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Does Monetary Policy Influence Economic Growth In Pakistan

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Abstract

The purpose of this analysis is to evaluate the growth-oriented monetary policy components of Pakistan from 1980 to 2021. This investigation implements secondary sources of data. The paper utilized the autoregressive distributed lag (ARDL) model as an analytical technique to assess the short- and long-term dynamics between Pakistan's monetary policy indicators and economic growth. While exchange rates have a growth-oriented effect, broad money (M3) impedes economic expansion, as indicated by our regression analyses. The investigation also looked into the significant and detrimental effects of interest rates. The control variable, trade openness, has a substantial and adverse impact on development, while inflation has a positive impact. The analysis concludes that the government must regulate the broad money, interest rate exchange rate, and liquidity ratio as part of its monetary policy in order to promote national growth. Policymakers should take into account the reciprocal relationship and consequential impact between economic growth and the nominal interest rate.

Key Words: Monetary policy, Economic growth, ARDL, Pakistan

Jell Classification: E42,O40, C52

Introduction

Monetary policy regulates the quantity, cost, and distribution of credit and money in the economy. Monetary policy plays a crucial role in determining the allocation of resources among different sectors, thereby significantly impacting economic development. Monetary policy establishes the appropriate investment amount and location. It also assists people in deciding how much they wish to save and how much to spend at any given time by figuring out the cost of money. Many economists assert that inflation is a universal monetary phenomenon, resulting from excessive money expansion that surpasses a specific rate of economic growth. Therefore, monetary policy, along with fiscal policy, plays a crucial role in determining the direction that an economy can go (Mohseni and Cao, 2020).

Many nations, including Pakistan, maintain monetary policy outside their direct jurisdiction, with governments merely setting the fundamental guidelines and end goals of monetary policy. The market then determines the outcomes and consequences of these regulations and targets. But unlike many other nations, Pakistan has had far more government influence and control over monetary policy. The government has established strict sectoral credit targets and

predetermined interest rates, with little influence from the market until recently. In recent years, all of this has changed, and the government has started to let the market decide on a few important factors (Hanif, 2014).

Some economists believe that money and monetary policy are the main factors influencing economic activity. Until recently, the Pakistani government exercised strict control over monetary policy, leaving the market with minimal influence over the distribution and spending of money across the economy. Since 1991, the government has implemented a more market-based strategy, with the periodic auction of Treasury bills determining, if not entirely influencing, the rate of interest. By all measures, Pakistan's money market is still in its infancy, which some economists believe is one of the reasons the country's economy has not performed well. The money supply and its annual expansion are believed to be one of the main factors influencing the level of prices in the economy. Pakistan experiences inflation due to a variety of systemic factors, as well as the government's regular hikes in controlled pricing. Hanif and Arby (2003) note that economic growth is weakly correlated with money supply.

While it is necessary to provide for the SBP Act, 1956, to achieve domestic price stability through the regulation of Pakistan's credit and monetary systems, the Act's preamble also outlines these objectives: "Without compromising the aforementioned primary objective, the SBP will contribute to the stability of Pakistan's financial system and support the Federal Government's general economic policies to foster growth and fuller utilization of the nation's productive resources." SBP has maintained its strict monetary policy stance as a stability tool at the beginning of 2020. The country's external and fiscal accounts have been steadily improving; the real economy is rebounding; and business and consumer confidence is high as a result of coordinated monetary and fiscal policies. The unprecedented shock of COVID-19 necessitated an unusual fiscal and monetary reaction. In order to do this, SBP lowered the policy rate from 13.26% to 7.01% over a brief three-month period. A series of targeted, short-term credit market interventions, such as refinance schemes, made this possible by providing much-needed cash flow relief to households and companies. In 2021, the SBP maintained its liberal monetary policy stance with a policy rate of 7.01%. The epidemic redirected the goal of monetary policy to promote employment and growth. Consequently, a monetary policy environment that was accommodating and focused on fiscal action to mitigate the effects of COVID-19 caused the economy to expand in 2021. In line with the rebound in economic activity and the availability of SBP concessionary refinancing schemes, loans to the private sector showed a positive uptick. In contrast to the retirement of Rs 5.22 billion in the previous year, fixed investment loans climbed significantly by Rs 127.42 billion in 2021, indicating a promising outlook for sustained development in the upcoming years (SBP, 2023; Eng, 2024).

