



THE CASUAL RELATIONSHIP BETWEEN GROSS DOMESTIC SAVINGS AND ECONOMIC GROWTH IN BANGLADESH

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ABSTRACT

Bangladesh has undergone a significant upswing in various macroeconomic factors over its 50-year economic journey. The purpose of this paper is to examine long run causal relationship between gross domestic savings and economic growth in the country. Annual time series data have been used as sample from the period of 1971 to 2020. Data of the Bangladeshi Gross Domestic Savings (GDS) and Gross Domestic Product(GDP) have been collected from World Bank at current dollar value. For econometric analysis we used in this study Unit Root test for checking data stationarity, Johansen Cointegration test for long run cointegration, and Granger Causality test for the long run causal relationship between GDS and GDP. In the Unit root test, Augmented Dickey-Fuller test and Phillips-Perron both tests found non-stationary at level. However, only GDP get stationary in Augmented Dickey-Fuller (ADF) test at first difference, while Phillips-Perron shows both the variables get stationary at first difference. So, unit root at second difference has been applied to make sure all the data get stationary for the test. Johansen cointegration test showed that there is a long-term cointegration between Gross Domestic Savings and GDP, but it is negatively correlated. Granger causality test showed there is a unidirectional relationship between gross domestic savings and economic growth, and the economic growth influences gross domestic savings in the economy.

Keywords: GDS, GDP, ADF test, johansen cointegration test, granger causality test

INTRODUCTION

Gross Domestic Product (GDP) is a key factor of economic output and the relationship between the gross domestic savings and economic growth is one of the most central subject areas in the macroeconomic domain. An economy can be referred to as a system that allows transactions through manufacturing, utilization, and trade activities in between to satisfy the people's livelihoods (Kenton 2021). When it comes to knowing the economic size, various identifiers can detect the immensity or the strength of an economy, and among them, GDP is the most straightforward one to track a nation's economy (Moffatt 2019). A heavy spending and little save can reduce the productivity of an economy (Ferdous 2020). A study from Miah and Majumder (2020) found there is a correlation between domestic saving and economic growth in Bangladesh,

but the relationship is not statistically significant. However, Chowdhury et al. (2019) found a positive correlation between other macroeconomic variables (inflation, exchange rate, and household consumption expenditures growth) and economic growth, which is statistically significant for the economy of Bangladesh. A study on developing economies by Misztal (2011) found a one-way causal relationship between savings and economic growth using cointegration and granger model. A research in India found a short run bi-directional relationship (Hashmi and Sedai 2016), and a long run unidirectional relationship using VEC and Johansen model (Mehta and Rami 2014). Pakistani economy has a positive relation for economic growth, dependency ratio, and foreign direct investment in case of enhancing domestic savings (Ilyas et al. 2014), as well as domestic saving has played a crucial role in long run (Chandio et al. 2015). On the other hand, **Sajid and Sarfraz** (2008) found in their study economic growth and domestic savings in Pakistan have a bi-directional relation for both long and short run, and they are negatively correlated and it is shrinking the GDP of Pakistan (Zamilur and Ferdaus 2021). A study in Kosovo shows economic growth and domestic savings have a significant positive relationship for the economy of Kosovo (Ribaj and Mexhuani 2021). Welela (2018) reveals in an Ethiopian study that there is both long and short run relationship between economic growth and domestic savings. Kenya (Musyoka and Ogero 2021) and Botswana (Jagadeesh 2015) have a similar result, both countries have a considerable relationship between economic growth and domestic savings. Outcomes from Nwanne (2016) exposes the economy of Nigeria have a long run relationship between economic growth and domestic savings, but it is negatively correlated and statistically significant.

