

Do monetary policy and macroeconomic fundamentals matter under high uncertainty? Evidence from Renminbi exchange rate regimes

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Abstract

Purpose — This study examines the nonlinear effect of Economic Policy Uncertainty (EPU) on China's Renminbi (RMB) exchange rate.

Methods — Based on the monetary model of exchange rate determination and the behavioural equilibrium exchange rate model, a threshold autoregressive model was estimated with EPU as the threshold variable. Quarterly data from Q1 2005 to Q4 2023 were utilised.

Finding — Under different regimes, the effects of EPU, monetary factors, and macroeconomic factors on the exchange rate are nonlinear. The study also reveals significant differences in the volatility characteristics of exchange rate misalignment under low and high EPU conditions, supporting the hypothesis that EPU has a nonlinear impact on the exchange rate. Furthermore, when EPU is low, external shocks exert a stronger impact on the exchange rate than when EPU is high.

Implications — These results suggest that governments and policymakers can help investors anticipate market shifts by increasing policy transparency and reducing unnecessary policy changes, thereby maintaining economic stability.

Originality — By integrating EPU into a framework combining the monetary model and the BEER model and estimating a nonlinear threshold model, this study provides new evidence on exchange rate dynamics and misalignment under varying EPU regimes.

Keywords — Economic Policy Uncertainty, Exchange Rate, Monetary Model, BEER Model, Threshold Autoregressive Model.

Introduction

The exchange rate (ER), which affects trade balances and macroeconomic stability, is the main channel between a nation's domestic and global markets (Abere, 2025; Cong et al., 2025; Kim et al., 2025). ER movements have been explained by several theoretical models, most of which are based on macroeconomic principles. The complexity of ER fluctuations, especially in reaction to shocks of economic uncertainty, is difficult for these current models to adequately explain (Msomi & Ngalawa, 2024). To develop a more comprehensive framework that accounts for the influence of both EPU¹ and conventional macroeconomic factors on ER fluctuations, this study integrates EPU into two established ER models. The first is the model of the Monetary Model of Exchange

¹ Economic policy uncertainty (EPU) refers to the inability of entities to predict future economic policies or the risks and consequences of policies adopted by the government (Nguyen et al., 2025; M. Zhang & Du, 2025).

Rate Determination (hereafter MM-ERD). Originally proposed by [Dornbusch \(1976\)](#) and [Frenkel \(1976\)](#), it establishes a relationship between ER and economic factors such as relative currency supply, interest rates, income levels, and inflation differentials. The second model is the Behavioural Equilibrium Exchange Rate (BEER) Model, proposed by [Clark and MacDonald \(1999\)](#), which estimates the equilibrium ER by incorporating other economic variables such as terms of trade (ToT), productivity differences, and foreign assets ([Ca' Zorzi & Rubaszek, 2023](#)). Therefore, integrating the two can consider both theory and practicality.

As China's economy has become increasingly integrated into the global financial system, its ER system has undergone several reforms ([Table 1](#)). Prior to 1994, China maintained a fixed ER system; following 1994, the country transitioned to a floating ER mechanism. In line with China's globalisation, it has continued to implement periodic ER reforms (e.g., in 2005 and 2015) to achieve ER marketisation. These structural adjustments, coupled with external shocks, motivate this study to investigate the dynamics of the RMB ER in response to EPU. In the context, traditional linear models, such as the Autoregressive Distributed Lag (ARDL) model, fail to capture actual dynamics, whereas nonlinear models, such as the threshold autoregressive (TAR) model, can better reflect asymmetric effects under different EPU regimes ([Msomi & Ngalawa, 2024](#); [Tong & Lim, 1980](#)). To capture the nonlinear effect, this study uses a TAR model.

Table 1. China's exchange rate system across different periods

Time	RMB Exchange Rate System
Before 1994	Fixed ER system with strict controls.
1994	Managed float ER system, pegged to the USD.
2005.7.21	ER is based on market supply and demand, adjusted for a portfolio of currencies.
2015.8.11	A basket of currencies serves as the primary benchmark for assessing the ER.
2016	"Counter-cyclical factor + basket currency ER fluctuation" two-factor pricing model.
2017	"Counter-cyclical factor + basket currency ER fluctuation + pro-cyclical factor" three-factor pricing model.

