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No Longer a Safe Haven Currency? A Fresh Evidence of Japanese Yen under Uncertainty

Summary: This paper aims to study the safe haven attribute of the Japanese yen under domestic and U.S. economic and policy uncertainty (EPU). Because of the existence of structural changes, a bootstrap rolling window subsample causality test is used to enhance the credibility of the results. The empirical results confirm that the exchange rate returns (RER) and Japanese EPU are correlated in specific periods when major economic or political events occur. In most crisis periods, the Japanese EPU has positive effects on RER, and the yen appreciates when the EPU is increasing. In addition, the RER of the yen and U.S. EPU are both negatively and positively connected. This finding confirms the hedging function of the yen in certain periods. The reason for this relationship is that Japan's low interest rates make the yen the primary funding currency in speculative carrying trade strategies, and thus, it tends to appreciate during crisis periods regardless of the origins of the EPU shocks. Therefore, the yen can be held as a safe haven currency unless the government intervenes artificially.

Keywords: Japanese yen, Economic policy uncertainty, Exchange rate, Bootstrap rolling window causality test, Safe haven.

JEL: C32, E52, F31.

The Japanese economic policy uncertainty (EPU) experienced several rounds of soaring in recent decades. The Japanese yen (JPY) maintained its superior performance in times of extreme market events, such as the global financial crisis and the European debt crisis. Consequently, the JPY has been regarded as a safe haven currency in terms of its effectiveness in hedging financial stress (Xin Cheng, Hongyi Chen, and Yinggang Zhou 2021). That is, an asset that offers hedging benefits is uncorrelated or negatively correlated with the performance of the economy. Subsequently, the safe-haven attribute of the JPY has also been demonstrated during the Great East Japan Earthquake and global COVID-19 pandemic. However, with the escalation of the crisis between Russia and Ukraine in 2022, the JPY showed a dramatic downwards trend, with a 13% depreciation within one quarter. Specifically, the JPY reached the lowest level in 20 years, from 115 yen/dollar in early 2022 to 130 yen/dollar on May 11. Therefore, the risk-off characteristic of the JPY in periods of turmoil has been called into doubt, arousing our attention.

To mitigate the negative influence of exchange rate fluctuations on the Japanese economy, foreign exchange market interventions are conducted as needed. Such fluctuation is an essential part of the transmission mechanism in the determination of economic policy because movements in exchange rates significantly affect a country's foreign trade and international capital investments. Furthermore, since Japan and the U.S. are close economic and political partners, EPU in either the home country or the U.S. increases exchange rate volatility for integrated industrial economies (Robert Krol 2014). Hence, we investigate how the exchange rate of the JPY responds to the uncertainty of Japan and the U.S. to verify the safe-haven attribute of the JPY.

We contribute to the literature by tracing the recent large fluctuations of JPY under uncertainty. The JPY performed strongly during the COVID-19 pandemic but demonstrated weakness during the Russia and Ukraine conflict, which is the opposite of the performance of the U.S. dollar. This paper investigates some possible reasons underlying this phenomenon. Furthermore, we apply a time-varying technique in the causality test between EPU and the exchange rate returns (RER) in Japan. This method reveals how such relationships vary over time in subsample periods and helps us judge when the JPY has the hedging attribute.

1. Literature Review

Concerns about policy uncertainty have intensified in the wake of the global financial crisis, trade conflicts, and COVID-19 pandemic. Scholars have shown great interest in the measurement of uncertainty. The Chicago Board Options Exchange (CBOE) Volatility Index (VIX) is usually regarded as a measure of market uncertainty (Ihsan Badshah, Riza Demirer, and Muhammad Tahir Suleman 2019; Ladislav Kristoufek 2020). Additionally, implied stock market volatility can also be a benchmark for economic uncertainty. For instance, the volatility of the S&P 500 stock market is a measurement for U.S. uncertainty, whereas the Nikkei stock average volatility is an indicator of uncertainty in Japan (Giray Gozgor 2014; Aviral Kumar Tiwari, R. K. Jana, and David Roubaud 2019). However, the most popular index for EPU is proposed by Scott R. Baker, Nicholas Bloom, and Steven J. Davis (2016). They develop a newspaper-based approach to measuring economic uncertainty.

