Macroeconomic Dynamics of Inflation: Assessing the Roles of Economic Growth, FDI, and External Debt in Pakistan

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Abstract

This study explores the intricate dynamics between inflation and key macroeconomic variables, specifically economic growth, foreign direct investment (FDI), and external debt, in the context of Pakistan. Utilizing time-series data from 1990 to 2022, the research employs econometric models to evaluate the short-term and long-term impacts of these variables on inflation. The findings reveal a complex relationship wherein FDI and external has positive and significant effects on inflationary pressures, while economic growth and population has negative impact on inflation both in short and long run. This research offers empirical insights into these linkages, enhancing the knowledge of inflation's macroeconomic determinants in developing economies such as Pakistan. The findings hold significant consequences for governments seeking to reconcile growth, entice international investment, and regulate external debt while avoiding inflationary pressures. Discussions revolve around recommendations for sustainable macroeconomic policy, emphasizing the attainment of price stability and the promotion of economic progress.

Keywords: Foreign Direct, Investment, External Debt, Inflation and ARDL

Introduction

Consumption is the most significant and consistent factor among the four components of the GDP method based on spending. In almost every global economy, a significant amount of production is consumed by home residents. Economists and policymakers focus on the drivers

of consumption to utilize them in policy instruments to stimulate the economy during a recession and shorten it amid inflation (Kumar et al., 2019). Inflation is the rise in the overall price level of goods and services within an economy over a specific period. Inflation is caused by an imbalance between demand and supply in the economy. Globalization and industrialization of markets have led to inflationary pressure caused by both domestic and global sources. Rising inflationary pressures in recent years have been exacerbated by the Russia-Ukraine war, interruptions in the global supply chain, congested ports, logistical challenges, and high demand for goods (GOP, 2023).

Inflation is typically linked to an increase in the money supply. Pakistan experience is similar to that of other countries. The increase in the overall price level can be correlated with the expansion of the money supply. The primary source of inflation is linked to the increase in money supply, although changes in monetary policy also reflect the conditions of other economic sectors. In Pakistan, it is often believed that budgetary imbalances may have significantly contributed to price fluctuations (Agha and Khan, 2006). Severe inflation is the most critical issue facing society. As prices increase, clients require more money for everyday transactions, leading them to carry more cash due to currency devaluation. Inflation hinders saving and encourages spending. Inflation's social impact surpasses its economic impact due to the devaluation of money. The current inflationary environment is leading to a reduction in deposit growth and savings. Pakistan has a lower tolerance for double-digit inflation because of its limited inflation experience. Sustaining high double-digit inflation for three years is not feasible. The government is managing the budget deficit by implementing fiscal and monetary policies, enhancing agricultural production, promoting investment for increased output, and constantly monitoring the market to maintain appropriate consumer goods prices. Lower inflation to an acceptable rate (Bashir et al., 2011).

Developing nations commonly face the problem of having an excessive amount of external debt in their fiscal sectors. Nations with low national saving rates often resort to borrowing loans to finance economic growth, resulting in a need to seek foreign funding. Pakistan is one of the developing countries having a substantial amount of debt. Pakistan is categorized as a highly indebted nation (HIN) according to World Bank figures from 2000-2001, attributed to its significant current and future debt situation (Ali & Mustafa, 2012). Gross external debt represents current financial commitments owed to non-residents of the economy, excluding any future liabilities that may need interest payments (World Bank, 2015).

External debt significantly impacts economic development. Since 1980, external debt has been a significant concern in Pakistan, a developing country. The IMF, World Bank, USA, China, and other Western and Arab countries are the primary sources of loans in Pakistan. The debt for the fiscal year 2021-2022 amounted to PKR 44,336 billion, which is equivalent to 71.3% of the Gross Domestic Product (GDP). Pakistan is ranked 59th on the list of countries with high levels of debt, placing it as the 5th most populous nation with substantial foreign debt challenges. The increasing debt post-independence is a result of substantial borrowing, extensive imports, devaluation of currency, and elevated interest rates on loans. Pakistan has accumulated a significant debt volume due to trade and investment shortages, leading to borrowing from internal and external sources because of insufficient internal resources (Awan and Qasim 2020; Reinhart and Rogoff 2011).