Analysis of Ghana from Pickson et al. (2017) explain there is no long run relationship, but in short run, there is a unidirectional relationship. A country comparison study from Mavrotas and Kelly (2001) noticed no relationship between economic growth and domestic savings for India, but Sri Lanka have a bi-directional relationship between economic growth and domestic savings. A long run study from Budha (2006) explains when all the variables are dependent, there are cointegration, but no short run relationship between economic growth and domestic savings in Nepal. In Vietnam, Nguyen and Nguyen (2017) discover there is no short run relationship between economic growth and domestic savings, but in long run, domestic savings is one of the main factors for economic growth of Vietnam.

Recently Bangladesh has celebrated its 50 years long journey in the economy. During this period, the economy has been changed at different phases. Bangladesh was compared to the bottomless basket after independent, but now it is booming (Abdin 2020). The World Bank impressed on Bangladesh for numerous macroeconomic and social development progress (World Bank 2016). The size of the economy at its birth in 1971 was USD 8.75 billion, but in 2020 it reached USD 323.06 billion (World Bank 2022^a). Comparing to the GDP, the gross domestic savings was increased relatively low during the period. However, the economy has beaten their neighbors' economy even though the neighbors having an enormous economy (Ahmed 2022). With a huge population, Bangladesh is now a developing country (United Nations 2021), which need a stable

and a strong economic system. However, several international organizations (World Bank 2022^b; IMF 2022) and economists (Doom 2022) predicted that the global might face an economic recession in 2023. The head of the government of Bangladesh requested to all to save resources whatever they can (UNB 2022).

After reviewing above literature, some scenarios were found that a good number of works done in domestic savings and economic growth areas, but a little work done in case of Bangladesh. However, there are a few works for Bangladesh in this area using time series data from 1971 to 2020. With these kept in mind, the purpose of this study is to examine the long-term causal relationship between gross domestic savings and economic growth in the country over the last 50 years. This study will help the Bangladesh government and macroeconomic policymakers in formulating investment strategies and setting interest rates to address potential economic challenges in the future.

METHODOLOGY

The study used secondary data on GDP and gross domestic savings in Bangladesh. All the data employed in this research consists of annual time-series data sourced from the World Bank, covering the period from 1971 to 2020. Following the data compilation in a spreadsheet, all values were transformed into natural logarithms for subsequent analysis in the study. We used the Unit Root test to check data stationarity, the Johansen cointegration test to examine long-run relationships between the variables, and the Granger causality test to investigate the direction of causal relationships between GDP and gross domestic saving. All the tests were conducted using the advanced statistical software EViews 10 for econometric analysis in the study. Unit root has followed by ADF and Phillips-Perron test. GDP was selected as the dependent variable, whereas gross domestic savings was chosen as the independent variable.

Econometric Model

The relationship between a dependent variable and one or more independent variables is examined using an econometric model specifically designed for the analysis of time series data. The econometric model can be expressed through various formulations, including:

$$y_{it} = \beta_0 + \beta_1 x_{it} + \beta_2 x_{it} + \beta_3 x_{it} + \dots + \beta_k x_{it} + \varepsilon_{it} \quad (1)$$

Where, y_{it} = the dependent variable at time t with i^{th} entity, β_0 = the intercept, x_{it} = the independent variables at time t with i^{th} entity, β_1 to β_k = the change in y_{it} for each one addition change in independent variables at time t with i^{th} entity, and ε_{it} = the stochastic error term.

As a result, the ordinary least square fit econometric model from (1) is

$$\hat{y}_{it} = \hat{\beta}_0 + \hat{\beta}_1 x_{it} + \hat{\beta}_2 x_{it} + \hat{\beta}_3 x_{it} + \dots + \hat{\beta}_k x_{it} \quad (2)$$

$\hat{y}_{it}$ = the forecasted value of the dependent variable y , $\hat{\beta}_0$ = the constant, x_{it} = the independent variables, $\hat{\beta}_1$ to $\hat{\beta}_k$ = the predictive value of β_1 to β_k .