The impact of EPU on economic and financial variables has been widely discussed. Uncertainty can affect precautionary spending by raising pressure on the cost of finance (Lubos Pastor and Pietro Veronesi 2012) and increasing managerial risk aversion (Vasia Panousi and Dimitris Papanikolaou 2012). Sanjai Bhagat, Pulak Ghosh, and Srinivasan P. Rangan (2013) find that gross domestic product (GDP) and fixed investment are negatively related to EPU because higher uncertainty causes firms to pause or prolong their investment (Bloom, Stephen Bond, and John Van Reenen 2007). Jonathan Brogaard and Andrew Detzel (2015) have recently proven that EPU affects equity by increasing the risk premium. However, David Su et al.'s (2016) results fail to confirm that the uncertainty of the economic policy influences the real estate market, although the feedback is obvious. Although Bitcoin returns are negatively associated with EPU, the effect is positive and significant at both lower and higher quantiles of Bitcoin returns and EPU (Ender Demir et al. 2018; Chi-Wei Su et al. 2022a). In addition, EPU also influences the connectedness of financial assets, especially in periods of turmoil (Zheng-Zheng Li et al. 2019; Li, Su, and Meng Nan Zhu 2022).

From the perspective of theoretical research, Craig S. Hakkio and Douglas K. Pearce (1985) highlight that the foreign exchange market receives an array of information, including changes in economic policies, economic fundamentals, social and political conditions and financial market sentiment. Such information will lead to the exchange rate becoming sensitive to economic variables. Thus, they conclude that a particular relationship between the exchange rate and economic policy changes exists. Robert J. Hodrick (1989) distinguishes the role of uncertainty in explaining the exchange rate determination based on the partial and general equilibrium model. Specifically, when uncertainty is high, domestic agents prefer to invest in assets denominated in the foreign currency, implying that the value of the domestic currency relative to the foreign currency depreciates (Gianluca Benigno, Pierpaolo Benigno, and Salvatore Nisticò 2012).

Empirically, Mehmet Balcilar et al. (2016) use the nonparametric causality-in-quantiles test and point out that EPU does not affect exchange rate returns in either high or low quantiles in Japan. Yosuke Kido (2016) analyses the spillover effects of EPU in the U.S. shock on real effective exchange rates. The researcher finds that the correlations between the EPU and high carry currencies, such as the Australian dollar, Korean won and Mexican peso, are consistently negative, and these correlations are intensified during recession periods. Zachary Bartsch (2019) analyses high-frequency data and finds that dollar-pound exchange rate volatility is more sensitive to U.K. EPU than to U.S. EPU. In contrast, the opposite evidence is provided by Valentina Colombo (2013). Furthermore, Benigno, Benigno, and Nisticò (2012) propose that an increase in uncertainty does not necessarily lead to currency depreciation, explaining that uncertainty may improve the hedging properties of the currency, thus leading to a rise in its demand and consequent appreciation. Liming Chen, Ziqing Du, and Zhihao Hu (2020) confirm that Europe and Japan EPUs display inverted-U-shaped correlations with exchange rate volatility in China. Panpan Wang, Yishi Li, and Sixu Wu (2022) determine that the rising U.S. EPU amplifies the renminbi exchange rate return volatility, and volatility spillover is further enhanced by trade friction.

Previous literature has conducted a few investigations regarding Japan's EPU and exchange rate, a critical topic for an export-oriented economy. Foreign trade became the primary recovery area in the Japanese economy during the COVID-19 pandemic period. Furthermore, the latest research does not concentrate on the unconventional changes in the JPY exchange rate in May 2022. A dramatic downward trend with a 13% depreciation of JPY has occurred in the foreign exchange market. This phenomenon has attracted our interest in providing fresh evidence on the interaction between EPU and the exchange rate in Japan. In addition, extant researchers have ignored the time-varying characters in their analyses (Joscha Beckmann and Robert Czudaj 2015). Most literature only considers the conventional causality relationship and is susceptible to unstable results because of structural changes in the time series. In recent decades, Japan has experienced economic restructuring and structural changes in its economic policy. Considering the presence of structural changes, the dynamic links between the two series will show instability across different subsamples. Moreover, previous studies have not considered U.S. EPU. The U.S. maintains close economic, political, and military cooperation with Japan. Thus, uncertainty from the U.S. may influence the JPY exchange rate.

