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The Impact of Money Supply on National Income: An Empirical Analysis of Bangladesh

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Abstract

This study explores the complex issue of relationship between money supply and national income in Bangladesh. It narrates the determinants of per capita GDP based on data on seventeen years of information on 2006-2022. It uses a multiple regression model to assess different macroeconomic variables, such as the inflation rate, GDP growth, the real interest rate (RIR), and the narrow (M1), broad (M2), and total (M3) money aggregates and, therefore, provides a holistic examination of the factors that affect the per capita GDP. The model scores highly in explanatory power, as its R-squared estimate suggests that the chosen variables have an explanatory power that is capable of attributing a significant part of the range of variation of per capita GDP. More importantly, real interest rates have a statistically significant negative correlation with per capita GDP, such that an increase in the real interest rates is associated with a decrease in national income. On the contrary, the correlation between the per capita GDP and the different money supply indicators (M1, M2 and M3) have minimal statistical significance and this indicates that other determinants have a stronger impact on national income in the Bangladeshi environment. The findings provide policymakers and economists with practical information that is relevant to the management of economic growth and the monetary policy in Bangladesh.

INTRODUCTION

The connection between the amount of money in circulation and the amount of national income has become a constant debate in the last several decades. There still exists a controversy on whether output can be increased by money supply. This research hypotes that the development of national income is related to an appropriately calibrated money supply. The quantity theory of money holds the view that there exists a positive correlation between money supply and national income in Bangladesh. The study utilizes the Autoregressive Distributed Lag (ARDL) stationary model as an analytical tool and therefore attempts to prove causality between the stipulated variables. The monetary-income-price nexus has long been a controversial subject between Keynesian and monetarist schools of thought

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(Weintraub et al., 2016; Mansoor et al., 2018; Congdon, 2007). The current analysis is taking a short-term approach where price is presumed to be constant. As long as the investment demand curve is elastic and the demand of money is not of infinite elasticity, changes in money supply positively affect income; on the other hand, changes in money stock are brought about by changes in income instead of the vice versa. The economy of Bangladesh is deeply dependent on agriculture and ready-made garments (RMG) industry, which have a high price volatility rate, which is also a major source of national income (Jiban et al., 2022). The association between money supply and output is dubious. Other researchers have doubted the fact that money supply has an influence on the economic variables, especially the income. According to classical economists money supply cannot influence the output, however, according to monetarists money is the only factor that can influence the overall level of the economy particularly prices. To monetarists, money supply may affect the level of income or output in the short-run perspective, but in the long-run, it is believed that additional growth in money supply would only result in the corresponding increase in the price level only. The main aim of this paper is to explore the connection of money supply and income between the years 2005 and 2023. As a result, the study will address a gap in the current literature by examining the nexus in the failover between money supply and economic growth in the income path of Bangladesh.

The change in the amount of money is one of the most important factors that define the economic growth rate, and the nation that pays much academic attention to the behaviour of the aggregate money supply is normally less volatile in the economic performance (Robinson, 1952; Chaitip et al., 2015; Hämäläinen, 2003). This research is expected to show the causality between broad money supply and gross domestic product, which will equip policy-makers with empirical data on formulating a more realistic monetary policy that can create a positive push in the GDP of Bangladesh. The amount of money in the economy and money to be used should be subject to strict research to draw the information on economic development. However, the supply of money has a strong impact on the economic activity which is directly related to inflation. Increased money supply at a rate higher than the real GDP leads to inflation, on a relatively constant velocity of circulation. To this end, the relationship between the money supply mechanism and the GDP needs to be of special attention in order to ascertain causality, sensitivity, and counterbalancing that is present between the two variables.

