What drives Inflation Expectations in Japan during Unconventional Monetary Policy and Pandemic Periods?

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(Paper jointly with Stefan Dürmeier)

Outline

- Introduction
- Methodology and Model Specification
- Empirical Results
- Forecasting During the COVID-19 Pandemic
- Concluding Remarks

Introduction

- COVID-19 pandemic breaking point for inflation in major advanced economies, including Japan
- Central role of expectation management in macroeconomic stabilization: key transmission channel from policy actions and global shocks to realized inflation (Blinder et al., 2024)
- Anchoring crucial for credibility of monetary policy (Coibion et al., 2020; Bems et al., 2021)
- Pass through to consumption and savings decisions of households, wage negotiation and pricing (e.g. Blinder et al. (2024))
- Japanese economy of particular interest: decades of low inflation and a declining natural rate of interest (Okazaki and Sudo, 2018; Han, 2019)

Introduction

- Persistent zero lower bound
- Repeated rounds of unconventional monetary easing (e.g. Kuroda (2017))
- The widespread inflation surge of 2021/2022 due to the supply shock in to the COVID-19 pandemic, while monetary policies of the ECB and Federal Reserve Bank "falling behind the curve". What about monetary policy of the Bank of Japan?
- Adaptive mechanisms in the formation of expectations: Past inflation (e.g. Maruyama and Suganuma (2019)), the process of learning about long-term inflation (Hogen and Okuma, 2025), and recent inflation (Hattori and Yetman, 2017)
- On the other hand, forward-looking mechanism implied by the New Keynesian Phillips Curve (e.g. Gali (2008))

Introduction

- BOJ's adoption of a formal 2% target and QQE in 2013 marked a turning point. Fukuda and Soma (2019), Shintani and Soma (2020) and Hogen and Okuma (2025) show expectations became slightly better anchored, though inflation remained subdued
- Monetary and fiscal aggregates underrepresented in research, especially the role of the broad money supply (M3) remains underexplored
- Sensitivity to external shocks? Oil price fluctuations as key driver (e.g. Ueda (2010)) and exchange rate movements of the yen (e.g. Ono (2017))
- Measure of survey-based expectations versus market-based expectations: Reis (2020) argues that financial market indicators often misrepresent the underlying sentiment, while survey data provide superior insights. International discussions echo this concern (e.g., Cochrane, 2011)

Structural Vector Autoregressive Modeling and Empirical Strategy

- Just identified structural vector autoregressive (SVAR) model derived from a VAR(p) process with p lags following Lütkepohl (2007)
- Two objectives: 1) Minimization of the contribution of the structural shock to inflation expectations to its forecast error variance decomposition (FEVD)
  2) Monetary policy evaluation
- Model specification strategy: Proceeding from the more commonly used variables (such as current inflation and output gap) towards adding less frequently ones, whilst excluding those that do not improve upon the results of the FEVD.
- Statistical tests: Augmented Dickey Fuller test (Dickey and Fuller, 1979)
- Lag order selected according to objective 1
- Portmanteau test of white noise of the residuals (Ljung and Box, 1978)
- Stability of the system

Data

- Full sample: Q2 2006-Q1 2022 (64 observations)
- Split for analysis of Qualitative and Quantitative Easing into subsample Q2 2006-Q1 2013 and subsample Q2 2013-Q1 2022
- Quarterly expectations of one year CPI inflation rate. Question: "By what percent do you think prices will change one year from now?", Opinion Survey on the General Public's Views and Behavior, No. 83. Source: Bank of Japan
- Quarterly CPI inflation rate. Source: Bank for International Settlements
- Output gap. Source: Bank of Japan
- Earnings, private sector, seasonally adjusted. Source: Organization for Economic Co-operation and Development
- Unemployment rate, age 15-64, seasonally adjusted. Source: Organization for Economic Co-operation and Development

Data

- Global price of energy index. Source: International Monetary Fund
- Broad money supply M3, growth rate, seasonally adjusted. Source: Organization for Economic Co-operation and Development
- 10 year bond yield. Source: Organization for Economic Co-operation and Development
- Total assets BOJ, 100 million Yen, quarterly. Source: Bank of Japan
- Effective exchange rate, broad basket. Source: Bank for International Settlements
- Bilateral exchange rate JPY/USD. Source: Bank for International Settlements
- Total gross debt, percentage of GDP. Source: Organization for Economic Co-operation and Development
- Total gross debt, nominal value, in trillion Yen. Source: Organization for Economic Co-operation and Development