The escalation of government borrowing prices and capital outflows, which intensified pressure on the budget and balance of payments, confronts the economy of Pakistan with numerous challenges. In 2023, the policy rate climbed by 21.00 percent after the State Bank of Pakistan (SBP) proceeded to tighten monetary policy in response to ongoing inflationary pressures and imbalances in the external economy. In 2023, the broad money (M2) growth rate was 4.3%, compared to 2.9% in the same period the previous year. In comparison to the same period last year, when private sector credit was Rs 1,199.32 billion, it climbed by Rs 302.31 billion in 2023. The average growth this year has been 3.31%, while the previous year's growth was 15.72%. Slow domestic economic activities hindered the private sector's loan off take in 2023. Throughout the review period, there has been a decrease in loans for both fixed investments and working capital. As a result, working capital loans in 2023 were Rs 113.43 billion, up from Rs 608.72 billion in the same period last year. However, fixed investment loans, which are impacted by economic growth, have dropped to Rs 147.50 billion from Rs 333.11 billion the previous year (Need, 2023).

Given the importance of monetary policy in Pakistan, this article aims to quantify the effect of monetary policy on GDP growth in Pakistan, considering the relative importance of monetary policy indicators and control variables such as inflation and trade openness. The article advances this understanding in the following ways: The article aims to (1) investigate the previously unexplored causal link between monetary policy indicators and Pakistani economic growth, and (2) assess the significance of the interplay between broad money (M3), interest rates, exchange rates, and control variables such as inflation and trade openness.

In light of this, the goal of this study is to close the knowledge gap by offering fresh data on the relationship, both short- and long-term, between monetary policy and economic growth in Pakistan. Using annual data from 1980 to 2021 and an autoregressive distributed lag model, this study attempts to address the following research questions:

- How do macroeconomic factors influence Pakistan's long-term money growth?
- What is the short-term impact of changes in the money supply, interest rate, exchange rate, trade openness, and inflation on the country's economic growth?
- Based on the results, what policy recommendations could effectively control Pakistan's money growth?

Our study's main goals are to:

- Use the autoregressive distributed lag bounds testing method to examine the long-term link between macroeconomic variables and money growth in Pakistan.
- To use error correction modeling to investigate the short-run dynamics between the money supply, interest rates, exchange rate, trade openness, and inflation.
- To propose policy recommendations based on empirical findings to effectively manage money growth in Pakistan.

The article's structure is as follows: We present a review of the literature in section "Literature review," and then we discuss method and modeling approach in section "Modeling strategy." The "Results" section presents the results, followed by the conclusion and policy recommendations.

Literature Review

There are essentially two schools of thought when it comes to how monetary policy affects economic growth. These are the viewpoints held by monetarists and Keynesians. The Keynesian perspective, in contrast to the classical framework, rejects the direct correlation between the money supply and output. According to the Keynesian perspective, money affects income via the interest rate channel. According to Castelnuovo and Pellegrino (2018), Keynesian analysis looks at the symbiotic link between the monetary and real sectors of the economy. In contrast, the monetarist framework emphasizes the importance of money and the direct, supportive relationship between the monetary and real sectors in every economy, which boosts employment opportunities and accelerates economic growth (Nelson, 2003).

Several academics have debated throughout the years how much monetary policy influences economic growth. To understand how monetary policies affect economic growth, especially in Pakistan, it is crucial to examine some of these researchers'. Many studies have examined the relationship between monetary policy and economic growth (Weiss, 1980; Schreft and Smith, 1998; Hanif, 2014; Oanh, 2023; Mohseni and Cao, 2020; Sadeghi et al., 2023; Lee and Werner, 2018; Golpe et al., 2023; Bhattacharya et al., 2009; Idris, 2019; Ahiadorme, 2022; Adediran et al., 2017). However, due to the advantages monetary policy releases have on entire economic activities, studies focusing on the multifaceted impact of monetary policy remain of great interest (Sun et al. 2010; Pradhan et al. 2014; Suhaibu et al. 2017; Bolbol et al. 2005).