The interrelationship between money supply and national income is a key aspect in the economy of Bangladesh. Being a developing economy, Bangladesh is quite prone to changes in aggregate monetary holdings, which also represent the overall amount of money in the domestic market. The shifts in the money supply have dramatic impacts on the main macroeconomic indicators, i.e., inflation, investment, consumption, and, finally, the aggregate level of national income (Doan Van, 2020; Alexandrov et al., 2021; Chugunov et al., 2021). Unraveling this association is crucial to policy makers required to come up with functional monetary policies that facilitate fiscal balance and sustainable development. Using the history of time-series data and using econometric methodologies, the researchers are trying to understand the complex relationships between monetary expansion and national income and hence explain how the changes in one variable pass to the other. The findings obtained through these sorts of analyses provide policy makers with concrete evidence to make prudent changes in its monetary policies to eventually set the country on the path of sustainable economic growth (Rana and Al Mamun, 2024; Chakraborty, 2024).

The economic growth in Bangladesh has been quite significant in the last few decades, which was catalyzed by industrialization, export development, and the inflows of remittances (Ahmed and Uddin, 2009; Hasan et al., 2019). However,

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accurate interpretation of money supply and national income relationship is still mandatory towards the formulation of an effective monetary policy that supports economic stability and growth. This research paper attempts to dig the delicate connection between the amount of money in circulation and the amount of national income in Bangladesh. Through the analysis of past data sets and the use of sophisticated econometric methods, the study aims to produce a set of subtle results regarding the moderating effects of the changes in money supply on the aggregate economic activity and income distribution in the nation (Oluseyi et al., 2017).

Literature Review

The interdependence of economic growth, the supply of monetary and inflation presents a universal trend, which manifests itself differently in particular situations of the state. The possible causal nexus between monetary expansion and the general price level and macro-economic growth is a topic that has been investigated by many scholars. This part engages in a detailed analysis of conflicting views about the relationship existing between monetary supply and income or GDP. It is structured into two subsections the first is the one with arguments in favor of the view that there is a strong relationship between monetary supply and income and the second is dealing with the positions that do not show a significant correlation among the variables under study.

The authors of the article Mansoor et al. (2018) are interested in exploring the causal and long-run correlation between monetary supply and price level and economic growth in Pakistan during the timeframe 1980-2016. Using an Autoregressive Distributed Lag (ARDL) model, they concluded that the long-run equilibrium between the three variables existed especially when broad money supply is taken into account. They affirm that economic growth has a positive impact and support the causal impact of monetary supply. Hussain and Haque (2017) investigated the relationship between monetary supply and economic growth in the form of the growth in per-capita GDP in Bangladesh over 1972 to 2014. Both the long-run and short-run analysis reveal that monetary supply plays a central role in the output. Equally, Aslam (2016) analyzed the effect of money supply on the economy of Sri Lanka during 1959-2013 and found out that its effect was very positive on the growth of the economy. In the study of interrelations of GDP, interest rates, CPI, and inflation rates in Pakistan, Ihsan and Anjum (2013) conducted regression analysis of the variables over a 2000-2011-time span.

They discovered that GDP and inflation have a high impact of CPI and interest rates. In their article, Abdullah, Parvez, and Tooheen (2012) considered the effects of inflation on the GDP growth in constant prices and the interaction of inflation and monetary policy in Bangladesh across 20002011. Their findings indicate that there is co-occurrence of the inflation rates with the GDP growth rates and monetary supply and show that the inflation and GDP growth at constant prices are positively correlated and monetary supply and inflation are negatively correlated. Hossain (2012) empirically tested the inflation growth relationship in Bangladesh using Augmented Dickey Fuller and Phillips perron tests to the years 1978-2010; he also did not find any relationship of cointegration between inflation and economic growth. Ahmed and Mortaza (2005) examined the nexus between inflation and growth in Bangladesh through the cointegration and error-correction model using annual data between 1980 and 2005 on real GDP and inflation. They found statistically significant long-run correlation between economic growth and inflation in the country.

Ahmed and Suliman (2011) examined how inflation, money supply and the GDP interrelate between the years 1960 and 2005 in Sudan using the Granger causality test and co-integration methods. Augmented DickeyFuller tests showed that both the

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GDP and the CPI had unit roots in their level series. Co-integration diagnostics were used to ensure that there was a long-run relationship between the three variables. According to the Granger causality model, the causal relationship between the money supply and the prices is in the former to the latter direction.

