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Analyzing Macroeconomic Indicators in Pakistan: Insights from Unemployment, Inflation, and Interest Rates

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Abstract

The study examines the intricate relationship between key macroeconomic indicators—unemployment rate, interest rate, and inflation rate in Pakistan spanning from 1974 to 2017. Through empirical analysis, the findings reveal various dynamics within these economic variables. One notable outcome is the absence of a significant trade-off between the unemployment rate and inflation rate. This suggests that changes in one variable do not consistently lead to predictable changes in the other, indicating a complex relationship between labor market conditions and price levels in Pakistan. However, the analysis does identify a trade-off in the short run between the interest rate and both inflation and unemployment rates. This implies that changes in interest rates can have an immediate impact on inflation and unemployment levels, highlighting the role of monetary policy in influencing economic conditions over shorter time horizons. Furthermore, the study sheds light on the factors influencing unemployment rates in Pakistan. Population growth is found to have a negative association with unemployment, suggesting that a growing population may contribute to higher employment opportunities. Conversely, external debt is positively correlated with unemployment, indicating potential constraints on job creation associated with indebtedness. Inflation dynamics are also explored, with money supply emerging as a significant determinant. This suggests that changes in the money supply, perhaps influenced by monetary policy decisions, have a direct impact on price levels in the economy. Additionally, the exchange rate and imports are found to exert a negative influence on inflation, indicating that factors affecting international trade can help mitigate inflationary pressures. Finally, the study highlights the role of interest rates in influencing domestic credit to the private sector, with a positive relationship observed. However, interest rates are negatively related to the exchange rate, indicating potential trade-offs in monetary policy decisions aimed at stimulating credit provision while maintaining exchange rate stability. The findings of the study provide valuable insights into the complex interactions between key macroeconomic variables in Pakistan, offering policymakers and researchers a deeper understanding of the country's economic dynamics and potential policy implications.

Keywords: Unemployment Rate, Inflation Rate, Interest Rate, External Debt, Money Supply, Exchange Rate
JEL Codes: E24, E31, E52

1. INTRODUCTION

Indeed, inflation, interest rates, and unemployment rates are pivotal indicators of macroeconomic health, each offering insights into different aspects of an economy's performance. Inflation, as you rightly pointed out, occurs when the supply of money surpasses its demand, leading to a sustained increase in the prices of goods and services. This erodes the purchasing power of money, effectively reducing the real income of individuals. Consequently, people can buy fewer goods and services with the same amount of money, impacting their standard of living. Additionally, inflation diminishes the real value of savings over time, as the purchasing power of saved funds diminishes. This can have adverse effects on savers, particularly those on fixed incomes. Furthermore, inflation can have redistributive effects within an economy. Lenders benefit from inflation, as the money they receive in repayment is worth less than when it was originally lent. Conversely, borrowers face increased repayment burdens, as they are required to pay back loans with money that has diminished purchasing power. This dynamic can influence borrowing and lending behavior, impacting investment decisions and overall economic activity. Sustainable inflation, within a reasonable range, is indeed considered beneficial for economic growth. It encourages consumer spending, incentivizes investment, and fosters overall economic activity. However, when inflation rates become too high, they can hinder economic growth. High inflation erodes the purchasing power of money, leading to a decrease in consumer spending as individuals become hesitant to make purchases due to rising prices. This reduction in consumer demand can result in excess inventory for businesses, leading to reduced profits and potentially forcing them to cut back on production and labor, thus increasing unemployment. Imported factors, such as increases in import prices or currency devaluation, can contribute to inflationary pressures in a country. When a country's currency is devalued relative to other currencies, the cost of imported goods rises, leading to higher prices for consumers domestically. This imported inflation can exacerbate domestic inflationary pressures and contribute to overall inflation rates. However, it's worth noting that the impact of devaluation on consumer prices may vary depending on various factors, including the structure of the economy, the degree of integration with global markets, and the effectiveness of monetary and fiscal policies in managing inflationary pressures.

The Phillips curve indeed illustrates the inverse relationship between inflation and unemployment, suggesting that policymakers face a trade-off between these two variables. Increasing inflation tends to reduce unemployment by

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stimulating economic activity, as higher prices may encourage firms to expand production and hire more workers. However, this relationship may not hold true in the long run, as expectations about future inflation can adjust, leading to a situation known as the "long-run Phillips curve" where there is no trade-off between inflation and unemployment. Exchange rate policy can also play a role in managing inflation. A depreciation of the domestic currency can lead to higher import prices, which may contribute to inflationary pressures. Conversely, a stronger exchange rate may help contain inflation by reducing the cost of imports. Unemployment, as you mentioned, has various social and economic implications, including increased social unrest and reduced overall welfare. Policies aimed at reducing unemployment often focus on stimulating investment and creating new job opportunities. Both public and private sector investment can contribute to job creation, with targeted interventions in sectors with high labor intensity often yielding positive results. The classification of unemployment into rural and urban categories highlights the importance of considering regional disparities in labor markets. Urban areas typically face higher levels of unemployment due to factors such as population density, industrial structure, and access to education and training opportunities. Policymakers may need to tailor their interventions to address the specific challenges faced by different regions.

Interest rates indeed play a crucial role in shaping the behavior of both consumers and producers. One significant aspect of interest rates is their influence on consumer behavior and spending patterns. When interest rates are low, borrowing costs decrease, making it more affordable for consumers to finance big-ticket purchases such as homes, cars, and durable goods (Mahmood et al., 2013). This can lead to an increase in consumer spending, which is a major driver of economic growth, as it accounts for a significant portion of aggregate demand. Conversely, when interest rates are high, borrowing becomes more expensive, which can discourage consumers from taking out loans and credit. This can lead to a decrease in consumer spending, which can have a dampening effect on economic activity and growth. Additionally, higher interest rates may incentivize individuals to save more of their income in interest-bearing accounts, rather than spending it on consumption (Mahmood et al., 2013). Interest rates also play a critical role in shaping investment decisions by businesses. Firms often rely on borrowing to finance capital expenditures, expand operations, or invest in research and development. When interest rates are low, the cost of borrowing is reduced, making it more attractive for businesses to undertake investment projects (Asari et al., 2011). This can lead to an increase in business investment, which can boost productivity, create jobs, and stimulate economic growth. Conversely, when interest rates are high, the cost of borrowing increases, which can deter businesses from investing in new projects or expanding their operations. This can result in lower levels of business investment, which can have negative implications for economic growth and employment (McCallum, 1989). In addition to their impact on consumer spending and business investment, interest rates also influence exchange rates and international capital flows. Changes in interest rates can affect the attractiveness of a country's currency relative to others, leading to fluctuations in exchange rates (Asari et al., 2011). This, in turn, can impact exports, imports, and overall trade balances, shaping the competitiveness of domestic industries in global markets. Central banks carefully monitor interest rates and use monetary policy tools to achieve their policy objectives, such as price stability, full employment, and sustainable economic growth (Mahmood et al., 2013). By understanding the complex interplay of interest rates with various sectors of the economy, policymakers can make informed decisions to support overall economic stability and prosperity.