Source: People's Bank of China (PBoC)

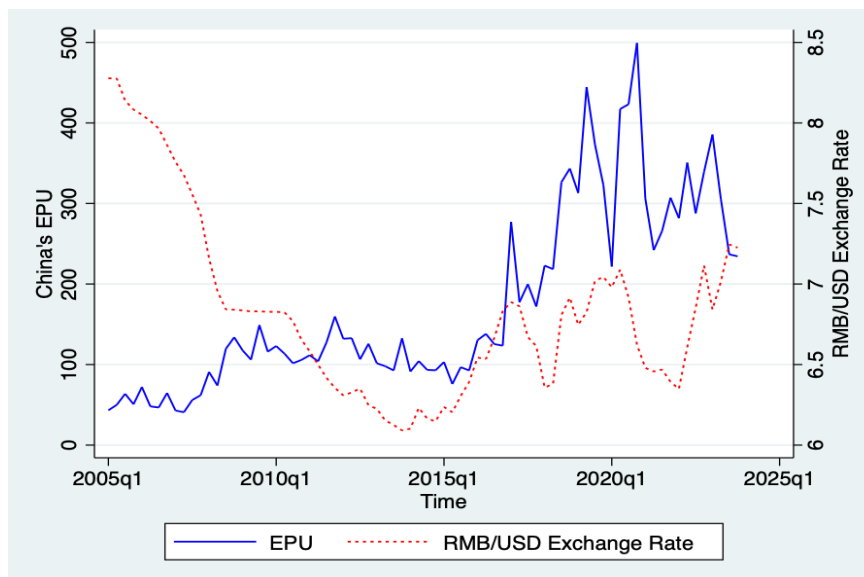


Figure 1. RMB/ USD exchange rate and China's EPU

Due to domestic as well as foreign economic uncertainties, the RMB ER has become more volatile in recent years ([Zhang & Huang, 2025](#)). [Figure 1](#) illustrates how important policy events—the 2005 and 2015 ER reforms, the rise of US-China trade tensions in 2018, and the global COVID-19 outbreak in 2020—caused notable fluctuations in the RMB/USD ER, increasing currency valuation uncertainty. EPU, a popular indicator of policy-driven economic unpredictability, can capture these events ([Wang, 2024](#)). In other words, the ER varies with the EPU ([Figure 1](#)).

ER can be affected by EPU in a few ways. First, it directly affects currency valuations, thereby raising risk premiums in global foreign exchange markets (Glebocki & Saha, 2024). Second, it influences investor expectations, leading to changes in ER adjustments and in speculative behaviour (Baker et al., 2016; Bernanke, 1983; Dixit, 1989; Kim et al., 2025). Thirdly, it affects international capital flows. Increased uncertainty frequently leads to fluctuations in foreign direct investment or capital flight (Goswami et al., 2023; Liu, 2024). The RMB ER continues to move away from its symmetrical point due to the factors noted above.

Thus, we hypothesise that RMB ER misalignment from its equilibrium state can result from changes in the ER system, economic shocks, and other factors (Edwards, 1989; Holtemöller & Mallick, 2013). Enterprise output is affected by this misalignment, prompting investors and practitioners in the global foreign exchange market to reduce risk by "waiting-and-seeing" (X. Wang, 2024). Thus, consistent with (Wen & Usman, 2024b) This study uses the BEER method to investigate the nonlinear effects of various EPU conditions on the RMB ER.

The existing literature supports the view that monetary variables drive ER fluctuations. For example, Chin et al. (2009) confirmed the cointegration relationship between monetary variables and the RMB/USD ER, both before and after the crisis, indicating that the MM-ERD significantly explains how Malaysia's ER is determined. However, many studies indicate that changes in monetary variables alone are insufficient to fully explain ER fluctuations. For example, Afat et al. (2015) found that deviations from PPP prevent the MM-ERD from establishing the predicted relationship between monetary factors and ER. To address these shortcomings, economists developed a series of equilibrium ER models in the 1980s and beyond, including the BEER model. However, the BEER model is essentially an empirical approach (Clark & MacDonald, 2004). As a result, using the BEER model alone to explain ER variation lacks a theoretical basis. To overcome the limitations, this study combines the MM-ERD model with the BEER framework. The former offers a theoretical foundation for the latter, while the latter addresses the former's shortcomings regarding the monetary determinants of ER fluctuations. A comprehensive and inclusive explanation of ER movement is made possible by this integrated approach.