Further empirical studies have also reported that an upsurge of the money supply, and indeed, the monetary policy in general, positively affected economic growth. Agbonlahor (2014) used the United Kingdom as the example in 1940-2012, Omodero (2019) worked with the economy of Ghana in 2009-2018, Ingabire et al. (2020) with the example of Rwanda during 2008-2018, and Jawaid, Qadri, and Ali (2011) with the example of Pakistan in 1981-2009. All these researches supported the positive influence of the monetary supply on growth. Senbet (2011) evaluated the influence of the monetary policy on the United States in the period 1959-2010. His results are much more consistent with the Monetarist dogma, showing a statistically significant effect of the monetary policy on the economy of the U.S. Conversely, there are contradictory findings between the empirical evidence on Indonesia. Prihatin, Arintoko, and Suharno (2019) studied the impact of monetary variables on the growth in Indonesia and found that money supply had a strong yet negative impact. Hasan (2021) then objected to this result, not finding a relationship between the money supply and GDP in the case of Indonesia and attributes the difference to the model restrictions, especially when the money supply is added to the empirical specification.

In its turn, a considerable amount of literature has challenged the Monetarist view. Those studies could not reveal enough evidence as to substantive effect of monetary aggregates on income levels. Inam and Ime (2017) evaluated how monetary policy tools affect the economy of Nigeria in the years 1970 to 2012. Similarly, Omodero (2019) has recorded that the broad money supply (M2) has a negligible negative impact on real GDP in Nigeria. These conclusions are not in line with the results made by Babatunde and Shuaibu (2011) and Enyim et al. (2013). They found the positive yet statistically unimportant correlation between money supply and economic growth, and also revealed no causal relationship between the two variables (Inam and Ime, 2017). In their study, Masih and AbdulKarim (2014) explored the connection between different macroeconomic variables in the Nigerian economy between 1970 and 2012, output, and money supply. The findings of their work are consistent with the findings of Inam and Ime (2017), which confirms the conclusion that money supply has not shown any positive impact on the economic growth in the Nigerian state. Precious and Makhetha-Kosi (2014) analyzed how the monetary policy can generate economic growth in South Africa within the period of 2000-2010. Though the analysis has reported a long run relationship between the variables, it finally reaches a conclusion that money supply does not have any significant impact on economic growth. Similarly, Kamaan (2014) evaluated the effect of monetary policy on the economic growth of Kenya, and the results showed that monetary policy has negligible effects on the economy, especially in the short-term.

METHODS

Sources of Data

A Study of the Relationship between Money Supply and the Level of National Income in Bangladesh in the period from 2005-2023. The data for this paper was obtained from secondary sources. Secondary sources encompassed financial data from financial statements of the Bangladesh Bank BB. This was taken because this type of data was easily accessible from the Bangladesh Bank (BB) and the Bangladesh Bureau Statistics (BBS) Reports.

Description of Research Variables

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Dependent Variable

Per Capital (PC) GDP Growth Rate:

Per Capita Gross Domestic Product (GDP)- Growth rate refers to the percentage change in the overall economic output of a country within a specific period of time. It forms a key proxy of assessing the economic performance and standard of living in a state. In this context, GDP per Capita can be defined as the overall economic output of a nation divided by the resident population. The growth rate is calculated by comparing the values of the GDP per Capita of two consecutive years.

Independent Variable

Broad Money (M2) is discussed as one of the major monetary aggregators, which help to explain the overall supply of money, as well as the current economic environment of a country. M2 is a broad conception of money, which goes beyond the skin and bone of M1. It also includes not just physical money and the demand deposits (the elements that comprise M1), but also near money, which are liquid assets that can readily be turned into cash. The paper is a comprehensive analysis of the components of M2, how it is determined quantitatively and which of the prescribed indicators reflect the state of economic health.

Real Interest rate, an important economic indicator, is more than nominal rates, as it incorporates inflationary adjustments hence providing a more accurate calculation of the true cost of financing and the rate of returns on investment. The given paper explains the intricacies of Real Interest Rates, the calculation and the subsequent implication of economic decision-making. Real Interest Rates are a pillar of economic analysis as they give a refined view of the real price of capital.

