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Economic, Fiscal, and Monetary Policy Uncertainty in Japan: What do They Affect?

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Abstract

This paper examines how economic, fiscal, and monetary policy uncertainty shape Japan's macroeconomic and financial conditions from 2004 to 2024. Using a VAR framework that includes economic policy uncertainty (EPU), fiscal policy uncertainty (FPU), and monetary policy uncertainty (MPU), we study their effects on money-supply growth, industrial production, inflation, and stock-market returns. We complement this analysis with GARCH-type volatility models to evaluate whether uncertainty meaningfully increases financial-market volatility. The results show that EPU has a consistent and significant impact on money-supply growth and industrial production, while inflation responds only weakly and gradually. Stock-market reactions are short-lived and show no strong evidence of heightened volatility. FPU and MPU play a secondary role: they appear in the VAR system but exert weaker and less stable effects on macroeconomic outcomes. Robustness checks, including alternative VAR lag structures, Granger causality tests, and additional volatility regressions, confirm the stability of these findings. The evidence suggests that Japan's institutional setting, particularly the Bank of Japan's communication strategy and policy tools, helps limit the transmission of uncertainty to asset-market volatility. These results highlight the importance of transparent and well-coordinated fiscal and monetary policies during periods of elevated uncertainty.

Keywords: Policy uncertainty, money supply, GARCH, VAR, Japan, financial volatility

Introduction

Economic policy uncertainty (EPU) has become an important factor shaping macroeconomic and financial outcomes in many countries. Uncertainty about fiscal actions, monetary decisions, or regulatory changes can influence expectations, delay investment plans, and affect how households and firms use liquidity. A growing body of research, following Baker, Bloom, and Davis (2016) demonstrates that EPU shocks influence output, inflation, and asset prices. However, fewer studies examine how policy uncertainty interacts with monetary dynamics and financial volatility in Japan, a country with a long history of unconventional monetary policy, low interest rates, and evolving policy frameworks. Japan provides an ideal context to study these relationships. Since the early 2000s, the Bank of Japan (BoJ) has implemented a series of unconventional monetary policies, including quantitative easing (QE) and yield curve control, in an effort to counter deflation and support economic activity. At the same time, changes in fiscal and regulatory policies have generated substantial policy uncertainty, influencing money supply growth and investor behavior. Understanding how EPU transmits into monetary aggregates, real production, and financial volatility is crucial for both policymakers and market participants. This study makes three main contributions. First, it analyzes how EPU affects monetary aggregates and monetary transmission in Japan. Second, it examines how uncertainty shocks influence industrial production and inflation, two core indicators of real economic performance. Third, it explores whether EPU contributes to financial market volatility using a GARCH framework to capture asymmetric and nonlinear volatility responses. Together, these contributions help clarify how policy uncertainty interacts with key macro-financial variables within Japan's unique institutional environment. We test the following hypotheses:

- H_0 (Null Hypothesis): Economic policy uncertainty has no significant impact on Japan's money supply dynamics, monetary transmission, or financial market volatility.
- H_1 (Alternative Hypothesis 1): Economic policy uncertainty significantly affects Japan's money supply dynamics and monetary transmission.
- H_2 (Alternative Hypothesis 2): Economic policy uncertainty significantly influences financial market volatility in Japan, with effects that may persist over time.The remainder of this paper is organized as follows. Section 2 develops the theoretical framework and outlines the transmission channels through which economic policy uncertainty (EPU) can influence monetary dynamics, real activity, inflation, and financial volatility in Japan. Section 3 reviews the relevant literature on policy uncertainty and its macro-financial effects, highlighting existing findings and gaps this study seeks to address.

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Section 4 describes the data and methodology, including the construction of variables, model specifications, and estimation procedures for both the VAR and GARCH frameworks. Section 5 presents empirical results, beginning with descriptive statistics and unit root tests, followed by the main VAR results, impulse responses, variance decomposition, and volatility modeling using GARCH family models. Section 6 discusses the results in the context of existing literature, the study's limitations and potential avenues for extension. Section 7 outlines the policy implications of our findings for monetary authorities and financial regulators. Section 8 concludes by summarizing the main contributions of the paper.

Theoretical Framework

The influence of economic policy uncertainty (EPU) on monetary dynamics, real activity, inflation, and financial volatility operates through several well-established theoretical mechanisms. This section synthesizes the conceptual foundations of these channels and connects them to expected empirical outcomes.

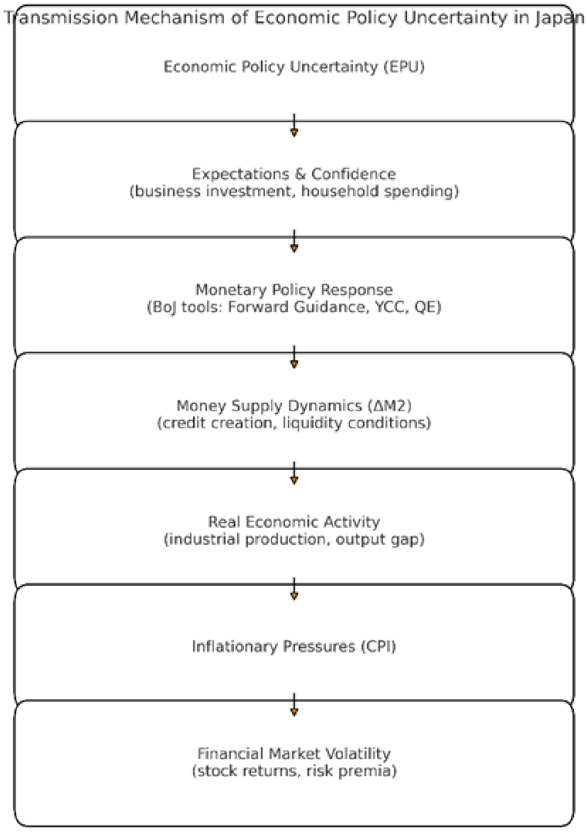

Figure 1: Transmission mechanism of economic policy uncertainty (EPU) in Japan

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Figure 1 summarizes the hypothesized transmission mechanism: EPU influences expectations and confidence, prompting a monetary policy reaction (e.g., forward guidance, yield-curve control, and asset purchases). These actions shape liquidity conditions and credit creation (ΔM2), which transmit to real activity (industrial production) and, with lags, to inflation. Financial-market volatility is expected to react primarily through the risk-premium channel, although its empirical salience may be limited in Japan's institutional setting.

Money Demand and Liquidity Preferences

Traditional monetary theory explains money demand as comprising transactions, precautionary, and speculative motives. Under conditions of heightened policy uncertainty, the precautionary motive becomes more pronounced: households and firms prefer to hold a greater share of their wealth in liquid balances to hedge against unforeseen shocks. This behavior leads to a rise in money demand beyond what is required for regular transactions (Telyukova & Visschers, 2013). Recent studies extend the classical money demand function by explicitly incorporating uncertainty, demonstrating that higher uncertainty increases liquidity preference and broad money aggregates (Gan, 2019). This mechanism provides a theoretical rationale for why EPU shocks can stimulate M2 growth as agents and financial institutions increase their demand for money in response to uncertainty about future policy directions.

Expectations and Monetary Transmission

Monetary policy transmission relies critically on expectations. When future policy paths become uncertain, expectations about interest rates, credit conditions, and policy interventions become less anchored, weakening the transmission of monetary policy through standard channels. Uncertainty reduces the responsiveness of consumption, investment, and credit decisions to policy signals. For example, elevated EPU leads firms to increase cash holdings as a buffer against potential adverse shocks, indirectly influencing liquidity conditions in the broader economy (Li, 2019). This mechanism implies that even if central banks expand liquidity or adjust interest rates, the effectiveness of such measures may diminish when uncertainty is high, resulting in altered or muted monetary dynamics.

Investment and Real Activity

Real options theory provides another key mechanism linking EPU to real activity. Because investment decisions are often costly and irreversible, firms prefer to delay investment when future conditions are uncertain, preserving the option to invest once the policy environment becomes clearer.

