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RESEARCH PAPER

Impact of US Dollar Exchange Rate and Interest Rate Volatility on Stock Market Capitalization in Pakistan: Empirical Evidence from 2007 to 2016

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ABSTRACT

This study examines the impact of US dollar exchange rate and interest rate volatility on Pakistan's stock market capitalization during 2007–2016, focusing solely on annual macroeconomic indicators. In emerging economies like Pakistan, fluctuations in key macroeconomic indicators can significantly shape stock market performance. Despite extensive global research, limited evidence exists on their combined long- and short-run effects in the Pakistani context. The research adopts a quantitative time-series design using annual data from the Pakistan Stock Exchange (market capitalization), the State Bank of Pakistan (interest rates), and international financial databases (PKR/USD exchange rate). Key statistical tools include the Augmented Dickey-Fuller (ADF) test for stationarity, Johansen cointegration for long-run relationships, Error Correction Model (ECM) for short-run dynamics, Ordinary Least Squares (OLS), and Granger causality tests. The study models log-transformed variables and ensures robust diagnostics through multicollinearity and residual testing. Exchange rate volatility had a significant positive long-term impact on market capitalization, while interest rate volatility showed a weaker, negative effect. In the short run, only exchange rate movements were significant. Granger causality confirmed that both variables influence market capitalization, with 22% of disequilibrium corrected annually. Policymakers should prioritize exchange rate stability and adopt measured interest rate policies to support stock market growth and investor confidence.

KEYWORDS Exchange Rate, Interest Rate, Market Capitalization, Stock Market, Pakistan, Volatility

Introduction

Financial markets are sensitive to macroeconomic volatility, particularly in emerging economies like Pakistan. Exchange rate fluctuations influence investor confidence, import-export dynamics, and portfolio decisions, while interest rate shifts affect borrowing costs and capital allocation. This study assesses how these two critical macroeconomic variables influence stock market capitalization in Pakistan over the post-global financial crisis decade (2007–2016), with a special focus on causal relationships and adjustment speeds using robust econometric techniques.

Literature Review

The relationship between exchange rates, interest rates, and stock market performance has been extensively discussed in economic research. The flow-oriented model (Dornbusch & Fischer, 1980) proposes that currency depreciation improves export competitiveness and business profits, resulting in higher stock prices. The portfolio balance model (Frankel J. , 1983) argues that stock market fluctuations impact exchange rates via capital flows (Branson & Henderson, 1985). While studies by Aggarwal (1981)

and Adjasi & Biekpe (2005) observed a positive relationship between currency depreciation and stock returns, others like Jorion (1991) found insignificant links. Muhammad & Rasheed (2002) report no significant relationship in Pakistan. whereas Ullah & Ali (2014) reported a bidirectional relationship between exchange rates and the KSE-100 index. Interest rates generally show an inverse relationship with stock returns. Higher interest rates raise borrowing costs and increase the attractiveness of fixed-income securities relative to equities. Hasan & Javed (2009) confirm this inverse relationship in the Pakistani context, consistent with findings from Fama & Schwert (1977) and Mishkin (1977). However, other studies (Elton & Gruber, 1988) have observed short-term positive effects of interest rate movements on stock prices, particularly when monetary policy expectations shift. The combined impact of exchange rate and interest rate volatility on stock markets has been explored in some studies. For instance, Ahmad, Rehman, and Raoof (2010) found that exchange rate depreciation positively affects stock returns, whereas higher interest rates have a negative effect. However, evidence on these relationships remains mixed in emerging markets, and comprehensive analysis specific to Pakistan is limited. This research addresses this gap by empirically investigating the joint short- and long-run impact of exchange rate and interest rate volatility on market capitalization.

Hypotheses

H1: Interest rate variations have a significant negative relationship with stock market capitalization.
H2: Exchange rate fluctuations significantly influence stock market capitalization.

