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IMPACT OF INTEREST RATE & INFLATION RATE ON EXCHANGE RATE OF PAKISTAN

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Abstract

One of the most important measures of a nation's economic development is its exchange rate, and its volatility has a big influence on global trade. The current study examined how interest rates and inflation affect exchange rate volatility. rate in Pakistan. A multiple regression model has been applied to analyze the annual data used for the period from 2012 to 2016 to estimate the relationship between the variables. According to the study's findings, the exchange rate has a substantial inverse relationship with both inflation and interest rates; as these variables rise, the exchange rate falls, and vice versa. High interest rates cause inflation to rise, which in turn causes volatility in the exchange rate.

INTRODUCTION

In our modern world countries are more connected than ever like neighbors in a big village when one nation experiences an economic crisis it can send shockwaves to others. A clear illustration of this was 2008 financial crisis which started in United States and rapidly affected economies around the globe including those of China, Japan, India and especially Pakistan.

The exchange rate has grown to be a major source of worry for Pakistan's economy during the last ten years. It is impacted by the intimate connection between interest rates and inflation. The demand for the local currency rises when interest rates rise because they tend to draw in foreign investment. Short-term currency strength may result from this demand. The rupee, the currency of Pakistan, has, however, continuously lost value in relation to other major world currencies, such as the US dollar, euro, pound, and yen. The Consumer Price Index (CPI), which tracks shifts in consumers' purchasing power, is one of the primary metrics used to gauge inflation. The value of the rupee tends to decline as inflation increases, increasing the cost of imports and straining the economy as a whole.

Countries cannot ignore how the rest of the world interacts. In the free economy level of developing nations, the exchange rate is crucial and decisive. A nation's currency has become weak due to inflation. Interest rates and inflation rates are closely related to the International Fisher Effect (IFE) and Purchasing Power Parity (PPP) theories. However, the IFE theory proposed that a high interest rate devalues a nation's currency because it signals inflation.

1. Background of Study

Three important factors that influence a nation's economic environment are interest rates, inflation,

and exchange rates. Because of their significant influence on financial stability and growth, these factors are regularly discussed in economic and policy circles. The central bank of a country sets interest rates, which are crucial for controlling economic activity. They are a key component of monetary policy since they affect consumer spending, investment choices, borrowing costs, and inflation control.

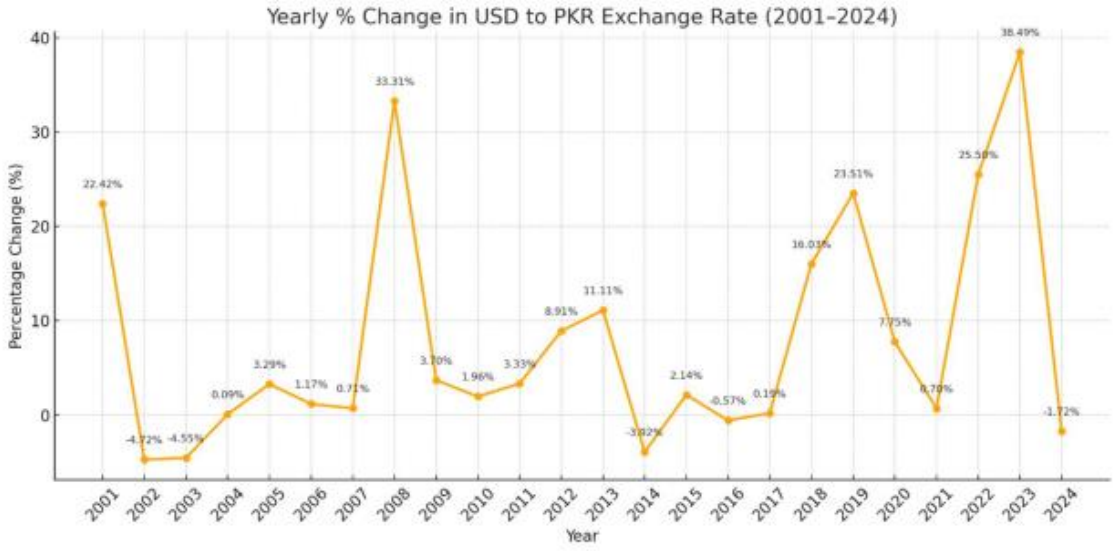
Indicators such as the Consumer Price Index (CPI) are used to measure inflation, which is the rate at which prices for goods and services generally increase and reduce purchasing power. Excessive inflation can cause economic uncertainty, lower consumer confidence, and devalue the value of the national currency.