Applying the ARDL technique, Musaa and Idrisb (2024) examined the link between monetary policy and economic development in Nigeria using time series data spanning from 1990 to 2022. The study incorporates a variety of monetary policy instruments as variables, including broad money, interest rates, inflation rates, exchange rates, and real GDP growth as a gauge of economic expansion. The results of the empirical approach demonstrate a positive correlation between GDP growth and MS, INF, and EXR. Manogna and Desai (2024) investigated the supply-side impacts of monetary policy on total factor productivity, a stand-in for economic growth, using time series analysis. The ARDL results show that there is a long-term positive link but a short-term negative correlation between TFP and some monetary policy proxies. These results demonstrate the possibility of supply-side monetary policy transmission in India, which can help determine the most effective way to raise total factor productivity (TFP), a crucial component of economic growth. We apply the nonlinear local projection approach to achieve this. Shah and Kundu (2024) look at how monetary policy affects the economy unevenly. According to a study, there is a large asymmetry in the effects of monetary policy on the Indian economy. The main reasons for the asymmetric effects are the direction of the shock and the state of the economy. The effects of monetary policy on output are larger in expansions than recessions, and contractionary shocks have a smaller effect on inflation than expansionary shocks.

Golpe et al. (2023) use multivariate Granger Causality to determine an ultimate "causality path" that eliminates redundant interactions in order to evaluate the joint interdependencies of the ultimate causal flow between monetary policy indicators, fiscal sustainability, and economic growth. Results indicate that factors related to monetary policy are crucial for maintaining economic stability. Caraiani et al. (2023) used a PVAR model covering the monthly period 1973:02 to 2020:9 to analyze the impact of monetary policy shocks on the six bubble indicators in G7 countries. It was discovered that monetary policy both influences and reacts to the bubble indicators. Given the relationship between finance and growth, our findings have significant ramifications for the monetary authorities of these developed markets with regard to sustainable development. Using the PVAR approach, Oanh (2023) examines the relationship between financial stability, monetary policy, and financial inclusion in 58 countries between 2004 and 2020. The empirical study's findings indicate that while money growth and inflation are adversely correlated, financial inclusion and stability are positively correlated.

Ahiadorme (2022) examines the significance of monetary policy using instrumental variable estimation for a large sample of countries. According to a study, developing countries have better success with monetary policy than developed ones do. Ahiadorme (2022) investigated how 144 countries' monetary policies functioned between 2000 and 2018. The support from the sample of nations demonstrates that reduced income disparity and enhanced impoverished well-being are linked to stable growth and low inflation. Nonetheless, disinflation damages the poor and equitable, increases the cost of

unemployment, and deteriorates growth inclusivity in developed economies with far lower inflation rates. In any event, more equitable growth requires price and output stability. Therefore, there is no trade-off between the two goals of inclusive growth and economic stability.

Samargandi et al. 2020, using the GVAR model, examine the impact of the money supply and equity market on economic growth in the BRICS economies from 1989Q1 to 2012Q4. According to the study's conclusions, factors related to the money supply and equities market have little bearing on the economy's growth. Hirose et al. 2020, using a New Keynesian model, examine the impact of active monetary policy on U.S. macroeconomic stability following the 1970s Great Inflation. The model's conclusions indicated that inflation and other macro variables have a direct impact on the macroeconomic stability of the US economy. Nair and Anand (2020) investigated how other monetary policy variables, such as interest rates, can also contribute to financial stability in addition to price stability. Thus, standard Taylor rule and asset price-enhanced Tylor rule interest rates can be used to ensure financial stability, a key goal. The usefulness of monetary policy in a modified neo-classical framework for economic growth is examined by Mohseni and Cao (2020). By including the bond market in the two-asset model while varying the parameters, the study presents the e-asset model. Since fiscal policy has intervened, the author concludes that monetary policy has a limited role. In growth models, government intervention is crucial to the efficiency and dissemination of monetary policy. Mendonca and Nascimento (2020) used panel data analysis to examine how monetary policy inefficiencies and macroeconomic instability were affected by growing financial openness and economic globalization between 1990 and 2014. The results show that monetary policy effectiveness and macroeconomic stability can be enhanced by financial openness and economic globalization, respectively. Additionally, we see that countries that target inflation have advanced economies, are less vulnerable to political pressures, have not had an international financial crisis, and perform better in terms of macroeconomic stability and monetary policy effectiveness.

