Sustainable Capital Markets as Exchange Rate Stabilizers: Quantile Evidence on Rupiah Resilience under External Monetary Shocks

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ABSTRACT

This study examines whether Indonesian capital market instruments are associated with Rupiah movements across the conditional distribution of the nominal effective exchange rate (NEER). Quarterly data from 2010Q1 to 2024Q4 are analyzed using quantile regression after unit root testing, a preliminary ARDL bounds assessment, and stationarity transformations. The U.S. Federal Funds Rate remains at level because it is stationary. Estimates are reported for lower, median, and upper quantiles using Huber Sandwich and XY pair bootstrap inference with 1,000 replications. The results identify the SRI KEHATI Index as the most consistent variable. Its coefficient is positive and significant across representative quantiles in Models 1 and 3, with the strongest robustness in Model 3. At the lower quantile, stronger sustainability-oriented equity performance is associated with more favorable Rupiah movements and reduced depreciation pressure. The LQ45 and Jakarta Islamic indices show no comparable robust relationships. Government bonds and the domestic policy rate are significant only under limited lower-quantile conditions, while the Federal Funds Rate has no robust direct association with NEER movements. Slope equality tests reveal no significant differences across quantiles. Overall, sustainability-oriented equity performance shows the strongest association with Rupiah resilience, although the empirical findings indicate a statistical association rather than causality.

1. Introduction

Exchange rate volatility remains a persistent challenge for emerging economies, particularly during periods of global monetary tightening and heightened financial uncertainty. For countries with relatively open capital markets such as Indonesia, fluctuations in the Rupiah are driven not only by macroeconomic fundamentals but also by financial market dynamics and cross border portfolio flows. Global shocks can alter investors' perceptions of risk and return, induce portfolio reallocation toward safer or more attractive assets, and generate capital outflows from emerging markets, thereby increasing pressure on domestic currencies.

For a developing economy such as Indonesia, fluctuations in the Rupiah against the U.S. dollar are closely related to international trade dynamics and domestic macroeconomic and financial conditions. Previous evidence indicates relationships between the exchange rate, international trade, external debt, government bond market conditions, and investors' assessments of financial risk (Soebagio & Solikin, 2019; Malini, 2020; Rangkuty et al., 2024; Hofmann et al., 2025). Recent episodes such as the taper tantrum, the COVID-19 pandemic, and subsequent U.S. monetary tightening have therefore highlighted the vulnerability of emerging market currencies to external financial and monetary shocks. In this context, understanding whether domestic capital market instruments are associated with exchange rate dynamics has become increasingly relevant for both research and policy. In the early 2010s, the Rupiah traded at around IDR 9,000–10,000/USD but entered a weakening trend following the 2013 taper tantrum, reaching above IDR 14,000/USD in 2015. The COVID-19 pandemic generated further pressure, with the Rupiah reaching approximately IDR 16,500/USD in March 2020 before stabilizing at around IDR 14,000–15,000/USD during 2021–2022 and facing renewed pressure to approximately IDR 16,200/USD in April 2024. Arisanti et al. (2022) also document substantial Rupiah volatility during the COVID-19 period, with depreciation ranging between 2.75% and 4.57% from March to September 2020. These episodes demonstrate the persistent exposure of the Rupiah to domestic and global financial shocks and raise the question of whether different domestic capital market instruments may be associated with exchange rate dynamics under different market conditions.

According to the monetary asset market approach, exchange rate movements can be explained through the interaction of Purchasing Power Parity (PPP), Uncovered Interest Rate Parity (UIP), and money market equilibrium. Within this framework, stock price fluctuations may influence exchange rates through income and interest rate effects under the assumption of perfect substitutability between domestic and foreign securities. Branson (1977, 1981, 1983) extended this perspective through the portfolio balance approach, which emphasizes investor portfolio adjustments among money, domestic bonds, and foreign bonds. Changes in the relative supply, return, or risk in these assets encourage investors to rebalance their portfolios, thereby affecting asset demand and exchange rates. Unlike the monetary approach, the portfolio balance model assumes imperfect substitutability between domestic and foreign assets, implying that UIP may not always hold (Tari & Gozen, 2018) . This approach provides the theoretical basis for understanding the relationship between domestic financial assets, portfolio reallocation, and exchange rate dynamics.

Recent empirical evidence demonstrates that exchange rate dynamics in emerging and developing economies are closely linked to financial and macroeconomic conditions. Risk premiums, interest rate differentials, and global monetary policy conditions may affect emerging market currencies, while their relationships can vary across time and market conditions (Özmen & Erdal, 2017). Central bank intervention may also produce different effects on exchange rate volatility during periods of financial stress (Katusiime, 2023). International financial inflows and debt conditions can influence currency appreciation and external competitivenes (Ahmad et al., 2023), while exchange rate volatility may affect investment decisions, macroeconomic sustainability, and international trade (Ghauri et al., 2024; Caytuiro-Valle et al., 2025). Shahabadi et al., (2025) further show that structural characteristics such as economic complexity and globalization may shape exchange rate dynamics. From a capital market perspective. Nusair & Olson (2022) identify a dynamic relationship between stock prices and effective exchange rates that is consistent with the portfolio balance mechanism. Hofmann et al. (2020) similarly show that currency appreciation in emerging markets is associated with narrower sovereign bond spreads through the portfolio choices of global investors. Collectively, these findings demonstrate important links among financial conditions, capital markets, portfolio decisions, and exchange rates.

In Indonesia, previous studies have examined the Rupiah in relation to a combination of domestic and external financial conditions. GDP, inflation, interest rates, and financial market returns have been associated with exchange rate and capital market conditions, although the direction and magnitude of their relationships are not always consistent (Seftarita & Diana, 2020; Siska et al., 2023; Roziq et al., 2024; Sanfa et al., 2024). Sakuntala & Meliza (2020), for example, find that monetary fundamentals have different effects on the Rp/USD exchange rate following the Global Financial Crisis, suggesting that the relationship between macroeconomic conditions and the Rupiah may not be uniform across economic conditions. Exchange rate conditions are also closely linked to foreign investment (Tan et al., 2020; Zuhroh & Harpiyansa, 2022). More recently, Setyowati et al. (2024) examine the exchange rate as one of the macroeconomic factors associated with movements in the Indonesian Sharia Stock Index. This evidence confirms a close interaction between exchange rates and domestic financial markets, although much of the existing literature focuses on macroeconomic determinants of exchange rates or examines exchange rates as determinants of capital market performance.