Foreign Direct Investment (FDI) has achieved a historical milestone during the previous three decades and has become a crucial feature in the developing countries. Several developing nations are increasingly successful in obtaining significant and growing levels of foreign direct investment (FDI). Policy makers in both rich and developing nations focus on achieving high sustained economic development with low inflation as a method for reducing poverty (Khan and Senhadji, 2001). Although the current literature offers excellent insights into each element separately, there is still a significant gap in understanding how foreign debt, economic growth, foreign direct investment and population have combined impact on inflation. This research intends to address this gap by using thorough empirical analysis to reveal the subtle dynamics and recognize patterns in various economic settings. This research is important because it has the potential to provide evidence-based insights for politicians, economists, and investors. The findings can help make more sophisticated and efficient policy decisions for sustainable economic development by understanding the complex connections among foreign debt, economic growth, FDI, and inflation. The next sections employed the econometric methodologyy and analysed the empirical data. After that based on the findings of the study the results are exhibited and concluded.

Research Methodology

The research primarily investigated the effects of economic development, foreign direct investment, external debt, and population on inflation in Pakistan from 1990 to 2022. Table 1 presents the data sources and a comprehensive delineation of the variables employed in the econometric analysis. The information regarding external debt was sourced from the State

Bank of Pakistan (SBP, 2023). The remaining variable data were sourced from the World Development Indicators (WDI) (World Bank, 2023). The GDP per capita is calculated in constant 2015 US dollars. The external debt is denominated in US dollars. The inflation is measured as the annual percentage change in consumer prices.

Table 1 Specification of the Variables and Data Sources

Code	Variables	Units	Source
INF	Inflation	Consumer prices (Annual %)	WDI
ECG	Economic Growth	GDP per capita 2015 constant US$	WDI
FDI	Foreign direct investment	Net inflows (% of GDP)	WDI
EXD	External debt	US$	SBP
POP	Population	Total numbers of Peoples	WDI

Source: Author (s) computation

Confirming the data's stationarity was the initial stage in our analysis. Time series data frequently exhibits patterns or non-stationary characteristics. Non-stationary data can lead to erroneous regression when using classic ordinary least squares (OLS) methods, resulting in false positives, as described by Granger and Newbold in 1974. Thus, verifying the data for stationarity is essential. A unit root test was employed for this objective. A time series dataset is considered stable if its mean, variance, and covariance remain constant during data processing. Each series was assessed for the presence of a unit root, which signifies non-stationarity, by the Augmented Dickey-Fuller (ADF) test and the Phillips-Perron (PP) test. Two well-established methodologies for rigorously examining stationarity are the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests.

We applied the ARDL model (bounds testing technique) developed by Pesaran et al. (2001) following an evaluation of the time series data for stationarity issues. This model aims to analyse the relationships between the independent and dependent variables separately in both short and long periods. When estimating the ARDL model, the properties of series integration are essential. The optimal scenario is for the series to be integrated at either I(0) or I(1), or co-integrated at both levels. Series labelled as I(2), indicating a second or higher order of difference, are not suitable for the ARDL model. The information provided below demonstrates the cause-and-effect connection between the inflation and its constituent independent factors.

$$INF = f(ECG, FDI, EXD, POP) \qquad (1)$$

We performed many diagnostic tests to assess the robustness of the ARDL model. Ensuring the precise specification of the model's functional form is essential. We used the Ramsey Reset test (1969) to assess the adequacy of the model formulation. The data distribution's normality was

evaluated using the Jarque-Bera (JB) test, developed by Jarque and Bera in 1987. The ARDL model outputs were tested for heteroskedasticity and serial correlation using the ARCH test by Engle in 1982 and the Breusch-Godfrey Serial Correlation LM test in 1978. We used the cumulative sum (CUSUM) of recursive residuals and the cumulative sum of squares (CUSUMSQ) of recursive residuals tests, recommended by Brown et al. (1975), to evaluate the stability of the ARDL model's parameters over short and long periods. If the CUSUM and CUSUMSQ graphs do not show a statistically significant difference, the null hypothesis suggests a stable parameter.

