JnU Journal of Economics Vol. 4, No. 1, December 2022, (Page 112–133) ISSN: 2707-0689

Interrelationship between Financial Development, Monetary Policy Instruments and Economic Growth in Bangladesh

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Abstract

We investigate the relationship between financial sector development and economic growth in Bangladesh using time series data for the period 1974-2019. We also examine the impacts of monetary policy instruments on economic growth. In the Vector Error Correction Model (VECM) framework, we use Johansen Co-integration test and the Granger-causality test and found a long-run causal relationship between financial development and economic growth. The error correction rate is 189.5 percent implying a faster adjustment towards long-run equilibrium, thereby ensure the occurrence of a stable long run relationship between the variables. Our short-run Granger causality test reports the existence of short-run unidirectional causalities from broad money and rate of inflation to GDP growth. The results of cointegration test suggest that the gross domestic savings has a favorable long-term effect on GDP growth rate. The rate of inflation also affects GDP in a favorable way. Our findings are likely to assist policymakers in rethinking policies focusing on financial development and monetary policy instruments to enhance economic growth.

Keywords: Bangladesh, financial development, monetary policy instrument, economic growth, VECM, co-integration

1. Introduction

In many developing countries financial sector plays a critical role as it promotes long-term growth, mobilizes savings, and increases productivity. Financial sector development further boosts growth and improves capital formation efficiency, as well as facilitates the transfer of funds (Chakraborty, 2008). As such, financial development can be a critical contributor to any growing country's economic progress. Monetary policy is also considered a strategy for economic growth by increasing investment. The two main objectives of monetary policy are to accelerate the growth of investment and control over inflation, which are closely related to the financial sector development (Mehar, 2023). Together, the financial system and

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monetary policy instruments can improve the efficiency of physical and human capital, promoting innovative activity (Okoroafor, 2020).

Like many other countries, Bangladesh's financial system is divided into three categories – formal sector, semi-formal sector and informal sector. The formal sector includes all regulated institutions such as banks, non-bank financial institutions, capital market intermediaries, insurance companies, and micro-finance institutions. Semi-formal institutions are those that are regulated but not fall under the jurisdiction of a central bank, securities commission or insurance body. The informal sector refers to private institutions that are completely unregulated (Hussain, Ahmed & Eaquab, 1998). Financial sector development is determined by the efficiency and stability of the economic system, which comprises markets, intermediaries, a range of assets, institutions and regulations, as well as its size, depth and accessibility. The longer the economic flight, the higher the level of monetary development, and greater the variety of financial services (WEF, 2012).

The historical data on financial development index reveals that while poor nations like Bangladesh achieved little progress, advanced economies and emerging markets improved significantly (Svirydzenka, 2016). To catch up with the advanced and emerging economics, the developing countries like Bangladesh need to focus on the improvement of their financial development indicators.

Broad money, domestic credit, gross capital formation, and gross domestic savings are examples of monetary policy instruments that help improve liquidity, and boosts economic growth. Economists employ a variety of definitions for monetary policy instruments. According to Einsig (1954), monetary policy includes all financial decisions and measures, regardless of whether the goals are financial or non-monetary, and all financial acts that aim to affect the medium of exchange. Patat (1987) defines monetary policy as work done by the central bank to control the money supply as a tool for achieving economic policy objectives. Domestic credit circulation, broad money, gross domestic savings, and gross capital formation are all elements of monetary policy instruments. As these indicators are related to monetary policy instruments tools, their relationship with economic growth should also be considered.

There is a lack of consensus in the existing literature regarding the effects of financial sector development and monetary policy instruments on economic growth. Studies focusing Bangladesh on this issue are very scant, and also produce conflicting results. Therefore, it is necessary to further investigate this matter in the context of Bangladesh. In this paper, we investigate how financial sector development and monetary policy instruments affect economic growth in Bangladesh. We also examine the causal relationships between them both in the long-run and short-run. Our findings have some policy implications to enhance economic growth.

The remainder of the paper is organized as follows. Following Introduction, Section 2 provides a brief literature review. Methodological aspects and data are

described in Section 3. The estimated results are discussed in Section 4, while Section 5 draws conclusion with some policy recommendations.

2. Literature Review

The interrelationship between financial sector development as well as monetary policy instruments and economic growth have been widely discussed in theoretical and empirical literature. This section reviews the main contribution of recent literature to identify the research gap for this paper.

2.1 Theoretical Literature

Theoretical literature established a strong linkage between financial development and economic growth. A well-developed financial system promotes economic growth by efficiently using savings in investment and capital formation (Schumpeter, 1934; Gurley & Shaw, 1955; Goldsmith, 1969; King & Levine, 1993; Greenwood, 1997). Schumpeter (1934) emphasized the necessity of adopting new technologies to stimulate economic growth. According to him, an efficient financial system promotes technological development, which in turn promotes economic growth. As opposed to this view, McKinnon and Shaw (1973) argued that in the absence of excessive regulations in the capital market, households are encouraged to save more, raising the amount of investment and foster economic growth.

The "debt-accumulation" theory put forward by Gurley and Shaw (1955) serves as the foundation for the quantifiable channel, also known as the capital accumulation channel. According to this theory, growth occurs when people save a portion of their disposable income and invest it in capital accumulation. The financial sector development helps investing these savings into productive sectors and capital accumulation. In contrary, Robinson (1952) expressed skepticism about the role of financial development in economic growth, stating that financial development occurs after economic growth.

Assuming unemployment and price restriction, Keynes (1936) looked into the factors that influence demand for money. People keep money for three reasons: transaction, precaution and speculation. The choice an individual makes regarding holding cash vs owning bonds, which depends on both the opportunity cost of holding cash and the return or interest rate of bonds, is referred to as speculative motive for holding money. Individuals prefer to maintain money balances speculatively when bond yields are lower. The money demand function can be represented in Keynesian theory as $\left(\frac{M}{P}\right)^{D} = \alpha + \frac{\beta}{I-i}\ ,\ \alpha > 0,\ \beta > 0.$

Where, I stands for the market interest rate and i for the liquidity trap interest rate – both of which are assumed to be equal. As a result, the market interest rate and the demand for real balance are inversely related. "Liquidity trap" describes a predicament in which the interest rate does not decline despite increased domestic credit creation, indicating that expansionary monetary policy is inefficient. The only predictor of projected investment in this system is the interest rate. According to this

idea, growth is slowed by high interest rates, and these rates cannot be significantly decreased in order to boost investment, output, or employment.