2. Theoretical Model

In terms of supply, EPU may indicate changes in national policies during periods of financial turmoil. Generally, the authorities implement an easing monetary policy, leading to an increase in supply and a decrease in RER. From the demand side, the transmission mechanism between EPU and RER can be obtained through the general equilibrium model (Pastor and Veronesi 2012). Suppose that there is an economy with a continuum of foreign exchange rate investors *i* ($i \in [0,1]$) and a finite horizon [0, T]. All investors continue to invest linearly in JPY, and the return of JPY (RER_t^i) is arbitrary. The equation of capital accumulation of investor *i* is $\mathrm{d}A_t^i = A_t^i dRER_t^i$, where A_t^i indicates the capital stock of investor *i* when the time is *t*. Then, we can construct the equilibrium model as Equation (1):

$$dRER_t^i = (g + u_t)\mathrm{dt} + \beta_0 dZ_t + \beta_1 dZ_t^i \quad t \in [0, T], \tag{1}$$

where g is a constant, and β_0 and β_1 are the observable coefficients. $Z_t$is a Brownian motion, and Z_t^i is an independent Brownian motion for investor *i*. u_t indicates that government economic policy affects the average profitability process of each investor. u^{old} refers to the effects of current economic policy. Suppose the policy can be adjusted at time $\mathcal{t}$ ($0 < \mathcal{t} <$ T); the government should decide whether to change it. If the government changes the current economic policy, the effects replace u^{old} with u^{new}. This process can be expressed as follows:

$$u_t = \begin{cases} u^{old}\ for \quad t \le \mathcal{t} \\ u^{old}\ for\ \ t \le \mathcal{t}\ if\ the\ government\ does\ not\ change\ the\ policy. \\ u^{new}\ for\ t \le \mathcal{t}\ if\ the\ government\ changes\ the\ policy \end{cases} \tag{2}$$

When $t = 0$, both u^{old} and u^{new} subject to $u \sim \mathrm{N}(0, \sigma_u^2)$. Then, EPU can be expressed by σ_u. While we can observe that u^{old} and u^{new} differ considerably, the size of the difference between these two values cannot be determined. Hence, the general equilibrium model states that EPU exerts certain impacts on RER, but the direction cannot be identified. If RER can be positively affected by EPU, it indicates that JPY can be considered a safe-haven currency, since its return will increase during periods of high policy uncertainty and *vice versa*.

3. Methodology

In the VAR model, statistics such as the likelihood ratio (LR) and the Lagrange multiplier (LM) may not have standard asymptotic distributions because structural changes always exist in a time series (Christopher A. Sims, James H. Stock, and Mark W. Watson 1990). Therefore, Hiro Y. Toda and Taku Yamamoto (1995) propose a modified Wald test, which acquires a standard asymptotic distribution for the Wald test by estimating an augmented VAR model with *I*(1) variables. However, this test fails in small and medium samples per the Monte Carlo simulations. Ghazi Shukur and Panagiotis Mantalos (2000) consider the critical values of the residual-based bootstrap (RB) method, and Balcilar, Zeynel Abidin Ozdemir, and Yalcin Arslanturk (2010) confirm its effectiveness without considering whether the two variables are cointegrated. The RB method is particularly excellent for standard asymptotic tests and power and size properties in small-sample corrected LR tests. Thus, we choose the RB-based modified LR statistic.

Firstly, the VAR process can be written as follows:

$$y_t = \varphi_0 + \varphi_1 y_{t-1} + \cdots + \varphi_p y_{t-p} + \varepsilon_t, t = 1,2, \dots, T, \tag{3}$$

where y_t follows a zero mean, independent, white noise process with nonsingular covariance matrix, and optimal lag length p can be obtained from the Schwarz Information Criteria (SIC). By splitting into two sub-vectors as the following:

$$\begin{bmatrix} EPU_{1t} \\ RER_{2t} \end{bmatrix} = \begin{bmatrix} \varphi_{10} \\ \varphi_{20} \end{bmatrix} + \begin{bmatrix} \varphi_{11}(L) & \varphi_{12}(L) & \varphi_{13}(L) \\ \varphi_{21}(L) & \varphi_{22}(L) & \varphi_{23}(L) \end{bmatrix} \begin{bmatrix} EPU_{1t} \\ RER_{2t} \\ US_{3t} \end{bmatrix} + \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{bmatrix}, \tag{4}$$

where *US* is the controlling variable, denoting the EPU index of U.S. $\varphi_{ij}(\mathrm{L}) = \sum_{k=1}^{p+1} \varphi_{ij,k} L^k$, L is the lag operator ($L^k x_t = x_{t-k}$).

