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(Research Article)

Macroeconomic stability and economic growth: Evidence from Bangladesh

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Abstract

This paper investigates the link and causal relationship between macroeconomic stability and economic growth in Bangladesh for the period 1971 through 2023. Cointegration, vector error correction technique, and the Granger causality test are applied for this purpose. The paper finds sufficient evidence that macroeconomic stability and economic growth are positively related with each other in the long run. Like the long-run relationship, government consumption and investment proxy are significant in the short-run among all the factors of stability while only government consumption and inflation show some causal relationship with growth. Thus, the results are suggestive of the fact that it is better to comment about factors of stability separately rather than macroeconomic stability as a whole. The results also emphasize evaluation of both the long-run and the short-run effects of macroeconomic stability separately for effective policymaking.

Keywords: Macroeconomic stability; Economic growth; Cointegration; Bangladesh

1. Introduction

Bangladesh has achieved a respectable growth rate since the early 1990s, but it can still be argued that the country has not performed well enough compared to the fastest growing economies like China and India. Therefore, it is extremely important to assess the effects of different policies on the growth of the country. One such area of special importance is the policy of the country to maintain macroeconomic stability, which has continued to be reflected in the Poverty Reduction Strategy Paper of the country (IMF 2005). Poverty decreased from 11.8 percent in 2010 to 5.0 percent in 2022, according to the international poverty line of $2.15 per day, adjusted for 2017 Purchasing Power Parity and using a comparable welfare series. The implementation of a multiple exchange rate regime in September 2022 discouraged foreign exchange inflows, resulting in a financial account deficit (World Bank, 2024a).

Researchers dealing with macroeconomic stability and economic growth vary widely in their focus, evaluation strategy, and results. For instance, Fischer (1992), Bassanini et al. (2001), Arai and Kinnwall (1997), and Muhammad et al. (2016) used panel data technique to explore the empirical relationship between macroeconomic stability and growth. While the first two found a positive relationship between stability and economic growth, the latter found opposite evidence. The time series studies by İsmihan, Metin-Özcan and Tansel (2002) and Akitoby and Cinyabuguma (2004) also produced results in favor of stability. It is found that inflation negatively impacts economic growth, while factors like foreign direct investment, domestic credit, currency exchange, and institutional differences positively influence growth, with labor force showing a negative association (Siddik, 2023). However, some writers identified more important factors of growth than macroeconomic stability, like cautious government intervention (Muqtada, 2003). On the other hand, several other studies searched for the causes of instability (Satyanath & Subramanian, 2004). Montiel and Servén (2004) pointed out the fact that stability did not work the same in all the countries and mentioned some reasons behind it. Most importantly, Ocampo (2005) opined that each countries' experience on this issue varies from each other, making it important to consider each case separately. Moreover, Chen et al. (2023) seeks to examine the hypothesis regarding the impact of macroeconomic stability on the green development of countries.

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In case of Bangladesh, many studies (e.g. Bhattacharya, 2006) have evaluated the macroeconomic performance of the country and emphasized on achieving macroeconomic stability for better performance of the economy. Islam (2022) found while GDP growth drives inflation, socioeconomic development measured by the HDI does not, making it a more stable macroeconomic indicator; additionally, the exchange rate and money supply positively influence inflation, with causality tests revealing unidirectional effects where inflation influences HDI, and both money supply and exchange rate affect inflation and HDI. CPI-inflation trends in Bangladesh since the 1950s, highlighting persistent and volatile inflation under fixed or managed exchange rate systems. It concludes that a rule-based monetary policy, such as inflation or monetary targeting, would be more effective in stabilizing inflation if Bangladesh adopts a more flexible exchange rate system, as the current approach undermines monetary policy credibility and exacerbates inflation volatility (Hossain, 2015). However, regression analysis on the relationship between macroeconomic stability and economic growth is scarce in the country. Studies about inflation and growth by some researchers (e.g. Ahmed & Mortaza, 2005; Mallik & Chowdhury, 2001) shed some light since inflation is considered the most important indicator of instability by some researchers (e.g. Fischer, 1992; Nogueira & León-Ledesma, 2011). Nonetheless, a comprehensive study covering the whole aspect empirically was missing. Only Islam (2005) tried to address this issue empirically albeit with some flaws. For example, his data was only for 16 years that is not sufficient for a time series study. The present study tries to fill the gap. It is also different from the others in that it identifies both the long-run and the short-run relationships and examines the direction of causality between macroeconomic stability and economic growth. Besides, the previous studies often failed to include any control variables like investment or capital.