In neoclassical model, two fundamental tenets are – the capital market is both flawless and costless, and it operates efficiently. Money's primary function is to satisfy the transactional motive, yet it has no physical consequences in the buildup of capital. In a neoclassical perspective, the concept of money demand can be stated as $\left(\frac{M}{P}\right)^D = f\left(Y, R_{Capital,} R_{Money}\right); \quad f_y > 0, \quad f_{R_{Capital}} < 0, \quad f_{R_{Money}} > 0$

In the equation above, real money demand and actual income are denoted by $\left(\frac{M}{P}\right)^D$ and Y, respectively. The real rate of return on capital and the real rate of return on money are denoted by $R_{capital}$ and R_{money}, respectively. The equation demonstrates that income is positively correlated with money demand due to transactions. Furthermore, one of the model's key assumptions is that money and capital are interchangeable. As a result, the need for physical capital declines as the real rate of return increases. On the other hand, holding sizable actual cash amounts will hinder capital accumulation. This means that $R_{Capital}$ has an inverse relationship with $\left(\frac{M}{P}\right)^D$, but R_{Moeny} has a positive relationship with $\left(\frac{M}{P}\right)^D$. In order to get the maximum rate of return on both capital and money, an optimal interest rate is therefore necessary to encourage economic growth. Money supply, also known as liquid liabilities, is a crucial component of financial development, thus it should be kept as high as possible. It has a negative and positive relationship with money and capital return.

The new growth theory was partially created as a result of the failure of the neoclassical growth model to foretell the future. The endogenous growth model established primarily by Romer (1986) with the emphasis on the hypothesis that economic growth is primarily achieved by long-run creativity rather than capital accumulation. According to the basic tenet of the endogenous growth hypothesis, capital increases as a result of high savings rate, which promote growth. However, in order to achieve stronger long-term growth, an economy must promote technological innovation. Human capital and institutions promote technological innovation and raise living standards. Lucas (1988) developed the idea that a healthy financial system fosters the implementation of new firms with improved technology. Therefore, financial system development can promote economic growth through technological improvement. According to neoclassical growth model, financial development is unable to promote long-run growth because technical innovation is assumed to be exogenous.

Endogenous growth models provide the theoretical foundation for financial intermediation and its impact on economic growth. Pagano (1993) emphasized the significance of the financial sector on economic growth, in light of endogenous growth model. Pagano used an AK model with a simple endogenous growth setup. The assumption is that the manufacturing process requires just capital (K_t) and that

the production function has constant returns to scale. Pagano's model also assumed that capital depreciates at a rate of δ and population growth rate is zero. So, the capital accumulation is given as $K_{t+1} = I_t + (1-\delta)K_t$. A portion of one's savings is lost throughout the financial intermediation process. However, investment receives a share of total savings (ϕ). An inefficient financial system is one that causes savings to be lost during financial intermediation. As a result, the saving-investment connection is denoted by $I_{t=}\, \phi S_t$, and the steady-state growth rate (g) is denoted by $g = \frac{K_{t+1}-K_t}{K_t} = \frac{I_t+(1-\delta)K_t-K_t}{K_t} = \frac{\phi S_t}{K_t} - \delta = A\phi S_t - \delta$, where, $s_t = \frac{S_t}{Y_t} = \frac{S_t}{AK_t}$. The equation above shows how financial development can have three different effects on growth. (i) Increasing the share of savings channeled to investments (ϕ); (ii) increasing the marginal productivity of capital (A); and (iii) an effect on the savings rate (s).

2.2 Empirical Literature

Recent empirical literature investigated the linkage between financial development and economic growth by using both cross-country and single-country approaches. Ahmad and Malik (2009) used panel data for 35 developing countries to examine the role of financial sector development on economic growth and found a positive impact. This study concluded that the positive impact of financial sector development on economic growth mainly channeled through its effects on efficient resource allocation but not on capital accumulation. Guru and Yadav (2019) used panel data from 1993 to 2014 for Brazil, Russia, India, China and South Africa (BRICS), and found that banking development indicators positively affect economic growth while banking sector development and stock market development indicators are complementary to each other in determining economic growth. Many other cross-county studies (King & Levine, 1993; Levine, Loayza & Beck, 2000; Jalilian & Kirkpatrick, 2005; Kumbhakar & Mavrotas, 2005) suggested that financial sector development positively affect economic growth while some studies (Favara, 2003; Shan, 2005) did not find a strong relationship between them.

A large number of studies used single-country approach to examine how financial sector development affects economic growth in a country. Puatwoe and Piabuo (2017) employed Auto Regressive Distributive Lag (ARDL) technique to investigate the effects of financial sector development on economic growth in Cameroon using time series data from 1980 to 2014. Their investigation confirmed a positive long-run impact of financial sector development on economic growth. Similar growth effects were found by Majid (2008), Kargbo and Adamu (2009), Arabi (2014), and Sehrawat and Giri (2018) in case of Malaysia, Sierra Leone, Sudan and India respectively. Adu, Marbuah, and Mensah (2013) investigated the long-run growth effects of financial development on economic growth in Ghana and found that growth effects depend on the indicators used to proxy for financial development. Musakwa and Odhiambo (2022) re-examined the relationship between financial development and economic growth in Botswana using data from 1980 to 2020 and failed to establish any causal relationship between these two.

Ahiadorme (2022) investigated the role of monetary policy on economic growth using a large sample of countries and found that monetary policy that aims at low inflation and stable economic growth is likely to improve growth inclusiveness permanently. Mehar (2023) examined the role of monetary policy on economic growth using data of 186 countries and concluded that credit to private sector and external debt positively affect economic growth through improved investment in infrastructure. Waty (2014) examined the monetary policy instruments in the form of open market operation, reserve requirements and discount rate on economic growth in Indonesia and found that any shock on monetary policy instruments negatively affect Indonesian economic growth. Tule, Ogundele and Apinran (2018) found that consumer price index, real exchange rate, money supply and interest rate all are crucial monetary policy instruments in fostering economic growth in Nigeria. Ahmad (2016) found a long-term relationship between money supply and exchange rate, which have a favorable effect on economic growth in Pakistan. Obeid and Awad (2017) revealed that monetary policy instruments enhance both long-run and short-run real GDP growth.