Despite this growing literature, several related gaps remain. Studies on the Rupiah have predominantly focused on macroeconomic fundamentals, external monetary conditions, and conventional financial determinants, while the relationship between sustainability oriented capital market instruments and exchange rate dynamics remains relatively underexplored. Existing studies also generally examine sustainability oriented, Islamic, and conventional equity markets and sovereign bonds separately, providing limited comparative evidence within a common empirical framework. More importantly, previous empirical studies tend to emphasize average relationships between macroeconomic or financial variables and exchange rates. Such an approach may conceal heterogeneous relationships at different points of the exchange rate distribution. Consequently, limited evidence is available on whether the relationship between different capital market instruments and the Rupiah varies across different parts of the exchange rate distribution, particularly under different market conditions.

Within this framework, the potential stabilizing role of domestic capital market instruments refers to their association with greater Rupiah resilience under changing financial and monetary conditions. Rupiah resilience is therefore examined through the heterogeneous

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relationship between these instruments and exchange rate movements across different parts of the conditional exchange rate distribution.

To address these gaps, this study examines whether different domestic capital market instruments are associated with exchange rate movements in Indonesia. While Rp/USD movements provide a visible bilateral representation of pressure on the Rupiah, the empirical analysis employs the Nominal Effective Exchange Rate (NEER), which captures broader changes in the nominal external value of the Rupiah against a trade weighted basket of currencies. The use of an effective exchange rate is consistent with previous studies examining exchange rate movements in emerging and developing economies and the relationship between stock prices and exchange rates (Keefe & Saha, 2022; Nusair & Olson, 2022). The main explanatory variables consist of the SRI KEHATI Index as a sustainability oriented equity index, the Jakarta Islamic Index (JII) as an Islamic equity index, the LQ45 Index as a conventional equity index, and government bonds (SUN) representing the sovereign bond market. The Bank Indonesia policy interest rate and the U.S. Federal Funds Rate are included as control variables representing domestic and external monetary conditions. Drawing on the portfolio balance approach, portfolio reallocation provides the theoretical transmission mechanism linking changes in the relative attractiveness of these financial assets to exchange rate movements.

Quantile regression is employed because the relationships between capital market instruments and the Rupiah may not be uniform across different exchange rate conditions. Specifically, the method allows this study to examine whether these relationships vary across different parts of the conditional NEER distribution rather than restricting the analysis to an average effect. This is particularly relevant to the objective of identifying whether the relationships between domestic capital market instruments and exchange rate dynamics differ when the Rupiah is exposed to varying financial and external monetary conditions.

Exchange rate stability is important because it can reduce uncertainty in international transactions, strengthen investor confidence, and support sustainable economic development (Chikwira & Jahed, 2024). Against this background, this study offers four contributions to the literature. First, it extends the exchange rate literature by examining sustainability oriented capital market instruments within the portfolio balance framework and their potential role in supporting Rupiah resilience. Second, it moves beyond average effects by examining whether the relationships between capital market instruments and exchange rate movements vary across the conditional NEER distribution. Third, by jointly examining sustainability oriented, Islamic, and conventional equity indices alongside sovereign bonds, the study provides comparative evidence across different domestic capital market segments. Finally, by focusing on Indonesia, the study provides context specific evidence on the relationship between diverse domestic capital market instruments and exchange rate dynamics in an emerging economy exposed to global monetary and portfolio shocks.

2. Literature Review

Exchange Rate Theory

The real exchange rate reflects the relative price of domestic goods and services compared to those abroad, adjusted for price levels. One of the fundamental theories explaining exchange rate movements is the Purchasing Power Parity (PPP), which posits that exchange rates adjust to equalize the purchasing power between two countries (Cassel, 1918). While conceptually straightforward, in practice exchange rates are influenced by additional factors such as interest rate differentials, capital flows, and market expectations (Rogoff, 1996).

The Interest Rate Parity (IRP) theory explains the relationship between the differential in domestic and foreign interest rates and exchange rate movements (Frankel, 1979). An increase in the domestic interest rate, ceteris paribus, can attract capital inflows, thereby fostering currency appreciation. Conversely, an increase in foreign interest rates particularly from countries with strong currencies such as the U.S. dollar can trigger capital outflows and lead to a depreciation of the domestic currency.

The Relationship Between the Green Stock Market and Exchange Rates

The relationship between the stock market and exchange rates can generally be explained through two main approaches: (1) the Traditional Approach, where currency depreciation can enhance export competitiveness, increase corporate profits, and, in turn, drive up stock prices; and (2) the Portfolio Balance Approach, where currency appreciation can attract foreign investors by increasing the returns on domestic assets when measured in foreign currency (Branson, 1983).

Capital markets, along with ESG (Environmental, Social, and Governance) instruments and SRI (Socially Responsible Investing), are interconnected in ways that can directly or indirectly influence exchange rate dynamics. ESG and SRI investments are increasingly prioritized by global investors due to their focus on long-term sustainability and societal benefits. This trend has led to higher capital inflows into ESG-oriented funds and instruments, particularly during periods of heightened environmental or social awareness (Kuksov, 2022; Fiordelisi et al., 2023). Positive performance in these indices can stimulate capital inflows, as global investors increasingly prioritize sustainable investments (Setyowati et al., 2024). ESG and SRI based investments focus on environmental, social, and governance criteria to generate long-term positive societal impacts while delivering financial returns (Kuksov, 2022; Poggi, 2025). This trend is expanding globally, including in emerging markets such as India and Russia, driven by both investor interest and supportive regulatory policies (Beloskar & Rao, 2023; Vishali & M.K, 2024). Firms with high ESG scores particularly in areas such as emissions reduction, innovation, human rights, and community responsibility are proven to be more attractive to foreign institutional investors (Chaklader et al., 2024). Nevertheless, ESG implementation often increases the cost of capital due to compliance requirements; however, this can be mitigated through effective government policies and robust corporate governance (Ekawati et al., 2025).

