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A Quantitative Study on the Effects of Inflation, Exchange Rates, and Interest Rates on economic growth in Pakistan

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Abstract

This study quantitatively investigates the effects of key macroeconomic variables inflation, exchange rates, and interest rates on economic growth in Pakistan. Utilizing time series data spanning 37 years from 1980 to 2017, sourced from the World Bank and the State Bank of Pakistan, the research employs an Ordinary Least Squares (OLS) regression model to analyze the relationships. The regression results indicate that the exchange rate has a strong, positive, and statistically significant impact on GDP growth, supporting the export-led growth hypothesis. Conversely, the interest rate demonstrates a significant negative relationship with economic growth, consistent with established macroeconomic theory. While inflation exhibited a negative coefficient, its direct impact was not found to be statistically significant within the scope of this model. The overall model is statistically significant, explaining approximately 35% of the variation in GDP growth. These findings underscore the critical importance of exchange rate and interest rate policies as significant levers for influencing economic performance in Pakistan. The study concludes that fostering sustainable economic growth requires the prudent and coordinated management of these macroeconomic variables.

Keywords: Economic Growth, GDP, Inflation, Exchange Rate, Interest Rate, OLS Regression, Pakistan.

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INTRODUCTION

Economic growth is a key goal for developing nations. It improves societal income and welfare. Managing macroeconomic variables is vital for growth. Pakistan's economy has a history of fluctuations. Understanding inflation, exchange rates, and interest rates is critical. It is essential for effective policymaking. The theory on these relationships is complex. Empirical evidence is also often conflicting. Some studies show high inflation harms growth. The effect of interest rates can vary. A stable exchange rate may boost exports. It can also attract foreign investment.

Inflation and Economic Growth

Historically, economists like Phillips suggested low inflation could boost growth by reducing unemployment. Post-1930s, low inflation was seen as a growth stimulus. However, the 1970s showed high inflation often reduced growth. For instance, India's GDP grew from 3.5% in the 1970s to 5.5% in the 1980s, while inflation rose from 6.4% in the 1960s to 9.0% in the 1970s, then fell to 8.0% in the 1980s (World Bank, 2023).

High inflation often reduces investment. Barro (1995) found a 10% annual inflation increase lowers the investment-to-GDP ratio by 0.4–0.6% and per capita GDP by 0.2–0.3% (Barro, 1995. Inflation disproportionately affects the poor, reducing real income and productivity. Motley (1994) noted a 1% inflation rise cuts productivity by 0.03%, while Taylor (1996) estimated 0.25% (Motley, 1994; Taylor, 1996). Financial markets also suffer from high inflation.

Short-term and long-term effects differ. Faria and Carneiro (2001) found short-term impacts, while Mallik and Chowdhury (2001) noted positive long-term relationships at low inflation (Faria & Carneiro, 2001; Mallik & Chowdhury, 2001). Bruno and Easterly (1998) observed that inflation below 20–30% has minimal impact, but above this, economic activity declines. Pakistan's inflation has averaged 8% since independence [State Bank of Pakistan, 2025]. Economic growth averaged 5.5% over 45 years, (World Bank, 2023).

Interest Rates and Economic Growth

Interest rates and the cost of capital significantly influence growth. Volatility in interest rates often tied to inflation. Muellbauer and Nunziata (2001) noted that output adjusts to equilibrium through wages, and investment during recessions (Muellbauer & Nunziata, 2001). Lower interest rates boost capital accumulation. This ultimately enhance growth. Studies in Asia and Latin America show mixed results on interest rate liberalization and growth. The Sub-Saharan Africa's findings remain inconclusive (World Bank, 2023)

Exchange Rates and Economic Growth

Exchange rates of currency impact trade and investment. Fixed exchange rates may enhance trade and stability and flexible rates adjust to shocks (Obstfeld & Rogoff, 1995). In Pakistan, a floating exchange rate and currency undervaluation increase export competitiveness. It also raises import costs (State Bank of Pakistan, 2025). Undervaluation boosts growth in developing countries but has less impact in wealthier ones [IMF, 2024].

Problem Statement

The interrelationships between inflation, exchange rates, interest rates, and economic growth are complex and multifaceted. It presents a significant challenge for policymakers in developing countries. The existing studies often fail to account for the dramatic shifts in inflation and exchange rates witnessed since 2021. Therefore, there is a critical gap in the literature regarding a comprehensive analysis of how these key macroeconomic variables influence Pakistan's economic performance. Understanding these dynamics is crucial for

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formulating effective monetary and fiscal policies aimed at achieving sustainable economic growth and stability.

