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An Empirical Investigation of the Effects of Monetary Policy Shocks on the Italian Economy

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Executive Summary

We assess empirically the effects of monetary policy shocks on the Italian economy through the lenses of a heteroskedastic SVAR model. The identifying information provided by the time variation in the volatility of the structural shocks is complemented sign and narrative restrictions. The presence of heteroskedasticty is strongly supported by the data and sharpens significantly the uncertainty about IRFs, but it is not sufficient to allow reliable inference on the responses of interest, hence it has to be complemented with external information in the form of sign and narrative restrictions. Our results show that unexpected monetary policy contractions reduce both inflation and output growth, generating a significant increase in the Corporate Bond Spread. On the other hand, the response of the Euro-Dollar exchange rate and the Italy-Germany sovereign spread is not significantly affected.

Introduction

As recognized by Altavilla et al. (2024), Euro Area (EA) monetary policy has received disproportionately little academic attention compared to monetary policy in the US. Some recent contributions, such as Jarocinski and Karadi (2020), Badinger and Schiman (2023), and Andrade and Ferroni (2024), have provided evidence that the aggregate effects of contractionary monetary policy shocks on the EA economy are similar to those estimated for the US economy. In line with textbook predictions, monetary contractions reduce inflation and output of the Euro Area as a whole. Little is known, however, about the impact on single member countries economies. In this paper, we analyze the response of the Italian economy to unexpected monetary interventions put in place by the ECB.[1]

Our empirical analysis is performed through a Bayesian Vector Autoregressive (BVAR) model, whose goal is to estimate the joint dynamic behavior of macroeconomic and financial variables. In the past two decades, a significant amount of research has endeavored to attach a causal interpretation to VAR estimates based on minimal and broadly defensible assumptions. One of the most popular strategies, employed by researchers to identify the primitive structural shocks driving the variables in a VAR model, is based on sign and narrative restrictions. Sign restrictions simply postulate that the impact of the shock of interest on some pre-specified variables has a known sign (see e.g. Uhlig, 2005), while narrative restrictions require that the shock has a known sign or magnitude on some well known historical events (see e.g. Antolin-Diaz and Rubio-Ramirez, 20218). In our analysis, we make use of uncontrovertial sign restriction complemented with th$Type\ equation\ here.$e narrative restrictions considered by Badinger and Schiman (2023). In addition, both to help identification and to obtain more efficient inference, we adopt the "blended" approach of Carriero et al. (2024) allowing for time variation in the variance of shocks.

The Analysis

Our empirical analysis builds on the Structural VAR (SVAR) model proposed by Badinger and Schiman (2023). The vector of endogenous variables the authors analyze, y_t, include the EONIA, EA Industrial Production, EA Harmonized Consumer Price Index (HCPI), a Corporate Bond Spread (CBS) computed as the difference between euro-denominated bonds below investment grade and the US Treasury rate, the M1 money aggregate, and the nominal euro/dollar exchange rate. The reduced-form model is therefore:

[1] A noteworthy exception is Barigozzi et al. (2024), who exploit a novel large EA dataset to provide a multi-country analysis of the ECB monetary policy.

$$y_t = c + \sum_{l=1}^{p} \Pi_l y_{t-l} + u_t,$$

Where $u_t \sim iidN(0, \Omega)$. It is well known that the reduced form parameters (c, Π, Ω) can be consistently estimated from the data, but this is not enough to pin down the contemporaneous impact matrix, B , that defines the contemporaneous effects of structural shocks, $\varepsilon_t \sim iidN(0, I)$, on the system variables, i.e. $u_t = B\varepsilon_t$.

To identify monetary policy shocks, Badinger and Schiman (2023) rely on narrative restrictions, assuming that the sign of the shock hitting the economy at carefully chosen points in time is known. In particular, based on information extensively discussed in the paper, the authors assume that in October 2008 and November 2011 the monetary policy shock was expansionary, while in November 2008 and October 2011 the shock was contractionary. In addition, Badinger and Schiman (2023) assume that the expansionary monetary policy shock occurred in November 2011 account for more than 50% of the unexpected movement observed for the interest rate in the same month. These restrictions are able to reduce the set of contemporaneous impact matrices that are compatible with inferred values for the reduced form parameters, i.e. $\Omega = BB'$. On top of the narrative restrictions, in our analysis we impose a sign restriction according to which the response of inflation to monetary tightening cannot be positive at three months horizon. Despite relatively uncontroversial, the additional sign restriction can attenuate the risk associated with masquerading shocks inherent in set indentifying strategies (see Wolf, 2021).

