



## MONETARY POLICY DYNAMICS AND ECONOMIC PERFORMANCE IN BANGLADESH: AN ARIMA MODEL APPROACH

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### Abstract

This study delves into the impact of monetary policy on the economic performance of Bangladesh, utilizing data derived from audited annual reports of the Bangladesh Bank covering the years 2014 to 2022. The central focus of the analysis revolves around Gross Domestic Product (GDP) as the dependent variable, with money supply growth, real interest rate, exchange rate, inflation rate, and repo rate considered as independent variables. Employing two regression models, namely Ordinary Least Squares (OLS) and Autoregressive Integrated Moving Average (ARIMA), the research aims to explore the relationships among these variables. In the OLS regression model, significant associations are identified between GDP and real interest rates, inflation rate, and the repo rate. However, no statistically significant relationships are observed between GDP and money supply growth or the exchange rate. On the contrary, the ARIMA regression model indicates statistical significance for all variables, except the exchange rate, concerning their impact on GDP. These findings suggest that monetary policy plays a substantial role in shaping the economic growth of Bangladesh, with real interest rates, inflation rates, and repo rates exerting particular influence. The lack of a significant relationship between the exchange rate and GDP in the ARIMA model implies that other factors, potentially external to the country, may have a more dominant influence on exchange rate dynamics during the study period. This research contributes to a deeper understanding of the complex interplay between monetary policy and economic performance in Bangladesh, offering valuable insights for policymakers and stakeholders.

**Keywords:** Effectiveness, Monetary Policy, GDP, Bangladesh

**Jel Classification:** I38, E52, O47

### BANGLADEŞ'TE PARA POLİTİKASI DİNAMİKLERİ VE EKONOMİK PERFORMANS: BİR ARIMA MODELİ YAKLAŞIMI

### Öz

Bu çalışma Bangladeş'te para politikasının ekonomik performans üzerindeki etkisini, Bangladeş Bankası'nın 2014'ten 2022'ye kadar denetlenmiş yıllık raporlarındaki verileri kullanarak, değerlendirmektedir. Çalışmada Gayrisafi Yurt İçi Hasıla (GSYH) bağımlı değişken; para arzı büyümesi, reel faiz oranı, döviz kuru, enflasyon oranı ve repo oranı bağımsız değişken olarak seçilmiştir. Bağımlı ve bağımsız değişkenler arasındaki ilişkinin belirlenmesinde Sıradan En Küçük Kareler (OLS) ve Otoresif Entegre Hareketli Ortalama Modelleri (ARIMA) kullanılmıştır. OLS regresyon modelinde GSYH ile reel faiz oranları, enflasyon oranı ve repo oranı arasında anlamlı bir ilişki bulunmuştur. Öte yandan GSYH ile para arzı büyümesi ve döviz kuru arasında anlamlı bir ilişki bulunmamaktadır. ARIMA regresyon modelinde döviz kuru dışında tüm değişkenler GSYH üzerinde etkileri bakımından anlamlıdır. Bu bulgular, para politikasının Bangladeş'in ekonomik

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*büyümesinde önemli bir rol oynadığını ortaya koyarken, reel faiz oranları, enflasyon oranı ve repo oranlarının da büyümedeki etkinliğinin önem arz ettiğini göstermektedir. ARIMA modelinde döviz kuru ile GSYH arasında anlamlı bir ilişkinin bulunmaması, çalışma dönemi boyunca potansiyel olarak ülke dışından olan diğer faktörlerin döviz kuru dinamikleri üzerinde daha baskın bir etkiye sahip olabileceğine işaret etmektedir. Bu araştırma, Bangladeş'te para politikası ile ekonomik performans arasındaki karmaşık etkileşimin daha derinlemesine anlaşılmasına katkıda bulunarak politika yapıcılara ve paydaşlara değerli bilgiler sunmaktadır.*

**Anahtar Kelimeler:** Etkinlik, Para Politikası, GSYH, Bangladeş

**Jel Sınıflandırması:** I38, E52, O47

## INTRODUCTION

Monetary policy and economic growth exhibit a closely intertwined relationship, often characterized by a causal link, particularly when monetary policy is effectively implemented. In the context of a developing nation like Bangladesh, monetary policy holds significant importance due to its impact on credit cost, credit availability, inflation management, and balance of payments. The recent positive trajectory in Bangladesh's GDP growth can be attributed to various components of monetary policy (Rahman et al. 2019). Across most countries, monetary policy aims to achieve multiple objectives, including price stability, equilibrium in the balance of payments, employment promotion, output growth, long-term stability, and efficient financial markets. Price stability and economic efficiency in financial markets are interconnected goals, forming the foundation for sustainable economic development. Maintaining an adequate money supply level consistent with the desired income growth objective is crucial for achieving non-inflationary economic growth. Inflation, often perceived as a monetary phenomenon, is effectively managed through monetary policy. Monetary policy exerts influence on aggregate expenditure, impacting consumer spending and investment decisions, thereby altering overall demand levels (Precious and Makhetha-Kosi, 2014). It is well-established that soundly executed monetary policy, focusing on price stability and inflation control, contributes significantly to a country's economic development. This is achieved through the monetary authority's regulation of money quantity, availability, and interest rates. The monetary authority utilises a range of methods and instruments to accomplish various macroeconomic goals, including managing interest rates, currency, promoting economic growth, controlling inflation, regulating exchange rates, and mitigating unemployment (Hameed, 2010). The efficacy of monetary policy and its impact on economic activity depend on the central bank's capacity to uphold an open monetary policy framework and choose suitable financial instruments that match with macroeconomic objectives. The objective of this study is to offer guidance to the central banks and commercial banks in Bangladesh on the implementation of an efficient monetary policy framework in order to attain predetermined goals. This issue has been a persistent and significant problem for the nation, encompassing a range of individuals and groups with a vested interest, such as scholars, government officials, and overseers. The study aims to tackle the concerns of money market players on the significant influence of monetary policy on economic development and the factors that shape monetary policy.