Econometric Model

The two econometric frameworks mainly used in obtaining the empirical findings in the manuscript include the initial one that evaluates the short-run and long-run relationships between the yearly per capita GDP growth rate, money supply (M2), and real interest rate based on the Engle-Granger (1987) paradigm. The secondary model uses a co-integration method and the attendant ErrorCorrection Model (ECM) scheme to examine the relationship between these variables.

Experiments have been conducted in both levels (annual per Capita GDP growth rate, real interest rate, and broad money (M2) as a percentage of GDP) and in first difference. The estimation of the next co-integration regression is considered to be appropriate when the two time series seem to have been set together of the same order:

$$PC\ (GDP)\ Growth\ Rate = a + \beta\ BM\ (m2)\ to\ GDP\ Growth\ Rate + \beta\ RIR + \mu \quad (1)$$

$$BM\ (m2)\ to\ GDP\ Growth\ Rate = a + \beta\ PC\ (GDP)\ Growth\ Rate + \beta\ RIR + \mu \quad (2)$$

Here,

PC = Per Capita

BM= Broad Money

RIR= Real Interest Rate

In their paper, Engle and Granger (1987) show that if two variables are co-integrated, i.e., there is a valid long-run relationship. Then there exists a corresponding short-run relationship. This is popularly known as Granger's Representation Theorem. Hendry's (1979, 1995) general-to-specific approach has been applied in this case where the model (ECM) is used in the following form.

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Δ PC (GDP) Growth Rate = a+ €β ΔBM (m2) to GDP Growth Rate + €β ΔRIR + €β PC (GDP) Growth Rate - θ μ+ μ…… (3)

RESULTS AND DISCUSSION

This part outlines the empirical results of a study on the connection between money supply and national income in Bangladesh between 2006 and 2022. It is based on the macroeconomic data of the annual macroeconomic variables, including per capita gross domestic product (GDP), GDP growth, broad money supply (M2), narrow money supply (M1), total money supply (M3), real interest rate (RIR), and inflation rate. The main objective is to determine the level at which changes in the level of money supply and interest rate explain changes in per capita GDP and hence explain the relationship that exists between monetary policy and economic growth. The findings are organized in three consecutive steps. At the outset, some descriptive statistics are given to provide a summary of distributional properties and dispersion of the data. Correlation analysis is then done to address the strength and direction of the associations of the variables. Lastly, it uses multiple regression analysis to both test the theoretical hypotheses and to determine the best salient predictors of per capita GDP growth in Bangladeshi context.

Descriptive Statistics

Table 1. Descriptive statistics

	N	Minimum	Maximum	Mean	Std. Deviation
per capital GDP	17	2.231	34.304	10.679	6.930
GDP Growth	17	3.45	7.88	6.372	1.016
Narrow Money Supply (M1)	17	-5.243	50.799	16.275	14.332
broad money supply (M2)	17	-54.532	21.078	9.593	17.294
money supply(M3)	17	-4.428	43.143	15.245	9.302
real interest rate (RIR)	17	-13.642	6.886	3.262	4.585
Inflation rate	17	5.43	11.40	6.938	1.677
Valid N (listwise)	17				

Table 1 shows descriptive statistics that offer an explanation of several economic indicators based on a sample of seventeen observations. The indicators include per capita gross domestic product (GDP), growth in GDP, narrow money supply (M1), broad money supply (M2), total money supply (M3), real interest rate (RIR) and inflation rate. The Minimum and the Maximum values reported outline the limits of the changes within the dataset. Here, the range of per capita GDP is between 2.23123-34.30420 which implies there is a massive heterogeneity in economic prosperity across the entities considered. The “Mean” refers to average of each variable; therefore, the average GDP growth is 6.3729 which means the mean rate of economic growth of the entities that have been observed. The standard deviation measures the spread of the observations about the corresponding means. The high values, which are experienced in narrow money supply (M1) and broad money supply (M2), mean increased variability in these measures.