However, previous studies have also provided evidence that traditional economic variables are insufficient to explain ER fluctuations, as they fail to capture policy changes and market expectations (Msomi & Ngalawa, 2024). Incorporating EPU into estimates of ER fluctuations can improve the explanatory power and predictive accuracy of macroeconomic models (Abid, 2020). Meanwhile, many studies have confirmed a direct linear relationship between EPU and ER (Gong et al., 2025). However, there is limited research on the nonlinear effects in this relationship, particularly using a model that combines the MM-ERD and BEER models.

The main contributions of this study are as follows. First, it integrates macroeconomic and monetary factors and considers the impact of the EPU, thereby constructing a more comprehensive ER determination model and enriching the literature on ER modelling. Second, it provides a more accurate analysis of dynamic adjustment processes by using a nonlinear approach to capture the nature of ER fluctuations. Third, it examines RMB ER misalignment under different EPU conditions, generating empirical evidence to support policies that maintain ER equilibrium and mitigate risks in foreign exchange markets. Finally, the findings provide a theoretical basis for investment decisions of foreign exchange market participants and production decisions of international enterprises.

The remaining sections of this paper, in order, review the relevant literature, describe the methodological framework, present the results of data analysis, and lastly, discuss the findings with appropriate policy recommendations.

Methods

Model Specification

According to the MM-ERD, the ER can be explained by four key factors: income, inflation, money supply, and interest rate (all in relative terms) (Chin, Azali, & Matthews, 2007; Chin, Azali, Yusop,

et al., 2007; Korap, 2024; MacDonald & Taylor, 1991). The functional relationship of this model is expressed as:

$$e_t = (m_t - m_t^*) - \alpha(y_t - y_t^*) + \theta(r_t - r_t^*) + \lambda(\pi_t - \pi_t^*) \quad (1)$$

Here, e_t represents the RMB/USD ER, while π_t , m_t , y_t , and r_t denote the inflation level, money supply, output level, and interest rate, respectively, in the domestic country. Similarly, π_t^* , m_t^* , y_t^* , r_t^* represent the corresponding variables in the foreign country. In this study, China was the domestic country, while the US represented the foreign country.

As explained previously, to overcome the shortcomings of individual methods, this study analysed the ER by integrating the MM-ERD and the BEER model. Based on previous research, two fundamental macroeconomic variables from the BEER model were selected: ToT (Wen & Usman, 2024a) and foreign exchange reserves (FER) (Abid, 2020; Aizenman et al., 2024). The new model is expressed as follows:

$$e_t = \alpha_1 + \alpha_2(m_t - m_t^*) + \alpha_3(y_t - y_t^*) + \alpha_4(r_t - r_t^*) + \alpha_5(\pi_t - \pi_t^*) + \alpha_6 FER_t + \alpha_7 TOT_t \quad (2)$$

Following (Msomi & Ngalawa, 2024), this study then introduced EPU into the new model to address the limitations of traditional economic variables in reflecting policy changes and market expectations. The final model, which combines the monetary variables with the macroeconomic fundamentals from the BEER model and considers EPU as an influencing factor, is below:

$$e_t = \alpha_1 + \alpha_2(m_t - m_t^*) + \alpha_3(y_t - y_t^*) + \alpha_4(r_t - r_t^*) + \alpha_5(\pi_t - \pi_t^*) + \alpha_6 FER_t + \alpha_7 TOT_t + \alpha_8 EPU_t \quad (3)$$

Measurement of Exchange Rate Misalignment

The degree of temporary ER misalignment refers to the deviation between the actual effective ER and its equilibrium level. Aligning with previous research (Banerjee & Goyal, 2021), this study adopted the BEER approach to calculate exchange rate misalignment (ME) using the following expression:

$$ME_t = \frac{e_t - \hat{e}_t}{\hat{e}_t} \quad (4)$$

Where, e_t is the RMB/USD ER, \hat{e} is the equilibrium ER.