The decade of 1990 marked a period of significant economic challenges for Pakistan, characterized by high rates of unemployment and inflation. Researchers such as Amjad (2005), Akhtar and Shahnaz (2006), and Aqil et al. (2014) have highlighted various factors contributing to these economic woes, including foreign direct investment, GDP growth rate, population growth rate, domestic investment, and education levels. Policy makers are faced with the daunting task of devising effective strategies to reduce unemployment without exacerbating inflationary pressures. Mahmood et al. (2013) undertook an investigation into the intricate relationship between unemployment, inflation, and the rate of interest, shedding light on the dynamics at play in Pakistan's economy. However, there remains a need to expand upon this research by incorporating additional policy variables. The present study aims to fill this gap by reinvestigating the trade-off among unemployment rate, inflation rate, and interest rate in Pakistan's economy, while incorporating a broader range of policy variables. By analyzing the interplay between these key economic indicators and various policy factors, this research seeks to provide policy makers with a more comprehensive understanding of the factors driving unemployment and inflation in Pakistan. Ultimately, the findings of this study are expected to offer valuable insights that can inform the development of more effective economic policies aimed at promoting sustainable growth, reducing unemployment, and mitigating inflationary pressures.

2. LITERATURE REVIEW

The relationship between the rate of interest, inflation rate, and unemployment has garnered significant attention in economic literature, particularly following the seminal findings of Friedman (1959). Friedman's work highlighted the role of the rate of interest in influencing individuals' demand for money, with assets demand playing a major role. Additionally, an increase in the money stock was found to impact income levels through the velocity of money.

Numerous studies have delved into the complex interplay between inflation, the rate of interest, and unemployment, yielding varied results that are contingent upon the unique structural and economic conditions of each economy. Tobin (1965) emphasized the influence of technology and savings on factor productivity, which subsequently affects the rate of interest. Furthermore, Tobin noted that the behavior of monetary factors can significantly impact the equilibrium rate of interest.

In the context of Pakistan, Bilquees (1988) provided a comprehensive analysis from both monetarist and structuralist perspectives to explain inflation. The study concluded that the inflationary process in Pakistan is determined by a

combination of monetary and structural factors, underscoring the multifaceted nature of inflation dynamics in the country. These seminal studies underscore the importance of considering various economic factors and perspectives when examining the relationship between the rate of interest, inflation rate, and unemployment, highlighting the need for nuanced analyses tailored to specific economic contexts.

Khan and Qasim (1996) conducted an analysis to estimate the determinants of inflation in Pakistan. Their study revealed that substantial borrowing from the banking system led to higher monetary expansion, thereby accelerating inflation. Additionally, expansionary fiscal policies were found to exacerbate balance of payments issues and contribute to an increase in the overall price level. The study recommended the adoption of a combination of moderate fiscal and monetary policies to stabilize the economy and mitigate inflationary pressures.

Shabbir and Ahmed (1994) explored the determinants of inflation in Pakistan over the period 1971-72 to 1987-88. Their findings indicated that fiscal deficits emerged as a significant cause of inflation, while the impact of monetary factors on inflation was negligible.

In a study focusing on the United Kingdom, Barr and Campbell (1996) investigated the interaction between expected future real interest rates and inflation rates. Their analysis decomposed the interest rate into expected nominal rates and expected real rates, leading to significantly improved inflation forecasts. The study highlighted the vulnerability of real interest rates in the short run compared to nominal interest rates.

Nickell (1997) conducted an investigation into the relationship between unemployment and labour market rigidities in Europe and North America. The study concluded that rising unemployment could be attributed to factors such as unemployment allowances, insufficient coordination between unions and employers, and high levels of taxes. However, the impact of labour institutions on unemployment was found to be negligible in European countries.

Kamin (1997) examined the influence of the real exchange rate on inflation in Latin American and Asian countries. The study revealed that currency devaluation led to increased inflation in Latin America, while Asian economies experienced inflation due to economic and structural factors. The findings suggested that inflation and the real exchange rate effectively influenced each other.

Mishkin and Posen (1997) investigated inflation targeting in New Zealand, Canada, the United Kingdom, and Germany. The study highlighted the importance of balancing transparency and flexibility in monetary policy for the successful implementation of inflation targeting. It concluded that inflation targeting appeared successful in Germany, Canada, and the United Kingdom, but less so in New Zealand.

Gali and Gertler (1999) conducted an analysis of inflation dynamics by considering firm behavior. Their study concluded that current and future expectations play a more significant role in determining prices than past experiences. Rigid wages were identified as a major cause of price increases, and deflation was found to potentially lead to output reductions.

Mankiw (2000) investigated the trade-off between inflation and unemployment. The study suggested that in the short run, monetary controls could increase unemployment in an economy. However, accurately determining the long-run relationship between inflation and unemployment remained challenging.

Mishkin (2000) examined inflation targeting in several countries including Chile, Brazil, Czech Republic, Poland, and South Africa. The study emphasized the importance of policy transparency and exchange rate control for successful inflation targeting. However, it also highlighted that inflation targeting might not be suitable for all emerging market countries.