## 1. OBJECTIVE OF THE STUDY

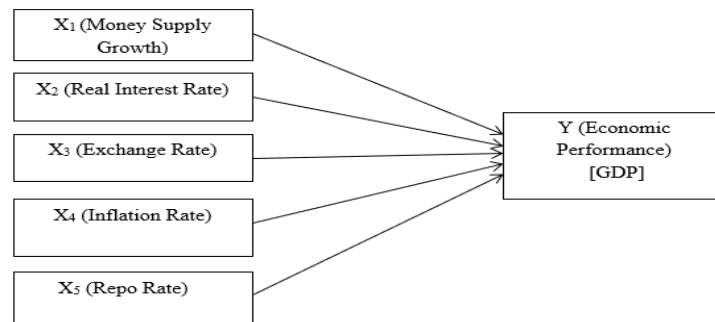
The main objective of this research is to examine the impact of monetary policy on the economic growth in Bangladesh. In order to accomplish this overarching purpose, the study has focused on the following specific aims:

- Identifying the variables relevant to the efficacy of monetary policy in influencing economic growth.

- Analyzing the attributes of monetary policy components and their influence on economic performance.
- Investigating and comprehending the correlation with monetary policy and economic success within the framework of Bangladesh.

## 2. THE CONCEPTUAL FRAMEWORK AND HYPOTHESES FOR THE RESEARCH

The theoretical foundation of the study was constructed by reviewing existing literature, conducting content analysis, and consulting experts. The researcher adhered to Keynes' monetary policy theory, incorporating elements such as the interest rate, the marginal efficacy of capital, and the investment multiplier (Dickens, 2011). Moreover, the research incorporated the Taylor Rule, a method for predicting interest rates in monetary policy (Caglayan and Astar, 2010), and Kaldor's (1970) Monetarist Quantity Theory of Money. The specified theoretical frameworks are delineated as follows:



**Figure 1: Relationship between Monetary Policy and Economic Performance**

*Hypothesis:*

Ho: Bangladesh's economic growth is not much impacted by monetary policy.

H1: Bangladesh's economic growth is significantly impacted by monetary policy.

## 3. REVIEW OF LITERATURE

### 3.1. Prior Evidence: Foreign Context

In 2020, Tan et al. did a research to evaluate the effects of fiscal and monetary policies on economic growth in Thailand, Singapore, and Malaysia between 1980 and 2017. They used an ARDL (Autoregressive Distributed Lag) technique to find long-term associations. Additionally, they used a variety of econometric models, such as the Dynamic Ordinary Minimum Square Method (DOLS), Canonical Cointegration Regression (CCR), and Fully Modified Minimum Square Method (FMOLS) to assess how robust their results were. Interestingly, every single one of these models produced solid and predictable outcomes every time. The study's main conclusions show that interest rates had a big impact on each of the three nations' economic progress. Furthermore, government expenditure benefited Thailand's economy while negatively affecting that of Malaysia and Singapore. This suggests that, in contrast to Thailand's fiscal strategy, the monetary policies of Malaysia and Singapore were more successful in fostering economic growth.

Benzene carried out studies in 2019 to look at how Algerian economic activity was affected by monetary policy between 1990 and 2017. The research found that the real money

supply had a more significant positive influence on GDP than credit and interest rates, using the VAR model. The introduction of Algerian capital markets, the financial system's high resilience but low development, protracted administrative procedures, and insufficient competition in the banking sector were all cited as reasons for the financial system's limited contribution to economic growth.

In 2018, Amiri and Gang conducted research to examine the impact of monetary policy on economic growth in the United States. Employing the TVP-FAVR approach, the researchers analyzed various factors over a 47-year period, spanning from 1970 to 2016, to evaluate the relationship between two types of monetary policy and economic development. Their study's results indicated that monetary policy had a favorable influence on economic growth in the short, medium, and long term. Specifically, interest rates exhibited diverse effects across different time periods, encompassing both positive and negative impacts. Furthermore, over these timeframes, inflation was found to positively affect economic growth, mitigating the impact of diminishing returns.

Ufoeze (2018) utilized unit root tests, co-integration tests, and the Ordinary Least Squares technique to investigate the consequences of changes in monetary and economic policies in Nigeria. The analysis revealed that the significant price fluctuations in Nigeria could not be adequately regulated by either monetary or economic policies. Additionally, the study identified that investment, interest rates, and monetary policy rates had only a marginal positive impact on Nigeria's economic activities. Nevertheless, while the exchange rate exerted a noteworthy negative influence on Nigeria's GDP, an increase in the money supply yielded a significant positive benefit. The report raised concerns regarding Nigeria's economic growth rate, the expansion of money supply, and the level of investment.