Formulation of the SVAR(2) model

- The final SVAR(2) model has the ordering:

$$y_t = (dpe_t, dm3_t, di_t, dxr_t^{eff}, d\mathbb{E}_t(\pi_{t+4})), \tag{1}$$

  where d is the change in the realizations of each variable, t is the time in quarters, pe_t is the global energy price index, $m3_t$ is the money supply M3, i_t is the 10 year bond yield, xr_t^{eff} is the nominal effective exchange rate and $\mathbb{E}_t(\pi_{t+4})$ is the formation of expectations for inflation in $t+4$

- Current global energy prices are only affected by the lagged system of coefficients
- The present money supply M3 is determined by the contemporaneous energy prices and the previous realizations of the endogenous variables
- The change in the bond yield is gauged by contemporaneous changes in energy prices, money supply, and the lagged system of determinants

Formulation of the SVAR(2) model

- The exchange rate responds to variations in energy prices, money supply, the bond yield, plus the lagged system of determinants
- The target variable is allowed to react immediately to all the variables owing to the fact that households can form expectations based on all the currently available information
- Sensitivity analysis regarding the ordering of the broad basket exchange rate (placed second and third) yields no improvement
- Evaluation of total assets of the BOJ (placed second) affecting money supply and the bond yield, or money supply and the exchange rate, respectively, results in model misspecification
- Replacement of the exchange rate by other variables (ranked third), and allowing for an effect on the bond yield, yields inferior results in terms of objective 1

Impulse Response Functions

Energy Prices | Money Supply | Bond Yield | Exchange Rate | Inflation Exp.

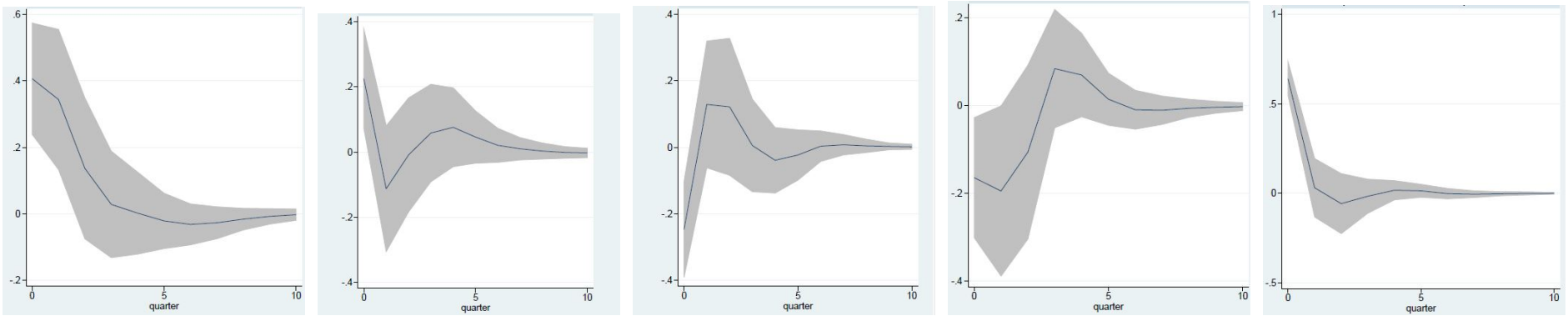

Figure: Impulse response functions for inflation expectations, 90 percent confidence intervals.

- All responses reveal a significant effect on the formation of inflation expectations
- Spurring effects of energy prices, money supply and previous expectations, inverse effects for the bond yield and the appreciation of the exchange rate
- Robustness check via Bayesian SVAR estimation (Woźniak, 2024)

