

# Dynamics between Bangladeshi Real Consumption and Economic Growth

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**Abstract:** *A Vector auto-regressive model was estimated using annual data from 1980 to 2014 to assess the causal relationship between Bangladeshi real consumption and GDP. The estimation results suggest Bangladeshi real consumption and real GDP mutually affect each other. This estimation result contradicts an earlier report by Sakib-Bin-Amin (2011) who examined annual data during the 1976-2009 time frame. This finding suggests that the Bangladeshi government should not promote exports in the age of globalization and the fashionable Washington Consensus Development doctrine at the expense of domestic consumption in development of the national economy. This empirically supported approach certainly mitigates the negative impacts of the adverse international economic conditions on the national economy.*

**Key Words:** VAR model; Granger causality; Bangladesh; real consumption; real GDP.

## Introduction

The growth and progress of every economy, developed, or otherwise, is inevitably marked by periods of instability. As a result, virtually all economies worldwide have, at some point, experienced both internal and external shocks and disturbances. Internally, unstable investment and consumption patterns combined with improper implementation of public policies have proven to be key factors in the destabilization of many economies. External factors such as war and revolution, population growth and migration, technological transfers and changes, and the openness of the economy can also create instabilities in international economies.

Cyclical fluctuations in economic activities have resulted in both periodic increases in unemployment and inflation rates along with disequilibria in the external sector (Gbosi, 2001). In the age of globalization, encouraged by the so called “Washington Consensus Development Hypothesis,” and fueled by advances in telecommunications, internet capabilities, transportation, and computerization usage in production, many countries have relied on exports of goods and services to promote GDP growth. Adherence to post World War II neoclassical export development along with increased membership and participation in the World Trade Organization has also contributed to this trend.

While an export-led based development strategy often serves as the catalyst for economic development in transitional economies, exposure to detrimental worldwide economic

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events, such as the recent international financial crisis can deal severe blows to domestic economic growth. The recent US subprime mortgage crisis and the European sovereign debt phenomenon, for example, produced ripple effects that extended to multiple developing nations. In fact, the US subprime mortgage crisis disrupted the economies of export-dependent countries causing many to experience a significant decline in export activity. These reductions in exports along with their attendant consequences forced policymakers in these countries to rebalance their economic development strategies by promoting domestic consumptions as the primary economic growth mechanism, which is a very costly process.

With respect to the Bangladeshi economy, the Fact Sheet of the Bureau of South and Central Asian Affairs of the U.S. Department of State reported on February 10, 2016 that the United States is Bangladesh's largest export market. In 2014, the United States exported approximately \$1.1 billion in U.S. goods to Bangladesh and imported approximately \$5.3 billion worth of goods from Bangladesh. Bangladesh's most important exported commodities are: garments, knitwear, agricultural products, frozen food (fish and seafood), jute and jute goods, and leather. As of 2014, Bangladesh's most important trading partners along with percentages of export activity are: US 14.3%, Germany 13.6%, UK 7.9%, France 5.2%, Spain 4.3%, and Italy 4.1%.

As revealed in the following section, results of empirical investigations of the causal relationship between GDP (as proxy measure for income) and consumption, postulated by the demand side of macroeconomics, yielded contradictory results for different economies. This in turn suggests that the nature of causality in a given economy should be empirically determined. Therefore, the objective of this investigation is to study the causal relationship between Bangladeshi real consumption and GDP. The remainder of the study is organized as follows: section 2 briefly reviews the literature; section 3 discusses the research methodology and model specification; the following section reports on the empirical results; and the final section provides concluding remarks and policy implications.

### **Review of Literature**

The demand-side macroeconomic school of thought has long postulated a causal relationship between consumption and GDP growth, which is the theoretical foundation for the countercyclical macroeconomic policy framework. Additionally, the consumption theory in macroeconomics clearly postulates that GDP, and hence consumer's incomes, stand as the main determinant of the level of aggregate consumption. The aforementioned theories collectively posit a bidirectional causality, at least in the Granger sense, between aggregate consumption and GDP. While the bidirectional causality between aggregate consumption and GDP has been well articulated theoretically, the empirical investigation of this theoretically articulated bidirectional causality remains very limited.

