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Economic Policy Uncertainty and Monetary Dynamics in Japan: A VAR–EGARCH Analysis

Gessie Louis, MA student
Shanghai University, China

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Abstract

This paper investigates the impact of economic policy uncertainty (EPU) on money supply, inflation, and financial markets in Japan over the period 2004–2024. Employing a Vector Autoregression (VAR) framework and an Exponential GARCH (EGARCH) model with a student-t distribution, we analyze both the mean and volatility effects of policy uncertainty on key macroeconomic variables. The results show that EPU exerts a considerable influence on monetary dynamics and real economic activity, with persistent feedback effects on industrial production, while its impact on inflation remains modest. Moreover, while volatility modeling reveals no statistically significant direct transmission from EPU to financial market volatility, this finding highlights the conditional, state-dependent, and institution-specific nature of uncertainty propagation in Japan's financial system. Jointly examining monetary dynamics, real activity, and volatility within a unified time-series framework, this study extends existing literature and provides policy-relevant insights into how central banks can manage uncertainty shocks in a prolonged low-interest-rate environment.

Keywords: Economic policy uncertainty, money supply, EGARCH, VAR, Japan, financial volatility

Introduction

Economic policy uncertainty (EPU) has emerged as a central determinant of macro-financial dynamics in modern economies. Uncertainty surrounding fiscal policy, monetary decisions, and regulatory frameworks can alter expectations, delay investment decisions, and reshape liquidity preferences. The growing body of research following Baker, Bloom, and Davis (2016) demonstrates that EPU shocks influence output, inflation, and asset prices. However, less attention has been devoted to examining the interaction between policy uncertainty, monetary dynamics, and financial volatility in Japan, a unique case of prolonged monetary accommodation and evolving policy regimes. Japan provides an ideal context to study these linkages. 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, to combat deflation and stimulate growth. At the same time, shifts 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 contributions. First, it investigates how EPU affects monetary aggregates and monetary transmission in Japan. Second, it examines how uncertainty shocks influence industrial production and inflation. Third, it explores whether EPU contributes to financial market volatility using an EGARCH framework. Together, these analyses shed light on how policy uncertainty interacts with macro-financial dynamics in a unique institutional context. 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 persistent effects 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. Section 4 describes the data and methodology, including the construction of variables, model specifications, and estimation procedures for both the VAR and EGARCH 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, while 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.

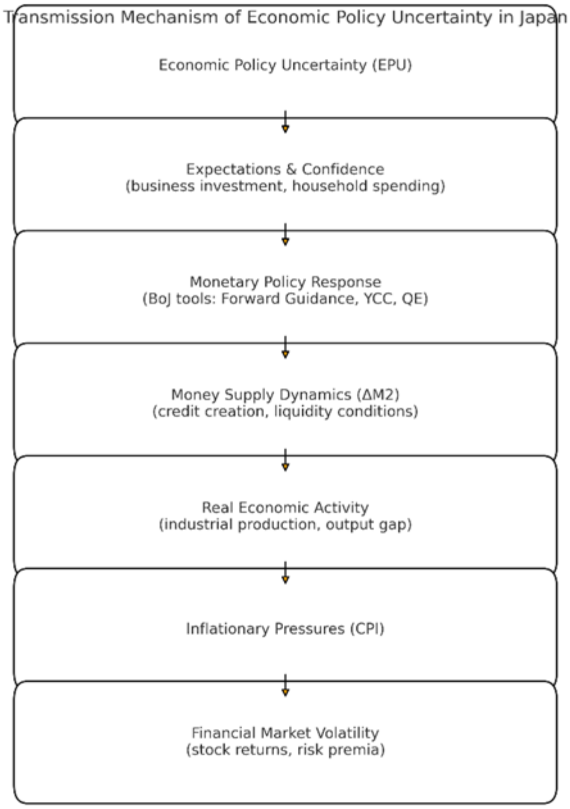

Figure 1. Transmission mechanism of economic policy uncertainty (EPU) in Japan

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. 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 EGARCH 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 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 EGARCH. 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:

1. Economic Policy Uncertainty Index (EPU), Fiscal Policy Uncertainty Index (FPU), Monetary Policy Uncertainty Index (MPU).
2. M2 Growth (d_m2): Monthly change in broad money supply.
3. Inflation (inf_cpi): Inflation rate based on the consumer price index.
4. Industrial Production (d_ip): Growth rate of industrial production
5. 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 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: EGARCH

To examine volatility dynamics, we estimate an EGARCH (1,1) model with a student-t distribution:

$$log\, log\, (\sigma_t^2) = \omega + \alpha \frac{\epsilon_{t-1}}{\sigma_{t-1}} + \gamma(\frac{|\epsilon_{t-1}|}{\sigma_{t-1}} - \sqrt{\frac{2}{\pi}}) + \beta\, log\, (\sigma_{t-1}^2)$$

The EGARCH model captures asymmetry (γ) and volatility persistence (β). We also examine how lagged EPU affects conditional volatility through HAC-robust OLS regressions on the estimated log-variance.