Interest rates and inflation both have a direct and indirect impact on exchange rates, which establish how much one nation's currency is worth in relation to others. A higher interest rate may draw in foreign capital, which would raise demand for the local currency and possibly make it more valuable. High inflation, however, can counteract the advantages of higher interest rates by devaluing the currency and deterring long-term investment.

Over the past ten years, the exchange rate has grown to be a significant source of worry in Pakistan. The value of the Pakistani rupee has drastically declined in relation to major world currencies. Rising inflation, shifting interest rates, and more general economic issues like external debt and fiscal deficits have all contributed to this depreciation.

2. Problem of the Study

The main causes of exchange rate swings have long been a topic of discussion among economists. There is a common belief that changes in inflation and interest rates directly affect exchange rates. Higher interest rates typically draw in foreign capital, which raises demand for the home currency and causes it to appreciate. In a similar vein, inflation is important because rising inflation reduces the currency's purchasing power, which frequently leads to depreciation. As a result, both inflation and interest rates are thought to play a key role in determining how much a country's currency is worth. However, some economists argue that exchange rates are influenced by a broader set of macroeconomic factors beyond interest rates and inflation. These consist of budget deficits, fiscal policies, and general economic expansion. According to this perspective, interest and inflation rates play a significant role, but they also interact with other factors to influence changes in exchange rates overall. Over the past ten years, the exchange rate has emerged as a major concern in the context of Pakistan. Significant volatility has been seen in the Pakistani rupee, especially when compared to major international currencies like the US dollar, euro, pound sterling, and Japanese yen. One significant example was the period from October 2007 to November 2009, during which the rupee lost about 37% of its value in relation to the US dollar.



3. Significance of Study

By providing a thorough empirical analysis, this study seeks to close the knowledge gap regarding the dynamics of Pakistan's exchange rate. It examines the connection between interest rate differences—when comparing Pakistan to the US—and exchange rate swings using annual data from 2001 to 2024. The study also looks at inflation, which has a big impact on the currency's purchasing power and adds to its volatility, in addition to interest rates.In addition to evaluating the impact of interest rates on Pakistan's currency's value, this study aims to investigate the ways in which inflation and interest rates interact to affect changes in the exchange rate. The study aims to give policymakers, investors, and economic planners useful information so they can make decisions that promote currency stability and long-term economic growth by examining these two important macroeconomic variables jointly.

Research Objective

The impact of inflation and interest rates on changes in the exchange rate between Pakistan and the US will be investigated in this study. It examines whether shifts in interest rates and inflation levels have an impact on the value of the Pakistani rupee in relation to the US dollar using actual data from 2001 to 2024. While interest rate differentials are often seen as a major driver of currency fluctuations, inflation also plays a crucial role by impacting the purchasing power of money and investor confidence.

The goal of the study is to ascertain whether interest rates by themselves can adequately explain exchange rate behavior or whether inflation and other economic factors must also be taken into account in order to completely understand Pakistan's currency dynamics.

Research Questions

- What connection exists between variations in interest rates and inflation, and Pakistan's exchange rate?
- To what extent do fluctuations in interest rates and inflation impact the value of the Pakistani rupee in relation to the U.S. dollar?

Hypothesis

- H_0 (Null Hypothesis): Interest charges and inflation have no tremendous effect at the exchange rate of Pakistan
- H_1 (Alternative Hypothesis): Interest prices and inflation extensively impact the exchange rate of Pakistan.