Our first contribution is to consider the same model for the Italian economy. We therefore substitute EA Industrial Production and EA HCPI inflation rate with their Italian counterparts. Furthermore, we add to the model the spread between 10-year yields paid by Italy and Germany on their Government bonds. This allows us to investigate whether monetary policy interventions affect the differential premium charged to the two large EA economies.

Figure 1 shows the Impulse Response Functions (IRFs) implied by the model estimated over the period 2000:01-2019:12.[2]

Similar to the findings of Badinger and Schiman (2023), a one-standard deviation contractionary monetary policy shock generates a significant drop in the inflation rate also when we focus on Italian data. Italian Industrial Production, on the other hand, does not decrease significantly after the unexpected monetary tightening, not excluding the possibility of a "soft landing". New evidence also concerns the Italian-German sovereign spread: the differential between the governments yields surprisingly shrinks following the monetary contraction, suggesting a smaller pass-through in the pricing of Italian long term bonds.

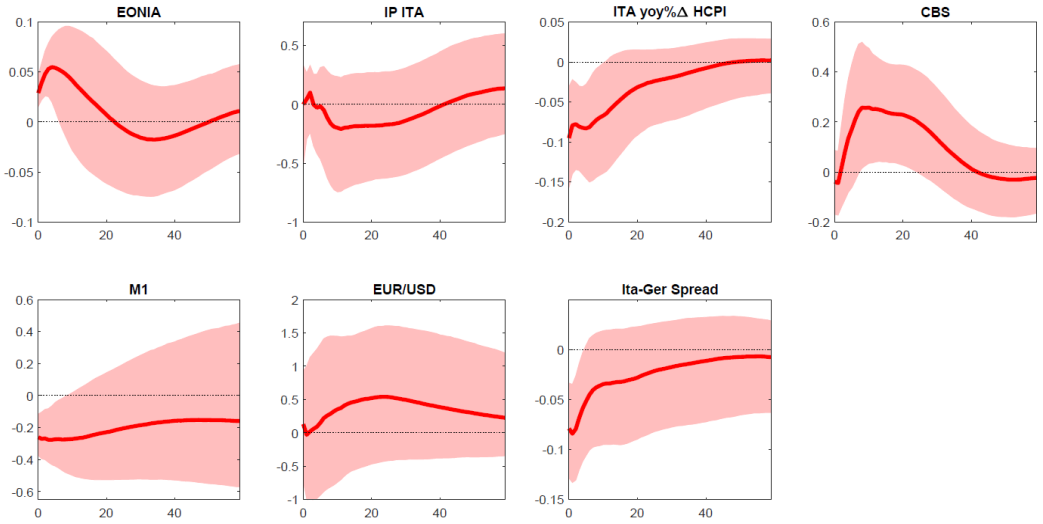
Following Carriero et al. (2024), we try to exploit time variation in the variance of structural shocks to help identification of monetary policy surprises. More specifically, we introduce time varying volatilities of all shocks following the change-point specification of Chib (1998), setting the total number of regimes to three. The change-point specification allows the variance of

[2] The prior assumed for the reduced form parameters is standard an it is borrowed from Badinger and Schiman (2023). It belongs to the Normal-Inverse Wishart family, with Minnesota-style moments.

shocks to change in two episodes within the sample period, which are not specified *a priori*. As discussed by Carriero et al. (2024), the presence of heteroskedasticity is able to sharpen identification and to improve the efficiency of the estimates.

The IRFs resulting from the heteroskedastic model are reported in Figure 2. The IRFs are plotted on the same scale used in Figure 1 to ease comparability. The amount of uncertainty around the responses to monetary policy shocks decreases when heteroskedasticity is taken into account, leading some of the IRFs to change significantly. The most important change is in the response of