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This "wait-and-see" behavior reduces capital formation and slows industrial production (Aïd $ al., 2015). The empirical implication is that higher EPU should be associated with lower industrial output and more sluggish real sector responses. This mechanism aligns with observed negative responses of industrial production to EPU shocks in empirical studies and is a core reason for the real economy's sensitivity to uncertainty shocks.

Inflation and Price Dynamics

The relationship between EPU and inflation is subtler and often emerges more gradually than for real activity or money demand. Policy uncertainty can influence inflation expectations by altering wage-setting behavior, price contracts, and demand conditions. However, these effects typically require sustained periods of uncertainty to become significant. As a result, inflation's response to EPU shocks tends to be weaker or delayed relative to monetary aggregates or industrial production. Moreover, in economies like Japan with a history of low inflation expectations, uncertainty shocks may have limited immediate effects on price dynamics, instead manifesting through indirect channels over longer horizons (Das & al., 2023).

Financial Volatility

Financial market volatility is also influenced by policy uncertainty, primarily through its effect on risk premia. Increased uncertainty raises investors' required compensation for bearing risk, leading to heightened volatility in asset prices and returns. However, these volatility effects are often nonlinear and state-dependent, varying across policy regimes and market conditions. Capturing such dynamics requires models that can account for asymmetries and leverage effects in volatility responses. The GARCH model is particularly well-suited for this purpose because it models the logarithm of conditional variance, thereby ensuring positivity without imposing parameter constraints, and allows negative shocks to have disproportionate effects on volatility (Chang, 2017). Empirical evidence shows that EGARCH often outperforms symmetric models like GARCH (1,1) in capturing asymmetries and fat tails in macro-financial data (McAleer, 2014). Nonetheless, because volatility may be driven by the joint dynamics of multiple variables, future research could extend beyond univariate EGARCH models to multivariate or dynamic conditional correlation (DCC) frameworks for a more complete understanding of volatility transmission (Engle, 2002).

Literature Review

Economic policy uncertainty (EPU) has been widely recognized as a critical determinant of macroeconomic performance, financial stability, and corporate decision-making. Existing research consistently shows that

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heightened policy uncertainty influences investment behavior, corporate finance decisions, and market dynamics by increasing risk premiums and reducing firms' willingness to invest or expand (Al-Thaqeb and Algharabali (2019). Baker et al. (2016) demonstrate that rising EPU leads to more conservative corporate policies, lower capital expenditures, and delayed investment, while Al-Thaqeb and Algharabali (2019) emphasize its asymmetric effects across sectors and policy regimes. At the macroeconomic level, several studies focus on the relationship between EPU and key variables such as inflation, exchange rates, and industrial output. Athari et al. (2021) show that EPU Granger-causes inflation in Japan at specific time scales, particularly during periods of economic turbulence. Similarly, Sami and Abdelhak (2024) confirm a long-run positive relationship between EPU and inflation in Japan, indicating that policy uncertainty can amplify price instability. Kurasawa (2016) investigates EPU's effect on the USD/JPY exchange rate, revealing that both anticipated and unanticipated policies significantly influence currency movements. These findings highlight the pervasive influence of policy uncertainty on price dynamics and exchange rate stability. Other work extends the analysis to firm-level outcomes and sectoral performance. Augustine et al. (2023) find that policy uncertainty moderates the effects of inflation and interest rates on firm efficiency, amplifying their impacts depending on firm characteristics such as size and dividend policy. Zhu and Yu (2022) explore the nonlinear effects of EPU on industrial output in China, revealing an inverted U-shaped relationship and demonstrating that technological progress mitigates adverse effects when uncertainty is high.

The relationship between policy uncertainty and monetary dynamics has also been explored, though less extensively. Nusair et al. (2024) examine the asymmetric effects of EPU on money demand in developed countries, including Japan. They find that rising EPU increases money demand, whereas declining EPU has no significant impact, suggesting that monetary behavior responds differently to positive and negative uncertainty shocks. This highlights the importance of nonlinear modeling approaches in understanding monetary transmission mechanisms under uncertainty. EPU's influence on financial markets is another important dimension. Phan et al. (2018) show that EPU predicts stock returns in several countries, though the strength and direction of predictability vary by market and sector. Chiang (2020) finds that heightened policy uncertainty leads to lower stock returns in Japan, while Aman et al. (2024) demonstrate that high EPU reduces financial system efficiency by disrupting intermediation and market operations. Other research underscores the role of EPU in driving volatility across equity, commodity, and foreign exchange markets, linking major political and economic events to heightened uncertainty and market instability. Despite the breadth of existing research, significant gaps remain in understanding how economic policy uncertainty shapes money supply dynamics and monetary transmission mechanisms in Japan, particularly in interaction with industrial production, inflation, and financial market volatility. Prior studies have largely focused on EPU's effects on inflation, exchange rates, or stock markets, often using shorter sample periods or linear models. Few have investigated the dynamic interactions between EPU and monetary aggregates such as M2 or examined volatility responses and asymmetries using advanced econometric techniques like VAR and GARCH. This study addresses these gaps by providing updated evidence (2004–2024) between EPU and Japan's money supply, while also exploring its broader macro-financial effects through a multivariate time-series framework. This paper advances the literature by integrating them into a single framework, linking EPU, monetary dynamics, real activity, and volatility.

Data

We use monthly data from February 2004 to November 2024, encompassing 249 observations. The variables include:

- Economic Policy Uncertainty Index (EPU), Fiscal Policy Uncertainty Index (FPU), Monetary Policy Uncertainty Index (MPU).
- M2 Growth (d_m2): Monthly change in broad money supply.
- Inflation (inf_cpi): Inflation rate based on the consumer price index.
- Industrial Production (d_ip): Growth rate of industrial production
- ret_stock: Stock market returns

Data are sourced from the Economic Policy Uncertainty database, the European Central Bank, the data catalog of world bank and the Federal reserve bank of St. Louis FRED. All series are transformed to ensure stationarity, using first differences and log-transformations where appropriate.

Methods

Vector Autoregression (VAR)

We employ a VAR model to capture dynamic interactions among the variables. The general VAR(p) specification is:

$$Y_t = A_0 + A_1 Y_{t-1} + A_2 Y_{t-2} + \cdots + A_p Y_{t-p} + \epsilon_t$$

where Y_t is a vector containing [EPU, FPU, MPU, d_m2, inf_cpi, d_ip, ret_stock]. The lag order was selected using AIC and BIC, resulting in a preferred specification of VAR (1). Stability conditions are satisfied (all roots < 1). The chosen recursive structure, Y_t= [EPU, FPU, MPU, d_m2, inf_cpi, d_ip, ret_stock], reflects the assumption that shocks propagate sequentially based on the variables' relative speed of adjustment within the monthly time frame. The uncertainty indices (EPU, FPU, MPU) are placed first, as they capture high-frequency policy news and are assumed to be predetermined with respect to contemporaneous movements in macroeconomic aggregates and

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financial variables (Baker et al., 2016). Consistent with standard macro-financial VAR literature, the slower-moving real activity variables (d_ip, inf_cpi) precede the instantaneous financial market response (ret_stock), ensuring that stock returns reflect all preceding policy and macro shocks (Kilian et al., 2022).

Volatility Modeling: GARCH and GJR-GARCH

To examine the volatility dynamics of stock returns in Japan, we estimate GARCH(1,1) and GJR-GARCH(1,1) models. Both are widely used to capture time-varying volatility and asymmetry in financial markets. The Generalized Autoregressive Conditional Heteroskedasticity (GARCH) model is specified as follows:

$$\sigma_t^2 = \omega + \alpha\epsilon_{t-1}^2 + \beta\sigma_{t-1}^2$$

Where:

σ_t^2 is the conditional variance (volatility) at time t,
ϵ_{t-1}^2 is the squared residual from the mean equation at time t - 1,
σ_{t-1}^2 is the previous period's conditional variance,
ω, α, β are estimated parameters.

This model captures volatility persistence and the impact of past squared errors on future volatility.