Yousaf et al. (2018) investigated the connection between unemployment, inequality, poverty and monetary policy in eleven Asian countries, including Pakistan. The relationship between monetary policy and socioeconomic characteristics was examined by using sophisticated Bayesian estimates on data from the World Development Index (WDI) spanning the years 1986 to 2017. In the majority of the nations under investigation, the results demonstrated a strong correlation between monetary policy and actual variables. The relationship's direction differed throughout indices and countries, nevertheless, highlighting the need of carefully weighing the implications of monetary policy before enacting it.

Galloppo and Paimanova (2017) investigated how monetary policy in the BRIC countries affected developing financial markets, taking into account financial crises throughout the study period. The Bank of England received the fewest comments and the Bank of Japan the most, according to the survey, which revealed differences in national replies. These results emphasized notable distinctions between the utility and basic materials sectors' responses, along with unexpected and controversial answers from certain nations.

In a study conducted by Aiyar et al. (2016), a theoretical model was employed to explore the connection between monetary policy and capital regulation, utilizing data on the minimum capital requirements for banks in the UK. The research revealed that alterations in capital requirements and interest rate policy had an impact on the ability of UK banks to extend loans. While small banks were influenced by both changes in monetary policy and adjustments in capital requirements, large banks only responded to alterations in capital requirements. These distinct reactions underscored the considerable distributional effects of these two policy instruments within the financial system.

Nguyen and Boateng (2015) utilized data from a sample of 95 institutions to examine the influence of monetary policy on the risk behavior of Chinese banks during periods of forced layoffs. According to the findings, substantial involuntary reserves made banks more

prone to aggressive actions, fostering rapid loan expansion and contributing to price bubbles in the Chinese financial system. Banks with significant involuntary surplus reserves tended to reduce risk more swiftly in response to tightened monetary policy, offering insights into the impact of involuntary excess reserves on bank risk-taking in emerging economies.

In 2015, Matmilula Benny-Arifin and Mohtar looked at the asymmetric adjustment of bank lending rates as well as the long-term transmission of money market interest rates to bank lending rates. Models of symmetric correction and momentum were used in the investigation. The results of the research showed that South Africa's lending rate reacted to recent price declines, suggesting that commercial banks modified their lending rates in accordance with historical patterns. On the other hand, loan rates showed increasing rigidity, supporting the idea of consumer reaction.

Ayub and Shah (2015) emphasized the significant impact of Pakistan's monetary sector on the Gross Domestic Product (GDP) of the country. The hypothesis was substantiated by the examination of variables using data spanning the previous decade, specifically from 2005 to 2014. The analysis primarily utilized two regression and communication approaches. The findings indicated that inflation, money supply, and interest rates wielded a substantial influence on a nation's GDP. The statement underscored the pivotal role played by Pakistan's monetary policy in achieving government objectives related to maintaining price stability, fostering GDP growth, and promoting overall economic advancement.

Adejare (2014) investigated the repercussions of monetary policy on industrial growth in the Nigerian economy, utilizing secondary data from the statistics bulletins of the Central Bank of Nigeria released between 1970 and 2010. The study disclosed that deposits had a significant positive impact on industrial production, while treasury notes had an adverse effect. Both variables demonstrated statistical significance, highlighting the importance of enhancing economic growth and augmenting capital expenditure in the government and industrial sectors.

Kamaan and Nyamongo (2014) have measured the effect of monetary policy on the rate of economic expansion in Kenya. According to their study, it was shown that initially, the standard deviation has a negligible and non-significant impact on productivity. However, this impact later becomes favorable but loses its significance during the next four months. During the first 2.5 months, the interbank inflation rate exhibited a significant and positive shock standard deviation. The favorable influence continued, although it became noticeable only in the sixth month. The study's results will provide valuable insights for governmental choices intended to foster economic growth. The findings of this research will aid the Bank of Kenya in devising a plan to decrease interest rates to the intended thresholds, therefore fostering economic expansion while upholding moderate inflation.

Precious and Makhetha-Kosi (2014) investigated how monetary policy impacts the promotion of economic growth in South Africa during the timeframe spanning from 2000 to 2010. The researchers employed extended Dickey-Fuller and Phillips Perron root tests to assess the consistency of the time series. Using Johansen cointegration and the error correction approach, the study aimed to understand both the long and short-term dynamics of variables. The research concluded that fiscal policy should be utilized to establish a conducive environment that attracts both local and foreign financial experts, thereby fostering tangible monetary progress. Furthermore, the research suggested that the government should provide more funds to sectors that contribute positively to the economy in order to improve budgetary outcomes. The report acknowledges that relying only on cash-based methods is not sufficient to successfully strengthen financial results.

### 3.2. Prior Evidence: Bangladesh Context

Rana et al. (2023) assessed the efficacy of monetary policy measures in stabilizing prices within Bangladesh, drawing on secondary data sourced from audited yearly reports of the Bangladesh Bank covering the period from 2014 to 2022. It examines the influence of various economic indicators - specifically the inflation rate as the dependent variable, and the exchange rate, real interest rate, cash reserve ratio, and repo rate as independent variables. Through regression analysis, complemented by tests for normality, multicollinearity, and autocorrelation, the study explores the dynamics between these variables. The findings indicate a statistically significant link between the inflation rate and both the cash reserve ratio and repo rate, underscoring their importance in monetary policy's role in price stabilization. Conversely, the study notes no significant impact of the inflation rate on the exchange rate and real interest rate, with a near-significant connection identified between the inflation rate and exchange rate. Thus, the research concludes that monetary policy mechanisms, particularly through adjustments in the cash reserve ratio and repo rate, are crucial for maintaining price stability in Bangladesh.