To achieve the purposes, cointegration and vector error correction method are used in this study. Cointegration technique helps to identify the long-run relationship between the variables whereas vector error correction method separates the short-run relationship from the long-run one. In addition, Granger causality test is utilized to discover the direction of causality between macroeconomic stability and economic growth in the country.

2. Material and methods

2.1. The Model

This paper takes the view of Washington Consensus and post Keynesian era. In accordance with this view, macroeconomic stability is achieved when price stability, fiscal balance, and balance of payments stability is achieved (Muqtada, 2003; Ocampo, 2005; Mussa, 2013; & Médici, 2020). Accordingly, the empirical model for testing the relationship between macroeconomic stability and economic growth is represented in general functional form as:

RGDP = F(RINV, INF, BSUR, ERAT)………(1)

where RGDP = real per capita GDP, RINV = annual per capita real investment, INF = GDP deflator, BSUR = annual budget surplus per head, and ERAT = annual nominal exchange rate.

This model is parsimonious in that only investment is included as a control variable. It is the most important variable that is found to have a positive and robust relationship with economic growth in many cross-country, time series, and panel regressions (e.g. Easterly & Wetzel, 1989; Levine & Renelt, 1991; Jun, 2003; Rabnawaz & Jafar, 2015; & Sarker & Khan, 2020). Some other variables like education and health are not included due to paucity of data. Nonetheless, scarcity of data on two of the dependent variables real investment and budget deficit makes the estimation of equation (1) impossible. Two different variables called GKF and GFCE are used instead of them where GKF represent “Gross capital formation per head” and GFCE represents “Annual government final consumption expenditure per head.” Therefore, the new version of equation (1) is

RGDP = F(GKF, INF, GFCE, ERAT)………(2)

Equation (2) is used to achieve the purpose of the present study. Here the behavior of GKF is assumed to follow the behavior of INV. On the other hand, while BSUR is supposed to have a positive relationship with RGDP, GFCE is supposed to have a negative one. The reason is that a reduction in government final consumption expenditure reduces revenue requirements of the government.

2.2. The data

Equation (2) specified above contains four independent variables. This consumes at least four degrees of freedom. If lags of the variables are considered, this number increases more. Since statistical inference becomes less reliable as more and more degrees of freedom are lost (Gujarati, 2004), it is necessary to maximize the data set. For this reason, the study period chosen in this study covers the period of 1971-2023. One problem that may arise from doing so is the parameter instability or structural change because of policy and other political, social, and economic changes before and after independence. However, Jones (1995) used augmented Dickey-Fuller (ADF) test for Norway and Finland for the period 1900-1987 when analyzing the time series properties of growth rates. Norway and Finland gained their independence in 1905 and 1917, respectively. The study also performed the same test for Belgium, Germany, Japan, and Netherlands, which were heavily affected by war several times within this time period. Since it is possible to identify if any structural changes have occurred in the model, use of data from 1971 possesses no additional problem. The data source for this study is World Development Indicators 2024 (World Bank 2024). The sources and description of data are discussed in detail in Appendix A.

2.3. The unit root test

The first step in time series regression starts with determining whether the variables are stationary or not. For this purpose, the augmented Dickey-Fuller (ADF) is used in this study from the several types of unit root tests available. The original Dickey-Fuller test assumes that the error term follows first-order autoregressive process. The augmented Dickey-Fuller test uses lagged difference terms of the dependent variable to dispose of this shortcoming of the Dickey-Fuller test. For performing the ADF test, a decision has to be made whether to include a constant, a constant and a linear trend, or none of them. Since all the series appear to have a trend, the tests are performed including it in the equation. Graphs of these series are provided in Appendix B.

