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DOMESTIC POLICY UNCERTAINTY VS. GLOBAL RISK: EXCHANGE RATE VOLATILITY UNDER DE JURE AND DE FACTO REGIMES IN PAKISTAN

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ABSTRACT

A large portion of the Pakistani literature holds that the rupee is mostly disturbed due to uncertainty with regard to domestic policies. In this study, the hypothesis is put to the test by examining it in comparison to the competing hypothesis of global risk as the primary driver. The monthly realized volatility is constructed using 3,092 daily exchange rate observations of the State Bank of Pakistan (SBP) from July 2013 to January 2026 and monthly movements in the economic policy uncertainty (EPU) indices in the newspapers, with the interest rate differential, SBP reserves, oil prices, and the VIX as controls. All specifications have a long run relationship, as confirmed by a linear and a nonlinear ARDL bounds test. The strongest and most robust driver is global risk; a 1% increase in the VIX increases rupee volatility by 4.091% in the long run ($p < .001$) but does not affect the elasticity of the SBP reserves (elasticity = –1.081, $p = .019$). Domestic EPU has a positive but insignificant long run effect over the full sample (0.471, $p = .317$). It is significant only before late 2023 (0.583, $p = .016$), and its effect is symmetric (long run Wald $p = .132$). US EPU reduces the volatility of the rupee even after controlling for global risk (−2.090, $p = .002$). Contrary to expectations, the domestic EPU effect is reduced after the switch to a market-based regime in May 2019 (interaction −1.559, $p = 0.033$), and Bai–Perron tests indicate that the de facto regime shift happened in June 2018 and December 2023, which is earlier than the official regime switch. In the case of rupee stability, reserve stocks and risk reduction measures are more important than the policy news emanating from within Pakistan, and the dates announced in the policy should be replaced by de facto dates in the regime analysis of Pakistan.

Keywords: economic policy uncertainty, global risk, exchange rate volatility, nonlinear ARDL, de facto exchange rate regime

JEL Classification: F31, E44, D81, C22

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INTRODUCTION

The impact of a quick rupee devaluation is fast felt. The cost of imports rises, exporters may find it difficult to judge the prices of their contracts, foreign currency loans become more expensive to service, and companies and banks have to adjust their budgets. Pakistan is particularly vulnerable. It imports the bulk of its fuel and a lot of its intermediate goods, needs outside capital, and has sought the aid of the International Monetary Fund (IMF) many times. This exposure was made apparent during the currency swing years 2018–2019 and 2022–2023, and in January 2023 alone, monthly realized volatility hit 8.8%.

Economic policy uncertainty (EPU) refers to uncertainty regarding who will make economic policy, what policy they will make, the timing of economic policymaking, and how it will be implemented (Baker et al., 2016). If it is difficult to deduce the policy stance for fiscal policy, monetary policy, trade policy, or exchange rate policy, investors seek higher risk premia, postpone commitments, and trade in their domestic and foreign currency asset sets. All these responses can contribute to increased volatility in the exchange rate (Bloom, 2009; Krol, 2014). With the EPU index developed by Choudhary et al. (2020) based on monthly newspaper coverage, it is now possible to test this relationship by applying country-specific data.

The general findings of international studies are that EPU increases exchange rate volatility in both advanced and emerging economies (Aftab et al., 2024; Krol, 2014). Data frequency and horizon (Bartsch, 2019; Yang, 2025) and both domestic and US uncertainty (Ekeocha et al., 2025; Zhou et al., 2020) can matter for the size of the effect. There is little evidence for Pakistan. EPU was found to increase the volatility of the exchange rate in the period 2011–2022 by Shair et al. (2023) in an EGARCH model, and Falak et al. (2024) analyzed EPU along with oil prices and trade volume. Both studies do not explore differential effects of increases and decreases in EPU, the impact of uncertainty in the United States on the rupee when global risk is controlled, or how the relationship changed in May 2019 when the SBP shifted to a market-determined exchange rate (International Monetary Fund [IMF], 2019).

These questions will be addressed in this study. It builds a model-free monthly realized volatility measure based on daily SBP data between July 2013 and January 2026 and estimates linear and nonlinear autoregressive distributed lag (ARDL) models (Pesaran et al., 2001; Shin et al., 2014), along with a set of robustness checks, regime interaction tests, and tests for structural breaks. The big question is whether rupee volatility is more correlated with domestic policy uncertainty or global risk.

The paper makes three contributions. First, it demonstrates that global risk, and not domestic policy uncertainty, is the most dominant and most reliable source of rupee volatility, and it offers the first asymmetric and regime-specific estimates of the EPU–volatility relationship using realized volatility from official daily data for Pakistan. Second, it distinguishes between domestic and US policy uncertainty and global financial risk, and discovers that the signs of the two policy uncertainty measures are opposite when the VIX is added. Third, it reveals that the regime change officially declared in May 2019 is not aligned with the rupee's behaviour in the data, happening in June 2018 and December 2023, respectively. This has direct relevance to the research questions of dating the exchange rate regimes in Pakistan. The study also

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tackles Sustainable Development Goal 17 (Target 17.13, global macroeconomic stability) and Sustainable Development Goal 8 (Decent work and economic growth).

Problem Statement

Pakistan's economy has been plagued by high volatility in the exchange rate, but its sources are not clearly understood. The country's policy debates focus on domestic issues: political transitions, slow reviews by the IMF, and fiscal and monetary signals. The international evidence, however, suggests the presence of other international influences like risk aversion in the world financial markets and policy uncertainty in the USA (Ekeocha et al., 2025; Yang, 2025). Domestic policy communication alone will not stabilize the currency if the rupee's volatility is primarily due to global risk. Policy focus should be placed on creating reserve buffers and managing external shocks.

The question cannot be decided by the existing Pakistani studies. They consider the rise or fall of EPU to have the same effect, they do not differentiate domestic from global uncertainty, and they rarely account for global financial risk, which means the sign and size of the EPU coefficient may be questionable (Falak et al., 2024; Shair et al., 2023). They also estimate the timing of the exchange rate regime as beginning on the official date of announcement in May 2019, although the literature cautions about the distinction between the official and actual dates (Calvo & Reinhart, 2002; Ilzetzki et al., 2019). This makes it difficult for policymakers, the SBP and firms to have solid information regarding what actually causes the rupee's volatility and whether the shift to a market-based regime has altered that relationship.

Research Objectives

The study proposes to determine whether the volatility of the PKR/USD exchange rate is being primarily caused by domestic policy uncertainty or global risk. It has specific aims as follows:

- The aim of this study is to estimate the short run and long run impact of the domestic EPU on the volatility of the exchange rate of the PKR/USD.
- To examine whether volatility is asymmetric to increases and decreases in EPU at the domestic level.
- To investigate if the US EPU has any impact on the volatility of the rupee apart from domestic uncertainty, holding global financial risk constant.
- To determine whether the effects of domestic EPU are distinctively set apart between the managed and market-based exchange rate regimes.
- To use structural break tests to determine whether the regime change in May 2019 occurred in the same period as the de facto change in the volatility of the rupee.

LITERATURE REVIEW

Domestic Economic Policy Uncertainty and Exchange Rate Volatility

Baker et al. (2016) constructed EPU indices by measuring the number of newspaper articles that featured terms associated with the economy, policy, and uncertainty and demonstrated that there is a correlation between increased newspaper coverage and political and policy events. Choudhary et al. (2020) created a monthly index for Pakistan starting from August 2010 and from January 2015 for four newspapers in the English language. A number of key events are captured: the 2010 floods, the brief period of political unrest, shifts in economic leadership, the 2019 IMF programme and the COVID-19 pandemic.

