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ARTICLE

Fiscal Sustainability: Public Revenue-Expenditure Nexus in a Few Asymmetric Countries in the Globe

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Abstract: This article examines the public revenue and expenditure patterns and its nexus of a few countries. This paper employs panel unit root, panel cointegration and Vector Error Correction Model to analyze the inter-temporal association among the variables of government revenues, expenditures and the growth of GDP through the panel data of ten divergent nations over the period 2001 to 2017. The study exercised three cointegration tests and these estimates find the evidence of long run association among articulated three variables. To know the cross-section status of different nations this paper diverted Phillips-Peron test with bandwidth statistics and it asserted that, all ten countries secured the long run association among the variables. The study uncovered that, growth of GDP has escalated in 0.78% by one percentage increase in revenue expenditure; meanwhile, 1.41% lessening in GDP growth by one percentage increase in revenue income. The specified model is supported by a few diagnostic tests.

Keywords: Government revenues income, Government expenses, GDP growth, Panel unit root, Panel cointegration, Fiscal synchronization hypothesis

1. Introduction

Each and every economy has been facing challenges of their allocation of resources and its distribution to their respective agents of the economy. Proper resource allocation and its distribution are the exigent affair for all states in the globe. The volume of government revenue income and it's spending principally based on the capability of production, that is, however recognized as GDP of a nation. The trends of GDP growth of an economy might be an instrument to exhibit the level revenue income as well as revenue expenditure for a particular country. The aim of this study is to scrutinize the inter-temporal association among GDP, government revenues and government expenditures for a panel of ten nations over the period from 2001 to 2017.

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According to the fiscal *synchronization hypothesis*, revenue income and expenditures decisions are constituted conjointly. In practice, the department of revenue and the department of expenditure of a government are working separately. So, it can be assessed that government revenues and government expenditures are not entirely related to each other. Meanwhile, some countries have been trailing their revenue income and expenditure target under their central planning. To judge the limit or fixing the level of both variables, the size of GDP and its growth need to be contemplated as a pivotal matter. The pattern of GDP of a country and its share can make a guideline to figure out the frontier of the uttered departments of the government revenue income and revenue expenditure. This article aims to assess the relationship among GDP, government revenues and government revenue expenditures in a panel data of ten nations. The variables of panel data of ten nonhomogeneous nations, with different socio-economic pattern, must be varied vastly in numeral. The study intends to examine the relationship among the variables.

Public revenue income and expenditure are the common stand to apprehend public financing and its process of synchronization with the growth of GDP for each and every country around the globe. From the viewpoint of public finance, the stem of revenue expenditure come first as an explanatory variable which determine the volume of revenue income for a particular country in each year. Every single component of revenue expenditure has been selected and approved by the state policy with their ruling government. Usually, social needs as well as public demand are reflected on revenue expenditure, such as expenditure on health, education, various development activities and so forth. These expenditures, precisely the sources of expenditure and its volume, mainly based on the capacity of an economy (GDP) and it also depends on noneconomic factors, such as socio, geographical, political, environmental shape of a nation. In addition to that, cultural and historical background of a nation play an important role to determine the social needs and the choice of public expenditure. To comprehend the *fiscal sustainability*, this study intends to understand the dissimilar capacity of different nations and its articulated asymmetric socio, political and geographical patterns which could explore their fiscal linearity in terms of revenue income and revenue expenditure and examine the actual consequence of *fiscal sustainability* among a few nations. In the view of uttered asymmetry, this study takes into account ten countries, such as Bangladesh, India, Israel, Malaysia, Poland, Switzerland, Thailand, United States, United Kingdom and Sri Lanka, that might be more relevant than other homogenous countries.