We test the null hypothesis that the RER does not Granger cause the EPU by imposing the restriction where $\varphi_{12,k} = 0$, k=1, 2, 3, …, s. The null hypothesis that the EPU does not Granger cause the RER can be similarly tested. Thus, if the null hypothesis is rejected, the RER significantly Granger causes the EPU.

The VAR model obtains that the parameters are constant, which may be incorrect if structural changes exist. This error will lead to unstable causal links (Balcilar and Ozdemir 2013). Thus, we test the stability of parameters in both the short and long terms. Short-term parameter stability can be evaluated by the Sup-*F*, Mean-*F* and Exp-*F* tests (Donald W. K. Andrews 1993). We also use the *Lc* test from Jukka Nyblom (1989) to examine whether the long-term parameters are stable. These tests are calculated from the sequence of LR statistics, which examine the stability of parameters versus the alternative of a single structural break at an unknown point. Andrews (1993) notes that statistics require 15% trimming from both ends of the sample to test the stability of the parameters in the short-term. Thus, the fraction of the sample in (0.15, 0.85) is needed.

There are two advantages of using the rolling-window bootstrap method. First, a rolling window applies when the causal link between variables is time-varying. Second, a rolling method is unstable in different subsamples because structural changes exist. The rolling window techniques rely on fixed-size subsamples sequentially rolling from the beginning to the end of the full sample (Balcilar, Ozdemir, and Arslanturk 2010). Suppose the rolling window includes m observations; then, we can obtain T-s subsamples, that is, τ-s+1, τ-s..., T for τ= s, s+1..., T. Every subsample can be estimated, and the RB-based modified-LR test can ensure the accuracy of the results. The time-varying causality between RER and EPU can be intuitively observed by calculating the bootstrap p-values of these estimations. We utilize the rolling method to obtain many estimations; their average ($N_b^{-1} \sum_{21,k}^{p} \hat{\varphi}_{21,k}^{*}$, $N_b^{-1} \sum_{12,k}^{p} \hat{\varphi}_{12,k}^{*}$) is defined as the impact of the EPU and the RER, which are the explained variables. In addition, N_b^{-1} is the repetitions of the bootstrap, and both $\hat{\varphi}^*_{21,k}$ and $\hat{\varphi}^*_{12,k}$ are bootstrap estimates from the VAR models. In the confidence interval of 90%, the lower and upper limits equal the 5^{th} and 95^{th} quantiles of each bootstrap estimate (Balcilar, Ozdemir, and Arslanturk 2010).

4. Data

We choose the monthly data of the real effective exchange rate (REER) and the EPU index ranging from January 2000 to March 2022, which are sourced from the Federal Reserve Bank of St. Louis. Japan's EPU index is constructed by four major Japanese newspapers (Yomiuri, Asahi, Mainichi and Nikkei) that contain at least one term in each of three categories: (E) "economic" or "economy"; (P) "tax", "government spending", "regulation", "central bank" or certain other policy-related terms; and (U) "uncertain" or "uncertaint" (Economic Policy Uncertainty 2019)[1]. Therefore, Japan's EPU index primarily reflects the changes in economic uncertainty related to Japanese policies. The U.S. EPU index is similarly constructed[2]. Figure 1 displays the evolution of EPU in Japan and the U.S. and the REER of the JPY. According to Figure 1, the fluctuations of these two EPU indices are approximately synchronized. The EPU in Japan and the U.S. grew high at the beginning of the 21^{st} century due to the collapse of the dot-com bubble. Then, the U.S. EPU hit a historical peak during the global financial crisis in 2008 and the consequent economic recession. At the same time, Japan encountered frequent presidential turnover between 2007 and 2012, causing EPU to spike. Such changes were compounded by the Fukushima earthquake and nuclear accident in 2011 and the following aggressive economic reforms by Prime Minister Abe. The global trade tension in 2018 and the COVID-19 pandemic in 2020 affected both the EPU indices for both Japan and the U.S. (Su et al. 2022b).