Results and Discussions

Table 2 displays statistical summary measures and relationships for variables such as economic growth, foreign direct investment, external debt, population, and inflation in Pakistan. The data spans from 1990 to 2022. The statistical summary for each variable is included in the top section of Table 2. Descriptive statistics are essential for determining the basic traits of the data. Skewness quantifies the concentration of data points relative to the mean. The inflation and foreign debt show a negative skewness, suggesting a preference for lower values. Kurtosis measures how much a distribution differs from a normal distribution by assessing the thickness or weight of its tails. High kurtosis in external debt suggests the existence of heavy tails. The Jarque-Bera test evaluates the normality of the data, confirming that all variables in the dataset follow a normal distribution. The lower section of Table 2 displays a statistical summary with metrics that quantify the degree of simultaneous changes between two variables. The coefficients offer insights into the connections between pairs of variables, aiding in quantifying the extent of their relationship. Inflation, the dependent variable, shows a strong positive correlation with all variables except foreign debt.

Table 2. Statistical Summary and Correlation Analysis

	LnINF	LnECG	LnFDI	LnEXD	LnPOP
Mean	0.84	3.12	-0.11	10.51	8.28
Median	0.88	3.11	-0.15	10.76	8.29
Maximum	1.30	3.22	0.48	11.11	8.37
Minimum	0.40	3.01	-0.50	5.10	8.17
Std. Dev.	0.25	0.06	0.27	1.16	0.05
Skewness	-0.03	0.01	0.79	-4.38	-0.28
Kurtosis	2.04	1.91	2.96	20.90	1.91
Jarque-Bera	0.91	1.17	2.55	397.80	1.49

Probability	0.63	0.55	0.27	0.00	0.47
Sum	20.28	74.88	-2.75	252.38	198.83
Sum Sq. Dev.	1.54	0.10	1.73	31.42	0.07
Observations	24	24	24	24	24
Correlations					
LnINF	1.00	0.38	0.30	-0.33	0.38
LnECG	0.38	1.00	-0.10	-0.20	0.97
LnFDI	0.30	-0.10	1.00	0.22	-0.17
LnEXD	-0.33	-0.20	0.22	1.00	-0.17
LnPOP	0.38	0.97	-0.17	-0.17	1.00

Source: Author (s) computation

Empirical studies need stationary variables to avoid generating inaccurate outcomes. ADF and PP are utilized for each of the five variables in this experiment. Despite a tiny test statistic, the null hypothesis of the unit root cannot be rejected in these tests. Table 3 displays the findings of the study. Our sample group consists of I(1) series, as indicated in Table 3. The results of the ADF and PP tests confirmed that all the series in the study encompassing of economic growth, foreign direct investment, external debt, population, and inflation are stationary at I(1). At the second order difference, denoted as I (2), none of the variables exhibit stationarity.

Table 3 Results of the Unit Root Tests

	ADF			PP		
Variables	Intercept	Difference	Integration	Intercept	Difference	Integration
LnINF	-1.59(0.46)	-4.87(0.00) *	I(1)	-1.59(0.46)	-4.87(0.00) *	I(1)
LnECG						
LnFDI						
LnEXD	-1.46(0.81)	0.27(0.00) *	I(1)	-2.01(0.27)	-2.7(0.04) **	I(1)
LnPOP						

Source: Author (s) computation

This study analysed the long-term relationship and short-term dynamics that emerge following the formation of co-integration using the ARDL model. The outcome is displayed in Table 4. The coefficient of economic growth has a negative sign, with a value of –4.32. The insignificance of the coefficient value indicates the negative short-run cointegration with inflation. This indicates that a 1% increase in economic growth diminishes inflation by 4.32% in Pakistan. Consequently, the coefficient of foreign direct investment exhibited a significant positive correlation with inflation at a 1% level of significance. It suggests that an increase of 1% in foreign direct investment will result in an inflationary pressure of 0.82%. Therefore, foreign direct investment in Pakistan constitutes a substantial contributor to inflation. There exists a negative short-term correlation between the population and external debt coefficients and inflation in the context of Pakistan. The coefficients of the cointegrating form of the

equation shows the speed of adjustment. This result represents the rate at which a system adjusts back to its long-term equilibrium following a deviation.