The Relationship Between the Bond Market and Exchange Rates

The bond market influences exchange rates through interest rate mechanisms and risk perception. According to the portfolio balance model developed by Branson (1977), changes in any of the following assets money, domestic bonds, or foreign bonds can trigger portfolio rebalancing, which affects the exchange rate through shifts in asset demand and may ultimately lead to currency appreciation (Tari & Gozen, 2018). Government involvement is also critical, particularly through the issuance of sovereign bonds aligned with ESG principles, which can attract sustainability-oriented investors and influence capital market dynamics (Ekawati et al., 2025; Kuksov, 2022).

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Direct empirical evidence linking capital market variables to exchange rates remains limited but provides support for the proposed transmission mechanism. Nusair & Olson (2022) identify dynamic relationships between stock prices and nominal effective exchange rates that are consistent with the portfolio balance approach, while Hofmann et al. (2020) show that sovereign bond risk premia and exchange rates in emerging markets are jointly influenced by the portfolio choices of global investors. By contrast, the ESG and SRI literature primarily provides evidence through investor confidence and capital allocation channels, whereby stronger sustainability performance may attract foreign institutional investment (Beloskar & Rao, 2023; Chaklader et al., 2024). Thus, while existing evidence supports the broader capital market and exchange rate linkage, the direct exchange rate implications of sustainability oriented instruments remain underexplored, providing an important empirical motivation for this study.

3. Research Method

This study examines different segments of the Indonesian capital market. The sustainability oriented equity segment comprises the SRI KEHATI Index (JKSRI) and the Jakarta Islamic Index (JII), although they represent different dimensions of sustainable investment. JKSRI represents sustainability and green oriented equities, while JII represents Shariah compliant equities characterized by ethical and financial screening criteria that conceptually align with responsible and sustainable investment principles (Ashraf & Khawaja, 2016; Sakuntala et al., 2022, 2025). Accordingly, JII is treated as an Islamic sustainability oriented equity segment rather than as a conventional green stock index. The LQ45 Index (LQ45X) represents conventional equities, while government bonds (SUN) represent the sovereign bond market. Two monetary policy variables are included as controls: the Bank Indonesia policy interest rate (PRI) representing domestic monetary conditions, and the U.S. Federal funds rate (FEDFR) representing external monetary conditions. Exchange rate movements are measured using the nominal effective exchange rate (NEER). NEER is expressed as an index in which an increase indicates nominal appreciation of the Rupiah against a trade weighted basket of currencies, whereas a decrease indicates nominal depreciation.

The empirical analysis uses quarterly time series data from 2010Q1 to 2024Q4, yielding 60 observations. All variables were originally available at a monthly frequency and were converted into quarterly observations using the last available month of each quarter; thus, March, June, September, and December represent Q1, Q2, Q3, and Q4, respectively. This end of quarter approach is consistent with previous financial and exchange rate studies that construct quarterly observations from monthly data using the last month of each quarter (Bhattacharya, 2024; Hu et al., 2024; Fiorelli et al., 2025). Data were obtained from Bank Indonesia, Bank for International Settlements (BIS), and Investing.com, and all series were chronologically aligned to form a balanced quarterly sample.

Prior to estimation, the stationarity properties of the variables are assessed using the Augmented Dickey Fuller test (Dickey & Fuller, 1979; Said & Dickey, 1984). The optimal lag length was determined using the Schwarz Information Criterion (SIC), which favors a parsimonious specification by balancing model fit against the number of estimated parameters (Schwarz, 1978). Appropriate lag selection is important because too few lags may leave residual autocorrelation, whereas too many lags may reduce the power of the ADF test (Ng & Perron, 2001). The test results indicate that NEER, JKSRI, LQ45X, JII, SUN, and PRI are integrated of order one, I(1), whereas FEDFR is stationary at level, I(0). Given the mixed integration orders, the ARDL bounds testing approach is applied as a preliminary assessment of possible long run levels relationships (Pesaran et al., 2001). The bounds tests are estimated under Case 3, which includes an unrestricted constant and no deterministic trend. The residual properties of the selected ARDL specifications are examined using the Breusch Godfrey LM test for serial correlation and the Breusch Pagan Godfrey test for heteroskedasticity. Parameter stability is assessed using the CUSUM and CUSUM of Squares tests

To examine heterogeneous relationships between sustainability oriented capital market instruments and the Rupiah exchange rate, this study employs quantile regression. Unlike conventional mean regression, quantile regression estimates relationships at different conditional quantiles of the dependent variable, allowing the effects of explanatory variables to vary across lower, median, and upper parts of the distribution (Koenker & Bassett Jr., 1978, 1982; Chu et al., 2023; Gijbels et al., 2018; Martínez & Ibeth, 2026). This property provides a more comprehensive characterization of exchange rate dynamics across different market conditions. Quantile regression is also suitable for distributions characterized by heteroskedasticity, asymmetry, heavy tails, and outliers (Dichandra et al., 2021; Gnardellis, 2026; Lu & Zi, 2024). Coefficient heterogeneity across quantiles is formally assessed using the Koenker and Bassett slope equality Wald test, while the robustness of statistical inference is evaluated using Huber Sandwich and bootstrap standard errors (Koenker & Bassett Jr., 1978, 1982; Koenker, 2005).