Mallik and Chowdhury (2001) explored the relationship between inflation and GDP growth for economies including Pakistan, India, Sri Lanka, and Bangladesh. Their study revealed that an increase in inflation tends to stimulate economic growth, and vice versa. However, policies aimed at controlling inflation may also dampen the growth rate. The study recommended policymakers to devise strategies that balance inflation control with economic growth objectives.

Choudhri and Khan (2002) investigated the relationship between exchange rates and consumer prices in Pakistan from 1982 to 2001. Their empirical analysis found that while the devaluation of the Pakistani rupee did not have a significant immediate impact on inflation, in the long run, inflation did lead to a depreciation of the rupee in Pakistan.

Amisano and Serati (2003) analyzed the determinants of unemployment in the USA, Italy, UK, and Sweden economies from 1975 to 1995. Their study identified that shocks in aggregate demand resulted in long-lasting variations in unemployment. Additionally, the burden of taxes on firms was shifted towards consumers in the US economy, while labour taxes directly affected unemployment levels in both the USA and Italy. Labour unions were considered a significant factor contributing to rising unemployment in Italy. Moreover, an increase in real wages was found to enhance productivity across all economies, although real wages were relatively insensitive to shocks in labour supply.

Amjad's (2005) analysis underscores the multifaceted nature of unemployment, emphasizing the need for holistic policy approaches that address not only skills mismatches but also broader structural issues within the labour market. This highlights the importance of proactive government intervention to create an enabling environment for job creation and skill development.

Agha and Khan's (2006) examination of fiscal deficits sheds light on the complex interplay between fiscal and monetary policies and their implications for inflation dynamics. Their findings underscore the challenges policymakers face in balancing the objectives of stimulating economic growth while maintaining price stability.

Ribba's (2006) study offers valuable insights into the relationship between productivity shocks and inflation dynamics, highlighting the nuanced relationship between productivity, prices, and employment. This underscores the importance of considering supply-side factors in understanding inflationary pressures.

Chaudhry and Choudhary's (2006) findings challenge conventional wisdom regarding the efficacy of monetary policy in combating inflation, suggesting that structural factors may play a more significant role in driving price levels. This

underscores the importance of a nuanced understanding of inflation dynamics and the limitations of monetary policy alone in addressing inflationary pressures.

Khan and Schimmelpfennig's (2006) comparative analysis of wheat support prices and money supply sheds light on the relative importance of different factors driving inflation in Pakistan. Their findings highlight the need for a comprehensive approach to inflation management that takes into account both monetary and non-monetary factors.

Akhtar and Shahnaz's (2006) examination of youth unemployment underscores the importance of addressing broader structural issues within the economy, such as the mismatch between skills supply and demand, in tackling unemployment among vulnerable demographic groups. This emphasizes the need for targeted interventions to enhance skills development and promote employment opportunities for youth.

Kemal's (2006) analysis of the monetary transmission mechanism provides valuable insights into the lags involved in the impact of changes in money supply on inflation. This underscores the importance of understanding the dynamics of monetary policy transmission channels in shaping inflation outcomes.

Benati and Vitale's (2007) comparative analysis of natural interest rates across different economies offers valuable insights into the heterogeneity of monetary policy challenges faced by policymakers globally. This highlights the importance of tailoring monetary policy strategies to the specific characteristics and challenges of each economy.

Khan et al.'s (2007) comparative analysis of fiscal and monetary policy sheds light on the relative effectiveness of different policy instruments in determining inflation outcomes in Pakistan. Their findings underscore the predominant role of monetary variables, such as adaptive expectations and private sector credit, in driving inflationary pressures, highlighting the importance of monetary policy in managing inflation dynamics.

Rafiq et al.'s (2008) examination of the determinants of unemployment in Pakistan highlights the complex interplay between population growth, foreign direct investment, and inflation in shaping unemployment outcomes. Their findings emphasize the interconnected nature of unemployment and inflation, underscoring the need for comprehensive policy approaches that address both demand and supply-side factors affecting the labour market.

Subhan and Hayat's (2009) analysis of price instability's effects on unemployment and economic growth offers valuable insights into the adverse consequences of inflation on GDP growth and employment. Their findings underscore the importance of price stability for promoting sustainable economic growth and reducing unemployment levels.

Hussain's (2009) investigation into the relative importance of different policy variables in influencing inflation and output dynamics in Pakistan provides valuable insights into the transmission channels of monetary policy. His findings highlight the role of exchange rate and government spending in shaping inflation and output outcomes, underscoring the importance of considering these factors in monetary policy formulation.

Achsani et al.'s (2010) analysis of the relationship between exchange rate and inflation in Asian countries sheds light on the unique challenges faced by Asian economies in managing inflation dynamics. Their findings underscore the importance of exchange rate management in inflation targeting strategies for Asian economies, given their heightened sensitivity to external shocks.

Khan and Gill's (2010) examination of budgetary deficits and inflation dynamics in Pakistan challenges conventional wisdom regarding the inflationary impact of government finance through bank loans. Their findings highlight the role of currency depreciation and import prices in driving inflationary pressures, emphasizing the need for a nuanced understanding of the factors influencing inflation dynamics in Pakistan.

Chen et al.'s (2010) analysis of the inflation-unemployment trade-off in the United Kingdom offers valuable insights into the importance of including real interest rates and real wages as policy variables in empirical analysis. Their findings underscore the significance of considering the role of real interest rates in Phillips curve analysis, highlighting the potential misspecification of models that exclude this variable.

Gentle and Chen's (2013) findings for the Canadian economy echo the importance of real interest rates in shaping inflation dynamics, underscoring the need for a comprehensive approach to Phillips curve analysis that incorporates key policy variables such as real interest rates.

Zaman et al.'s (2011) empirical analysis provides robust evidence of the existence of a Phillips curve relationship between inflation and unemployment in Pakistan, both in the short and long run. Their findings underscore the negative relationship between inflation and unemployment, highlighting the potential trade-offs and policy implications for managing these macroeconomic variables.

Mahmood et al.'s (2013) investigation into the trade-off among inflation, interest rates, and unemployment rates in Pakistan further elucidates the dynamic interrelationships between these variables. Their findings reveal a negative impact of interest and unemployment rates on inflation, suggesting that changes in these variables can influence inflationary pressures in the economy. The study also highlights the presence of significant trade-offs among these variables in the long run, emphasizing the importance of policy interventions to manage inflation and unemployment dynamics effectively.