2.4. Cointegration test

If a time series is nonstationary but its first difference is stationary, it is called to be integrated of order 1 and is denoted by I*(1)*. A time series can be integrated of order d meaning that it has to be differenced d times to transform it to stationarity. In such cases, regression may be used to estimate long-run relationship of the variables. Engle and Granger, Stock and Watson, and Johansen have proposed three alternative methods for testing cointegration (Dickey, Jansenn & Thornton, 1991). While the first method is single equation based, the latter two are vector autoregression (VAR) based. This study uses Johansen's method. A lag length of one is chosen for Johansen's method on the basis of information criteria for the whole VAR system. Since all the series seem to have stochastic trends, only intercept but no trend is included in the cointegrating equations.

2.5. Vector Error Correction (VEC) Model

According to Granger's representation theorem, when variables are cointegrated, a short-run relationship also exists between them that are different from their long-run trend. For this purpose, the vector error correction method is used in this study. The number of equations in the vector error correction model equals the number of endogenous variables in the model. The corresponding vector error correction equation for the dependent variable ΔRGDP, which is of interest in this study is of the form

$$\Delta RGDP = a + b_1 ect_{t-1} + \sum_i^{p_1} b_{2i} \Delta RGDP_{t-i} + \sum_j^{p_2} b_{3j} \Delta GKF_{t-J} + \sum_k^{p_3} b_{4k} \Delta GFCE_{t-k}$$

$$+ \sum_l^{p_4} b_{5l} \Delta INF_{t-l} + \sum_n^{p_5} b_{6n} \Delta ERAT_{t-n} + \epsilon_t \ldots \ldots \ldots \text{ (3)}$$

where

$$ect = RGDP - \beta_1 GKF - \beta_2 GFCE - \beta_3 INF - \beta_4 ERAT.$$

And $\beta_1, \ldots, \beta_4$ represents the long-run coefficients. In estimating the VEC model, two lagged variables are included according to the lag length selection rule used in Johansen's method.

2.6. Granger Causality Test

Regression analysis does not imply causation. However, for time series studies, one kind of causality, the Granger causality, can be tested. This paper applies to the VAR based Granger causality test. For two variables Y_t and X_t the technique is based on the following regression model

$$\Delta Y_t = \sum_{i=1}^{k} \alpha_i Y_{t-i} + \sum_{i=1}^{k} \beta_i X_{t-i} + \theta Z_t + \varepsilon_t \ldots \ldots \ldots (4)$$
$$\Delta X_t = \sum_{i=1}^{k} \gamma_i Y_{t-i} + \sum_{i=1}^{k} \delta_i X_{t-i} + \vartheta Z_t + \epsilon_t \ldots \ldots \ldots (5)$$

where Z_t contains constant and other exogenous variables.

The null hypothesis for equation (4) is $H_0: \sum \beta_i = 0$, i.e., X does not Granger cause Y and for equation (5) is $H_0: \sum \delta_i = 0$, i.e., Y does not Granger cause X. The Granger causality test is applicable only to stationary variables. Therefore, the endogenous variables included in the model are first differenced.

3. Results and discussion

Table 1 provides results of the unit root tests. It shows that the null hypothesis of a unit root in the series at levels cannot be rejected even at the 10% significance level. However, the scenario is opposite for unit root tests of the series at first differences. All the series, except RGDP and GFCE, rejected the null hypothesis of a unit root at the 1% significance level. For RGDP and GFCE, the null hypothesis is rejected at the 5% level. All these facts identify the stationarity of all the series at first differences.

Table 1 Unit root test results

Variable	At levels	At first differences
RGDP	5.877	-3.827**
GKF	3.598	-4.746***
GFCE	1.468	-3.900**
INF	1.481	-4.189***
ERAT	-3.308	-4.442***

Notes: ***, **, and * denote statistical significance at the 1%, 5%, and 10% level, respectively. The lag length for ADF test is selected to be 1.