In their investigation, Rahman et al. (2019) explored the relationship between monetary policy and other economic variables impacting the economic development of Bangladesh. The data collection spanned a period of twenty years, specifically from 1997 to 2017, and encompassed both descriptive and inferential statistics. The study utilized multivariate analytical methods, including correlation analysis with SPSS version 20.0, to identify the factors influencing the economic performance of Bangladesh. The results indicated that the levels of consumption, investment, net government spending, and net exports significantly influence the GDP development of Bangladesh.

Karim (2019) undertook an empirical evaluation of the effects of monetary and fiscal policy in Bangladesh. The research assessed the efficacy of these policies by using Structural Vector Auto Regression (SVAR) and Cholesky factorization techniques on time series data including political and non-political macro factors spanning from 1971 to 2017. The study revealed that an augmentation in the monetary base resulted in elevated real Gross Domestic Product (GDP) and general price levels, accompanied by an appreciation of the US dollar in relation to the taka. The implementation technique of expansionary fiscal policy resulted in a delayed but ultimately favorable effect on real GDP.

In their study, Ahmad et al. (2016) specifically examined the importance of economic growth and monetary policy. Their research, conducted from 1973 to 2014, included conducting unit root tests and measuring state variables. The study revealed that a rise in the money supply had a transitory effect of stimulating economic development and had a favorable influence on the currency rate. Conversely, interest rates have a marginal adverse impact on both inflation and economic growth. The text highlights the significance of implementing efficient monetary policy to manage inflation and maintain favorable interest rates in order to stimulate economic development.

In their study, Chowdhury and Afzal (2015) examined the crucial functions of monetary and fiscal policy in maintaining economic growth. The researchers conducted a time series analysis using annual data from 1980 to 2012 to evaluate the impact of these regulations on economic activity in Bangladesh. The results suggested that both monetary and fiscal policies exhibited comparable efficacy in encouraging economic activity inside the nation.

Noman and Khudri (2015) analyzed the effects of fiscal and monetary policies on the economy of Bangladesh by using several statistical methodologies and utilizing data from 1979 to 2013. Their study revealed that the independent variables in each model explained

over 75% of the variability in the corresponding variables. The currency rate was seen as a critical determinant impacting economic growth in Bangladesh.

In 2010, Islam performed a research that examined several facets of money supply, using secondary data analysis. The statistics were obtained from reliable organizations, such as the Bangladesh Bank, the Ministry of Finance, the Bangladesh Bureau of Statistics (BBS), and the National Strategy for Accelerated Poverty Alleviation document (NSAPR). The research examined the elements that affect the money supply, specifically focusing on the monetary base and money multiplier, in relation to current developments. It was discovered that differences in interest rates served as a driving force for borrowers to participate in the money supply process within the government of Bangladesh. The report also emphasized that the money supply was not primarily directed at a certain portion of the market.

#### 4. METHODOLOGY OF THE STUDY

This research article presents a comprehensive examination of monetary policy's impact on economic development, relying on nine years of secondary data spanning from 2014 to 2022. The study primarily draws data from meticulously audited annual reports provided by the Bangladesh Bank. The data collection process involved thorough organization, categorization, and tabulation, with the necessary calculations undertaken to construct time series data tailored to the research's objectives. To rigorously evaluate its hypotheses, this study employs both the Ordinary Least Squares (OLS) method for multiple regressions and the ARIMA Regression model, allowing for a robust comparative analysis of findings. A zero-order correlation matrix is utilized to quantify the degree of interrelationship among the variables under scrutiny. To enhance analytical rigor, the study applies various techniques, including descriptive analysis, stationary tests, autocorrelation analysis, multicollinearity assessment, and normality tests. At the heart of this investigation lies the examination of Gross Domestic Product (GDP) as the primary dependent variable. Simultaneously, the study explores the influence of independent variables such as Money Supply Growth (MSG), Real Interest Rate (RIR), Exchange Rate (ER), Inflation Rate (INFR), and Repo Rate (RR). The research formulates a comprehensive regression equation to model these relationships in Equation (1):

$$GDP = \beta_0 + \beta_1 MSG + \beta_2 RIR + \beta_3 ER + \beta_4 INFR + \beta_5 RR + \mu \quad (1)$$

Where:

GDP = Gross Domestic Product

MSG = Money Supply Growth

RIR = Real Interest Rate

ER = Exchange Rate

INFR = Inflation Rate

RR = Repo Rate

$\beta_0$  = Intercept of relationship in the model/constant

$\beta_1, \beta_2, \beta_3, \beta_4, \beta_5$  = Coefficients of each independent or explanatory variable

$\mu$  = Error term

This comprehensive approach ensures a robust analysis of the relationships between monetary policy and economic development in Bangladesh.

## 5. DESCRIPTIONS OF THE MONETARY POLICY PARAMETERS AND ECONOMIC PERFORMANCE

The following table displays the characteristics of each variable employed in the linear regression technique, as described in the research using descriptive statistics.