Aurangzeb and Asif's (2013) analysis of factors affecting unemployment rates in Pakistan, India, and China sheds light on the multifaceted determinants of labour market outcomes in these countries. Their findings underscore the significant impact of GDP, inflation, and exchange rates on unemployment, highlighting the complex interplay between macroeconomic variables and labour market dynamics.

Umair and Ullah's (2013) longitudinal study of the impact of inflation on GDP and unemployment rates in Pakistan offers valuable insights into the nuanced relationships between these variables over time. While their findings suggest an insignificant influence of inflation on GDP and unemployment rates, the study contributes to a deeper understanding of the complex dynamics shaping economic growth and employment outcomes in Pakistan.

Habib and Sarwar's (2013) investigation into the impact of foreign direct investment (FDI) on employment levels in Pakistan provides valuable insights into the role of FDI in driving job creation and economic development. Their findings highlight the positive impact of FDI on employment levels, underscoring the importance of policies aimed at attracting foreign investment to stimulate job growth and economic prosperity.

Maqbool et al.'s (2013) findings regarding the relationship between inflation and unemployment in Pakistan underscore the dynamic nature of these macroeconomic variables and the potential for policy interventions to influence labour market outcomes. Their findings suggest that policies aimed at enhancing domestic industrial support and attracting FDI can play a crucial role in reducing unemployment and stimulating economic growth in Pakistan.

Jaradat and AI-Hhosban's (2014) analysis of inflation and interest rates in Jordan provides valuable insights into the macroeconomic dynamics of the country over the past two decades. The bidirectional causality between inflation and various economic indicators, including unemployment, economic growth, and budget deficit, underscores the interconnectedness of these variables and their implications for policy formulation. The weak positive relationship between inflation and interest rates reflects the challenging economic conditions faced by Jordan during the study period, highlighting the need for targeted policy interventions to address inflationary pressures while supporting economic growth and fiscal sustainability.

Aqil et al.'s (2014) investigation into the determinants of unemployment in Pakistan offers important insights into the factors shaping labour market outcomes in the country. Their findings suggest that while GDP growth and inflation have insignificant effects on unemployment, population growth rate and foreign direct investment (FDI) play crucial roles in reducing unemployment. By identifying key drivers of unemployment, the study contributes to a deeper understanding of the complex dynamics underlying labour market dynamics in Pakistan and provides valuable inputs for policy makers seeking to address unemployment challenges.

Ebiringa and Anyaogu's (2014) analysis of the relationship among exchange rates, inflation rates, and interest rates in Nigeria offers valuable insights into the macroeconomic dynamics of the country over the past four decades. The findings regarding the determinants of exchange rates underscore the importance of lagged exchange rates and inflation rates in shaping exchange rate movements, while highlighting the limited role of interest rates in this context. By examining the interrelationships among key macroeconomic variables, the study enhances our understanding of the factors driving exchange rate dynamics in Nigeria and provides valuable inputs for policymakers seeking to manage exchange rate volatility and inflationary pressures.

Ali et al.'s (2015) investigation into the relationship between interest rates and investment in Pakistan sheds light on the mechanisms through which monetary policy affects economic activity and inflationary pressures. The findings suggest that increases in interest rates lead to higher output and investment levels, which in turn contribute to inflationary pressures. By highlighting the importance of interest rate management in controlling inflation and exchange rate volatility, the study underscores the crucial role of monetary policy in stabilizing the economy and promoting sustainable growth.

3. ECONOMIC THEORY

The construction of economic models serves as a fundamental tool for understanding and analyzing economic behavior and phenomena. Economic models allow individuals to make sense of complex interactions within the economy by simplifying and abstracting key factors and relationships. These models are essential for economic theory as they enable economists to make predictions and formulate policy recommendations based on theoretical insights. However, it's important to recognize that economic models are built on assumptions and limitations. Due to the complexity of real-world economic systems, not all factors can be included in a single model. Therefore, economists must make strategic choices about which variables to include and how to represent them in the model. These assumptions and restrictions help to streamline the analysis and focus on the most relevant factors driving economic outcomes. The primary purpose of economic models is to provide insights into economic phenomena and to make predictions about future behavior. A valid economic model is one that accurately reflects reality, provides meaningful predictions, exhibits simplicity without sacrificing important details, and captures the general behavior of the economic system under study. In the context of this study, which focuses on analyzing the trade-off among unemployment, interest rate, and inflation in the Pakistan economy, economic models play a crucial role. By constructing a model that incorporates these key macroeconomic indicators, researchers can better understand the dynamics at play and identify potential policy implications. Additionally, the use of dummy variables to account for political and military rule adds nuance to the analysis, allowing researchers to assess how changes in governance may impact economic stability. Previous studies, such as those by Maqbool et al. (2013), Aurangzeb and Asif (2013), Khan and Gill (2010), Ali and Rehman (2015), and Aqil et al. (2014), have contributed valuable insights into the determinants of unemployment, interest rates, and inflation in Pakistan. This study is following their methodology hence present models become as:

$UNE_t = f (POP_t, ED_t, EXR_t, IR_t, INF_t, PINS)$

$INF_t = f (IR_t, EXR_t, UNE_t, IMP_t, M2_t, PINS)$

$IR_t = f (DCP_t, UNE_t, INF_t, EXR_t, PINS)$

Where

UNE = unemployment rate (%)

POP = population growth (annual percent)

ED = external debt (Debt disbursed excluding grants, $ Million)

EXR = exchange rate (LCU per US$, period average)

IR = interest rate

INF = inflation (consumer prices annual %)
DCP = domestic credit to private sector (% of GDP)
IMP = imports of goods and services (% of GDP)
M2 = broad Money (% of GDP)
PINS= political instability
Political instability is a dummy variable which is defined as:
PINS = 1, for dictatorship
PINS = 0, otherwise
In this study data on unemployment rate and external debt is taken from various issues of economic surveys of Pakistan. Data regarding population growth, exchange rate and inflation is taken from World Bank online database.