Krol (2014) detected that EPU increases the volatility of the exchange rate in both industrial and emerging economies, especially in recessions. This is consistent with the results of Aftab et al. (2024), who established a positive impact in 26 advanced and emerging economies, and those of Wei et al. (2025), who demonstrated that cross-country disparities in EPU are useful for forecasting exchange rate volatility over short and long horizons. In the Chinese context, Jiang and Wu (2025) identified that the volatility impact of EPU is time-varying, and that the impact is partially driven by investor sentiment. Shair et al. (2023) showed that EPU has a positive impact on exchange rate volatility in Pakistan using an EGARCH model. Together with the real options and portfolio balance arguments set out in the theoretical framework, this evidence leads to the first hypothesis.

H_1: The long-run relationship between domestic economic policy uncertainty and the volatility of the exchange rate of PKR/USD is significant and positive.

Asymmetric Effects of Policy Uncertainty

People tend to respond more negatively to bad news than good news of equal magnitude (Kahneman & Tversky, 1979). Uncertainty in policies may trigger a rush for dollars, capital flight, and hedging by the importers, but a decline in uncertainty can rebuild confidence only gradually. These responses can amplify the volatility effect of increasing uncertainty more than the effect of making uncertainty less. In emerging markets, where foreign exchange markets are thin, this can be the case. This can be tested using the Shin et al. (2014) nonlinear ARDL model, where the regressor is divided into positive and negative partial sums.

H_2: Domestic economic policy uncertainty has a nonlinear impact on exchange rate volatility, given that an increase in economic policy uncertainty has a larger impact than a decrease.

Global Policy Uncertainty Spillovers

Other currencies can be affected by US policy uncertainty through international capital flows, dollar funding conditions, and commodity prices. For both domestic and US EPU, Yang (2025) discovered that they increase the implied volatility of the foreign exchange market, and that this effect is most pronounced in longer-term periods. Zhou et al. (2020) demonstrated in a GARCH-MIDAS model that the ratio of

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the Chinese EPU and the US EPU increases the volatility of the renminbi in the long run. In Nigeria, Ekeocha et al. (2025) observed that domestic and global EPU cause more exchange rate volatility, with the domestic EPU effect being larger. The dollar-denominated external financing dependence of Pakistan points towards the same channel. But it is crucial to distinguish financial risk (VIX) from US policy uncertainty. Both are correlated, but they measure different things: one, uncertainty about US policy; the other, general risk aversion in the world markets causing capital movements to and from emerging markets (Forbes & Warnock, 2012; Rey, 2013).

H_3: With domestic economic policy uncertainty controlled for, global (US) economic policy uncertainty has a strong positive relationship with the exchange rate volatility of PKR/USD.

Moderation by the Exchange Rate Regime

With a managed regime, the central bank takes up some of the policy uncertainty shock, which helps to maintain lower volatility. In a more market-determined system, shocks should be transmitted more completely to the exchange rate. To meet a prior action in the context of an IMF Extended Fund Facility, Pakistan implemented a market-determined exchange rate with limited SBP intervention on 16 May 2019 (IMF, 2019). However, the "fear of floating" literature also warns that announced regime changes do not necessarily influence the behavior of the central bank (Calvo & Reinhart, 2002). It is thus an empirical issue whether the EPU effect is moderated by the regime.

H_4: Domestic economic policy uncertainty has a positive relationship with exchange rate volatility, which is larger under a market-based exchange rate regime (from May 2019) than under a managed regime.

De Jure and De Facto Regimes

The dates of the exchange rate regimes are typically taken from the announcement of the regime, but classifications based on the actual behavior of the exchange rate sometimes diverge from the announced regimes (Ilzetzki et al., 2019). Comparisons based on official dates will be muddied if a central bank continues to manage the currency after announcing a float or if a central bank gives more freedom before it announces a float. The timing of the de facto regime in Pakistan is treated as an exploratory question in this study, which is examined by structural break tests instead of a formal hypothesis.

Research Gap

The international literature generally confirms the importance of EPU on exchange rate volatility, but most of the evidence is based on the experience of advanced economies or large emerging market countries or multi-country panels that have an average of significantly diverse EPU regimes (Aftab et al., 2024). This is because studies on Pakistan do not distinguish between domestic and global uncertainty, disregard the 2019 regime change, and assume that the impacts are symmetric, which results in the combination of outcomes from various policy settings. They also tend to leave the sign of the domestic EPU coefficient open to interpretation,

and usually exclude a measure of global financial risk. This study fills these gaps by using a model-free realized volatility measure, controlling for global risk, allowing for asymmetric cointegration, adding a regime interaction, and dating regime shifts from the data.

THEORETICAL FRAMEWORK

There are three theories of how policy uncertainty can be related to exchange rate volatility, and a fourth theory about why the impact can be asymmetric.

Real Options Theory

Standard real options theory of investment under uncertainty argues that the more uncertain, the more valuable it is to wait when the investment is irreversible (Bernanke, 1983; Bloom, 2009). When uncertainty increases, domestic—and foreign—investors delay the transaction of rupee assets and retain funds in safer currencies, in this case abroad. Capital inflows subsequently become more erratic and volatile, and news-driven.

Portfolio Balance Approach

The portfolio balance approach is adopted by investors, who spread their wealth among domestic and foreign assets based on expected return and risk (Branson & Henderson, 1985). An increase in policy uncertainty leads to an increase in the risk premium on domestic assets and induces portfolio rebalancing. Such changes come about as a result of news and, therefore, increase the volatility of the exchange rate and also shift its level. The same reasoning suggests that the volatility should be reduced with an increase in foreign exchange reserves, given that it makes domestic assets safer.

Exchange Rate Regime Theory

According to exchange rate regime theory, the effect of a shock on the exchange rate is influenced by the intervention of the central bank. Both a managed and a flexible regime will reduce the amount of news reaching volatility, but a managed regime will do so by restricting the amount of news sent, while a flexible regime will do so by allowing the shock to pass through. However, many emerging market central banks that announce a float engage in heavy de facto intervention (Calvo & Reinhart, 2002), and as noted, de facto floating regimes often differ from their de jure counterparts (Ilzetzki et al., 2019). The theory therefore suggests that there will be a moderating function of the regime, though only if the regime is in fact in operation.

Prospect Theory

Prospect theory is a theory of how losses are assigned a greater value than equal gains (Kahneman & Tversky, 1979). This can indicate a more pronounced reaction when uncertainty increases in currency markets (losses are imminent) than when it decreases (losses are less likely). This gives a theoretical justification for H2.

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Conceptual Framework

The conceptual framework is shown in Figure 1. The independent variables are Domestic EPU (increases and decreases) and US EPU. The dependent variable is the volatility of PKR/USD. The moderator is the exchange rate regime, while the interest rate differential, SBP reserves, Brent oil prices and the VIX are controls.

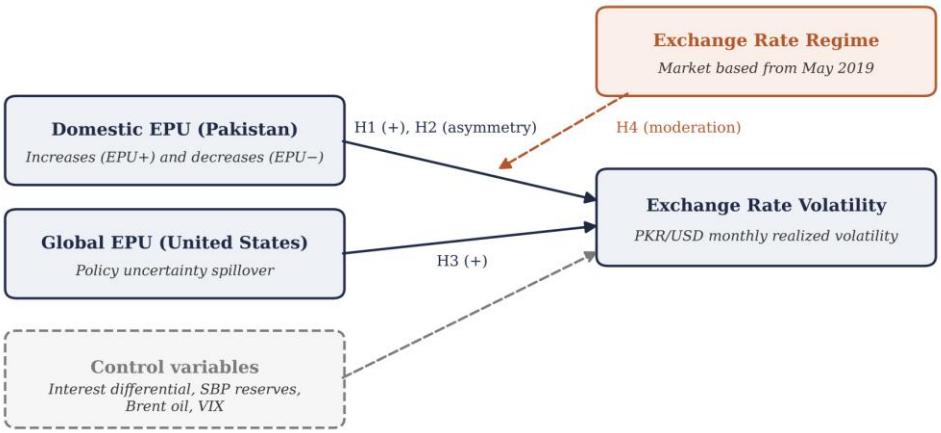


Figure 1: Conceptual framework of the study

Note. The dashed orange arrow indicates the hypothesized moderating effect of the exchange rate regime, and the solid arrows represent the hypothesized direct effects.