For our study, the predicted model is,

$$\widehat{Gross\ domestic\ product}_t = \hat{\beta}_0 + \hat{\beta}_1 Gross\ domestic\ saving_t \quad (3)$$

RESULTS AND DISCUSSION

In this paper we used the following terms: LNGDP is the ln of gross domestic product at level and LNGDS is the ln of gross domestic savings at level and DLNGDP is the 1st difference of LNGDP and DLNGDS is the 1st difference of LNGDS. Figure 1 and Figure 2 show the trend of these variables from 1971 to 2020. The data series has an increasing trend during the period and show non stationarity at level. However, it seems stationarity in second difference.

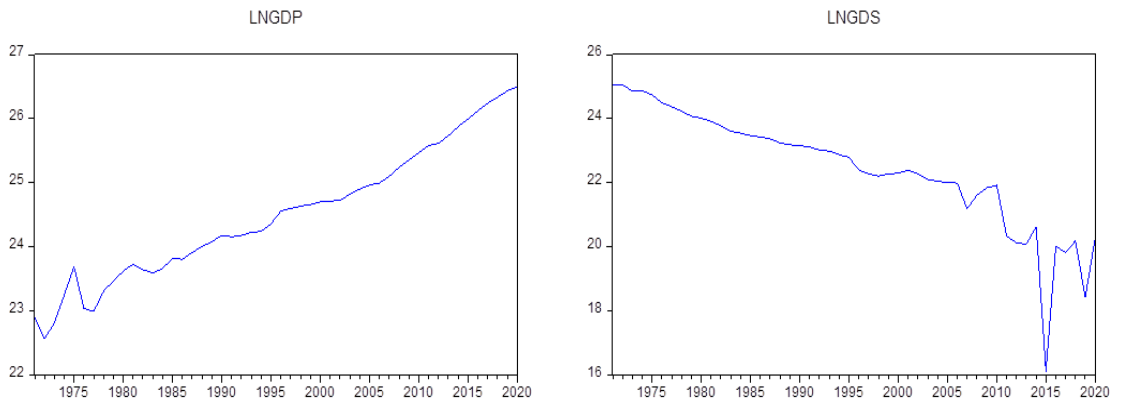
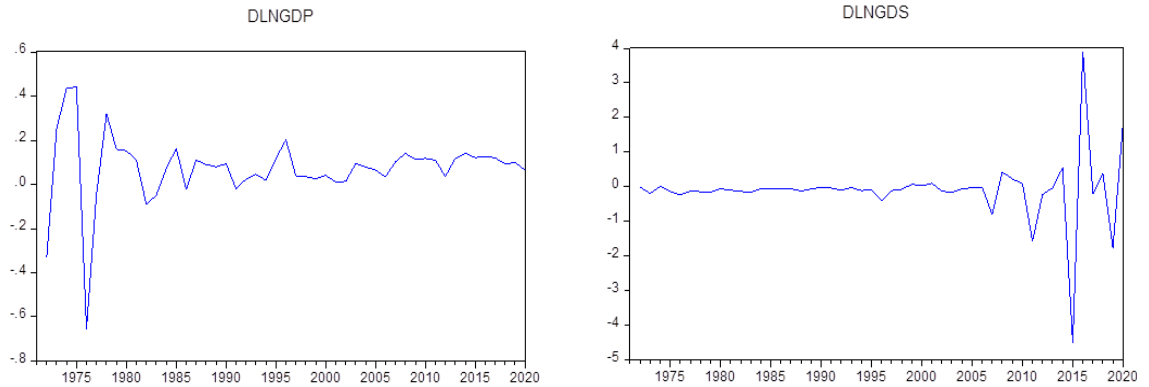


Figure 1. Data at level for both GDP and



Figures 2. Data at 1st difference for both GDP and

Unit Root Test

The ADF test has been applied for all the variables at level, assuming two models: with intercept (M1), and with intercept and trend (M2). Findings of this study have been described in Table 1. The standards to check the variable is that it has a unit root if the probability value of each variable shows 5% or less. So, based on the standards and the findings of the study, it can be determined that all LNGDP and LNGDS are non-stationary for the ADF test at level. But the Philips-Perron test found the LNGDP is non-stationary for both model (M1 & M2), and for the LNGDS it is found non-stationary in model 1 as well as stationary in model 2 at level.