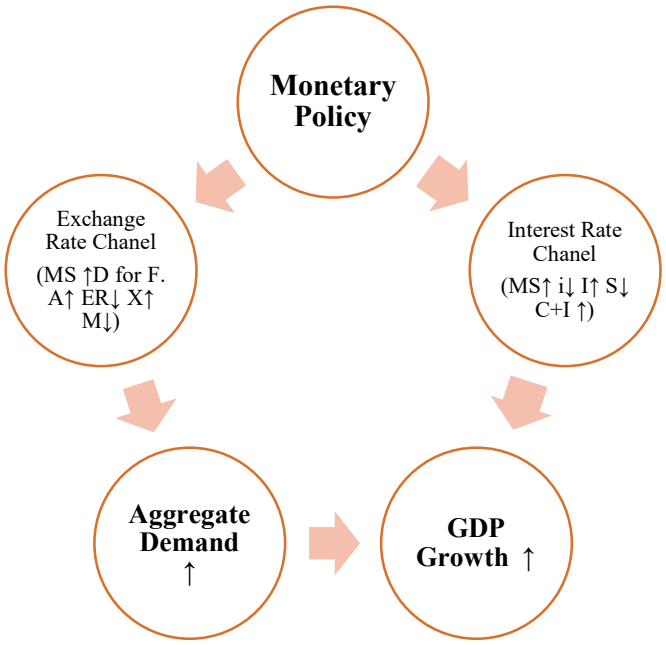
Wang (2018) uses a VAR technique to analyze the importance of monetary policy in the US and Japan. The study concludes that the inconsistent tail risk return distribution and spatial circumstances make monetary policy less applicable. Market capitalization and banking spread impacted GDP per capita in Latin American countries between 1994 and 2012, according to Ali-Bujari et al. (2017). According to the GMM model, market capitalization has a positive impact on GDP growth, whereas the banking spread has a negative impact. Moreover, Ma (2016) makes an effort to investigate the impact of monetary policy on China's economy and discovers that monetary policy had very little relevance in China.

Monetary policy and economic growth have been shown to have unidirectional and/or bidirectional impacts. In their 2014 study, Pradhan et al. investigate the tenuous relationship between the expansion of the stock market and the banking industry and the economic growth of ASEAN nations between 1961 and 2012. The uni- and bi-directional relationship between the variables under inquiry was investigated using the Granger Causality test. The relationship between the stock market and monetary policy for established and emerging nations is examined by Belkie and Beckmann (2014). They investigated causation between the chosen variables using the CVAR model, but their model did not make it clear which way causality ran. Conversely, Hanif (2014) used the VAR methodology to study the significance of monetary policy in Pakistan from 1951 to 2010. According to this research, monetary policies can help maintain economic stability and control inflation when structural reforms are implemented. Monetary policy, in the opinion of Aleem and Lahiani (2011), can significantly contribute to Pakistan's economic stability. Research has shown that SBP can support this country's economy by utilizing key indicators such as inflation, the output gap, and the Fed fund ratio. Using the VAR technique, Saizar and Chalk (2008) investigate how monetary policy affects output and inflation in Pakistan, Brazil, and Chile. They discover a positive correlation between output, interest, and inflation. In the period of financial management, Nnanna (2001) examines Nigeria's monetary management. The author used an indirect approach to investigate the function of monetary policy, highlighting its diminished significance as a result of political meddling and budgetary dominance.

Scholars have extensively studied the relationship between monetary policy and economic growth, particularly in advanced economies. However, to fully understand the details of this relationship in Pakistan, further research is necessary. Previous research has provided insight into the various facets of monetary policy, such as its causes, effects, and policy ramifications. Nonetheless, there is still a dearth of thorough research covering both the short- and long-term dynamics of money policy and growth in the Pakistani setting. The results of previous research are conflicting; while some point to the importance of structural issues, others back up the monetarist theory of a significant correlation. Furthermore, only a small number of studies have made use of sophisticated cointegration methods like ARDL, which may handle variables with varied integration orders and result in an inadequate comprehension of the long-run interactions.

Our paper contributes to the body of information previously available on monetary policy and economic growth in Pakistan by offering new empirical data on the association between monetary policy indicators, inflation, and trade openness as control variables and economic growth. Using robust econometric techniques and sizable data sets covering the years 1980–2021, the research sheds light on Pakistan's short- and long-term monetary policy dynamics. The policy recommendations included in the conclusions also give policymakers helpful guidance for developing fiscal and monetary

policies that successfully reduce inflationary pressures and promote economic stability. The primary goal of this study is to address Pakistan's ongoing macroeconomic policy conundrum by advancing information and directing decision-making processes.



[Figure 1: The linkage between monetary policy and economic growth] (Author's own compilation)

To be more precise, the study created a theoretical research framework to show how the variables included in it relate to one another and identify how they affect Pakistan's economic growth. Figure 1 displays the research framework model for this study.