The framework links the theories to the hypotheses. The direct impact of domestic EPU (H1) is supported by the real options and portfolio balance channels. There is a motivating reason for H2 in prospect theory. The effect of US EPU (H3) is motivated by spillover arguments from the global level, while the role of the regime (H4) is motivated by the regime theory. The inclusion of the VIX in the set of controls enables separation of the US policy uncertainty effect from the effect of risk aversion more generally.

RESEARCH METHODOLOGY

Research Design

This study is carried out with a positivist, deductive approach and a quantitative, longitudinal time series design with secondary data obtained on a monthly basis. The design is well suited to the goal of identifying short run and long run relationships between macroeconomic variables and for regime change tests.

Data and Sample

The sample period runs from July 2013, when the daily bank floating average exchange rate series was made available on the SBP EasyData portal (State Bank of Pakistan, 2026), to January 2026, which is the latest month of the Pakistan EPU index at the time of data collection. The number of monthly observations is thus 151: 71 in

the managed regime (July 2013 – May 2019) and 80 in the market-based regime (June 2019 – January 2026). The variables, their measurement and their sources are described in Table 1.

Table 1: Variables, Measurement and Data Sources

Variable	Measurement	Role	Source
Exchange rate volatility (RV)	Monthly realized volatility of daily log returns of PKR/USD (natural log)	Dependent	SBP EasyData, daily bank floating average rates
Domestic EPU (EPU_PK)	Pakistan EPU index, two-newspaper series (natural log)	Independent	Choudhary et al. (2020); policyuncertainty.com
Global EPU (EPU_US)	US news-based EPU index (natural log)	Independent	Baker et al. (2016); FRED series USEPUINDXM
Regime dummy (D)	0 up to May 2019; 1 from June 2019	Moderator	IMF (2019)
Interest rate differential (IRD)	SBP policy rate – US federal funds rate (percentage points)	Control	SBP; FRED series FEDFUNDS
Reserves (RES)	Net reserves held by SBP (USD million) (natural log)	Control	SBP EasyData
Oil prices (OIL)	Brent crude oil price (USD/bbl) (natural log)	Control	FRED series MCOILBRENTEU
Global risk (VIX)	Monthly average of daily values of VIX (natural log)	Control	FRED series VIXCLS

Note. SBP = State Bank of Pakistan; FRED = Federal Reserve Economic Data. SBP policy rate is the monthly average of the daily effective rate, which is generated based on SBP's published history of policy rate changes; prior to 25 May 2015, it was the reverse-repo (discount) rate, and thereafter it is the SBP target (policy) rate.

As seen in Table 1, the model is composed of one domestic and one global uncertainty measure along with four controls that account for the key fundamentals of a small import-dependent economy. The interest rate differential is the incentive for the holder of rupee assets, reserves are the SBP's capacity to absorb shocks, oil prices represent the biggest import bill for Pakistan, and the VIX is the global measure of risk appetite. All but the interest rate differential and the regime dummy are in natural logs, whose coefficients are therefore elasticities.

There are three aspects of the data that warrant discussion. The rupee per unit rates of 22 currencies are reported in SBP EasyData for banks' floating average rates on a daily basis, but there is no report for the US dollar. The Saudi riyal has been fixed at the equivalent of 3.75 per US dollar throughout the sample; hence the daily rate of PKR/USD is calculated by multiplying the rate of PKR/SAR by 3.75. The monthly averages of this series are only 0.079% away on average from the official monthly average PKR/USD rate maintained by SBP, and a second series constructed from the UAE dirham peg (3.6725 per dollar) adds an element of robustness. Second, the Pakistan EPU index is not available for August, November and December 2020, while

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the four-newspaper index begins in 2015; these months have been filled by log-linear interpolation, and the four-newspaper index is used as a robustness check. Third, the series for the SBP policy rate is not downloadable as a single series and hence the published effective dates of the changes in the policy rate are used to compile it and then converted to monthly averages of daily rates.

Measuring Exchange Rate Volatility

As with Andersen and Bollerslev (1998) and Andersen et al. (2003), the monthly realized volatility is calculated from daily log returns. Assume that the currency rate of the PKR to USD on trading day d is denoted by E_d. Then

$$r_d = 100 \times \ln(E_d / E_\{d-1\}), \quad RV_t = \sqrt{(\Sigma_\{d \in t\}\ r_d^2)} \qquad (1)$$

Summed over all days of trading during month t (20.5 days/month on average). It is model-free and utilizes all daily information available in each month, which is not the case for monthly volatility or parametric volatility. The distribution is strongly right-skewed (skewness 2.33) in RV, and so it is entered in natural logarithm form in all models.

Econometric Models

The ARDL bounds testing approach of Pesaran et al. (2001) is employed due to the mixed nature of the series being I(0) and I(1) series, and the absence of any I(2) series and its suitability for the sample size employed. The linear model (Model 1) with unrestricted error correction, which tests H_1 and H_3, is

$$\Delta \ln RV_t = \alpha + \rho \ln RV_\{t-1\} + \beta_1 \ln EPU_PK_\{t-1\} + \beta_2 \ln EPU_US_\{t-1\} + \gamma' X_\{t-1\} + \Sigma_i \varphi_i \Delta \ln RV_\{t-i\} + \Sigma_j \theta'_j \Delta Z_\{t-j\} + \varepsilon_t \qquad (2)$$

where X contains the vector of controls (IRD, ln RES, ln OIL, ln VIX) and Z represents all the regressors. The maximum number of lags of the dependent variable is 3 and of the regressors is 2, selected by the Akaike information criterion. The hypothesis H0 being tested in the bounds F test is that of a null hypothesis, which is $\rho = \beta_1 = \beta_2 = \gamma = 0$. The long run effects of domestic EPU and US EPU are, using the delta method, $-\beta_1/\rho$ and $-\beta_2/\rho$, respectively, with standard errors following the delta method.

In Model 2, H_2 is decomposed into positive and negative partial sums (Shin et al., 2014):

$$EPU^+_t = \Sigma_\{j=1..t\} \max(\Delta \ln EPU_PK_j, 0),$$
$$EPU^-_t = \Sigma_\{j=1..t\} \min(\Delta \ln EPU_PK_j, 0) \qquad (3)$$

It substitutes EPU^+ and EPU^- for ln EPU_PK in Equation 2. A Wald test for symmetry in the long run is performed with the test of $\beta^+ = \beta^-$; a Wald test for symmetry in the short run is performed with the test that the sum of the two short run coefficients for ΔEPU^+ and ΔEPU^- is equal; and cumulative dynamic multipliers track the adjustments of volatility in response to positive and negative shocks.

Model 3 includes the regime dummy D and interaction term (ln EPU_PK × D) in Equation 2 for testing H4.

$$\Delta \ln RV_t = \alpha + \delta D_t + \rho \ln RV_{t-1} + \beta_1 \ln EPU_PK_{t-1} + \beta_3 (\ln EPU_PK \times D)_{t-1} + \ldots + \varepsilon_t \quad (4)$$

The long run effect of domestic EPU is $-\beta_1/\rho$ for the managed regime and $-(\beta_1 + \beta_3)/\rho$ for the market-based regime, thus a positive and significant long run interaction is in favor of H_4. This is another check to be performed using split-sample ARDL and static regressions.