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

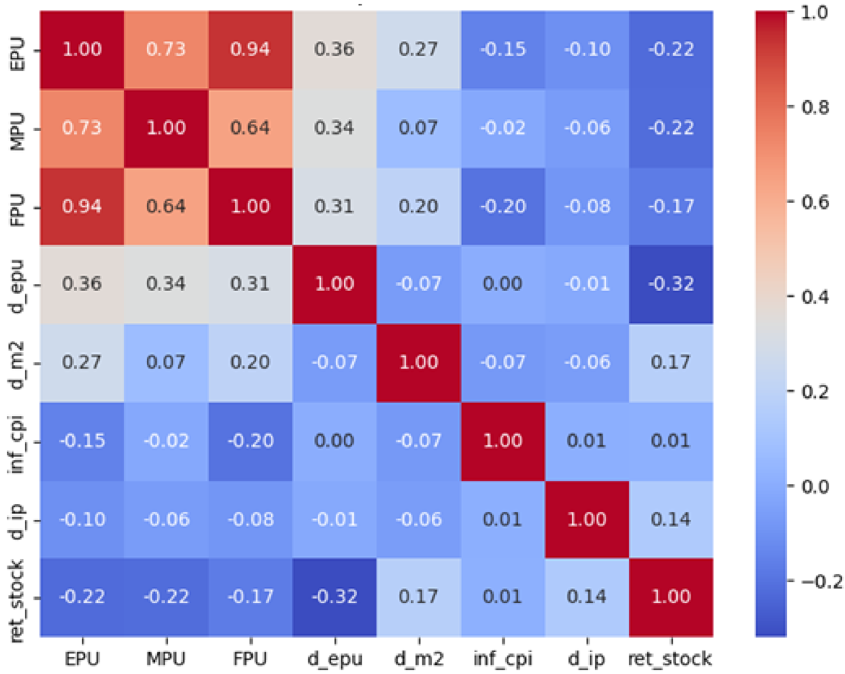

Figure 2: Correlation heatmap of the variables

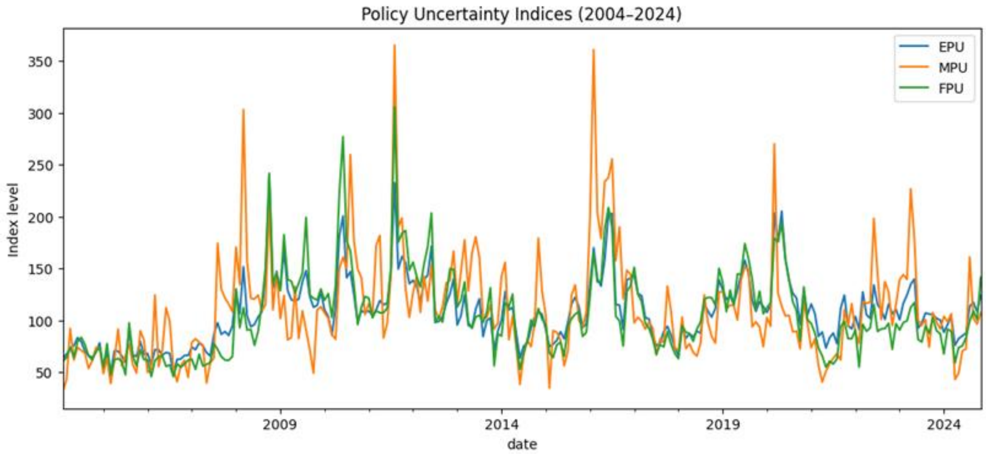

Figure 3: Policy Uncertainty Indices for EPU, MPU And FPU (2004-2024)

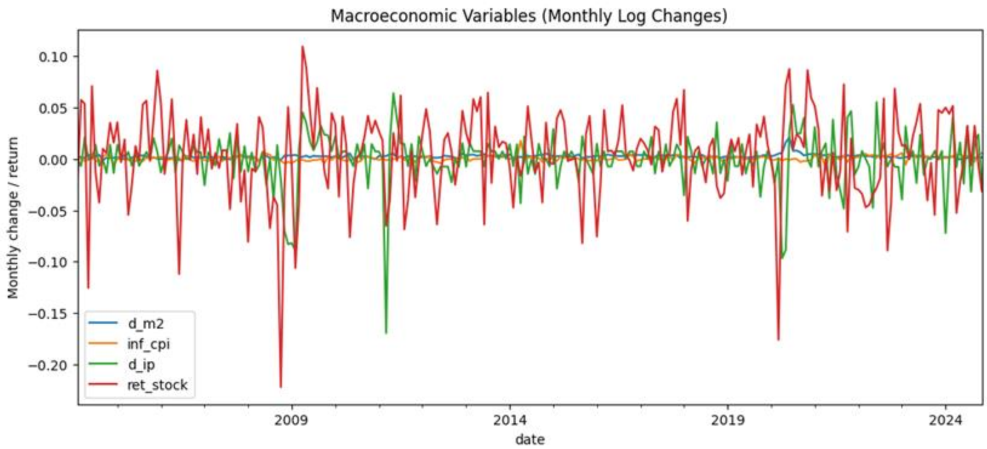

Figure 4: Macroeconomic variables (Monthly Log Changes)

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 selection criteria including the Akaike Information Criterion (AIC), Bayesian Information Criterion (BIC), Final Prediction Error (FPE), and the Hannan–Quinn Criterion (HQIC). As reported in Appendix B, most of these criteria reach their minimum at lag 1, suggesting that a VAR (1) specification is sufficient to capture the underlying dynamics while preserving degrees of freedom.

However, to test the robustness of our results and explore potential delayed effects, we also estimate a VAR (3) model. This dual approach allows us to verify whether the main conclusions hold under alternative lag structures and ensure that our findings are not driven by model specification choices.

VAR Estimation Results

The VAR (1) results show strong persistence in uncertainty indices (EPU, FPU, MPU), consistent with an endogenous uncertainty environment. EPU_{t-1} to $\Delta M2_t$ is positive and significant (coef=0.000034, p=0.002), consistent with a precautionary-liquidity/offsetting-policy channel. EPU_{t-1} to ΔIP_t is negative and significant (coef=−0.000410, p=0.015), in line with wait-and-see investment behavior. Inflation (INF) is only marginally responsive to EPU (p≈0.09), while FPU_{t-1} to INF_t is negative and significant (p=0.005), suggesting fiscal uncertainty dampens near-term price pressure. Stock returns display AR persistence but no direct short-run response to uncertainty. A VAR (3) produces qualitatively similar patterns with some longer-lag effects gaining marginal significance; we keep VAR (1) as the baseline and show VAR (3) IRFs in Appendix C.

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

Regressor	EPU	FPU	MPU	d_m2	inf_cpi	d_ip	ret_stock
const	31.534908 [5.598] ***	23.640282 [3.353] ***	37.242087 [3.481] ***	-0.000361 [-0.887]	0.000740 [1.153]	0.008484 [1.338]	-0.000932 [-0.085]
L1.EPU	0.636391 [4.235] ***	0.189957 [1.010]	0.136385 [0.478]	0.000034 [3.130] **	0.000029 [1.696] *	-0.000410 [-2.424] **	-0.000124 [-0.421]
L1.FPU	0.094955 [0.928]	0.647626 [5.055] ***	0.071679 [0.369]	-0.000014 [-1.888] *	-0.000033 [-2.793] ***	0.000229 [1.984] **	0.000020 [0.101]
L1.MPU	-0.038524 [-0.917]	-0.066809 [-1.270]	0.474263 [5.941] ***	-0.000005 [-1.562]	0.000002 [0.377]	0.000042 [0.878]	0.000114 [1.387]
L1.d_m2	791.173298 [1.059]	299.149946 [0.320]	-489.152133 [-0.345]	0.474873 [8.793] ***	-0.063419 [-0.746]	2.417534 [2.876] ***	1.230141 [0.844]
L1.inf_cpi	133.028215 [0.236]	-243.942539 [-0.345]	-48.596605 [-0.045]	-0.073744 [-1.808] *	0.118127 [1.839] *	0.597131 [0.940]	-0.643794 [-0.585]
L1.d_ip	-72.573465 [-1.294]	-47.781997 [-0.681]	-36.881978 [-0.346]	-0.015690 [-3.869] ***	0.008355 [1.309]	0.078763 [1.248]	0.048297 [0.441]
L1.ret_stock	-21.949991 [-0.628]	-9.667776 [-0.221]	37.201820 [0.560]	0.006052 [2.394] **	0.004059 [1.020]	0.039200 [0.996]	0.157048 [2.302] **

