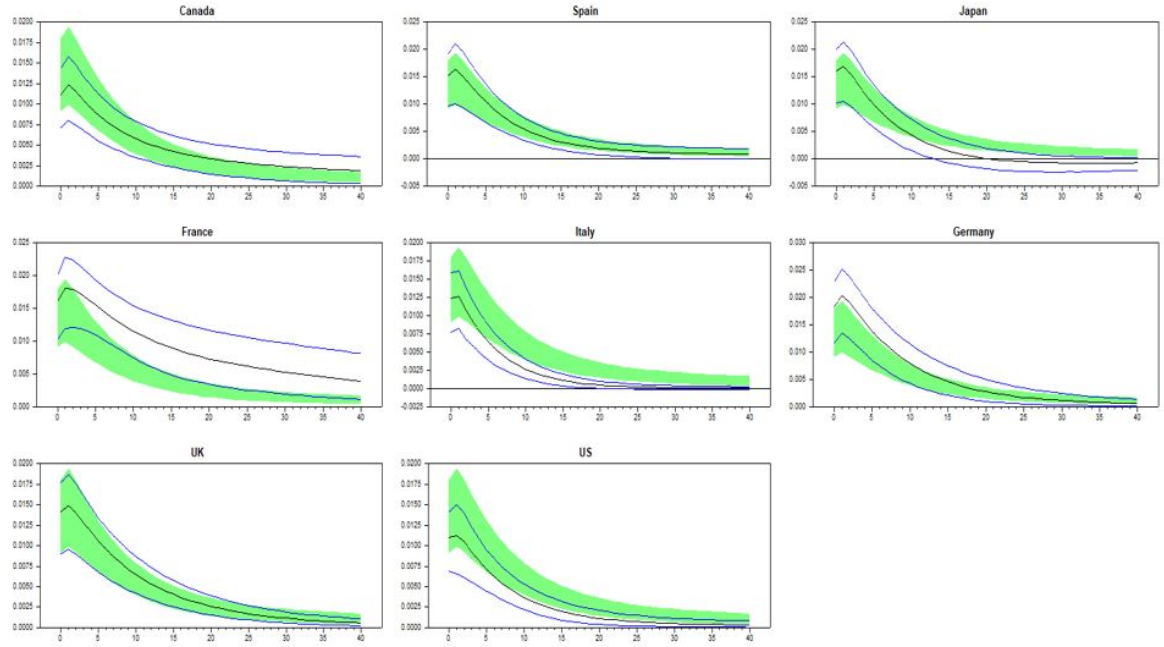
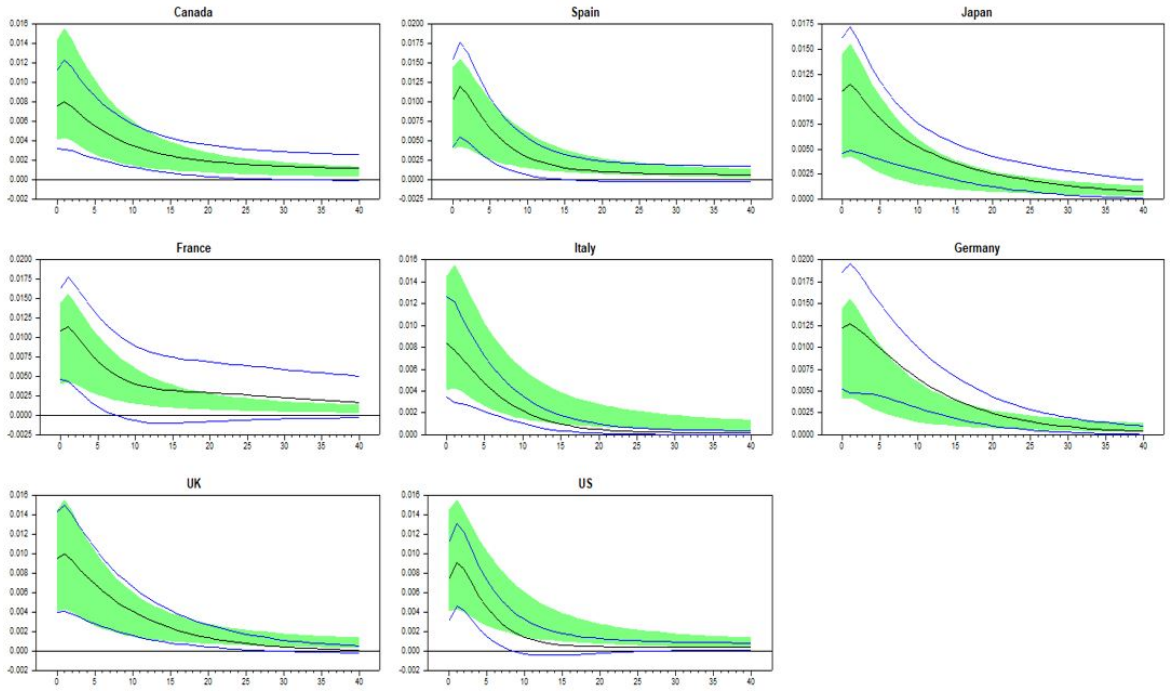