**Table 1: Descriptions of the Monetary Policy Parameters and Economic Performance**

Variable	Min	Max	Range	Mean	Std. Dev.
<b>GDP</b>	6	8.15	2.15	6.91	0.76
<b>MSG</b>	9.2	21.3	12.1	14.48	4.07
<b>RIR</b>	3.07	6.89	3.82	4.89	1.24
<b>ER</b>	71.2	84	12.8	78.79	3.53
<b>INFR</b>	5.4	8.8	3.4	6.74	1.30
<b>RR</b>	6	7.75	1.75	6.92	0.60

**Note:** The researcher has compiled the data. (GDP= Gross Domestic Product, MSG=Money Supply Growth, RIR= Real Interest Rate, ER= Exchange Rate, INFR= Inflation Rate and RR= Repo Rate).

**Source:** (Results from the use of Stata Version-15)

Table 1 presents the expected Gross Domestic Product (GDP) forecasted to grow by 6.91% over the nine-year period from 2014 to 2022. However, the actual GDP has deviated by 0.76% from the projected rate. During this timeframe, the GDP has experienced fluctuations, ranging from a minimum of 6% to a maximum of 8.15%, resulting in a range of 2.15%. The envisaged growth rate in the money supply for the same period is 14.48%, but the actual growth rate has deviated by 4.07% from the projection. Over this span, the money supply growth (MSG) has varied from a minimum of 9.2% to a maximum of 21.3%, leading to a range of 12.1%. The expected interest rate over the nine-year period is 4.89%, deviating by 1.24% from the projected rate. Throughout this duration, the rate of interest (RIR) has fluctuated between a minimum of 3.07% and a maximum of 6.89%, resulting in a range of 3.82%. The anticipated exchange rate for the nine-year period is 78.79%, with an actual deviation of 3.53% from the projected rate. Over this time frame, the exchange rate (ER) has ranged from a minimum of 71.2% to a maximum of 84%, resulting in a range of 12.8%. The predicted inflation rate for the nine years from 2014 to 2022 is 6.74%, with an actual deviation of 1.30% from the predicted rate. Throughout this period, the inflation rate (INFR) has varied from a minimum of 5.4% to a maximum of 8.8%, resulting in a range of 3.4%. The expected repo rate for the nine-year period is 6.92%, deviating by 0.60% from the projected rate. Over this time frame, the repo rate (RR) has fluctuated between a minimum of 6% and a maximum of 7.75%, resulting in a range of 1.75%.

### 5.1. Investigation of the Two-Variable Relationship within the Zero-Order Correlation Matrix

**Table 2: Investigation of the Two-Variable Relationship within the Zero-Order Correlation Matrix**

Correlations						
	GDP	MSG	RIR	ER	INFR	RR
GDP	1					
MSG	-.753*	1				



<b>RIR</b>	-.676*	.402	1			
<b>ER</b>	.604***	-.795*	-.176	1		
<b>INFR</b>	-.667*	.838**	.546	-.677*	1	
<b>RR</b>	-.904**	.749*	.536	-.615***	.770*	1
*. The correlation is statistically significant to the 0.05 levels.						
**. The correlation is statistically significant to the 0.01 scale.						
***. The correlation is statistically significant with a 0.10 significance level.						

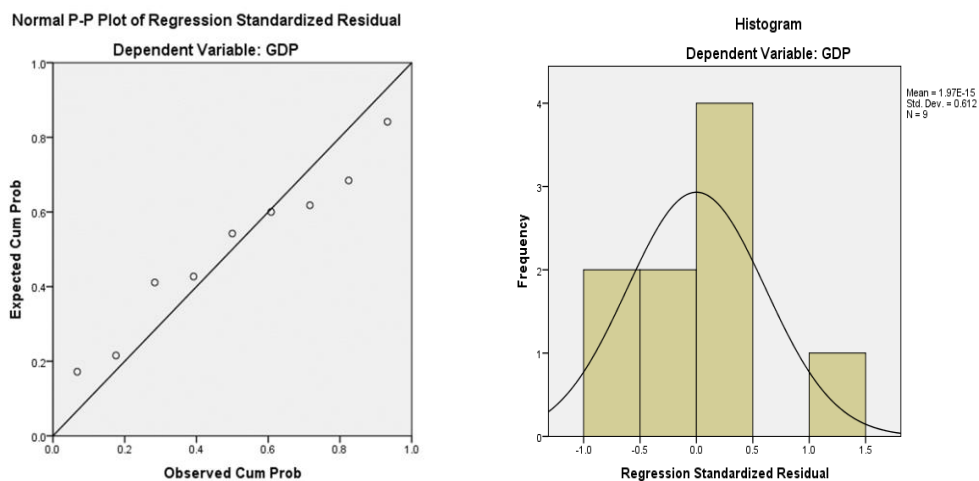
**Note:** The researcher has compiled the data. GDP= Gross Domestic Product, MSG=Money Supply Growth, RIR= Real Interest Rate, ER= Exchange Rate, INFR= Inflation Rate and RR= Repo Rate).