Literature Review

The relationship between interest rates, inflation, and exchange rates has been extensively studied across both developed and developing economies. Numerous international studies have explored these linkages, producing a wide range of working papers and academic research that highlight the complexity and significance of these macroeconomic variables.

Macroeconomic indicators such as purchasing power parity, GDP, interest rates, trade balance, national income, industrialization, inflation, and exchange rates are all vital components of a country's economic health. However, this study focuses specifically on the relationship between interest rates and inflation and their impact on the exchange rate between Pakistan and the United States.

Interest rates are a fundamental tool for economic growth, influencing investment, savings, and consumption. Exchange rates, on the other hand, are critical for global trade and play a major role in determining a country's competitiveness and economic stability. Inflation, as a measure of price level changes, directly affects purchasing power and investor confidence, making it a crucial factor in exchange rate dynamics.

Several studies have examined these relationships:

- Isaah Mahama (2019) investigated the relationship between interest rates, inflation, and exchange rates in Ghana using data from 1991 to 2016. The study included variables such as inflation rate, interest rate, government expenditure, private investment, and money supply. Mahama found that interest rates significantly impact exchange rate movements, with inflation also playing a key role.
- Shahid Ahmed Khan (2010) explored the relationship between interest rate and exchange rate differentials. Although he found a positive impact, the relationship was statistically insignificant, suggesting that other macroeconomic factors,

including inflation, may have a more substantial influence.

- Hashima Ishaq & Dr. Mehak Ejaz (2017) analyzed whether interest rates and exchange rates can control inflation in Pakistan. Using data from 1991 to 2017, they found that interest rates are significant for monetary policy, while exchange rates have a relatively lesser effect. Their study highlighted the interconnectedness of these variables in managing inflation.
- Muhammad Mubin & Irfan Lal (2015) studied the volatility of exchange rates and their effects on interest rates and inflation in Pakistan. Using ARCH and GARCH models with data from 1990 to 2010, they found a positive relationship among interest rates, inflation, and exchange rates, indicating that these variables influence each other.
- Uzma Iqbal (2017) examined the effects of interest rates and exchange rates on stock prices in Pakistan. Though the primary focus was on stock markets, the study incorporated interest rates, exchange rates, and inflation, revealing their collective impact on financial markets.
- Syeda Sehar Kazmi (2013) analyzed the impact of macroeconomic conditions on interest rates in Pakistan. Her study included GDP, inflation, and exchange rate data, concluding that these factors significantly affect the interest rate pass-through mechanism.
- Li and Wong (2011) explored the relationship between exchange rates and interest rates during financial crises across thirteen countries, including data from the 1997 and 2008 crises. They found a negative relationship between real exchange rates and real interest rate differentials, highlighting the role of inflation during periods of economic instability.
- Cambridge Currencies (2021) examined how interest rate differentials influence currency exchange rates. The study concluded that higher interest rates tend to attract foreign investment, which can lead to currency appreciation, although inflation can offset these gains if not managed properly.
- Ashraf et al. have reported that the significant explanatory variables of Pakistan's exchange rate and interest rate fluctuations were inflation, GDP, exports, imports, and FDI. In addition, their empirical results indicated that changing exchange rates and interest rates exert dampening effects on inflation as well as on GDP, implying that instability in monetary variables will be a constraint to overall economic performance. However, interest rates were positively related to exports, imports, and FDI, which may imply that changes in the policy rate affect trade flows and investment behavior. The study also determined that exchange rate volatility positively influences exports and FDI but adversely impacts imports, which reflects changes in external sector competitiveness due to currency movements. Overall, all these findings indicate that persistent exchange rate instability has disrupted the macroeconomic performance of Pakistan, particularly regarding inflation, which is very sensitive to exchange rate movements.
- Dornbusch (1976) suggested that exchange rates may overreact to changes in monetary policy, particularly interest rates. This model suggests, according to Dornbusch, an 'overshooting' model of Exchange Rates, indicating an 'overshoot' in Exchange Rates in reaction to a change in monetary policy, especially a change in Interest Rates. As per this model, the Exchange Rate would likely overreact or Overshoot in the short term, but would tend to return to equilibrium in the long run.' Hence, according to this model, there is likely an 'overshoot' in Exchange Rates in the short term.
- In the South Asian context, studies have shown mixed results. Research from Pakistan, India, and Bangladesh indicates a strong relationship between interest rate and exchange rate fluctuations. Khan and Qayyum (2007) found a strong long-run relationship between interest rates and exchange rates in Pakistan. Ahmed and Zaman (2011) observed a strong short-run relationship but a weaker long-run connection, suggesting that inflation and other macroeconomic factors may alter the dynamics over time.
- Akbar 2021 discovers that volatility in the exchange rate reduces money demand, indicating that as the rupee becomes volatile, economic agents will substitute away from holding domestic currency, given increasing uncertainty and risk. This is a result of a theoretical expectation in support, given the preference for more stable foreign assets