Recent empirical analysis examining the relationship between financial sector development, monetary policy instruments and economic growth in the context of Bangladesh are very rare. Biplob and Haider (2018) examined the causal relationship between financial development and economic growth and found a significant long-run causality from financial development to economic growth in Bangladesh. Qamruzzaman and Jianguo (2017) found positive and statistically significant relationships between proxies of financial innovation and economic growth in Bangladesh. This study also confirmed reverse causality between economic growth and two proxies of financial innovation both in the short-run and long-run. Islam, Habib and Khan (2004) analyzed the causal relationship between financial development and economic growth in Bangladesh using data from 1975 to 2002 and failed to establish any causal relations form financial development to economic growth. Their empirical results confirmed reverse causality running from economic growth to financial development in Bangladesh.

The existing literature analyzing the effects of financial development and monetary policy instruments on economic growth expressed divergent views. The empirical studies also expressed conflicting results about the direction of causality between financial development and economic growth both in the short-run and long-run. The literature focusing on the effects of financial development and monetary policy instruments on economic growth in Bangladesh are very rare. Within these limited Bangladesh specific studies there is also a lack of consensus.

3. Data and Methodology

3.1 Data and Variables

We construct our time series data for both dependent and independent variables for the period 1974–2019 using the World Bank's World Development Indicators

(WDI) database.[3] We use GDP growth rate as a stand-in for economic growth. The growth rates of domestic savings, domestic credit to private sector, and broad money (M2) are employed as proxies to financial development. Two macroeconomic measures – gross capital formation and rate of inflation are used to analyze their impact on economic growth.

In this study, the dependent variable GDP is measured as annual average growth rate. The amount of broad money (BM), measured as a share of GDP, is anticipated to affect GDP either favorably or unfavorably. Domestic credit to the private sector (DCPS) and gross capital formation (GCF), both measured as percentage of GDP, are expected to affect GDP in positive ways. Gross domestic savings (GDS) as a percentage of GDP may have a positive or negative impact on GDP. The rate of inflation measured by GDP deflator is expected to have a negative impact on GDP.

3.2 Method

We examine the relationship between financial development and economic growth as well as the monetary policy instruments and economic growth using the Vector Error Correction Model (VECM). This method provides a dynamic pattern with unique characteristics, such as a current state of change from a long-term relationship and an internal mechanism to adjust to a short-term position over time. The same amount of cointegration is required to ensure a long-term relationship between variables. Under this strategy, the error correction term must be negative and statistically different from zero. It shows how the parameters re-unite towards their long-term values at different speeds.

The Johansen technique is a system-based approach to cointegration. Johansen and Juselius (1990) cointegration test assess the long-term relationship between the variables. The linear combination of I (1) variables will be I (0) or stationary, if the variables are cointegrated. There might have more than one linear combination, implying several cointegrating relationships between the variables. There are a number of statistical benefits of vector error correcting approach. For instance, after setting the model's lags order, the cointegrating connection may be easily computed using VECM. It enables simultaneous testing of both long-run and short-run correlations among variables in a time series model. It involves estimating the Engle-Granger and Johansen procedures. This test is valid if the variables are I (1). Finally, in terms of dynamic interrelationships among variables, this test is exceedingly efficient and consistent.

3.2.1. Model Specification

The following equation is used to investigate the long-run impact of broad money (BM), domestic credit to private sector (DCPS), gross capital formation (GCF), gross domestic savings (GDS), and inflation rate (INF) on GDP growth rate (GDP).

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[3] Based on the availability of data for our dependent and independent variables, we construct our time series for the period 1974–2019.

$$GDP_t = \alpha_0 + \alpha_1 BM_t + \alpha_2 DCPS_t + \alpha_3 GCF_t + \alpha_4 GDS_t + \alpha_5 INF_t + \varepsilon_t \quad (1)$$

Where, α_0 is constant term, and $\alpha_1 \dots \dots \alpha_5$ are long run elasticities of GDP growth rate with respect to independent variables in the equation.

3.2.2 Estimation Methods

Unit root test: When there is no causal relationship between two non-stationary time series, spurious regression happens. To avoid false causation, it is crucial to verify the stationarity of time series before regression analysis and forecasting. A time series is said to be stationary if its mean, variance, and auto-covariance (at various lags) remain constant over time; otherwise, it is said to be non-stationary, i.e. the process has a unit root.

We used two popular unit root tests, the Augmented Dickey-Fuller (ADF) test and the Phillips-Perron (PP) test, to attest stationarity and investigate integrated order in our time series. If a time series is discovered to be stationary at level (for example, Z_t), it is referred to be I (0) or integrated of order 0 without differencing. If a series is identified as stationary at the first difference (for example, $Z_t - Z_{t-1}$), it is referred to as integrated of order 1 or I (1). The ADF test is performed to determine whether each variable has a unit root problem. The ADF test with trend and intercept looks like the following one:

$$Z_t = K_0 + K_1 t + \delta Z_{t-1} + \sum_{j=1}^{m} \Phi_j \Delta Z_{t-j} + u_t \quad (2)$$

Where, Z is the variables under investigation as included in equation (1). The variable is of I (1) if δ = 0. Appropriate lag length would be selected by the Akaike Information Criterion (AIC) and the Bayesian Information Criterion (BIC). The PP test (Phillips & Perron, 1988) is also be performed in addition to the ADF test to reach a conclusion.

Cointegration test: Cointegration test is used to observe if there is a stable long-run relationship between several time series, especially when they are nonstationary. This test is applied when all the variables in a multivariate model are stationary after identifying the order of integration and integrating in the same order. Cointegration or a long-run equilibrium relationship between two non-stationary time series exist when the following two conditions are fulfilled. First, the integration order of each series must be the same. Second, the linear combination of the series is stationary at their respective levels (Thome, 2014).