Correlation Matrix

Table 2. Correlation Matrix

Variables	PC GDP	GDP Growth	M1	M2	M3	RIR	Inflation Rate
PC GDP	1	0.159	-0.088	0.025	-0.165	-0.849	-0.049
		(0.543)	(0.737)	(0.923)	(0.526)	(0.000)	(0.851)

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GDP Growth	0.159	1	-0.470	0.244	-0.129	-0.130	0.014
	(0.543)		(0.057)	(0.345)	(0.623)	(0.620)	(0.958)
M1	-0.088	-0.470	1	0.145	0.165	-0.045	-0.183
	(0.737)	(0.057)		(0.579)	(0.528)	(0.865)	(0.483)
M2	0.025	0.244	0.145	1	-0.025	0.030	0.299
	(0.923)	(0.345)	(0.579)		(0.926)	(0.908)	(0.243)
M3	-0.165	-0.129	0.165	-0.025	1	-0.017	-0.384
	(0.526)	(0.623)	(0.528)	(0.926)		(0.947)	(0.128)
RIR	-0.849	-0.130	-0.045	0.030	-0.017	1	0.221
	(0.000)	(0.620)	(0.865)	(0.908)	(0.947)		(0.395)
inflation Rate	-0.049	0.014	-0.183	0.299	-0.384	0.221	1
	(0.851)	(0.958)	(0.483)	(0.243)	(0.128)	(0.395)	

**. Correlation is significant at the 0.01 level (2-tailed).

The Pearson correlation coefficients (r) and the corresponding p -value of the relationships between per capita GDP (PC GDP), GDP growth and a combination of monetary and price level variables, Narrow Money Supply (M1), Broad Money Supply (M2), Money Supply (M3), Real Interest Rate (RIR), and Inflation rate are provided in Table 1. The inverse relationship between PC GDP and RIR is also statistically significant and especially strong (r 0.849, p 0.000) indicating that the high level of real interest rates is closely related to lower values of per capita GDP. The correlations between PC GDP itself with GDP growth, M1, M2, M3, and inflation are relatively weak and fail to obtain conventional levels of statistical significance which means that the variables have little direct effect on PC GDP in the present dataset. Moreover, the growth of GDP is moderately and only slightly significantly negatively related with M1 (r -0.470, p -0.057), which suggests that there could be an inverse relationship between them and further study is needed. On the whole, the data demonstrate that RIR is the most significant variable that can be used to explain cross-sectional variation in per capita GDP.

Regression Results

Coefficient of determination is denoted as R 2; it is the fraction of the total variance in the dependent variable (per capita GDP) caused by the linear combination of the independent variables in the model. In this analysis, the R 2 is 0.878, which means that about 87.8 percent of the variance that the predictors explain is the per capita GDP. Accordingly, the R statistic as the square root of R 2, indicates the magnitude of the linear relationship between the predicted and observed values of the dependent variable.

Table 3. Regression Analysis Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	0.878	0.770	0.632	4.203	1.026

In this case, the coefficient of determination, R 2 is stated to be 0.770 which means that some 77 0 precent of the variance in per capita gross domestic product is explained by the predictors used in this model. The figure shown is an expression of the R 2 which has been adjusted to include a penalty on the number of explanatory variables in the regression (adjusted R 2). The purpose of this change is to control the possible inflation of the explanatory power caused by the presence of unnecessary predictors that do not bring a significant contribution to the predictive power of the model; adjusted R 2 in the current analysis is 0.632.

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The statistic also measures the existence of autocorrelation- correlation between the successive residuals within the data set. The range of Durbin-Watson (DW) test is 0 to 4, and the value two indicates flawless lack of serial correlation. Values close to 0 indicate that there is a positive serial correlation and values close to 4 indicate negative serial correlation. In the given case, the value of DW reported is 1.026, implying that the presence of any autocorrelation is minimal or non-existent.