Modeling Approach

Model's Framework

Researchers such as Imoisi (2018), Akalpler and Duhok (2018), Lee and Werner (2018), Huang et al. (2017), Yien et al. (2017), Chen et al. (2017), Choudhri et al. (2015), Valentina and Silaghi (2015), Zakir and Malik (2013), Aleem and Lahiani (2011), and Saizar and Chalk (2008) have all investigated the relationship between monetary policy and economic growth.
The model currently in use expresses its functional form as follows:

$$GDPg = (M3, INT, ER, INF, TOP) \quad \ldots\ldots (1)$$

This model is presented in its econometric form as follows:

$$GDPg = \beta_0 + \beta_1 M3 + \beta_2 INT + \beta 3ER + \beta_4 INF + \beta_4 TOP + \mu \quad \ldots\ldots (2)$$

Trade openness, broad money, interest rates, exchange rates, and inflation rates all are impacted by real GDP growth. This study improves the ARDL (Autoregressive Distributed Lag) model to see the impact of monetary policy on economic growth. The model incorporates monetary policy with broad money (M3), a feature previously absent from any growth analysis for Pakistan.

Since the variables under analysis do not all integrate in the same order, we assessed co-integration using the autoregressive distributed lag method. Autoregressive distributed lag generates data in a general-to-specific manner by utilizing the error correction technique and appropriately delaying events to capture short-term dynamics while preserving

long-term information, according to Pesaran and Shin (1995). Reda and Nourhan (2020) also suggest the use of a "simple linear transformation" to develop the dynamic error correction model with ARDL.

The study, which uses specified variables with 'n' numbers of lags for both dependent and independent variables, can express the dynamic ARDL (Autoregressive Distributed Lag) equation as follows:

$$\Delta(GDPg) = \alpha + \beta_1(GDPg)_{t-1} + \beta_2(M3)_{t-1} + \beta_3(INT)_{t-1} + \beta_4(ER)_{t-1} + \beta_5(INF)_{t-1} + \beta_6(TOP)_{t-1} + \sum_{i=1}^{\alpha 1} \delta_1\Delta(GDPg)_{t-i} + \sum_{i=0}^{\alpha 2} \delta_2\Delta(M3)_{t-i} + \sum_{i=0}^{\alpha 3} \delta_3\Delta(INT)_{t-i} + \sum_{i=0}^{\alpha 4} \delta_4\Delta(ER)_{t-i} + \sum_{i=0}^{\alpha 5} \delta_5\Delta(INF)_{t-i} + \sum_{i=0}^{\alpha 6} \delta_6\Delta(TOP)_{t-i} + \varepsilon_t \quad (3)$$

The aforementioned equation's difference terms represent the short-run process, whereas the delayed terms in the first half of the equation represent the long-run variables. The error correction coefficient (βi) is the coefficient of the lagged dependent variable in equation 3, which determines the speed of adjustment. The insignificance of this coefficient suggests that the dependent variable's change is not contingent upon past errors.

Data

A study needs to use accurate and reliable data to produce credible findings. Finding connections between variables is the aim of econometric analysis, which examines data collected between 1980 and 2021. In this study, the author takes into account the available data, the state of affairs, the fervor of existing discussions, and the dearth of empirical research on monetary policy indicators and GDPg as a stand-in for economic growth. Table 1 provides an extensive list of the sources used to gather the study's data.

Table 1: Description of variables used in the model

Variable	Measurement	Data Source
	Dependent Variable	
GDPg	GDP Growth (% annual)	World Development Indicator (WDI)
	Independent Variables	
M3	Broad Money	World Development Indicator (WDI)
INT	Interest Rate (% annual)	International Financial Statistics(IFS)
ER	Exchange Rate	World Development Indicator(WDI)
INF	Inflation Rate	World Development Indicator(WDI)
TOP	Trade Openness	World Development Indicator (WDI)

Source: Author'sown elaboration

Co integration

Cointegration is a method for modeling time series that preserves their long-term information. In the beginning, Granger (1981) and Engle and Granger (1987) made the idea of cointegration official by creating tests and estimation methods to see if there is a long-term connection between a set of variables in a dynamic specification framework. This test looks at how to pair non-stationary time series that are very different from equilibrium so that equilibrium forces keep them from moving too far apart. To put it another way, co-integration involves a particular stationary linear combination of non-stationary variables that integrate to a specific order, I(d). Cointegration is an econometric concept that simulates the existence of a long-term equilibrium among underlying economic time series that converges over time. Cointegration, therefore, provides a more robust statistical and economic foundation for the empirical error correction model, which integrates short- and long-term information in variable modeling. In order to determine whether a model empirically demonstrates significant long-term relationships, it is essential to conduct cointegration testing. If you don't establish the cointegration among underlying variables, it's crucial to keep working with variables that differ. Nevertheless, the long-term information will be absent. In addition to the Engle and Granger (1987) procedure, there are numerous cointegration tests, including the autoregressive distributed lag cointegration technique and the bound cointegration testing technique. This is the central focus of the paper (Sari et al. 2008).