Customarily, the choice and the quantity of revenue expenditure are not solely depending on economic analyses. Economic optimization, such as welfare optimization does not assure the actual decision of expenditure of a particular country. Similarly, revenue income did not materialize only with the basic theme of public finance, expressly, social equity and justice. So, the policy of fiscal matter could be justified by the regular framework of economics as well as outside the economic analyses. But whatever the outcome made of fiscal variables, it requires to be harmonized with the capacity of an economy, namely, the growth of GDP for the all nations. Finally, the empirical investigation of *fiscal sustainability* could be ensured as well as be justified the former fiscal decisions. In this regard, some research experiences might be justified and rationalized the empirical analyses. By considering selected South Asian Countries (SANs), BRICS and other emerging nations, an empirical modeling analyses of [1] and covered the period of 2007 to 2016 through U-shaped hypothesis (Armey curve, 1995) and system of Generalized Method of Moments (GMM) technique. The study examined the linkage between government spending and economic growth. The investigation unearthed that, a rise in the public spending followed in a significant change in the growth rate when the public spending was attain the optimal threshold level, indicating a non-monotonic association. Furthermore, it suggested a policy consequence that public spending could only be a short-term determine to share out with crises in any nation, but not a long-term solution. To comprehend the impact of monetary and fiscal policies on economic growth in Malaysia, Singapore and Thailand, the analyses of [2] employed Autoregressive Distributed Lag (ARDL) to establish a long-run relationship. The examination vintages a consistent result and find the government spending had a negative impact on economic growth in Malaysia and Singapore, but it had a positive effect in Thailand. The analyses also specified that monetary policy is more effective in Malaysia and Singapore, while fiscal policy is more effective in Thailand. The study recommended that, in spite of the countries' results are asymmetric, due to the mutually dependency of monetary and fiscal policies, it needs a consistent and sustainable policy-mix structure to escape possible inconsistencies. Meanwhile, for the single economy of cross section analyses, a study [3] examined the nonlinear link between government expenditure and government revenue for South African economy. This study comprises quarterly data from the first quarter of 1965 to the second quarter of 2019 with the dynamic mechanism of threshold Vector Autoregression (VAR) and

threshold Vector Error Correction Model (VECM), finally, Markov Switching model is employed to determine the tendency of the variables. The results exhibited that the presence of nonlinear but one-way casual relation between government expenditure and revenue. Additionally, the adjustment mechanism of government expenditure towards the equilibrium is more persistent than government revenue when the threshold level is attained.

Under the articulated ten nations, this paper concentrated on the causality, inter-temporal relation and fiscal sustainability of the two basic fiscal variables with the progression of GDP. In particular, the study examines the causality between government revenue and government expenditure with respect to GDP. In addition to that, this study investigates cointegration relationship and inter-temporal relationship among the uttered three variables and finally check the *fiscal sustainability* thru fiscal synchronization hypothesis.

The manuscript is arranged as follows: Section 2 Literature Review, Section 3 deliberates the Data and Methodology are used in the study, Section 4 Results and Discussion, while Section 5 tenders some concluding remarks.

2. Literature Review

In the fiscal policy research, there are lots valuable research outcomes have taken into account of this study. To seizure the field of fiscal policy, this review has comprised most pioneer study outcomes of this arena and the outcomes precisely based on panel and time series estimates and analyses consist of a particular nation or cluster of nations. In Taiwan's analysis [4] employed the technique of VECM and suggest that unidirectional causality running from government revenues to government expenditures which leads support to the *tax and spend hypothesis*. The major consolation was the government of Taiwan should be more focused on spending cuts rather than look for ways to raise revenues from taxes or from any other means. Considering the causality test of the revenue and expenditure nexus of the experience of Ghana disclosed through a study [5] comprised the time series period 1980 to 2013. This study unearths that, in short run, upsurges in taxes have a rather negative impact on government expenditure, indicating the possibility of an absence of fiscal illusion. The Granger Causality Test (GCT) outcomes, however, indicate a unidirectional causal association between government revenue and government expenditure.

