

Dynamic Interplay between Monetary Indicators and Equity Market Valuation: An Empirical Study of Interest Rate and Exchange Rate Effects on Stock Prices in Pakistan

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ABSTRACT

This study investigates the short-term and long-term relationships between stock market performance, interest rates, and exchange rates in Pakistan, utilizing monthly data spanning from 2010 to 2023. Employing a robust econometric framework, including the Augmented Dickey-Fuller (ADF) test and the Johansen-Juselius cointegration method, the analysis confirms that all variables are integrated of order one and co-integrated, indicating a stable long-run equilibrium relationship among the variables. The long-run findings reveal that interest rates have a negative impact on stock market performance, while exchange rates exert a positive influence. In the short run, empirical results suggest that a 1% increase in interest rates leads to a 0.52% decline in stock market performance, whereas a 1% rise in exchange rates results in a 3.24% increase in stock market performance. The model demonstrates strong explanatory power, with an F-statistic of 266.62 ($p < 0.05$) and an R-squared value of 0.70, indicating that the combined effect of interest and exchange rate movements explains 70% of the variation in stock market performance. The coefficients of both variables are statistically significant, underlining their critical roles in influencing the dynamics of Pakistan's stock market.

Introduction

Macroeconomic factors, including interest rates and exchange rates, influence the intricate ecosystem in which financial markets operate (Haider, 2018). These two factors, among the most important, have a significant impact on capital flows, investor expectations, and valuation models, making them important predictors of stock market behavior (Gillal, et al., 2024). Investors, legislators, and business decision-makers must comprehend their impact on stock prices. Interest rates, which central banks typically set, influence consumer spending, business investment decisions and overall economic growth because they represent the cost of borrowing and the return on savings. Mishkin (2015) asserts that the present value of future cash flows, which are essential to stock valuation models, is directly impacted by changes in interest rates (Nawab et al., 2021). Since stocks and interest rate changes are inversely correlated, stocks are sensitive to interest rate changes (Alam, Uddin, 2009). As a result, when the discount rate rises, an increase in interest rates frequently causes stock prices to fall.

Exchange rates also impact the competitiveness of businesses in global markets. Currency fluctuations can impact both foreign investment in domestic stocks and the profits of multinational firms (Talla, 2013). According to Dornbusch and Fischer (1980), exchange rate volatility can increase uncertainty, which in turn influences equity valuations and prompts investors to behave in a risk-averse manner. Despite the theoretical underpinnings, empirical research has yielded inconsistent outcomes in various markets (Haider, 2018) and eras, underscoring the importance of contextual analysis (Jawad Khan et al. 2018). Studies such as those conducted by Pan et al, (2007) indicate more complex, market-specific dynamics. In contrast, Rahman et al. (2009) discovered a strong inverse relationship between exchange rates and stock prices in emerging markets.

For example, previous research (e.g., Nishat & Shaheen, 2004; Qayyum & Khan, 2008) has found a negative relationship between interest rate changes and stock market returns; however, it was unable to account for the structural pauses and regime shifts in Pakistan's monetary policy over time. Although others (e.g., Ali & Afzal, 2012; Rehman & Nawaz, 2017) have recognized the significance of exchange rates, especially in foreign investment behavior, they have frequently treated the variable separately without incorporating it into a more comprehensive macro-financial model (Batool, 2021). It is necessary to reevaluate these relationships, especially in emerging economies, in light of the increasing integration of global financial systems and the frequent changes in monetary policy (Nawab et al., 2021). The objective of this research is to employ time-series econometric models to investigate the dynamic interplay among interest rates, exchange rates, and stock prices, with a focus on establishing both short-term and long-term relationships. Despite strong theoretical connections, conflicting empirical data still exist regarding these connections (Gillal, et al., 2024). Although some studies (e.g., Rahman et al., 2009; Pan et al., 2007) find an apparent directional influence, others contend that, depending on market maturity and (Wang, 2014) country-specific dynamics, stock markets respond asymmetrically or with a lag (Haider, 2018).