**Source:** (Results from the use of SPSS Version-23)

The analysis in Table 2 reveals significant relationships between GDP and various independent variables. GDP is negatively associated with MSG, RIR, and INFR at a 5% significance level, while it has a substantial negative relationship with RR at a 1% significance level. Conversely, GDP shows a significant positive correlation with ER at a 10% significance level. MSG and ER have a significant negative relationship at a 5% significance level. MSG also has positive correlations with INFR and RR at 1% and 5% significance levels, respectively. ER is negatively associated with INFR and RR at 5% and 10% significance levels. Lastly, there is a substantial positive relationship between INFR and RR at a 5% significance level. These findings provide valuable insights into the complex interplay among these economic variables and their directional influence.

## 5.2. Examining Assumptions

The researcher formulated the following presumptions for this study, drawing from literature reviews and content analysis: tests for normality, multicollinearity, and autocorrelation; stationary tests are employed to assess the data's applicability and the model's fitness; and multicollinearity and autocorrelation tests were also incorporated.



**Figure 2: Examining the Dependent Variable for Normality-GDP**

According to Frost, a normal distribution is characterized as a symmetrical and continuous probability distribution centered around the mean. The majority of observations are concentrated around the central peak, and the probability of values decreasing in either direction from the mean is roughly equal. Unusual values are rarely found in the left and right tails of the distribution. Upon examination of the PP plots and histograms presented earlier, the researcher concluded that the data adhered to a normal distribution.

**Table 3: Examination of Multicollinearity Considering Independent Variables**

Independent Variables	Collinearity Statistics	
	Tolerance	VIF
MSG	.448	2.231
RIR	.577	1.734
ER	.699	1.431
INFR	.674	1.483
RR	.339	2.950

Note: The researcher has compiled the data.

Source: (Results from the use of SPSS Version-23)

When evaluating multicollinearity, researchers have established various criteria to assess the appropriateness of Variance Inflation Factor (VIF) values. Generally, previous research (Hair et al. 1995; Kennedy, 1992; Marquardt, 1970) indicated a threshold of 10. As an alternative, a tighter tolerance limit of 0.10 is suggested by some specialists. On the other hand, some studies propose lower VIF criteria, including a maximum value of 4 (Pan & Jackson, 2008) or even 5 (Rogerson, 2001). The VIF values for the independent variables, the supply of money growth (MSG), real interest rate (RIR), exchange rate (ER), inflation rate (INFR), and repo rate (RR), were examined in our investigation. The results indicated that all VIF values remained below 3, with only two variables, MSG and RR, exceeding a VIF of 2. Additionally, three variables, namely RIR, ER, and INFR, exhibited tolerance levels exceeding 0.5. Based on these findings, it can be reasonably concluded that multicollinearity did not present a significant concern in this study, as the VIF values remained comfortably below the commonly recommended thresholds. This reinforces the reliability and validity of the regression analysis conducted in our research.

**Table 4: Test of Autocorrelation**

	Durbin-Watson
Dependent Variable: GDP	2.188
Predictors: (Constant), MSG, RIR, ER, INFR and RR	

Note: The researcher has compiled the data.

Source: (Results from the use of SPSS Version-23)

The assumption of independent mistakes is ascertained using the Durbin-Watson statistics (autocorrelation). The range of a Durbin Watson value is 0 to 4. When the Durbin Watson value is near 0, it indicates a high positive correlation; when the value is near 4, it indicates a strong negative correlation. When the Durbin Watson score is near to 2, it indicates the absence of serial correlation. generally speaking (Alsaeed, 2006). Lower than 1 or more than 3 Durbin Watson readings need to be cause for concern. The Durbin-Watson score of 2.188, which is near to 2, indicates that the model does not include serial correlation, according to the study.

**Stationary Test:**

Null: Variable has unit root or isn't stationary.

ALT: Variable has not unit root or is stationary.

**Table 5: Unit Root Test**

Variables	Test Statistics	1% Critical Value	5% Critical Value	10% Critical Value	P-Value	Order of Integration
<b>GDP</b>	-2.903	-3.750	-3.000	-2.630	0.0450	I (1) ***
<b>MSG</b>	-4.781	-3.750	-3.000	-2.630	0.0001	I (1) *
<b>RIR</b>	-3.415	-3.750	-3.000	-2.630	0.0105	I (1) **
<b>ER</b>	-4.077	-3.750	-3.000	-2.630	0.0011	I (1) *
<b>INFR</b>	-4.359	-3.750	-3.000	-2.630	0.0003	I (1) *
<b>RR</b>	-6.119	-3.750	-3.000	-2.630	0.0000	I (1) *

**Note:** The researcher has compiled the data. \* 1% Critical Value, \*\*5% Critical Value and \*\*\*10% Critical Value

**Source:** (Results from the use of Stata Version-15)

It has been found from the examination of Table 5 that the researcher performed tests on whether the interested variables are stationary and to determine their integration orders. The results indicate that all the variables are stationary. GDP, MSG, RIR, ER, INFR, and RR had p values are less than 5%. That showed the variables have stationary and no unit root. That indicates all the variables are significant for ARIMA regression analysis.

## 6. ANALYSIS OF EFFECTIVENESS OF MONETARY POLICY ON ECONOMIC PERFORMANCE

This research examines the influence of monetary policy on economic performance in Bangladesh, concentrating on Gross Domestic Product (GDP) as the dependent variable. It considers money supply growth, real interest rate, exchange rate, inflation rate, and repo rate as independent variables. The analysis utilizes both the Ordinary Least Squares (OLS) regression model and the ARIMA regression model to uncover the connections between these variables. Additionally, the study incorporates the outcomes of tests for normality, evaluations for multicollinearity, assessments for autocorrelation, and tests for stationarity.