Estimation Procedure

There were 9 steps to estimation. Descriptive statistics and time series plots were investigated and the two regimes compared. To ensure that no series is I(2), the augmented Dickey–Fuller test (ADF; Dickey & Fuller, 1979), the Phillips and Perron (1988) test, and the Zivot and Andrews (1992) test with one structural break were used to test stationarity. Multiple structural breaks in the mean of ln RV were determined by the Bai and Perron (1998, 2003) dynamic programming procedure, using 15% trimming, combined with Andrews's (1993) sup-F test and a Chow test for the month of June 2019, with the number of breaks selected by the modified Schwarz criterion of Liu et al. (1997; LWZ). The ARDL bounds tests and long and short run coefficients were estimated for Models 1 to 3. For Model 2, (5) the following calculations were made: asymmetry tests and dynamic multipliers. The effect of the regime was evaluated using Model 3 and split samples (6).

The 7 diagnostic tests were the Breusch–Godfrey serial correlation test, the Breusch–Pagan–Godfrey heteroskedasticity test, the Ramsey RESET test, the Jarque–Bera normality test, and the CUSUM and CUSUM of squares stability tests of Brown et al. (1975). All reported standard errors are heteroskedasticity- and autocorrelation-consistent (HAC; Newey & West, 1987) with three lags (the Breusch–Pagan–Godfrey test rejected homoskedasticity). To check for reverse causality, the Toda and Yamamoto (1995) Granger causality test was used, in which one additional lag was added to the levels vector autoregression. Robustness was assessed by (9) a COVID-19 dummy, Schwarz lag selection, a volatility series based on the dirham, the EPU index of four newspapers, a GARCH(1,1) volatility measure (Bollerslev, 1986) and a break-based regime dummy, with the sample ending prior to the break in 2023. The estimation was performed in Python with the use of the libraries statsmodels (Seabold & Perktold, 2010) and arch (Sheppard, 2024).

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ANALYSIS AND INTERPRETATION

Descriptive Statistics

Table 2: Descriptive Statistics, July 2013 to January 2026 (N = 151)

Variable	Mean	SD	Min	Max	Skewness	Kurtosis	JB	p
Realized volatility (%)	1.063	1.413	0.042	8.788	2.328	9.684	417.45	< .001
Pakistan EPU index	106.909	60.949	24.429	328.862	1.065	3.772	32.28	< .001
US EPU index	144.129	61.699	71.262	460.114	1.996	8.174	268.70	< .001
Interest rate differential (pp)	8.901	3.549	4.310	16.880	0.821	2.768	17.29	< .001
SBP net reserves (USD bn)	11.348	4.099	3.048	20.074	−0.013	2.244	3.60	.165
Brent crude (USD/bbl)	70.754	21.459	18.380	122.710	0.298	2.630	3.10	.212
VIX index	17.815	6.244	10.125	57.737	2.460	13.804	886.71	< .001

Note. JB = Jarque–Bera statistic. Kurtosis is reported in raw (non-excess) form.

Table 2 indicates that the monthly realized volatility averaged 1.063% with a standard deviation of 1.413%, and the realized volatility varied from 0.042% to a high of 8.788% in January 2023. The skewness of the series is strong (2.328), and the fat tail is strong as well (kurtosis 9.684), while the standard deviation is larger than the mean value. In simple language, the rupee is in a peaceful state as far as most months are concerned, but it experiences occasional bouts of extreme turbulence. The Jarque–Bera test suggests that the data are not normally distributed ($p < .001$), making it appropriate to use the log of RV in the models.

The Pakistan EPU index had an average of 106.9 and the US EPU index was 144.1, with both indices exhibiting considerable peaks with maximum index values more than three times their averages. The VIX is also extremely skewed and leptokurtic, as during the short periods of the world markets that experience panic, like March 2020. Net reserves averaged USD 11.3 billion, but dipped to as low as USD 3.0 billion, indicating a high degree of external stress. Only the reserves and Brent oil prices are not rejected as being normal.

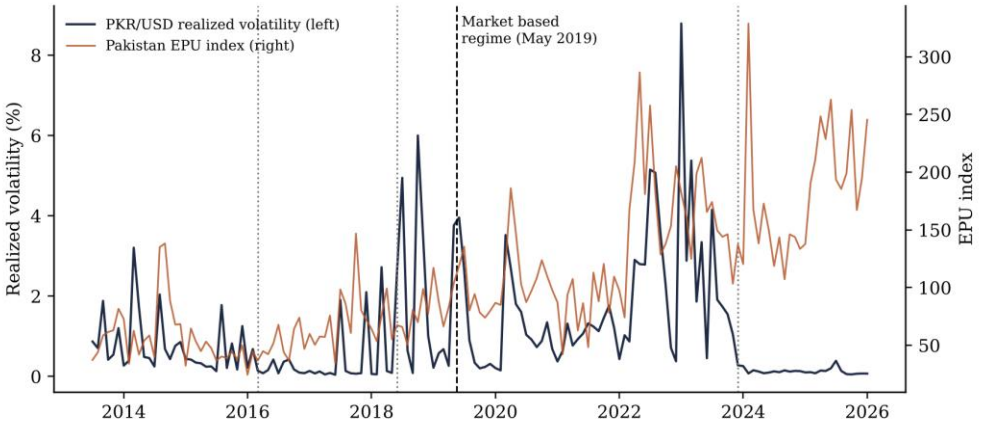


Figure 2. Monthly realized volatility of PKR/USD and the Pakistan EPU index, July 2013–January 2026

Note. The dashed line indicates the switch to the market-based exchange rate in May 2019. The structural breaks in mean volatility estimated using the Bai and Perron procedure are indicated by dotted lines (March 2016, June 2018 and December 2023).

Realized volatility and Pakistan EPU index are compared to each other in Figure 2. Volatility was intermittent and fairly muted until the 2018–2019 devaluations, which resulted in a spike in volatility, as well as the volatility that occurred during the 2022–2023 balance of payments crisis. Domestic EPU remained high and peaked for several months in 2023 but volatility fell from late 2023. This split is the most obvious indicator that doubt about the domestic economy is not the sole reason for the rupee's performance.

Table 3: Comparison of the Managed and Market-Based Regimes

Variable	Managed regime, Jul 2013–May 2019 (n = 71): M (SD)	Market regime, Jun 2019–Jan 2026 (n = 80): M (SD)	Welch t	p
Realized volatility (%)	0.827 (1.178)	1.273 (1.571)	−1.989	.049
Pakistan EPU index	63.720 (25.111)	145.239 (57.710)	−11.470	< .001
US EPU index	110.398 (24.345)	174.066 (69.085)	−7.721	< .001

As seen in Table 3, volatility was found to be higher in the market-based regime (1.273%) than the managed regime (0.827%); however, this difference was only marginally significant (Welch $t = -1.989$, $p = .049$). The higher standard deviation since May 2019 also indicates that the volatility became more volatile.

The two uncertainty indices were quite large during the second period. The Pakistan EPU index more than doubled, from 63.7 to 145.2 ($p < .001$), and the US index rose from 110.4 to 174.1 ($p < .001$). Some of this increase is due to the COVID-

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19 pandemic and the political instability in Pakistan since 2019. Uncertainty and volatility also rose after May 2019, but it is not possible to tell from just comparing the means whether it was the regime change, the rise in uncertainty or other shocks that were to blame; the econometric models below answer that question.

Unit Root Tests

Table 4: Unit Root Tests

Variable	ADF level	PP level	ADF first difference	PP first difference	Zivot–Andrews level	Conclusion
ln RV	−2.163	−8.024***	−12.153***	−29.411***	−4.275	Mixed, I(0)/I(1)
ln EPU_PK	−1.030	−4.764***	−8.437***	−30.582***	−6.058***	Mixed, I(0)/I(1)
ln EPU_US	−2.798*	−3.848***	−9.554***	−18.833***	−4.249	Mixed, I(0)/I(1)
IRD	−2.152	−1.853	−5.063***	−7.838***	−2.859	I(1)
ln RES	−3.558***	−2.397	−3.234**	−10.684***	−3.980	Mixed, I(0)/I(1)
ln OIL	−2.560	−2.525	−9.511***	−9.003***	−3.652	I(1)
ln VIX	−4.191***	−4.323***	−8.589***	−15.767***	−5.536***	I(0)

Note. An intercept is always included in all tests. The Akaike information criterion (maximum 8) was used to choose ADF and Zivot–Andrews lag length. *** $p < .01$, ** $p < .05$, * $p < .10$.