We use the maximum likelihood approach, established by Johansen and Juselius (1990), to examine the long-run equilibrium relationships (cointegrations) among the variables. The maximum eigenvalue test and the trace test are two likelihood ratio test statistics proposed by Johansen (1988) for determining the number of co-integrating vectors. Brief description of the test is as follows:

$$\Delta Z_t = B_0 + \prod Z_{t-p} + \sum_{j=1}^{p} B\, Z_{t-j} + v_t \quad (3)$$

Where, Z_t is the vector of endogenous I (1) variables, B_0 is a vector of constant terms, B is the coefficients matrix, v_t is the vector of residuals, and p is the length of

the lag. It appears that all the variables in equation (1) are endogenous. The long-run relationship among Z_t is determined by the rank of Π (say r). If $r = 0$, the variables in the level do not have cointegration and equation (1) can be transformed to VAR model of p^{th} order. If $0 < r < n$, then there are $(n \times r)$ matrices of α and β such that: $\Pi = \alpha\beta'$. The strength of cointegration relationship is measured by α. B is called the cointegration vector and $\beta' Z_t$ is of I (0) even if Z_t is of I (1).

Causality analysis: If the time series data exhibit cointegration – a long-run equilibrium relationship, the dynamic relationship involving variables inside the VECM framework must be investigated. In the absence of cointegration, the Granger causality test could be employed without applying the VECM. The Engle and Granger (1987) test technique is used to analyze the causality. Because of the cointegration connection, the expanded form of the Granger causality test includes an error correction component and is written in a vector error correction framework, as shown below:

$$\Delta GDP_t = \sum_{i=1}^{k} \alpha_{11i}\, \Delta GDP_{t-i} + \sum_{i=1}^{k} \alpha_{12i}\, \Delta BM_{t-i} + \sum_{i=1}^{k} \alpha_{13i}\, \Delta DCPS_{t-i} + \sum_{i=1}^{k} \alpha_{14i}\, \Delta GCF_{t-i} + \sum_{i=1}^{k} \alpha_{15i}\, \Delta GDS_{t-i} + \sum_{i=1}^{k} \alpha_{16i}\, \Delta INF_{t-i} - s_{11} ECM_{1,t-1} - s_{12} ECM_{2,t-1} - s_{13} ECM_{3,t-1} - s_{14} ECM_{4,t-1} + \varepsilon_{1t} \quad (4)$$

$$\Delta BM_t = \sum_{i=1}^{k} \alpha_{21i}\, \Delta GDP_{t-i} + \sum_{i=1}^{k} \alpha_{22i}\, \Delta BM_{t-i} + \sum_{i=1}^{k} \alpha_{23i}\, \Delta DCPS_{t-i} + \sum_{i=1}^{k} \alpha_{24i}\, \Delta GCF_{t-i} + \sum_{i=1}^{k} \alpha_{25i}\, \Delta GDS_{t-i} + \sum_{i=1}^{k} \alpha_{26i}\, \Delta INF_{t-i} - s_{21} ECM_{1,t-1} - s_{22} ECM_{2,t-1} - s_{23} ECM_{3,t-1} - s_{24} ECM_{4,t-1} + \varepsilon_{2t} \quad (5)$$

$$\Delta DCPS_t = \sum_{i=1}^{k} \alpha_{31i}\, \Delta GDP_{t-i} + \sum_{i=1}^{k} \alpha_{32i}\, \Delta BM_{t-i} + \sum_{i=1}^{k} \alpha_{33i}\, \Delta DCPS_{t-i} + \sum_{i=1}^{k} \alpha_{34i}\, \Delta GCF_{t-i} + \sum_{i=1}^{k} \alpha_{35i}\, \Delta GDS_{t-i} + \sum_{i=1}^{k} \alpha_{36i}\, \Delta INF_{t-i} - s_{31} ECM_{1,t-1} - s_{32} ECM_{2,t-1} - s_{33} ECM_{3,t-1} - s_{34} ECM_{4,t-1} + \varepsilon_{3t} \quad (6)$$

$$\Delta GCF_t = \sum_{i=1}^{k} \alpha_{41i}\, \Delta GDP_{t-i} + \sum_{i=1}^{k} \alpha_{42i}\, \Delta BM_{t-i} + \sum_{i=1}^{k} \alpha_{43i}\, \Delta DCPS_{t-i} + \sum_{i=1}^{k} \alpha_{44i}\, \Delta GCF_{t-i} + \sum_{i=1}^{k} \alpha_{45i}\, \Delta GDS_{t-i} + \sum_{i=1}^{k} \alpha_{46i}\, \Delta INF_{t-i} - s_{41} ECM_{1,t-1} - s_{42} ECM_{2,t-1} - s_{43} ECM_{3,t-1} - s_{44} ECM_{4,t-1} + \varepsilon_{4t} \quad (7)$$

$$\Delta GDS_t = \sum_{i=1}^{k} \alpha_{51i}\, \Delta GDP_{t-i} + \sum_{i=1}^{k} \alpha_{52i}\, \Delta BM_{t-i} + \sum_{i=1}^{k} \alpha_{53i}\, \Delta DCPS_{t-i} + \sum_{i=1}^{k} \alpha_{54i}\, \Delta GCF_{t-i} + \sum_{i=1}^{k} \alpha_{55i}\, \Delta GDS_{t-i} + \sum_{i=1}^{k} \alpha_{56i}\, \Delta INF_{t-i} - s_{51} ECM_{1,t-1} - s_{52} ECM_{2,t-1} - s_{53} ECM_{3,t-1} - s_{54} ECM_{4,t-1} + \varepsilon_{5t} \quad (8)$$

$$\Delta INF_t = \sum_{i=1}^{k} \alpha_{61i}\, \Delta GDP_{t-i} + \sum_{i=1}^{k} \alpha_{62i}\, \Delta BM_{t-i} + \sum_{i=1}^{k} \alpha_{63i}\, \Delta DCPS_{t-i} + \sum_{i=1}^{k} \alpha_{64i}\, \Delta GCF_{t-i} + \sum_{i=1}^{k} \alpha_{65i}\, \Delta GDS_{t-i} + \sum_{i=1}^{k} \alpha_{66i}\, \Delta INF_{t-i} - s_{61} ECM_{1,t-1} - s_{62} ECM_{2,t-1} - s_{63} ECM_{3,t-1} - s_{64} ECM_{4,t-1} + \varepsilon_{6t} \quad (9)$$