Theoretical Framework

Several economic theories attempt to explain the relationship between macroeconomic indicators and stock market performance. The **flow-oriented model** proposed by Dornbusch and Fischer (1980) suggests that exchange rate movements influence stock prices through their impact on international trade competitiveness. A depreciation of the local currency benefits exporting firms by making their goods cheaper in foreign markets, thereby increasing their stock prices, whereas appreciation has the opposite effect. On the other hand, the **stock-oriented model** (Branson & Frankel, 1983) posits that exchange rates are determined by capital flows, where a strong stock market attracts foreign investment, leading to an appreciation of the domestic currency. The **interest rate parity theory** posits that fluctuations in interest rates affect capital flows and investment choices, hence influencing stock prices. According to the **efficient market hypothesis** (Fama E. , 1970), stock prices fully reflect all available information, including changes in exchange and interest rates. However, empirical findings indicate that stock markets exhibit inefficiencies due to delayed reactions to macroeconomic shocks.

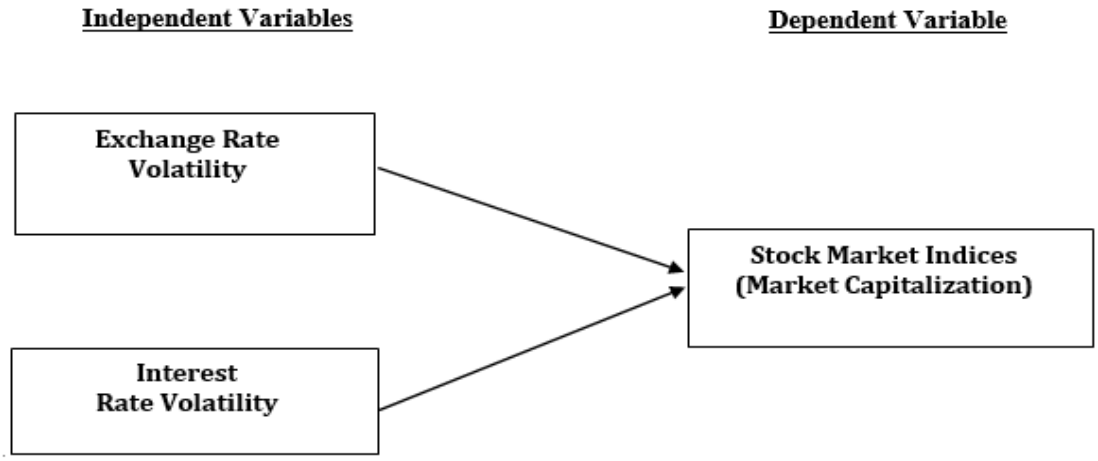

Figure 1: Relationship among the variables.

Material and Methods

This quantitative study employs a time-series design using annual data from 2007 to 2016. Market capitalization data were sourced from the Pakistan Stock Exchange (PSX), interest rates from the State Bank of Pakistan (SBP), and exchange rates from international financial databases.

Variables include:

- Dependent Variable: Market Capitalization (log-transformed).
- Independent variables: Exchange Rate (PKR/USD), Interest Rate (Bank rate).

Econometric Model Specification:

$$\text{InMCt} = \beta 1 + \beta 1\text{R} \quad \text{In IRt} + \beta\text{EX In EXt} + \varepsilon\text{t}$$

Where:

InMCt	=	log of the stock market capitalization at period t
IRt	=	log of the bank rate at period t
EXt	=	log of the exchange rate at period t
$\beta 1$	=	intercept
$\beta 1\text{R}$	=	slope coefficients of the independent variables
εt	=	error term
t	=	number of years

Statistical techniques include the Augmented Dickey-Fuller (ADF) test for assessing stationarity, the Johansen cointegration test for identifying long-term correlations, the Error Correction Model (ECM) for short-term adjustments, and Granger causality tests for exploring predictive linkages.

Results and Discussion

The empirical findings about the impact of exchange rate and interest rate volatility on Pakistan's stock market capitalization from 2007 to 2016 are presented as follows:

Table 1
Results of Descriptive Statistics

Variables	Minimum	Maximum	Mean	Standard Deviation
Stock Market Capitalization (MC)	8.04	10.11	9.32	0.52
Interest Rate Variation (IRV)	5.5	12.6	10.1	3.01
Exchange Rate Variation (ERV)	59.5	102.2	71.08	11.16

Table 1, the average log market capitalization (MC) value of 9.32 suggests moderate growth during the sample period. Meanwhile, the average interest rate was 10.1%, and the exchange rate averaged 71.08 PKR/USD, indicating persistent depreciation.