Entries show coefficient with t-stat in brackets.
*Significance: * p<0.10, ** p<0.05, *** p<0.01.*

Impulse Response and Variance Decomposition Analysis

The impulse response functions (IRFs) trace the dynamic effects of a one-standard-deviation shock to EPU and other variables over a 24-month horizon (Figures 5a). The responses of EPU to its own shocks display strong persistence but decay over time, reflecting the mean-reverting nature of policy uncertainty. A positive EPU shock induces a temporary but significant increase in money supply growth, peaking within the first few months before gradually returning to baseline. This suggests that policymakers may respond to heightened uncertainty with accommodative monetary measures. Conversely, industrial production responds negatively and persistently to uncertainty shocks, corroborating the hypothesis that elevated uncertainty depresses real activity. Inflation exhibits a short-lived and modest reaction to EPU shocks, while stock returns show limited sensitivity, with responses quickly dissipating. These results imply that the real sector is more vulnerable to policy uncertainty than asset markets in Japan's context.

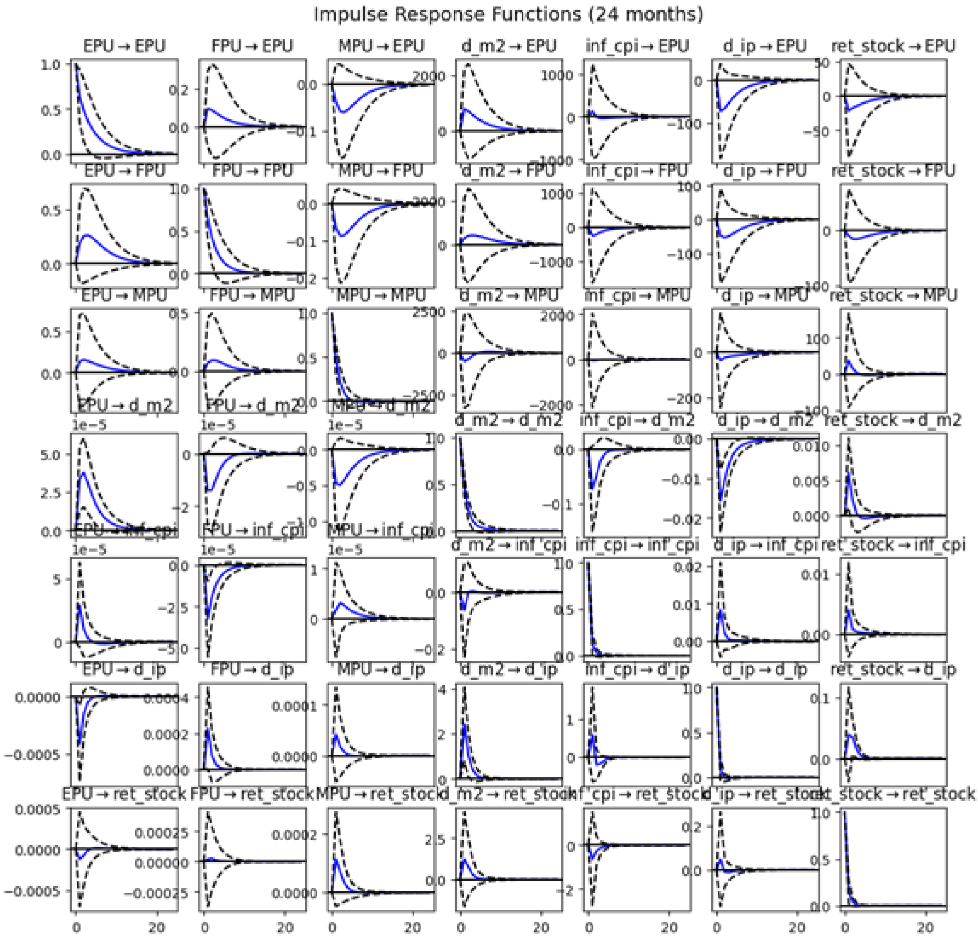

Figure 5a: VAR (1) Impulse Responses

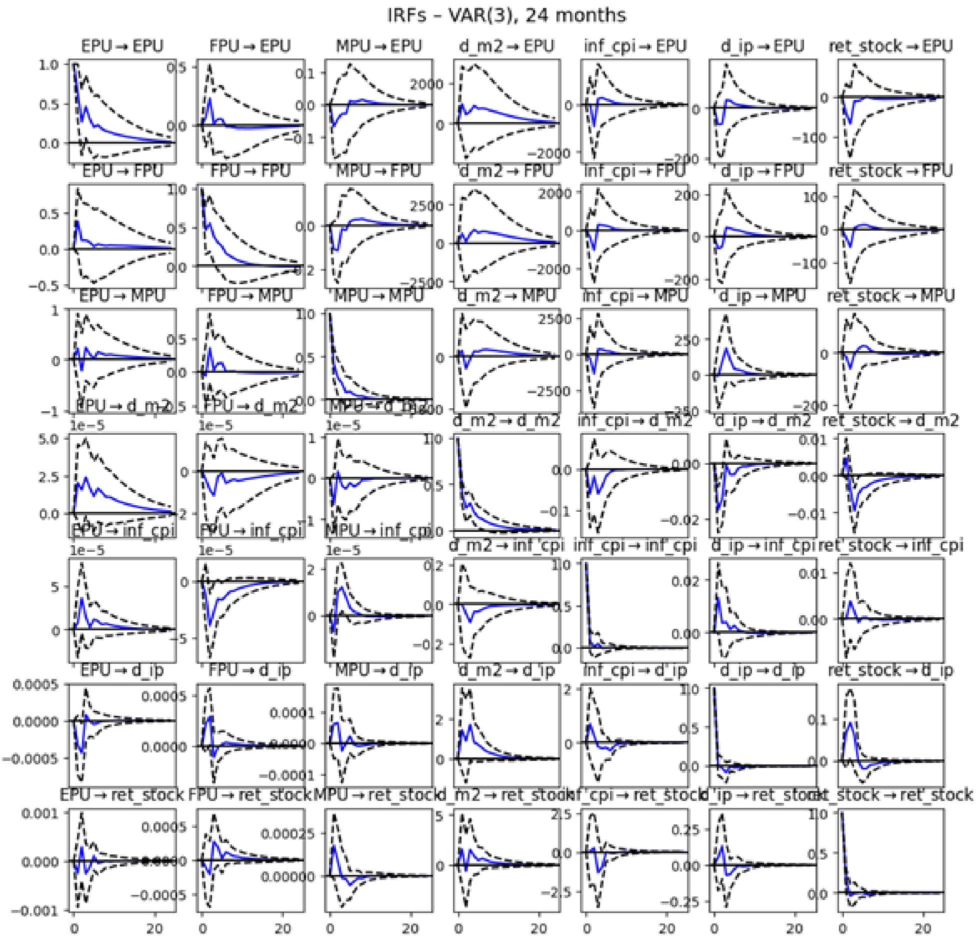

Figure 5b: VAR (3) Impulse Responses (Robustness Check)

Forecast Error Variance Decomposition

The forecast error variance decomposition (FEVD) results (Figures 6) provide further insight into the relative importance of policy uncertainty in explaining macroeconomic fluctuations. EPU's own innovations account for the vast majority of its forecast variance across the horizon, underlining its strong endogenous dynamics. For monetary growth (ΔM2), policy uncertainty explains a non-negligible portion of forecast variance, especially in the short run, highlighting its role as a driver of liquidity conditions. Industrial production variance is also partly attributable to uncertainty shocks, though its dynamics are predominantly self-driven. In contrast, inflation and stock return variances remain largely explained by their own innovations, reflecting weaker transmission from policy uncertainty to these variables.

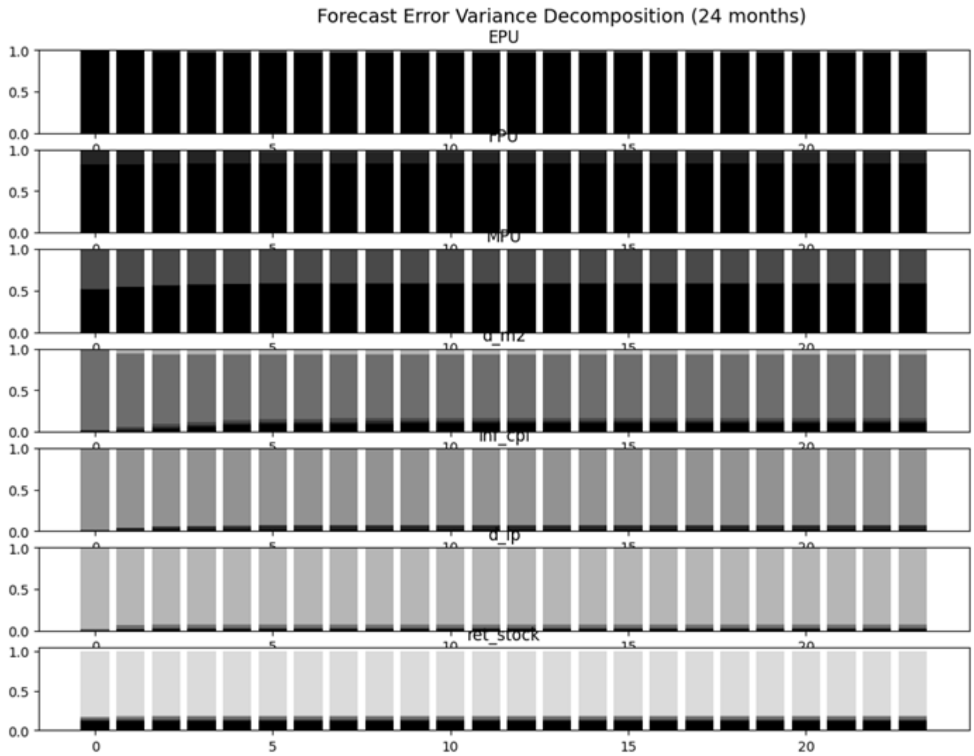

Figure 6: Forecast Error Variance Decomposition (FEVD) – 24 Months Horizon

EPU is highly persistent and significantly influences money supply dynamics and real economic activity. Higher policy uncertainty tends to stimulate monetary expansion while dampening industrial production. Inflation and equity markets exhibit limited sensitivity to policy uncertainty shocks. These results are robust across VAR (1) and VAR (3) specifications, though some effects manifest more strongly over longer horizons.

Volatility Analysis: EGARCH Results

