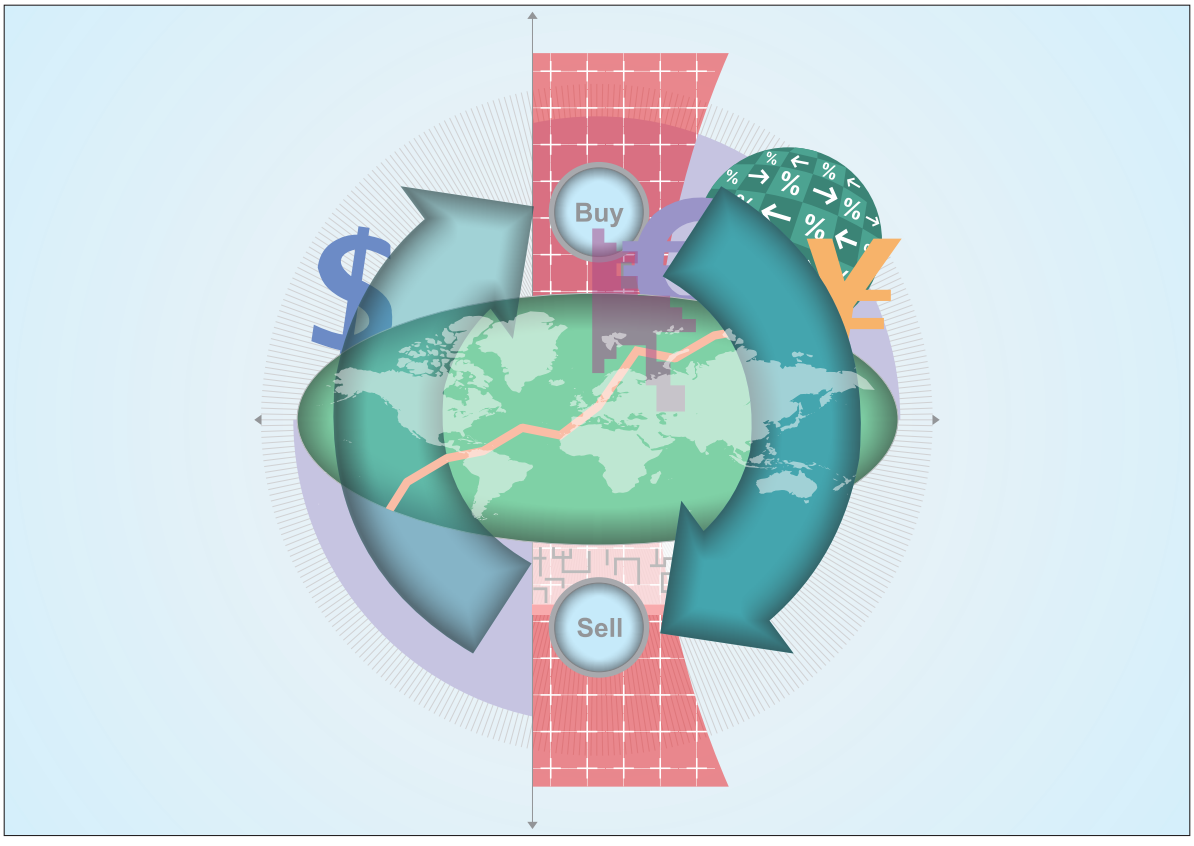

The International Journal of Applied Economics & Finance

ISSN 1991-0886

science alert

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http://ansinet.com

The International Journal of Applied Economics and Finance 8 (3): 98-108, 2014
ISSN 1991-0886 / DOI: 10.3923/ijaef.2014.98.108

Tax and Spend, Spend and Tax, Fiscal Synchronization or Fiscal Neutrality: Evidence from Bangladesh