Thus,

$$ECM_{1,t-1} = GDP_{t-1} - b_{11} GDS_{t-1} - b_{12} INF_{t-1} - c_1 \quad (10.a)$$

$$ECM_{2,t-1} = BM_{t-1} - b_{21} GDS_{t-1} - b_{22} INF_{t-1} - c_2 \quad (10.b)$$

$$ECM_{3,t-1} = DCPS_{t-1} - b_{31} GDS_{t-1} - b_{32} INF_{t-1} - c_3 \quad (10.c)$$

$$ECM_{4,t-1} = GCF_{t-i} - b_{41} GDS_{t-1} - b_{42} INF_{t-1} - c_4 \quad (10.d)$$

Here, a_{ji}'s, s_{ji}'s and b_{ji}'s are the parameters to be estimated. ECM_{t-1} is the one year lagged error term derived from the long run cointegration equation. ε's is serially independent with mean zero and a finite covariance matrix. The direction of the causal association between the variables is investigated using the F-test.

4. Results and Discussion

4.1 Descriptive Statistics

The annual percentage growth rate of GDP shows how quickly various components of an economy are rising. Broad money refers to the volume of money flowing in a given economy. Gross capital creation was originally known as gross domestic investment. It includes the economy's fixed assets as well as net changes in inventory levels. Gross domestic savings consists of household savings, private company savings, and public sector savings. Inflation refers to a general increase in the price level over time.

Table 1 summarizes the descriptive statistics of these variables during 1974 to 2019. The yearly average growth rate of GDP was 5.03 percent with a range from -4.09 percent to 9.60 percent, while the share of broad money as a percentage of GDP ranges from 8.35 percent to 65.85 percent. The minimum and maximum shares of domestic credit to private sector as percentages of GDP was 1.92 percent and 47.58 percent respectively. The percentage of GDP devoted to gross capital formation varies from 6.15 percent to 31. 57 percent, while the percentage of GDP made up of gross domestic savings differs from -2.98 percent to 25.33 percent. The annual average rate of inflation, measured by GDP deflator, was 13.59 percent which ranges from -17.64 percent to 80.56 percent.

Table 1: Summary of descriptive statistics for each series

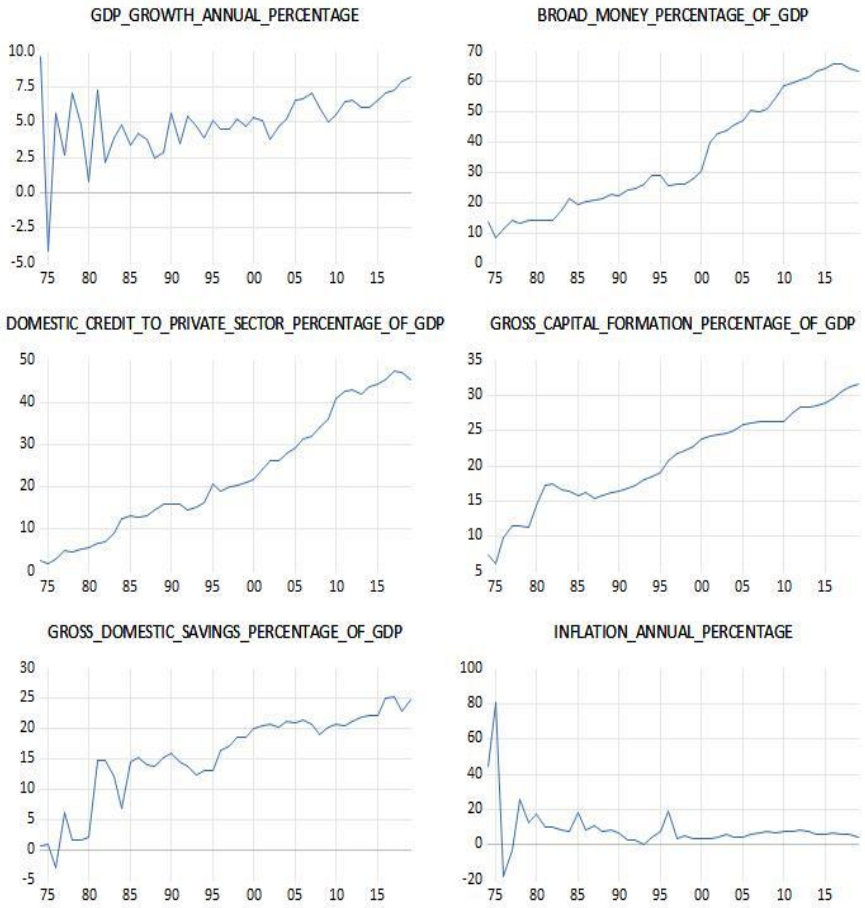
Variables	Measuring Unit	Mean	Standard Deviation	Minimum	Maximum
GDP Growth rate	Annual percentage	5.03	2.19	-4.09	9.60
Broad Money	Percentage of GDP	34.94	18.90	8.35	65.85
Domestic Credit to private Sector	Percentage of GDP	22.67	14.25	1.92	47.58
Gross capital Formation	Percentage of GDP	20.78	6.65	6.15	31.57
Gross Domestic Savings	Percentage of GDP	15.60	7.26	-2.98	25.33
Inflation	Annual Percentage	9.17	13.59	-17.64	80.57

Source: Based on World Development Indicators (WDI) database

Figure 1 shows that the annual average growth rate of GDP fluctuates throughout the period. Since 1995, these fluctuations reduce with an upward trend. Because the supply side of money was performing well, but the demand side was not up-to-the mark, broad money showed a downward trend at the beginning of 1975.

After that, it exhibits an upward trend. Domestic lending to private sector has been steadily expanding since 1975. Gross capital creation and gross domestic savings exhibits an upward trend with some fluctuations until 1995. The inflation rate was volatile during 1974-75 while the country experiences a famine just after its independence in 1971. After that the rate of inflation gradually became steady.