The quantile τ, where $0 < \tau < 1$ identifies a particular point of the conditional distribution of the dependent variable. Values below 0.50 represent the lower part of the distribution, τ=0.50 represents the conditional median, and values above 0.50 represent the upper part. Consistent with the research design, the quantile process is examined across the conditional NEER distribution from τ=0.10 to τ=0.90, allowing the relationships between capital market instruments and the exchange rate to be compared across different distributional conditions. The general linear quantile regression model is specified as follows (Peng, 2021):

$$y_t = X_t\,\beta\,(\theta) + \varepsilon_t \quad \text{(1)}$$

where y_t is an [n × 1] vector of response variables, X_t is an [n × p] matrix of explanatory variables, $\beta(\theta)$ is a [p × 1] vector of parameters for the conditional quantile θ, and ε is an [n × 1] vector of error terms. The estimation results of equation (1) yield a quantile distribution for each parameter estimate. Formally, the conditional quantile function of y_t given X_t at quantile τ is defined as:

$$Q_{Y_t}(\tau \mid X_t) = X_t'\,\beta(\tau) \quad \text{(2)}$$

where $Q_{Y_t}(\tau \mid X_t)$ denotes the conditional quantile τ of the exchange rate, and X_t' represents the set of explanatory variables, including sustainability-oriented stock market indices, government bonds, and monetary policy variables. The parameters $\beta(\tau)$ are estimated by minimizing the asymmetric loss function associated with the quantile τ (Koenker, 2005; Koenker & Bassett Jr., 1978).

In this study, the vector of independent variables consists of JKSRI, JII, LQ45X, SUN, PRI, and FEDFR, while NEER is the dependent variable. Subsequently, equation (1) is adapted to the specific research model, which can be expressed as follows:

$$Q_{NEER}\,(\tau \mid Xt\,) = \beta_0(\tau) + \sum_{i=1}^{k} \beta_i\,(\tau)\,X_{it} + \varepsilon_i(\tau) \quad \text{...} (3)$$

where $Q_{NEER}\,(\tau \mid Xt\,)$ denotes the conditional quantile of the exchange rate; τ represents the quantiles ranging from 0.1, 0.25, 0.5, 0.75, until 0.9; $\beta_i(\tau)$ denotes the the quantile specific coefficient; and $\varepsilon_i(\tau)$ is the error term at quantile τ. Three empirical specifications are estimated:

a. Model 1 : Sustainability oriented and conventional equity markets

$$Q_{NEER}(\tau) = \beta_0(\tau) + \beta_1(\tau)\,\mathrm{JKSRI}_t + \beta_2(\tau)\,\mathrm{LQ45X}_t + \beta_3(\tau)\,\mathrm{PRI}_t + \beta_4(\tau)\,\mathrm{FEDFR}_t + \varepsilon_t(\tau) \quad \text{.....................} (4)$$

b. Model 2 : Islamic equity and sovereign bond markets

$$Q_{NEER}(\tau) = \beta_0(\tau) + \beta_1(\tau)\,\mathrm{JII}_t + \beta_2(\tau)\,\mathrm{SUN}_t + \beta_3(\tau)\,\mathrm{PRI}_t + \beta_4(\tau)\,\mathrm{FEDFR}_t + \varepsilon_t(\tau) \quad \text{.....................} (5)$$

c. Model 3 : Sustainability oriented equity and sovereign bond markets

$$Q_{NEER}(\tau) = \beta_0(\tau) + \beta_1(\tau)\,\mathrm{JKSRI}_t + \beta_2(\tau)\,\mathrm{SUN}_t + \beta_3(\tau)\,\mathrm{PRI}_t + \beta_4(\tau)\,\mathrm{FEDFR}_t + \varepsilon_t(\tau) \quad \text{..................} (6)$$

4. Results and Discussion

Results

For time-series data, an initial step involves conducting a stationarity test. This test is essential to avoid spurious regression. Formal tests for non-stationarity, commonly referred to as unit root tests or random walk tests, can be carried out using the Augmented Dickey-Fuller (ADF) tests to assess the stationarity of the variables, with lag length base on Schwarz Information Criterion (SIC).

Table 1. Stationarity Test Results

Variables	ADF t-Statistics		Stationary
	Level	First Difference	
NEER	-1.8157	-9.1811***	I (1)
JKSRI	-3.1886	-8.8201***	I (1)
LQ45X	-3.2428	-6.7763***	I (1)
JII	-2.8382	-8.0208***	I (1)
SUN	-2.1319	-4.9628***	I (1)
PRI	-2.1192	-5.0009***	I (1)
FEDFR	-5.9728***		I (0)

Source: Author's calculation based on processed data, (2026).

Since, the results of the stationarity tests, as presented in Table 1 indicate that variables are stationary either at the level form I(0) or at the first difference I(1), so we must doing cointegration test with Autoregresive Distributed Lag (ARDL) bound test (Pesaran et al., 2001; Pesaran & Shin, 1999) .

Table 2. ARDL Bound Test Cointegration

Model	Selected ARDL	N	F-stats	I(0) lower bound 5%	I(1) upper bound 5%	t-stats	Decision
Model 1	(1,4,0,3,0)	56	3.4861	3.068	4.334	−2.7808	Inconclusive
Model 2	(1,4,1,3,0)	56	4.0765	3.068	4.334	−3.6956	Inconclusive
Model 3	(1,1,1,3,0)	56	5.8064	3.068	4.334	−4.1704	Cointegration

Notes: The null hypothesis is no levels relationship. Critical values refer to the finite sample bounds reported by EViews for the nearest available sample size, n=55, under Case 3 (unrestricted constant and no trend). At the 5% level, the I(0) and I(1) F bounds are 3.068 and 4.334, respectively.
Source: Author's calculation based on processed data, (2026).

Table 3. ARDL Residual and Stability Diagnostic

Model	BG Serial Correlation LM		BPG Heteroskedasticity		CUSUM	CUSUMSQ
	χ^2 (*p*-value)	Decision	χ^2 (*p*-value)	Decision		
Model 1	8.0195 (0.0909)	No serial correlation	13.0767 (0.3635)	Homoskedastic	Stable	Stable
Model 2	1.5750 (0.8133)	No serial correlation	14.9088 (0.3131)	Homoskedastic	Stable	Stable
Model 3	7.2672 (0.1224)	No serial correlation	14.1893 (0.1645)	Homoskedastic	Unstable	Stable

Source: Author's calculation based on processed data, (2026).

The diagnostic results show no evidence of serial correlation or heteroskedasticity across the three specifications at the 5% significance level. Both the CUSUM and CUSUMSQ tests indicate parameter stability in Models 1 and 2. In Model 3, however, the CUSUM statistic crosses the 5% critical boundary, indicating potential parameter instability, although the CUSUMSQ statistic remains within the critical bounds.