4. EMPIRICAL RESULTS AND DISCUSSION

Table 1 presents the unit root estimation results for various variables both at the level and after taking the first difference. The T-statistics and associated probabilities indicate the presence or absence of a unit root, which helps determine the stationarity of the variables. At the level, the variables LINF (Inflation), LIR (Interest Rate), LEXR (Exchange Rate), LUNE (Unemployment Rate), LED (Employment), LPOP (Population), and LDCP (Domestic Consumer Price) exhibit mixed results. While LINF, LPINS, and LPOP show significant unit roots (indicated by low probabilities), others like LIR, LUNE, LED, and LDCP do not show significant evidence of unit roots. After taking the first difference, indicating stationarity, all variables except LEXR and LDCP demonstrate significant unit roots. This suggests that after differencing, these variables become stationary, indicating that they are suitable for time series analysis. Notably, variables like LPINS (Inflation Rate), LINF, and LED (Employment) exhibit strong evidence of stationarity, with very low probabilities, both at the level and after differencing. Conversely, variables like LEXR (Exchange Rate) and LDCP (Domestic Consumer Price) show mixed results, with significant unit roots at the level but not after differencing, suggesting potential non-stationarity in their original form but achieving stationarity through differencing. These results provide insights into the stationarity properties of the variables, crucial for time series analysis and forecasting, guiding the appropriate modeling approaches for each variable based on their stationarity characteristics.

Table 1: Unit Root Estimation

	At level	At First Difference
Variables	T-Statistic(Prob.*)	T-Statistic(Prob.*)
LINF	-3.297741(0.0218)	-6.661657(0.0000)
LIR	-3.357581(0.0192)	-5.044074(0.0002)
LEXR	0.620530(0.9886)	-4.306877(0.0016)
LUNE	-2.182690(0.2156)	-3.916251(0.0046)
LED	-2.878139(0.0571)	-4.064366(0.0031)
LPINS	-7.552195(0.0000)	-6.000000(0.0000)
LPOP	-2.761008(0.0735)	-3.631408(0.0097)
LDCP	-1.139937(0.6901)	-5.439563(0.0001)

Table 2: ARDL Bound Testing Approach

	Dependent Variable LUNE, ARDL (1,1,1,1,1,0,0)	
Critical values	F-Statistics (4.903)**	
	Lower Bound	Upper bond
95%	2.45	3.61
90%	2.12	3.23
	Dependent Variable LINF,ARDL (1, 0, 0, 0, 1, 1,0)	
Critical values	F-Statistics (3.422)*	
	Lower Bound	Upper bound
95%	2.45	3.61
90%	2.12	3.23
	Dependent Variable LIR, ARDL (1, 1, 2, 0, 0, 1)	
Critical values	F-Statistics (5.872)**	
	Lower Bound	Upper bound
95%	2.62	3.79
90%	2.26	3.35

Table 2 presents the results of the ARDL (AutoRegressive Distributed Lag) bound testing approach for three different dependent variables: LUNE (Unemployment Rate), LINF (Inflation Rate), and LIR (Interest Rate). This approach helps determine the presence of cointegration among the variables. For LUNE, the ARDL model specification is (1,1,1,1,1,0,0). The critical values for the F-statistics are shown alongside the lower and upper bounds. The calculated F-statistics are significant at the 5% level, exceeding the upper bound critical value, indicating the presence of cointegration among the

variables. Similarly, for LINF, the ARDL model specification is (1,0,0,0,1,1,0), and the calculated F-statistics are significant at the 10% level, surpassing the upper bound critical value. This suggests cointegration among the variables. For LIR, the ARDL model specification is (1,1,2,0,0,1), and the calculated F-statistics are significant at the 5% level, exceeding the upper bound critical value, indicating the presence of cointegration among the variables. Overall, these results indicate that there is evidence of cointegration among the variables for all three dependent variables: LUNE, LINF, and LIR, suggesting long-run relationships among them. Cointegration is an essential concept in time series analysis, indicating that the variables move together in the long run despite short-term fluctuations.

Table 3 presents the estimated long-run coefficients of the Unemployment Rate model using the ARDL (AutoRegressive Distributed Lag) approach with the specification (1,1,1,1,1,0,0). The dependent variable in this model is LUNE (Unemployment Rate), and several regressors are included to explain its behavior. The coefficients represent the impact of each regressor on the unemployment rate in the long run. Here's the interpretation of each coefficient: The population variable (LPOP) shows a coefficient of 6.786860, indicating that a one-unit increase in the population leads to an approximate 6.79 unit increase in the unemployment rate. This suggests that population growth may contribute significantly to unemployment levels, a finding supported by its statistical significance at the 1% level. The labor force participation rate (LED) exhibits a coefficient of 2.835045, suggesting that a one-unit increase in the labor force participation rate results in an approximately 2.84 unit increase in the unemployment rate. This implies that an expanding labor force might exacerbate unemployment, supported by its statistical significance at the 1% level. The exchange rate (LEXR) coefficient is -3.099978, indicating that a one-unit increase in the exchange rate leads to a decrease of approximately 3.10 units in the unemployment rate. This suggests that a stronger exchange rate may alleviate unemployment, a significant finding supported by its statistical significance at the 1% level. The interest rate (LIR) coefficient is -0.070665, suggesting a negligible effect on unemployment, as indicated by its lack of statistical significance (p-value = 0.8697). This implies that changes in interest rates may not have a significant impact on unemployment levels in the long run. The inflation rate (LINF) coefficient is -0.240607, implying that a one-unit increase in the inflation rate leads to a decrease of approximately 0.24 units in the unemployment rate. However, this coefficient is not statistically significant (p-value = 0.2299), suggesting caution in interpreting its effect on unemployment. The personal income (PINS) coefficient is -0.187301, indicating that a one-unit increase in personal income results in a decrease of approximately 0.19 units in the unemployment rate. This coefficient is statistically significant at the 5% level, suggesting that higher personal income may mitigate unemployment. Finally, the constant term (C) represents the intercept, with a coefficient of -3.823038. This suggests that when all other regressors are zero, the unemployment rate is expected to be approximately -3.82. The constant term is statistically significant at the 5% level. These coefficients provide insights into the relationships between various economic factors and the unemployment rate, aiding policymakers in understanding the dynamics affecting unemployment in the long run.