To account for asymmetric responses to positive and negative shocks, we also estimate a GJR-GARCH(1,1) model:

$$\sigma_t^2 = \omega + \alpha\epsilon_{t-1}^2 + \gamma(\epsilon_{t-1}^2 . I(\epsilon_{t-1} < 0)) + \beta\sigma_{t-1}^2$$

γ captures the asymmetric effect of negative shocks on volatility.
$I(\epsilon_{t-1} < 0)$ is an indicator function that is1 if the previous shock was negative and 0 otherwise. This model allows for different volatility responses to positive and negative returns, a feature often observed in financial markets.

In addition to the basic GARCH models, we estimate GARCH(1,1) with EPU (Economic Policy Uncertainty) and MPU (Monetary Policy Uncertainty) included in the variance equation. This allows us to analyze how policy uncertainty influences volatility. The model specification is:

$$\sigma_t^2 = \omega + \alpha\epsilon_{t-1}^2 + \beta\sigma_{t-1}^2 + \lambda Uncertainty_t$$

Where λ is the coefficient for the uncertainty measure ($Uncertainty_t$ could be either EPU or MPU).

To ensure the robustness of our results, we perform additional tests, including: Heteroscedasticity and autocorrelation robust OLS regressions for the log-volatility on lagged uncertainty measures. Granger Causality Tests to test for the directional influence of uncertainty on volatility. Impulse Response Functions (IRFs) to explore the effect of shocks to policy uncertainty on volatility and asset prices.

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Results

Descriptive Statistics

The variables display substantial variability over the sample period. EPU exhibits pronounced spikes during major global and domestic events, including the 2008 financial crisis, the 2011 Tohoku earthquake, and the COVID-19 pandemic. Money supply growth remains relatively stable but shows responses to key policy shifts. Stock returns are characterized by volatility clustering.

Table 1: Descriptive Statistics and Correlations

Panel A: Summary Statistics

Variable	Count	Mean	Std	Min	25%	50%	75%	Max
EPU	250	107.17	31.88	48.41	85.50	104.50	123.91	239.05
MPU	250	110.27	50.11	31.79	77.42	102.12	129.33	365.13
FPU	250	104.80	40.54	45.66	75.22	97.82	125.12	305.71
d_epu	250	0.21	23.28	-107.93	-9.96	1.48	10.64	94.65
d_m2	250	0.00	0.00	-0.00	0.00	0.00	0.00	0.02
inf_cpi	250	0.00	0.00	-0.01	-0.00	0.00	0.00	0.02
d_ip	250	-0.00	0.02	-0.17	-0.01	0.00	0.01	0.06
ret_stock	250	0.00	0.04	-0.22	-0.02	0.01	0.03	0.11

Panel B: Skewness & Kurtosis

Variable	Skewness	Kurtosis
EPU	1.07	2.09
MPU	1.79	5.51
FPU	1.38	3.26
d_epu	-0.19	5.00
d_m2	3.99	31.50
inf_cpi	1.03	7.86
d_ip	-2.08	10.37
ret_stock	-1.09	3.80

Panel C: Correlation Matrix

	EPU	MPU	FPU	d_epu	d_m2	inf_cpi	d_ip	ret_stock
EPU	1.00	0.73	0.94	0.36	0.27	-0.15	-0.10	-0.22
MPU	0.73	1.00	0.64	0.34	0.07	-0.02	-0.06	-0.22
FPU	0.94	0.64	1.00	0.31	0.20	-0.20	-0.08	-0.17
d_epu	0.36	0.34	0.31	1.00	-0.07	0.00	-0.01	-0.32
d_m2	0.27	0.07	0.20	-0.07	1.00	-0.07	-0.06	0.17
inf_cpi	-0.15	-0.02	-0.20	0.00	-0.07	1.00	0.01	0.01
d_ip	-0.10	-0.06	-0.08	-0.01	-0.06	0.01	1.00	0.14
ret_stock	-0.22	-0.22	-0.17	-0.32	0.17	0.01	0.14	1.00

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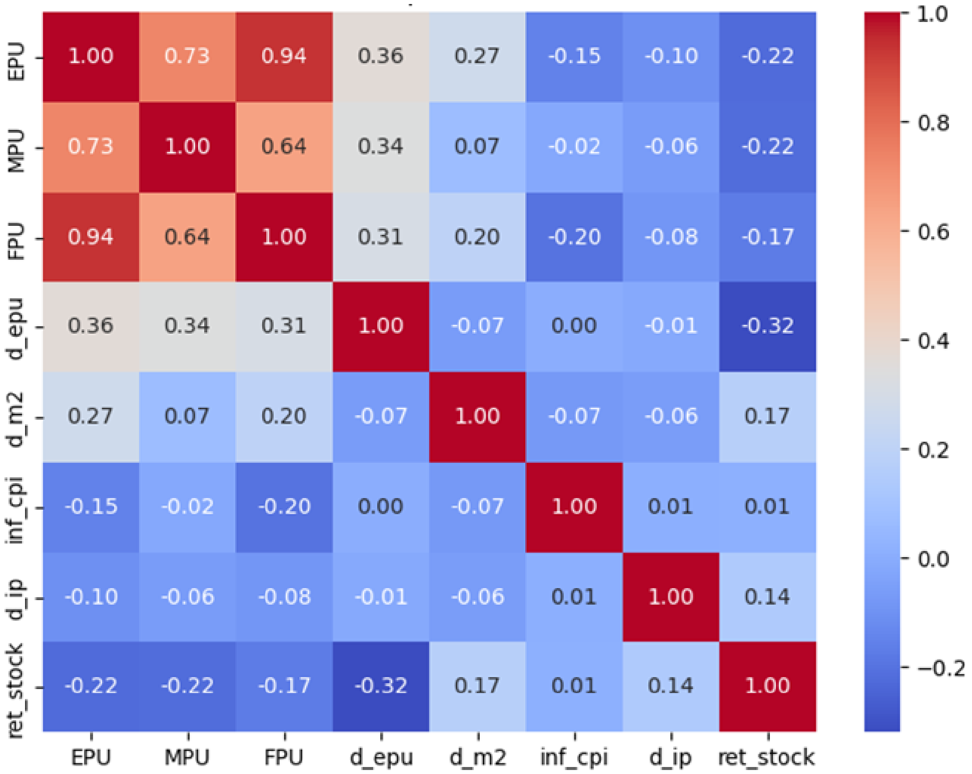

Figure 2: Correlation heatmap of the variables

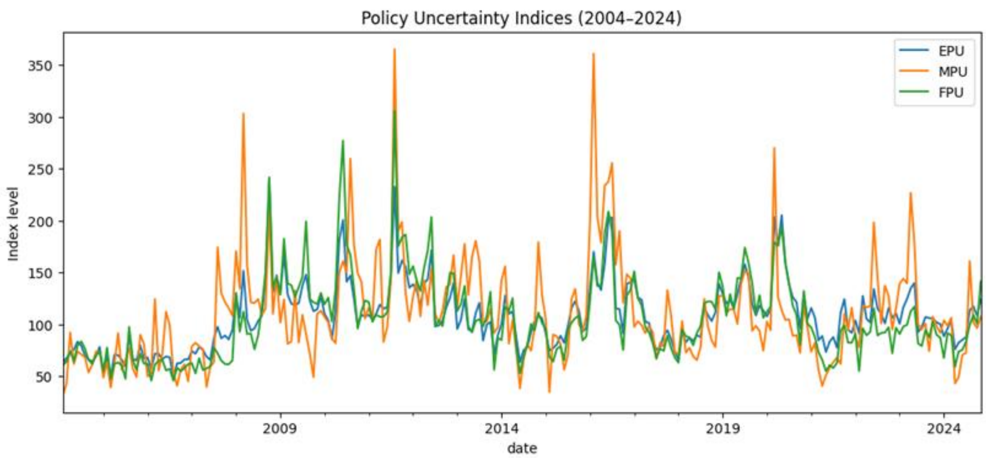

Figure 3: Policy Uncertainty Indices for EPU, MPU And FPU (2004-2024)