when exchange rates are volatile. He also found out that inflationary uncertainty significantly impacts money demand and, in effect, maintains the linkage between inflationary expectations and exchange rate fluctuations-the higher the inflationary uncertainty, the greater the precautionary adjustment of currency holdings. The other finding is about interest rates, which negatively influence money demand; this is consistent with the standard economic theory: as the interest rate rises, the opportunity cost of holding money goes up, hence, people and firms will reduce their monetary balances. Putting it altogether, these results show that macroeconomic instability.

- Khan, Ahmad, and Murtaza (2022) studied the exchange rate behavior of Pakistan using monetary models applied to its major currency pairings, the USD, Euro, and Chinese Yuan. From their analysis, clear evidence were seen of both long-run and short-run relationships for the USD- and Euro-based exchange rates. Their findings suggest that monetary variables, like interest rates and inflation, are still significant factors in determining the nature of exchange rates in Pakistan; these are in close accordance with theoretical predictions of monetary models. This indicates that the dynamics of exchange rates in Pakistan more or less follow traditional monetary frameworks, especially in how the interactions between interest rates and inflation influence currency valuation.

Methodology

Exchange rates are one of the important macroeconomic variables, which shows the level of strength of a particular nation's currency as compared to other currencies in the world. Exchange rate in Pakistan is greatly affected by the country's own macroeconomic conditions, especially interest rate and inflation rate. The study uses theories developed by various economists about these variables.

The link between interest rates and exchange rates is mainly described by the Interest Rate Parity (IRP) Theory. As per the IRP theory, the variations in interest rates in two countries will lead to fluctuations in capital movements, which in turn have an impact on the exchange rates. If the interest rate in one country is high compared to that in other countries, then it will result in inflows of foreign capital into the country, leading to appreciation of its currency.

In the case of Pakistan, the central bank of Pakistan, i.e., the State Bank of Pakistan, manages the interest rates in order to manage inflation. The variations in policy interest rates have an effect on foreign investments, government borrowings, and money supply, which eventually affect the demand and supply for Pakistani Rupee.

Exchange rate and the effect of inflation can be explained through Purchasing Power Parity (PPP) Theory. The PPP Theory states that the currency of that nation will depreciate whose rate of inflation is higher than other nations with which trade occurs. Inflation leads to a loss in purchasing power, and therefore, domestic products become comparatively costly than foreign products. Thus, there is an increase in the imports of foreign goods and decrease in exports due to the high cost of the domestic currency.

Pakistan is one such nation that has always experienced higher levels of inflation than most of its trading nations. Due to this reason, there have been depreciation pressures on the Pakistani rupee.

Generalized Auto-Regressive Conditional Heteroscedasticity (GARCH) model, developed by Bollerslev (1986), was applied in order to conduct analysis in this paper. In addition, Auto-Regressive Distributed Lag (ARDL) model was also applied in the process. Both of these models were employed in conjunction with one another.