The ARDL bounds test provides heterogeneous evidence of long run relationships across the three specifications. The results are inconclusive for Models 1 and 2 at the 5% significance level, whereas Model 3 provides evidence of a levels relationship. In addition, the diagnostic tests reveal potential parameter instability in Model 3. Therefore, the ARDL analysis is retained as a preliminary assessment of possible long run relationships, while the main empirical analysis is conducted using quantile regression on stationary transformed series. This sequential use of ARDL and quantile based analysis is consistent with previous empirical applications that distinguish mean based time series relationships from distributional heterogeneity (Shafiullah et al., 2020; Sangco, 2024). Quantile regression therefore allows the relationships between capital market variables and NEER to be examined across lower, central, and upper parts of the conditional distribution rather than being restricted to the conditional mean.

Following the preliminary time series analysis, the main empirical relationships are examined using quantile regression on stationary series. NEER, JKSRI, LQ45X, JII, SUN, and PRI enter the quantile specifications in first differences, whereas FEDFR remains in level because it is stationary at level. After first differencing, all three specifications contain 59 observations. Representative estimates are reported for the lower (τ=0.25), median (τ=0.50), and upper (τ=0.75) parts of the conditional distribution of changes in NEER. Huber Sandwich inference is used as the baseline, while XY pair bootstrap inference with 1,000 replications is reported as a robustness check.

Table 4, 5, and 6 are presents the quantile regression estimates across the lower, median, and upper parts of the conditional distribution of changes in exchange rate (ΔNEER). The results reveal substantial differences in the consistency of the estimated relationships across the three specifications. In Table 4 Model 1, ΔJKSRI has a positive coefficient at all three representative quantiles. The coefficient increases from 0.1287 at τ=0.25 to 0.1638 at the median and 0.2238 at τ=0.75. The corresponding Huber p values are 0.0280, 0.0105, and 0.0003, respectively. Bootstrap inference confirms the relationship at the median and upper quantiles, with *p*-values of 0.0018 and 0.0021. At the lower quantile, the bootstrap *p*-value increases to 0.0612, indicating that the relationship remains significant at the 10% level but not at the 5% level. In contrast, ΔLQ45X is statistically insignificant at all three quantiles under both Huber Sandwich and bootstrap inference. The coefficients of ΔPRI are negative but statistically insignificant across the representative quantiles. FEDFR is positive and weakly significant at the lower quantile under Huber Sandwich inference (β=0.0051, p=0.0958), although the corresponding bootstrap *p*-value of 0.1018 does not support significance at the 10% level. At the median and upper quantiles, FEDFR is statistically insignificant. The Quasi LR test indicates overall statistical significance for Model 1 at the lower and median quantiles, while the upper quantile is significant at the 10% level.

At Table 5 Model 2 provides weaker statistical evidence. ΔJII is statistically insignificant at the lower, median, and upper quantiles, with Huber *p*-values of 0.4435, 0.7222, and 0.5734, respectively. ΔSUN has a negative coefficient of −0.5138 at the lower quantile and is significant at the 10% level under Huber Sandwich inference (p=0.0641).

Table 4. Quantile Regression Estimates Model 1

Variable	Lower (τ =0.25)	Median (τ =0.50)	Upper (τ =0.75)
ΔJKSRI	0.1287**	0.1638**	0.2238***
Huber *p*-value	(0.0280)	(0.0105)	(0.0003)
Bootstrap *p*-value	[0.0612]	[0.0018]	[0.0021]
ΔLQ45X	−0.0005	0.0025	0.0021
Huber *p*-value	(0.8781)	(0.3616)	(0.2913)
Bootstrap *p*-value	[0.8903]	[0.3871]	[0.8670]
ΔPRI	−0.0235	−0.0019	−0.0044
Huber *p*-value	(0.1727)	(0.9113)	(0.7847)
Bootstrap *p*-value	[0.2548]	[0.9396]	[0.8162]
FEDFR	0.0051*	0.0008	0.0008
Huber *p*-value	(0.0958)	(0.7914)	(0.7406)
Bootstrap *p*-value	[0.1018]	[0.7547]	[0.7731]
Constant	−0.0338***	−0.0071	0.0082
Pseudo (R2)	0.1872	0.1359	0.1271
Prob. Quasi LR	0.0119	0.0442	0.0587

Note : The dependent variable is ΔNEER. The first line for each variable reports the estimated quantile coefficient. Huber Sandwich *p*-values are reported in parentheses, while *p*-values based on XY pair bootstrap standard errors with 1,000 replications are reported in square brackets. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively, based on Huber Sandwich inference. All specifications contain 59 observations.
Source: Author's calculation based on processed data, (2026).

However, this result is not supported by bootstrap inference (p=0.1110). The coefficient of ΔSUN becomes positive at the median and returns to a small negative value at the upper quantile, but neither estimate is statistically significant. ΔPRI is negative and statistically significant at the 5% level at the lower quantile (β=−0.0327, p=0.0433), but its bootstrap *p*-value rises to 0.1140. Thus, the significance of PRI at the lower quantile is sensitive to the covariance estimator. At the median and upper quantiles, PRI is statistically insignificant. FEDFR is positive but insignificant throughout the three representative quantiles. Consistent with the individual estimates, the Quasi LR statistic provides only weak overall evidence at the lower quantile and no evidence of joint significance at the median or upper quantiles.

At Table 6 Model 3, yields the most consistent estimates for ΔJKSRI. The coefficient is positive at all three representative quantiles and increases from 0.1355 at τ=0.25 to 0.1712 at τ=0.50 and 0.2201 at τ=0.75. The estimates are statistically significant under Huber Sandwich inference, with *p*-values of 0.0110, 0.0025, and 0.0009, respectively. Importantly, the same conclusion is maintained under bootstrap inference, for which the corresponding *p*-values are 0.0115, 0.0015, and 0.0005. Thus, the positive ΔJKSRI coefficient is robust across the lower, median, and upper quantiles in Model 3.