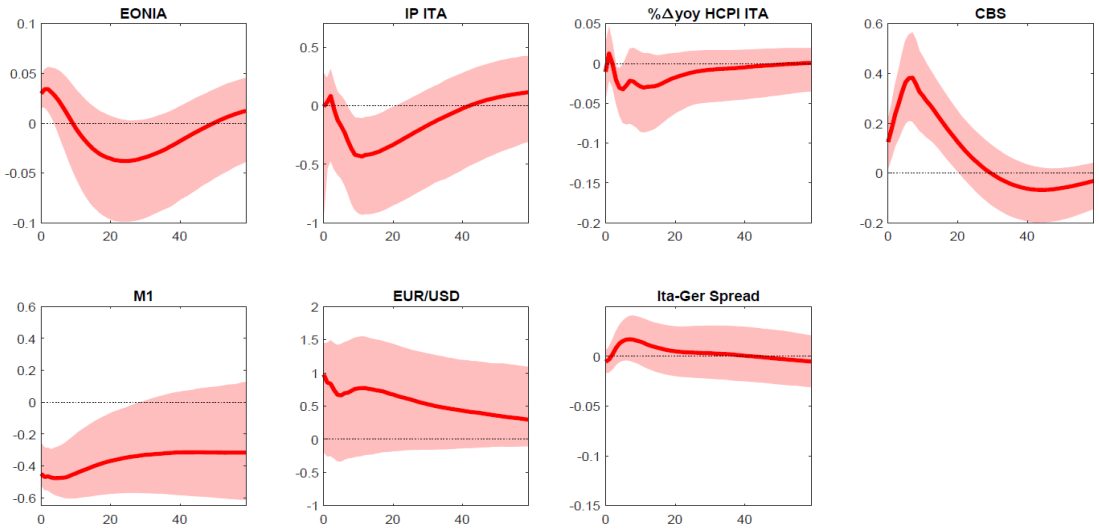
Figure 1: IRFs -Homoskedastic SVAR



Notes: IRFs implied by the homoskedastic SVAR. Solid lines denote the posterior median, dashed areas correspond to the 68% credible bands.

Industrial Production, which was not significant in the homoskedastic case, but is significantly negative one year after the shock according to the heteroskedastic model. Also the response of inflation change considerably, remaining negative but becoming less important in magnitude. The reaction of CBS remains broadly similar, but with credible bands remarkably shrunk, showing an increase in credit spread paid by firms in the two years following the shock. Lastly, in contrast to the previous results, the Italian-German sovereign spread does not appear to be affected by the monetary policy contraction, as one would reasonably expect.

Figure 2: IRFs – Heteroskedastic SVAR



Notes: IRFs implied by the homoskedastic SVAR. Solid lines denote the posterior median, dashed areas correspond to the 68% credible bands.

The posterior median identifies the two volatilities change-points in October 2007 and April 2011, corresponding to the onset of the Great Financial Crisis and the peak of the EA sovereign debt crisis respectively. The posterior median of the variance of the monetary policy shock for the period between 2007:10 and 2011:04 was 1.35 times larger than in the previous period, reflecting the aggressive measures the ECB put in place in response to the Great Financial Crises and the sovereign debt crisis. After April 2011, the variance of the identified monetary policy shocks decreased to one third of the size it had at the beginning of the sample.

The presence of heteroskedasticity is overwhelmingly supported by the data. The log-Savage-Dickey Density Ratio (SDDR) computed to test the hypothesis of homoskedasticity has a value of -5.00, which reflects strong evidence in favor of the presence of heteroskedasticity according to the scale considered by Kass and Raftery (1995).[3] However, the evidence against the hypothesis that the variance of monetary policy shock change proportionally to the variance of other shocks is positive but not strong.[4] This implies that heteroskedasticity provides only weak identifying information for the shock of interest, and hence the combination with narrative and sign restrictions is crucial to perform reliable inference about IRFs in our model.

Conclusion

In this paper, we have assessed empirically the effects of monetary policy shocks on the Italian economy through the lenses of a heteroskedastic SVAR model. The identifying information provided by the time variation in the volatility of the structural shocks is complemented with widely accepted sign and narrative restrictions. Our analysis has demonstrated that the

[3] A discussion of the computation of SDDR to test for homoskedasticy in SVAR models is given by Lütkepohl and Woźniak (2020).
[4] Log-SDDR are between -1.32 and -3.05.

presence of heteroskedasticty is strongly supported by the data and it sharpens significantly the uncertainty about IRFs, but, at the same time, the information provided by time variation in volatilities is not sufficient to allow reliable inference on the responses of interest, and it has to be complemented with external information in the form of sign and narrative restrictions.

Our results show that unexpected monetary policy contractions are able to reduce both inflation and output growth in the short to medium horizon, generating a significant increase in the Corporate Bond Spread. On the other hand, the response of the Euro-Dollar exchange rate and the Italy-Germany sovereign spread is not significantly affected on average.

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