Data and Variables

Table 2 presents the descriptive analysis results of the variables, based on quarterly data from Q1 2005 to Q4 2023. The data's starting point was set as 2005 due to the beginning of China's "managed ER system" that year, meaning that ER data after this period better reflects the impact of EPU.

The dependent variable was the ER, denoted as e . Its maximum, minimum, and average values are 8.277, 6.091, and 6.831, respectively (Table 2). Additionally, the independent variable is the China EPU² Index. It was developed by (Davis et al., 2019). The index extracts relevant EPU-related information by analysing news media and newspaper reports. Its highest recorded value of 499.200, its minimum of 40.800, and its average of 173.425 (Table 2).

Regarding the control variables, Δm , Δi , Δy , and $\Delta \pi$ respectively represent the differences in money supply, interest rates, output levels, and inflation between China and the US. China's money supply was measured via M2 data obtained from the CEInet Statistics Database, while US M2 data was sourced from the Federal Reserve Economic Data (FRED). Interest rates were derived from the three-month (90-day) Treasury bond yield for China and the three-month U.S. Treasury yield for the U.S., both sourced from the U.S. Federal Reserve. China's and the US's output levels were measured using GDP, with data sourced from the International Financial Statistics. For inflation, the CPI growth rate was the proxy for both countries, with data obtained

² The data was obtained from the following website: https://policyuncertainty.com/china_monthly.html.

from the International Monetary Fund. Finally, FER and ToT represent China's FER and ToT (total exports/total imports), acquired from the CEInet Statistics Database.

Table 2. Descriptive statistics

	Variable	Obs	Mean	Std. dev.	Min	Max
Dependent variable	e	76	6.831	0.567	6.091	8.277
Independent variables/Threshold variable	EPU	76	173.425	114.210	40.800	499.200
Control variables	Δm	76	6919.395	6956.037	-3291.600	19640.900
	Δi	76	2.006	2.43384	-2.9233	6.113
	Δy	76	1.23E+07	7592378	934001	2.80E+07
	$\Delta \pi$	76	-0.057	1.260	-2.966	2.497
	FER	76	27448.660	9021.847	6418	39853
	ToT	76	1.222	0.101	0.992	1.485

Estimation Methods

Threshold Autoregression (TAR) Model

This study applied the TAR model by [Tong and Lim \(1980\)](#) to examine the EPU-ER relationship using the new integrated MM-ERD-BEER Model. The TAR model allows changes in the dynamics of a time series when a threshold is exceeded, effectively capturing asymmetric, nonlinear, or transitional patterns that linear models may miss. The models used in this study are as follows:

$$e_t = \alpha_1 + \theta_1 X_t + \lambda_1 EPU_t + \epsilon_{1,t}, EPU_t \leq q \quad (5)$$

$$e_t = \alpha_2 + \theta_2 X_t + \lambda_2 EPU_t + \epsilon_{2,t}, EPU_t > q \quad (6)$$

Where e_t is the RMB/USD ER, X_t is a set of control variables, such as monetary variables, FER, and ToT; EPU_t is China's EPU, and q is the threshold value. When $\lambda_1 \neq \lambda_2$, there is a threshold. While α_1 and α_2 are the intercepts, $\epsilon_{2,t}$, $\epsilon_{2,t}$ are error items.

Threshold Effect Test

Before estimating the TAR model, it is crucial to verify the existence of threshold effects to ensure that the model accurately captures nonlinear patterns. This study uses the likelihood ratio test to assess the existence and statistical significance of the threshold effect and calculates the F-statistic to determine whether the threshold model fits the data better than the linear model. The formula for this test is as follows:

$$F = \frac{(SSR_{linear} - SSR_{single}) / (k_1 - k_0)}{SSR_{single} / (n - k_1)} \quad (7)$$

Where SSR_{linear} represents the sum of squared residuals of the linear model and SSR_{single} represents the sum of squared residuals of the single-threshold model. n denotes the sample size, k_0 is the total number of parameters in the linear model, and k_1 is the total number of parameters in the threshold model, including the intercept, non-interaction terms, and interaction terms. If the F-statistic is small, the increased fit from the single-threshold model is insignificant, such that the null hypothesis of "non-existent threshold effect" cannot be rejected.