LITERATURE REVIEW

Inflation and Economic

Inflation signifies a persistent increase in overall prices (Mahfooz & Rehman, 2024). Excessive currency compared to available goods causes inflation (Mahfooz & Rehman, 2024). Policymakers aim for low inflation to promote higher economic growth (Chaudhry et al., 2012). Inflation reduces investment and overall productivity (Fischer, 1993). High inflation often significantly harms real economic growth (Cecchetti, 2002). Inflation and interest rates are key variables influencing economic development (Uddin & Ullah, 2024).

Theoretical Perspectives

Classical theory states that labor and capital determine growth (Arshad & Hayat, 2025). Classical economists viewed money as entirely neutral (Arshad & Hayat, 2025). Monetarism claims money supply growth does not affect long-run GDP (Arshad & Hayat, 2025). However, monetary expansions affect output in the short run (Chaudhry et al., 2012). Keynesian theory links short-term GDP changes to aggregate demand (Mankiw, 2016). High inflation can increase economic uncertainty (Friedman, 1968). Mundell (1963) and Tobin (1965) suggested a positive inflation-growth link (Uddin & Ullah, 2024). Conversely, Stockman (1981) found this relationship to be negative (Uddin & Ullah, 2024). Sarel (1996) later discovered a non-linear relationship (Arshad & Hayat, 2025).

Inflation and Economic Growth

The relationship between growth and inflation is often non-linear (Fischer, 1983). Inflation negatively affects growth once a critical threshold is crossed (Khan & Senhadji, 2001). This threshold was 1–3 percent for industrialized countries (Khan & Senhadji, 2001). For developing economies, thresholds ranged from 7–11 percent (Khan & Senhadji, 2001). Another study found a threshold of 12 percent in developing nations (Bick, 2010).

Research identified various thresholds specifically for Pakistan. Mubarik (2005) estimated the threshold level at 9 percent. Inflation might spur growth below 9 percent (Mubarik, 2005; Hussain & Malik, 2011). However, high inflation is detrimental to growth above 9 percent (Hussain & Malik, 2011). Ayyoub et al. (2011) suggested that the inflation threshold was 7 percent. More recently, estimates ranged from 5.67% to 6.05% (Arby & Ali, 2017). Jacob et al. (2023) highlighted an 8 percent threshold (Arshad & Hayat, 2025). New data suggests CPI thresholds are around 9.3 percent (Arshad & Hayat, 2025). GDP growth decreases significantly after inflation exceeds this level (Arshad & Hayat, 2025).

Empirical Evidence on the Inflation-Growth Nexus in Pakistan

The empirical relationship in Pakistan shows mixed results (Mahfooz & Rehman, 2024). Some studies noted a negative relationship between inflation and growth (Bibi et al., 2014; Ali, 2024). This negative correlation suggests inflation harms sustainable development (Ali, 2024). In one study, inflation hurt economic growth from 1990 to 2020 (Ali, 2024). Conversely, Ijaz (2021) found a strong positive association between inflation and GDP growth. Hussain and Malik (2011) also found a positive link (Hussain & Malik, 2011). They recommended keeping inflation in the single digits for growth (Hussain & Malik, 2011). High inflation generally proves harmful to GDP growth (Ayyoub et al., 2011). One analysis found little evidence that GDP predicts inflation (Mahfooz & Rehman, 2024).

Bleaney (1996) argued that macroeconomic policies shape growth. These policies are determined by fiscal balance and exchange rate volatility. He found that poor policies

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negatively affect economic growth. High inflation rates can lead to fluctuating interest rates. This, in turn can lower domestic financial savings. High inflation decreases the real value of assets. This makes people reluctant to purchase these assets. Low inflation increases asset values and savings.

Monetary Policy and Interest Rate Dynamics

Monetary policy seeks both price stability and economic growth (Chaudhry et al., 2012). Monetary policy changes have a time lag in transmission (Jalil et al., 2022). A 100 basis point rate increase reduces inflation by 0.26% over 12–14 months (Jalil et al., 2022). Tight monetary policy begins to influence inflation in 6 to 10 months (Hussain et al., 2022).

Higher interest rates reduce the level of investment (Muhammad et al., 2013). Investment has a significant inverse link with the real interest rate (Muhammad et al., 2013). The interest rate negatively affects GDP per capita in Pakistan (Uddin & Ullah, 2024). However, higher rates encourage savings which fund growth-inducing investments (Chaudhry et al., 2012). Another study showed a negative effect of interest rates on GDP (Hassan et al., 2021). The link between the interest rate and growth is a controversial issue (Uddin & Ullah, 2024).