Forecast Error Variance Decomposition

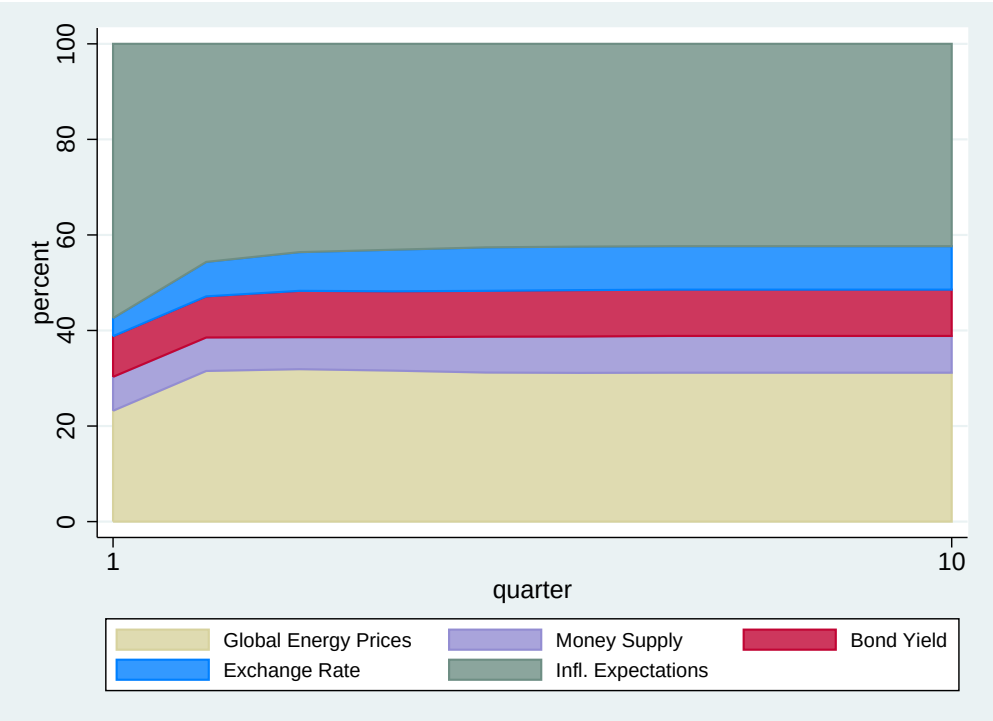

Figure: Cholesky forecasting-error variance decomposition for inflation expectations, in percentage points, SVAR(2) model.

- Previous expectations and global energy prices exhibit the highest explanatory power with 42.4 percent and 31.2 percent, respectively.
- The structural shocks to the bond yield, the exchange rate and money supply contribute with roughly 9.7 percent, 9.1 percent and 7.7 percent, respectively.