If the F-statistics are substantial, the threshold effect is statistically significant. In this case, the fit between the single- and double-threshold models is further compared using the LR Test Statistic. Its calculation is as follows:

$$F = \frac{(SSR_{single} - SSR_{double}) / (k_2 - k_1)}{SSR_{double} / (n - k_2)} \quad (8)$$

Where SSR_{single} represents the sum of squared residuals of the single-threshold model, and SSR_{double} represents the same for the double-threshold model. k_2 is the total number of parameters in the double-threshold model.

Results and Discussion

Unit Root Test

This study employed the Augmented Dickey-Fuller unit root test to examine the stationarity of each time series variable. As shown in Table 3, the series for EX and Δi were not stationary at the level. However, after first-order differencing, both variables become stationary. Therefore, their first-order differences—denoted as dex and $d\Delta i$, respectively—were used in subsequent analyses. In addition, $\Delta\pi$, FER, and ToT reject the unit root under the constant specification at the 1% significance level. Δy rejects the unit root at the 1% significance level, EPU and Δm reject the unit root at the 5% significance level, under the trend specification.

Table 3. Results of the unit root test

Variables	Constant without trend		Constant with the trend
	Level	First dif.	Level
EX	0.089	0.000***	0.867
EPU	0.200	-----	0.023**
Δm	0.977	-----	0.021**
Δi	0.840	0.000***	0.986
Δy	0.828	-----	0.000***
$\Delta\pi$	0.000***	-----	-----
ToT	0.000***	-----	-----
FER	0.001***	-----	-----

Note: ***, **, * indicate critical values at 1%, 5%, and 10% significance levels, respectively.

Threshold Analysis

This study's main aim was to examine ER changes under different conditions of EPU; accordingly, EPU was set as the threshold variable. Table 4 presents the threshold-effect findings from the likelihood ratio test. For the single-threshold model, the null hypothesis of no threshold effect was rejected at the 1% significance level, confirming the presence of nonlinearity and thus the suitability of the TAR model. Next, Equation (8) was used to test the double-threshold model, and the null hypothesis was not rejected at the 5% significance level. Since the double-threshold effect was excluded, this study adopted a single-threshold TAR model.

Table 4. Threshold effect results

Threshold	F-statistics	P-value	Estimated threshold value
Single	4.130	0.001	159.745
Double	2.264	0.132	-----
Robustness	chi2(1)	Prob > chi2	
Breusch-Pagan test	1.480	0.223	
Durbin-Watson test	0.090	0.764	

Table 5 summarises the results for the two different EPU states. Regime 1 indicates that the EPU is in a low state. Regime 2 indicates that the EPU is in a high state. The results indicate that in Regime 1, China's EPU has a significant positive impact on the RMB/USD ER. From Table 5, we can see that for every 1% increase in EPU, the RMB/USD ER rises by around 0.1%, indicating RMB depreciation. This finding aligns with Abid (2020), who observed that an increase in EPU leads to currency depreciation. Table 5 also indicates that Δm is significantly correlated with the RMB/USD ER. And it also shows a significant correlation between Δm and the RMB/USD ER. It means that when China's money supply grows faster than the US money supply, the RMB tends to depreciate. This supports the findings of (Chin, Azali, Yusop, et al., 2007), who found that relative money supply directly affects the nominal ER of the peso against the US dollar.

In Regime 1, Δi has a significant negative impact on the RMB/USD ER. It means that rising interest rates led to RMB appreciation. For every 1% increase in the relative interest rates between

China and the US, the RMB/USD ER will decrease by 2.4%. This may be because rising interest rates attract capital inflows, thereby strengthening the domestic currency ER. Similarly, [Chin, Azali, and Matthews \(2007\)](#) and [Msomi and Ngalawa \(2024\)](#) found that, ceteris paribus, interest rate growth and currency appreciation generally move together. Although the same negative influence on ER was observed for Δy at low EPU, this effect was not statistically significant. In other words, higher levels of GDP decrease the RMB/USD ER and appreciate the RMB, but not enough to be statistically significant. This finding supports the work of [Korap \(2024\)](#), who also noted a non-significant yet long-term negative correlation between relative income and the nominal ER.