To further investigate the relationship between policy uncertainty and financial market volatility, we estimate an EGARCH (1,1) model with a Student-t distribution of errors. This specification captures asymmetric volatility responses and heavy-tailed shocks, which are particularly relevant in periods of heightened uncertainty. Figure 7 plots the conditional volatility σ_t of Japanese stock returns estimated from the EGARCH (1,1) model with a Student-t distribution. The results reveal persistent fluctuations in volatility throughout the sample period (2004–2024), with pronounced spikes during major episodes of macroeconomic and geopolitical uncertainty, such as the 2008 global financial crisis, the 2011 Tōhoku earthquake, and the COVID-19 shock in 2020. These volatility surges coincide with heightened policy uncertainty, indicating that EPU is associated with elevated financial market turbulence, even though the magnitude of the estimated coefficients remains modest. We then examine how policy uncertainty influences conditional volatility by regressing the log of the estimated EGARCH variance on lagged policy uncertainty indices. Table 3 reports the results of the OLS regressions with heteroskedasticity- and autocorrelation-consistent (HAC) standard errors. Panel A includes the Economic Policy Uncertainty (EPU) index alone, while Panel B adds Monetary Policy Uncertainty (MPU) and Fiscal Policy Uncertainty (FPU) indices as additional explanatory variables. The coefficient of lagged EPU in Panel A is positive (0.0610) but statistically insignificant ($p = 0.205$), suggesting a weak direct relationship between policy uncertainty and conditional volatility. When MPU and FPU are included (Panel B), the coefficient on EPU increases to 0.1359, though it remains statistically insignificant ($p = 0.215$). MPU and FPU both enter with negative but insignificant coefficients, indicating that their independent contributions to volatility are limited in this specification. Across both panels, the R-squared values remain low (0.037 and 0.051, respectively), implying that while uncertainty exerts some influence on dynamic volatility, much of the variation is explained by a broader set of macro-financial forces beyond policy uncertainty alone. These results are consistent with Antonakakis et al. (2013), who emphasize the state-dependent and nonlinear nature of the uncertainty–volatility relationship. Figure 8 further illustrates the relationship between lagged EPU and the log conditional variance from the EGARCH model. Although the fitted line suggests a modest positive association, the dispersion of observations highlights the complexity of the volatility response to uncertainty shocks. These findings point to the nuanced nature of the uncertainty-volatility linkage: while economic policy uncertainty appears to contribute to volatility dynamics, its effect is not statistically robust in isolation. This aligns with the broader literature suggesting that uncertainty interacts with other macroeconomic and financial variables in shaping market volatility. The weak statistical evidence also points to the limitations of univariate GARCH models and suggests that richer specifications such as GJR-GARCH or multivariate DCC-GARCH may better capture asymmetric or spillover effects.