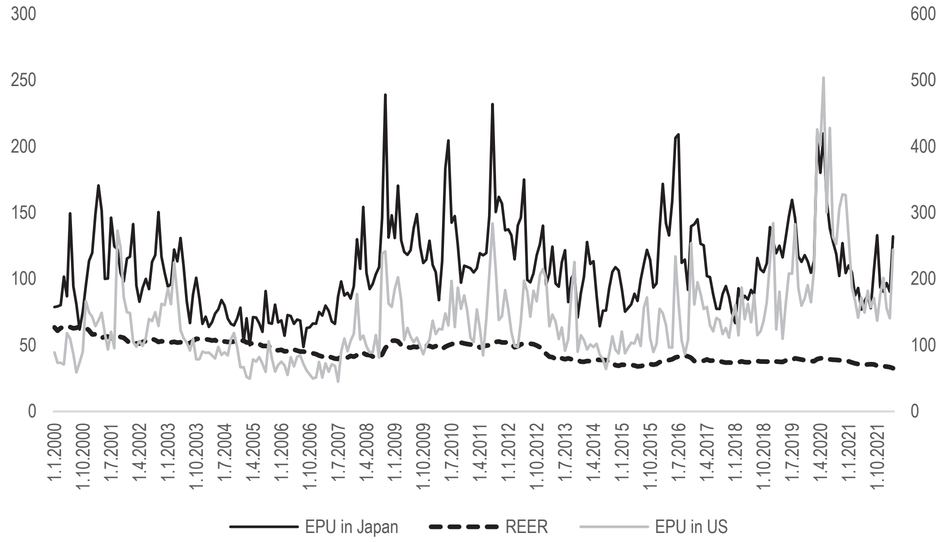
The REER is obtained as weighted averages of bilateral exchange rates adjusted by relative consumer prices, reflecting the currency's actual value (James R. Lothian 2016). To ensure the stationarity of the exchange rate, we take the logged differences, which is known as the exchange rate returns (RER) of the JPY in the empirical research. From Figure 1, we find that the REER of the JPY experienced significant fluctuations during the sample periods. Following the JPY peak in 2001, it weakened over the next few years. When the Japanese economy witnessed the global financial crisis in 2008, the JPY demonstrated relatively stable performance, since one of the "Abenomics"[3] targets was to weaken the JPY to stimulate exports and the global economy by issuing excessive money and implementing loose monetary policy (Rishi Goyal and

[1] **Economic Policy Uncertainty.** 2019. Economic Policy Uncertainty Index. https://www.policyuncertainty.com/ (accessed January 12, 2019).

[2] EPU in U.S. is an index of search results from 10 large newspapers (USA Today, the Miami Herald, the Chicago Tribune, the Washington Post, the Los Angeles Times, the Boston Globe, the San Francisco Chronicle, the Dallas Morning News, the Houston Chronicle, and the WSJ).

[3] "Abenomics" refers to a new, unconventional economic policy regime in Japan since late 2012 (Shin-ichi Fukuda 2015). It consists of the three arrows: unconventional monetary policy (the first arrow), expansionary fiscal policy (the second arrow), and economic growth strategies to encourage private investment (the third arrow).

Ronald McKinnon 2013). After averaging 79 JPY per dollar in the first 10 months of 2012, the JPY weakened rapidly against the dollar over the next few years to 120 JPY per dollar (Joshua K. Hausman and Johannes F. Wieland 2014). The turmoil caused by the Brexit event and global trade tension led the JPY to rebound, presenting its predominant safe-haven function. Furthermore, the recent COVID-19 pandemic did not suppress the status of the JPY in the foreign exchange market. However, a significant depreciation has occurred in the JPY since May 2022, when the Bank of Japan (BOJ) maintained low interest rates, in sharp contrast to the U.S. interest rate hike. Supply-side disruptions stemming from the global pandemic and the war in Ukraine coupled with the weak JPY drove up domestic commodity prices. The JPY slid to its lowest level in 20 years, going above 130 per U.S. dollar.



Notes: The EPUs correspond to the left y-axis; and REER corresponds to the right y-axis.

Source: Authors' calculations.