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ABSTRACT

This study analyzes the direction of causal linkage between Government Expenditure (GE) and Government Revenue (GR) in Bangladesh applying Johansen's cointegration and Error Correction Mechanism (ECM) covering the period from 1973-2013. Before proceeding to check cointegration and causality, we apply augmented Dickey-Fuller and and Phillips-Perron (PP) unit root test to assess the time series properties of the variables. The results of ADF and Phillips-Perron (PP) unit root test indicate that both time-series data is nonstationary at their levels but stationary at their first differences. Results of the Johansen cointegration test show that a significant long-run equilibrium exists between GE and GR. Results from Granger causality test based on Vector Error Correction Models (VECM) suggest unidirectional causality from revenue to expenditure in the long run supporting Tax-and-spend hypothesis.

Key words: Government spending, government revenue, causality, vector error correction

INTRODUCTION

The subject of causal relation between government revenue and expenditure has important implications for the political economy of fiscal policies in the field of public finance and budget deficit that is one of the very important and widely discussed topics in the literature of public finance. Understanding the behavior of budget deficits for all, economies has been continuing to develop research agenda and it is important from a policy point of view, especially for a country like Bangladesh, which is suffering from persistent budget deficits. Owing to the great concern over the growing budget deficits, numerous studies (Blackley, 1986; Jones *et al*., 1993; Jones and Joulfaian, 1991; Hasan and Lincoln, 1997; De Castro *et al*., 2004; Baharumshah and Lau, 2007; Saunoris and Payne, 2010; Puah *et al*., 2011) perform time series studies (Marlow and Manage, 1987; Ram, 1988; Chowdhury, 1988; Dahlberg and Johansson, 1998; Chang and Chiang, 2009) and apply panel data analysis all over the world have been devoted to testing the "tax-and-spend, spend-and-tax, fiscal synchronization or fiscal neutrality" hypothesis. Some studies (Darrat, 2002; Payne *et al*., 2003; Wahid, 2008; Eita and Mbazima, 2008) have been performed in developing countries while others in developed (Blackley, 1986; Jones and Joulfaian, 1991; Ewing *et al*., 2006; Anderson *et al*., 1986), the U.K. (Hasan and Lincoln, 1997; Saunoris and Payne, 2010) or Canada (Payne, 1997). To investigate the relationship between government revenue and government expenditure, different methodologies are used. The majority of these studies apply Johanshen cointegration techniques (Eita and Mbazima, 2008; Payne, 1997;

Hondroyiannis and Papapetrou, 1996; Katrakilidis, 1997; Park, 1998; Engle and Granger, 1987; Jones and Joulfaian, 1991; Kollias and Makrydakis, 2000; Kollias *et al.*, 2007; Miller and Russek, 1990) to test for long run relationship between government spending and government revenues. Consequently, they deploy Granger causality test (Oshikoya and Tarawalie, 2009; Von Furstenberg *et al.*, 1985, 1986; Konstantinou, 2004) in order to identify the direction of causality. The determination of which hypothesis characterizes an economy is an intellectual exercise and has implications about solutions to the problem of budget deficits. Understanding the relationship between revenue and expenditure is a crucial prerequisite for any effective fiscal consolidation process. The fiscal deficit can be reduced via changes in government expenditures or revenues or both. The selection of any of these approaches should be based on the outcome of empirical investigation.