Tapsin, and Hepsag (2014) provide a fairly complete survey of literature on the relationship between consumption and gross domestic product. Guisan (2001) provided

an extensive review of causality and cointegration between private consumption and GDP in twenty-five OECD countries over the period of 1960-1997. The author suggested using a country's own GDP (excluding GDPs of other countries in the group) as the sole explanatory variable in the investigating process. Guisan (2004) evaluated the power of Granger Causality, Modified Granger Causality, Engle-Granger Cointegration, Two Stage Least Squares, and Hausman tests in detecting the causal relationship between real consumption and GDP in Mexico and the United States. He found that there exists a strong degree of causal dependence of private consumption on GDP and a lower dependence when the variables are reversed.

More recently, Gomez-Zaldivar and Ventosa-Santaularia (2009) further investigated the causality between consumption and GDP in Mexico and the United States. The authors found no evidence of either causality or cointegration between Mexican series for consumption and GDP; but, in the case of the US series, the authors found that the two are cointegrated, with a unidirectional causality from consumption to GDP. Mishra (2011) investigated the dynamic relationship between real consumption expenditure and economic growth in India over the period of 1950-2008 and found a long-term unidirectional causality from real consumption expenditure to economic growth. However, the author reported that there is no short-term Granger causality between these two macroeconomic variables.

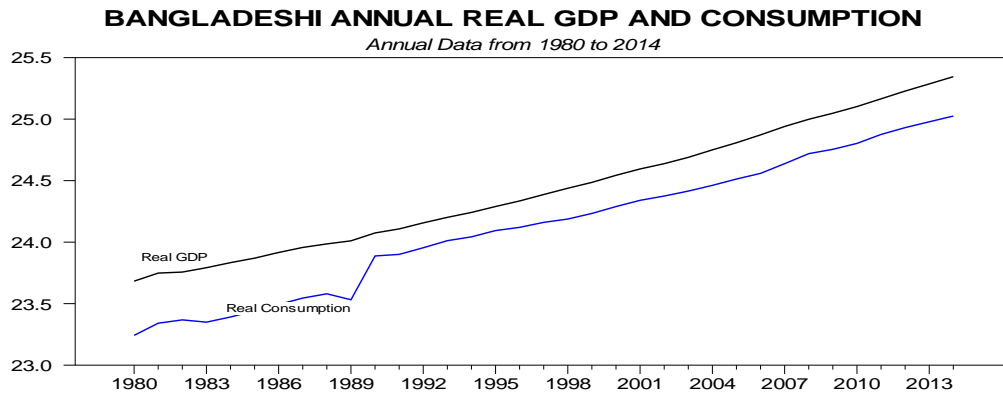
Alimi (2013) investigates the relationship between consumption expenditure and income in Nigeria. The model was tested by ordinary least squares for the period of 1970-2011. The author estimated the marginal propensity to consume and average propensity to consume and found that as income increases, the average and marginal propensity to consume is reduced, although the statistical results indicating a marginal propensity to consume less is not stable in the long run. Nwabueze Joy Chioma (2009) analyzed the casual relationship between gross domestic product and personal consumption expenditure using the data from Nigeria for the years of 1994 – 2007. the author indicated that an increase in gross domestic product has no significant effect on the personal consumption expenditure and the gross domestic product explained about 3.5% of the personal consumption expenditure in Nigeria.

Ofwona (2013) reported that consumption is determined by income in Kenya in accordance with Kenya over the period 1992. Генчев, (2012), studied the relationship between income and consumption in Bulgaria and Russia over the period 1990-2010 and found that there exist positive and significant long run relationships between gross national income and consumption for Bulgaria and Russia.

Sakib-Bin-Amin (2011), investigated the causal relationship between consumption expenditure and economic growth in Bangladesh using annual data from 1976-2009. The method used in the study is Johansen and ARDL cointegration tests. The empirical results revealed a long run unidirectional causal relationship running from economic growth to consumption expenditure.

### Data and Descriptive Statistics

This study uses available annual data on Bangladeshi real GDP and private consumption over the period from 1980 to 2014. All data series were obtained from the IMF databases. The annual Bangladeshi logarithmic real GDP and private consumption are denoted by  $GDP_t$  and  $CON_t$ , respectively. The difference between the annual Bangladeshi logarithmic real  $GDP_t$  and private consumption,  $CON_t$ , is defined as the spread and is denoted by  $SP_t$ .