Figure 1: Time series plots of the variables, 1974 to 2019



Source: Authors' calculation based on World Development Indicators (WDI) database

4.2 Estimation Results

4.2.1 Unit Root Test Result

A time series is said to be stationary if its mean, variance, and auto-covariance (at various lags) remain constant over time; otherwise, it is said to be non-stationary (Gujarati, 2009). The unit root test results are reported in Table 2. The ADF and PP

test results show that, at 1% level of significance, the null hypothesis, i.e., a unit root is present in a time series sample, is rejected. This finding suggests that all series are stationary and integrated of order one or I (1).

Table 2: Unit root test results

	ADF Statistics		PP Statistics	
Level	**Intercept & Trend**	**Intercept**	**Intercept & Trend**	**Intercept**
GDP growth (GDP)	-1.606793	-13.55362***	-7.520625***	-12.62074***
Broad Money (BM)	0.312031	-1.749084	0.312031	-2.378615
Domestic credit to private sector (DCPS)	0.098821	-2.090844	0.147355	-2.093812
Gross capital formation (GCF)	-2.069473	-4.576480***	-1.293704	-2.694608
Gross domestic saving (GDS)	-2.629216*	-4.261668***	-1.785402	-3.384552*
Inflation (INF)	-6.153307***	-6.421768***	-6.270265***	-7.008958***
GDP growth (GDP)	-8.586522***	-4.031262***	-26.53533***	-26.07194***
Broad Money (BM)	-6.121946***	-5.949376***	-6.117100***	-5.957902***
Domestic credit to private sector (DCPS)	-6.240973***	-6.120630***	-6.216595***	-6.076813***
Gross capital formation (GCF)	-5.944734***	-6.081958***	-6.016218***	-6.131088***
Gross domestic saving (GDS)	-2.740262***	-2.994011	-12.01450***	-16.19763***
Inflation (INF)	-10.85864***	-11.09689***	-11.63184***	-12.06823***

Source: Author's estimation.

*Notes: *, **, *** indicates statistical significance at 10%, 5% & 1%, respectively.*

4.2.2 Cointegration Test

Table 3 shows the results of the Johansen cointegration test. According to the formula, there are four cointegrating equations since their trace statistics are bigger than the maximum eigenvalue statistics among the variables. As a result, the variables have a long-term link.

Table 3: Results of Johansen–Juselius cointegration tests

No. of cointegrating equation(s)	**Eigen value**	**Trace statistics**	**Critical value trace**	**Max-eigen statistics**	**Critical value (max-eigen statistics)**
r =0	0.778754	188.6686 (0.0000)***	95.75366	63.35624 (0.0000)***	40.07757
r ≤ 1	0.714482	125.3124 (0.0000)***	69.81889	52.64487 (0.0001)***	33.87687
r ≤ 2	0.554913	72.66748 (0.0001)***	47.85613	33.99840 (0.0065)***	27.58434
r ≤ 3	0.431739	38.66909 (0.0037)***	29.79707	23.73731 (0.0210)**	21.13162

Source: Author's estimation.

*Notes: *, **, *** indicates statistical significance at 10%, 5% & 1%, respectively.*

4.2.3 Short Run and Long Run Causality

Table 4 provides an explanation of the lagged explanatory factors for the VECM and their combined F-statistic. The F-statistic shows the significance of short-term causality. Long-term causality is shown by the coefficient of ECT's t-statistic. The estimated results identified that there are short-term unidirectional causalities running from broad money and rate of inflation to GDP growth, and form broad money to domestic credit to private sector. Short-run unidirectional causalities are also found to gross capital formation from gross domestic saving and rate of inflation, and to gross domestic saving from domestic credit to privet sector, gross capital formation and rate of inflation. The results also show short-run unidirectional causality running form domestic credit to privet sector to the rate of inflation. The coefficient of ECT of GDP growth rate, domestic credit to private sector, gross domestic savings and rate of inflation are all significant at the one percent level.

Table 4: Short-run and long-run Granger causality results based on VECM

Depen-dent variable	**Sources of Causation (independent variable**						
	Short-run						**Long-run**
	ΔGDP	ΔBM	ΔDCPS	ΔGCF	ΔGDS	ΔINF	ECT
ΔGDP		2.5789	1.7807	0.8071	0.7479	2.9099	-1.8958
		(0.0838)*	(0.1850)	(0.5054)	(0.5369)	(0.0612)*	[-4.5718]***
ΔBM	0.0386		0.4109	0.1682	0.1368	0.0871	0.1687
	(0.9895)		(0.7470)	(0.9165)	(0.9368)	(0.9663)	[0.7689]
ΔDCPS	1.4808	5.5758		1.3350	0.8993	2.1392	-0.5801
	(0.2516)	(0.0065)***		(0.2926)	(0.4598)	(0.1289)	[-4.0563]***
ΔGCF	0.4239	0.1349	0.6064		5.3223	3.6615	0.0385
	(0.7381)	(0.9380)	(0.6189)		(0.0078)***	(0.0309)**	[0.2666]
ΔGDS	1.0073	0.8699	3.1079	3.1624		3.3808	-0.7093
	(0.4112)	(0.4739)	(0.0509)**	(0.0484)**		(0.0397)**	[-2.7657]***
ΔINF	0.6112	0.5969	3.5181	1.5622	1.3865		-1.1126
	(0.6160)	(0.6248)	(0.0351)**	(0.2313)	(0.2774)		[-3.2712]***

Source: Author's estimation

*Notes: Figures in brackets [] and parenthesis () represent p-values and t-statistics, respectively. *, **, *** indicates statistical significance at 10%, 5% & 1%, respectively*

The long-term association is shown in Table 5 by the cointegrating equations (10.a), (10.b), (10.c), and (10.d). We have four cointegrating equations. These are:

$$ECM_{1t-1=} 1.000GDP_{t-1} - 0.2998GDS_{t-1} - 0.2752INF_{t-1} + 1.9371$$

$$ECM_{2t-1=} 1.000BM_{t-1} - 5.3408GDS_{t-1} - 6.9531INF_{t-1} + 103.6293$$

$$ECM_{3t-1=} 1.000DCPS_{t-1} - 3.9O75GDS_{t-1} - 4.5613INF_{t-1} + 74.678$$

$$ECM_{4t-1=} 1.000GCF_{t-1} - 1.3886GDS_{t-1} - 0.8429INF_{t-1} + 7.7225$$

The sign of the coefficient is reversed in the long term. Our objective variable, for example is GDP growth, and the equation will be as follows:

$$ECM_{1t-1=} 1.000GDP_{t-1} + 0.2998GDS_{t-1} + 0.2752INF_{t-1} - 1.9371$$

From the result of our first cointegrating equation, we may conclude that gross domestic savings has a positive long-term impact on GDP growth rate. A 0.29

percent increase in GDP is typically associated with a one percent increase in GDS (*ceteris paribus*). The rate of inflation has a positive impact on GDP. In this case, a one percent increase in inflation is linked to a 0.27 percent increase in GDP on average *(ceteris paribus).* Gross domestic savings have a long-term positive effect on broad money, as demonstrated by our second cointegrating equation.