It is more important than ever to reevaluate these macro-financial ties in a time of monetary tightening, currency volatility, and geopolitical unpredictability (Batool, 2021). To identify both short-term shocks and long-term trends, this study employs rigorous econometric techniques to investigate the dual impact of interest rate and exchange rate fluctuations on stock prices. This study attempts to make a significant contribution to both scholarly discourse and practical financial strategy by placing the analysis within the framework of the Pakistan Stock Exchange (PSX).

Objective

The primary objective of this study is to investigate the impact of interest rates and exchange rates on stock prices in the context of the Pakistan Stock Exchange (PSX). In doing so, the study aims to:

- Examine the short-term and long-term relationships between interest rate fluctuations and stock market performance in Pakistan.
- Analyze the effect of exchange rate movements on stock prices
- Determine the impact of interest rate on stock market
- Identify the impact of exchange rate on stock market

Literature Review

Stock markets are sensitive indicators of the economy's state in the dynamic world of global finance, frequently responding quickly to macroeconomic cues. Interest rates and exchange rates are two of the most potent indicators; they are constantly manipulated by central banks and external factors, which causes financial markets to fluctuate (Jehandad, 2025). The complex relationship between these economic factors and changes in stock prices is supported by theory and empirical research, allowing for continued investigation and interpretation. Interest rates are a significant factor in determining equity valuation and investor expectations. The discounted cash flow model posits that a rise in interest rates increases the cost of capital, thereby reducing the present value of future earnings and, ultimately, stock prices (Mishkin, 2015). On the other hand, bullish stock markets are typically linked to lower interest rates, which reflect cheaper capital and higher corporate profitability. Numerous empirical studies have confirmed this inverse relationship. Fama and Schwert (1977), for instance, discovered that changes in interest rates have a significant impact on stock returns in the US market. Mukherjee and Naka (1995) noted that interest rate shocks have both direct and indirect impacts on equity markets in emerging economies and that market inefficiencies often exacerbate these effects. The impact of interest rates on the Karachi Stock Exchange (KSE) through 2010 was examined by Ghazanvi and Akram (2010). Although it falls outside the time frame, it establishes the methodological framework; they found that rising interest rates had a substantial detrimental effect on stock market returns. From mid-2011 to mid-2016, Haider (2011–2016) examined the effects of several macroeconomic factors, such as interest rates and exchange rates, on the Karachi Meezan Index (Islamic finance index). The study discovered a negative correlation between interest rates and the KMI-30 index using multiple regression analysis. Tiwano et al. (2024) used correlation analysis and linear regression to analyze data from 2009 to 2018 for two PSX-listed companies (Fauji Fertilizer & Engro). They found a positive correlation between changes in interest rates and stock prices, indicating that when interest rates changed, the stock prices of both companies moved in tandem (Jehandad, 2025).

The primary way the exchange rate affects stock prices is by influencing corporate earnings and trade competitiveness, particularly for businesses that conduct international transactions (Jamil et al., 2024). According to Dornbusch and Fischer (1980), fluctuations in exchange rates increase investor apprehension and often lead to capital flight and stock market declines. Accordingly, Aggarwal (1981) showed that exchange rates and stock prices in multinational corporations based in the United States had a positive relationship. The outcomes are more inconsistent in emerging markets (Jehandad, 2025). In several Asian nations, Abdalla and Murinde (1997) found a unidirectional causal relationship between exchange rates and stock prices, whereas Pan et al.

(2007) discovered a market-dependent and occasionally bidirectional relationship. Qayyum and Khan (2008) noted that the depreciation of the exchange rate had a negative impact on stock prices in Pakistan, as it increased import costs and led to a withdrawal of foreign investors. Jawaid and Haq (2012) employed GARCH volatility models and co integration analysis to examine Pakistan's banking industry. They found that bank stock prices, interest rates, and exchange rates had negative long-term relationships, while changes in these macroeconomic variables had a positive impact on stock prices (Gillal, et al., 2024). The exchange rate and stock prices were causally related in both directions; however, only interest rates influenced stock prices. On long-term data, Nawab, Ahmad, and Khan (1998–2018) used Granger causality and Johansen co integration tests. Results showed that interest rates and exchange rates had a unidirectional causal relationship with stock returns, with stock prices reacting to both macro variables (Gillal, et al., 2024). Additionally, Haider (2011–2016) discovered that the Karachi Meezan Index benefited from exchange rate depreciation, suggesting that some Islamic stocks were favored by currency weakness. Post-2020 research examined external shocks, such as COVID-19, using VAR/VECM models to investigate the impact of interest and exchange rate volatility on market returns in conjunction with pandemic-induced uncertainty (Batoool, 2021). Record highs in the PSX were the result of the 2022–2024 Pakistani economic crises, characterized by skyrocketing inflation (29% in January 2024), rupee depreciation, and the SBP's rate hikes to around 20% (Ilahi et al., 2015). Studies have demonstrated that currency stabilization and monetary tightening enhance the performance of the equity market.