**Figure 1:** Bangladeshi Real GDP and Consumption, 1980- 2014.

Figure 1 displays the behavior of the respective the annual Bangladeshi logarithmic real GDP and private consumption over the sample period. As Figure 1 suggests, both the annual Bangladeshi logarithmic real  $GDP_t$  and private consumption,  $CON_t$ , oscillated around a moderately upward trend over the sample period, except for the logarithmic real private consumption in 1990.

The mean of the logarithmic  $GDP_t$  during the sample period was 24.44, and ranged from 23.68 to 25.03 with a standard error of 0.54. The mean private consumption,  $CON_t$ , over the same period was 24.13, and ranged from 23.24 to 25.03 with a standard error of 0.50. Their correlation was 98.92 which is fairly high. Moreover, as suggested by Figure 1, it is likely that the spread between the Bangladeshi logarithmic real  $GDP_t$  and private consumption,  $CON_t$ , experienced a structural break over the sample period.

### Stationarity of the Time Series

Econometrically, to estimate a Vector-autoregressive (VAR) Model, the time series data must be non-stationary and cointegrated. To this end, this study uses two standard unit root tests: the augmented Dickey-Fuller (1979) (ADF) test and the Phillips-Perron (1988) (PP) tests to determine stationarity and co-integration of the Bangladeshi  $GDP_t$  and

$CON_t$ , The null hypothesis for both tests is that a unit root exists in the autoregressive representation of the series. The augmented Dickey-Fuller and Phillips-Perron unit root test results are reported in Table 1. An analysis of the test results suggests the presence of unit roots in level. Both series are stationary after the first differencing. These findings indicate that the series under consideration are non-stationary and integrated of order I(1)

**Table 1: ADF and PP Test Results, Bangladeshi Annual Data from 1980 to 2014**

Series	<u>Augmented Dickey- Fuller</u>		<u>Phillips- Perron</u>	
	<i>t-Statistic</i>	<i>Probability*</i>	<i>t-Statistic</i>	<i>Probability*</i>
$CON_t$	-7.909035	0.0000	-8.126620	0.0000
$GDP_t$	-4.359869	0.0000	--4.763024	0.0005

**Note:** \* MacKinnon (1996) one-sided p-values; Null Hypothesis: the variable has a unit root.

**Long-run Cointegrating Relationship**

Additionally, Engle and Granger (1987) argued that if two series are integrated of order one, I(1), there is need to test for the possibility of a long-run cointegrating relationship among the variables. Since the cointegration and error correction methodology is well documented (Engle and Granger, 1987; Johansen and Juselius, 1990; Banerjee et al., 1993) only a brief overview is provided here. Johansen and Juselius’ (1990) multivariate cointegration model is based on the error correction representation given by:

$$\Delta X_t = \mu + \sum_{i=1}^{p-1} \Gamma_i \Delta X_{t-i} + \Pi X_{t-1} + \varepsilon_t \tag{1}$$

where  $X_t$  is an  $(n \times 1)$  column vector of p variables,  $\mu$  is an  $(n \times 1)$  vector of constant terms,  $\Gamma$  and  $\Pi$  represent coefficient matrices,  $\Delta$  is a difference operator, k denotes the lag length, and  $\varepsilon_t \sim N(0, \Sigma)$ . The coefficient matrix,  $\Pi$ , is known as the impact matrix; and contains information about the long-run relationships. Johansen and Juselius’ (1990) methodology requires the estimation of the VAR equation (1), and the residuals are then used to compute two likelihood ratio (LR) test statistics that can be used in the determination of the unique cointegrating vectors of  $X_t$ . The number of cointegrating vectors can be assessed by using two statistics: the trace test and the maximal eigenvalue test. The testing results are reported in Table 2.

**Table 2: Johansen Cointegration Test Results, Bangladeshi Annual Data 1980 to 2014**

Number of cointegrating vectors	<u>Trace Statistics</u>		<u>Max-Eigen Statistics</u>	
	<b>Statistics</b>	<b>C (5%)</b>	<b>Statistics</b>	<b>C (5%)</b>
$r \leq 0$	33.6914*	15.4947	32.1779*	14.2646
$r \leq 1$	1.5135	3.8415	1.5135	3.8415

**Note:** \* denotes rejection of the hypothesis at the 5 percent level.

As shown in Table 2, results for cointegration tests suggest the existence of, at most, one cointegrating vector. This implies the presence of one independent common stochastic trends in this system of two variables, i.e., these two variables have a long-run cointegrating relationship.