Figure 11: High Sentiment:Impulse responses to a monetary base shock- Individual country estimation



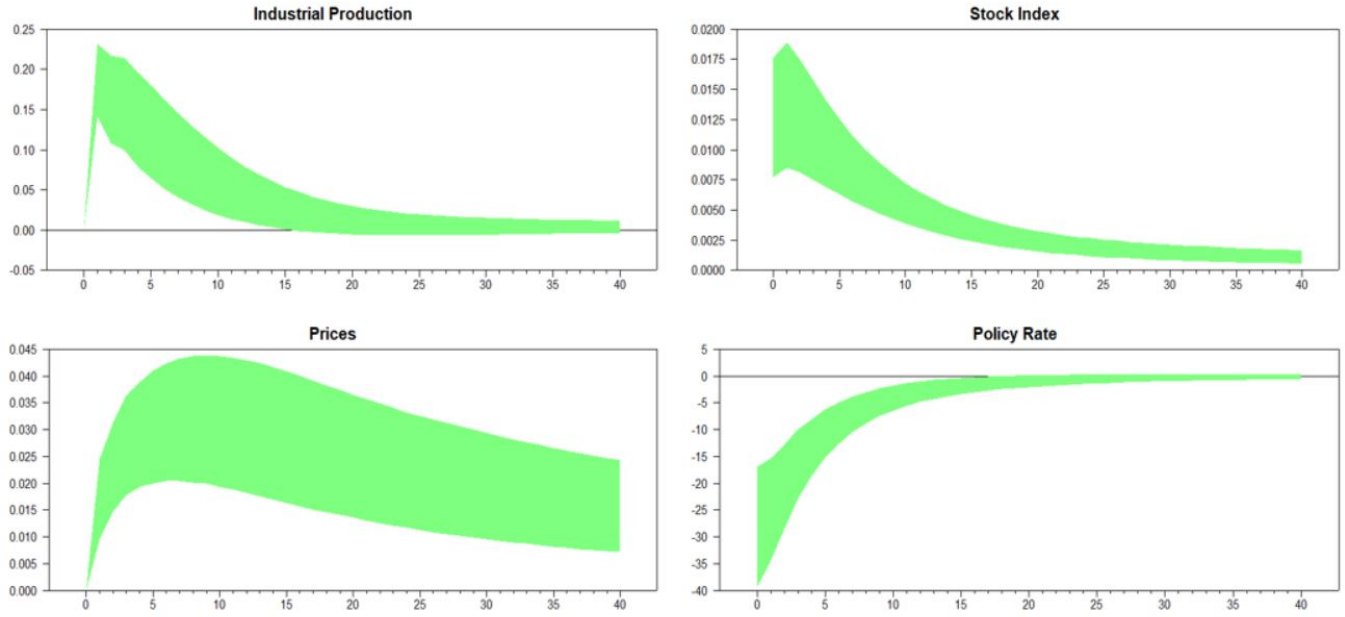
Notes: The 16th and 84th bootstrap percentiles. Shaded area represent the mean group panel VAR estimation results.

Figure 12: Low Sentiment:Impulse responses to a monetary base shock- Individual country estimation



Appendix

Figure A1: High Business Sentiment: Impulse responses to a shadow short rate shock- Mean group panel VAR estimation



Notes: The 16th and 84th bootstrap percentiles.

Figure A2: Low Business Sentiment: Impulse responses to a shadow short rate shock- Mean group panel VAR estimation