Analysis of Quantitative and Qualitative Easing Period

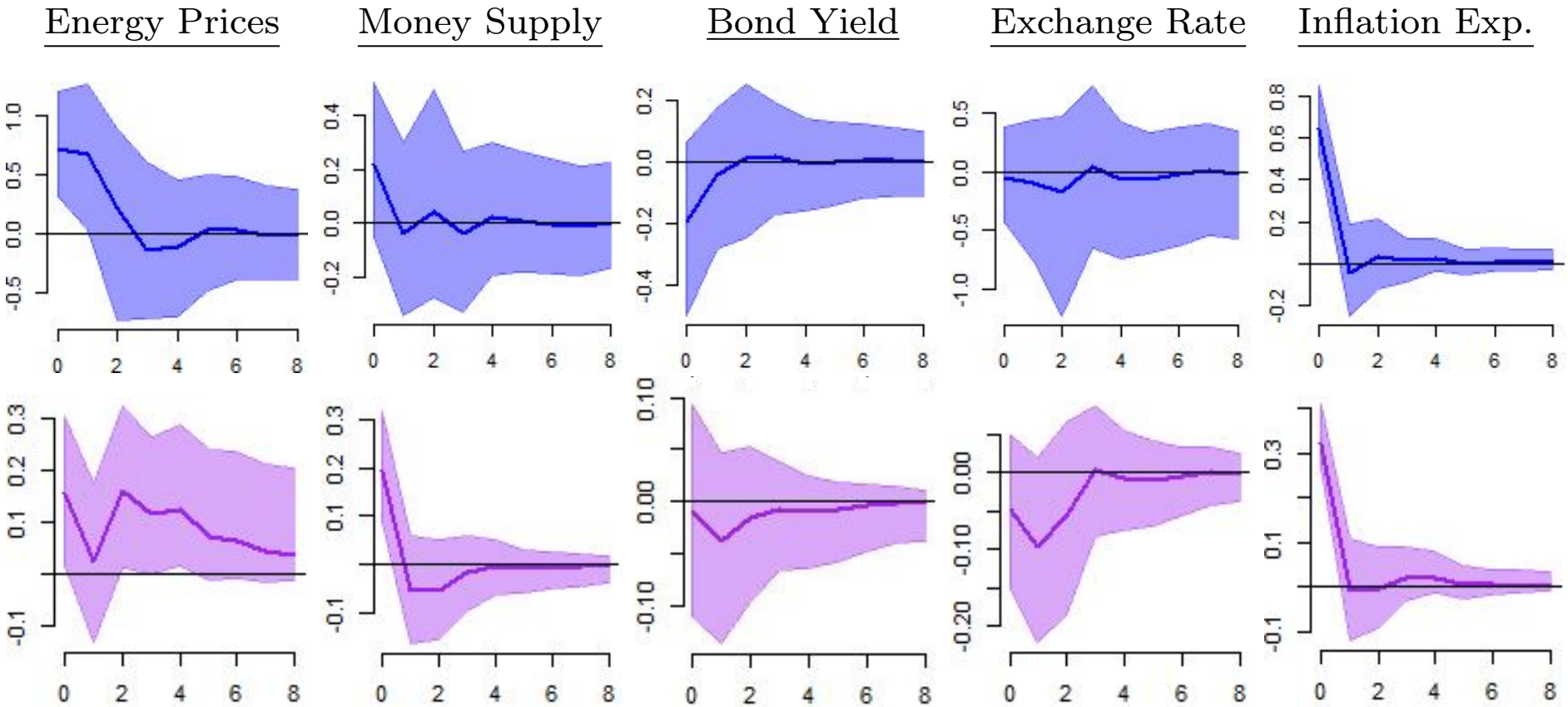

Figure: Impulse response functions for inflation expectations, comparison of subsample Q2 2006-Q1 2013 (first row) and subsample Q2 2013-Q1 2022 (second row).

- Bayesian SVAR estimation (Woźniak, 2024). Both models satisfy the assumption of homoskedasticity of the residuals (test of Lütkepohl and Woźniak (2020))

Analysis of Quantitative and Qualitative Easing Period

- The effect of broad money supply in the QQE period is positive and distinct from zero while the trajectory does not show oscillating behaviour
- Any conflict in between the indicator of money growth and the inflation forecast, as noted by Gerlach and Svensson (2003) for the Eurozone, is not apparent in Japan
- Support for the quantity theory of money by combining money growth with the interest rate and the output of the economy (Teles et al., 2016; Lucas, 2000; Beck and Wieland, 2008), yet in SVAR(2) model causality running merely from present money supply to the present interest rate and inflation expectations
- The liquidity and cash balances held by households are subsumed under the monetary aggregate, whose use is more prevalent in Japan than in other advanced economies (Altman, 2019; Fujiki, 2025)
- The effect of the bond yield is more delayed in the QQE period and is associated with high uncertainty. The sensitivity of the target variable is substantially lower