Results and Discussion

Descriptive statistics and Correlation Analysis

Table 2: Descriptive Statistics and Correlation Matrix

	GDPG	M3	INT	ER	INF	TOP
Mean	3.16	58.64	11.85	61.18	8.19	31.38
Median	3.1	57.62	11.75	57.62	7.88	32.38
Maximum	6.2	79.13	16.63	176.52	20.29	38.50
Minimum	0.3	34.80	7.25	9.90	2.53	21.46
Std. Dev.	1.10	12.18	2.37	44.23	3.72	4.45
Skewness	0.04	0.03	-0.03	0.88	0.66	-0.50
Kurtosis	3.56	2.04	2.18	3.01	3.82	2.31
Jarque-Bera	0.55	1.62	1.17	5.40	4.18	2.62
Probability	0.76	0.44	0.56	0.07	0.12	0.27
GDPG	1	0.07	-0.33	0.22	-0.15	-0.21
M3	0.07	1	-0.33	0.93	0.08	-0.52
INT	-0.33	-0.33	1	-0.29	0.29	0.40
ER	0.22	0.93	-0.29	1	0.01	-0.55
INF	-0.15	0.08	0.29	0.01	1	0.57
TOP	-0.21	-0.52	0.40	-0.55	0.57	1

Source: Authors' calculations

Table 2 contains the correlation matrix and descriptive statistics. The Jarque-Bera test results suggest that the distribution of GDP growth, broad money (M3), interest rate, exchange rate, inflation, and trade openness is normal. The correlation analysis reveals a positive relationship between GDP growth, M3, and ER. Please note that GDPg and INT have a negative correlation. The correlation between broad money and GDP growth is positive, whereas it is negative for interest rates.

Unit root

To estimate the long-term relationship between variables, all time series must be stationary at the same level, which means that the series cannot be I(2). This paper implemented two distinct unit root tests. Table 5 presents the study results, incorporating the Augmented Dickey and Fuller (1979) and Phillips and Perron (1988) tests. In this study, the test statistics justified the ARDL approach, indicating that certain variables are stationary at the level and others at the first difference.

Table 3: Stationary Test Results by using Trend and Intercept

Variables	Level		First Difference		Order of Integration
	ADF	**PP**	**ADF**	**PP**	
GDP Growth	-3.928342 0.0042	-3.183081 0.0283	-6.786163 0.0000	-8.176981 0.0000	I(0)
Lending Interest Rate	-3.275588 0.0228	-2.362958 0.1582	-5.359311 0.0001	-5.353469 0.0001	I(1)

Exchange Rate	3.389835 1.0000	3.554877 1.0000	-4.158098 0.0023	-4.194574 0.0020	I(1)
Broad Money	-5.076014 0.0001	-5.028470 0.0002s	-7.742547 0.0000	-21.93146 0.0001	I(0)
Inflation	-3.061620 0.0376	-3.201049 0.0271	-7.449372 0.0000	-7.434078 0.0000	I(1)
Trade Openness	-1.931860 0.3149	-2.136947 0.2319	-6.350246 0.0000	-6.351661 0.0000	I(1)

Source: Author's calculations

This paper uses the autoregressive distributed lag (ARDL) method from Pesaran et al. (2001) to determine whether there is a relationship between the interest rate, the exchange rate, inflation, and trade openness at levels where broad money and GDP growth are stable. This method is applicable to series, regardless of whether they are I(0), I(1), or mutually co integrated, as previously mentioned. Previous years (Pesaran et al. 2001) have primarily focused the literature on cases where the fundamental variables integrate in order one.