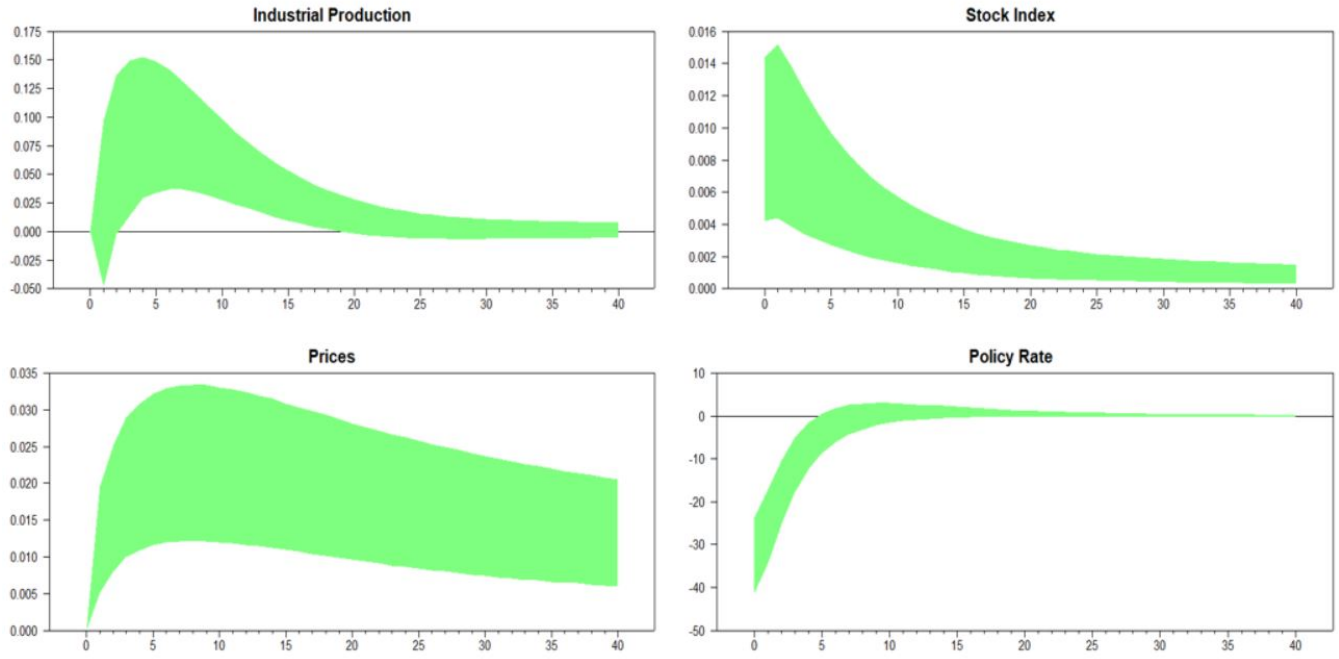
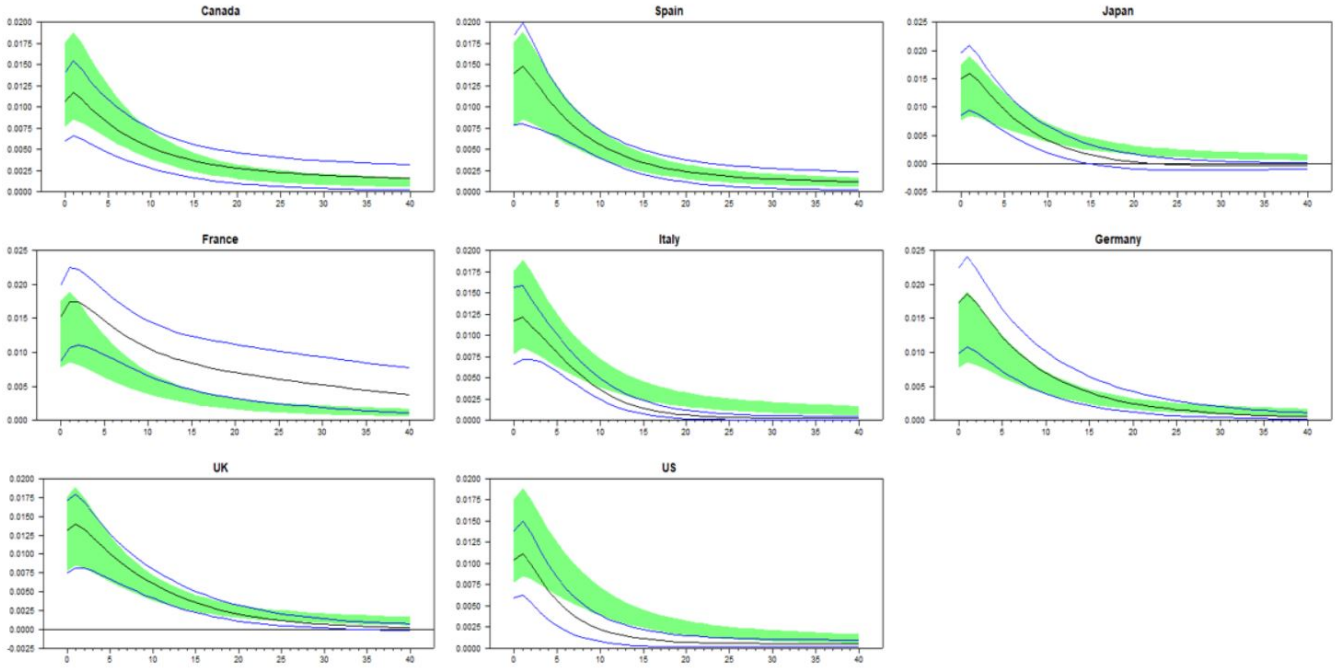


Figure A3: High Business Sentiment: Impulse responses to a shadow short rate shock- Individual country estimation



Notes: The 16th and 84th bootstrap percentiles. Shaded area represent the mean group panel VAR estimation results.

Figure A4: Low Business Sentiment: Impulse responses to a shadow short rate shock- Individual country estimation