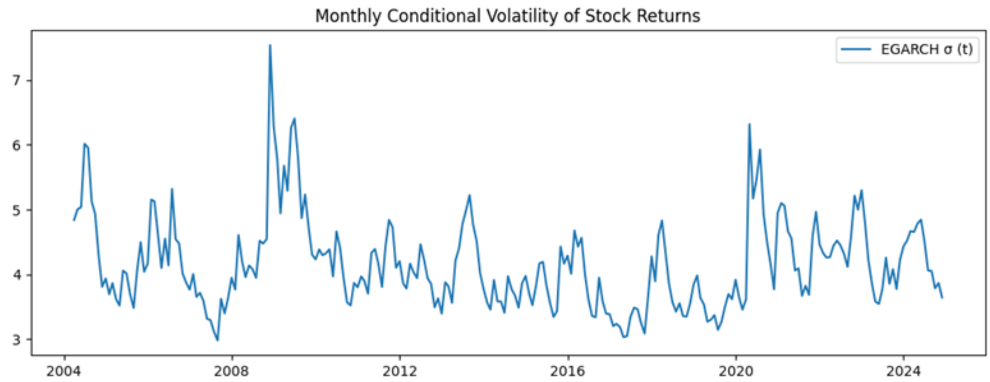

Figure 7. Monthly Conditional Volatility of Stock Returns (EGARCH Model

Table 3. OLS(HAC) Regression Results of log (EGARCH Variance)
Panel A: Regression of log_var on EPU (lag 1)

Variable	Coef	Std. Err.	z	P>|z|	[0.025]	[0.975]
const	2.8223	0.048	59.047	0.000	2.729	2.916
EPU_z_l1	0.0610	0.048	1.267	0.205	-0.033	0.155

Observations: 249 | R-squared: 0.037 | Adj. R-squared: 0.034 | F-statistic: 1.606 | Prob(F): 0.206 | AIC: 125.7 | BIC: 132.8 | Log-Likelihood: -60.868 | Covariance: HAC (12 lags)

Panel B: Regression of log_var on EPU, MPU, FPU (lag 1)

Variable	Coef	Std. Err.	z	P>|z|	[0.025]	[0.975]
const	2.8223	0.046	60.705	0.000	2.731	2.913
EPU_z_l1	0.1359	0.110	1.239	0.215	-0.079	0.351
MPU_z_l1	-0.0540	0.045	-1.209	0.227	-0.142	0.034
FPU_z_l1	-0.0381	0.078	-0.486	0.627	-0.192	0.116

Observations: 249 | R-squared: 0.051 | Adj. R-squared: 0.040 | F-statistic: 0.708 | Prob(F): 0.548 | AIC: 126.1 | BIC: 140.2 | Log-Likelihood: -59.046 | Covariance: HAC (12 lags)

Following the estimation of the EGARCH(1,1) model for stock returns, we examined the hypothesis of a direct, lagged impact of policy uncertainty on financial volatility. We regressed the estimated conditional log-variance on the lagged standardized EPU index, employing HAC standard errors to ensure robust inference. As shown in [Table 3/Appendix D], the coefficient for EPU_z_l1 is positive but statistically insignificant. This finding persists when including the FPU and MPU indices simultaneously, indicating that after accounting for the inherent time-varying volatility dynamics captured by the EGARCH process, the aggregate, lagged policy uncertainty shocks do not exert a significant linear, direct influence on Japanese stock market volatility. This suggests that the impact of EPU on the financial sector is likely conditional, short-lived, or channeled through other mechanisms.

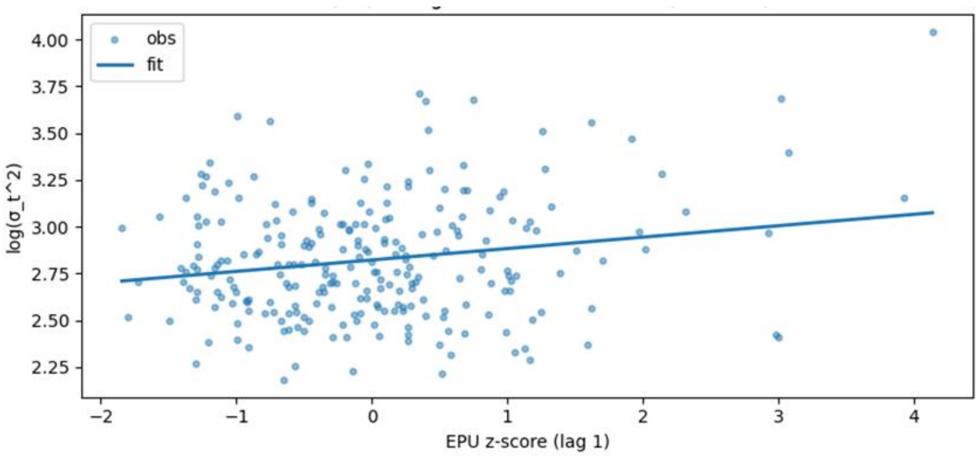

Figure 8: Relationship between EPU (lag 1) and log conditional variance (EGARCH)