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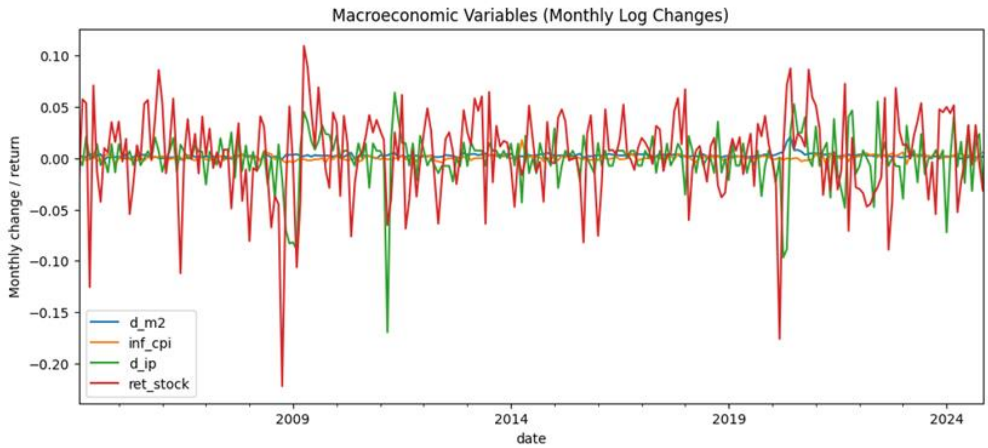

Figure 4: Macroeconomic variables (Monthly Log Changes)

Unit Root and Stationarity Tests (ADF)

Augmented Dickey–Fuller (ADF) tests were conducted to assess the stationarity of all variables. The results indicate that all series are stationary at levels or first differences at the 5% significance level, satisfying the prerequisite conditions for VAR estimation (Appendix A).

Lag Length Selection

To estimate the VAR model, we employ standard lag selection criteria, including the Akaike Information Criterion (AIC), the Bayesian Information Criterion (BIC), the Final Prediction Error (FPE), and the Hannan–Quinn Criterion (HQIC). As reported in Appendix B, all four criteria reach their minimum at lag 1, indicating that a VAR(1) specification provides the best balance between model fit and parsimony. Accordingly, we adopt VAR(1) as our baseline specification. As a robustness check, we also estimate VAR models with two and three lags. The impulse responses, variance decompositions, and diagnostic tests for VAR(2) and VAR(3) are broadly consistent with those of the baseline VAR(1), confirming that our main conclusions are not sensitive to the choice of lag length.

VAR Model Estimation

To analyze how policy uncertainty affects Japan's macroeconomic environment, we estimate a Vector Autoregression (VAR) that includes economic policy uncertainty (EPU), fiscal policy uncertainty (FPU), monetary policy uncertainty (MPU), money supply growth (d_m2), industrial production growth (d_ip), inflation (inf_cpi), and stock returns (ret_stock). The lag length is selected using standard information criteria (AIC, BIC, FPE, and HQIC). As reported in Appendix B, all four criteria reach their minimum at lag 1, so we adopt a VAR(1) specification as our baseline model. All

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variables enter the VAR in stationary form, based on the unit root tests discussed earlier. The estimated VAR(1) system is stable: the inverse roots of the companion matrix lie inside the unit circle, and residual autocorrelation tests indicate no remaining serial correlation. Additional diagnostic checks (normality and ARCH tests) suggest that the residuals are well behaved. The estimated coefficients reveal several statistically significant linkages from policy uncertainty to monetary and real variables, although the magnitude and sign differ across EPU, FPU, and MPU. The following table reports only those lagged coefficients that are statistically significant at the 5% level. The results show strong persistence in the uncertainty indices (EPU, FPU, MPU), as well as significant transmission from policy uncertainty to money supply growth (via EPU), industrial production growth (via EPU and FPU), and inflation (via FPU). Full estimation output is available in Appendix C.

Table 2: Main VAR (1) Results (Constant and Lag 1)

Equation	Regressor (L1)	Coefficient	p-Value
EPU	EPU	0.636391	0.000
FPU	FPU	0.647626	0.000
MPU	MPU	0.474263	0.000
d_m2	EPU	0.000034	0.002
d_m2	d_m2	0.474873	0.000
d_m2	d_ip	-0.015690	0.000
d_m2	ret_stock	0.006052	0.017
inf_cpi	FPU	-0.000033	0.005
d_ip	EPU	-0.000410	0.015
d_ip	FPU	0.000229	0.047
d_ip	d_m2	2.417534	0.004
ret_stock	ret_stock	0.157048	0.021

Impulse Response and Variance Decomposition Analysis

To examine how policy uncertainty affects Japan's macroeconomic environment, we compute impulse response functions (IRFs) from the baseline VAR(1) using orthogonalized (Cholesky) identification. Policy uncertainty is ordered before macroeconomic variables, with EPU placed first. This structure reflects the idea that uncertainty can adjust quickly, while real activity and prices respond more gradually, a standard assumption in macro-finance research.

EPU shock

A positive shock to EPU produces several clear reactions. Money supply (d_m2) rises on impact, consistent with precautionary liquidity behavior or accommodative monetary policy during uncertainty episodes. Industrial production (d_ip) declines, indicating that firms postpone investment and production decisions when uncertainty increases. Inflation

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(inf_cpi) reacts only mildly and with delay, in line with Japan's weak price dynamics. Stock returns fall briefly but quickly revert to baseline, reflecting limited financial-market sensitivity.

MPU shock

Monetary policy uncertainty generates a different pattern. Money supply responds only moderately. Industrial production shows a small and temporary decline. Inflation increases slightly, suggesting that uncertainty around future monetary actions affects price expectations. These results indicate that MPU captures a distinct dimension of uncertainty relative to headline EPU.

FPU shock

Fiscal policy uncertainty mainly affects real activity. Industrial production shows a short-run decline, consistent with uncertainty about government spending or taxation. Money supply and inflation react weakly, indicating that fiscal uncertainty operates more through real-activity channels than monetary transmission. Figure 5 illustrates the IRFs to an FPU shock.

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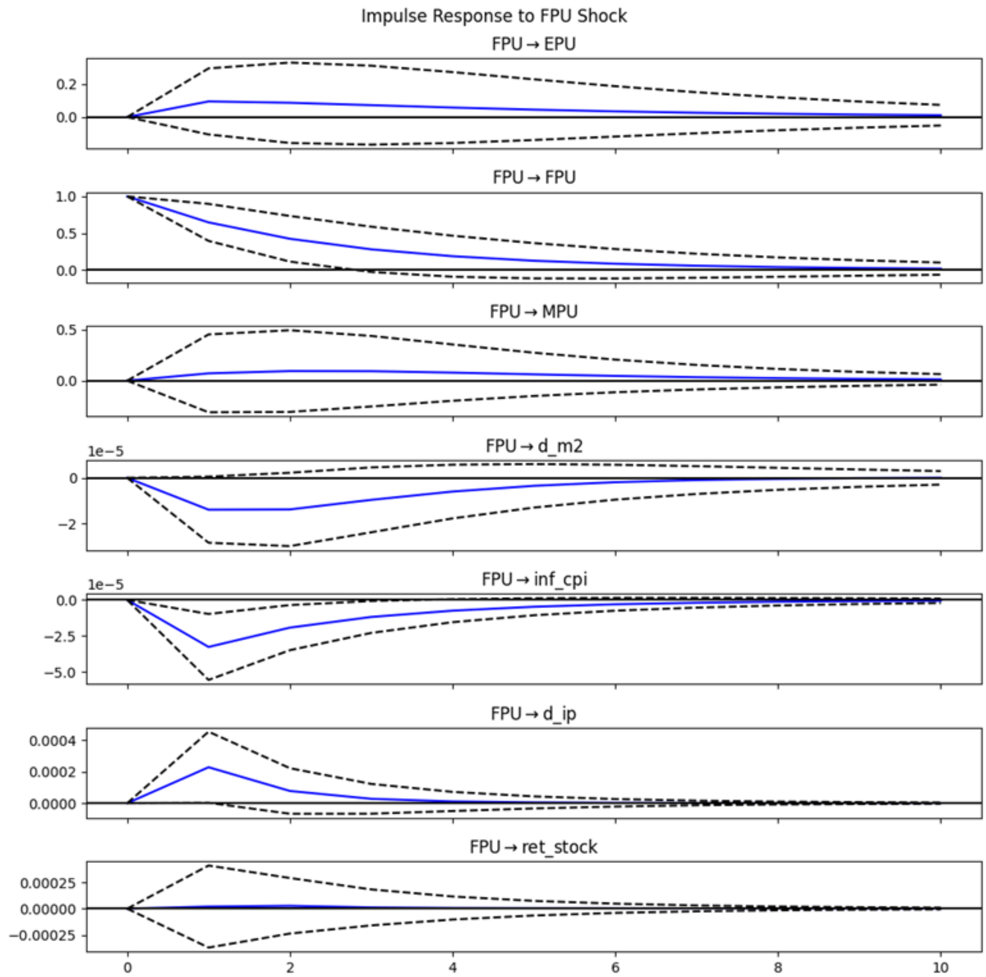