Table 5. TAR model and linear regression results

Parameter estimation	Regime 1 (EPU ≤ 159.745)	Regime 2 (EPU > 159.745)	Linear Regression
_cons	0.002 (0.152)	6.625 (2.409)	-0.254 (0.201)
EPU	0.001* (0.001)	-0.001 (0.001)	-0.001 (0.001)
Δm	0.001** (0.001)	-0.001 (0.001)	-0.001 (9.30E-06)
d Δi	-0.024* (0.014)	-0.082 (0.051)	-0.065*** (0.020)
Δy	-3.00E-09 (1.18E-08)	4.38E-08** (1.76E-08)	1.56E-08* (9.23E-09)
$\Delta \pi$	0.001 (0.008)	-0.046 (0.032)	0.003 (0.012)
FER	-7.43E-06** (2.82E-06)	-0.000198** (0.001)	2.00E-06 (2.48E-06)
ToT	0.030 (0.111)	-0.890 (0.599)	0.091 (0.159)

Note: Standard errors are in parentheses; ***, **, * indicate critical values at 1%, 5%, and 10% significance levels, respectively.

Next, [Table 5](#) shows that $\Delta \pi$ has no significant effect on the RMB/USD ER. This contradicts the Sticky Price Monetary Model's theoretical proposition that the relative inflation rate between China and the US is associated with RMB depreciation. [Chin et al. \(2009\)](#) reported a similar outcome on the ringgit-dollar nominal ER, attributing it to price rigidity. The impact of inflation on ER typically has a considerable lag; its short-term effects are not statistically significant. The results further indicate that, under Regime 1, China's FER has a significant negative impact on the RMB/USD ER and promotes RMB appreciation. [Aizenman et al. \(2024\)](#) also reached the same conclusion: a higher FER will strengthen the ER of the domestic currency. Finally, at Regime 1, [Table 5](#) shows that improvements in China's ToT led to a depreciation of the RMB, although this result is not statistically significant. This result may support [Clark and MacDonald \(1999\)](#) view that improvements in ToT generally lead to an appreciation of the domestic currency.

Meanwhile, Regime 2 shows that interest rates and FER have a significant negative impact on ER, consistent with the situation under low EOU. Although inflation and the ToT have opposite effects on ER under high EPU, these effects are not statistically significant. In Regime 2, the negative impact of relative inflation on ER was not significant. This can be attributed to China's effective control over inflation expectations. According to [Wang & Wang \(2015\)](#), China's "expectation management" policy in 2009 enhanced the central bank's ability to control changes in inflation expectations, thereby strengthening market confidence in the RMB and promoting its appreciation. The advancement of the ER system also appears to have contributed to the RMB's appreciation. For ToT, its improvement appears to lead to RMB appreciation. Although not significant, this result agrees with the findings of [Abid \(2020\)](#), when the ToT of Mexico, Brazil, and India improved, their currencies also appreciated.

In conclusion, many variables in Regime 1—such as EPU, money supply, interest rates, FER, and inflation—generally follow BEER theory and conventional monetary models. However, in Regime 2, the signs of most variables become insignificant or their directions "reverse". The linear regression results, shown in Table 5, indicate that EPU has no significant impact on ER. This suggests that if EPU exceeds a certain threshold, the linear relationships predicted by the classical monetary model and the BEER framework no longer fully hold. Therefore, the use of the TAR model can better capture ER changes under varying EPU conditions and, consequently, facilitate timely interventions to maintain ER stability.

Exchange Rate Misalignment

In the second part of the analysis, this study investigated the degree of misalignment of the RMB ER, calculated as the difference between the equilibrium ER (estimated through the BEER approach) and the actual ER. Figure 2 plots the different levels of ER misalignment under the two EPU regimes, where the solid blue line represents low EPU and the red dotted line represents high EPU. Each data point corresponds to the misalignment from the regime (Regime 1: $EPU \leq 159.745$; Regime 2: $EPU > 159.745$) to which the observation belongs. The results show that the volatility of ER misalignment varies significantly under EPU conditions, supporting the hypothesis that EPU has a nonlinear effect on ER misalignment.

