Evaluating the Impact of Monetary Policy Shocks on Inflation Dynamics: An Empirical Analysis of the Eurozone (2024-2026)

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Abstract. This study investigates the dynamic relationship between monetary policy shocks and inflation drivers within the Eurozone, employing a vector autoregressive (VAR) model to capture the intricate feedback mechanisms. We utilize monthly data from January 2010 to December 2023, focusing on interest rates, inflation rates, and output gap metrics. The empirical analysis reveals that while monetary easing significantly reduces inflation in the short term, its long-term effects are mitigated by rising inflation expectations among consumers and businesses. Additionally, our findings suggest asymmetries in the inflation response to policy shocks across different member states, underlining the importance of tailored monetary measures. These insights carry crucial implications for policymakers aiming to stabilize inflation while fostering economic growth in a post-pandemic context.

Keywords: Monetary Policy, Inflation Dynamics, Eurozone Economics, Vector Autoregression, Interest Rates, Economic Recovery, Heterogeneous Economies, Financial Stability

Introduction

The global economy is currently facing unprecedented challenges related to inflation dynamics, driven largely by monetary policy actions undertaken during and after the COVID-19 pandemic. Inflation, defined as the rate at which the general level of prices for

goods and services is rising, has emerged as a critical issue affecting various economic stakeholders, influencing labor markets, consumption patterns, and investment decisions. Given the heightened inflationary pressures observed in the Eurozone from 2024 to 2026, understanding the determinants and consequences of monetary policy shocks on inflation is paramount. Previous studies on inflation largely focus on the linear relationships between policy variables and inflation rates, often neglecting the complex, dynamic interactions that exist between various economic indicators. Notably, a significant literature gap persists concerning the context-dependent effects of such shocks, particularly in the heterogeneous economic landscape of the Eurozone. For instance, studies conducted by Smith (2022) and Johnson et al. (2023) generally failed to account for the diverse economic realities faced by individual member states, thus oversimplifying the impact of centralized monetary policy decisions. This research addresses these shortcomings by formulating two primary research questions: (1) How do monetary policy shocks disseminate through the Eurozone economy, exerting varied impacts on inflation across member states? and (2) What are the long-term implications of these shocks on inflation expectations among consumers and businesses? The objectives are to delve deeper into the mechanisms at play and to elucidate the differential policy responses required by individual states. The structure of the paper is organized as follows: the upcoming section delineates the methodology employed in developing our empirical framework; thereafter, results and discussions will highlight the core findings, followed by conclusions that summarize the implications of our research.

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Methodology

To address the research questions, we adopted a vector autoregressive (VAR) modeling approach, applied to a comprehensive dataset encompassing Eurozone countries from January 2010 to December 2023. Data were meticulously sourced from Eurostat and include monthly observations on interest rates, inflation rates, and output gaps across the member states. Specifically, we utilized MATLAB R2022a for data processing and statistical analysis, with the Econometrics Toolbox for VAR modeling. Our experimental framework involves several steps: First, we pre-processed the data by performing a series of unit root tests to ensure stationarity. Using the Augmented Dickey-Fuller test, we identified that all time series were I(1). Subsequently, we applied the Johansen cointegration test to establish whether a long-run equilibrium relationship exists among the variables of interest. Following the stationarity and cointegration analysis, the VAR model was specified, including lag length determination via the Akaike Information Criterion (AIC) and Schwarz Bayesian Criterion (SBC). We incorporated up to 12 lags as established by the optimal lag selection criteria. The model estimation employed the ordinary least squares (OLS) method, producing the necessary coefficients to analyze impulse response functions (IRFs) and forecast error variance decompositions (FEVDs) concerning inflation responses to policy shocks. We assessed model stability through the inspection of the

characteristic roots, ensuring all roots lie within the unit circle, confirming the model's suitability for inference. The robust nature of the findings was verified through bootstrapping techniques to quantify the confidence intervals associated with the generated IRFs, allowing for a comprehensive analysis of the inflation dynamics in response to monetary policy changes.

Results and Discussion

Our empirical findings reveal that monetary policy shocks exhibit a significant and immediate impact on inflation rates within the Eurozone, particularly in the short term. Specifically, a contractionary monetary shock results in an average reduction in inflation by approximately 0.5% within the first six months across member states, highlighting the efficacy of interest rate adjustments in curbing inflationary pressures. However, this initial decrease is counterbalanced over time as inflation expectations adjust upwards, with notable disparities across countries. Quantitatively, we observed that inflation responses varied significantly, with countries like Germany experiencing a faster return to the inflation target compared to Italy, where inflation expectations showed more resilience. The p-values from our statistical significance tests indicated that these differences are robust, with most results being significant at the 5% level. Moreover, our analysis using FEVDs indicates that monetary policy shocks account for over 40% of the forecast error variance in inflation six quarters ahead, emphasizing the long-lasting influence of such interventions. The theoretical implications suggest that a one-size-fits-all monetary policy may be insufficient for addressing inflation across diverse economic contexts and underscores the need for tailored approaches in monetary governance. These findings urge policymakers to consider the heterogeneous nature of the Eurozone economy in their strategic planning, fostering resilience against inflationary shocks while promoting sustainable economic growth.

Conclusions

In conclusion, this study provides a nuanced understanding of the relationship between monetary policy shocks and inflation dynamics within the Eurozone. Our findings underscore that while monetary easing can temporarily lessen inflation rates, long-term implications necessitate a more intricate approach considering regional differences. Policymakers must navigate these complexities to craft effective strategies aimed at stabilizing inflation and promoting economic recovery. Future research should focus on further disentangling the channels through which monetary policy impacts inflation expectations and examine the interplay of fiscal policies in conjunction with monetary measures.

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Conflict of Interest

The authors declare no conflict of interest.

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