Table 3: Estimated Long Run Coefficients of Unemployment Rate Model

ARDL (1,1,1,1,1,0,0) Dependent variable is LUNE			
Regressor	Co-efficients	Standard-Error	T-Ratio (Prob)
LPOP	6.786860	1.367285	-4.963749(0.0000)
LED	2.835045	0.733295	3.866171(0.0006)
LEXR	-3.099978	0.830054	-3.734671(0.0009)
LIR	-0.070665	0.426711	-0.165603(0.8697)
LINF	-0.240607	0.195879	-1.228341(0.2299)
PINS	-0.187301	0.089413	-2.094780(0.0457)
C	-3.823038	1.654771	-2.310312(0.0287)

Table 4: Vector Error-Correction Model (VECM) of Unemployment Rate Model

ARDL (1,1,1,1,1,0,0) Dependent variable is LUNE			
Regressor	Co-efficients	Standard-Error	T-Ratio (Prob)
LPOP	-11.146757	2.664200	-4.183903(0.0003)
LED	-0.030419	0.651984	-0.046656(0.9631)
LEXR	-0.628593	0.568657	-1.105399(0.2787)
LIR	-0.525022	0.234175	-2.242003(0.0334)
LINF	-0.103379	0.087852	-1.176739(0.2496)
PINS	-0.080476	0.031116	-2.586315(0.0154)
ECM_{t-1}	-0.429658	0.103774	-4.140313(0.0003)

Table 4 presents the Vector Error-Correction Model (VECM) results for the Unemployment Rate model, utilizing the ARDL (AutoRegressive Distributed Lag) approach with the specification (1,1,1,1,1,0,0). The dependent variable in this model is LUNE (Unemployment Rate), and various regressors are included to explain its behavior. Each coefficient in the table represents the impact of the corresponding regressor on the unemployment rate in the VECM framework. The coefficient is -11.146757, indicating that a one-unit increase in population leads to a decrease of approximately 11.15 units in the unemployment rate. This suggests that population growth may exacerbate unemployment, as supported by its statistical significance at the 0.01 level. The coefficient is -0.030419, implying a negligible effect on unemployment, as indicated by its lack of statistical significance (p-value = 0.9631). This suggests that changes in the labor force

participation rate may not have a significant impact on unemployment levels in the VECM framework. The coefficient is -0.628593, indicating that a one-unit increase in the exchange rate leads to a decrease of approximately 0.63 units in the unemployment rate. However, this coefficient is not statistically significant (p-value = 0.2787), suggesting caution in interpreting its effect on unemployment. The coefficient is -0.525022, suggesting that a one-unit increase in the interest rate leads to a decrease of approximately 0.53 units in the unemployment rate. This coefficient is statistically significant at the 0.05 level, implying that higher interest rates may mitigate unemployment. The coefficient is -0.103379, indicating that a one-unit increase in the inflation rate leads to a decrease of approximately 0.10 units in the unemployment rate. However, this coefficient is not statistically significant (p-value = 0.2496), suggesting caution in interpreting its effect on unemployment. The coefficient is -0.080476, suggesting that a one-unit increase in personal income results in a decrease of approximately 0.08 units in the unemployment rate. This coefficient is statistically significant at the 0.05 level, indicating that higher personal income may mitigate unemployment. The coefficient is -0.429658, indicating the speed of adjustment towards the long-run equilibrium in the VECM framework. A larger absolute value suggests a faster adjustment process. In this case, the coefficient is statistically significant at the 0.01 level, suggesting a significant role in correcting deviations from the long-run equilibrium.

Table 5 presents the estimated long-run coefficients of the Inflation Rate model, derived using the ARDL (AutoRegressive Distributed Lag) approach with the specification (1, 0, 0, 0, 1, 1, 0). The dependent variable in this model is LINF (Inflation Rate), while several regressors are included to explain its behavior. Each coefficient in the table represents the impact of the corresponding regressor on the inflation rate in the long run. The coefficient is -0.629382, indicating that a one-unit increase in the interest rate leads to a decrease of approximately 0.63 units in the inflation rate in the long run. However, this coefficient is not statistically significant (p-value = 0.2839), suggesting caution in interpreting its effect on inflation. The coefficient is -0.930346, suggesting that a one-unit increase in the exchange rate leads to a decrease of approximately 0.93 units in the inflation rate in the long run. This coefficient is statistically significant at the 0.05 level (p-value = 0.0411), indicating that changes in the exchange rate may influence inflation. The coefficient is 0.240524, implying that a one-unit increase in the unemployment rate results in an increase of approximately 0.24 units in the inflation rate in the long run. However, this coefficient is not statistically significant (p-value = 0.2686), suggesting caution in interpreting its effect on inflation. The coefficient is -0.223580, indicating that a one-unit increase in import prices leads to a decrease of approximately 0.22 units in the inflation rate in the long run. However, this coefficient is not statistically significant (p-value = 0.8284), suggesting caution in interpreting its effect on inflation. The coefficient is 5.219113, suggesting that a one-unit increase in the money supply leads to an increase of approximately 5.22 units in the inflation rate in the long run. This coefficient is statistically significant at the 0.05 level (p-value = 0.0155), indicating that changes in the money supply may affect inflation. The coefficient is -0.341809, indicating that a one-unit increase in personal income results in a decrease of approximately 0.34 units in the inflation rate in the long run. This coefficient is statistically significant at the 0.01 level (p-value = 0.0015), suggesting that changes in personal income may influence inflation. The coefficient is -5.281586, representing the intercept term in the model. It indicates the expected value of the inflation rate when all regressors are zero. This coefficient is statistically significant at the 0.05 level (p-value = 0.0118). These coefficients provide insights into the relationships between various economic factors and the inflation rate in the long run, aiding policymakers in understanding the dynamics affecting inflation over time.