Table 1. The ADF and Philips-Perron tests for the variables at level

At level							
		With intercept (M1)			With intercept and trend (M2)		
	Variables	Test Statistic	5% Critical Value	Probability Value	Test Statistic	5% Critical Value	Probability Value
ADF Test	LNGDP	0.095885	-2.922449	0.9623	-3.23437	-3.50433	0.0898
	LNGDS	0.702599	-2.935001	0.9908	-2.46661	-3.523623	0.3421
Philips-Perron	LNGDP	1.192315	-2.922449	0.9977	-3.46833	-3.50433	0.0542
	LNGDS	-1.91172	-2.922449	0.3244	-6.28077	-3.50433	0.0000

As the findings of table 1 are not converted into stationary yet for this study, a test in the first difference has been applied to the consequence of constant and trend. The results of the ADF and Philips-Perron test at first difference given below at table 2.

Table 2. The ADF and Philips-Perron tests for the variables at 1st difference.

At 1st Difference							
		With intercept (M1)			With intercept and trend (M2)		
	Variables	Test Statistic	5% Critical Value	Probability Value	Test Statistic	5% Critical Value	Probability Value
ADF Test	LNGDP	-7.41813	-2.92378	0.0000	-7.30463	-3.506374	0.0000
	LNGDS	-1.96707	-2.935001	0.2997	-2.20562	-3.523623	0.4740
Philips-Perron	LNGDP	-13.4247	-2.92378	0.0000	-13.0511	-3.506374	0.0000
	LNGDS	-43.391	-2.92378	0.0001	-44.9931	-3.506374	0.0000

Findings of the variables in Philips-Perron test indicate that all the figures at first difference both have unit root which is stationary, but maybe because of minus figure in GDS in ADF test, EViews always increasing the lag interval of LNGDS, and the statistical result doesn't match with the graphical result. So, a test for LNGDS at second difference of the ADF test has been applied shown in Table 3. In this study, the data get stationary at second difference. The results of other studies (Rahman and Pabon 2021; Miah and Majumder 2020) indicate that the data are stationary at their first differences. The contradiction arises due to differences in the study periods.

Table 3. The ADF test for the variables at 2nd difference.

2nd Difference							
		(M1)			(M2)		
	Variables	Test Statistic	5% Critical Value	Probability Value	Test Statistic	5% Critical Value	Probability Value
ADF Test	LNGDP	-7.41813	-2.92378	0.0000	-7.30463	-3.506374	0.0000
	LNGDS	-1.967071	-2.935001	0.0033	-2.20562	-3.523623	0.0087

Johansen Cointegration

Usage of the Johansen cointegration test is to identify whether there is a long run relationship between the variables. Johansen cointegration test have two test statistic by which it provides result, which are trace test and maximum eigen value test. The outcomes from the maximum eigen value test and trace statistic test provide greater number than the critical value from $r = 0$ and $r \leq 1$, which specifies there is a cointegration between the variables and the null hypothesis gets rejected. Both the trace and maximum eigen statistic are presented in Table 4. The results are presented based on the criteria of the test and using lag interval 2.

Table 4. Johansen co-integration test between gross domestic savings and GDP

Null hypothesis, H_0	Alternative hypothesis, H_1	Eigen value	Trace Statistic	Critical value at 5% level	Probability value	Decision
$r = 0$	$r = 1$	0.805412	131.8828	12.32090	0.0001	H_0 rejected
$r \leq 1$	$r = 2$	0.725789	58.22351	4.129906	0.0001	H_0 rejected

Null hypothesis, H_0	Alternative hypothesis, H_1	Eigen value	Max-Eigen Statistic	Critical value at 5% level	Probability value	Decision
$r = 0$	$r = 1$	0.805412	73.65927	11.22480	0.0001	H_0 rejected
$r \leq 1$	$r = 2$	0.725789	58.22351	4.129906	0.0001	H_0 rejected

Result in the table 4 shows that the trace statistic value is too large (131.8828) compared to the critical value at 5% level (12.3209) for $r = 0$. It implies this hypothesis has cointegration. Same thing happened with the $r \leq 1$.