Hypothesis

H1: There is a significant negative short-term and long run relationship between interest rate fluctuations and stock market performance in Pakistan.

H2: Exchange rate movements have a significant impact on stock prices in Pakistan

H3: Changes in interest rates significantly influence stock market returns in Pakistan

H4: Depreciation (or appreciation) of the Pakistani Rupee has a statistically significant effect on the performance of the Pakistan Stock Exchange.

Methodology

Research Design

This study examines the short- and long-term relationships between Pakistani stock prices, interest rates, and exchange rates using a quantitative, time-series econometric approach. Monthly data from January 2010 to December 2023 is used in the empirical analysis; these data were chosen to capture shifts in financial policy and cyclical economic changes over a significant time frame.

Data collection

The study uses secondary data collected from reputable sources:

- **Stock Prices:** Pakistan Stock Exchange (PSX).
- **Interest Rates:** State Bank of Pakistan(SBP)
- **Exchange Rates:** Monthly average PKR/USD exchange rate from the State Bank of Pakistan.

All data are converted to natural logarithms when needed in order to reduce heteroscedasticity and stabilize the variance. Each time series' stationarity and order of integration are determined using the Augmented Dickey-Fuller (ADF) test. Given the likelihood of long-term equilibrium relationships between the variables, the Johansen-Juselius Cointegration Test is employed. The general form of the VECM model is:

$$\Delta Y_t = \alpha + \sum_{i=1}^{p-1} \beta_i \Delta Y_{t-i} + \gamma ECT_{t-1} + \epsilon_t$$

Where:

- ΔY_t are the first-differenced variables
- ECT_{t-1} is the error correction term from the cointegration equation
- γ gamma captures the speed of adjustment to the long-run equilibrium

Results and Analysis

Descriptive Statistics

There are some prior steps to move forward for analysis. Descriptive statistics deliver summaries regarding observations and sample that have been selected for the study. The Descriptive statistics of the complete data depicted in table 1.

Table 1:

Statistic Name	index Points(IPT)	Interest rate(IRT)	Exchange rate(ERT)
Mean	9.237635	2.238592	4.351818
Median	9.336528	2.251292	4.402133
Maximum	10.83154	2.708050	4.943498
Minimum	7.033013	1.832581	3.948373
Std. dev	1.066521	0.258040	0.263524
Skewness	-0.443563	0.103315	0.117824
Kurtosis	2.262596	2.047859	1.538994
Jarque-Bera (J.B)	12.64220	9.018057	20.80566
Probability	0.001798	0.011009	0.000030
Observation	228	228	228

The above table illustrates that the Mean (average) value of the Index Points of Pakistan's stock exchange is 9.23, while the Standard Deviation is 1.066. The mean interest rate is 2.23, while the standard deviation (SD) is 0.25. The average exchange rate is 4.35, with a standard deviation (SD) of 0.26. Two variables, i.e., interest rate and exchange rate, are positively skewed, while the index point is negatively skewed. The kurtosis values of all three variables are less than 3, indicating that all are platykurtic.

Correlation

The results of the correlation test among the variables are given in Table 2. Based on the table information, we conclude that there is no problem with multicollinearity in the model. The coefficients of all variables are less than 0.90.