Four alternative hypotheses have been used to describe the relationship between these variables in the budgetary process: (1) Tax-and-spend hypothesis, (2) Spend-and-tax hypothesis, (3) Fiscal synchronization hypothesis and (4) Fiscal neutrality hypothesis or institutional separation hypothesis. Over the last four decades, different studies have focused on different countries, time periods, proxy variables and different econometric methodologies to investigate the relationship between government revenues and expenditures. Regarding the direction of causality, some researchers (Von Furstenberg *et al.*, 1986; Anderson *et al.*, 1986; Carneiro *et al.*, 2005; Wahid, 2008) find the evidence of spend-and tax hypothesis, some (Manage and Marlow, 1986; Baghestani and McNown, 1994; Darrat, 1998; Eita and Mbazima, 2008; Wang and Fasano-Filho, 2002) find the evidence of tax-and-spend hypothesis and fiscal synchronization hypothesis are found in the studies by Al-Qudair (2005), Gounder *et al.* (2007), Aslan and Tasdemir (2009) and Chang and Chiang (2009). Again, there are some studies (Baghestani and McNown, 1994; Hoover and Sheffrin, 1992) that find an absence of any causal relationship (institutional separation). The empirical outcomes of these studies have been varied and sometimes found to be conflicting. The results seem to be different on the direction of causality. The policy implications of these relationships can be significant depending upon what kind of causal relationship exists between variables. Narayan and Narayan (2006) give three reasons why the nature of the relationship between government expenditure and revenue is very important. Firstly, if the tax-spend hypothesis is supported, budget deficits can be avoided by implementing policies that stimulate government revenue. Secondly, if the bidirectional causality does not hold, it means that government revenue decisions are made independent from expenditure decisions. This can cause high budget deficits and government expenditure rises faster than government revenue. Finally, if the spend-tax hypothesis is supported, it means that the government spends first and pays for this spending later by raising taxes. This will have as a result a fear of paying more taxes in the future and will encourage the outflow of capital.

Bangladesh has been facing persistent budget deficits since the independence. Figure 1 shows that Bangladesh's government expenditure is always greater than government revenue. There is some similar type of fluctuations on the data that are shown in the Fig. 1. It seems that there is some causal link between government revenue and expenditure. But it is not clear from the data what direction of causal link between the variables exist. On the empirical side, literature on the issue for Bangladesh is very rare. To the best of our knowledge, there are no studies in Bangladesh that are performed in the issue. This creates a lacuna for research in the area.

The focus of this study is to examine the causal relationship between Government Revenue (GR) and Government Expenditure (GE) in Bangladesh. This study tests whether government

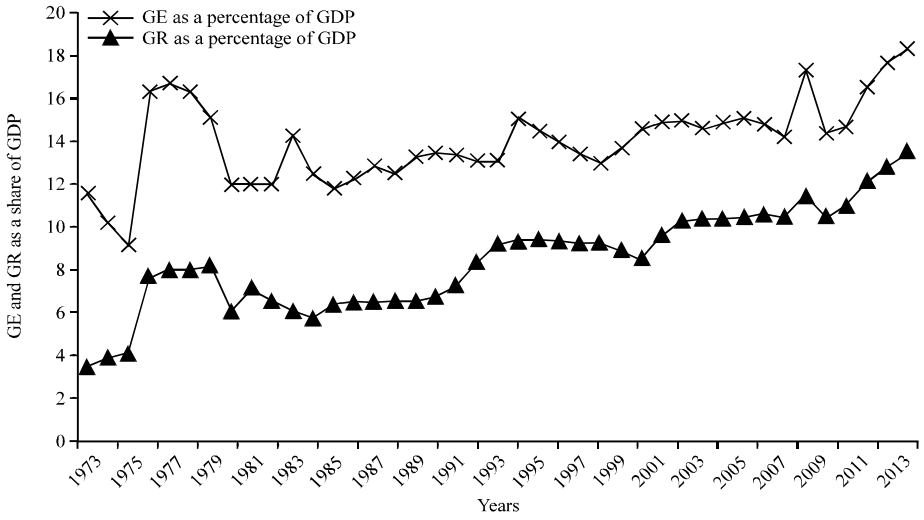

Fig. 1: Government expenditure and government revenue as a share of GDP in Bangladesh (1973-2013)

revenue causes government expenditure or whether the causality runs from government expenditure to government revenue and if there is bidirectional causality.

THEORETICAL FRAMEWORK

Causality between government revenues and expenditure is exploited to evaluate the dynamics behind the formation of budget deficits in the empirical public finance. Within this context, there are four main hypotheses formulated in the literature that help to illustrate the relationship between government revenues and expenditure.