Figure 1 Trend of REER and EPUs

5. Empirical Result

Table 1 highlights summary statistics for the variables. The EPUs for both Japan and the U.S. have taken natural logarithms. As shown, the mean, maximum values and standard errors of EPU in the U.S. are larger than those in Japan. This result suggests that the EPU index in the U.S. fluctuates more sharply than in Japan. Additionally, the kurtosis in the RER and U.S. EPU are larger than 3, indicating that they are leptokurtotic rather than normally distributed. The Jarque-Bera test results suggest that the RER series are approximately nonnormal distributions. The three series are stationary based on the unit root test.

Table 1 Descriptive Statistics

Series	Mean	Max.	Min.	SD	Skewness	Kurtosis	Jarque-Bera
EPU in Japan	4.634	5.476	3.885	0.292	0.141	2.895	1.001
RER	-0.002	0.106	-0.068	0.021	0.375	5.357	67.862***
EPU in U.S.	4.830	6.222	3.802	0.427	0.296	3.205	4.372

Notes: *** denotes significance at 1%.

Source: Authors' calculations.

When structural changes are considered, the parameters in the VAR model will vary with time, leading to an unstable relationship. Therefore, there is a default assumption in the previous literature that structural changes do not exist in time series (Su et al. 2022c). For this purpose, this paper primarily tests for parameter stability and examines the structural changes. The Sup-*F*, Mean-*F* and Exp-*F* tests are used to assess the temporal stability of the parameters in the VAR models. The *Lc* test of Nyblom (1989) is also used to test all parameters in the overall VAR system. The corresponding results are reported in Table 2. The Sup-*F* tests under the null hypothesis of parameter constancy against a one-time sharp shift in parameters are reported in the first row. The results suggest that a one-time sharp shift exists in the EPU, RER and U.S. equations at the 1% level and exists in the VAR system at the 5% level. The Mean-*F* and Exp-*F* tests under the null hypothesis that parameters follow a martingale process against the possibility that the parameters may evolve gradually are presented in the second and third rows, respectively. The results suggest that the equations of the EPU, RER, U.S. and the VAR system may vary gradually with time. The *Lc* tests against the alternative that the parameters follow a random walk process, which indicates that the parameters are nonconstant in the overall VAR models. Overall, these results provide robust evidence that short-term instability exists in the parameters of the estimated VAR model.

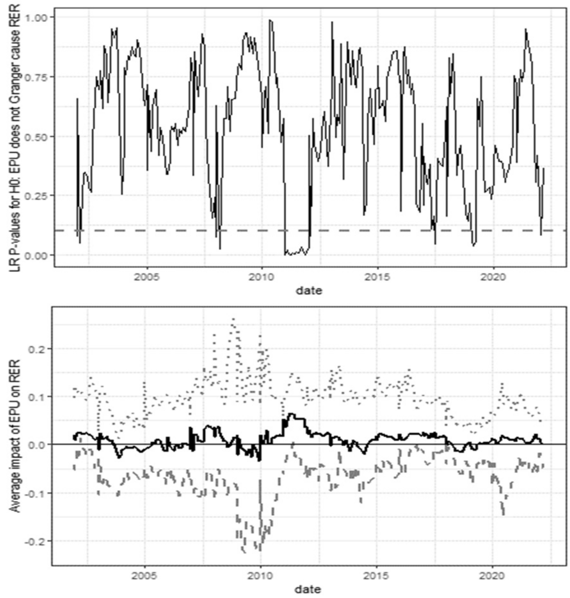
Table 2 Parameter Stability Tests

	EPU equation		RER equation		U.S. equation		VAR system	
	Statistics	*p*-value	Statistics	*p*-value	Statistics	*p*-value	Statistics	*p*-value
Sup-F	35.568***	0.000	29.796***	0.002	26.556***	0.009	47.211**	0.021
Mean-F	14.025***	0.001	8.538	0.233	12.703**	0.027	30.200**	0.027
Exp-F	13.412***	0.000	10.816***	0.004	9.979***	0.008	19.753**	0.021
L_c^b							5.302**	0.013

Notes: We calculate *p*-values using 10,000 bootstrap repetitions. ** and *** denote significance at 5 and 1 percent, respectively. Hansen-Nyblom (L_c^b) parameter stability test for all parameters in the VAR System jointly. Residual-based bootstrap *LR* causality Tests are used to account for small-sample bias.

Source: Authors' calculations.