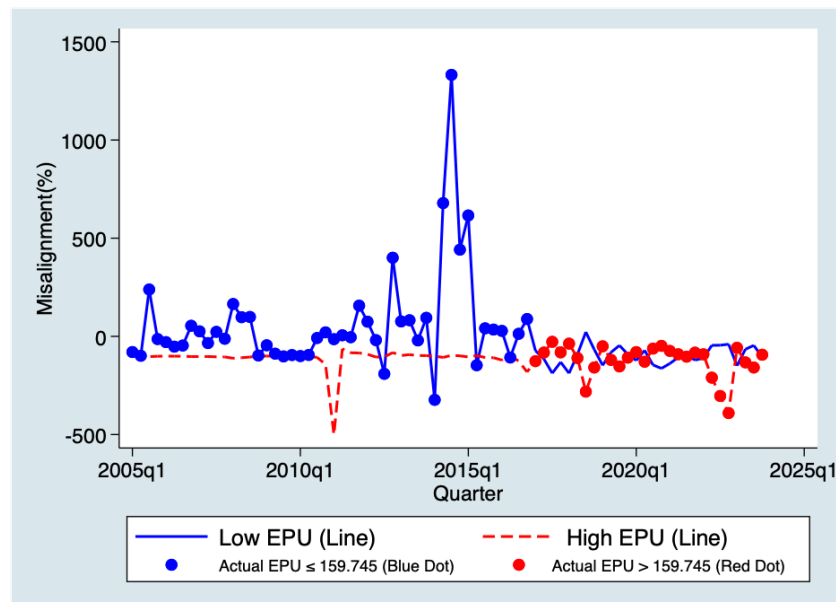


Figure 2. ER misalignment under different EPU states.

Note: Misalignment is measured as the difference between the actual RMB/USD ER and its estimated equilibrium ER. Each dot represents the degree of deviation for the quarter. It is colour-coded according to the EPU regimes. Blue dots indicate that the EPU for the quarter is in Regime 1, while red dots indicate that the EPU for the quarter is in Regime 2. Regimes are identified using the TAR model and the BEER-based equilibrium estimation described in Section 3. A positive deviation (above zero) suggests an undervalued RMB, while a negative deviation (below zero) indicates an overvalued RMB.

Figure 2 shows that periods with higher EPU are largely concentrated after 2017.—In 2018, the US–China trade war broke out, exerting depreciation pressure on the RMB. On August 3, 2018, the PBoC announced that the foreign exchange risk reserve ratio for forward foreign exchange sales would be raised from 0% to 20%. This measure elevated costs for businesses and financial institutions engaging in forward foreign exchange purchases, thereby mitigating excessive speculative activities. Subsequently, on August 24, 2018, the PBoC reinstated the counter-cyclical factor to mitigate excessive RMB depreciation. Then, from 2022 to 2023, the US Federal Reserve significantly raised

the federal funds rate, leading to a rise in US interest rates³. In China, the PBoC dropped the reserve requirement ratio and interest rates several times in 2023, including two reserve requirement ratio cuts in March and September⁴ and loan prime rate cuts in June and August⁵, aiming to support domestic economic recovery after COVID-19. The RMB faces continued depreciation pressure. As shown in [Figure 2](#), when the EPU is high, the RMB ER is undervalued most of the time.

However, [Figure 2](#) shows that before 2017, the EPU was low most of the time. And the RMB ER was overvalued of times, but the RMB also alternates between undervaluation and overvaluation when EPU is low. In addition, the degree of misalignment is greater than that at Regime 2. This is because, following a series of ER reforms, government intervention decreases in a less uncertain environment, leaving the RMB more vulnerable to market supply and demand ([Cui & Si, 2024](#)). In Regime 2, the most significant instance of RMB undervaluation occurred in 2014. On March 15, 2014, the PBoC announced that the daily trading range of the RMB against the USD would be widened from 1% to 2%, increasing the ER's flexibility and improving its representation of market supply and demand ([Funke et al., 2015](#)). However, the expanded trading range also triggered market expectations of RMB depreciation. It will lead to increased capital outflow pressure and accelerated RMB depreciation. As a result, the RMB depreciated sharply against the US dollar in 2014, undervaluing itself by approximately 13%, the largest undervaluation under Regime 1.