Table 5. Quantile Regression Estimates Model 2

Variable	Lower (τ =0.25)	Median (τ =0.50)	Upper (τ =0.75)
ΔJII	0.0917	−0.0177	0.0260
Huber *p*-value	(0.4435)	(0.7222)	(0.5734)
Bootstrap *p*-value	[0.2448]	[0.8429]	[0.7907]
ΔSUN	−0.5138*	0.2274	−0.0396
Huber *p*-value	(0.0641)	(0.4517)	(0.8820)
Bootstrap *p*-value	[0.1110]	[0.5016]	[0.9007]
ΔPRI	−0.0327**	−0.0086	−0.0088
Huber *p*-value	(0.0433)	(0.6364)	(0.5542)
Bootstrap *p*-value	[0.1140]	[0.7214]	[0.6633]
FEDFR	0.0021	0.0026	0.0022
Huber *p*-value	(0.5461)	(0.4131)	(0.5595)
Bootstrap *p*-value	[0.4822]	[0.4280]	[0.4870]
Constant	−0.0147	−0.0132	0.0150
Pseudo R	0.1511	0.1511	0.1511
Prob. Quasi LR	0.0513	0.0513	0.0513

Note : The dependent variable is ΔNEER. The first line for each variable reports the estimated quantile coefficient. Huber Sandwich *p*-values are reported in parentheses, while *p*-values based on XY pair bootstrap standard errors with 1,000 replications are reported in square brackets. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively, based on Huber Sandwich inference. All specifications contain 59 observations.
Source: Author's calculation based on processed data, (2026).

ΔSUN has a negative coefficient of −0.5016 at the lower quantile and is significant at the 5% level under Huber Sandwich inference (p=0.0489). The bootstrap *p*-value is 0.0505, placing the estimate immediately above the 5% threshold but within the 10% significance level. At the median and upper quantiles, the SUN coefficients are statistically insignificant. ΔPRI is negative and weakly significant at the lower quantile under Huber Sandwich inference (p=0.0583), but this result is not preserved under bootstrap inference (p=0.1472). Neither PRI nor FEDFR is statistically significant at the median or upper quantiles. The Quasi LR statistic indicates overall significance of Model 3 at the lower and median quantiles and weaker evidence at the upper quantile.

Table 7 reports the Wald slope equality tests across the representative quantiles. The null hypothesis of equal slope coefficients cannot be rejected for any of the three specifications. The Wald statistics are 6.1568 for Model 1 (p=0.6297), 11.6226 for Model 2 (p=0.1689), and 5.5143 for Model 3 (p=0.7015). Accordingly, although several coefficient estimates vary numerically across the lower, median, and upper quantiles, the joint tests do not provide statistically significant evidence that the slopes differ across these representative points of the conditional distribution.

Table 6. Quantile Regression Estimates Model 3

Variable	Lower (τ =0.25)	Median (τ =0.50)	Upper (τ =0.75)
Variable	Lower τ=.25	Median τ=.50	Upper τ=.75
ΔJKSRI	0.1355**	0.1712***	0.2201***
Huber *p*-value	(0.0110)	(0.0025)	(0.0009)
Bootstrap *p*-value	[0.0115]	[0.0015]	[0.0005]
ΔSUN	−0.5016**	−0.0803	−0.3117
Huber *p*-value	(0.0489)	(0.7969)	(0.3613)
Bootstrap *p*-value	[0.0505]	[0.7833]	[0.3667]
ΔPRI	−0.0262*	−0.0033	−0.0199
Huber *p*-value	(0.0583)	(0.8733)	(0.5413)
Bootstrap *p*-value	[0.1472]	[0.8948]	[0.3211]

Variable	Lower (τ =0.25)	Median (τ =0.50)	Upper (τ =0.75)
FEDFR	0.0016	0.0007	0.0016
Huber *p*-value	(0.6203)	(0.8107)	(0.6179)
Bootstrap *p*-value	[0.5809]	[0.7890]	[0.5393]
Constant	−0.0129	−0.0052	0.0207
Pseudo R	0.2522	0.2522	0.2522
Prob. Quasi LR	0.0011	0.0413	0.0962

Note : The dependent variable is ΔNEER. The first line for each variable reports the estimated quantile coefficient. Huber Sandwich *p*-values are reported in parentheses, while *p*-values based on XY pair bootstrap standard errors with 1,000 replications are reported in square brackets. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively, based on Huber Sandwich inference. All specifications contain 59 observations.
Source: Author's calculation based on processed data, (2026).

Table 7. Quantile Slope Equality Tests

Specification	Quantiles Compared	Wald (χ^2)	df	*p*-value	Result
Model 1	0.25, 0.50, 0.75	6.1568	8	0.6297	Equality not rejected
Model 2	0.25, 0.50, 0.75	11.6226	8	0.1689	Equality not rejected
Model 3	0.25, 0.50, 0.75	5.5143	8	0.7015	Equality not rejected

Note: The null hypothesis of the Wald test states that the slope coefficients are equal across the representative quantiles
Source: Author's calculation based on processed data, (2026).

At Table 8, we can see the quantile process estimates provide a broader view of the coefficient trajectories over the conditional distribution of ΔNEER. In Model 1, the ΔJKSRI coefficient remains positive throughout the process and generally becomes larger toward the upper quantiles. By contrast, the ΔLQ45X coefficient remains close to zero throughout the distribution. The PRI coefficient is more negative in the lower part of the distribution and approaches zero around the median, while the FEDFR coefficient is also larger at the lower quantiles than around the center and upper parts of the distribution.