Table 2
Results of Correlation Analysis

Variables	MC	ERV	IRV
Market Capitalization (MC)	1	0.612	-0.709
Exchange Rate Variation (ERV)	0.612	1	0.708
Interest Rate Variation (IRV)	-0.709	0.708	1

Table 2, A moderate positive correlation exists between MC and ERV (r = 0.612), and a strong negative correlation between MC and IRV (r = –0.709), consistent with

theoretical expectations. ERV and IRV also showed a strong positive correlation (r = 0.708), suggesting interdependence which was further examined during regression diagnostics.

Table 3
Results of Augmented Dickey-Fuller (ADF) Test

Variable	ADF Statistic	Critical Value (5%)	p-Value	Stationarity
MC	−3.17	−3.00	0.044	Stationary
ERV	−2.16	−3.00	0.205	Non-stationary
IRV	−2.71	−3.00	0.084	Non-stationary

The Augmented Dickey-Fuller (ADF) test indicated that MC was stationary at level, while ERV and IRV were non-stationary and became stationary after first differencing. The cointegration and error correction models were thus estimated using variables integrated of order one, I (1).

Table 4
Johansen Cointegration Test (Long-Run Relationships)

Variable	Coefficient	Direction of Impact	Statistical Significance	Economic Interpretation
Exchange Rate	3.17	Positive	Significant	A 1% increase in the exchange rate leads to a 3.17% rise in market capitalization.
Interest Rate	-0.23	Negative	Significant	A 1% increase in interest rates leads to a 0.23% decline in market capitalization.

Table 4 presents, the Johansen cointegration test revealed a significant long-run positive relationship between ERV and MC (β = 3.17), and a significant negative relationship between IRV and MC (β = −0.23).

Table 5
Results of Short-Run Regression Analysis

Variables	Coefficient (β)	Standard Error	T-Statistics	P-Value	Significance
Constant	20.324	10.705	1.898	0.071	Not Significant
Exchange Rate Variation (ERV)	0.045	0.027	1.667	0.049	Significant
Interest Rate Variation (IRV)	-0.019	0.033	-0.576	0.564	Not Significant

Table 5 provides, the short-run regression (OLS), ERV exhibited a significant positive effect on MC (p = 0.049), while IRV was not statistically significant. The overall model showed a good fit (R^2 = 0.765, Adjusted R^2 = 0.730).

Table 6
Results of Error Correction Model (ECM)

Component	Coefficient	Std. Error	t-Statistic	p-Value
Error Correction Term (ECT)	−0.2207	0.089	−2.48	0.041

Table 6 suggests that, approximately 22% of disequilibrium from the previous year's deviation is corrected annually toward long-run equilibrium.

Table 7
Results of Granger Causality Test

Null Hypothesis	F-Statistic	P-Value	Conclusion
ERV does not Granger-cause MC	1.285	0.003	Causality exists.
MC does not Granger-cause ERV	0.950	0.447	No causality.
IRV does not Granger-cause MC	1.751	0.002	Causality exists.
MC does not Granger-cause IRV	1.231	0.387	No causality.

According to Table 7, Both ERV and IRV Granger-cause MC, supporting the predictive power of macroeconomic variables over stock market capitalization. These results confirm that fluctuations in exchange and interest rates significantly influence stock market performance (p < 0.05), while the stock market does not predict changes in these macroeconomic variables.

Table 8
Results of Multicollinearity Diagnostics

Variable	Tolerance	VIF	Interpretation
Exchange Rate Variation (ERV)	0.498	2.01	No serious multicollinearity.
Interest Rate Variation (IRV)	0.498	2.01	No serious multicollinearity.

Variance Inflation Factors (VIF) were computed and found to be below 5 for all predictors, indicating no severe multicollinearity.

- **Residual serial correlation (Breusch-Godfrey LM test):** No significant serial correlation.
- **Heteroscedasticity (White test):** No evidence of heteroscedasticity.
- **Normality (Jarque-Bera):** Residuals approximately normal.