The study furnish emphasis on particular worthwhile research outcome have investigated by supporting *fiscal synchronization hypothesis* which shielded a *feedback mechanism* between government revenue income and spending. In this connection, a South African study deals with articulated the main three variables have taken into account with the time period from 1960 to 2013. The study [6] identified that there exists a long run association ship in terms of threshold cointegration. The data only exhibit a symmetric cointegration relationship between government expenditures and revenues. In addition to that, the results explored the short and long run causality relationships between the variables and thus support the *fiscal synchronization hypothesis*. For the viewpoint of Turkey, a specified research outcome has signified by [7] concerning the time series analysis of taxes and expenditure variables encompassed data from 1950 to 2007. The study recommended that there occurs a *feedback mechanism* between government revenue and expenditure. In other words, in Turkish budgetary process, both revenue income and expenditure levels modify each other; so that higher tax levels and caused by higher expenditure levels and vise-versa. Another analysis [8] advised that, fiscal legislators in 40 Asian nations should set revenues and expenditures simultaneously. Under this situation the fiscal specialists of these nations with budget shortfalls should raise revenues and decrease expenditure simultaneously in order to curb their budget deficits. This panel study also corroborates that GDP, revenue income and expenditure variables are cointegrated and surveyed *a bidirectional causal relation* between government revenues and government expenditure, which leads defend to the *fiscal synchronization hypothesis* in these nations. A research work [9] of Chinese experience was considered the objectives of *fiscal synchronization* its relative issues over the period of 1997 to 1999. The research employed GCT based on the corresponding multivariate VECM and the outcomes of this study recommended *feedback existed* between government revenues and government expenditures. Explicitly, for China, it was supporting the fiscal synchronization. To understand the fiscal sustainability of 15 European Union (EU) nations for the sequences from 1970 to 2003, the study [10] recommended that, small number of nations appear as less likely to unveil sustainability glitches, such as, Germany, Netherlands, Finland, Austria the UK. Another study of *fiscal sustainability* of 28 EU nations accomplished by [11] and revealed that the panel estimates of the cointegration relationships point to a positive long run co-movement between government revenue and expenditures.

In the Bangladeshi perspectives, a time series analysis comprised data information for the period of 1972 to 2015, examined by [12]. The result infers that GDP and tax are having long-run negative affiliation, which also showed that tax has significant adverse impacts on GDP

and hindrance to achieve sustainable economic growth. They argued that, the burden of sizeable direct tax badly effect on the wage employees, infant and small business firms. Another research of [13] examined the relationship between GDP and indirect tax, it encompassed an econometric model for time series data of Bangladesh over a period of 43 years. This study exposed that, if the government, in the long run, upsurges the indirect tax revenue by one percent (USD 167.511 million) then the GDP has decreased to a 0.96 percent (USD 2,572 million). In the viewpoint of Romanian economy, an investigation [14] of VAR model stated that whether government revenues have or not a more influent role than government expenditures on controlling economy. Additionally, this examination showed that GDP increases in both cases: positive government expensive shock and positive government revenues shock. This study employed GCT through cointegrated VAR methods for time series quarterly data over the period 1998q1-2014q1, as a fiscal policy of the state, controlling economy instrument might play a significant role.

As a concept of GDP, it has been presenting a final yearly performance of an economy and to figure out the inter-temporal relationship among the articulated variables, public debt become an influential and most interrelated variable to justify decisions relating to the matter of fiscal policy. With contemplation of the matter of fiscal policy, a study of debt was roofed by [15] in the context of Malaysia. The paper incorporated public debt as another variable to determine and justify the government budget relating to fiscal variables and GDP. The analysis investigates the time series data of Malaysia for the period of 1970 to 2006. The examination authenticated a long run affiliation between GDP and all types of public debt in Malaysia. It was uncovered that; all debts influence negatively and significantly to the economic growth. Overall findings uncovered that; all types of debts unveiled adverse long run association with the progress of an economy. From the study of negative sign denotes that if the volume of debt increases then the particular GDP has decreased. By using the time series data for the Namibian perspective, an investigation [16] conducted thru the relationship between government expenditure, government revenue and public debt and these variables covered for the period of 1980 to 2018. An error correction model (ECM) was employed to analyze the short-run dynamics and a positive relationship depicted between government expenditure and government revenue. By the application of pair-wise GCT, the evidence failed to support the spend-revenue hypothesis. Moreover, the study suggests that, the policy maker requires to review meticulously government expenditure and carry it to optimal levels in order to avert the widening of public debt.