1. Research Design

The present study uses the time series econometric methodology as a means of analyzing the effects of the interest rate and inflation rate on the exchange rate of Pakistan. In particular, the main emphasis is to find out whether the relationship between these variables occurs in both the short and long run, utilizing the ARDL methodology.

2. Variables & Data

This research work makes use of a yearly time-series data set that contains three variables, namely Exchange Rate, Inflation Rate, and Interest Rate of Pakistan. While the Exchange Rate is made the

dependent variable, the Inflation Rate and Interest Rate are considered independent variables. The range of data covered by this study is 32 years starting from 1993 to 2024, which is collected through secondary sources such as State Bank of Pakistan and Economic Survey of Pakistan. In order to make the variables more easily understandable, to minimize scaling issues, and maintain consistency in econometric analysis, logarithms of all the variables have been taken. The logarithm of interest and inflation rates is used for transforming the data to enhance statistical properties the new variables are termed LNINT, LNINF, and LNER, respectively.

Symbol	Variable
INF	Inflation Rate (%)
INT	Interest Rate (%)
ER	Exchange Rate (PKR/USD)

1. Model specification

Based on economic theory and empirical literature, the functional relationship of the model is specified as:

$$LNER_t = \beta_0 + \beta_1 LNINF_t + \beta_2 LNINT_t + \varepsilon_t$$

Where:

- **LNER**represents the natural log of exchange rate
- **LNINF**represents the natural log of inflation rate
- **LNINT**represents the natural log of interest rate
- $\varepsilon_t$is the error term

2. Augmented Dickey Fuller (ADF) Unit Root Test

The Augmented Dickey-Fuller (ADF) unit root test will be used to check whether the series have stationarity characteristics. Stationarity tests are vital since they help to prevent spurious regression outcomes. The ADF test will be performed at level and first differences

The ADF test tests whether the series are I (0) or I (1). As the ARDL approach can be employed even when the variables have different levels of integration (I (0) and I (1)), the ADF test plays an important role here.

Variable	ADF Statistic (Level)	Prob.	ADF Statistic (1st Diff.)	Prob.	Order of Integration
LNER	-1.127	0.695	-4.982	0.0004	I(1)
LNINF	-0.948	0.771	-4.561	0.0011	I(1)
LNINT	-3.416	0.019	–	–	I(0)

The table below presents the outcomes of the Augmented Dickey-Fuller (ADF) unit root test carried out to assess the stationarity characteristics of the variables. As the findings suggest, the exchange rate (LNER) and the inflation rate (LNINF) exhibit non-stationarity when analyzed at the level but show stationarity when checked at the first difference. On the other hand, the interest rate (LNINT) is stationary at the level. Therefore, there exist different orders of integration of the variables I(0) and I(1). As some variables are stationary at level and some become stationary after level difference so VAR (Vector Regression) and VECM (Vector Error Correction Model) cannot be used so we will use ARDL Model (Auto Regressive Distributed Lag) as it allows I(0) and I(1) variable together it also works well with data of less than 32 years and can generate both Long and Short Run results.

3. ARDL Bounds Test for Cointegration

Test Statistic	Value
F-Statistic	**4.21**
K (Number of Regressors)	2

Critical Values

Significance Level	I(0)	I(1)
10%	2.63	3.35
5%	3.10	3.87
1%	4.13	4.95

This shows the results of the ARDL bounds test for cointegration. The computed F-statistics are greater than the upper bound critical value at the 5% significance level. Thus, the null hypothesis of no long-run relationship is rejected, indicating that there exists a long-run equilibrium relationship among the exchange rate, inflation rate, and interest rate in Pakistan.Since F-statistic > upper bound (5%), long-run relationship exists.