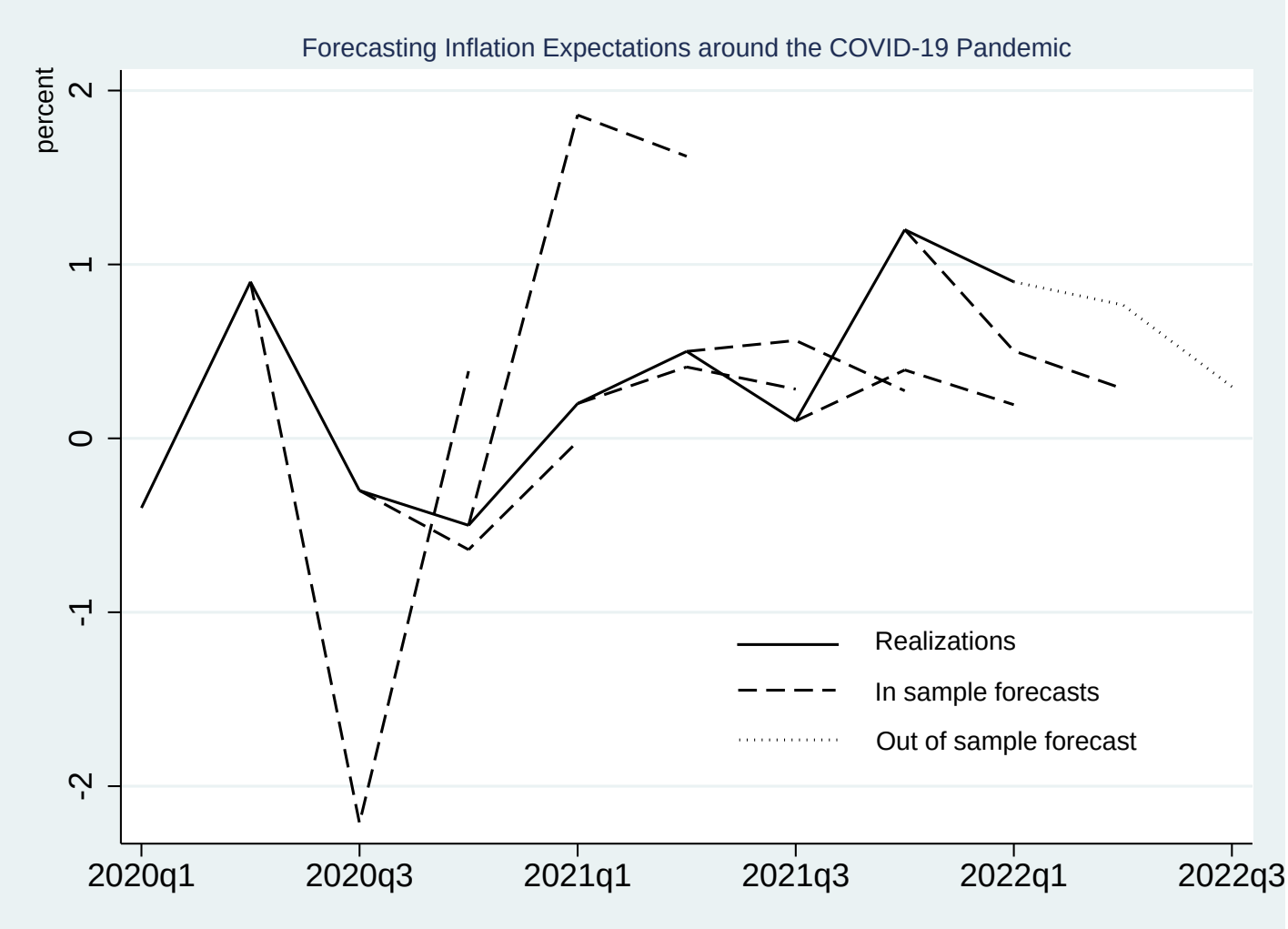

Figure: Forecasting performance of the SVAR(2) model around the COVID-19 pandemic.

- Forecast in Q2 2020 cannot be fully associated with the exogenous event of the pandemic due to the lag order of 2

Forecasting during the COVID-19 Pandemic

- The forecast made in Q3 2020 matches the actual realizations very closely
- Spike in expectations in Q4 2020 does not materialize to the same extent, still the forecast precedes the higher levels of the inflation rate in the year 2021
- The forecast in Q1 2021 resonates well with the observed development of household expectations until Q3 2021
- Towards the end of the sample, the forecasts are tilted downwards, like the out of sample forecast
- In general, the SVAR(2) model largely predicts the signs correctly (except for the forecast in Q2 2021), shift in near term forecasts to about 0.5 percent per quarter

Concluding Remarks

- Households form expectations based on adaptive elements with sensitivity to salient shocks:
- Expectations rise in response to higher global energy prices
- Further significant and sizable, positive effects of broad money supply growth and past expectations
- Expectations decline when long-term bond yields increase or when the broad trade weighted exchange rate appreciates
- The introduction of QQE and the inflation anchor altered the responsiveness of expectations, indicating a channel via liquidity provision rather than via the interest rate:
- The effect of broad money supply growth became stronger and more persistent

Concluding Remarks

- Whereas the impact of a lower bond yield was delayed and substantially weaker, pointing to the limits of asset purchase-based policies to influence household beliefs
- During the COVID-19 pandemic, survey-based expectations of households provided early signals of an upward shift in inflation
- Qut-of-sample forecasts anticipated a break in expectations toward levels consistent with annual inflation around 2 percent, preceding the realized surge of 2021
- Future research could extend this analysis by incorporating measures of central bank communication and forward guidance, or by exploring heterogeneous household responses using microdata

Thank you for your attention!