The probability value is less than 5% and trace statistic is large than critical value. Likely the maximum eigen value has the same output. Probability value is less than 5%, max-eigen statistic are larger (73.65927) and (58.22351) than critical value for both $r = 0$, and $r \leq 1$ respectively. All the value rejects the null hypothesis and implies there is cointegration.

Based on the trace and maximum eigen statistic, result can be interpreted as there is a long run cointegration between gross domestic savings and economic growth. This result is supported by other studies on different economies (Chandio et al. 2015; Nwanne 2016).

Granger Casualty Test

If there is a cointegration between two variables, then there will be a minimum one direction of casualty (**Granger 2009**). A Granger test has applied for a broad causal relationship between LNGDP and LNGDS by F-Statistic.

Table 5. Granger casualty test between LNGDP and LNGDS

Null Hypothesis:	Obs	F-Statistic	Prob.
LNGDS does not Granger Cause LNGDP	49	2.15277	0.1491
LNGDP does not Granger Cause LNGDS		37.1273	0.0000

Result in Table 5 shows the probability value for first null hypothesis is high compared to the conventional acceptable value, and the F-Statistic is way too low. However, the second null hypothesis shows the F-statistic is high and the probability value is less than 0.05. To conclude this test result, the first null hypothesis will be accepted as the probability value is more than 5 percent level of significance. But the second hypothesis will be rejected as the probability value is less than 0.05. So, result can be interpreted that the gross domestic savings doesn't affect economic growth, but economic growth has a granger cause gross domestic savings in Bangladesh.

Table 6. Result of the estimated equation.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.073640	0.023107	3.186933	0.0026
LNGDS	-0.000042	0.023698	-0.001762	0.9986
R-squared	0.000000	F-statistic		3.11E-06
Adjusted R-squared	-0.021277	Prob(F-statistic)		0.998601
S.E. of regression	0.160934	Durbin-Watson stat		1.897455

The estimated model is presented in Table 6. The estimated econometric model is

$$\widehat{\text{Gross domestic product}_t} = 0.073640 - 0.000042 \text{Gross domestic saving}_t$$

From the model, it is seen that, gross domestic savings was negatively related to Gross domestic product. The economic growth in Pakistan (Zamilur and Ferdaus 2021) and the economic growth in Nigeria (Nwanne 2016) are also negatively correlated with gross domestic savings. According to Durbin-Watson value, in this model there is no autocorrelation problem between the variables.

CONCLUSION

The study might reflect patterns in the economy of Bangladesh over the past five decades. The aim of this research is to investigate the long run causal relationship between gross domestic savings and economic growth in the country. Based on this study, the researchers discovered a negative correlation in the long run between GDP and gross domestic savings in the country. It suggests that high economic growth coincide with lower savings rates, and when savings goes up, the GDP tends to go down considering a longer period. Furthermore, GDP has granger cause on domestic savings in Bangladesh. There is a statistical relationship where changes in GDP precede and can be used to forecast changes in domestic savings. This finding could have implications for policymakers in taking future investments strategies and economists studying the economic dynamics of Bangladesh, suggesting that fluctuations in GDP may influence the level of domestic savings in the country. It is important to note that Granger causality does not imply a causal relationship in the traditional sense; it only indicates a statistical association and the possibility of predictive power. Other factors and variables could also influence domestic savings, and further analysis would be needed to understand the complexity of the relationship between GDP and domestic savings in Bangladesh.

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