Discussion

The empirical results provide new insights into the role of economic policy uncertainty (EPU) in shaping Japan's monetary and macro-financial dynamics. Our VAR estimates show that EPU exerts a statistically significant influence on money supply (M2) dynamics and industrial production, while its impact on inflation is modest and its direct effect on stock returns remains weak. The strong significance of EPU in the money supply equation ($p < 0.01$) suggests that rising uncertainty alters liquidity preferences and precautionary savings behavior, reshaping monetary transmission channels. This finding is consistent with Nusair and Olson (2024), who document asymmetric effects of EPU on money demand in advanced economies, with Japan displaying heightened sensitivity to uncertainty shocks. The negative and significant impact of EPU on industrial production ($p < 0.05$) further indicates that uncertainty dampens real activity by inducing firms to postpone investment and hiring, a result aligned with Zhu and Yu (2022), who emphasize the adverse real-sector effects of uncertainty in China. Fiscal policy uncertainty (FPU) also emerges as a significant factor, underscoring the importance of policy credibility and coordinated fiscal-monetary action for macroeconomic stability. Inflation responds weakly and only marginally to EPU, suggesting that price effects manifest gradually and primarily over longer horizons. These finding complements Athari et al. (2021), who show that EPU influences inflation dynamics in Japan over extended periods. In contrast, stock returns show limited sensitivity to uncertainty shocks, corroborating Chiang (2020), who finds that EPU's effects on Japanese equity markets are largely indirect and short-lived. Turning to volatility dynamics, the EGARCH results reveal that lagged EPU has a positive but statistically insignificant effect on conditional variance ($p \approx 0.20$). Although this implies that uncertainty may contribute to financial market volatility, it is unlikely to be its primary driver. This outcome aligns with Antonakakis et al. (2013), who argue that the EPU–volatility relationship is nonlinear and state-dependent. The evidence underscores the multifaceted role of EPU in Japan's economy. Its influence on monetary dynamics and real activity is robust, while its effects on volatility and asset prices are more nuanced and institutionally conditioned. Relative to Athari et al. (2021) and Sami and Abdelhak (2024), our results suggest that uncertainty's price effects are weaker and slower than its effects on liquidity and output. Compared with Chiang (2020), the influence on equity returns appears indirect and transient. These findings underscore the importance of incorporating uncertainty metrics into macroeconomic analysis and policy design particularly in economies like Japan, where prolonged low interest rates and unconventional monetary policies shape the transmission of uncertainty shocks. As for limitations and Future Research, this study employs linear VAR and univariate EGARCH models, which may not capture nonlinear or regime-dependent relationships. Future research could adopt TVP-VAR, DCC-GARCH, or sign-restricted SVAR frameworks and conduct cross-country comparisons. Exploring alternative uncertainty measures such as geopolitical or financial policy uncertainty could also yield richer insights.

Policy Implications

The findings of this study yield several important policy implications for Japan's monetary and macroeconomic strategy. The significant influence of policy uncertainty on money supply and real activity underscores the importance of clear forward guidance and transparent communication by the Bank of Japan (BoJ) and fiscal authorities. Such measures can mitigate uncertainty, anchor expectations, and enhance the effectiveness of monetary transmission. The joint impact of economic and fiscal policy uncertainty suggests that isolated policy actions risk amplifying uncertainty, whereas a coordinated framework particularly regarding debt management, fiscal stimulus, and interest rate decisions can reduce market ambiguity and strengthen policy credibility. Policymakers should also integrate real-time uncertainty indicators into decision-making processes, enabling timely adjustments to evolving macroeconomic conditions and improving information symmetry for firms and households. Given the statistically weak but non-negligible link between uncertainty and volatility, financial regulators should integrate EPU indicators into stress-testing, macroprudential buffers, and capital planning frameworks. Moreover, the BoJ could enhance forward guidance. (i) Tie forward guidance explicitly to an uncertainty dashboard (EPU/FPU/MPU, survey dispersion) and publish thresholds that trigger re-calibrations. (ii) Under elevated uncertainty, allow yield curve control (YCC) bands to widen counter-cyclically while pairing this with term-premium communication to avoid signaling confusion. (iii) Align japanese government bond (JGB) issuance profiles and fiscal announcements with bank of japan (BoJ) meeting cycles to reduce information gaps. (iv) Integrate EPU metrics into macroprudential stress tests (market-risk and liquidity modules) and time-varying countercyclical buffers.

Conclusions

This paper investigates the impact of economic policy uncertainty on Japan's monetary dynamics and macro-financial environment using monthly data from February 2004 to November 2024. Employing a VAR framework and an EGARCH model, we examine how policy uncertainty influences money supply, inflation, industrial production, and financial market volatility. Our key findings can be summarized as follows:

- Economic policy uncertainty significantly affects money supply dynamics, suggesting that uncertainty alters liquidity preferences and monetary transmission.
- Elevated EPU dampens industrial production, indicating that firms reduce investment and output in the face of policy ambiguity.
- Inflation responds weakly to EPU shocks, consistent with the view that uncertainty affects price dynamics primarily over longer horizons.
- The link between policy uncertainty and financial volatility is positive but statistically weak, pointing to the need for richer volatility modeling frameworks.

These findings contribute to the literature by extending previous work (e.g., Baker et al., 2016; Nusair & Olson, 2024) into the Japanese context and by highlighting how uncertainty interacts with monetary variables in a low-interest-rate, unconventional policy environment. The results underscore that while EPU's effect on money supply and industrial output is robust, its impact on financial volatility is statistically weak, highlighting the complexity of transmission channels and the moderating role of Japan's institutional environment, it is a critical factor that policymakers cannot ignore. This finding reveals the complexity of uncertainty transmission and underscores the moderating role of the Bank of Japan's communication credibility and policy tools in dampening volatility responses. Overall, uncertainty primarily operates through liquidity and real activity in Japan, while volatility effects are weak in univariate models, emphasizing the role of policy design and communication in dampening shock amplification.