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Impulse Response Functions SVAR(2) Model with 95 Percent Confidence Intervals

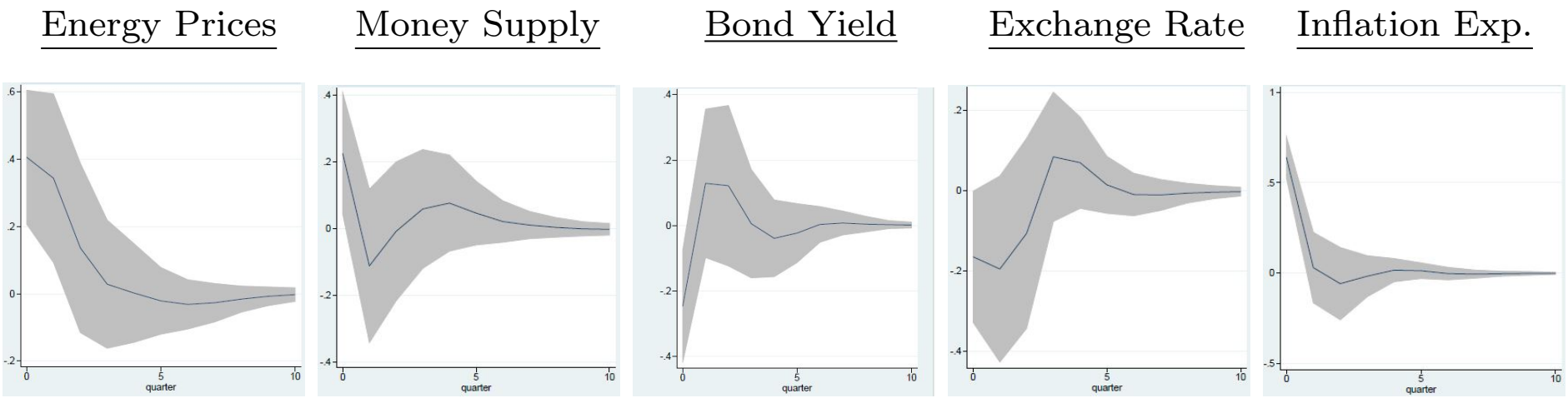

Figure: Impulse response functions for inflation expectations, 95 percent confidence intervals.

Impulse Response Functions Bayesian SVAR(2) Model Full Sample

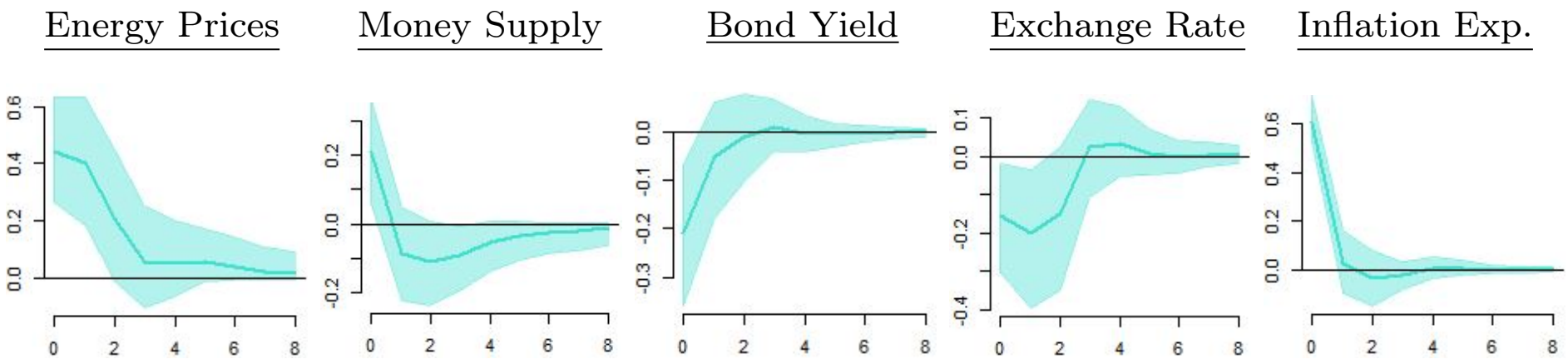

Figure: Impulse response functions for inflation expectations, density interval of 90 percent.