Additionally, the ARDL model's long-run outcomes exhibit that economic growth and inflation are negatively correlated. This suggests that a 1% increase in economic growth is associated with a decrease of 7.40% in the inflation variable in the long run. Moreover, the result of the foreign direct investment has positive impact on inflation in the long-run. A 1% increase in foreign direct investment is associated with an increase of 1.40% in the inflation variable in the long run. Moreover, the result of the external debt has positive impact on inflation in the long-run. A 1% increase in foreign direct investment is associated with an increase of 4.99% in the inflation variable in the long run. The coefficient of the population has negative impact on inflation in the ARDL model's long-run. The outcomes exhibit that population and inflation are negatively linked. This suggests that a 1% increase in population is associated with a decrease of 6.04% in the inflation variable in the long run. The best ARDL model was choose using the Akaike information criteria (1,0,0,1,0) Figure 1.

Table 4 Results of the ARDL Model

| Cointegrating Form				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLnECG	-4.32	3.42	-1.26	0.22
DLnFDI	0.82	0.25	3.29	0.00***
DLnEXD	-0.06	0.03	-2.03	0.06**
DLnPOP	-3.53	3.40	-1.04	0.31
Cointegrating Eq (-1)	-0.58	0.18	-3.28	0.00***
Long-Run Coefficients				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LnECG	-7.40	4.81	-1.54	0.14
LnFDI	1.40	0.39	3.63	0.00***
LnEXD	4.99	1.80	2.77	0.01**
LnPOP	-6.04	6.71	-0.90	0.38
C	20.56	35.87	0.57	0.57

Source: Author (s) computation
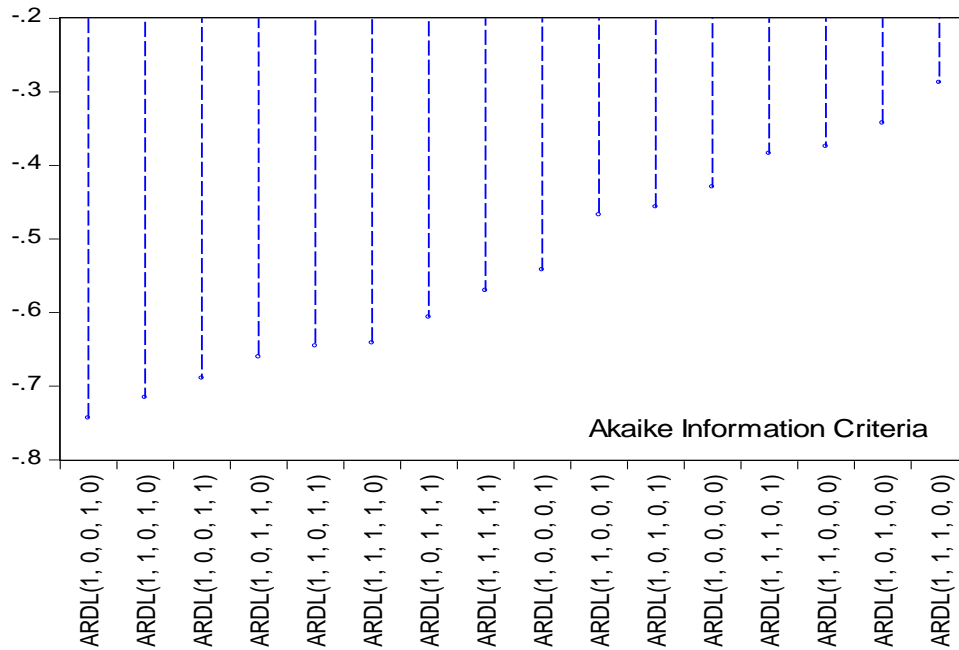
Figure 1. ARDL model selection