Figure 5: Impulse responses to an FPU shock

Stock-market responses

Across all uncertainty measures, stock-market reactions remain small and short-lived. Returns briefly decline but stabilize quickly, reflecting Japan's relatively resilient financial structure and the limited exposure of domestic equity markets to policy uncertainty.

Variance Decomposition (FEVD)

The 24-month forecast error variance decomposition shows that each variable is primarily driven by its own shocks, especially at short horizons. EPU shocks explain a meaningful share of the variation in money supply growth and industrial production, especially at medium horizons. Contributions of EPU, FPU, and MPU to inflation and stock-return volatility are small, reinforcing the view that policy uncertainty in Japan affects the real

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economy more than financial markets. Appendix C reports the orthogonalized IRFs from the VAR(1) model. The full 24-month IRF grid and the FEVD plots are reported in Appendix D.

Volatility Modeling Results

To assess whether policy uncertainty influences financial-market volatility in Japan, we estimate several GARCH-type models using monthly stock returns. These include a standard GARCH(1,1), a GARCH model with policy uncertainty included in the variance equation, and a GJR-GARCH specification that allows for asymmetric volatility responses. Across all models, the parameters linked to economic policy uncertainty (EPU), fiscal policy uncertainty (FPU), and monetary policy uncertainty (MPU) are statistically insignificant. The explanatory power of the volatility equations remains low, and adding uncertainty measures or leverage terms does not materially improve model fit. Figure 6 compares the conditional volatility produced by the plain GARCH(1,1) model and the GJR-GARCH model with EPU included in the variance equation. The two series overlap almost perfectly, confirming that incorporating uncertainty indicators or asymmetric effects does not meaningfully alter volatility dynamics. This reinforces the conclusion that equity-market volatility in Japan is only weakly affected by policy uncertainty. This pattern is broadly consistent with existing research like Antonakakis et al. (2013), which finds that the uncertainty–volatility relationship in Japan tends to be modest, state-dependent, and often overshadowed by broader institutional and macroeconomic factors.

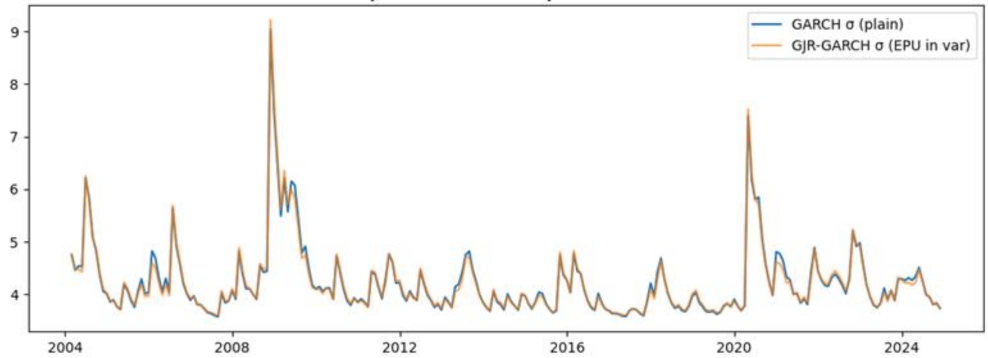

Figure 6: Conditional Volatility of Stock Returns Estimated with GARCH and GJR-GARCH Models

This figure displays the monthly conditional volatility from a standard GARCH(1,1) model and a GJR-GARCH model with EPU included in the variance equation. The two series are nearly identical, indicating weak leverage effects and minimal influence of policy uncertainty on stock-return volatility. Full estimation results for all GARCH specifications, including

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GARCH(1,1), GJR-GARCH, and the OLS(HAC) variance regressions, are reported in Appendix E.

Granger Causality Analysis

To complement the VAR results, we perform Granger causality tests to assess whether policy uncertainty helps forecast key macroeconomic and financial variables. We test whether EPU Granger-causes money-supply growth (d_m2), industrial production (d_ip), inflation (inf_cpi), and stock returns (ret_stock) using 1- and 2-lag specifications. Across all variables and lag lengths, the null hypothesis of no Granger causality cannot be rejected at conventional significance levels. The p-values for all tests exceed 0.15, indicating that lagged EPU does not provide additional predictive power for real activity, monetary aggregates, inflation, or financial returns once other dynamics are accounted for in the VAR. These results reinforce the view that, although uncertainty shocks influence contemporaneous dynamics (as shown in the IRFs), they do not systematically forecast future macroeconomic or financial outcomes. Full Granger test statistics are reported in Appendix F.

Robustness: Alternative VAR Lags and Diagnostic Checks

To verify that our results are not sensitive to the choice of lag length, we re-estimate the system using VAR(2) and VAR(3) models. Across these alternative specifications, the key coefficients linking policy uncertainty to money-supply growth and industrial production remain similar in sign and magnitude, and the impulse-response functions display the same qualitative patterns as in the baseline VAR. Diagnostic tests also support the adequacy of the higher-order models. Both VAR(2) and VAR(3) satisfy the stability condition, with all eigenvalues lying outside the unit circle. Ljung–Box tests indicate little remaining residual autocorrelation, except for a mild rejection in the EPU equation at longer lags. Residuals show non-normality according to the Jarque–Bera test typical for monthly macro-financial data but this does not affect inference, as the impulse-response confidence bands are bootstrapped. ARCH LM tests reveal limited remaining heteroskedasticity, mostly in the money-growth equation, which is addressed separately through the GARCH analysis. To sum up, the VAR(2) and VAR(3) results confirm that the main findings are robust to alternative lag structures.