From Table 4, it can be seen that the variables are not all integrated in the same way. The interest rate differential and oil prices are I(1) because they have a unit root in levels but not in first differences. The VIX is I(0), which failed all three levels tests. The remaining series (ln RV, both EPU indices and reserves) exhibit mixed results; each is stationary under at least one test. The level of domestic EPU becomes clearly stationary after a structural break occurs (Zivot–Andrews statistic −6.058), suggesting a change in level in the sample.

Most importantly, each series is stationary in first differences; none of the series is I(2). This combination of I(0) and I(1) variables does not support the Johansen approach, and the ARDL bounds test is the most suitable test, as it is valid for both I(0) and I(1) regressors (Pesaran et al., 2001). There is no significant multicollinearity since the highest pairwise correlation between the regressors is 0.640 (ln EPU_US, ln VIX). However, it should be noted when interpreting the coefficient of US EPU.

Structural Breaks in Exchange Rate Volatility

Table 5: Bai and Perron Multiple Structural Break Test for ln RV

Number of breaks	BIC	LWZ	Break dates
0	92.81	0.6466	None
1	64.20	0.5213	January 2024
2	24.97	0.3257	June 2018; December 2023
3	7.89	0.2771	March 2016; June 2018; December 2023
4	5.51	0.3261	March 2016; June 2018; February 2022; December 2023

Note. The results from the dynamic programming with 15% trimming (at least two-year segments) of the ln RV showed the presence of breaks in the mean. The three breaks have the minimum LWZ, and BIC continues to diminish, which is typical of small sample sizes. Andrews (1993) sup-F = 43.45 (January 2024), significant at the 1% level.

Table 5 indicates that the lowest (0.2771) LWZ is achieved with three breaks, dated March 2016, June 2018, and December 2023. The sample is de facto split into four regimes: a moderately volatile period up to February 2016 (mean ln RV = −0.59), a fairly stable period from March 2016 to May 2018 (−1.89), a highly volatile period from June 2018 to November 2023 (0.18), and a very stable period from December 2023 onward (−2.15).

The Andrews sup-F statistic is significant and reaches its maximum in January 2024, indicating that the most important change of the whole series is likely to occur at the end of 2023. In contrast, a Chow test performed in June 2019, which followed the official regime change by a month, is only marginally significant ($F = 3.98$, $p = .048$). The data thus indicate that the major events of rupee devaluation in June 2018 and stabilization in late 2023 were the most important in rupee behavior rather than the May 2019 announcement. This is the answer to RQ5: the de facto and de jure regimes are not the same.

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ARDL Bounds Tests for Cointegration

Table 6: ARDL and NARDL Bounds Tests

Model	F	k	5% bounds I(0) / I(1)	1% bounds I(0) / I(1)	p (I(1) bound)	Decision
Model 1: linear ARDL	5.084	6	2.33 / 3.50	2.96 / 4.25	.001	Cointegrated
Model 2: NARDL	10.646	7	2.22 / 3.40	2.80 / 4.09	< .001	Cointegrated
Model 3: regime interaction	4.838	7	2.22 / 3.40	2.80 / 4.09	.001	Cointegrated

Note. Case III (unrestricted intercept, no trend). k = number of long run regressors. The critical values and p values are taken from Pesaran et al. (2001) as implemented in statsmodels.

The bounds tests are given in Table 6. The selected lag structures are ARDL(3, 2, 2, 1, 0, 0, 1) for Model 1, ARDL(1, 0, 2, 2, 1, 0, 0, 1) for Model 2, and ARDL(3, 2, 2, 2, 1, 0, 0, 1) for Model 3. In all three models, the F statistic is greater than the 1% upper bound (5.084 > 4.25 in Model 1, and 10.646 > 4.09 and 4.838 > 4.09 in Models 2 and 3), hence the null hypothesis of no long run relationship is rejected.

Thus, over the long run, the rupee volatility and policy uncertainty co-move, and the volatility reverts to an equilibrium once it is shocked, which is determined by the control variables. Although the two components of EPU turn out to be similar in size (as is indicated below), the NARDL model yields the strongest evidence of cointegration and hence provides the best description of the long-run relationship.

Long Run Estimates

Table 7: Long-Run Coefficients (Dependent Variable: ln RV)

Regressor	Model 1: ARDL	Model 2: NARDL	Model 3: Regime
ln EPU_PK	0.471 (0.469)		1.166* (0.685)
EPU_PK^{+} (increases)		0.364 (0.428)	
EPU_PK^{-} (decreases)		0.412 (0.450)	
ln EPU_PK × D			−1.559** (0.721)
ln EPU_US	−2.090*** (0.657)	−0.979* (0.557)	−1.648** (0.676)
IRD	−0.116* (0.069)	−0.018 (0.058)	−0.058 (0.083)
ln RES	−1.081** (0.454)	−0.776** (0.359)	−0.804* (0.441)
ln OIL	0.134 (0.712)	0.300 (0.497)	0.287 (0.572)
ln VIX	4.091*** (0.753)	3.345*** (0.478)	4.029*** (0.681)
EPU_PK effect, market regime ($\beta_1 + \beta_3$)			−0.392 (0.485)
Regime dummy D (level)			4.138**

Note. Standard errors (Newey–West, 3 lags) in parentheses, using the delta method. D = 1 from June 2019. The market regime effect in Model 3 is the sum of the coefficient of ln EPU_PK and the coefficient of ln EPU_PK × D. *** p < .01, ** p < .05, * p < .10.

The long run coefficients are displayed in Table 7. The long run impact of domestic EPU is positive but marginal (0.471, p = .317), and in the full sample, H1 is not supported. US EPU has a significant negative long run effect (−2.090, p = .002), opposite to that proposed in H3.

The global risk is by far the greatest influence. There is a significant rise in the realized volatility of the rupee in the long run when the VIX rises by 1% (3.345 to 4.091, p < .001) and it is also large and significant in all three models. Volatility is negatively and significantly related to SBP reserves (elasticity of −1.081, p = .019): volatility decreases by approximately 11% whenever reserves increase by 10%. The interest rate differential is marginal (−0.116) and the long run impact of oil prices is not significant.

Increases in domestic EPU are less strongly associated with increases in volatility than decreases, with the size of both coefficients being similar (0.364 and 0.412), and both being insignificant, as is shown in Model 2. Model 3 revealed that, under the managed regime, the domestic EPU effect is greater (1.166, p = .091) and its interaction is negative and significant (−1.559, p = .033) with the market-based regime. The market regime domestic EPU effect is −0.392 and not significant (p = .420). The regime dummy is positive (4.138, p = .018), suggesting that volatility was higher for

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any level of regressors after May 2019. In brief, the market-based regime increased the volatility of the entire market but decreased its relationship with domestic uncertainty.