Table 2:

	index points	interest rate	exchange rate
index points(IPT)	1		
interest rate(IRT)	0.30	1	
exchange rate(ERT)	0.82	0.22	1

Stationarity of Data

Stationarity is a key concept in time series analysis—especially for interest rates, exchange rates, and stock prices. Most econometric models (like ARIMA, VAR, or cointegration models) require stationary data

For estimation of an equilibrium association among two series in the data. The order for their integration is very important regarding for the estimation of an equilibrium association among two series in the data. The order of integration is crucial for determining an appropriate cointegration. The ADF (Augmented Dicky Fuller) test results are given in Table 3. Decision for an appropriate cointegration. The ADF (Augmented Dicky Fuller) test results are given in table3. The following hypothesis were test for

H0: Variable is having a unit root

H1: Variable is stationary.

The findings and results of the ADF test, as depicted in Table 4.3, indicate that we failed to reject the Null hypothesis H0 for all three series of variables at the specified level. However, after taking the first difference, the outcomes indicate that IPT (Index Point), IRT (interest rate), and ERT (exchange rate) are stationary at a 5% level of significance, which indicates that the entire data series is integrated at order one

Table 3:

Variables		Intercept (C)		Trends and Intercept		
		B	S.E	B	S.E	
IPT	Level	-0.000653	0.005306	-0.022091	0.012758	I (1)
	1 st difference	-0.937541	0.068289	-0.940397	0.068555	
IRT	level	0.014451	0.014451	-0.025940	0.015009	I (1)
	1 st difference	-1.000399	0.066815	-1.003694	0.066963	
ERT	level	0.004681	0.003630	-0.011720	0.012054	I (1)
	1 st difference	-0.348024	0.088840	-0.379388	0.090477	

Trends with non-stationary series

The following figures (1,2, and 3) depict the trends with non-stationary data. All three graphs show a positive correlation with time. Index points, interest rates, and exchange rates have increased over the years; therefore, the figures are presented without applying the ADF test. Figure 4.4 shows the stationary series. After taking the first difference, all three variables become stationary

Figure 1:

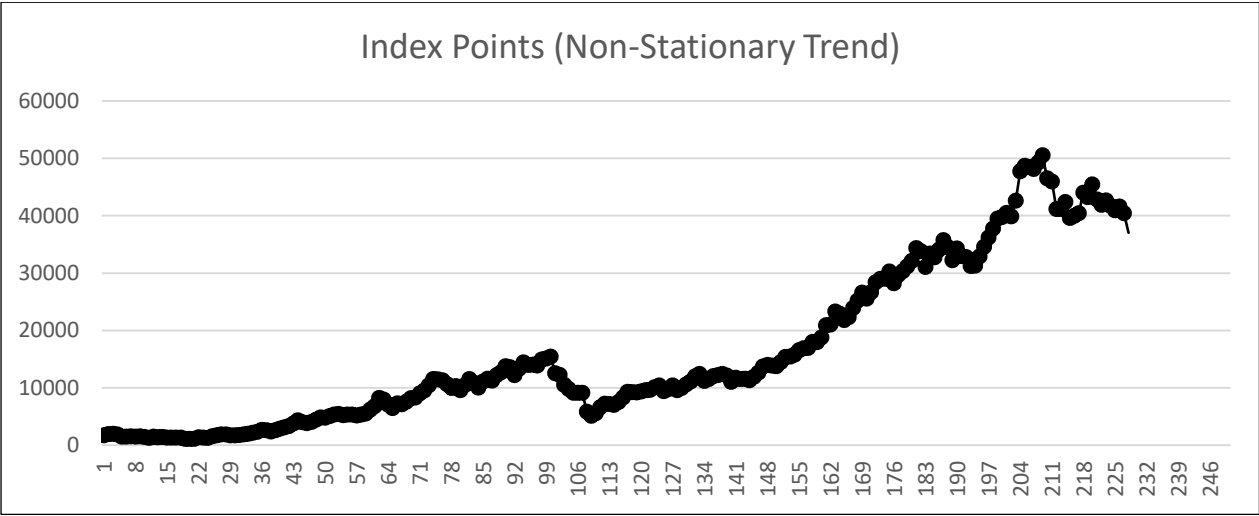


Figure 2:

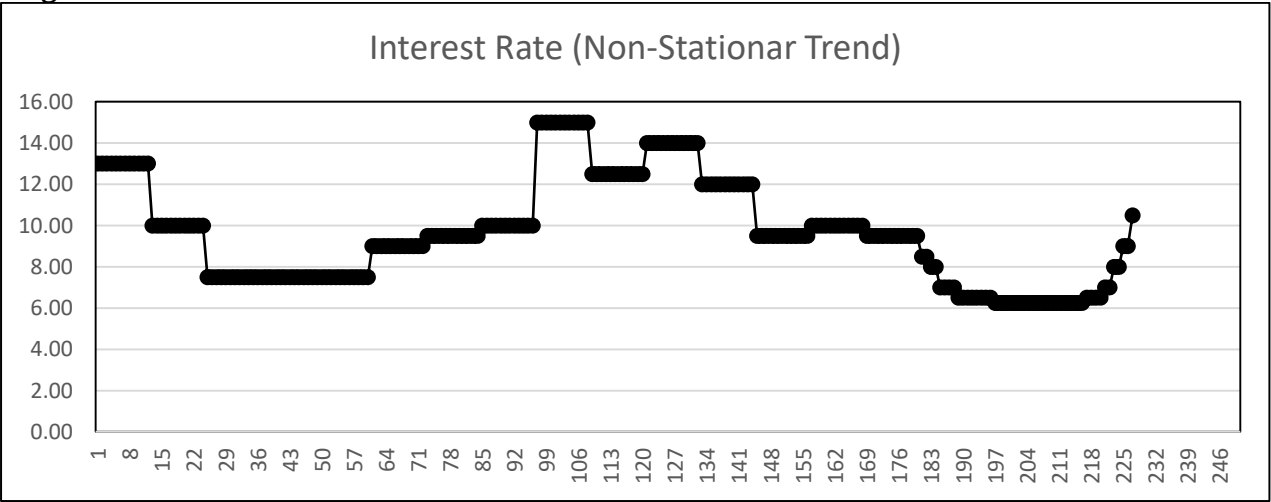


Figure 3:

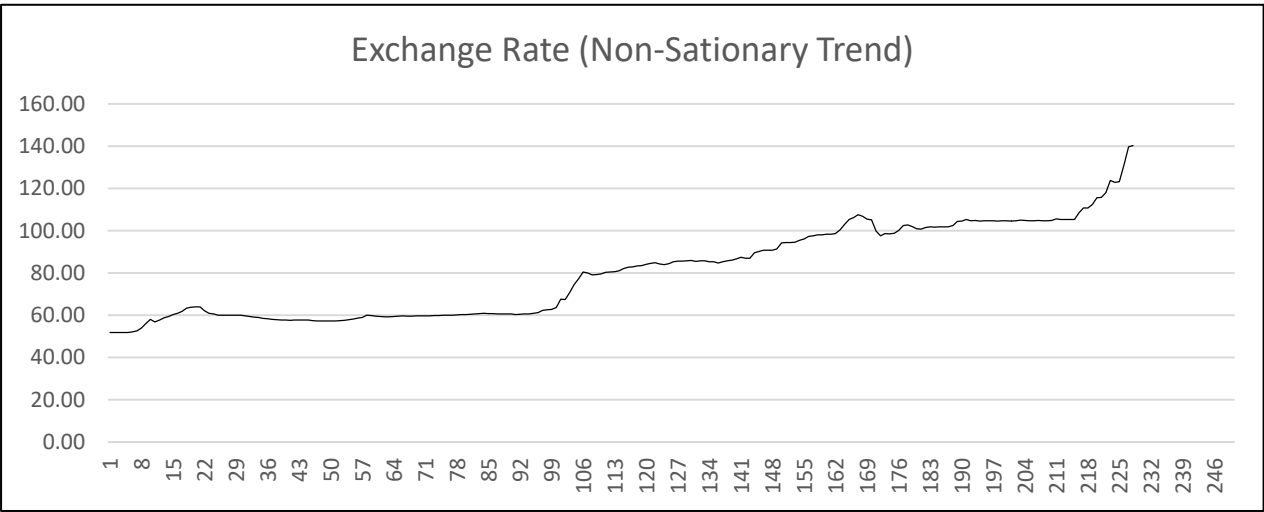
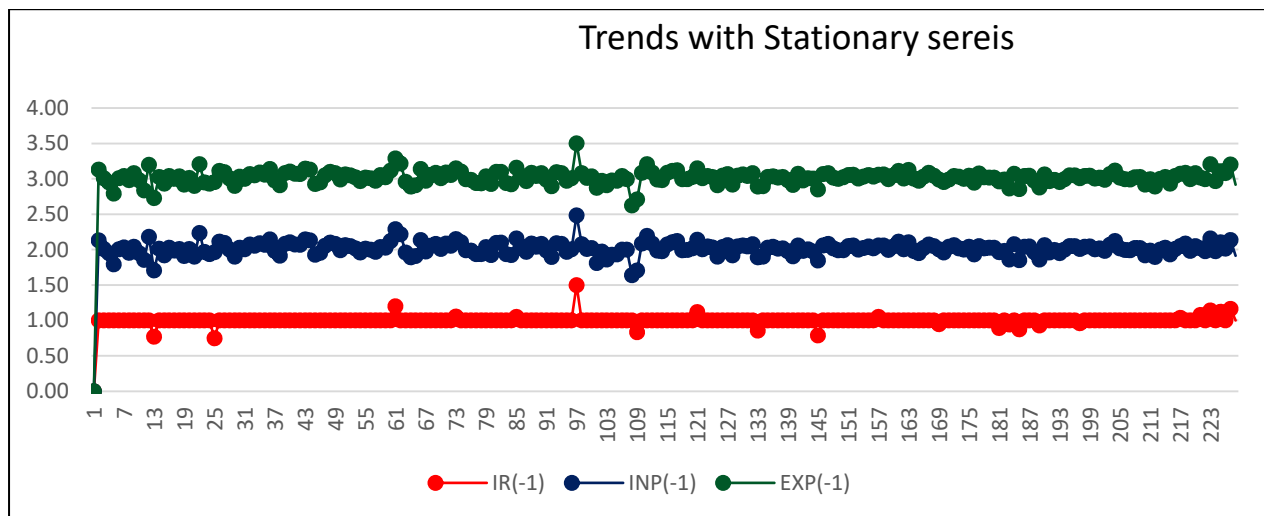