The impact of inflation on broad money is positive. According to our third cointegrating equation, domestic credit to the private sector has a significant relationship with gross domestic savings. In the long run, the rate of inflation has a favorable impact on domestic credit to the private sector. Gross domestic savings have a considerable link with gross capital formation in the long run, according to our fourth cointegrating equation. Gross capital formation is benefited over the long term by the rate of inflation.

Table 5: Long run estimates

Variables	$ECM_{1,t-1}$	$ECM_{2,t-1}$	$ECM_{3,t-1}$	$ECM_{4,t-1}$
GDS_{t-1}	-0.299778	-5.340793	-3.907550	-1.388563
	(-8.09139)***	(-13.7573)***	(-13.4140)***	(-16.9266)***
INF_{t-1}	-0.275218	-6.953079	-4.561355	-0.842954
	(-3.35056)***	(-8.07831)***	(-7.06259)***	(-4.63473)***

Source: Author's estimation

*Notes: *, **, *** indicates statistical significance at 10%, 5% & 1%, respectively*

4.2.4 Diagnostic and Stability Test Result

Table 6 reports the findings of the diagnostic tests for normality, serial correlation, and heteroscedasticity. It demonstrates that the residual of the model satisfies the diagnostic tests for normality (Jarque-Bera test), serial correlation (LM tests), and homoscedasticity. The results of the diagnostic test suggest that the VECM is relatively well specified.

Table 6: Diagnostic tests

Test	**GDP Growth rate Annual**
Normality test	3.4080 (0.1819)
Autocorrelation LM test	1.4923 (0.1134)
Heteroscedasticity test	0.6391 (0.8463)

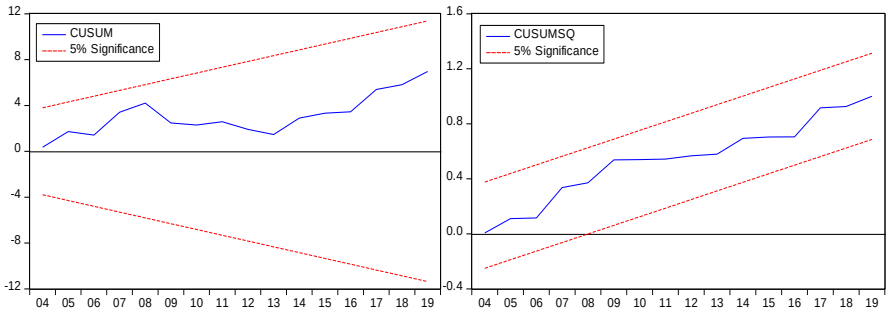
Source: Author's estimation

Notes: The p-values for the tests are shown in the figures with parenthesis. The heteroscedasticity test explores the null of homoscedasticity, the normality test reports the Jarque-Bera residual normality tests, and the autocorrelation luminous flux unit test analyzes the null of no serial correlation

The stability of the error correction model coefficients in each of the specifications was tested using cumulative sum of recursive residuals (CUSUM) and cumulative sum of squares of recursive residuals (CUSUMSQ). Figure 2 presents the CUSUM and CUSUMSQ statistics for coefficient stability of ECM_1, where GDP is the dependent variable and broad money, domestic credit to private sector, gross capital formation, gross domestic saving and the rate of inflation are independent

variables. At the 5% significance level, the test lines of CUSUM and CUSUMSQ in Figure 2 are inside the critical bounds, indicating that the model's coefficients are stable.

Figure 2: CUSUM and CUSUMSQ tests



Source: Author's estimation

4.2.5 Discussions

Our first cointegrating equation generally suggests that gross domestic savings has a long-term beneficial impact on GDP growth rate. On average, a one percent rise in gross domestic savings is associated with a 0.29 percent increase in GDP. Higher savings rate leads to increased gross domestic savings, which generates capital and boosts economic growth. Savings stimulate investment, increase production and create more employment opportunities, resulting a higher level of long-term economic growth. Countries with higher savings rate rely less on foreign direct investment and face a minimal risk from volatile foreign direct investment (Ribaj & Mexhuani, 2021).

Nexus between saving rate and economic growth across countries found that domestic saving has a significant steady-state growth effect in developing countries (Seifu, 2015). Significant domestic saving can be a major source of local investment and economic growth without reducing the demand for foreign investment (Misztal, 2011). In case of Bangladesh, factors associated with gross domestic saving can explain the significant variation in economic growth (Khan & Sarker, 2016).

In Bangladesh, the long-term link between inflation and GDP growth has important implications for the economy (Majumder, 2016). Our results in this paper suggest that GDP is positively impacted by the rate of inflation. A one percent increase in inflation is associated with a 0.28 percent increase in GDP (*cetirus paribus*). According to our cointegration result, inflation is positively associated with GDP growth rate across the years studied. However, in contrary Hossain (2007) found that low inflation is favorable for the GDP growth rate in Bangladesh. Studies on major South Asian countries, like Bangladesh, India, Pakistan, and Sri Lanka, have been examining the linkage between inflation and economic growth. Many of those studies found a statistically significant positive association between inflation

and economic growth, whereas a moderate inflation supports economic growth (Mallik & Chowdhury, 2001).

We can explain the positive relationship between inflation and economic growth in a number of ways. Firstly, we must increase production to fulfill the rising demand in an economy. Higher inflation leads to a reduction in unemployment, which creates more demand. Consumers with higher level of income are more eager to spend. As a result, both GDP and inflation rise simultaneously. Secondly, raising prices do not result in an increase in customer demand. Many producers encountered greater costs due to the price hike of raw materials and factors. Both GDP and inflation rise in this case. Thirdly, when inflation is high, investors and entrepreneurs have more incentives to invest in productive activities to earn more profits, which accelerates economic growth.