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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 Criteria

Lag	AIC	BIC	FPE	HQIC
0	-19.05	-18.94	5.351e-09	-19.00
1	-20.95*	-20.14*	7.943e-10*	-20.62*
2	-20.89	-19.36	8.467e-10	-20.27
3	-20.73	-18.48	9.992e-10	-19.82
4	-20.72	-17.76	1.013e-09	-19.53
5	-20.70	-17.02	1.041e-09	-19.22
6	-20.63	-16.24	1.132e-09	-18.86
7	-20.44	-15.33	1.393e-09	-18.38
8	-20.34	-14.52	1.563e-09	-18.00
9	-20.14	-13.60	1.970e-09	-17.51
10	-20.00	-12.75	2.343e-09	-17.08
11	-19.97	-12.01	2.525e-09	-16.76
12	-20.01	-11.33	2.562e-09	-16.51

Appendix C: VAR (3) Regression Results

Model: VAR
Method: OLS
No. of Equations: 7.00000
Nobs: 247.000
Log likelihood: 257.877
AIC: -20.7063
HQIC: -19.8253
BIC: -18.5182
FPE: 1.02053e-09
Det(Omega_mle): 5.61617e-10

Results for equation EPU

Variable	Coefficient	Std. Error	t-Stat	Prob
const	25.006287	6.823390	3.665	0.000
L1.EPU	0.638167	0.182934	3.489	0.000
L1.FPU	0.061355	0.127236	0.482	0.630
L1.MPU	-0.067043	0.050144	-1.337	0.181
L1.d_m2	973.262415	944.246298	1.031	0.303
L1.inf_cpi	18.448186	596.904338	0.031	0.975
L1.d_ip	-65.454429	59.329208	-1.103	0.270
L1.ret_stock	-41.478603	37.947386	-1.093	0.274
L2.EPU	-0.201836	0.194051	-1.040	0.298
L2.FPU	0.171093	0.135923	1.259	0.208
L2.MPU	0.051476	0.056439	0.912	0.362
L2.d_m2	-414.590195	1016.460385	-0.408	0.683
L2.inf_cpi	-825.215462	583.109677	-1.415	0.157
L2.d_ip	-0.329961	60.865180	-0.005	0.996
L2.ret_stock	-34.649837	37.282533	-0.929	0.353
L3.EPU	0.291118	0.182398	1.596	0.110
L3.FPU	-0.205163	0.128063	-1.602	0.109
L3.MPU	0.011570	0.050821	0.228	0.820
L3.d_m2	318.072806	905.745068	0.351	0.725
L3.inf_cpi	992.662044	579.985291	1.712	0.087
L3.d_ip	101.011418	59.043119	1.711	0.087
L3.ret_stock	43.148118	36.702675	1.176	0.240

Results for equation FPU

Variable	Coefficient	Std. Error	t-Stat	Prob
const	19.531442	8.577054	2.277	0.023
L1.EPU	0.387425	0.229949	1.685	0.092
L1.FPU	0.461157	0.159937	2.883	0.004
L1.MPU	-0.107421	0.063032	-1.704	0.088
L1.d_m2	623.572007	1186.924895	0.525	0.599
L1.inf_cpi	-355.155959	750.313367	-0.473	0.636
L1.d_ip	-57.000597	74.577273	-0.764	0.445
L1.ret_stock	-24.810974	47.700157	-0.520	0.603
L2.EPU	-0.317492	0.243923	-1.302	0.193
L2.FPU	0.317197	0.170857	1.857	0.063
L2.MPU	0.015400	0.070944	0.217	0.828
L2.d_m2	-605.411865	1277.698562	-0.474	0.636
L2.inf_cpi	-819.023887	732.973372	-1.117	0.264
L2.d_ip	19.876850	76.508002	0.260	0.795
L2.ret_stock	-22.283794	46.864432	-0.475	0.634
L3.EPU	0.023307	0.229276	0.102	0.919
L3.FPU	-0.064415	0.160976	-0.400	0.689
L3.MPU	0.088853	0.063883	1.391	0.164
L3.d_m2	452.470914	1138.528552	0.397	0.691
L3.inf_cpi	1159.762281	729.045995	1.591	0.112
L3.d_ip	108.350379	74.217658	1.460	0.144
L3.ret_stock	55.277843	46.135546	1.198	0.231

Results for equation MPU

Variable	Coefficient	Std. Error	t-Stat	Prob
const	26.590739	13.020188	2.042	0.041
L1.EPU	0.223535	0.349069	0.640	0.522
L1.FPU	-0.059984	0.242789	-0.247	0.805
L1.MPU	0.409060	0.095684	4.275	0.000
L1.d_m2	608.545070	1801.782400	0.338	0.736
L1.inf_cpi	-297.194848	1138.994914	-0.261	0.794
L1.d_ip	-9.604167	113.210211	-0.085	0.932
L1.ret_stock	-15.828656	72.410061	-0.219	0.827
L2.EPU	-0.446189	0.370282	-1.205	0.228
L2.FPU	0.394684	0.259365	1.522	0.128
L2.MPU	0.099471	0.107696	0.924	0.356
L2.d_m2	-1775.169297	1939.579151	-0.915	0.360
L2.inf_cpi	-1195.144955	1112.672358	-1.074	0.283
L2.d_ip	120.156018	116.141107	1.035	0.301
L2.ret_stock	-47.141753	71.141409	-0.663	0.508
L3.EPU	0.457744	0.348047	1.315	0.188
L3.FPU	-0.341784	0.244366	-1.399	0.162
L3.MPU	0.044925	0.096976	0.463	0.643
L3.d_m2	747.486054	1728.315511	0.432	0.665
L3.inf_cpi	1156.579062	1106.710498	1.045	0.296
L3.d_ip	152.358258	112.664306	1.352	0.176
L3.ret_stock	36.081977	70.034941	0.515	0.606

Results for equation d_m2

Variable	Coefficient	Std. Error	t-Stat	Prob
const	-0.000126	0.000484	-0.260	0.795
L1.EPU	0.000020	0.000013	1.566	0.117
L1.FPU	-0.000004	0.000009	-0.449	0.654
L1.MPU	-0.000006	0.000004	-1.774	0.076
L1.d_m2	0.404684	0.066984	6.042	0.000
L1.inf_cpi	-0.060747	0.042344	-1.435	0.151
L1.d_ip	-0.016795	0.004209	-3.991	0.000
L1.ret_stock	0.004741	0.002692	1.761	0.078
L2.EPU	-0.000007	0.000014	-0.480	0.631
L2.FPU	-0.000004	0.000010	-0.389	0.697
L2.MPU	0.000008	0.000004	1.875	0.061
L2.d_m2	0.082219	0.072107	1.140	0.254
L2.inf_cpi	0.020707	0.041365	0.501	0.617
L2.d_ip	-0.004104	0.004318	-0.950	0.342
L2.ret_stock	-0.004543	0.002645	-1.718	0.086
L3.EPU	0.000005	0.000013	0.349	0.727
L3.FPU	-0.000001	0.000009	-0.127	0.899
L3.MPU	-0.000001	0.000004	-0.379	0.704
L3.d_m2	0.180522	0.064253	2.810	0.005
L3.inf_cpi	-0.036860	0.041144	-0.896	0.370
L3.d_ip	0.006288	0.004188	1.501	0.133
L3.ret_stock	-0.004952	0.002604	-1.902	0.057