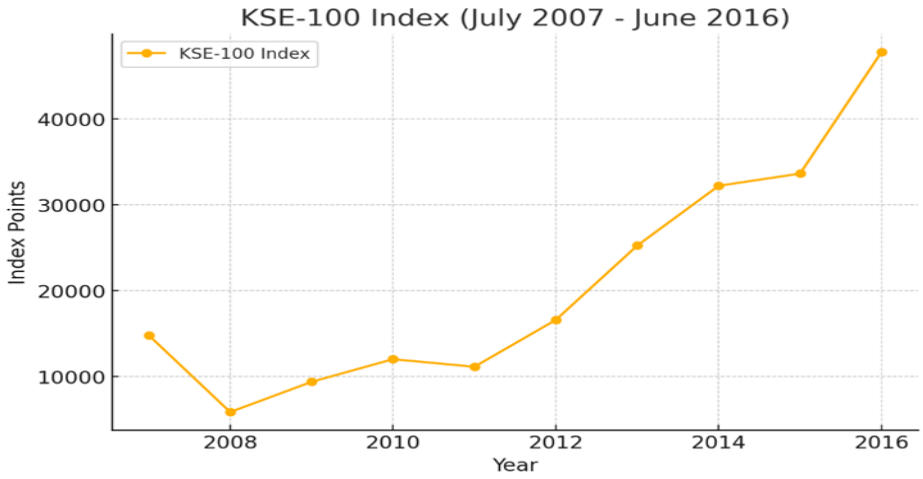

Figure 2: Stock Market Capitalization in Pakistan (Log Values) from 2007 to 2016.

Source: Pakistan Stock Exchange (PSX).

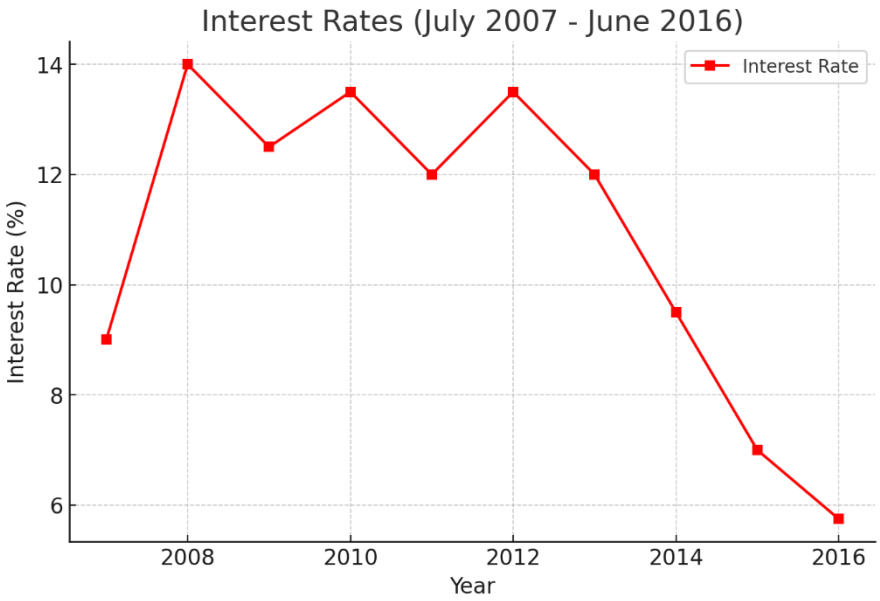

Figure 3: Annual Trend of Interest Rates in Pakistan (2007–2016).

Source: State Bank of Pakistan (SBP).