Our findings suggest short-run unidirectional causalities running from broad money and rate of inflation to GDP growth rate. Arfanuzzaman (2014) showed that broad money and GDP growth rate are closely related and growing at the same direction. The estimated results of VECM of this study claimed a long-term relationship between broad money and GDP growth rate.

The four cointegrating equations in this study show the long term cointegration between gross capital formation, domestic credit to the private sector, and broad money. These factors are intertwined with monetary policy tools. Our findings show that gross domestic savings, which is one of the proxy of financial development, has a long-term association with GDP growth rate, and broad money has a unidirectional causal relationship with GDP growth rate. These findings imply that financial development and economic growth have an impactful relationship.

Gross domestic saving and broad money are two significant elements of monetary policy instruments. These two elements have a positive impact on the rate of economic growth. Domestic investment or savings is critical to developing countries' revenue collecting operations. High domestic savings rates provide the means for achieving financial independence, long-term economic growth, and the sustainable development goals (SDGs).

5. Conclusion

The primary goal of this study is to determine the impact of financial development on economic growth in Bangladesh. We used time series data from WDI and deployed a series of standard econometric methods and diagnostic tests to address the issue. The VECM framework was used since the time series data of the variables under examination were found to be non-stationary and co-integrated. The findings of VECM show that financial development and economic growth have a long-term favorable link. The coefficient of the error correction term implies a 189.5 percent annual adjustment towards long run equilibrium, thus indicating the variable's stable long run connection. Also, gross domestic saving has a long-term positive link with Bangladesh's GDP growth rate, while inflation has a long-term positive relationship with GDP.

There exist short-run unidirectional causalities running from broad money and the rate of inflation to GDP growth rate. For Bangladesh, the results of the cointegration reveal that inflation is positively associated to economic growth. International credit agencies, on the other hand, are pressuring Bangladesh to lower inflation in order to boost its economy. Inflation, they contend, is damaging economic growth. However, according to this study, moderate inflation is beneficial to GDP growth. This finding has substantial policy implications for the economy of Bangladesh. Moderate inflation is recommended as a strategy of boosting economic growth.

The link between inflation and growth is still debated in both theory and practice. Mallik and Chowdhury (2001) examined the relationship between inflation and economic growth in Bangladesh, India, Pakistan, and Sri Lanka. The findings of this paper reveal that growth and inflation rates in all four nations are cointegrated, meaning that there is a long-term link between this two. The link between inflation and growth is positive, with inflation rates having greater estimated elasticities than growth rates. This suggests that inflation is advantageous rather than damaging to growth, and that quicker economic expansion is likely to be inflationary.

Levine's five financial intermediaries focus on mobilizing savings first and foremost, and our findings reveal that gross domestic savings has a long-term association with economic growth. Because Romer's endogenous finance and growth theory focuses on savings and credit circulations, we can conclude that our findings have a long-term relationship with the theoretical idea.

The findings of our paper have certain policy implications. Policymakers might make effort in designing new policy devices to assist the beneficial association between financial development and economic growth. First, government might promote a competitive financial environment with more interactions by including both official and informal financial institutions into the financial system. Second, for effective financial development with financial innovation, steps should be done to combine and accept new financial assets, services, and payment channels. Third, the monetary and credit expansion of the Bangladesh Bank must be properly watched. The government can effectively use its legal authority to break up monopolistic or cartel tendencies to ensure the competitiveness of the distribution chain. Fourth, the government and the private sector should collaborate to promote and implement financial policies that allow financial development to proceed at its own pace.

Fifth, financial reforms and changes in the real sector of the economy, such as innovations, adequate and effective regulation, efficient fund mobilization and direct funding to the most productive sectors should be prioritized in order to strengthen and improve the link between financial sector development and economic growth in Bangladesh. Long-term initiatives, such as the construction of modern, efficient, and resilient financial institutions that can drive Bangladesh's economic progress, should be prioritized by policymakers. The risk management system must be improved. Financial liberalization without risk management has resulted in financial distress in some developing countries, including Argentina, Chile, Columbia, Brazil, Mexico,

and Uruguay (Lee, 1991). Sixth, policymakers should make the necessary efforts to boost income levels in a sustainable manner. They should concentrate on alternative possible determinants of gross domestic savings. Seventh, to concentrate on the financial industry's short- and long-term growth, monetary policy instruments and the financial sector should work together to reduce lending interest rates in order to boost investment and income. Bangladesh's loan interest rate is now relatively high, with only a few initiatives for lower-cost productive investment. However, to encourage productive investment and to boost the country's economic growth, the loan interest rate should be kept low.

Our study suffers from limited generalizability as it focused on only one economy. There is a lot of potential to investigate the interrelationship between financial development and economic growth using cross-sectional and panel data by encompassing many economies.

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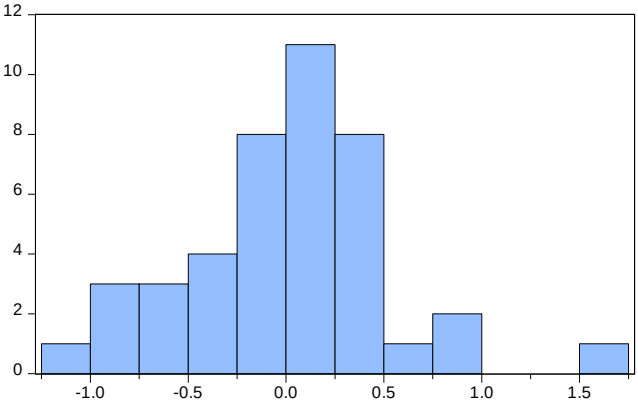
Annex

Figure A1: Normality TEST.



Series: Residuals	
Sample 1978 2019	
Observations 42	
Mean	-1.04e-15
Median	0.077609
Maximum	1.577616
Minimum	-1.021080
Std. Dev.	0.497949
Skewness	0.377281
Kurtosis	4.173914
Jarque-Bera	3.408013
Probability	0.181953

Source: Author's estimation