Since all the series are nonstationary at levels but stationary at first differences, this suggests that the variables are integrated of order one and there exists the possibility of at least one long-run equilibrium relationship between them. Table 2 contains the results of cointegration tests. Both the trace test and the maximum eigenvalue test indicate only one cointegrating vector. Therefore, it is concluded that there is only one long-run equilibrium relationship between the variables.

Table 2 Results of cointegration tests (trace test)

Hypothesized number of cointegrating equations	Eigenvalue	Trace Statistic
$r = 0$	-	101.9515
$r \leq 1$*	0.66855	45.6331
$r \leq 2$	0.34550	24.0152
$r \leq 3$	0.24682	9.5595
$r \leq 4$	0.13863	1.9486
$r \leq 5$	0.03749	-

Notes: *Selected rank

The estimated long-run coefficients of the variables are provided in Table 3. GKF, GFCE, and ERAT are found to be statistically significant at the 1% level and INF is insignificant even at 10% level. Among the variables, only GKF has a positive sign, as was expected. On the other hand, the sign of GFCE is negative, which is also in line with previous expectations. Surprise also comes from the insignificance of the coefficient of INF even at very higher levels of significance, which is contrary to the expectation.

The coefficient of GKF supports the hypothesis that economic growth is positively related to macroeconomic stability in the long run. In contrast, two other measures of stability, GFCE and ERAT, support the opposite view. Thus, the results suggest that there is sufficient evidence of a long-term positive association between macroeconomic stability and economic growth. The results also imply that the long-run relationship between macroeconomic stability and economic growth is dependent on what factors we include under macroeconomic stability.

Table 3 The long-run coefficients of the model

Variable	Coefficient	Standard Error
Constant	43020.63***	-
GKF	3.652339***	.3991649
GFCE	-6.199797***	1.271975
INF	-199.4521	134.8122
ERAT	-139.3692***	41.31075

Notes: ***, **, and * denote statistical significance at the 1%, 5%, and 10% level, respectively.

Table 4 reports the short-run parameters of the regression variables obtained from equation (3). The error correction term is significant suggesting that the coefficient of the error term is not zero. The value of 0.33 means that any deviation of RGDP in the short-run returns to the long-run trend at a relatively slow pace. The coefficients are statistically significant for GKF at the 1% significance level while that of GFCE is significant at the 5% significance level. INF, on the other hand, has been found not to have a significant relationship with RGDP. The results suggest that GKF is positively related to RGDP while GFCE has a negative relationship. Therefore, the results provide evidence that macroeconomic stability influences RGDP in the short run.

Table 4 The short-run coefficients of the VEC model

Variable	Coefficient	Std. Err.
ect_{t-1}	.3312013***	.0439603
$\Delta RGDP_{t-1}$	-.4107453**	.1606428
ΔGKF_{t-1}	1.330414***	.3325903
$\Delta GFCE_{t-1}$	-1.685129**	.7192986
ΔINF_{t-1}	27.5814	64.82171
$\Delta ERAT_{t-1}$	3.310519	86.71288
Constant	-107.9258	283.7331

Notes: ***, **, and * denote statistical significance at the 1%, 5%, and 10% level, respectively.

It is to be noted that Bruno and Easterly (1995, as cited in Samuelson & Nordhaus, 2001) found INF to be positively related with economic growth positively in the short-run but negatively in the long-run. Easterly and Wetzel (1989) stated that inefficiency of investment affects the output level and growth rate in the long-run and policy that affects resource use plays an important role in making investment efficient. The composition of investment goods could have been inappropriate for the long-term growth of the economy. Investment consists of many types of goods such as machinery, land improvement, construction of roads, hospitals, etc. Not all of them have the same effect or importance. For example, Jones (1994) identified machinery as the most important element of capital. The long-term effect of the different components of GKF in Bangladesh, however, seems to be the same in Bangladesh like its short-run effects.

Table 5 Granger causality test where the dependent variable is $\Delta RGDP$

Excluded	Chi-square statistic	Degrees of freedom	P-value
ΔGKF	1.5781	2	0.454
ΔGFCE	12.142	2	0.002
ΔINF	5.7496	2	0.056
ΔERAT	0.07541	2	0.963
All	23.131	8	0.003

Notes: Number of observations is 50.