Figure 4



Ordinary Least Squares Regression Model

All variables transformed into log form have been selected for the development of the Ordinary Least Squares (OLS) regression model. The rationale behind running the OLS method at this stage is to find the non-sense regression (Batool, 2021). If the empirical results are found to be nonsensical and spurious, we are unable to proceed further with time series data analysis. In Econometrics analysis and theory, when the value is greater than the value of Durbin-Watson Statistics (DW), such results are considered nonsensical and spurious and cannot be used for informed policy-making in the country (Gillal, et al., 2024).. In the following table, the DW value is clear that the OLS is suffering from spurious regression. In the following table the $R^2 > D.W$ which is clear that the OLS is spurious regression.

Table 4:

Dependent Variable: LOG(INP)				
Method: Least Squares (OLS)				
Variable	B	S.E	t-statistic	p-value
IPT	-3.682742	0.806214	-4.567948	0.0000
IRT	-0.529846	0.153895	-3.442912	0.0007
ERT	3.241516	0.150692	21.51085	0.0000
R-squared	0.703266	Mean dependent var	1.237635	
Adjusted R-squared	0.700629	S.D. dependent var	.066521	
S.E. of regression	0.583545	Akaike info criterion	.773680	
Sum squared resd	76.61809	Schwarz criterion	.818803	
Log likelihood	-199.1996	Hannan-Quinn criter.	.791886	
F-statistic	266.6281	Durbin-Watson stat	1.026341	
Prob(F-statistic)	0.000000			
Note: The are significant at 5% level				

The results in Table 4 illustrate the relationship between the stock market index point and two independent variables, interest rate and exchange rate, using the OLS method. The value of the F-

statistic is 266.62, with a probability value of 0.000, indicating that the overall model is statistically significant at the 5% level. It has a strong correlation, which means that a coefficient of 0.70 indicates a 70 percent variation in the dependent variable that is explained by two independent variables. The coefficients of both variables are significant. The coefficient of interest rate is -0.52 with a 0.000 P value, which is statistically significant; it means one unit or 1 percent decrease in the interest rate, the index points will raise by 0.52 units (percent) or one unit increase in the interest rate will decline the stock market by 0.52 units. The coefficient of the exchange rate is 3.24, with a P-value of 0.000, which is also strongly significant. It means that a one-unit increase in the exchange rate in dollar terms means a depreciation of the Pakistani rupee, which will increase the momentum in the stock market by 3.24 units or percent. The estimated model can be written in the following form.