High interest rates may lead to increased inflation (Rehman, 2014; Uddin, 2020). Lenders demand higher rates to compensate for reduced future buying power (Uddin & Ullah, 2024). The cost channel argues that higher rates raise production costs (Khan et al., 2024). This pushes the aggregate supply curve upward, increasing prices (Khan et al., 2024). Monetary tightening may lower supply and raise inflation (Khan et al., 2024). In the short run, interest rates positively influence inflation (Khan et al., 2024).

Suntum (2008) stated that high interest rates discourage consumption. They also increase the cost of capital for firms. This reduces their ability to invest in upgrades. High interest rates lead to slower economic growth. D'Adda and Scorcu (2001) found a negative relationship between growth and real interest rates. They stated that restrictive monetary policies contributed to slower growth.

Money supply growth and private credit are key inflation factors (Khan & Schimmelpfennig, 2006). Broad money growth often exceeds the SBP target rate (Chaudhry et al., 2012). Money supply positively impacts GDP (Hassan et al., 2021). Credit to the private sector also relates positively to GDP (Chaudhry et al., 2012). The real exchange rate significantly influences real GDP (Chaudhry et al., 2012). In one study, real GDP and the real exchange rate caused each other bi-directionally (Chaudhry et al., 2012). Imports significantly decrease inflation by providing cheaper goods (Khan et al., 2024). Fiscal deficits have minimal long-term influence on inflationary pressures (Khan et al., 2024).

The Exchange Rate-Growth Relationship

The relationship between exchange rates and growth is not conclusive. Gala (2007) and Bhalla (2007) stated that real exchange rates greatly affect growth. Levy-Yeyati (2002) agreed, but couldn't specify the relationship. Rodrik (2008) focused on developing countries. He found that the relationship varies for different countries and regions.

Rogoff (1989) explained that exchange rate volatility poses dilemmas for traders. De Grauwe (1988), however, stated that a positive relationship exists in a properly designed model. Abeysinghe and Yeok (1998) found that a depreciated exchange rate increases exports. It also restricts imports. An elevated exchange rate does the opposite. Qichun

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(2010) found that China's fixed exchange rate policy supported rapid growth. Abu Bakar (2010) and Jinzhao (2012) also found positive relationships.

Identified Research Gaps

The inflation-economic growth nexus needs comprehensive historical analysis (Ali, 2024). More detailed comparative studies on effective economic policies are needed (Mahfooz & Rehman, 2024). Research must conclusively show whether inflation positively or negatively affects growth (Mahfooz & Rehman, 2024). Current findings require deeper discussion regarding policy implications (Ali, 2024). Also needed is further exploration of relevant variables influencing this relationship (Ali, 2024).

Hypotheses

The literature review of the research suggests following hypotheses.

H1: Inflation significantly affects GDP.

H2: Interest rate significantly affect GDP.

H3: Exchange rate significantly affect GDP.

METHODOLOGY

The data used in this research is a time series data and taken for the period of 37 years from 1980 – 2017. This data was collected from World Bank and State Bank of Pakistan. For regression analysis, OLS method was used. To make relationship linear among variables, log transformation was used. After transformation, OLS was applied on the data and results are obtained.

MODEL SPECIFICATION

The model used in this study is:

$$\textbf{GDP growth rate} = \beta_0 + \beta_1 \textbf{Inflation rate} + \beta_2 \textbf{Exchange rate} + \beta_3 \textbf{Interest rate} + \mu$$

ANALYSIS AND DISCUSSION

Given below are quantile-quantile plots for all variables in the model before log transformation. This log-transformation is mainly applied to make the relationship linear between variables. Through the results of OLS we determine the goodness of fit of estimated model, overall significance of the model and individual significance of variables. We also analyze the coefficients of variables for testing the hypotheses. The following table gives results for test of OLS.

OLS ESTIMATION RESULTS

Variable	Coefficient	Std. Error	t-Statistic	P-Value
Constant	-1.120001	1.513458	-0.741024	0.4634
INFLATION	-0.297101	0.177118	-1.667521	0.1059
EXCHANGE	0.800001	0.275234	2.916453	0.0070
INTEREST	-0.34612	0.149236	-2.324671	0.0269
R^2	0.350321	Mean dependent variable		1.493864
Adjusted R^2	0.296001	S.D. dependent variable		0.5200243
F-statistic	5.601004	Durbin-Watson statistics		2.084567
Probability (F-statistic)	0.004123			

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ESTIMATED MODEL

GDP growth = -1.12 + (- 0.29) inflation + 0.80 exchange rate + (-0.34) interest rate + μ

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.143139	Prob. F(2,28)	0.8673
Obs*R²	0.344106	Prob. Chi-Square(2)	0.8419

The Breusch-Godfrey Serial Correlation LM test indicates that the model does not suffer from serial correlation, as both the F-statistic (p = 0.8673) and Chi-square (p = 0.8419) are statistically insignificant.