To understand the usefulness of fiscal policy and its impact on macroeconomic activities, a study conducted by [17] in the context of Pakistani economy during the period of 1972 to 2008. With the help of ARDL model, this examination unearths that, in the long run, the overall fiscal deficit exerts a negative effect on economic growth. The analysis acclaims that, the shortfall of budget should be in the narrow band of 3 to 4 percent of GDP. Away from this limit, the unsustainable shortfall of budget could have detrimental macroeconomic costs and the macroeconomic aims of government such as low inflation and high economic growth might be in distress. Another study [18] of Pakistani economy based on *fiscal synchronization hypothesis*. To understand the government revenue and income nexus of Pakistan, this investigation employed non-linear cointegration technique and contained data information from 1972 to 2014. The study evidence established *fiscal synchronization hypothesis* with cointegration between revenues and expenditures. These two components of public finance unveiled an asymmetric and negative changes in revenues and expenditures have a greater impact than the positive ones.

Regarding the fiscal policy and sustainability of government debt contained panel data research [11] in EMU countries. The investigation explored that, panel unit root tests in the attendance of cross section dependence showed that the government debt series was stationary, indicating that the affluence condition would be satisfied for these countries. The study of *Wagner's Law* and *Keynes approach* conducted by [19] for the Italian economy and this experiment covered the period of 1960 to 2008. The association between various entries of government expenditure and national income is keener to practice by Keynesian than Wagnerian views. Thus, to reduce the gap between revenue-expenditure, the dependency on public debt is not a wise decision. So, fiscal issue needs to be settled by the specific endogenous fiscal variables. On the other hand, by considering the capacity of GDP, an affluent country may find the result by changing public debt variable or even the rational level of negative debt, such as EMU countries.

Decisively, in the long run, the mismatch of government revenue income and revenue expenditure or any distortion of fiscal policy of a particular economy may have been adjusted the capacity of an economy, that is, the rate of growth of GDP. A steady state growth rate of an economy is the prerequisite to justify the proportional expansion or progression of the variables relating to fiscal policy. Actually, an optimal level of revenue income

and revenue expenditure are the desirable components to corroborate the proper usages of resources of an economy. But it is arduous to accomplish the said goals properly for a particular economy. In that case, a rational question needs to be considered of this study regarding the intertemporal relationship between revenue income and revenue expenditure. The results of the articulated relationship will be figured out and justified about the previous fiscal decisions are congruent or indistinct from the rate of growth of GDP for the specific economy.

In practice, fiscal policy decision has not been always exactly depending on the outcome of economic analyses, such as optimization of resources, citizen benefit maximization, consumer utility maximization, sustainability of development, public welfare maximization, and so forth. We are observing that, sometimes, it depends on the specific outline of a ruling party, like a commitment which had given before election, specific public interest (may or may not be supported by the outcome of economic analyses), nurturing religious and cultural issues, supporting custom and heritages, and many more. In that case, fiscal policy judgement may not always purely purely reinforced by the optimal choice of economics. So, fiscal policy pronouncement could be originated from outside the box of the analyses of economics, but it is factual that, whatever the execution conducted by the policy of fiscal instruments, a synchronization needs to be considered among the variables of revenue income, revenue expenditure and the growth of GDP in the long run for a particular economy. Eventually, a policy maker of a particular country put emphasis on the harmony between the growth of GDP and change of fiscal variables. So, the inter-temporal relationship among revenue income, revenue expenditure and GDP need to be investigated and the analysis of the cointegration relationship becomes an exigent question of this research.

3. Data and Methodology

The study takes in to account ten countries and the countries are: Bangladesh, India, Israel, Malaysia, Poland, Switzerland, Thailand, United States, United Kingdom and Sri Lanka. The data information's are collected from WDI and this annual data comprised 2001 to 2017 years. All three variables are formed by percentage and logarithmic in nature. For three variables: Government revenue income (lnreve), Government revenue expenditure (lnexpe) and Gross Domestic Product (lngdpg) of seventeen years annual data of each country are most found from the source.