Short Run Dynamics

Table 8: Short Run Coefficients and Error Correction Terms (Dependent Variable: Δln RV)

Regressor	Model 1: ARDL	Model 2: NARDL	Model 3: Regime
ECT (ln RV, t−1)	−0.528*** (0.110)	−0.688*** (0.087)	−0.614*** (0.114)
Δln EPU_PK	0.340 (0.314)		0.643 (0.399)
Δln EPU_PK (t−1)	−0.376 (0.229)		−0.637** (0.249)
ΔEPU_PK^{+}		−0.048 (0.519)	
ΔEPU_PK^{-}		0.437 (0.448)	
ΔEPU_PK^{-} (t−1)		−1.491*** (0.552)	
Δ(ln EPU_PK × D)			−0.805** (0.398)
Δ(ln EPU_PK × D) (t−1)			0.484*** (0.114)
Δln EPU_US	0.192 (0.479)	0.262 (0.470)	0.034 (0.475)
Δln EPU_US (t−1)	−0.644* (0.349)	−0.938** (0.371)	−0.764** (0.362)
ΔIRD	0.405** (0.158)	0.506*** (0.143)	0.425*** (0.151)
Δln VIX	0.843 (0.511)	0.963* (0.516)	1.063** (0.494)
Δln RV (t−1)	−0.196* (0.102)		−0.134 (0.109)
Δln RV (t−2)	−0.166* (0.093)		−0.161* (0.094)
R^2	0.494	0.501	0.532
Adjusted R^2	0.428	0.436	0.454
Observations	148	149	148

Note. HAC (Newey–West, 3 lags) standard errors in parentheses. Estimated but not shown are the short run terms for reserves and oil and the intercepts. ECT = error correction term. *** $p < .01$, ** $p < .05$, * $p < .10$.

The error correction terms are all negative and are less than one in absolute value and highly significant in all models (−0.528, −0.688, and −0.614). This validates the cointegration result, and indicates that 53% to 69% of any deviation from the long-run volatility is corrected within one month. So shocks to the rupee quickly disappear – usually within 2–3 months.

Volatility is increased in all models in the short run when the interest rate differential is increased (0.405 to 0.506, $p < .05$). This is likely to be the case because the currency pressures generally seem to occur at the same time as the changes in the policy rate by SBP. Lagged changes in US EPU lead to a significant decrease in

volatility in all three models, whereas changes in the VIX lead to an increase in volatility, especially in Models 2 and 3. The short run regime pattern is less evident than the long run pattern as the lagged change in domestic EPU is negative and significant (−0.637, p = .012) for Model 3 and the interaction between the market regime and the lagged change in domestic EPU has mixed signs. The month-to-month variation explained by the models is reasonable, ranging from 49% to 53%.

Asymmetry Tests

Table 9: Wald Tests of Asymmetry (Model 2)

Null hypothesis	Statistic	p
Long run: $\beta^+ = \beta^-$	2.266	.132
Short run: $\Sigma\pi^+ = \Sigma\pi^-$	1.439	.232

Note. Long run test: Wald $\chi^2(1)$ with HAC delta method standard errors. Short run test: F test on the sums of the short run coefficients on ΔEPU^+ and ΔEPU^-.

Table 9 shows that neither the long run Wald test (W = 2.266, p = .132) nor the short run test (F = 1.439, p = .232) rejects the null hypothesis of symmetry. So, volatility of the rupee is equally affected by increases and decreases in domestic EPU and H2 is not supported. The idea underlying prospect theory is not supported in the Pakistani data, which suggests that the increasing uncertainty on the part of investors does not seem to lead to a stronger reaction.

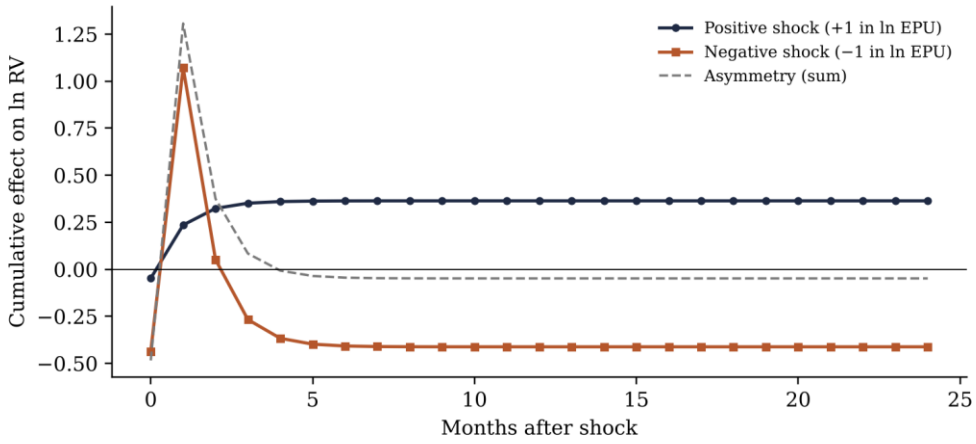


Figure 3: Cumulative dynamic multipliers of ln RV to shocks in domestic EPU (Model 2)

Note. The positive line represents the effect of a permanent unit increase in ln EPU_PK; the negative line the effect of a permanent unit decrease in ln EPU_PK. The difference (asymmetry) is drawn as a dashed line that approaches the value of −0.05.

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The cumulative dynamic multipliers are shown in Figure 3. In the long run, a change in ln EPU_PK of one unit would lead to an adjustment in ln RV of approximately 0.36 per year increase, and approximately 0.41 per year decrease, in about six months. The asymmetry line remains near zero (−0.05), and matches the result of the Wald test, just as the Wald test itself was visually confirmed.

The only positive effect found was from the fall in uncertainty in the first month (EPU^{-}), which had a large negative coefficient, −1.491, p = .008. There may be one-off exchange rate adjustments required under the programme, which have been accompanied by decreases in uncertainty, such as the end of IMF negotiations. A decline in uncertainty was accompanied by an increase in volatility in those months.

Regime Analysis

Table 10: Split-Sample Estimates by Exchange Rate Regime (Dependent Variable: ln RV)

Regressor	Managed: long run ARDL	Market: long run ARDL	Managed: static OLS	Market: static OLS
ln EPU_PK	−0.122 (0.219)	0.375 (0.886)	0.537* (0.288)	−0.834** (0.382)
ln EPU_US	−0.929* (0.466)	−3.564** (1.469)	−0.072 (0.799)	−1.113 (0.825)
ln VIX	1.609*** (0.506)	5.952*** (1.448)	1.837* (0.957)	3.037*** (0.468)
ln RES	−0.463 (0.446)	−1.165 (0.884)	−0.382 (0.539)	−1.804*** (0.466)
Bounds F [p]	9.836 [< .001]	3.382 [.063]		
Observations	71	80	71	80

Note. Managed regime: July 2013 to May 2019. Market regime: June 2019 to January 2026. No regressions include OIL (it is on the side of the graph). HAC standard errors are in parentheses. *** p < .01, ** p < .05, * p < .10.

Model 3 is complemented by Table 10, which provides separate estimates for each regime. In the static regressions, the domestic EPU effect is positive under the managed regime (0.537, p = .062), while the ARDL long run coefficient is small and insignificant. The static coefficient (p = .029) is negative under the market regime while the ARDL coefficient is insignificant (p = .509), and the bounds test is inconclusive (p = .063). Along with Model 3, all these results indicate that domestic EPU has no greater effect since May 2019, leading to rejection of H4.

The VIX, in contrast, is important in all of the split-sample regressions, and its long run elasticity is nearly four times higher in the market regime (5.952 versus 1.609). So it was not a shift in the sensitivity of the rupee to domestic uncertainty – it was a shift in the sensitivity of the rupee to global risk. Also, in the market-regime static regression, the coefficient of the reserves is significant at the .01 level (−1.804), suggesting a larger impact once the exchange rate is permitted to fluctuate.

Diagnostic Tests

Table 11: Diagnostic Tests

Test	Model 1	Model 2	Model 3
Breusch–Godfrey LM, 2 lags (F)	0.654 [.522]	0.287 [.751]	0.817 [.444]
Breusch–Godfrey LM, 4 lags (F)	1.629 [.171]	0.675 [.610]	1.722 [.149]
Breusch–Pagan–Godfrey (LM)	39.419 [.002]	38.747 [.002]	37.749 [.014]
Ramsey RESET (F)	7.480 [.007]	8.244 [.005]	5.817 [.017]
Jarque–Bera	7.716 [.021]	8.377 [.015]	10.383 [.006]
CUSUM (5%)	Stable	Stable	Stable
CUSUM of squares (10%)	Stable	Stable	Stable

Note. p values in brackets.