Table 5 displays the F-statistic result for the bound test along with its corresponding critical values. This method was developed by Pesaran et al. (2001) and the value was provided for the ARDL model with a restricted intercept and no trend. At a 5% significance level where K=4, the F-statistic is 4.29, above the upper critical bounds. The result concluded that alternative hypothesis of co-integration is accepted above the null hypothesis of no co-integration.

Table 5 Bounds Test for Co-Integration Analysis

Critical value	Lower Bound value I(0)	Upper Bound value I(1)
10%	2.45	3.52
5%	2.86	4.01
1%	3.74	5.06
F-statistic = 4.29, K= 4		

Source: Author (s) computation

We performed six residual diagnostic tests to evaluate the reliability and stability of the ARDL model. The findings of the diagnostic test are presented in Table 6. The Autoregressive Conditional Heteroskedasticity (ARCH) model was proposed by Engle in 1982. The Breusch-Godfrey test is employed to identify serial correlation. The examinations performed by Breusch (1978) and Godfrey (1978) demonstrate that the results of the ARDL model are unaffected by

heteroscedasticity and serial correlation, since the p-values exceed 0.05. The null hypotheses of homoscedasticity and absence of serial correlation are upheld in this instance. The Ramsey RESET test, performed by Ramsey in 1969, demonstrated that the model was accurately specified, as the test's p-value surpassed 0.05. The Jarque-Bera test (1987) was employed to assess if the residuals have a normal distribution. The null hypothesis of normal distribution was accepted because the p-value above 0.05. Figures 2 and 3 illustrate the CUSUM and CUSUMSQ tests for parameter stability. The straight line represents the critical threshold at a 5% significance level. The null hypothesis of stable parameters is accepted over the alternative hypothesis of unstable parameters since the CUSUM and CUSUMSQ statistic plots are beneath the 5% significance level. The short-term and long-term parameters of the ARDL model are verified to be stable and consistent.

Table 6 Results of Diagnostic Tests

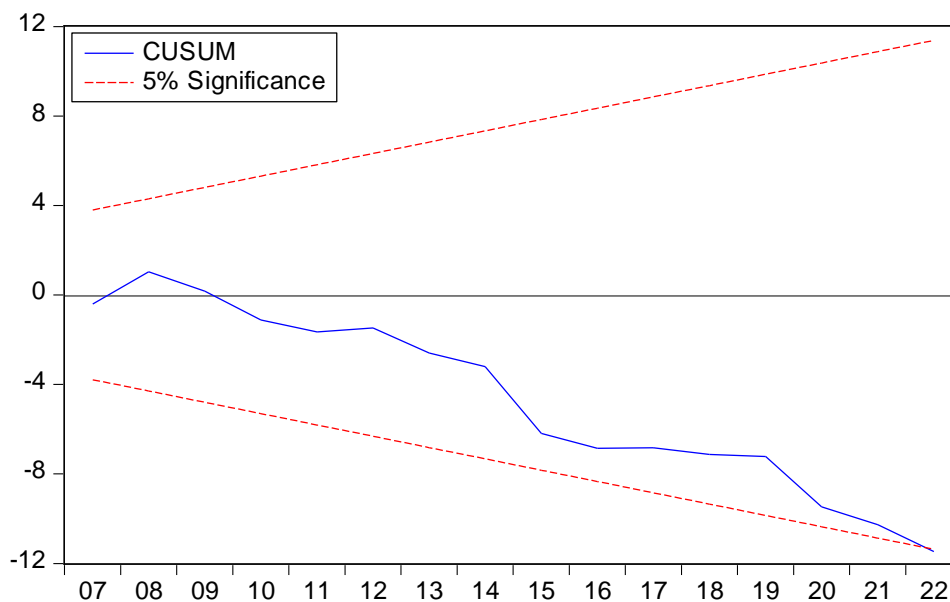| Test type				
ARCH Test	χ^2-statistic	Value (1.28)	df(1)	P-value (0.27)
Ramsey RESET Test	F-statistic	Value (1.31)	df (1,15)	P-value(0.26)
Breusch–Godfrey Serial Correlation LM Test	χ^2-statistic	Value (2.75)	df(2)	P-value(0.31)
Jarque–Bera Test	F-statistic	Value (0.22)		P-value(0.89)