Table 5: Estimated Long Run Coefficient of Inflation Rate Model

ARDL (1, 0, 0, 0, 1, 1, 0) Dependent variable LINF			
Regressor	Co-efficients	Standard-Error	T-Ratio (Prob)
LIR	-0.629382	0.576464	-1.091799(0.2839)
LEXR	-0.930346	0.435206	-2.137714(0.0411)
LUNE	0.240524	0.213256	1.127868(0.2686)
LIMP	-0.223580	1.021943	-0.218780(0.8284)
LM2	5.219113	2.029456	2.571681(0.0155)
PINS	-0.341809	0.097823	-3.494155(0.0015)
C	-5.281586	1.966181	-2.686216(0.0118)

Table 6: Vector Error-Correction Model (VECM) of Inflation Rate Model

ARDL (1, 0, 0, 0, 1, 1, 0) Dependent variable LINF			
Regressor	Co-efficients	Standard-Error	T-Ratio (Prob)
LIR	-0.407384	0.347471	-1.172425(0.2506)
LEXR	-0.602191	0.231637	-2.599722(0.0145)
LUNE	0.155686	0.124138	1.254129(0.2198)
LIMP	1.014281	0.553079	1.833880(0.0770)
LM2	-0.732879	0.802552	-0.913186(0.3687)
PINS	-0.221244	0.073029	-3.029558(0.0051)
ECM_{t-1}	-0.647276	0.143786	-4.501660(0.0001)

Table 6 presents the results of the Vector Error-Correction Model (VECM) for the Inflation Rate Model, estimated using the ARDL (AutoRegressive Distributed Lag) approach with the specification (1, 0, 0, 0, 1, 1, 0). In this model, the dependent variable is LINF (Inflation Rate), and various regressors are included to capture the dynamic relationships

between these variables. The coefficients in the table represent the impact of each regressor on the inflation rate, considering both short-term dynamics captured by the error-correction term (ECMt-1) and long-term relationships. Interpreting the coefficients reveals valuable insights into the relationships between the variables. For instance, the coefficient for Interest Rate (LIR) is -0.407384, suggesting that an increase in the interest rate leads to a decrease in the inflation rate in the long run. However, this effect is not statistically significant (p-value = 0.2506), indicating uncertainty regarding the interest rate's impact on inflation. Similarly, the coefficient for Exchange Rate (LEXR) is -0.602191, indicating that an increase in the exchange rate results in a decrease in the inflation rate in the long run. This effect is statistically significant at the 0.05 level (p-value = 0.0145), suggesting that changes in the exchange rate may influence inflation. On the other hand, the coefficient for Unemployment Rate (LUNE) is 0.155686, implying that an increase in the unemployment rate leads to an increase in the inflation rate in the long run. However, this effect is not statistically significant (p-value = 0.2198), indicating caution in interpreting its impact on inflation. The coefficient for Import Prices (LIMP) is 1.014281, suggesting that an increase in import prices leads to an increase in the inflation rate in the long run. Although marginally significant (p-value = 0.0770), caution is warranted in interpreting its effect on inflation. Furthermore, the coefficient for the Error-Correction Term (ECMt-1) is -0.647276, indicating the speed of adjustment towards the long-run equilibrium. This coefficient is statistically significant at the 0.001 level (p-value = 0.0001), suggesting the presence of cointegration among the variables and the existence of a long-term relationship. These findings provide policymakers and economists with valuable insights into the factors influencing inflation and the dynamics of the inflation rate model. They can help inform policy decisions aimed at stabilizing inflation and promoting economic growth.

Table 7: Estimated Long Run Coefficient of Interest Rate Model

ARDL (1, 1, 2, 0, 0, 1) Dependent variable LIR			
Regressor	Co-efficients	Standard-Error	T-Ratio (Prob)
LDCP	0.751671	0.332114	2.263294(0.0319)
LUNEM	0.142535	0.086062	1.656195(0.1093)
LINF	0.183956	0.080672	2.280289(0.0307)
LEXR	-0.211884	0.121490	-1.744039(0.0925)
PINS	-0.185062	0.040986	-4.515254(0.0001)
C	0.229690	0.511036	0.449460(0.6567)

Table 7 presents the estimated long-run coefficients of the Interest Rate Model, derived using the ARDL (AutoRegressive Distributed Lag) approach with the specification (1, 1, 2, 0, 0, 1). The dependent variable in this model is LIR (Interest Rate), while various regressors are included to capture their long-term relationships. Interpreting the coefficients provides insights into the effects of each regressor on the interest rate. For instance, the coefficient for Domestic Credit to the Private Sector (LDCP) is 0.751671. This suggests that an increase in domestic credit to the private sector leads to a rise in the interest rate in the long run. This effect is statistically significant at the 0.05 level (p-value = 0.0319), indicating that changes in domestic credit levels may influence interest rates. Similarly, the coefficient for Unemployment Rate (LUNEM) is 0.142535, implying that an increase in the unemployment rate is associated with a higher interest rate in the long run. Although this effect is not statistically significant (p-value = 0.1093), it suggests a potential relationship between unemployment and interest rates. The coefficient for Inflation Rate (LINF) is 0.183956, indicating that higher inflation rates are associated with higher interest rates in the long run. This effect is statistically significant at the 0.05 level (p-value = 0.0307), suggesting that inflation dynamics play a role in shaping interest rate movements. On the other hand, the coefficient for Exchange Rate (LEXR) is -0.211884, suggesting that an increase in the exchange rate leads to a decrease in the interest rate in the long run. However, this effect is not statistically significant (p-value = 0.0925), indicating uncertainty regarding the relationship between exchange rates and interest rates. Furthermore, the coefficient for Producer Price Index (PINS) is -0.185062, indicating that higher producer prices are associated with lower interest rates in the long run. This effect is statistically significant at the 0.001 level (p-value = 0.0001), suggesting an inverse relationship between producer prices and interest rates. These findings provide valuable insights into the determinants of interest rates and their long-term relationships with various economic variables. They can inform policymakers and economists in formulating monetary policies aimed at achieving price stability and economic growth.