Engle and Granger (1987) developed one of the most frequently used methods that require the integration of variables of order one. This methodology comprises two phases. In the first step, a non-stationary series is regressed onto another series, and the residuals are checked for stationarity to see if cointegration is true (Engle and Yoo, 1987). The two non-stationary series are considered co integrated if they establish a stable linear relationship. According to the Representation Theorem, an error correction representation is present when the variables are co integrated. The subsequent step of estimating the error correction model determines its short-term dynamics and long-term linkage. This approach becomes ineffective in multivariate scenarios. Johansen (1988, 1991) and Johansen and Juselius (1990) developed another frequently employed approach that is more effective in multivariate systems. The ARDL approach has specific advantages over these other methods. According to Al-Malkawi et al. (2012), it is not necessary to initially utilize the I(1) series. Secondly, it is feasible to identify more effective cointegration relationships with restricted samples (Shahbaz and Islam, 2011). Finally, Van Treeck (2008) posits that the ARDL approach effectively addresses the obstacles associated with non-stationary time series data. For instance, non-stationary time series data results in spurious regression coefficients that are biased toward zero (Bölük and Mert, 2015).

Co integration ARDL Results

Pesaran et al. (1996) developed the bound testing method to check co-integration when the underlying variables are a mix of stationary series and trends. Pesaran et al. (1996) developed two sets of asymptotic critical values, one based on the assumption that all variables are I(1), or difference stationary, and the other on the assumption that they are I(0), or trend stationary. If the computed statistic surpasses the critical value bounds, we can draw a conclusive inference about the co-integration among the variables (Nkoro and Uko, 2016).

Table 4: Bound Test Results

		5% Critical Value		**10% Critical Value**		
Model	**F- Statistic**	**I(0)**	**I(1)**	**I(0)**	**I(1)**	**Remarks**
GDPg / M3, INT, ER, INF, TOP	8.03	2.39	3.38	2.08	3	Reject null hypothesis and accept alternative hypothesis.

Source: Authors' calculations

The bound test results indicate that the computed F-Statistics value is 8.03, which exceeds the upper bound critical value at all levels of significance. In particular, the F-stat is greater than I (1), suggesting that 8.03 exceeds both 3.38 and 3. This investigation rejects the null hypothesis and accepts the alternate hypothesis. The null hypothesis indicates that co-integration is not present in the model.

Long Run Analysis

This section focuses on the long-run model estimation results. We are currently in the process of examining the long-term relationship between variables, establishing a rationale for their significance, and subsequently interpreting the data in accordance with economic theory. This is the second stage of the ARDL approach. Table 5 presents the results.

Table 5: Long-run results

Dependent Variable: broad money is GDPg				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
M3	-0.254693	0.063418	-4.016106	0.0004
INT	-0.500836	0.186702	-2.682546	0.0125
ER	0.066856	0.016540	4.041991	0.0004
INF	0.337924	0.155646	2.171105	0.0392
TOP	-0.192172	0.111380	-1.725365	0.0963
C	23.87395	6.430778	3.712450	0.0010

Source: Author's calculations

The long-term coefficient of broad money was negative and significant, as noted by Ramachandran (2004) and Azimi (2022). If the sole use of the increased money supply for non-durable consumption expenditures diverts resources from productive uses, broad money can impede economic growth. The theoretical evidence from various sources, including Neumeyer and Perri (2005) and Pradhan et al. (2014), defines the coefficient of interest rate as negative. These authors are of the opinion that the decrease in the interest rate stimulates investment through infrastructure development, which in turn leads to economic growth. Researchers found a positive correlation between the exchange rate and growth. In this scenario, an advantageous exchange rate environment can help the economy expand and support exports. These findings are consistent with those of Habibet et al. (2017). Inflation also exhibits a positive correlation with growth. This outcome is consistent with the Keynesian economist's assertion that inflation is responsible for the substitution of money for interest-earning assets, which in turn promotes economic growth and increases capital accumulation. The findings are consistent with those of Rouangsang and Nimanussornkul (2012).

Error Correction Analysis of Model

Table 6: Short-run results

Dependent Variable: GDPg				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
D(INT)	-0.016579	0.082803	-0.200217	0.8429
D(ER)	-0.000987	0.017626	-0.055978	0.9558
D(ER(-1))	-0.058527	0.022103	-2.647973	0.0136
D(INF)	0.063201	0.038836	1.627378	0.1157
D(INF(-1))	-0.246315	0.040407	-6.095827	0.0000
D(TOP)	-0.193675	0.053507	-3.619603	0.0013
D(TOP(-1))	0.107941	0.044576	2.421501	0.0227
CointEq(-1)*	-0.735444	0.088372	-8.322174	0.0000

Source: Author's calculations

The error correction model captures the short-term and long-term coefficients between the variables of interest. The coefficients of the EC mechanism provide the adjustment towards long-term equilibrium (Bölük and Mert, 2015). The coefficient in the error correction model is negative, and the p value (0.7354) is statistically significant. The error correction term denotes the rate at which a short-term disturbance alters the annual GDP growth to its long-term equilibrium. Furthermore, the importance of the error correction term serves as confirmation of the long-term relationship

between the independent and dependent variables. The term "error correction" implies that the return to long-term equilibrium takes place within a year, specifically within seven months.