The first one is the tax-and-spend hypothesis led by Friedman (1978) and Buchanan and Wagner (1978). Friedman (1978) argues that there is a positive causal relationship between government revenue and expenditure. According to Friedman, increasing taxes simply lead to more expenditure. Therefore, decreasing taxes is the appropriate remedy to budget deficits. On the contrary, Buchanan and Wagner (1978) state that the causal relationship between the variables is negative. They propose an increase in taxes revenue as a remedy for deficit budgets. Their point of view is that with a decline in taxes the public perceive that the cost of government programs has fallen.

The second hypothesis known as spend-and-tax hypothesis that has been proposed by Peacock and Wiseman (1979). They argue that temporary increases in government expenditure as a result of economic and political crises lead to permanent increases in government revenues. This hypothesis is also consistent with Barro (1979) view that today's deficit-financed expenditure means increased tax liabilities in the future in the context of the Ricardian equivalence proposition, which, in fact, rules out the fiscal illusion. As higher expenditure now, lead to higher tax later, this hypothesis suggests that expenditure decreases are the desired solution to reducing budget deficits.

The third hypothesis, which is led by Musgrave (1966) and Meltzer and Richard (1981), is called the fiscal synchronization hypothesis. According to this hypothesis, government's decision on the optimal levels of expenditure and taxation is determined concurrently and depends on the voters' welfare maximizing demand for public services and on voters' attitude towards the

redistribution function of the government, based on the comparison of their marginal benefits and cost of public services. This implies bidirectional causality between government expenditure and government revenue. In this case, governments take decisions about revenues and expenditures simultaneously.

The fourth one is the institutional separation hypothesis or fiscal neutrality hypothesis introduced by Baghestani and McNown (1994), in which government revenue and expenditure are argued to be independent from each other due to the independent functions of the executive and legislative branches of the government. This perspective suggests that there is no causality between revenues and expenditures, i.e., they are independent of each other.

The link between government expenditure and government revenue is specified as:

$$GE_t = \alpha_1 + \alpha_2 GR_t + \mu_t \quad (1)$$

$$GR_t = \beta_1 + \beta_2 GE_t + \mu_t \quad (2)$$

where, GE and GR are government expenditure and government revenue, respectively and μ is an error term. We expect that $\alpha_2 > 0$ and $\beta_2 > 0$. The definition of government expenditure is its ratio to GDP. The government revenue is defined as the ratio of revenue to GDP.

METHODOLOGY

Data: The data set used for the empirical analysis in this study consists of annual time series data for the period 1973-2013 on Government Revenue (GR) and Government Expenditure (GE). All variables are expressed as a ratio of GDP. Data was obtained from Sixth five year plan, Ministry of Planning, Government of the People's Republic of Bangladesh.

Econometric methodology: Econometric methodology of this study includes unit root test, which detects the stationarity of these variables, government expenditure and revenue, Johansen cointegration method, which observes the long run relationship between the variables and Vector Error Correction Mechanism (VECM) based Causality test, which explores the direction of causality. These are briefly described as follows.

Unit root test: We examine stationary properties of data by Augmented Dickey Fuller (ADF) and Phillips and Perron (PP) tests. The ADF test is estimated by the following regression:

$$\Delta Y_t = \beta_1 + \beta_2 t + \delta Y_{t-1} + \sum_{i=1}^{m} \alpha_i \Delta Y_{t-i} + u_t \quad (3)$$

where, ΔY_t is the first difference of Y series, β_1 is a constant term, t is a trend variable, m is the number of lags which are included to allow for serial correlation in the residuals and u_t is the residual term.