$$\text{Log(IPT)} = -3.682742 - 0.529846 \text{ Log(IRT)} + 3.241516 \text{ Log(ERT)}$$

Residual Analysis

Testing for Serial Correlation

One of the key problems of time series data is serial correlation. Serial correlation is frequently found in time series data. For checking serial correlation, the Breusch-Godfrey Lagrange Multiplier test is commonly used. To avoid serial correlation, two statisticians, Breusch and Godfrey, introduced the LM test for checking such issues.

H0: Residuals are not serially correlated.

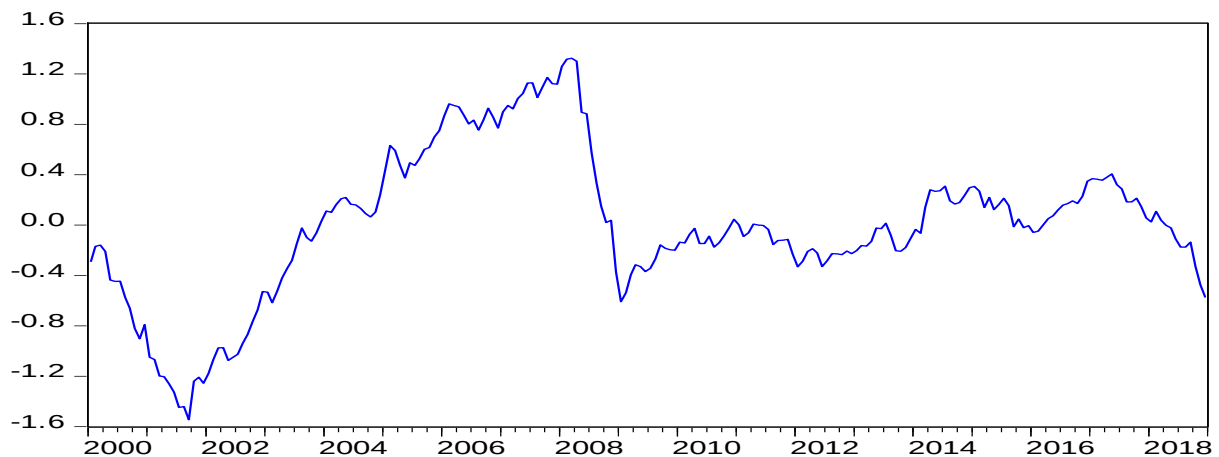
H0: Residuals are serially correlated.

The LM test result depicted in table 5 Which detected serial correlation in the model and thus we reject H0 at 5 percent significance level.

Table 5:

Breusch-Godfrey Serial Correlation LM Test:			
Second order Serial Correlation			
F-statistic	1546.531	Prob. F(2,223)	1.0000
Obs*R-squared	212.6674	Prob. Chi-Square(2)	1.0000

Figure 4.5 Residual



Removal of Serial Correlation

After accounting for the lag of the dependent variable, using this lag as an independent variable in the model, and applying the LM test, the residual became independent and uncorrelated. The result of the model after applying the lag variable as a predictor is shown in Table 6

Table 6: No serial correlation after taking lag of dependent variable

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	0.457163	Prob. F(2,221)	0.6337
Obs*R-squared	0.935279	Prob. Chi-Square(2)	0.6265

Optimal Lag Selection

In the econometric model, one important question arises regarding the lag length, as the model's variables are highly responsive in the long run. Several criteria are available for determining the optimal lag length, but the most important among them are AIC (Akaike Information Criterion) and SC (Schwarz Criterion). In this study, the selection of the optimal lag is based on the minimum AIC value, which is 4, as shown in Table 7. The minimum lag value of the SC test is 1, depicted in Table 7.