In the subsample rolling window causality test, we employ *RB*-based modified-*LR* causality tests to examine the causal relationship between the RER and EPU. The null hypothesis of the tests is that EPU does not Granger cause RER and *vice versa*. A 24-month window size is selected to ensure the accuracy of the model estimates and the representativeness of the method over the subsample periods based on Monte Carlo simulations (Hashem M. Pesaran and Allan Timmermann 2005).

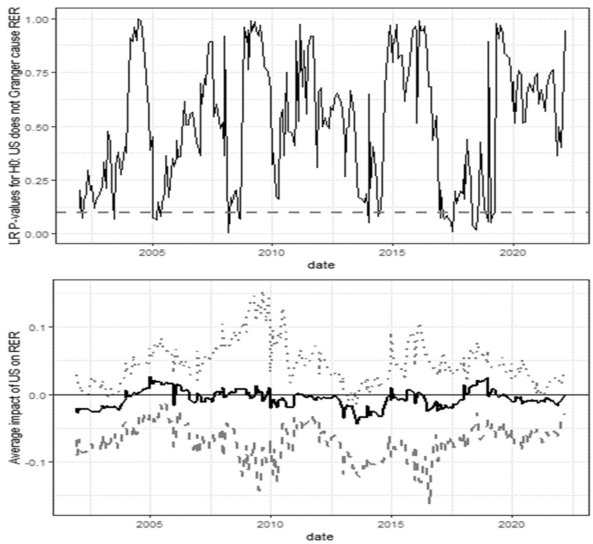


Notes: The EPU of U.S. is considered as the controlling variable.

Source: Authors' calculations.

Figure 2 Bootstrap p-values and Coefficients for the Japanese EPU and RER

Figure 2 shows the rolling bootstrap of the *LR* statistics' *p*-values and the impact magnitudes using the RER as a dependent variable in Japan, where the U.S. uncertainty index is a controlling variable. According to the *p*-values of *LR* statistics, the null hypotheses can be rejected when the rolling bootstrap of the *p*-value is less than 10 percent. We further observe that the null hypothesis is rejected in 2008:01-2008:02, 2012:01-2013:02 and 2018:12-2019:02, indicating that EPU has a significant effect on RER in these periods. Based on the second figure, we can determine that the average impact of EPU on RER is positive in these periods. Although the model controls for the uncertainty index of the U.S., the impact of the subprime mortgage crisis in the U.S. was propagated to the Japanese economy through international trade. Japan's trade dependence has increased since the early 2000s, and it is particularly vulnerable to negative demand shocks originating externally (Masahiro Kawai and Shinji Takagi 2011). The economy was adversely impacted by the 2008 recession, increasing domestic EPU. Specifically, the Japanese annual GDP growth rate in 2009 was -5.5% due to the severe decline in real exports of 26.2% (Naohisa Hirakata et al. 2016). However, since its low interest rate and strong net foreign asset position were maintained, Japan's relatively resilient financial system initially alleviated the direct external impact (Kawai and Takagi 2011). The JPY strengthened in the sharp financial market deterioration period starting from September 2008, with over 20 percent appreciation, behaving as a safe-haven currency in the global financial market crisis (Dimitrios Dimitriou and Dimitris Kenourgios 2013). The Japanese government adopted a three-pronged approach ("Three Arrows of Abenomics") to revive the economy through flexible fiscal policy, aggressive monetary easing, and bold structural reforms to raise long-term growth. One pillar of Abenomics called on the BOJ to print unlimited quantities of the JPY to reach its inflation target. The JPY subsequently depreciated against the U.S. dollar (Willem Thorbecke 2022). Generally, investors' activity in carrying trade strategies exerted an enormous impact on foreign exchange market volatility. High capital inflow to countries with higher interest rates contributed to their currency appreciation. In turn, high outflow of capital from countries with a low interest rate led to a significant currency depreciation. The combination of a decline in global risk aversion, the larger trade deficit, and the widening of the expected interest rate differential with the U.S. contributed to a depreciation of the JPY by close to 30 percent, effectively, between July 2012 and September 2013. More recently, the JPY depreciated substantially until the onset of the "tapering" discussions in the United States in May 2013. In quiet periods, the JPY has generally served as a carry trade funding currency and has tended to depreciate against higher-yielding currencies. In regard to 2018M12-2019M02, EPU rose again amid concerns about developments in China, a new negative interest rate policy, the Brexit referendum, consumption tax hike delays, and intensifying trade policy tensions in 2018 and 2019 (Elif C. Arbatli et al. 2022). The JPY acted as a safe-haven currency because investors tended to buy JPY and reduce overseas investment to diminish risk.