A test for nonstationarity of the series, Y_t, accounts to a t-test of $\delta = 0$. The alternative hypothesis of stationary requires that δ be significantly negative. If the absolute value of the computed t-statistics for δ exceeds the absolute critical value, then the null hypothesis, that the Y_t series is nonstationary must be rejected against its alternative hypothesis. That is, if, on the other hand, it is less than the critical value, it is concluded that the Y_t series is nonstationary.

Phillips-Perron (PP) test is estimated by the following regression:

$$\Delta Y_t = \alpha+\beta t+\rho Y_t+u_t \tag{4}$$

where, the second equation includes a trend variable. The PP test is verified by the t value associated with the estimated coefficient of ρ. The series are to be stationary if ρ is negative and significant. The test is to be performed for all the variables where both the original series and the differences of the series are to be tested for stationary.

Cointegration test: Cointegration broadly refers that one or more linear combinations of time-series data are stationary although, they are individually non-stationary at their levels. In other words, the series are concluded as cointegrated when two or more series are individually integrated in the same order but some linear combination of them have order of integration lower than individual series. Cointegration analysis is inherently multivariate as a single time series cannot be cointegrated. Consequently, consider a set of integrated variables such as government expenditure and government revenue. To determine the number of cointegrating vectors, we apply Johansen cointegration approach in a Vector Autoregressive (VAR) framework which involves the Likelihood Ratio (LR) tests; the maximum eigenvalue test and the trace test. In a VAR, each variable is 'explained' by its own lagged values and the lagged values of all other variables in the system. We formulate the following VAR model:

$$Y_t = \mu + \sum_{k=1}^{p} \pi_k Y_{t-k} + \varepsilon_t \tag{5}$$

where, Y_t is an (n×1) column vector of n(I) variables, π_k is a coefficient matrix, μ presents a (n×1) vector of constants, p denotes lag length and ε_t is a disturbance term that is independently and identically distributed with zero mean and constant variance. Equation 5 can also be expressed in first difference form as:

$$\Delta Y_t = \mu + \eta y_{t-1} + \sum_{k=1}^{p-1} \alpha_i \Gamma'_k y_{t-k} + \varepsilon_t \tag{6}$$

where, Δ is the first difference operator and I is a n×n identity matrix:

$$\eta = \sum_{k=1}^{p} \Pi_k - 1$$

and:

$$\Gamma'_k = -\sum_{j=k+1}^{p} \Pi_j$$

The rank of matrix Π determines the number of cointegration vectors which is equal to the number of independent numbers of cointegrations. If the rank of Π equals r and r<n, then there exist r cointegrating relationships in the model.

If we postulate a bi-variate VAR and allow for one cointegration relation we get the following VAR system:

$$\begin{bmatrix}\Delta Y_{1,t}\\ \Delta Y_{2,t}\end{bmatrix}=\begin{bmatrix}\eta_{11} & \eta_{12}\\ \eta_{21} & \eta_{22}\end{bmatrix}\begin{bmatrix}\Delta Y_{1,t-1}\\ \Delta Y_{2,t-1}\end{bmatrix}+\begin{bmatrix}I'_{11} & I'_{12}\\ I'_{21} & I'_{22}\end{bmatrix}\begin{bmatrix}(Y_1-Y_2)_{t-1}\\ (Y_2-Y_1)_{t-1}\end{bmatrix}+\begin{bmatrix}\varepsilon_{1,t}\\ \varepsilon_{2,t}\end{bmatrix}$$

The number of cointegrating relations is tested with two statistics namely, trace statistics and maximum eigenvalue statistics. Trace and maximum eigenvalue statistics are done from the following equations:

$$\lambda_{trace}(r) = -T\sum_{i=r+1}^{n} In(1-\lambda_i) \tag{7}$$

$$\lambda_{max}(r, r+1) = -TIn(1-\lambda_{r+1}) \tag{8}$$

where, λ_i is the estimated values of the characteristic roots obtained from the estimated Π and T is the number of observations.