With the purpose of establish the association between fiscal policy variables and economic growth, the study applied panel unit root tests. The panel unit root tests investigated the stationarity of the variables by using the Augmented Dickey-Fuller (ADF) [20], the Phillip-Perron (PP) and Levin, Lin and Chu (LLC) [21], tests. The Fisher Phillips-Perron (PP) test was proposed by [22] and [23]. In contrast to the IPS (Im, Pesaran Shin) Test, which is a parametric and asymptotic test, the PP test is a nonparametric and exact test. Subsequently, the study took into account the unrestricted VAR and then determined lag length to run the VECM. In addition to that, to work out the long run relationship among the variables, the analysis introduced three panel cointegration techniques: a) Johansen Fisher Panel Cointegration Test, [24] and [25], b) Pedroni Residual Cointegration Test [26] and c) Kao's Residual Cointegration Test [27]. Through these Tests of Cointegration, the study established the long run association among the three pronounced variables. Finally, VECM specify exact relationship between government expenditure to GDP and between revenue incomes to GDP. The net effect was carried out among the fiscal policy variables. All estimations were carried out using Econometric analyses (Eviews11 sv (X64) package, Microsoft Office Professional Plus 2010 for Excel and Word software.

3.1 Objective

The study is based on the following objectives:

i) To estimate causality between government revenues and government expenditures with respect to GDP.

ii) To figure out the cointegrating relationship among three variables of revenue income, revenue expenditure and growth of GDP.

iii) To find out inter-temporal relationship and specific effect on GDP growth to change of revenue income-expenditure variables.

iv) To understand the relationship between the basic fiscal variables with GDP under *fiscal synchronization hypothesis.*

3.2 Hypothesis

The null hypotheses of the experiment are

i) Ho: There is a cointegration occur among three variables of revenue income, revenue expenditure and growth of GDP of the ten nations.

ii) Ho: A feedback will be endured between government revenues and government expenditures, i.e., accompanying the "*Fiscal Synchronization*" hypothesis.

3.3 Model and Model Specification

The economic growth of a nation and her fiscal policy related major issue of revenue income and expenditure are interdependent with each other. An equation for

time series has been formed in pursuance of expose the association the aforesaid three variables.

Model-1 (General):

$$Y_t = \alpha + \beta_1 X_t + \beta_2 Z_t + \varepsilon_t \quad (1)$$

Model-2 (Specific):

$$\ln GDPg_t = \alpha + \beta_1 \ln \mathrm{Re}v_t + \beta_2 \ln Exp_t + \varepsilon_t \quad (2)$$

Model-3 (Panel):

$$\ln GDPg_{i,t} = p_i \ln GDPg_{i,t-1} + q_i \ln \mathrm{Re}v_{i,t} + r_i \ln Exp_{i,t} + \varepsilon_{i,t} \quad (3)$$

t =2001, 2002……..…2017 and i = 1, 2, 3,……10, nations

Where, Y or GDP consists of Gross Domestic Product, X or Rev represents revenue income, Z or Exp consists of revenue expenditure and t signifies the time periods. In the models β_1 and β_2 and are a deterministic constant factor and ε is a stochastic disturbance expression with period 2001 to 2017 of the ten nations.

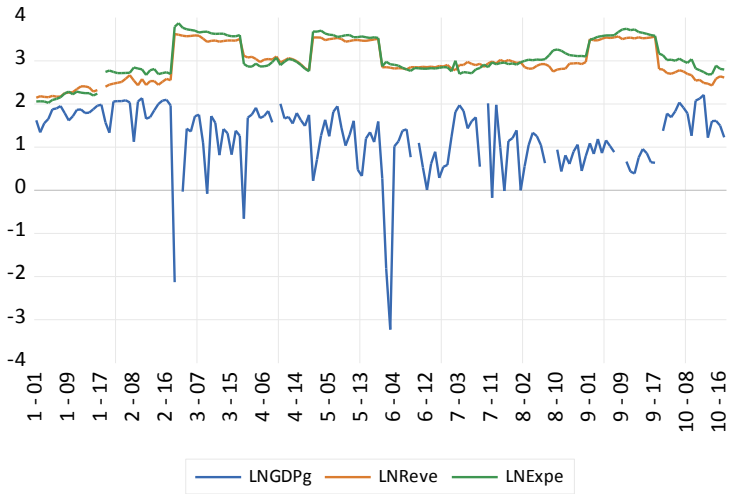

Figure 1. The Basic Status of the Ten Nations

Note: Each number indicates a particular country, Bangladesh 1, India 2, Israel 3, Malaysia 4, Poland 5, Switzerland 6, Thailand 7, United States 8, United Kingdom 9 and Sri Lanka 10