Table 5 reports results of the Granger causality test for the $\Delta RGDP$ equation. The null hypothesis that the excluded variable does not Granger cause ΔRGDP is rejected separately for ΔGFCE at the 5% level and ΔINF for at the 10% significance level. This provides evidence in favor of a causal relationship between government consumption expenditure and inflation with economic growth. On the other hand, absence of any causal relationship between the other stability variables and economic growth indicates the nonexistence of any causal relationship between them, although the same does not hold true for the exclusion of all the variables simultaneously.

4. Conclusion

This paper uses cointegration and vector error correction technique to discover the long-run and short-run relationship between macroeconomic stability and economic growth in Bangladesh and Granger causality test to find out causation between them. The signs and significance of a number of factors of macroeconomic stability (GKF, GFCE, and ERAT) suggests that there is sufficient evidence of relationship between growth and macroeconomic stability in the long run. However, two of them are significant in the short-run (GKF and GFCE) and only one shows causal relationship with economic growth (GFCE). Thus, the results imply that rather than emphasizing macroeconomic stability as a whole, the policymakers are required to consider each factor separately. It also implies that the short-run and the long-run effects have to be evaluated carefully when formulating government economic policies. However, additional research covering new control variables like education and health and using more reliable data set needs to be carried out for a more complete picture.

Compliance with ethical standards

Disclosure of Conflict of interest

The author confirms that they have no identifiable conflicts of interest, financial interests, or personal affiliations that could have influenced the research reported in this article.

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Appendix A: Data Appendix

Per capita real GDP (RGDP): The data on real per capita GDP are taken from the *World Development Indicators* 2024, the World Bank. It is calculated by dividing the series 'real GDP' by the series 'Population, total'. This data is in constant LCU.

Gross capital formation per head (GKF): The data on gross capital formation per head are calculated by dividing the series 'Gross capital formation' by the series 'Population, total'. The source of calculation data is again the *World Development Indicators* 2024. The units are expressed in constant LCU.

Annual government final consumption expenditure per head (GFCE): Annual government final consumption expenditure per head is constructed by dividing the series 'General government final consumption expenditure' by the series 'Population, total' of the *World Development Indicators* 2024. Units are in constant LCU.

GDP deflator (INF): Data for GDP deflator is also from the *World Development Indicators* 2024.

Annual nominal exchange rate (ERAT): Data on annual nominal exchange rate (ERAT) comes from the *World Development Indicators* 2024. It is expressed as local currency units relative to the U.S. dollar.

Summary statistics for the variables are given in Table A1 and Table A2. Correlation matrices at levels and first differences are reported in Table A3 and Table A4.

Table A 1 Summary statistics of regression variables at levels

Variable	Mean	Maximum	Minimum	Standard Deviation
RGDP	76193.23	185623.20	38317.29	41166.33
GKF	17872.51	60436.60	583.59	16618.06
GFCE	4202.46	11319.93	542.99	2680.09
INF	40.82	139.88	1.36	38.54
ERAT	48.18	106.31	7.70	26.97

Notes: Number of observations is 53.

Table A2 Summary statistics of regression variables at first differences

Variable	Mean	Maximum	Minimum	Standard Deviation
RGDP	2700.95	9964.62	-6856.29	3138.92
GKF	1136.58	5656.93	-750.75	1206.16
GFCE	204.76	1343.84	-261.76	286.11
INF	2.66	21.78	-1.05	3.35
ERAT	1.89	14.56	-3.76	2.66

Notes: Number of observations 52.