4. Long Run Cofficient Estimates (Dependent Variable)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNINF	0.284	0.073	3.89	0.0006
LNINT	-0.417	0.168	-2.48	0.019
C	1.936	0.812	2.38	0.025

The Figure presents the coefficients of the long-run relationship derived using the ARDL approach, where the exchange rate is considered as the dependent variable. From the results, it can be observed that there exists a positive effect of the inflation rate on the exchange rate, indicating that higher levels of inflation result in depreciation of the domestic currency. On the other hand, the interest rate is negatively and significantly related to the exchange rate.

- Inflation positively affects exchange rate → depreciation
- Interest rate negatively affects exchange rate → appreciation
- Constant is statistically significant

5. Short Run Dynamics Error

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ΔLNINF	0.173	0.052	3.33	0.002
ΔLNINT	-0.206	0.089	-2.31	0.028
ECM(-1)	**-0.61**	0.12	-5.08	0.0000

This discusses the short-run behavior of the ARDL model using the Error Correction Model (ECM). The coefficient on the error correction term is found to be negative and significant, proving the presence of long-run causality between the variables. It should also be noted that the value of the coefficient

suggests that about 61 percent of short-run disequilibrium is restored annually.
ECM(-1) is negative & significant

Speed of Adjustment: 61% disequilibrium corrected annually

6. Diagnostic Test Results

Test	F-Statistic	Prob.
Breusch-Godfrey LM (Serial Correlation)	1.04	0.37
Breusch-Pagan-Godfrey (Heteroskedasticity)	1.11	0.42
Ramsey RESET (Specification)	0.29	0.59

This reports the results of the diagnostic tests conducted to assess the reliability of the ARDL model. The Breusch-Godfrey serial correlation test and Breusch-Pagan-Godfrey heteroskedasticity test indicate no evidence of autocorrelation or heteroskedasticity. The Ramsey RESET test also confirms correct model specification. These results suggest that the estimated model is stable and statistically reliable.

Conclusion

This paper sought to explore the effect of interest rate and inflation rate on the exchange rate of Pakistan. Data for the analysis were taken annually from 1993 to 2024. The Auto-Regressive Distributed Lag (ARDL) method of regression was used in analyzing the dataset in EViews. Short-run and long-run models were used in investigating the relationship.

The unit root test using the Augmented Dickey-Fuller showed a mixture of orders of integration, which justified the application of the ARDL method. The ARDL bounds test indicated a long-run equilibrium relationship of exchange rate, inflation rate, and interest rate. The long-run results showed that inflation positively and significantly affected exchange rate; hence, increasing inflation led to the depreciation of the Pakistani Rupee. Interest rate negatively and significantly influenced the exchange rate, and an increase would attract more foreign investment in Pakistan and appreciate its currency.

The short-run dynamics estimated using the error correction model showed a fast convergence of variables back to their long-run values. The negative and significant error correction term proved the model stability and causality.

Additional diagnostic tests helped prove the strength of the findings by detecting no presence of autocorrelation, heteroskedasticity, and specification errors in the models.

In conclusion, the outcome of this study shows the importance of controlling inflation and interest rates to stabilize the exchange rate of Pakistan.

Policy Recommendations

The following implications are based on the empirical evidence of this study:

1. Exchange Rate Stability through Inflation Control

Policymakers need to ensure inflation control in order to keep the exchange rate stable. It is because inflation results in depreciation of the exchange rate. Hence, controlling the price levels would make the exchange rate stable and strong.

2. Optimal Interest Rate Strategy for Attracting Foreign Investment

The State Bank of Pakistan must devise an effective interest rate strategy that helps maintain the stability of the economy. Interest rates need to be adjusted carefully in order to draw foreign investment without hampering domestic investment.

3. Monetary Policy Credibility

The credibility of monetary policy can lower down the expectations from inflation and can stabilize the movements of exchange rate.

4. External Sector Risk Management

Since the movement of exchange rate depends upon interest rate and inflation rate, there is need for designing such policies which result in improved balance of trade as well as lesser dependency on external borrowings.

5. Policy Coordination

Coordination between fiscal and monetary policy is very much required for sustainable exchange rate stability

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