Vector error correction based causality test: After testing cointegration, the main step is to provide Vector Error Correction Modeling (VECM) based Granger Causality between government expenditure and revenue for Bangladesh to verify the direction of causal relationship between the variables. According to Granger (1988), a variable (government revenue) is said to Granger cause another variable (government expenditure) if past and present values of government revenue help to predict government expenditure. The rationale for conducting the Granger causality test between government expenditure and revenue is to determine whether Bangladesh is characterized by either the tax-and-spend, spend-and-tax or fiscal synchronization hypotheses. The result obtained may have severe policy implications for fiscal discipline as well as sustainability of fiscal policy.

Granger (1988) points out that if there exists a cointegrating vector among variables, there must be causality among these variables at least in one direction.

Thus, we try to determine whether the stochastic trends in the variables that contained unit root have long run relationship. The Granger representation theorem posits that if cointegration is established then GRt and GEt may be considered to be generated by error correction models of the form:

$$\Delta GE_t = \alpha_0 + \sum_{i=1}^{n1}\alpha_{1i}\Delta GE_{t-1} + \sum_{i=1}^{n2}\alpha_{2i}\Delta GR_{t-1} + \delta\mu_{t-1} + \varepsilon_{1t} \tag{9}$$

$$\Delta GR_t = \beta_0 + \sum_{i=1}^{T1}\beta_{1i}\Delta GR_{t-1} + \sum_{i=1}^{T2}\beta_{2i}\Delta GE_{t-1} + \lambda\xi_{t-1} + \varepsilon_{2t} \tag{10}$$

where, n and T are the optimal lag length. GR_t and GE_t are government revenue and government expenditure, respectively. Equation 9 is expenditure equation, while Eq. 10 is revenue equation. Δ is the difference operator, μ_{t-1} and ξ_{t-1} are the error correction terms and ε_{1t} and ε_{2t} are white noise error terms, which are identically and independently normally distributed with mean zero and constant variance. δ and λ are the error correction coefficients and are expected to capture the adjustment of ΔGE_t and ΔGR_t towards long-run equilibrium, while ΔGR_{t-1} and ΔGE_{t-1} are expected to capture the short-run dynamics of the model.

In Eq. 9 and 10, the focus is mainly on the statistical significance of the error correction coefficients, δ and λ, which are used to test the causal relationship between expenditure and revenue. The null hypothesis to be tested in Eq. 9 is that GR_t does not Granger cause GE_t. Thus, the null hypothesis is to be rejected if $\sum\alpha_{2i}$ is significantly different from zero. In a similar fashion for Eq. 10, the null hypothesis to be tested is that Ge_t does not Granger cause GR_t. The null hypothesis is to be rejected if $\sum\beta_{2i}$ is significantly different from zero.

After the cointegration of the variables is established for the long-run relation, the long-run and the short-run causality can be examined. The Granger causality from the VECM framework is used to determine the direction of the causality between the variables. The VECM is developed as follows:

$$\begin{bmatrix}\Delta GE_t\\ \Delta GR_t\end{bmatrix}=\begin{bmatrix}\alpha_0\\ \beta_0\end{bmatrix}+\begin{bmatrix}\alpha_{11i} & \alpha_{12i}\\ \beta_{21i} & \beta_{22i}\end{bmatrix}\begin{bmatrix}\Delta GE_{t-1}\\ \Delta GR_{t-1}\end{bmatrix}+\begin{bmatrix}\delta\\ \lambda\end{bmatrix}\times\begin{bmatrix}\mu\\ \xi\end{bmatrix}_{t-1}+\begin{bmatrix}\varepsilon_{1t}\\ \varepsilon_{2t}\end{bmatrix}$$

The significance of the coefficient for the error terms uses the t-test statistic to indicate the causality over the long run.