The dynamic specifications seem to capture persistence in volatility well with none of the models exhibiting serial correlation at 2 or 4 lags (all $p > .14$) as indicated in Table 11. The Breusch–Pagan–Godfrey test is used to test for homoskedasticity across all models, and it is rejected in all of them, so HAC standard errors are used to keep inferences robust to this issue.

The RESET test suggests that there is some nonlinearity, as seen in the regime shifts from Table 5. The Jarque–Bera test rejects the normality of the residuals, but the departure is not severe (skewness 0.46 and kurtosis 3.63 in Model 1) and has little effect on inference for a sample of this size. Most importantly, the CUSUM and CUSUM of squares statistics do not cross the 5% boundaries in any of the models, implying the stability of the estimated coefficients across the sample period.

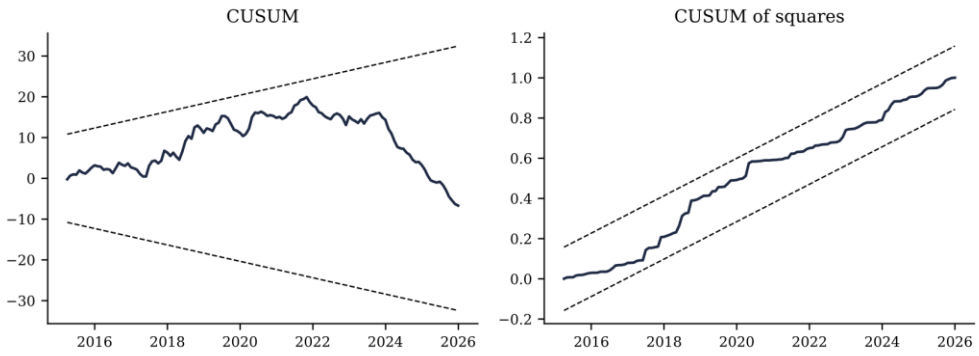


Figure 4: CUSUM and CUSUM of squares tests for Model 1

Note. The 5% significance bounds are shown as dashed lines.

This is also illustrated in Figure 4. The CUSUM line moves up until approximately 2022 and then it goes down, but it never touches the bounds. The

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CUSUM of squares line is also maintained within its corridor all of the time. The values of the parameters shown in Tables 7 and 8 are thus assumed to be stable.

Robustness Checks

Table 12: Robustness of the Long Run Coefficients (Linear ARDL)

Specification	ln EPU_PK	ln EPU_US	ln VIX	Bounds F	N
Baseline (Model 1)	0.471	−2.090***	4.091***	5.08***	148
(a) COVID-19 dummy, Mar–Dec 2020	0.649	−2.730***	3.616***	5.14***	148
(b) BIC lag selection	0.352	−2.174***	4.142***	4.86***	148
(c) Volatility from AED cross rate	0.411	−2.082***	4.111***	5.13***	148
(d) Four-newspaper EPU index, 2015–2026	0.594	−2.424**	4.167***	4.02**	130
(e) GARCH(1,1)-t volatility	0.323	−1.876***	3.652***	4.68***	148
(f) Sample ending Nov 2023	0.583**	−0.628	2.234***	17.10***	124
(g) Excluding VIX	0.005	0.757	excluded	2.13	148

Note. IRD, ln RES and ln OIL are in all models. Each specification has a set of lag orders which are reinstated for each iteration. *** $p < .01$, ** $p < .05$, * $p < .10$.

The primary findings are consistent over alternative specifications as reflected in Table 12. Even if a COVID-19 dummy is included (a), lags are selected by BIC (b), volatility is constructed from the dirham cross rate (c), the four-newspaper EPU index is employed (d), or volatility is estimated with a GARCH(1,1) model (e), the domestic EPU effect remains positive but not significant. The GARCH model estimated on daily returns yields highly persistent volatility parameters: $\alpha = 0.438$ and $\beta = 0.563$, and the monthly aggregate of the GARCH model is highly correlated with ln RV (0.971).

Two of the specifications are particularly helpful. The domestic EPU effect is significant (0.583, $p = .016$) and the US EPU effect disappears (f) when the sample ends at the final break in November 2023. This indicates that the weak full-sample EPU effect is due to the post-2023 sample in which uncertainty remained high and the rupee was kept very stable. When the VIX is dropped (g), cointegration is no longer found and the US EPU coefficient turns positive but insignificant. The US EPU effect is thus only present under a condition of global risk and the VIX plays an important role in this long run relationship.

Table 13: Robustness of the Regime Interaction (Long Run Coefficients)

Specification	ln EPU_PK (managed)	ln EPU_PK × D	Market regime effect
Baseline, D from June 2019	1.166*	−1.559**	−0.392
COVID-19 dummy	0.973	−1.190*	−0.217
GARCH(1,1)-t volatility	0.486	−0.786	−0.300
Break-based D from June 2018	1.609**	−1.990***	−0.381
Sample ending Nov 2023	0.439	0.042	0.481

Note. All models contain the following variables: a regime dummy, ln EPU_US, IRD, ln RES, ln OIL, and ln VIX. *** p < .01, ** p < .05, * p < .10.

Table 13 presents test results for the regime interaction for alternative specifications. The negative interaction is strong and significant, and is actually stronger with the data-identified June 2018 break (−1.990, p = .008), and it is marginally significant in the presence of a COVID-19 dummy (−1.190, p = .083). But it vanishes when using the GARCH-based volatility measure and, for the sample ending in November 2023, the domestic EPU effect is virtually equal in both regimes (interaction 0.042).

This weak effect after 2019 is mainly due to the time frame from December 2023 when domestic uncertainty was relatively high and the rupee was very stable. As had been previously planned, a GARCH-MIDAS model (Engle et al., 2013) was estimated in addition as a means to relate daily volatility to monthly EPU. It was not able to give reliable results due to its maximum likelihood estimates reaching the limit of the parameter space; that is, GARCH persistence of one. This mirrors the near-integrated GARCH dynamics from above and the often long periods of little change in the daily rates followed by large, discrete changes.

Causality Tests

Table 14: Toda and Yamamoto Granger Causality Tests

Null hypothesis	With no controls: W [p]	With controls: W [p]
ln EPU_PK does not cause ln RV	5.371 [.147]	5.881 [.118]
ln RV does not cause ln EPU_PK	2.143 [.543]	6.063 [.109]
ln EPU_US does not cause ln RV	3.191 [.363]	8.112 [.044]
ln RV does not cause ln EPU_US	3.491 [.322]	2.440 [.486]
ln EPU_US does not cause ln EPU_PK	4.349 [.226]	7.164 [.067]

Note. Wald $\chi^2(3)$ on the first 3 lags of a VAR(4) in levels. The exogenous variables were IRD, ln RES, ln OIL and ln VIX.

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Table 14 shows the Toda and Yamamoto (1995) tests, which are based on a VAR of three lags chosen by the Akaike criterion plus an augmentation lag. There is no evidence at the monthly frequency that currency turmoil causes domestic EPU (p = .543 without controls and .109 with controls). The EPU coefficients are therefore not likely to be biased by reverse causality.

Also, domestic EPU does not Granger-cause volatility (p = .147 and .118), similar to its small full-sample effect. US EPU causes an increase in rupee volatility after the controls (p = .044) and weakly causes an increase in Pakistani EPU (p = .067). The results show that uncertainty in the domestic market is an inferior predictor of the rupee when compared with the external market.