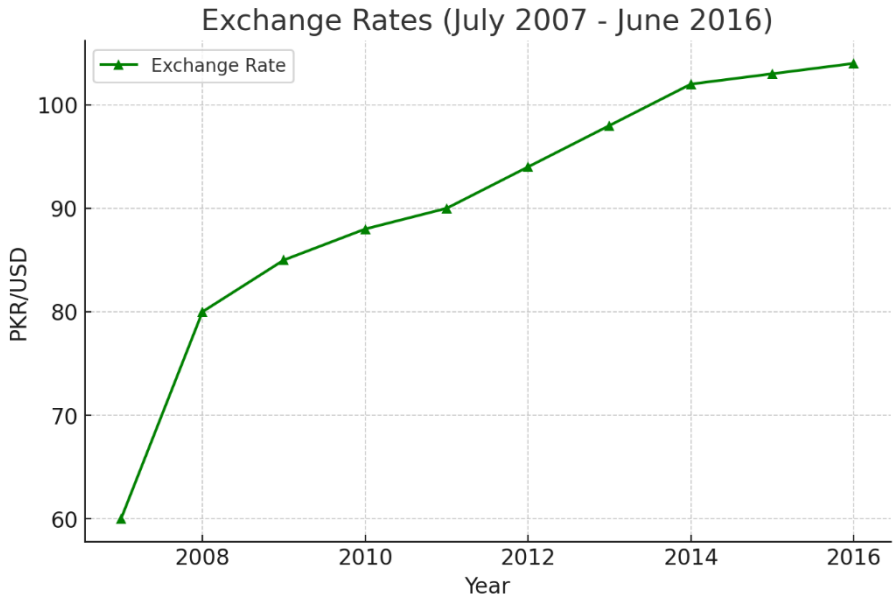

Figure 4: Annual Trend of PKR/USD Exchange Rate in Pakistan (2007–2016).

Source: State Bank of Pakistan (SBP).

The KSE-100 index demonstrated resilience, recovering from a significant drop in 2008 to sustained growth through 2016. Interest rates decreased significantly after 2014, while the exchange rate showed continued depreciation.

To sum it up, the findings indicate that market capitalization is mainly affected by variations in exchange rates, while interest rates play a smaller yet still important role over time. The results show how important it is to have stable exchange rates and careful monetary policy to build investor confidence and help the stock market grow.

Discussion

The study's findings unequivocally demonstrate that the impacts of exchange rate and interest rate volatility on market capitalization vary between the short term and the long term.

In the long run, both exchange rate volatility (ERV) and interest rate volatility (IRV) exhibit significant relationships with stock market capitalization. In particular, ERV exerts a positive and significant long-run impact on stock market capitalization. This suggests that rupee depreciation, particularly in an export-oriented environment, enhances corporate earnings and market performance. This dominant role of exchange rate variation in influencing market capitalization reflects Pakistan's trade-based exposure and currency-sensitive investment climate. Depreciation often benefits exporters, improving stock values. This fits with the flow-oriented model (Dornbusch & Fischer, 1980) and supports the notion that a depreciated local currency benefits public enterprises, particularly exporters.

Conversely, IRV exhibits a negative long-term impact, suggesting that higher interest rates suppress stock market capitalization by deterring equity investments and escalating borrowing expenses. This is consistent with classical finance theory and empirical evidence from Pakistan.

In the short run, however, only ERV shows a statistically significant effect on market capitalization. IRV's impact is statistically insignificant, suggesting that immediate

investor reactions to interest rate changes may be muted or delayed in Pakistan's context. This finding highlights a possible lagged adjustment mechanism where market participants respond more strongly to interest rate changes over time rather than instantly.

The Granger causality analysis supports these interpretations, showing that both ERV and IRV predict changes in market capitalization, but market capitalization does not predict movements in these macroeconomic indicators.

The error correction model further confirms that deviations from long-run equilibrium are partially corrected each year, with an adjustment speed of about 22%. This indicates moderate responsiveness of the market to macroeconomic shocks.

Conclusion

Overall, this study underscores the critical role of exchange rate movements in shaping Pakistan’s stock market capitalization and highlights the importance of integrated macroeconomic policies to support market stability and long-term investor confidence.

Policy Implications

Given the dominant role of exchange rate volatility, policymakers should prioritize maintaining exchange rate stability to promote sustainable stock market growth and investor confidence. While interest rate management remains critical for broader economic stability, its direct short-run effect on market capitalization appears limited and should be approached with gradual adjustments to avoid abrupt market reactions.

Recommendations

Policymakers should prioritize maintaining exchange rate stability, as it has a significant long-term influence on market capitalization and plays a key role in fostering investor confidence and stock market growth. Interest rate policies, on the other hand, should be applied gradually, considering their weaker and delayed impact on the market, to prevent abrupt disruptions. Coordinated macroeconomic management—particularly between monetary and exchange rate policies—is essential to reduce uncertainty and support the healthy development of the capital market. Additionally, as exchange rate depreciation may attract speculative capital that temporarily boosts market capitalization, regulatory authorities should closely monitor such inflows to ensure long-term financial stability.

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