RESULTS

The results of unit root, cointegration and VECM based causality test are described as follows:

Results of unit root test: We first perform unit root tests on all the series in levels and first differences in order to determine the time series properties of the data. To investigate the presence of unit root in the variables, we conduct the ADF test with an intercept term and trend. We use the Schwarz Information Criterion (SIC) to determine the appropriate lag lengths of the variables. We also run the PP test with both an intercept and trend term. Results of both the tests are presented in Table 1. It is evident from Table 1 that the ADF and PP statistics for both government revenue and government expenditure in levels do not exceed their critical values except in case of government expenditure for ADF test. However, when the variables are differenced once and subjected to ADF and PP tests, the test statistics exceed their critical values at the 1% significant level. These results suggest that both series are integrated of order one, that is, they are I (1) series.

Results of cointegration test: Table 2 presents the results of cointegration analysis by using the Johansen maximum likelihood approach which generates maximum eigenvalue and trace statistics. In Table 2, both trace and maximum eigenvalue test indicate the rejection of the null hypothesis that there is no cointegrating relationship at 5% level of significance and hence accepts the alternative hypothesis that there is cointegration relationship between the variables. This indicates

Table 1: Results of unit root test

	Augmented Dickey Fuller (ADF) test		Phillips-Perron (PP) test		
Parameters	Govt. revenue	Govt. expenditure	Govt. revenue	Govt. expenditure	Order of integration
Level	-2.6971	-3.4907*	-2.8656	-3.1629	
First difference	-6.2684**	-6.7713**	-6.2684**	-8.5271**	I(1)

*,**Rejection of null hypotheses of unit root at 10 and 1% level of significance, respectively

Table 2: Results of cointegration test between TR and TE

Hypothesized No. of CE(s)	Eigen value	Trace statistics	Critical value 5%	Probability	Max-eigen statistic	Critical value 5%	Probability
None*	0.497145	34.41943	25.87211	0.0034	26.81069	19.38704	0.0035
At most 1	0.177244	7.608748	12.51798	0.2853	7.608748	12.51798	0.2853

Trace test and max-eigen value test indicate 1 cointegrating equations at the 0.05 level, *Rejection of the null hypothesis at the 5% level

Table 3: Result of ECM based causality test

Direction of causality	ECM	t-value	R^2
Results of causality between GR_t and GE_t (Tax and spend, Eq. 9)	0.5519	4.24	0.35
Results of Causality between GE_t and GR_t (spend and tax, Eq. 10)	0.2335	1.65	0.099

the existence of one cointegrating relationship between total revenue as a share of GDP and total expenditure as a share of GDP. This implies that there is a long term or equilibrium relationship between them.

VECM based causality test: The Ganger causality results based on ECM are given in Table 3. Results show that there is a unidirectional causality running from revenue to expenditure (as the estimated coefficient of ECM of Eq. 9 is statistically significant and that of Eq. 10 is statistically insignificant), implying that the decision to spend in Bangladesh depends on revenue and hence, higher revenue would lead to higher government expenditure but not vice versa. This result supports the tax-and-spends hypothesis.

CONCLUSION

The study empirically examines the causal relation between government revenue and expenditure for Bangladesh for the period 1973-2013. The cointegration results reveal that there is existence of long-run relationship between the variables. The Granger causality result indicates that a unidirectional causality exists in Bangladesh running from revenue to expenditure. This result shows that the tax-and-spend hypothesis exists in Bangladesh. Hence, the policy implication for Bangladesh is that it should broaden tax bases and making more improvement in revenue administration and collections. Maintaining fiscal sustainability, Bangladesh requires a more equitable and transparent tax system with prudent tax reforms which are intended to increase revenue. At present, legal taxpayer in Bangladesh pays 25% of his income as direct income tax, whereas, unrecorded money could be regularized by paying only 10% in the name of whitening of black money, thus enjoying benefits up to 15%. This type of privileged treatment discourages tax payers from paying tax and encourages evasion and avoidance. Addressing this issue of tax avoidance and evasion, the government of Bangladesh should remove these loopholes.

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