Summary of Hypothesis Testing

Table 15: Summary of Hypothesis Tests

Hypothesis	Key evidence	Decision
H1: Domestic EPU has a positive long run effect on volatility	Full sample 0.471 (p = .317); sample to Nov 2023 0.583 (p = .016); managed regime 1.166 (p = .091)	Partially supported
H2: The effect is asymmetric, larger for increases than decreases	Long run Wald p = .132; short run Wald p = .232	Not supported
H3: US EPU is positively associated with volatility	Negative with VIX (−2.090); positive but insignificant without VIX	Not supported (p = .002)
H4: The domestic EPU effect is larger under the market-based regime	Interaction −1.559 (p = .033)	Not supported (effect weaker)

The results are summarized in Table 15. H1 is only partially supported, as domestic EPU increases volatility prior to the end of 2023 and in the managed regime, but not across the entire sample. There is no support for H2, H3 and H4. The domestic EPU effect was symmetric, but US EPU weakened (not strengthened) the domestic EPU effect after controlling for global risk, and the market-based regime had a negative impact on the domestic EPU effect. In all of the tests, the VIX and the rupee reserves of SBP prove to be the most stable factors of rupee volatility.

DISCUSSION

The first finding is that domestic policy uncertainty leads to rupee volatility, albeit the result is quite sensitive. The point estimates are all positive across the linear specifications and the effect is found to be significant under the managed regime and for the sample that ends in November 2023. It is in accordance with the evidence provided by Shair et al. (2023) for Pakistan and the cross-country evidence of Krol (2014) and Aftab et al. (2024). However, the impact is not significant when looked at over the entire sample, as there was relatively high uncertainty during the same period but the rupee was relatively stable. The real options and portfolio balance arguments do apply, but only if uncertainty is free to reach the market. If a government intervenes or administers the exchange rate, it will absorb the uncertainty, not pass it on.

The second finding is that the effect is symmetric. This contradicts the prospect theory argument for H2 and the findings in the literature that indicate greater reactions to increases in uncertainty. The movements in uncertainty in Pakistan are closely coupled with a specific policy event, typically when the IMF agreement begins or ends, and that event is in turn followed by a change in the exchange rate. This can, of course, be as unsettling as an increase in uncertainty in the short run, which is reflected in the large short run coefficient for lagged decreases in EPU.

The third finding is that the main story is global. The biggest and most important effect is that of the VIX, which is several times larger following 2019, meaning that the rupee became more vulnerable to fluctuations in global risk appetite. This is consistent with the literature on the global financial cycle, where increases and decreases in global risk aversion lead to surges and stops of capital inflows to emerging markets (Forbes & Warnock, 2012; Rey, 2013). In fact, US policy uncertainty has a negative impact on rupee volatility once the VIX is controlled for. This must be taken with a grain of salt. The negative sign arises because US EPU is correlated with the VIX (0.640) (not all policy uncertainty is correlated with market stress). The arrival of abundant liquidity in the world or a weaker dollar, for reasons like the pandemic response in 2020 and tariff negotiations in 2025, could have reduced the rupee pressure. The findings are in line with those of Yang (2025) and Ekeocha et al. (2025), which is that external shocks are transmitted through global financial conditions and not US policy uncertainty per se for a small, managed currency. As the portfolio balance view anticipates, reserves negatively affect volatility, for high reserves mean that the rupee asset risk premium is low.

The fourth key conclusion is that the official 2019 regime change did not cause more domestic uncertainty to be transmitted. The break tests reveal that the rupee became volatile from June 2018, one year before the formal change, and has been very stable since December 2023, a long time after the change. It is consistent with the "fear of floating" literature (Calvo & Reinhart, 2002) and with findings that de facto regimes can differ from the de jure regimes (Ilzetzki et al., 2019). This increase in average volatility after 2019 is not due to increasing sensitivity to domestic policy news, but is rather due to an increase in exposure to global risk and the risk of the crisis of 2022–2023. Research that attempted to date the regime from the announcement of the regime might thus be mistaken in blaming the volatility on the regime itself.

CONCLUSION

This study examined whether policy uncertainty at home or global risk is the primary determinant of the exchange rate volatility of Pakistan's currency, the rupee (PKR/USD). It identifies a long run relationship in all specifications using realized volatility constructed from daily SBP data from July 2013 to January 2026, and ARDL models, both linear and nonlinear. Domestic EPU showed a significant positive long run effect before late 2023 and during the managed regime, but not overall, and the effect is symmetric. US EPU is a de-risker with respect to rupee volatility. The impact of domestic EPU was not exacerbated by the market-based regime that was introduced in May 2019.

The most powerful influences on rupee volatility are global risk, captured by the VIX, and SBP reserves, with the de facto break dates (June 2018 and December

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2023) being a better explanation of the data than the official date of May 2019. To sum up, the global risk and reserve buffers, as seen from the perspective of the regime that is actually working, are more important for rupee volatility than domestic policy news.

RECOMMENDATIONS

The findings suggest the following recommendations to the State Bank of Pakistan, the Government, firms and researchers:

- Create and maintain buffers. The most consistent domestic factor that was dampening volatility was reserves. SBP should give importance to the buildup of reserves as the primary domestic anchor for stability of the rupee and establish clear targets for reserve adequacy like months of import coverage.

- Keep a close eye on global risk. Global risk aversion is pervasive and strong in the rupee under a flexible regime, so global indicators like VIX should be monitored and contingency plans should be formulated in advance of global stress situations, both in terms of financing and communication with the market, by the SBP and Ministry of Finance.

- Communicate policy events clearly. Well-communicated reviews and major policy announcements of the IMF can minimize short-term volatility in the build-up to and during the resolution of domestic uncertainty.

- Adjust corporate hedging. Importers, exporters and firms having foreign currency debt should link their hedge ratios more closely to the global risk indicators than to the domestic policy news.

- Diversify external financing. This would reduce the need for short-term, dollar-denominated flows which change direction as soon as the world's risks increase, thereby reducing the rupee's vulnerability to global shocks.

- Use de facto regime dates. One should look at the actual experience with Pakistan's exchange rate policy and not just official announcements.

LIMITATIONS AND FUTURE RESEARCH

There are some limitations to the study. The US dollar rate was calculated from the riyal peg as the SBP data export provided no dollar series, but it followed the official rate very closely. The managed regime period is shorter than the length of the EPU index because the sample begins in July 2013. Three months of the EPU index had to be interpolated and the policy rate had to be built up using published decision dates. Time series regression is used to find associations and lagged predictive relationships, but not causal effects. The GARCH-MIDAS model failed to yield interior estimates, and the long stable period following December 2023 may reflect the effect of administrative measures, which are not reflected by the regressors.

Future work may involve: using intraday or interbank data to confirm results for the preceding years; modeling the de facto regime directly in a Markov-switching model; investigating the category-specific EPU indices (fiscal, monetary and trade);

and testing the results for other Asian countries that have undergone similar currency reforms.

SIGNIFICANCE OF THE STUDY

- **Theoretical significance.** The study examines and assesses the theories of real options, portfolio balance, and exchange rate regime in an emerging market where currency stress has occurred in the past. It demonstrates that policy uncertainty transmission mechanisms are regime-dependent and that global risk needs to be distinguished from US policy uncertainty to accurately assess the impacts of EPU.

- **Methodological significance.** The study uses a model-free realized volatility measure based on official daily data, asymmetric cointegration and a regime interaction, and break dating based on data. This mix has never been used in Pakistan and can serve as a blueprint for other small open economies.

- **Practical significance.** The findings provide the SBP and the government with some proof that the presence of a sufficient buffer of reserves and being prepared for global shocks is a better way to ensure stability of the currency than simply making statements about their domestic policies. They also provide a more robust foundation for firms and banks to base their currency risk management on, and they contribute to SDGs 8 and 17, informing macroeconomic stability policies.

AUTHOR NOTE

Correspondence concerning this article should be addressed to Mohammad Ahmer Abbas Khan Saldera, Department of Business, Economics and Finance, Greenwich University, Karachi, Pakistan. Email: Saldera25@gmail.com. The authors declare no conflict of interest. The study uses publicly available secondary data and received no external funding.

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