### Structural Break

To search endogenously for the possibility of any structural break in the relationship between Bangladeshi real consumption,  $CON_t$ , and  $GDP_t$ , this study utilized Perron's (1997) endogenous unit root test function with the intercept, slope, and the trend dummy to test the hypothesis that the difference between the annual Bangladeshi logarithmic real  $GDP_t$  and private consumption,  $CON_t$ , defined as the spread,  $SP_t$ , has a unit root.

$$SP_t = \mu + \theta DU + \alpha t + \gamma DT + \delta D(T_b) + \beta SP_{t-1} + \sum_{i=1}^k \psi_i \Delta SP_{t-i} + v_t \quad (2)$$

where  $DU = 1(t > T_b)$  is a post-break constant dummy variable;  $t$  is a linear time trend;  $DT = 1(t > T_b)$  is a post-break slope dummy variable;  $D(T_b) = 1(t = T_b + 1)$  is the break dummy variable; and  $\varepsilon_t$  are white-noise error terms. The null hypothesis of a unit root is stated as  $\beta = 1$ . The break date,  $T_b$ , is selected based on the minimum t-statistic for testing  $\beta = 1$  (see Perron, 1997, pp. 358-359).

**Table 3: Perron's Endogenous Unit Root Test, Bangladeshi Data, 1980 to 2014**

$$SP_t = 0.5010 - 0.3479DU - 0.0102t + 0.0151DT + 0.2885D(T_b) - 0.0210SP_{t-1} + v_t$$

(6.3076\*)    (-4.5440\*)    (-1.0919)    (1.6188)    (17.8781\*)    (-0.3945)

No. of augmented lags:  $k = 5$       Break Date: 1990       $t(\alpha = 1) = -19.2774^*$

**Notes:** Values for t-statistics in parentheses: Critical values based  $n = 100$  sample for the break-date (Perron, 1997). "\*" indicates significance at 1 percent levels.

The estimation results of Perron's endogenous unit root tests are summarized in Table 3. The post-break intercept dummy variable,  $DU$ , is negative and significant at any conventional level, while the post-break slope dummy variable,  $DT$ , is positive and is insignificant at any conventional level. The empirical results of these tests suggest that the Bangladeshi spread between the annual Bangladeshi logarithmic real  $GDP_t$  and private consumption,  $CON_t$ , followed a stationary trend process with a break date of 1990.

### Methodology and Model's Specification

As aforementioned, the objective of this investigation is to empirically study the causal relationship between Bangladeshi real consumption and GDP. To achieve this objective, the following system of two equations are jointly determined by the Vector auto-regression.

$$CON_t = \alpha_0 + \sum_{p=1}^P \alpha_p CON_{t-p} + \sum_{q=1}^Q \alpha_q GDP_{t-q} + \alpha_d DUM_1 + \varepsilon_{1,t} \quad (3)$$

$$GDP_t = \beta_0 + \sum_{m=1}^M \beta_m CON_{t-m} + \sum_{n=1}^N \beta_n GDP_{t-n} + \beta_d DUM_2 + \varepsilon_{2,t} \quad (4)$$

where  $CON_t$  and  $GDP_t$  are previously determined.  $\alpha_i$  and  $\beta_j$ , are parameter to be estimated and  $\varepsilon_{k,t}$  are disturbances.  $DUM_k$  is a dummy variable assuming a value of 1 for 1990 and 0 elsewhere to account for the structural break in the relationship between  $CON_t$  and  $GDP_t$  in 1990.