Table 4. Coefficients of Regression Analysis

Model	**Unstandardized Coefficients**		**Standardized Coefficients**		**t**	**Sig.**
1	**B**	**Std. Error**	**Beta**	**Std. Error**		
(Constant)	18.346	12.231	-		1.500	0.165
Broad Money Supply (M2)	0.026	0.072	0.066	0.367	0.722	
Narrow Money Supply (M1)	-0.062	0.092	-0.128	-0.672	0.517	
Money Supply (M3)	-0.109	0.125	-0.147	-0.876	0.401	
GDP Growth	-0.347	1.316	-0.051	-0.264	0.797	
Real Interest Rate (RIR)	-1.324	0.238	-0.876	-5.552	0.000	
Inflation Rate	0.186	0.768	0.045	0.242	0.814	

Table 4 lists the regression coefficients obtained as a result of a multivariate regression analysis in which per capita Gross Domestic Product (GDP) is the dependent variable. The predictors used to explain it are the plural types of monetary aggregates such as broad money supply (M2), narrow money supply (M1) and money supply (M3), and macro-economic variables such as GDP growth, real interest rate, (RIR) and the inflation rate. The unstandardised coefficients (B) are used to quantify the absolute change in the per capita GDP which can be attributed to a one unit change in each of the predictors when all the other covariates are held constant. As an example, the coefficient of M2 is 0.026, which means that a 1-unit increase in broad money supply is expected to increase per capita GDP by a 0.026-unit, where other things are held constant.

Standardised coefficients (Beta) are used to indicate changes in standard deviations of the dependent variable to a one-standard-deviation change in the predictor. They provide a relative importance of predictors. Under the current model, the normalized coefficient of RIR is -0.876, which means with one standard deviation increase in RIR this will result in a 0.876 standard deviation decrease in per capita GDP.

The t -statistic assesses level of statistical significance of each of the estimated coefficient by dividing the coefficient by its standard error. Greater absolute t -values indicate more significant rejection of the null hypothesis that the coefficient is zero. The t-value of RIR = -5.552 thus indicating that the coefficient of RIR is significant. The corresponding p -value (Sig.) is the likelihood of obtaining the given approximate coefficient with the null hypothesis being true. The less the p-value, the larger is the statistical significance. The p-value of RIR is 0.000, which supports the statistical significance of RIR coefficient at standard levels of significance.

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CONCLUSION

This paper sheds light on the nexus point of monetary growth and aggregate national income in Bangladesh. By examining the historical data thoroughly down to the use of sophisticated econometrical methods, it has been shown that changes in money supply have a significant impact on the aggregate economic activity and income distribution in the country. The discussion also highlights the importance of the real interest rate (RIR) in determining per capita GDP. The negative relationship between RIR and per capita GDP has been observed and this implies that policy efforts to lower real interest rates have a potential to trigger economic growth and improvement in living standards. However, it is necessary to consider the macroeconomic environment in general and the trade-offs that are likely to be faced when this policy is undertaken, carefully. Although the correlations between other variables including the inflation rate, GDP growth, and other money supply aggregates and per capita GDP in our results are relatively diluted, they still give useful information about the overall economic environment. The policymakers must thus continue to observe these indicators and evaluate their effects on economic growth in order to develop better interventions.

In addition, the paper emphasizes the importance of carefully tuned monetary policy instruments in order to control the money supply effectively as well as to protect macroeconomic stability. The policymakers should be on the lookout and take the initiative of changing monetary policies as per the changing economic and external factors. Financial literacy and responsible financial behavior can further help to provide a more stable and resilient economic environment by increasing financial literacy and responsible financial behavior across the population.

Recommendations

Guided by the evidence provided, the decrease of real interest rates as a tool of economic growth stimulation should be prioritized by the policymakers since the relationship between RIR and per capita GDP is important significantly negative. Nevertheless, the analysis should go beyond the sphere of the money supply per se since the analysis does not find any significant statistical correlation between per capita GDP and the different aggregates of money supply (M1, M2, and M3). Monetary policy should be reinforced with measures to enhance financial literacy and inclusive access to financial services to enhance economic resilience. Further studies should include more macroeconomic determinants to include foreign direct investment (FDI) and government expenditure to study the determinants of national income in greater depth and to guide the development of more effective economic policies.

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