Table A3 Correlation matrix at levels

Variable	RGDP	GKF	GFCE	INF	ERAT
RGDP	1.0000				
GKF	0.9986	1.0000			
GFCE	0.9860	0.9906	1.0000		
INF	0.9951	0.9964	0.9869	1.0000	
ERAT	0.9088	0.9183	0.9216	0.9156	1.0000

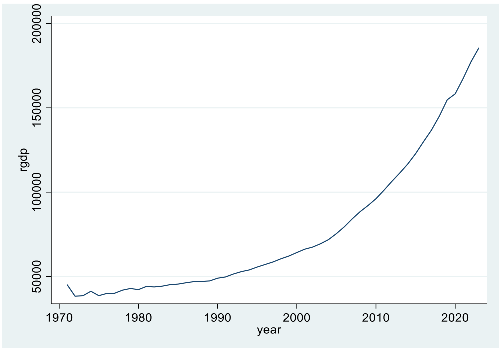
Notes: Number of observations is 53.

Table A4 Correlation matrix at first differences

Variable	RGDP	GKF	GFCE	INF	ERAT
RGDP	1.0000				
GKF	0.8633	1.0000			
GFCE	0.5965	0.4444	1.0000		
INF	0.6143	0.5547	0.3077	1.0000	
ERAT	0.2575	0.1252	0.2629	0.1760	1.0000

Notes: Number of observations is 52.

Appendix B: Graphs of Regression Variables



Source: See Appendix A.

Figure B1 Per capita real GDP (RGDP), 1971-2023

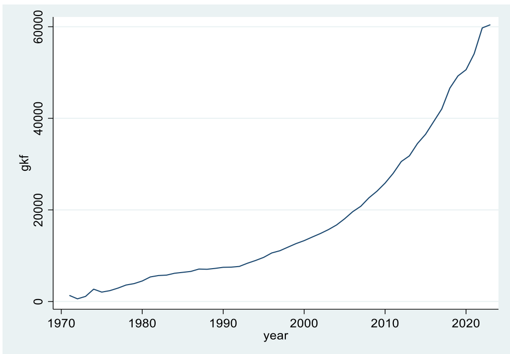


Figure B2 Gross capital formation per head (GKF), 1971-2023

Source: See Appendix A.

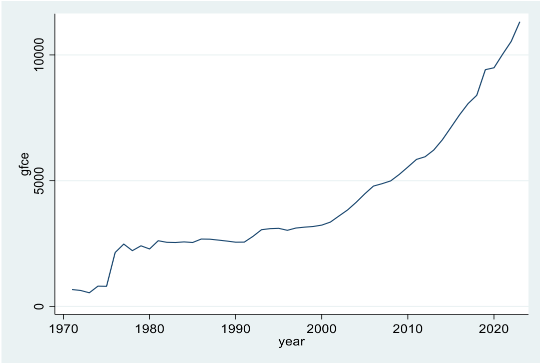


Figure B3 Annual government final consumption expenditure per head (GFCE), 1971-2023

.*Source*: See Appendix A.

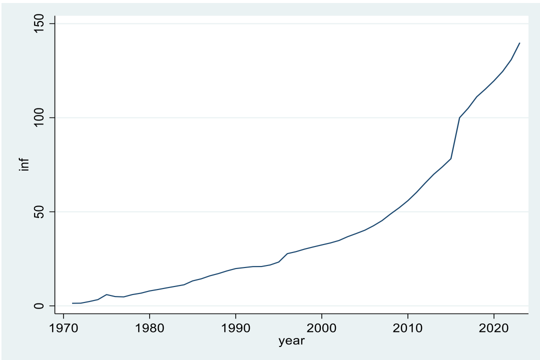


Figure B4 GDP deflator (INF), 1971-2023

Source: See Appendix A.

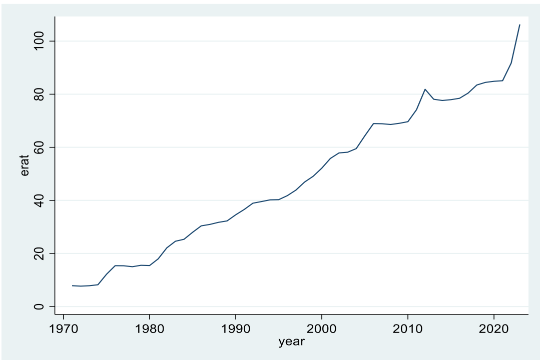


Figure B5 Annual nominal exchange rate (ERAT), 1971-2023

Source: See Appendix A.