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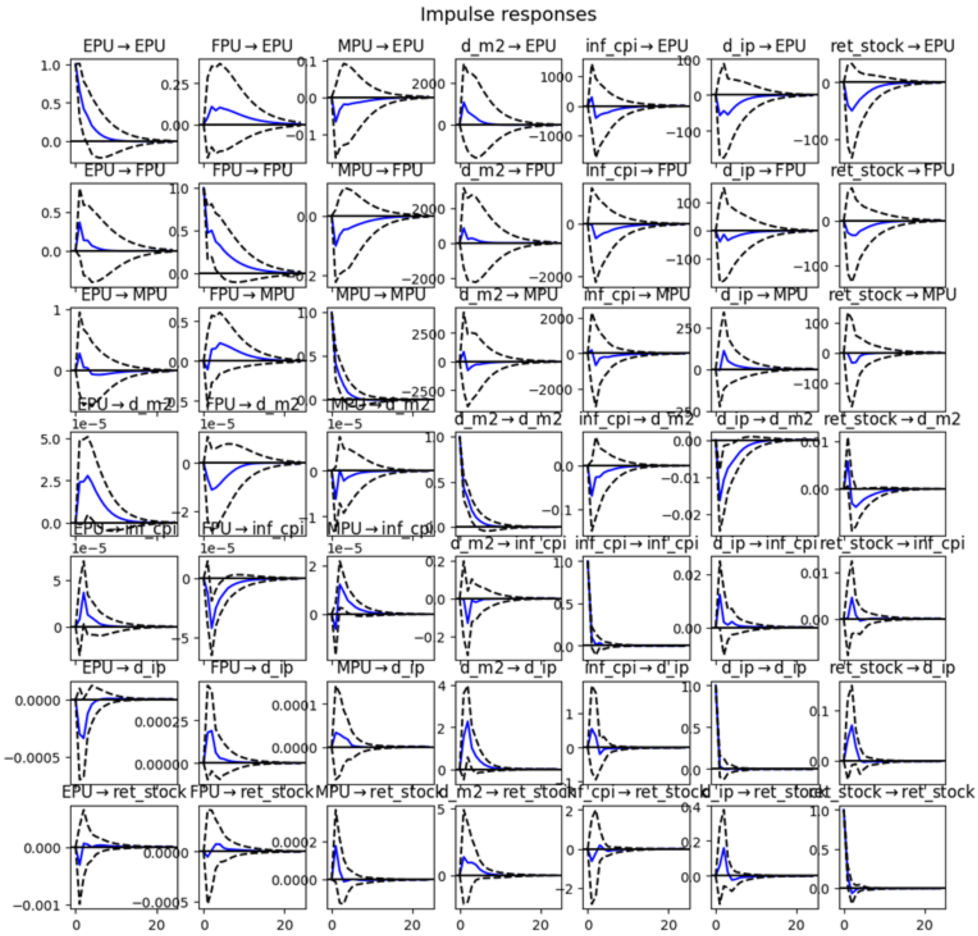

Figure 7: Impulse-Responses

Discussion

The results of this study show that policy uncertainty plays a clear role in Japan's monetary and real economy. Across all VAR models, economic policy uncertainty (EPU) has a strong and significant effect on money-supply growth. This suggests that when uncertainty rises, households and firms adjust their liquidity behavior, holding more cash, delaying spending, or changing precautionary savings. Similar patterns have been reported in earlier research such as Nusair and Olson (2024). Uncertainty also reduces industrial production. The negative and significant coefficients in the VAR indicate that firms become more cautious, postpone investment, and slow down activity when they are unsure about future policy. Studies on other Asian economies, such as Zhu and Yu (2022), report similar effects. Inflation reacts much more slowly. The impact of EPU on inflation is small and only weakly significant, consistent with the idea that price adjustments in Japan are gradual and heavily

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shaped by long-standing low-inflation dynamics. Financial markets respond differently. Stock returns react only mildly to uncertainty shocks, which supports earlier findings by Chiang (2020). The GARCH analysis also shows that uncertainty is linked to higher volatility, but the effect is not statistically strong. This suggests that uncertainty is only one of many factors affecting Japanese financial markets. The evidence indicates that uncertainty mainly affects money supply and real activity, while its impact on inflation and financial volatility is weaker. This pattern reflects Japan's institutional environment, including strong policy communication and unconventional monetary tools that help reduce uncertainty shocks.

Limitations and Directions for Future Research

While this study provides new evidence on the role of economic, fiscal, and monetary policy uncertainty in Japan, several limitations remain. First, the analysis relies on a linear VAR and GARCH model, which may not fully capture nonlinear or regime-dependent dynamics. Future research could apply TVP-VAR, threshold VAR, or structural VAR models to allow uncertainty to affect the economy differently during high- and low-uncertainty periods. Second, the volatility analysis is restricted to univariate GARCH-type models; richer frameworks such as multivariate DCC-GARCH could provide deeper insights into how uncertainty spreads across financial markets. Third, this study focuses only on Japan. Extending the analysis to other advanced Asian economies such as Korea, Singapore, or Taiwan would help evaluate whether Japan's muted volatility response is unique or part of a broader regional pattern. These limitations suggest valuable opportunities for follow-up research.

Policy Implications

The findings have several implications for Japanese policymakers. First, because uncertainty strongly affects money supply and industrial production, the Bank of Japan (BoJ) and fiscal authorities should focus on clear and consistent communication. Reducing uncertainty about future policy can help stabilize expectations and improve monetary transmission. Second, the results show that different types of uncertainty, economic, fiscal, and monetary often move together. This means that policy coordination matters. When fiscal and monetary policies send mixed signals, uncertainty rises and the economy becomes more vulnerable. Third, policymakers should monitor uncertainty indicators in real time. Including EPU, FPU, and MPU in forecasting and decision-making can help the BoJ react more quickly to sudden changes in sentiment. Fourth, although uncertainty does not strongly affect financial volatility, it still plays a role. Regulators can strengthen macroprudential frameworks by including uncertainty measures in stress tests, liquidity planning, and countercyclical buffers. In practice, this could involve: providing forward guidance tied to an "uncertainty dashboard", aligning major fiscal announcements with BoJ meetings to avoid confusion, adjusting the yield-curve-control framework during periods of unusually high uncertainty, and integrating EPU-based scenarios in risk assessments. These steps can reduce ambiguity, strengthen credibility, and help stabilize both financial markets and the real economy.

Conclusion

This paper studied how economic policy uncertainty affects Japan's monetary and macro-financial conditions using monthly data from 2004 to 2024. Using a VAR model and a GARCH volatility model, we examined how uncertainty influences money supply, inflation, industrial production, and stock-market volatility. The main results are: Money supply reacts strongly to uncertainty. Higher EPU affects liquidity behavior and monetary transmission. Industrial production declines when uncertainty rises. Firms reduce investment and output when policy becomes harder to predict. Inflation shows only a mild response. Price dynamics adjust slowly and are less sensitive to short-term uncertainty. Financial volatility increases only slightly and not significantly. Uncertainty is not the main driver of market volatility in Japan. These findings add to the existing literature (e.g., Baker et al., 2016; Nusair & Olson, 2024) by showing how uncertainty works in Japan's unique low-interest-rate environment. The results suggest that uncertainty mainly affects the real economy and liquidity, while its effects on volatility and inflation are limited. To conclude, uncertainty remains an important factor for policymakers to monitor. Clear communication, coordinated fiscal-monetary policy, and strong institutional credibility can help soften the impact of uncertainty shocks on Japan's economy.

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Appendix A: Augmented Dickey–Fuller (ADF) Unit Root Test Results

Variable	Test Statistic	p-value	1% Critical	5% Critical	10% Critical	Stationarity
EPU	-3.9643	0.0016	-3.4572	-2.8734	-2.5731	Stationary
FPU	-3.0103	0.0339	-3.4580	-2.8737	-2.5733	Stationary
MPU	-6.4197	0.0000	-3.4570	-2.8733	-2.5730	Stationary
d_epu	-5.5055	0.0000	-3.4582	-2.8738	-2.5733	Stationary
d_m2	-4.4498	0.0002	-3.4573	-2.8734	-2.5731	Stationary
inf_cpi	-9.2374	0.0000	-3.4570	-2.8733	-2.5730	Stationary
d_ip	-14.2640	0.0000	-3.4569	-2.8732	-2.5730	Stationary
ret_stock	-11.1931	0.0000	-3.4570	-2.8733	-2.5730	Stationary

Appendix B: VAR Lag Order Selection

Lag	AIC	BIC	FPE	HQIC
0	-19.04	-18.94	5.371e-09	-19.00
1	-20.95*	-20.14*	7.945e-10*	-20.63*
2	-20.90	-19.38	8.403e-10	-20.28
3	-20.74	-18.50	9.908e-10	-19.84
4	-20.72	-17.78	1.011e-09	-19.53
5	-20.69	-17.03	1.055e-09	-19.21
6	-20.62	-16.26	1.137e-09	-18.86
7	-20.44	-15.36	1.387e-09	-18.39
8	-20.36	-14.58	1.530e-09	-18.03
9	-20.16	-13.66	1.928e-09	-17.54
10	-20.02	-12.81	2.290e-09	-17.12

Note: Asterisks indicate the minimum value for each information criterion.
All criteria select a lag order of 1.