**Table 6: Effectiveness of Monetary Policy on Economic Performance: OLS Regression Model**

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	
	B	Std. Error	Beta			
<b>(Constant)</b>	10.966	4.983		2.200	.115	
<b>MSG</b>	-.068	.059	-.365	-1.153	.332	
<b>RIR</b>	-.242	.112	-.395	-2.168	.039	
<b>ER</b>	.031	.052	.144	.597	.592	
<b>INFR</b>	.296	.171	.507	1.732	.044	
<b>RR</b>	-.915	.301	-.721	-3.036	.033	
	<b>Sum of Squares</b>	<b>df</b>	<b>Mean Square</b>	<b>Calculated value of F</b>	<b>Table value of F</b>	<b>Sig.</b>
<b>Regression</b>	4.357	5	.871	9.848	3.69	.044 <sup>b</sup>
<b>Residual</b>	.265	3	.088			
<b>Total</b>	4.622	8				
<b>r<sup>2</sup></b>	0.943					
<b>Adjusted r<sup>2</sup></b>	0.847					

**Note:** The researcher has compiled the data. Dependent Variable: GDP, Predictors: (Constant), MSG, RIR, ER, INFR and RR.

Source: (Results from the use of SPSS Version-23)

The Ordinary Least Squares (OLS) regression outcomes, as presented in Table 6, indicate a coefficient of determination ( $r^2$ ) value of 0.943. This value signifies that approximately 94.3% of the variation observed in Gross Domestic Product (GDP) can be elucidated collectively by money supply growth, real interest rate, exchange rate, inflation rate, and repo rate, while the remaining 5.7% of the variation may be attributed to other unaccounted factors outside this model. With  $r^2$  ranging from 0 to 1, higher values closer to 1 suggest a better model fit (Gujarati et al. 2012). Typically, an  $r^2$  exceeding 60% indicates a well-fitted model (Ozili & Peterson, 2016). In this study, the calculated  $r^2$  value of 0.943 demonstrates a robust model fit. Additionally, considering the overall number of variables incorporated in the hypothesis, the adjusted R-squared value of 0.847 reflects the extent to which the predictor factors account for the variation in the dependent variable. The alternative hypothesis posits that money supply growth, real interest rate, exchange rate, inflation rate, and repo rate collectively impact GDP, in contrast to the null hypothesis suggesting otherwise. Upon examination, the F-statistic yields a result of 9.848 with a probability of 0.044. The probability value of 4.4% is below the 5% threshold, while the computed F-value surpasses the tabular F-value of 3.69. Consequently, the alternative hypothesis is accepted, and the null hypothesis is rejected based on the F-test and the corresponding p-value. This indicates that the dependent variable, GDP, is collectively influenced by money supply growth, real interest rate, exchange rate, inflation rate, and repo rate.

Analyzing the individual variables, money supply growth is deemed non-significant due to a high probability value of 33.2%, indicating that it does not significantly explain the GDP variation. Its coefficient of -0.068 implies a negative association with GDP. In contrast, the real interest rate, with a p-value of 3.9% which is less than 5%, is considered a significant variable in explaining GDP. Its coefficient of -0.242 indicates a negative relationship with GDP. The exchange rate, with a p-value of 59.2%, is found non-significant in explaining GDP, and its coefficient of 0.031 indicates a positive association with GDP. The inflation rate, with a p-value of 4.4% which is less than 5%, is deemed significant in explaining GDP, and its coefficient of 0.296 implies a positive association. Lastly, the repo rate, with a p-value of 3.3% which is less than 5%, is considered significant in explaining GDP and its coefficient of -0.915 signifies a negative association. To sum up, the study identifies statistically significant associations between GDP and each of the independent variables, namely the repo rate, inflation rate, and real interest rate. Conversely, there is no substantial correlation observed between GDP and exchange rate or money supply growth. This underscores a robust connection between monetary policy and the economic performance, ultimately supporting the acceptance of the alternative hypothesis and the rejection of the null hypothesis.

**Table 7: The Impact that Monetary Policy has on Economic Growth: ARIMA Regression Model**

	Coefficients	Semi robust Std. Err.	z	P>  z	[95% Conf. Interval]	
<b>MSG</b>	-.0682147	.0345783	-1.97	0.049	-.1359869	-.0004425
<b>RIR</b>	-.2420441	.0470061	-5.15	0.000	-.3341744	-.1499139
<b>ER</b>	.0309761	.0247909	1.25	0.211	-.0176132	.0795655
<b>INFR</b>	.296143	.097957	3.02	0.003	.1041509	.4881352
<b>RR</b>	-.9146297	.1945846	-4.70	0.000	-1.296009	-.5332508

<b>-Cons</b>	10.96558	2.078658	5.28	0.000	6.891486	15.03968
<b>/Sigma</b>	.1717366	.0341149	5.03	0.000	.1048726	.2386005
<b>Number of obs</b>	9					
<b>Wald chi2(5)</b>	236.51					
<b>Prob&gt; Chi2</b>	0.000					

**Note:** The researcher has compiled the data. Dependent Variable: GDP, Predictors: (Constant), MSG, RIR, ER, INFR and RR