Results for equation inf_cpi

Variable	Coefficient	Std. Error	t-Stat	Prob
const	0.000029	0.000767	0.038	0.970
L1.EPU	0.000008	0.000021	0.380	0.704
L1.FPU	-0.000012	0.000014	-0.855	0.393
L1.MPU	-0.000007	0.000006	-1.196	0.232
L1.d_m2	-0.000533	0.106205	-0.005	0.996
L1.inf_cpi	0.080104	0.067137	1.193	0.233
L1.d_ip	0.013206	0.006673	1.979	0.048
L1.ret_stock	-0.000024	0.004268	-0.006	0.996
L2.EPU	0.000041	0.000022	1.884	0.060
L2.FPU	-0.000036	0.000015	-2.369	0.018
L2.MPU	0.000012	0.000006	1.831	0.067
L2.d_m2	-0.062322	0.114327	-0.545	0.586
L2.inf_cpi	-0.008483	0.065586	-0.129	0.897
L2.d_ip	0.002125	0.006846	0.310	0.756
L2.ret_stock	0.002819	0.004193	0.672	0.501
L3.EPU	0.000003	0.000021	0.168	0.866
L3.FPU	-0.000006	0.000014	-0.396	0.692
L3.MPU	0.000004	0.000006	0.717	0.473
L3.d_m2	-0.115093	0.101874	-1.130	0.259
L3.inf_cpi	0.015086	0.065234	0.231	0.817
L3.d_ip	0.004209	0.006641	0.634	0.526
L3.ret_stock	0.000302	0.004128	0.073	0.942

Results for equation d_ip

Variable	Coefficient	Std. Error	t-Stat	Prob
const	0.008574	0.007680	1.116	0.264
L1.EPU	-0.000331	0.000206	-1.607	0.108
L1.FPU	0.000212	0.000143	1.479	0.139
L1.MPU	0.000061	0.000056	1.087	0.277
L1.d_m2	1.462152	1.062800	1.376	0.169
L1.inf_cpi	0.693244	0.671848	1.032	0.302
L1.d_ip	0.013633	0.066778	0.204	0.838
L1.ret_stock	0.067058	0.042712	1.570	0.116
L2.EPU	-0.000335	0.000218	-1.534	0.125
L2.FPU	0.000235	0.000153	1.536	0.124
L2.MPU	0.000042	0.000064	0.657	0.511
L2.d_m2	0.341186	1.144081	0.298	0.766
L2.inf_cpi	0.376416	0.656321	0.574	0.566
L2.d_ip	-0.024096	0.068507	-0.352	0.725
L2.ret_stock	0.064600	0.041963	1.539	0.124
L3.EPU	0.000209	0.000205	1.017	0.309
L3.FPU	-0.000197	0.000144	-1.364	0.173
L3.MPU	-0.000066	0.000057	-1.157	0.247
L3.d_m2	1.557453	1.019465	1.528	0.127
L3.inf_cpi	-0.059431	0.652804	-0.091	0.927
L3.d_ip	-0.103266	0.066456	-1.554	0.120
L3.ret_stock	0.040943	0.041311	0.991	0.322

Results for equation ret_stock

Variable	Coefficient	Std. Error	t-Stat	Prob
const	-0.004834	0.013260	-0.365	0.715
L1.EPU	-0.000247	0.000355	-0.693	0.488
L1.FPU	-0.000106	0.000247	-0.430	0.668
L1.MPU	0.000178	0.000097	1.823	0.068
L1.d_m2	1.589810	1.834951	0.866	0.386
L1.inf_cpi	0.013439	1.159962	0.012	0.991
L1.d_ip	0.049900	0.115294	0.433	0.665
L1.ret_stock	0.146150	0.073743	1.982	0.047
L2.EPU	0.000471	0.000377	1.249	0.212
L2.FPU	-0.000122	0.000264	-0.463	0.643
L2.MPU	-0.000035	0.000110	-0.320	0.749
L2.d_m2	-1.314950	1.975284	-0.666	0.506
L2.inf_cpi	0.344531	1.133155	0.304	0.761
L2.d_ip	0.129658	0.118279	1.096	0.273
L2.ret_stock	-0.084259	0.072451	-1.163	0.245
L3.EPU	-0.000380	0.000354	-1.072	0.284
L3.FPU	0.000342	0.000249	1.376	0.169
L3.MPU	-0.000064	0.000099	-0.651	0.515
L3.d_m2	1.622512	1.760131	0.922	0.357
L3.inf_cpi	-1.698402	1.127083	-1.507	0.132
L3.d_ip	-0.105164	0.114738	-0.917	0.359
L3.ret_stock	0.014638	0.071324	0.205	0.837

Appendix D: OLS(HAC) Regression Results of log (EGARCH Variance)

Panel A: Regression of log_var on EPU (lag 1)

Variable	Coef	Std. Err.	z	P>|z|	[0.025]	[0.975]
const	2.8223	0.048	59.047	0.000	2.729	2.916
EPU_z_l1	0.0610	0.048	1.267	0.205	-0.033	0.155

Observations: 249 | R-squared: 0.037 | Adj. R-squared: 0.034 | F-statistic: 1.606 | Prob(F): 0.206 | AIC: 125.7 | BIC: 132.8 | Log-Likelihood: -60.868 | Covariance: HAC (12 lags)

Panel B: Regression of log_var on EPU, MPU, FPU (lag 1)

Variable	Coef	Std. Err.	z	P>|z|	[0.025]	[0.975]
const	2.8223	0.046	60.705	0.000	2.731	2.913
EPU_z_l1	0.1359	0.110	1.239	0.215	-0.079	0.351
MPU_z_l1	-0.0540	0.045	-1.209	0.227	-0.142	0.034
FPU_z_l1	-0.0381	0.078	-0.486	0.627	-0.192	0.116

Observations: 249 | R-squared: 0.051 | Adj. R-squared: 0.040 | F-statistic: 0.708 | Prob(F): 0.548 | AIC: 126.1 | BIC: 140.2 | Log-Likelihood: -59.046 | Covariance: HAC (12 lags)