Table 7: Appropriate lag length selection

VAR Lag Order Selection Criteria						
Lag	LogL	LR	FPE	AIC	SC	HQ
0	-3714.484	NA	9.54e+10	33.79531	33.84158	33.81399
1	-2389.723	2601.347	609400.2	21.83385	22.01896*	21.90860
2	-2368.630	40.84513	545981.3	21.72391	22.04784	21.85472*
3	-2360.176	16.13807	548769.5	21.72888	22.19164	21.91575
4	-2344.930	28.69048*	518593.7*	21.67209*	22.27369	21.91503
*indicates lag order selected by the criterion						

Test for Cointegration

One of the important steps in econometric analysis is testing for cointegration. In Table 3, it is clear that all the variables are explored. (1) Means that the data series of all three variables become stationary after taking the first difference. Hence, the suitable methodology and criteria is the Johansen cointegration test to calculate the equilibrium relationship between the selected series. To determine the number of equations in the whole model, Johansen uses two key statistics: the trace statistics and the maximum eigenvalue test. The results of both tests are given in Tables 8 and 9.

Table 8: Cointegration test results (Trace)

Hypothesized		Trace Statistic	5% Critical Value	P-values**
No. of CE (s)	Eigen value			
None *	0.114465	41.63513	29.79707	0.0014
At most 1 *	0.051622	16.47150	15.49471	0.0355
At most 2 *	0.026221	5.500163	3.841466	0.0190
Trace test indicates 3 cointegrating eqn(s) at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				
**MacKinnon-Haug-Michelis (1999) p-values				

Table 9: Cointegration test results (Maximum Eigen value)

Hypothesized		Maximum Eigen Statistic	5% Critical Value	P-values**
No. of CE (s)	Eigen value			
None *	0.114465	25.16363	21.13162	0.0128
At most 1	0.051622	10.97133	14.26460	0.1557
At most 2 *	0.026221	5.500163	3.841466	0.0190
Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level * denotes rejection of the hypothesis at the 0.05 level **MacKinnon-Haug-Michelis (1999) p-values				

Conclusions

This study aims to examine the short-term and long-term relationships between stock market performance, interest rates, and exchange rates, using monthly data from Pakistan for the period 2000-2018 and employing a set of econometric methods. The projected regression model appears not to be spurious, as checked. The outcome of the ADF test indicates that the entire set of variables in concern are not stationary at the level but become stationary after taking their first difference. The Johansen-Juselius method for cointegration suggests that all three series in our data are co-integrated with each other, indicating a long-run relationship. The results of the Johansen cointegration test indicate that the interest rate has an inverse relationship (a negative coefficient value), and the exchange rate has a positive effect on the Pakistani stock market in the long term. The parameter estimates of the repressors' are statistically significant. The parameter estimates of the model imply that in the short run, a 1% rise in the interest rate and the rate of exchange will result in a 0.52% decrease and a 3.24% increase in the stock market performance of the PSX. The value of the F-statistic is 266.62, with a probability value of 0.000, indicating that the overall model is statistically significant at the 5% level. It has a strong correlation, which means that a coefficient of 0.70 indicates a 70 percent variation in the dependent variable that is explained by two independent variables. The coefficients of both variables are significant.

Recommendations

This research study offers policy recommendations to enhance the financial and capital sectors of Pakistan. The vibrant stock exchange market can be significantly encouraged by reducing the interest rate through the central regulatory power of the State Bank of Pakistan's monetary policy (Nawab et al., 2021). High bank rates are helpful in discouraging high economic growth, whereas lower bank rates would boost and encourage financial activity in the stock market (Gillal, et al., 2024). This policy aims to mitigate the high inflationary trends in Pakistan's economy. In addition, the monetary regulatory authorities of Pakistan's central bank are hereby recommended to prepare and adopt an expansionary monetary policy that attracts new investors and capital to the Pakistani stock exchange market (Batoool, 2021). This will foster business growth and have a favorable impact on the stock market. If the stock exchange market becomes stable and well-developed, the depreciation of the Pakistani rupee will automatically stop, and it will gain appreciation (Ita et al., 2013). The results of the study also help Pakistani overseas investors to reflect on the explosive condition and nature of the Pakistan Stock exchange market when deciding to invest in Pakistan since the stock exchange market volatility and instability bring a change in currency exchange rates so investors of a foreign country can also predict their exchange risk concern to the instability of stock returns.

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