The RMB is more susceptible to market supply and demand when EPU is low, thus making it more prone to periods of alternating overvaluation and undervaluation. Conversely, when EPU is high, the RMB is undervalued for most of the time. Therefore, the difference in the degree of RMB ER misalignment under high and low EPU environments supports the conclusion that there is a non-linear relationship between EPU and ER misalignment. In addition, when EPU is low, external shocks (e.g., international economic events) exert a stronger impact on the ER than when EPU is high.

Conclusion

This research developed a TAR model based on the MM-ERD and the BEER Model to explore the nonlinear association between EPU and the RMB ER. Analysis of quarterly data from Q1 2005 to Q4 2023 revealed that the RMB/USD ER behaves differently across different levels of the threshold variable, EPU. Specifically, at a threshold of 159.745, the EPU environment can be divided into low and high states (Regime 1 and Regime 2). The results show that in Regime 1, most variables, such as EPU, money supply, interest rate, FER, and inflation rate, are consistent with the MM-ERD and BEER models. However, in Regime 2, most variables become insignificant, or their directions reverse. These results indicate that once EPU exceeds a threshold, the linear relationships predicted by the classic monetary model and the BEER framework no longer hold in full.

This study also examined whether the RMB is overvalued or undervalued across different EPU conditions. The findings show that the volatility of ER misalignment differs significantly between low- and high-EPU regimes. When the EPU is low, the ER may be overvalued or undervalued, but it is overvalued most of the time. Conversely, when the EPU is high, the RMB is effectively undervalued. In addition, the degree of misalignment is greater at low EPU than at high EPU. This conclusion supports the hypothesis that EPU has an asymmetric impact on ER misalignment. Given that traditional ER theories (e.g., the MM-ERD and the BEER Model) do not explicitly consider policy uncertainty, this study's examination of EPU's role in ER variation expands extant theories and provides new perspectives for the development of better explanatory ER models.

³ According to the St. Louis Federal Reserve Bank, between 2022 and 2023, the Federal Reserve implemented a series of interest rate increases, raising the federal funds target rate from 0.00%–0.25% to 5.25%–5.50%, a cumulative increase of 5.25 percentage points.

⁴ According to the PBoC, the first reserve requirement ratio reduction was on March 27, 2023; the ratio for financial institutions' RMB deposits was reduced by 0.25 percentage points. The second was on September 15; the PBoC again decreased the ratio for financial institutions' RMB deposits by 0.25 percentage points.

⁵ According to the PBoC, on June 20, 2023, the one-year loan prime rate was lowered from 3.65% to 3.55%, and the rate for more than five years was lowered from 4.30% to 4.20%. On August 20, the one-year loan prime rate was further lowered to 3.45%, while the rate for more than five years was maintained at 4.20%.

In fact, the empirical evidence in this paper confirms that EPU has a non-linear impact on ER, providing an important reference for central banks when making intervention decisions in the foreign exchange market. This study also highlights the critical importance of tracking regimes of EPU and ER misalignment for ensuring ER stability. Investors can even use ER misalignment as an indicator of EPU to make informed decisions about holding foreign currency assets. Governments and policymakers should increase policy transparency to improve "expectation management" policies, helping investors better anticipate market fluctuations. Furthermore, unnecessary policy changes should be minimised to maintain a stable economic environment, as predictable markets are crucial for maintaining ER equilibrium.

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Author contribution

All authors contributed to the conception and design of the study, data collection, analysis and interpretation of the results, and the writing of the manuscript. All authors read and approved the final version of the manuscript.

Use of AI tools declaration

Artificial intelligence tools were used to assist with language editing and to enhance the clarity and readability of the manuscript. The authors remain fully responsible for the content and conclusions of this study.

Conflict of interest

The authors declare that there are no competing interests related to this manuscript.

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