Notes: The EPU of Japan is considered as the controlling variable.

Source: Authors' calculations.

Figure 3 Bootstrap p-values and Coefficients for the U.S. EPU and RER

According to Figure 3, U.S. uncertainty has significant effects on the JPY RER in 2017:01-2018:12. During the sample period, the correlation between U.S. uncertainty and the JPY RER was both negative and positive, suggesting that when the uncertainty increased, the JPY RER first decreased and then increased. After Donald Trump became the U.S. president, uncertainty increased as tax reductions and global trade wars increased. However, the JPY showed a downwards trend because of domestic ultraloose monetary policy. Since the tariff conflict between U.S. and China had been intensifying, trade frictions had spread to the U.S. with other North American Free Trade Agreement (NAFTA) members, Europe, East Asia and practically the rest of the world (Dan Steinbock 2018). The tariffs placed on China limited their export volume to the U.S., which increased the opportunity for Japan to export a larger volume of its products. In that case, Japan increased the U.S. dollar inflow, which increased the value of the JPY. This situation explains the positive comovement between U.S. uncertainty and the JPY RER.

6. Conclusion and Implication

The objective of this paper is to investigate the safe-haven attribute of the JPY under uncertainty. In recent decades, Japan has experienced a series of economic fluctuations. The global financial crisis and the subsequent natural disasters in 2011 exercised a significant shock to the JPY exchange rate. Although the JPY appreciated during the global financial crisis, exports were severely overpriced, which was intensified by the global economic recession. The government budget deficit-to-GDP ratio has reached 200% (Naoyuki Yoshino and Farhad Taghizadeh-Hesary 2014). The Japanese economy requires a stimulus to escape from a severe pattern of slow growth in the long-term. Prime Minister Abe’s administration carried out economic reform in 2013, depreciating the JPY. Since then, the JPY has acted as a safe-haven currency during Brexit, trade wars and the COVID-19 pandemic. However, the JPY showed a dramatic downwards trend in May 2022 when the crisis between Russia and Ukraine began. Considering the nonlinear characteristics of EPU and the exchange rate due to significant economic and political events, we infer that the time series may have structural breaks that will lead to unstable results. By employing the parameter stability examination, we confirm that short-run instability exists in the parameters of the estimated VAR model. Therefore, the bootstrap subsample rolling window causality test method is a superior choice when the parameters are nonconstant.

On the one hand, the RER and Japanese EPU are correlated in specific periods, where the U.S. uncertainty is defined as the controlling variable. Specifically, in 2008:01-2008:02, 2012:01-2013:02 and 2018:12-2019:02, there are positive effects of EPU on RER, which conform to the risk-off attribute of the JPY. On the other hand, the impact of U.S. uncertainty on RER in 2017:01-2018:12 is both negative and positive. This finding confirms the safe-haven function of the JPY in certain periods because Japan's low interest rates make it the primary funding currency in speculative carrying trade strategies, and, consequently, the JPY tends to appreciate during crisis periods regardless of EPU shock origin.

Based on the results, the following implications can be inferred. First, the JPY tends to appreciate when uncertainty rises. Thus, the JPY seems to be an excellent example of a safe-haven currency that serves as a hedge for global investors during crisis periods. In the case of economic turmoil, such as the bursting of asset price foam and the tense international trade environment, the Japanese yen can be held as a safe-haven currency. However, this does not always obtain in practice. The government usually implements easing monetary policy to deal with economic recession and actively devalues the currency. In this case, the risk-off character of the JPY no longer exists, which applies to the depreciation of the JPY during the Russian-Ukrainian war. Furthermore, uncertainty from the U.S. can influence the RER of the JPY because of the two countries' close partnership. This finding provides evidence for preventing international exchange rate risk spillovers. Finally, we find that the exchange rate is an essential indicator for affecting EPU. Therefore, the BOJ could implement interventions to the exchange rate to influence the public's expectation to enable EPU to stabilize the economy.

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