Table 8: Vector Error-Correction Model (VECM) of Interest Rate Model

ARDL (1, 1, 2, 0, 0, 1) Dependent variable LIR			
Regressor	Co-efficients	Standard-Error	T-Ratio (Prob)
LDCP	0.037736	0.239819	0.157353(0.8761)
LUNE	-0.158292	0.097751	-1.619349(0.1170)
LUNE(-1)	-0.356819	0.103590	-3.444525(0.0019)
LINF	0.097808	0.043113	2.268650(0.0315)
LEXR	-0.112657	0.061954	-1.818394(0.0801)
PINS	-0.049878	0.026460	-1.885068(0.0702)
ECM_{t-1}	-0.531693	0.094262	-5.640600(0.0000)

Table 8 displays the Vector Error-Correction Model (VECM) results for the Interest Rate Model, based on the ARDL (AutoRegressive Distributed Lag) approach with the specification (1, 1, 2, 0, 0, 1). In this model, the dependent variable

considered is LIR (Interest Rate), while several regressors are included to capture their relationships with the interest rate in both the short and long run. Analyzing the coefficients provides insights into the dynamics of the interest rate and its adjustment process. For instance, the coefficient for Domestic Credit to the Private Sector (LDCP) is 0.037736. This suggests that changes in domestic credit levels have a minimal impact on the interest rate in the short and long run, as indicated by the non-significant t-ratio (p-value = 0.8761). The coefficient for Unemployment Rate (LUNE) is -0.158292, indicating that changes in unemployment levels may lead to a decrease in the interest rate in the short run. However, this effect is not statistically significant (p-value = 0.1170), suggesting uncertainty regarding the relationship between unemployment and interest rates. Furthermore, the lagged variable of Unemployment Rate (LUNE(-1)) has a coefficient of -0.356819, indicating that changes in unemployment levels in the previous period have a significant negative impact on the interest rate in the current period. This effect is statistically significant at the 0.05 level (p-value = 0.0019), suggesting that past unemployment dynamics influence present interest rate movements. The coefficient for Inflation Rate (LINF) is 0.097808, suggesting that higher inflation rates are associated with higher interest rates in the short and long run. This effect is statistically significant at the 0.05 level (p-value = 0.0315), indicating the importance of inflation dynamics in shaping interest rate movements. Similarly, the coefficient for Exchange Rate (LEXR) is -0.112657, suggesting that changes in the exchange rate may lead to a decrease in the interest rate in the short run. However, this effect is not statistically significant (p-value = 0.0801), indicating uncertainty regarding the relationship between exchange rates and interest rates. Lastly, the coefficient for Producer Price Index (PINS) is -0.049878, suggesting that higher producer prices are associated with lower interest rates in the short run. Although this effect is not statistically significant (p-value = 0.0702), it provides insights into the potential relationship between producer prices and interest rates. These findings highlight the complex dynamics of interest rate determination and the role of various economic factors in influencing interest rate movements.

5. CONCLUSIONS

The findings of this study shed light on the intricate relationship between key macroeconomic indicators in the context of Pakistan. Population growth, exchange rate, and political instability are identified as significant determinants of the unemployment rate. Specifically, population growth and exchange rate exert a negative impact on unemployment, implying that higher population growth and a favorable exchange rate environment are associated with lower unemployment rates. Conversely, political instability is found to have a negative effect on unemployment, indicating that periods of instability in the political landscape may contribute to higher unemployment levels. External debt, on the other hand, is positively associated with unemployment, suggesting that higher levels of external debt may exacerbate unemployment challenges. Interestingly, interest rate and inflation rate do not exhibit significant impacts on the unemployment rate, implying that changes in these variables may not directly influence unemployment levels in the Pakistani economy. Exchange rate and political instability emerge as significant determinants of the inflation rate. Exchange rate fluctuations and periods of political instability are found to have an inverse relationship with inflation, indicating that a stable exchange rate and political environment may contribute to lower inflation levels. Broad money supply is identified as a direct and significant contributor to inflation, suggesting that increases in the money supply lead to higher inflation rates. Additionally, imports and interest rates are found to have negative but insignificant effects on inflation, implying that changes in these variables may not have a substantial impact on inflation dynamics in Pakistan. Domestic credit to the private sector and inflation rate are identified as significant determinants of the interest rate. An increase in domestic credit to the private sector leads to higher interest rates, indicating a positive relationship between credit availability and borrowing costs. Similarly, inflation rate exerts a positive and significant impact on interest rates, suggesting that higher inflation levels are associated with higher nominal interest rates. Conversely, political instability and exchange rate fluctuations are found to have negative and significant effects on interest rates, implying that a stable political environment and exchange rate may contribute to lower interest rates. Interestingly, the unemployment rate does not exhibit a significant impact on interest rates, indicating that changes in unemployment levels may not directly influence borrowing costs in the Pakistani economy. These results provide valuable insights into the complex dynamics of unemployment, inflation, and interest rates in Pakistan, highlighting the importance of considering various economic and political factors in understanding macroeconomic outcomes. The findings may have important implications for policymakers seeking to formulate effective strategies for promoting economic stability and growth in Pakistan.

The findings of this study highlight the significance of the Error Correction Model (ECM) in understanding the dynamics of the short-run and long-run equilibrium relationships among key macroeconomic variables in Pakistan. The negative and significant value of the ECM in all models indicates the speed of adjustment from the short-run to the long-run equilibrium. Specifically, the estimated ECM suggests that it takes approximately two and a half years for the unemployment rate, one and a half years for the inflation rate, and two years for the interest rate to converge to their long-run equilibrium levels. Interestingly, the study reveals that the unemployment rate and inflation rate do not have a significant impact on each other. However, the interest rate affects the unemployment rate in the short run. Moreover, the interest rate is significantly influenced by both the inflation rate and the unemployment rate in the short run, while only the inflation rate exhibits a significant long-run relationship with the interest rate. Based on these findings, the study suggests several policy implications for the government of Pakistan. To reduce the unemployment rate, policymakers should focus on controlling population growth, external debt, and exchange rate fluctuations. Inflation rate can be managed by implementing measures to control the exchange rate, imports of goods and services, and the supply of money. Additionally, effective control over domestic credit to the private sector, inflation, and exchange rate can influence the interest rate. The study also reveals that periods of dictatorship in Pakistan have been associated with decreases in the

interest rate, unemployment rate, and inflation rate. This may be attributed to a perceived sense of stability and security under authoritarian regimes. Overall, addressing these factors may contribute to enhancing macroeconomic stability in the Pakistani economy.

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