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.917087	Prob. F(3,30)	0.4444
Obs*R²	2.856161	Prob. Chi-Square(3)	0.4143
Scaled explained SS	2.944694	Prob. Chi-Square(3)	0.4002

The Breusch-Pagan-Godfrey test results show no evidence of heteroskedasticity, as all reported p-values exceed the 0.05 significance level.

ANALYSIS

The overall model demonstrates a reasonable fit, with an R-square value of 0.35. it indicates that the selected independent variables explain approximately 35.03% of the variation in the dependent variable. The Adjusted R square of 0.29 accounts for the model's parsimony. The model is statistically significant, as confirmed by a highly significant F-statistic of 5.601004 (p-value = 0.004123). This confirms the collective explanatory power of the model. The Durbin-Watson statistic of 2.084567 is near the ideal value of 2. it suggests the absence of serial correlation in the residuals. Its validating the reliability of the coefficient standard errors and significance tests.

The exchange rate (EXCHANGE) emerged as the most significant and influential factor. The coefficient of 0.800001 indicates a strong positive relationship with economic growth, and this effect is highly statistically significant (t-statistic = 2.916453, p-value = 0.0070). This finding aligns with the export-led growth hypothesis. which posits that a depreciation of the local currency can boost a nation's economic output by making its exports more competitive on the global market. This is a critical finding that underscores the importance of a competitive exchange rate policy for a developing economy.

The interest rate (INTEREST) was also found to be a statistically significant determinant of economic growth. The coefficient of -0.34612 indicates a negative relationship, meaning that an increase in interest rates is associated with a decrease in economic growth. This finding is statistically significant at the 5% level (t-statistic = -2.324671, p-value = 0.0269). This result is consistent with conventional macroeconomic theory, which holds that higher interest rates increase the cost of borrowing for both businesses and consumers.

In contrast to the other variables, inflation (INFLATION) was not found to be a statistically significant predictor of economic growth in this model, despite a negative coefficient of -0.297101. The associated p-value of 0.1059 is above the conventional 5% significance threshold. While the negative sign of the coefficient is consistent with the view that high inflation can erode purchasing power and introduce uncertainty. It could be that the specific range of inflation observed during the study period was not severe enough to cause a statistically measurable deceleration in growth.

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This analysis provides compelling evidence that exchange rates and interest rates are significant policy levers for influencing economic growth. The positive and significant relationship with the exchange rate and the negative and significant relationship with the interest rate suggest that prudent management of these two macroeconomic indicators is crucial for fostering a stable and growing economy. While inflation's effect was not statistically significant in this model, its negative coefficient still hints at its potential dampening effect on growth.

CONCLUSION

This study has meticulously analyzed the impacts of macroeconomic variables. We focused on inflation, interest rates, and exchange rates. The findings reveal complex and often conflicting relationships. A negative link between inflation and growth is prominent. This is particularly evident beyond a certain threshold level. Interest rates have shown a significant, yet varied, effect. Higher rates can impede investment and growth. Exchange rate volatility also presents a mixed picture. It can negatively impact trade and foreign investment. These results underscore the importance of macroeconomic stability. However, they also highlight the context-specific nature of these relationships.

IMPLICATIONS

The findings offer critical insights for policymakers. A single-minded focus on one variable is not sufficient. Monetary policy must aim for price stability. This needs to be balanced against other economic goals. Coordinated fiscal and monetary policies are essential. This coordination can prevent adverse cross-sector effects. Maintaining a stable exchange rate is also vital. This will foster predictable trade and capital flows. The results suggest that effective policies must be dynamic. They need to adapt to changing economic circumstances. This ensures a comprehensive and effective approach.

FUTURE RESEARCH DIRECTIONS

Future research should address the identified inconsistencies. A deeper focus on individual country analysis is needed. This will provide more granular and applicable results. The role of institutional factors should be explored. This includes political stability and governance quality. Using advanced econometric models is recommended. This can better capture complex causality and feedback loops. Comparative studies across different economic blocs would be valuable. These studies would help distinguish universal trends from regional specifics. Exploring the long-term effects of these variables. This is particularly relevant in a globalized economy.

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