**Source:** (Results from the use of Stata Version-15)

The Autoregressive Integrated Moving Average model (ARIMA), also referred to as the Box-Jenkins model, was introduced by Box and Jenkins (1976) and is a widely utilized method for time-series forecasting. This approach involves analyzing historical and current data, exploring self-correlation and partial self-correlation functions, and other relevant characteristics to construct a three-stage model for forecasting and data analysis (Siami-Niami et al. 2018). ARIMA extends the Autoregressive Moving Average model by incorporating autoregressive terms (p) based on lagged observations and constructing a composite model of the time series using Moving Average processes (q) to account for dependencies between observations and residual error components. In this investigation, the ARIMA regression model was employed to investigate the relationship between Gross Domestic Product (GDP) and several independent variables, specifically money supply growth, real interest rate, exchange rate, inflation rate, and repo rate. The analysis encompassed nine observations, yielding a Wald chi2 statistic of 236.51 and a probability value of 0.000, indicating the overall significance of the model.

The study's results revealed a statistically significant correlation between money supply growth and GDP, as indicated by a p-value of 4.9% and a coefficient of -0.0682147. Similarly, the real interest rate displayed a statistically significant inverse correlation with GDP (p-value = 0.000, coefficient = -0.2420441). On the other hand, the inflation rate exhibited a significant and positive association with GDP (p-value = 0.003, coefficient = 0.296143). The repo rate demonstrated a statistically significant inverse correlation with GDP (p-value = 0.000, coefficient = -0.9146297). In contrast, the analysis did not identify a statistically significant correlation between the exchange rate and GDP (p-value = 0.211; positive coefficient = 0.0309761). In summary, this investigation established statistically significant correlations between Gross Domestic Product (GDP) and the following independent variables: money supply growth, real interest rate, inflation rate, and repo rate. However, no such correlation was observed between GDP and the exchange rate. The outcomes of this study underscore the substantial impact of monetary policy on the economic performance of Bangladesh. Consequently, the null hypothesis is rejected in favor of the alternative hypothesis. Thus, the research concludes that monetary policy significantly influences economic growth in Bangladesh, supported by both the OLS regression model and the ARIMA regression model.

## CONCLUSION

This research extensively investigated the intricate interplay between monetary policy and the economic performance of Bangladesh over a nine-year period, spanning from 2014 to 2022. The principal aim of this study was to elucidate the influence of specific monetary policy variables on the nation's Gross Domestic Product (GDP). The key independent variables under scrutiny encompass the expansion of the money supply, real exchange rates, interest rates, inflation rates, and repo rates. To unveil these relationships, two distinct regression models were employed: the Ordinary Least Squares (OLS) and the Autoregressive Integrated Moving Average (ARIMA). Our analysis using the OLS

regression model unveiled several significant findings. Specifically, we identified substantial correlations between GDP and real interest rates, inflation rates, and the repo rate. This indicates that alterations in these monetary policy variables hold substantial sway over Bangladesh's economic growth trajectory. These discoveries underscore the pivotal role played by interest rates and measures to control inflation in shaping the nation's economic landscape. It is noteworthy that the repo rate, symbolizing the central bank's lending rate to commercial banks, also emerged as a noteworthy determinant of economic performance. These findings underscore the significance of prudent management of monetary policy to effectively steer the economy. However, it is equally important to acknowledge the absence of substantial relationships between GDP and two critical variables: money supply growth and the exchange rate – within the framework of the OLS model. These findings suggest that, within the scope of this study, fluctuations in money supply growth and exchange rates may not decisively impact Bangladesh's GDP. This could imply that other factors or external influences might wield a more considerable influence on these specific economic outcomes. Shifting our focus to the ARIMA regression model, we unveiled a different set of outcomes. Here, all variables-with the exception of the exchange rate-demonstrated statistical significance in relation to their connection with GDP. Money supply growth, real interest rates, inflation rates, and repo rates all exhibited noteworthy associations with economic performance. These results reaffirm the significance of these monetary policy indicators in influencing GDP fluctuations in Bangladesh. The absence of a notable correlation between the exchange rate and GDP in the ARIMA model implies that, unlike other variables, the exchange rate may not have a central role in driving economic growth during the study period. It is crucial to recognize that the dynamics of exchange rates can be influenced by numerous external factors, including global economic conditions and trade relationships. In summary, this research provides valuable insights into the intricate relationship between monetary policy and economic performance in Bangladesh. While the OLS model highlighted the importance of real interest rates, inflation rates, and the repo rate; the ARIMA model underscored the significance of money supply growth, real interest rates, inflation rates, and repo rates.

These findings underscore the multifaceted nature of economic dynamics and the necessity for policymakers to judiciously consider these variables. Future research endeavors should delve further into contextual nuances and explore the repercussions of specific policy changes and external influences, contributing to a deeper comprehension of Bangladesh's economic landscape. In summary, this study adds to the ongoing discourse regarding the role of monetary policy in fostering economic stability and growth in Bangladesh, potentially influencing policy formulation and decision-making.

### **Statement of Research and Publication Ethics**

This study has been prepared in accordance with the rules of scientific research and publication ethics.

### **Authors' Contribution Rates**

Author 1's contribution to the article is 50%, author 2's contribution to the article is 50%.

### **Declaration of Interest**

There is no conflict of interest arising from the study from the point of view of the author or from the point of view of third parties.

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