In the estimation process, the estimated coefficients,  $\alpha_i$  and  $\beta_j$ , are retained based on the t-statistics. The exclusion test in the VAR, having a  $\chi^2$  distribution, is used to test for lag exclusion. Failure of the exclusion test to reject the null hypothesis that all estimated  $\alpha_q$ 's in equation (3) are equal to zero indicates that Bangladeshi real  $GDP_t$  Granger causes real consumption,  $CON_t$ , i.e., there is unidirectional Granger causality from real  $GDP_t$  to real consumption,  $CON_t$ . Similarly, failure of the exclusion test to reject the null hypothesis that all estimated  $\beta_m$ 's in equation (4) are equal to zero indicates that Bangladeshi real consumption,  $CON_t$ , Granger causes real GDP; i.e., there is unidirectional Granger causality from real consumption,  $CON_t$ , to real  $GDP_t$ . Finally, if real  $GDP_t$  Granger causes real consumption,  $CON_t$ , and real consumption,  $CON_t$ , Granger causes real  $GDP_t$ , then there is a bidirectional Granger causality between Bangladeshi real consumption,  $CON_t$ , and real  $GDP_t$ .

### Empirical Results

The estimation results for the VAR system of equations (3) and (4), using the annual data from Bangladesh over the period 1980-2014 are reported in Table 4.

A closer look at the estimation results reveals that on the strength of the t-statistics, the lag length of two of both the real consumption,  $CON_t$ , and real  $GDP_t$  are retained in the model. Additionally, the calculated exclusion test statistic,  $\chi^2$ , testing the null hypothesis that both the estimated coefficients of  $GDP_{t-1}$  and  $GDP_{t-2}$  in equation (5) are equal to zero is 9.218 with the p-value of 0.0100. Similarly, the calculated exclusion test statistic,  $\chi^2$ , testing the null hypothesis that both the estimated coefficients of  $CON_{t-1}$  and  $CON_{t-2}$  in equation (6) are equal to zero is 9.858 with the p-value of 0.0072. Taken together, these two exclusion test results indicate that there is a bidirectional Granger causality between Bangladeshi real consumption,  $CON_t$ , and real  $GDP_t$ ; i.e., Bangladeshi real consumption,  $CON_t$ , and real  $GDP_t$  mutually affect each other's. This finding contradicts the earlier report by Sakib-Bin-Amin (2011) over period 1976-2009.

**Table 4: VAR Estimation Results, Bangladeshi Annual Data, 1980 to 2014**

$$\begin{aligned}
 CON_t &= 0.34 + 0.77CON_{t-1} + 0.23CON_{t-2} + 2.02GDP_{t-1} - 2.04GDP_{t-2} + 0.33DUM_t + \varepsilon_{1t} \\
 &\quad (1.07) \quad (9.28^*) \quad (2.85^*) \quad (3.04^*) \quad (-3.02^*) \quad (14.80^*) \\
 GDP_t &= -0.197 - 0.06CON_{t-1} + 0.08CON_{t-2} + 1.47GDP_{t-1} - 0.48GDP_{t-2} + 0.02DUM_t + \varepsilon_{2t} \\
 &\quad (-1.96^{***}) \quad (-2.34^{**}) \quad (3.11^*) \quad (7.04^*) \quad (-2.28^{**}) \quad (3.73^*)
 \end{aligned}$$

$$\text{Log-likelihood} = 166.5033 \quad R^2(LR) = 0.99990 \quad F\text{-statistic}_{(10, 52)} = 519.551^*$$

**Note:** Values of t-statistics are in parentheses. “\*”, “\*\*” and “\*\*\*” indicate the 1 percent, 5 percent, and 10 percent significant levels, respectively.

### Concluding Remarks and Policy Recommendations

Literature on empirical investigations of the causal relationship between GDP (as proxy measure for income) and consumption, postulated by the demand side of macroeconomics, yielded contradictory results for different economies. This in turn suggests that the nature of their causality in a given economy should be empirically determined. The objective of this investigation is to study the causal relationship between Bangladeshi real consumption and GDP. To achieve this objective, this study specified and estimated a VAR system of two equations using annual data from Bangladesh from 1980 to 2014.

The estimation results suggest that there is a bidirectional Granger causality between Bangladeshi real consumption,  $CON_t$ , and real  $GDP_t$ ; i.e., Bangladeshi real consumption,  $CON_t$ , and real  $GDP_t$  mutually affect each other's. This finding contradicts the earlier report by Sakib-Bin-Amin (2011) over the period 1976-2009.

As to the policy implications, the above findings suggest that as much as the Bangladeshi government likes to promote exports in the age of globalization and the fashionable Washington Consensus Development doctrine, it is well advised that the government simultaneously promote domestic consumption to develop the economy as well. This approach not only is supported by empirical evidence, it also mitigates the negative impact of the international adverse economic conditions.

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