Appendix C: Full VAR(1) Estimation Results

Equation: EPU

Regressor	Coefficient	Std. Error	t-Stat	p-Value
const	31.534908	5.633205	5.598	0.000
L1.EPU	0.636391	0.150257	4.235	0.000
L1.FPU	0.094955	0.102363	0.928	0.354
L1.MPU	-0.038524	0.042028	-0.917	0.359
L1.d_m2	791.173298	746.905978	1.059	0.289
L1.inf_cpi	133.028215	564.225046	0.236	0.814
L1.d_ip	-72.573465	56.085847	-1.294	0.196
L1.ret_stock	-21.949991	34.961415	-0.628	0.530

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Equation: FPU

Regressor	Coefficient	Std. Error	t-Stat	p-Value
const	23.640282	7.049850	3.353	0.001
L1.EPU	0.189957	0.188044	1.010	0.312
L1.FPU	0.647626	0.128105	5.055	0.000
L1.MPU	-0.066809	0.052598	-1.270	0.204
L1.d_m2	299.149946	934.738721	0.320	0.749
L1.inf_cpi	-243.942539	706.116986	-0.345	0.730
L1.d_ip	-47.781997	70.190377	-0.681	0.496
L1.ret_stock	-9.667776	43.753551	-0.221	0.825

Equation: MPU

Regressor	Coefficient	Std. Error	t-Stat	p-Value
const	37.242087	10.699869	3.481	0.001
L1.EPU	0.136385	0.285403	0.478	0.633
L1.FPU	0.071679	0.194431	0.369	0.712
L1.MPU	0.474263	0.079830	5.941	0.000
L1.d_m2	-489.152133	1418.694263	-0.345	0.730
L1.inf_cpi	-48.596605	1071.704952	-0.045	0.964
L1.d_ip	-36.881978	106.531037	-0.346	0.729
L1.ret_stock	37.201820	66.406697	0.560	0.575

Equation: d_m2

Regressor	Coefficient	Std. Error	t-Stat	p-Value
const	-0.000361	0.000407	-0.887	0.375
L1.EPU	0.000034	0.000011	3.130	0.002
L1.FPU	-0.000014	0.000007	-1.888	0.059
L1.MPU	-0.000005	0.000003	-1.562	0.118
L1.d_m2	0.474873	0.054005	8.793	0.000
L1.inf_cpi	-0.073744	0.040796	-1.808	0.071
L1.d_ip	-0.015690	0.004055	-3.869	0.000
L1.ret_stock	0.006052	0.002528	2.394	0.017

Equation: inf_cpi

Regressor	Coefficient	Std. Error	t-Stat	p-Value
const	0.000740	0.000641	1.153	0.249
L1.EPU	0.000029	0.000017	1.696	0.090
L1.FPU	-0.000033	0.000012	-2.793	0.005
L1.MPU	0.000002	0.000005	0.377	0.706
L1.d_m2	-0.063419	0.085034	-0.746	0.456
L1.inf_cpi	0.118127	0.064236	1.839	0.066
L1.d_ip	0.008355	0.006385	1.309	0.191
L1.ret_stock	0.004059	0.003980	1.020	0.308

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Equation: d_ip

Regressor	Coefficient	Std. Error	t-Stat	p-Value
const	0.008484	0.006339	1.338	0.181
L1.EPU	-0.000410	0.000169	-2.424	0.015
L1.FPU	0.000229	0.000115	1.984	0.047
L1.MPU	0.000042	0.000047	0.878	0.380
L1.d_m2	2.417534	0.840485	2.876	0.004
L1.inf_cpi	0.597131	0.634916	0.940	0.347
L1.d_ip	0.078763	0.063113	1.248	0.212
L1.ret_stock	0.039200	0.039342	0.996	0.319

Equation: ret_stock

Regressor	Coefficient	Std. Error	t-Stat	p-Value
const	-0.000932	0.010991	-0.085	0.932
L1.EPU	-0.000124	0.000293	-0.421	0.673
L1.FPU	0.000020	0.000200	0.101	0.920
L1.MPU	0.000114	0.000082	1.387	0.165
L1.d_m2	1.230141	1.457264	0.844	0.399
L1.inf_cpi	-0.643794	1.100841	-0.585	0.559
L1.d_ip	0.048297	0.109427	0.441	0.659
L1.ret_stock	0.157048	0.068212	2.302	0.021

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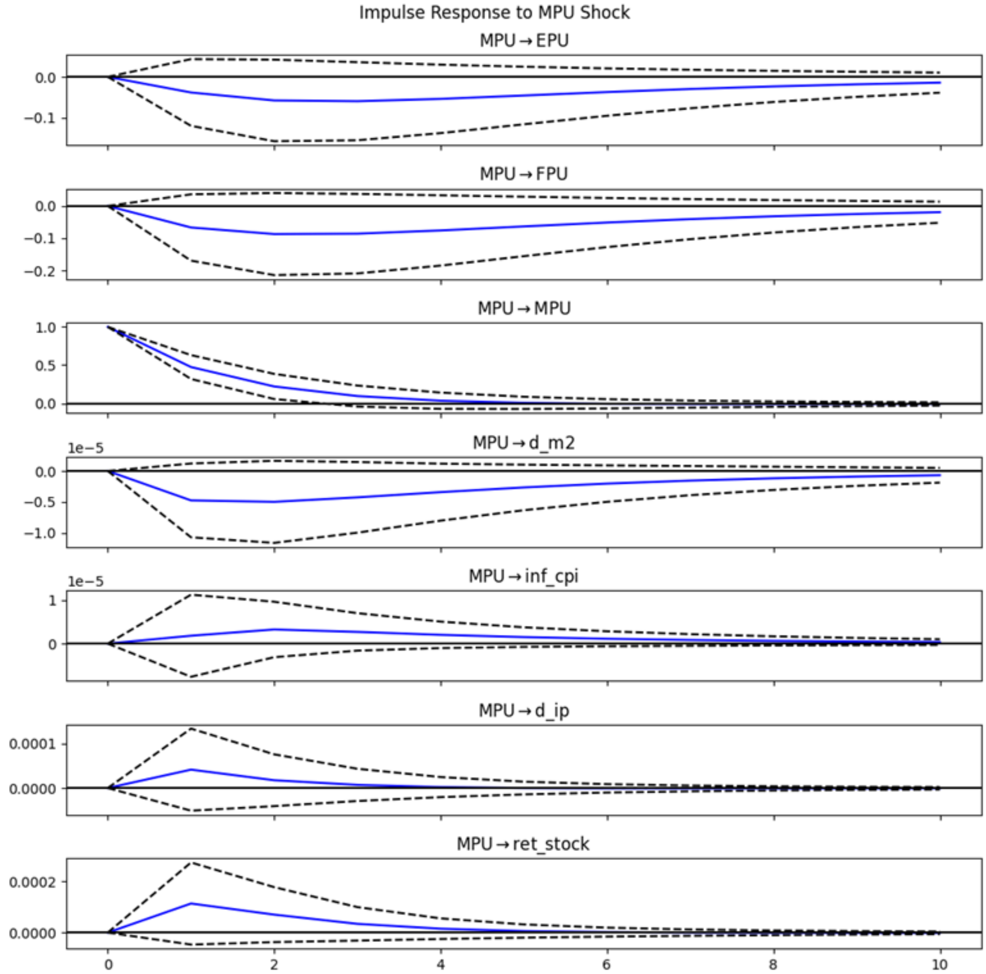
Appendix D: Full 24-month IRF grid and FEVD plots