Table 8. Selected Quantile Process Coefficients

Variable	τ=0.10	τ=0.30	τ=0.50	τ=0.70	τ=0.90
Model 1					
ΔJKSRI	0.1438	0.1376	0.1638	0.2075	0.2334
ΔLQ45X	0.0018	−0.0001	0.0025	0.0014	0.0020
ΔPRI	−0.0336	−0.0185	−0.0019	−0.0035	−0.0058
FEDFR	0.0063	0.0046	0.0008	0.0015	0.0016
Model 2					
ΔJII	0.0819	0.0819	−0.0177	0.0168	0.0424
ΔSUN	−0.3758	−0.5639	0.2274	0.0316	0.3256
ΔPRI	−0.0302	−0.0312	−0.0086	−0.0116	−0.0107
FEDFR	0.0040	0.0011	0.0026	0.0031	0.0054
Model 3					
ΔJKSRI	0.1219	0.1418	0.1712	0.1821	0.1822
ΔSUN	−0.4084	−0.5406	−0.0803	0.0146	0.0605
ΔPRI	−0.0314	−0.0238	−0.0033	−0.0056	0.0013
FEDFR	0.0039	0.0010	0.0007	0.0023	0.0021

Note: The complete quantile process is estimated from τ=0.10 to τ=0.90. Selected quantiles are displayed to provide a compact representation of the coefficient trajectories. Statistical differences across the representative quantiles are formally evaluated using the Wald slope equality tests reported in Table 7.
Source: Author's calculation based on processed data, (2026).

Model 2 displays less uniform coefficient patterns. The JII coefficient changes sign around the center of the distribution, while the SUN coefficient is negative across the lower quantiles before becoming positive around the median and parts of the upper distribution. The PRI coefficient remains predominantly negative, although its magnitude generally decreases away from the lower quantiles. FEDFR remains positive but relatively small throughout the quantile process.

For Model 3, ΔJKSRI remains positive over the entire quantile process, ranging from 0.1219 at τ=0.10 to 0.1822 at τ=0.90, with larger coefficients generally observed in the middle and upper parts of the distribution. SUN records comparatively large negative coefficients in the lower part of the distribution, which diminish substantially toward the median and upper quantiles. PRI follows a similar pattern, with more negative coefficients at the lower quantiles and values approaching zero in the remainder of the distribution. FEDFR remains positive but small across the quantile range. These coefficient trajectories are descriptive; the formal Wald tests in Table 5 do not reject joint slope equality across the representative quantiles.

Overall, the quantile estimates identify ΔJKSRI as the most consistently associated capital market variable across the three specifications. JKSRI is positive and statistically significant at the lower, median, and upper quantiles in Models 1 and 3, with particularly strong bootstrap robustness in Model 3. No comparable statistically robust pattern is observed for LQ45X or JII. Evidence for SUN and PRI is concentrated mainly in the lower part of the conditional ΔNEER distribution and is more sensitive to the choice of covariance estimator. FEDFR does not exhibit a statistically robust relationship at the representative quantiles. Although the magnitudes of several coefficients vary across the distribution, the slope equality tests indicate that these numerical differences should not be interpreted as statistically significant cross quantile heterogeneity.

Discussion

The findings show that changes in domestic capital market instruments do not have a uniform relationship with Rupiah exchange rate movements. Changes in the sustainability oriented equity index (JKSRI) exhibit the most consistent positive association with changes in the exchange rate (NEER) at the lower, median, and upper representative quantiles in Models 1 and 3, with particularly strong robustness in Model 3. Since an increase in NEER represents nominal appreciation, an increase in JKSRI is associated with Rupiah exchange rate movements toward appreciation. At the lower quantile, where changes in NEER are relatively less favorable, this relationship is consistent with reduced depreciation pressure and greater Rupiah resilience. The finding is also consistent with Branson (1977) about portfolio balance framework, in which changes in the relative attractiveness, expected returns, and risks of financial assets can influence portfolio allocation and exchange rate adjustment. Recent studies show that sustainability characteristics influence investor preferences and portfolio allocation, while changes in relative equity performance can induce portfolio rebalancing, capital flows, and exchange rate movements (Camanho et al., 2022; Hartzmark & Sussman, 2019; Pástor et al., 2021; Pedersen et al., 2021). The result is economically relevant for Indonesia because the 2010–2024 period includes episodes of substantial changes in investor risk perceptions and portfolio positions, particularly during the taper tantrum, the COVID-19 crisis, and subsequent global monetary tightening. Nevertheless, because portfolio flows and individual crisis effects are not directly estimated, they provide an economic context and a theoretically supported transmission mechanism rather than identified causal channels.

The results for changes in the conventional equity index (LQ45X) and changes in the Islamic equity index (JII) provide an important comparison with the JKSRI finding. Changes in LQ45X are not statistically significant across the representative quantiles, indicating that changes in conventional equity performance do not exhibit the same consistent relationship with Rupiah exchange rate movements. This finding is compatible with Fianto et al. (2020), who find no consistent full sample evidence that stock prices predict Indonesian exchange rate returns. At the same time, international evidence shows that the relationship between stock prices and exchange rates can vary across countries and market conditions, indicating that a significant relationship should not be expected uniformly across equity segments. Changes in JII are similarly insignificant, suggesting that changes in Islamic equity performance do not exhibit the same relationship with changes in NEER as changes in JKSRI. This distinction is consistent with recent evidence showing mixed responses of Islamic equities under financial stress. (Hidayah & Swastika, 2022) identify different behavior among conventional, Islamic, and socially responsible equity indices in Indonesia during COVID-19; Hasan et al. (2022) find that Islamic and conventional stock markets were affected relatively similarly by the pandemic; while Mirza et al. (2022) and Shear & Ashraf (2022) report stronger resilience for Islamic equities in other settings. Setyowati et al. (2024) also show that movements in Indonesian Islamic equities are related to domestic macroeconomic conditions, including exchange rates and the BI rate. Thus, the present results indicate that the positive relationship with Rupiah exchange rate movements is more consistently observed for changes in JKSRI than for changes in conventional or Islamic equity indices.