Source: Author (s) computation

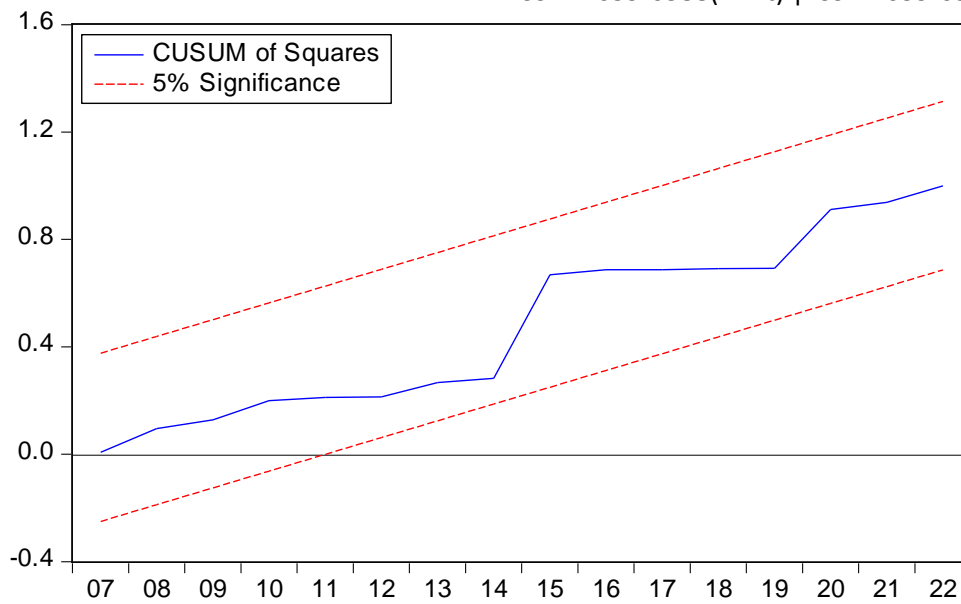**Figure 2.** CUSUM at 5% Significance level

Figure 3. CUSUM of Squares at 5% Significance level

Conclusions

The research offers significant insights into the macroeconomic dynamics of inflation in Pakistan, emphasizing the influences of economic growth, foreign direct investment (FDI), and external debt. The empirical study demonstrates that foreign direct investment and external debt positively influence inflation. Nonetheless, economic expansion and population increase adversely affect inflation in Pakistan. Economic expansion induces short-term inflation through heightened demand-side pressures, while its long-term effects are more equilibrated as productivity enhancements stabilize prices. Foreign Direct Investment (FDI), although typically advantageous for economic advancement, may induce inflation if not directed efficiently towards productive areas, especially when it results in increased consumption rather than investment in infrastructure or industrial capacity.

External debt is a significant factor, as elevated debt servicing and budget imbalances exert pressure on monetary policy, resulting in inflationary surges. The paper emphasizes that unregulated external borrowing might expose price stabilization attempts, especially in a fluctuating economic scene. The data indicate that controlling inflation in Pakistan necessitates a balanced macroeconomic approach. Policymakers should strive to promote sustainable economic growth, attract high-quality foreign direct investment that improves productive capacity, and manage external debt judiciously to prevent fiscal imbalances. The research emphasizes the necessity of incorporating inflation management into comprehensive

macroeconomic strategies that address growth, investment, and debt sustainability. A holistic strategy for economic management is crucial for sustaining price stability and attaining long-term economic advancement in Pakistan.

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