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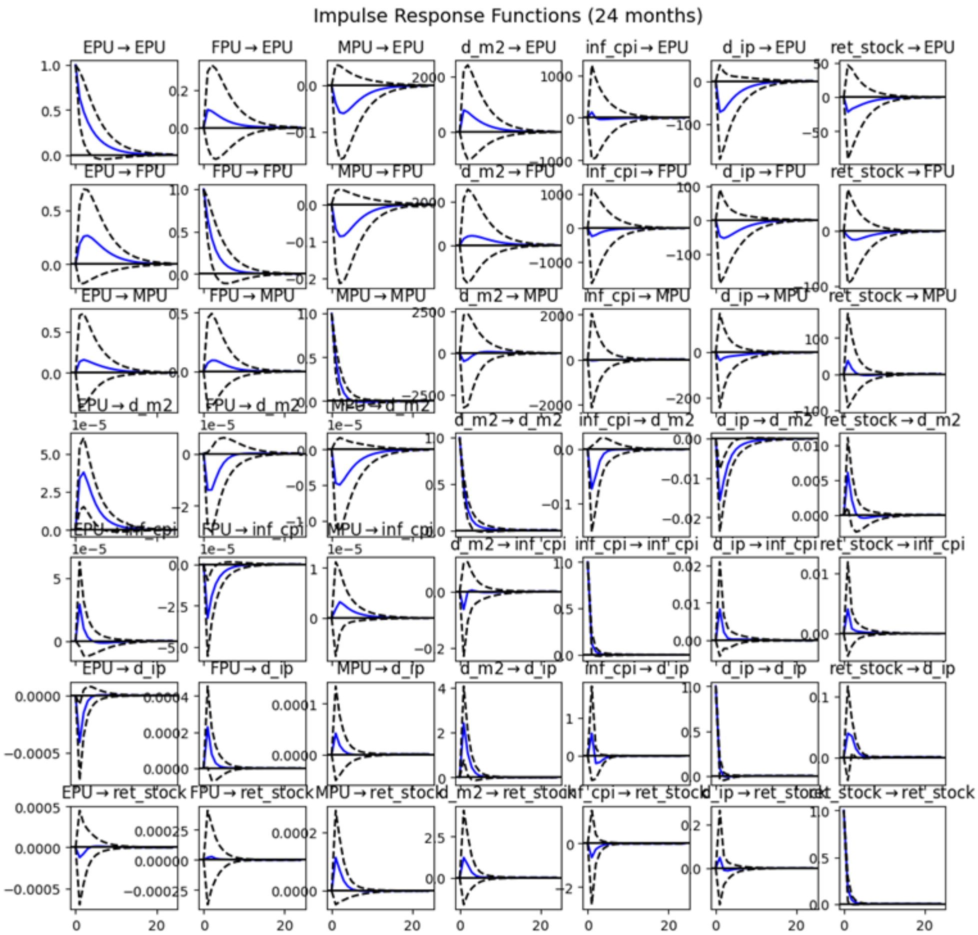

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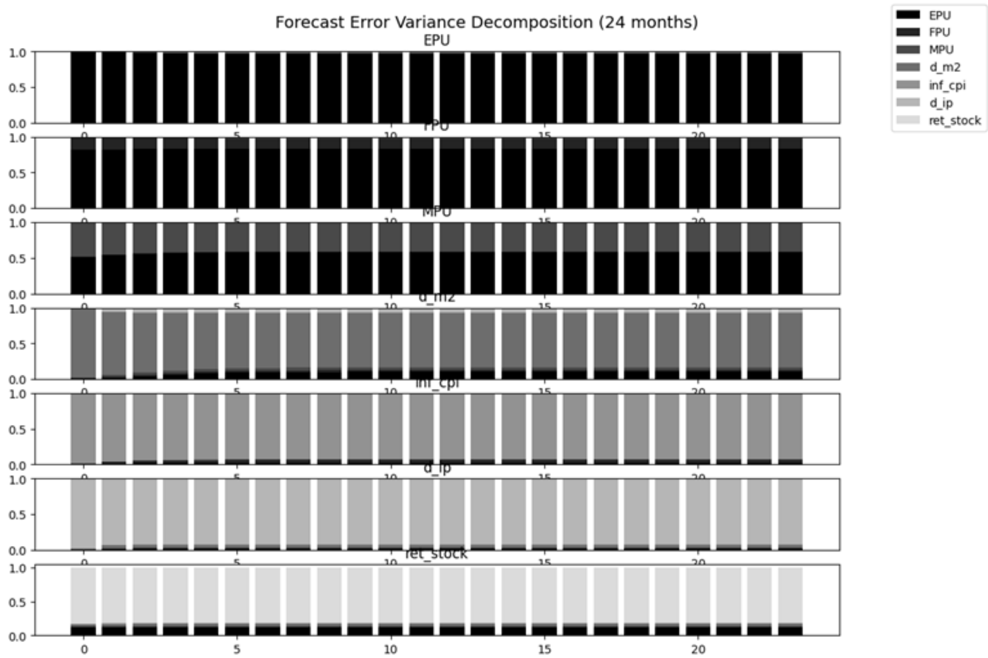

Appendix E: Volatility Modeling Results

Table E1. Plain GARCH(1,1)

Parameter	coef	std err	t	P>|t|	95% Conf. Int.
mu	0.3944	0.311	1.268	0.205	[-0.215, 1.004]
omega	4.9315	3.776	1.306	0.192	[-2.470, 12.333]
alpha[1]	0.1266	0.206	0.615	0.538	[-0.277, 0.530]
beta[1]	0.6052	0.318	1.902	0.05714	[-0.01836, 1.229]

Table E2. GARCH(1,1) with EPU in Variance

Parameter	coef	std err	t	P>|t|	95% Conf. Int.
mu	0.3944	0.311	1.268	0.205	[-0.215, 1.004]
omega	4.9315	3.776	1.306	0.192	[-2.470, 12.333]
alpha[1]	0.1266	0.206	0.615	0.538	[-0.277, 0.530]
beta[1]	0.6052	0.318	1.902	0.05714	[-0.01836, 1.229]

Table E3. GJR-GARCH(1,1) with EPU in Variance

Parameter	coef	std err	t	P>|t|	95% Conf. Int.
mu	0.3796	0.309	1.227	0.220	[-0.227, 0.986]
omega	4.8780	4.689	1.040	0.298	[-4.312, 14.068]
alpha[1]	0.0975	0.211	0.462	0.644	[-0.316, 0.511]
gamma[1]	0.0346	0.155	0.223	0.824	[-0.270, 0.339]
beta[1]	0.6159	0.406	1.515	0.130	[-0.181, 1.413]

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Table E4. GARCH(1,1) with MPU in Variance

Parameter	coef	std err	t	P>|t|	95% Conf. Int.
mu	0.3944	0.311	1.268	0.205	[-0.215, 1.004]
omega	4.9315	3.776	1.306	0.192	[-2.470, 12.333]
alpha[1]	0.1266	0.206	0.615	0.538	[-0.277, 0.530]
beta[1]	0.6052	0.318	1.902	0.05714	[-0.01836, 1.229]

Appendix F: Granger Causality Tests

Table F1. EPU → d_ip

Lags	Test	Statistic	p-value
1	F-test	1.9629	0.1625
1	Chi-square	1.9868	0.1587
1	LR test	1.9789	0.1595
2	F-test	0.9260	0.3975
2	Chi-square	1.8901	0.3887
2	LR test	1.8829	0.3901

Table F2. EPU → inf_cpi

Lags	Test	Statistic	p-value
1	F-test	0.0075	0.9309
1	Chi-square	0.0076	0.9304
1	LR test	0.0076	0.9304
2	F-test	0.6919	0.5016
2	Chi-square	1.4122	0.4936
2	LR test	1.4082	0.4946

Table F3. EPU → d_m2

Lags	Test	Statistic	p-value
1	F-test	1.1193	0.2911
1	Chi-square	1.1330	0.2871
1	LR test	1.1304	0.2877
2	F-test	0.6734	0.5109
2	Chi-square	1.3745	0.5029
2	LR test	1.3707	0.5039

Table F4. EPU → ret_stock

Lags	Test	Statistic	p-value
1	F-test	0.1206	0.7287
1	Chi-square	0.1220	0.7268
1	LR test	0.1220	0.7269
2	F-test	0.5467	0.5796
2	Chi-square	1.1158	0.5724
2	LR test	1.1133	0.5731