Diagnostic Tests

The study will implement the diagnostic analysis for serial correlation, heteroscedasticity, and normality. For serial correlation, we use Breusch-Godfrey's (1978) Lagrange method. The null hypothesis of the multiplier test states that there is no serial correlation among the errors in the regression model. A study employs the Breusch-Pagan test to assess the presence of autoregressive conditional heteroscedasticity. Thadewald and Büning (2007) used the Jarque-Bera (1987) test to assess the model's fit or normality.

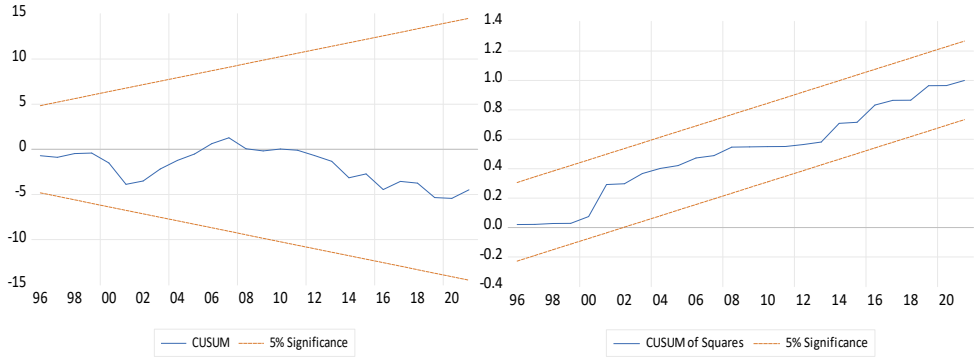
Table 7: Diagnostic Test Results

Test	Null Hypothesis	P-Value
Breusch-Godfrey Serial Correlation LM Test	No serial correlation at up to 2 lags	0.5981
Heteroskedasticity Test: Breusch-Pagan-Godfrey	Null hypothesis: Homoskedasticity	0.4265
Normality Test (Jarque-Bera)	Estimated residuals are normal	0.519532

Source: Author's own calculations

CUSUM Test

Pesaran used two tests to verify the model parameters' short- and long-term structural stability. The first test is the cumulative sum test (CUSUM) for residuals, while the second test is the cumulative sum of squares (CUSUM). The estimated coefficients of the two models are considered structurally stable if the CUSUMSQ and CUSUM tests fall within the critical boundary at a 5% morale level. The graphs above confirm the model's stability at the 5% significance level by showing the cumulative sum of CUSUM and CUSUMSQ residuals within the critical zone. These results indicate that the relationship between economic growth and money supply variables has undergone structural changes.



Conclusion and policy recommendations

The goal of this investigation was to assess the influence of monetary policy on Pakistan's economic expansion. We conducted the analysis using time-series data spanning from 1980 to 2021. To advance the discipline, we conducted an investigation into the influence of monetary policy on economic growth in the context of a small open economy, such as Pakistan. Our examination encompassed a broad spectrum of subjects, such as inflation, exchange rates, money, lending interest rates, and trade openness. During our investigation, we used diagnostic tests and ARDL-bound testing to determine the model's stability. The unit root test results validated the concept, indicating that the variables under investigation were stationary at I(1) or I(0). As a result, we implemented the ARDL model. The cointegration results demonstrate the long-term correlation between the monetary policy variables and growth, suggesting that all variables move in tandem over time. Broad money, interest rates, and trade openness adversely affect economic growth, according to the results of the ARDL approach. Conversely, inflation and the exchange rate positively correlate with economic expansion. Ultimately, we administered the CUSUM and CUSUMSQ examinations. The CUSUM and CUSUMSQ tests validate the long-term correlations between variables and illustrate the stability of the coefficients. The empirical findings of the study have led

to a plethora of recommendations for enhancing Pakistan's economic growth. Monetary authorities manage M3, the primary instrument of monetary policy that stimulates growth, in addition to the interest rate and exchange rate channels. (2) Policymakers should take into account the inverse relationship and feed-back effect between the lending rate and economic growth. (3) The study suggests that the government should regulate the exchange rate (ER), as a decrease in the rate will lead to an increase in net exports, which in turn accelerates a nation's economic expansion.

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