The findings for changes in the government bond index (SUN) and changes in the domestic policy interest rate (PRI) are more conditional. Changes in SUN show their clearest negative relationship with changes in exchange rate (NEER) in the lower part of the conditional distribution, particularly in Model 3, whereas the relationship becomes statistically insignificant at the median and upper representative quantiles and is only borderline under bootstrap inference at the lower quantile. Consequently, changes in SUN cannot be characterized as having the same persistent positive association with Rupiah exchange rate movements as changes in JKSRI. This conditional pattern is consistent with studies showing that international bond allocation and exchange rates are closely related to currency conditions, investor portfolio decisions, and changing global financial conditions (Burger et al., 2018; Camanho et al., 2022; Ferriani, 2021; Hofmann et al., 2020). Changes in PRI also show predominantly negative coefficients toward the lower part of the distribution, but these relationships weaken under bootstrap inference. One possible explanation is that increases in the domestic policy interest rate may occur when depreciation pressures, inflationary concerns, or capital outflows have already intensified. Thus, the negative contemporaneous association should not be interpreted as evidence that an increase in PRI causes Rupiah depreciation. Indonesian evidence supports a broader interpretation of monetary transmission such as Handayani & Kacaribu (2021) document asymmetric responses of Indonesian interest rates to monetary policy, Lubis et al. (2023) show that foreign investor risk appetite and foreign exchange intervention operate through a portfolio channel, and Melati & Kurniawan (2023) find that Indonesian monetary conditions are sensitive to changes in domestic interest rates. These findings remain consistent with Branson's portfolio balance perspective, in which interest rate changes interact with portfolio decisions rather than operating as an isolated determinant of exchange rate movements.

The insignificant U.S. Federal Funds Rate (FEDFR) coefficients provide an important qualification to the research question concerning Rupiah resilience under external monetary shocks. Unlike the domestic variables, FEDFR enters the final specification in level form. The estimates therefore indicate that the prevailing level of FEDFR does not have a statistically robust direct relationship with changes in NEER after changes in domestic capital market variables and PRI are taken into account. This result does not imply that U.S. monetary policy is unimportant for Rupiah exchange rate movements. Koepke (2018) shows that emerging market portfolio flows are particularly sensitive to the unexpected component of U.S. monetary policy and revisions in expectations about future Federal Reserve policy. Miranda-Agrippino & Rey (2020) show that U.S. monetary tightening affects international financial conditions through global asset prices, credit, and cross-border financial flows, while Iacoviello & Navarro (2019) document substantial spillovers from U.S. monetary tightening to emerging economies. Ferriani (2021) further finds unusually large portfolio outflows from emerging markets during the 2013 taper tantrum and COVID-19 crisis. These findings are relevant to the 2010–2024 sample, which encompasses the taper tantrum, COVID-19, and the subsequent period of global monetary tightening. Fianto et al. (2020) likewise find that the Federal Funds Rate does not consistently predict Indonesian exchange rate returns over their full sample. At the national level, Suripto et al. (2025) emphasize the importance of exchange rate dynamics in Indonesia's macroeconomic adjustment, while Zuhroh & Harpiyansa (2022) show that exchange rates and interest rates are significantly related to international investment within ASEAN economies. Thus, external monetary conditions remain relevant to Rupiah exchange rate movements, but the present findings indicate that this relationship is not represented by a stable direct coefficient on the level of FEDFR.

The quantile evidence shows that the positive relationship between changes in JKSRI and changes in NEER persists throughout the conditional distribution, whereas the relationships involving changes in SUN and PRI are more concentrated in the lower quantiles. Changes in LQ45X and JII do not display comparable statistically significant patterns. However, the Wald slope equality tests do not reject equality of the coefficients across the representative quantiles. The numerical differences should therefore not be interpreted as statistically distinct relationships between lower, median, and upper conditions. The main contribution of the quantile analysis is instead the persistence of the JKSRI relationship, particularly its continued significance in the lower part of the distribution, where Rupiah exchange rate movements are relatively less favorable. Accordingly, the proposition that sustainable capital markets can contribute to Rupiah resilience is supported in a qualified manner. The evidence does not indicate that changes in all capital market instruments are associated with more favorable exchange rate movements, nor does it establish causal stabilization. Rather, changes in JKSRI provide the clearest evidence of an association with reduced depreciation pressure and more favorable Rupiah exchange rate movements. Viewed through Branson's portfolio balance framework, the findings suggest that changes in the relative attractiveness of domestic capital market instruments matter for Rupiah exchange rate movements, with sustainability oriented equities displaying the strongest potential cushioning association.

5. Conclusion

This study examines whether changes in sustainability oriented, conventional, and Islamic equity indices, the government bond index, and the domestic policy interest rate are associated with Rupiah exchange rate movements across the conditional distribution of changes in NEER. The results identify changes in the sustainability oriented equity index (JKSRI) as the most consistent variable. Changes in JKSRI are positively and significantly associated with changes in NEER at the lower, median, and upper representative quantiles in Models 1 and 3, with particularly robust evidence in Model 3. At the lower quantile, this positive relationship indicates that an increase in JKSRI is associated with less adverse Rupiah exchange rate movements and reduced depreciation pressure. In contrast, changes in the conventional equity index (LQ45X) and the Islamic equity index (JII) do not exhibit statistically robust relationships with changes in NEER.

The relationships involving changes in the government bond index (SUN) and changes in the domestic policy interest rate (PRI) are concentrated mainly in the lower part of the conditional distribution and are sensitive to the method of inference. The level of FEDFR also does not have a statistically robust direct relationship with changes in NEER. Moreover, the slope equality tests provide no evidence that the coefficients differ significantly across the representative quantiles. The contribution of the quantile analysis therefore lies primarily in identifying the persistence of the JKSRI relationship rather than separate exchange rate regimes. Overall, the findings support a qualified interpretation of sustainability oriented equities as being associated with Rupiah resilience through the portfolio balance mechanism. However, the results establish statistical associations rather than causal effects, and portfolio reallocation remains a theoretically supported mechanism because portfolio flows are not directly included in the model.

Capital market authorities should continue strengthening the credibility and accessibility of sustainability oriented equity instruments through consistent disclosure standards, broader issuer participation, and increased domestic and international investor engagement. These measures may improve the relative attractiveness of sustainability oriented assets and support more favorable Rupiah exchange rate movements, although they should complement rather than replace monetary policy, foreign exchange management, and government bond market development. Future studies should incorporate direct measures of domestic and foreign portfolio flows and identified external monetary policy shocks to test the proposed portfolio reallocation mechanism more explicitly. The use of crisis indicators, event specific models, or subsample analysis could also clarify whether the relationships change during episodes such as the taper tantrum, COVID-19, and global monetary tightening.

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