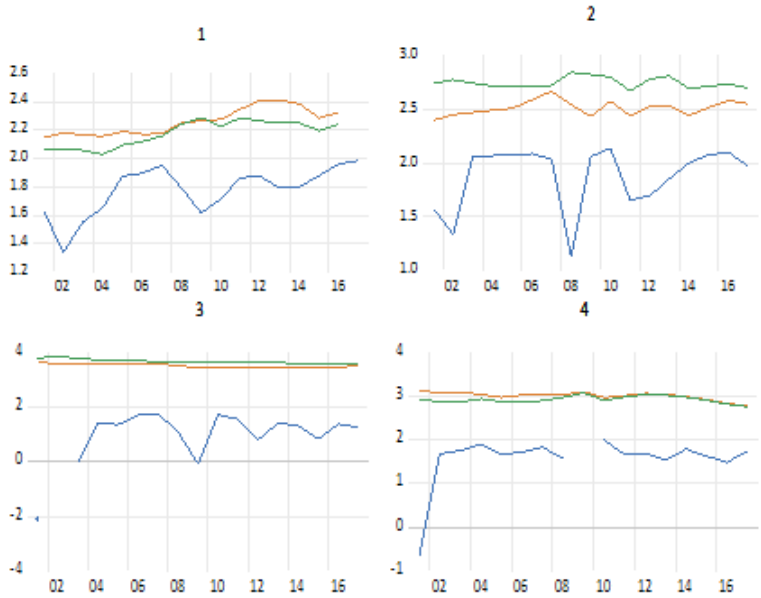

Figure 2. Individual Country Status

Note: Graph No. 1, 2, 3 and 4 consists of Bangladesh, India, Israel and Malaysia respectively.

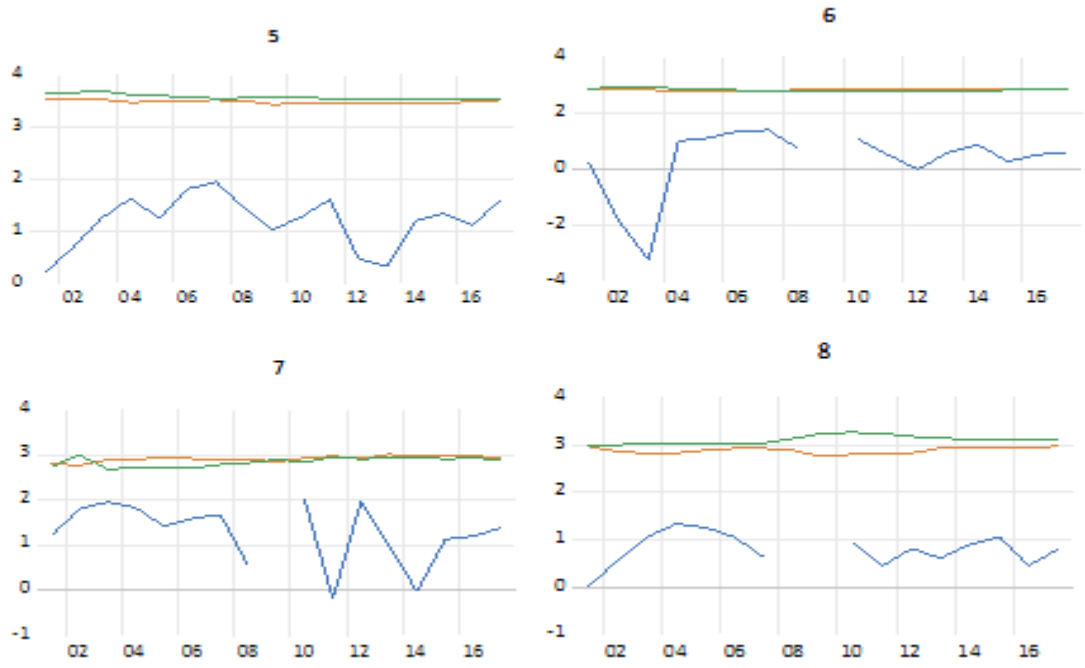

Figure 3. Individual Country Status

Note: Graph No. 5, 6, 7 and 8 consists of Poland, Switzerland, Thailand and United States respectively.

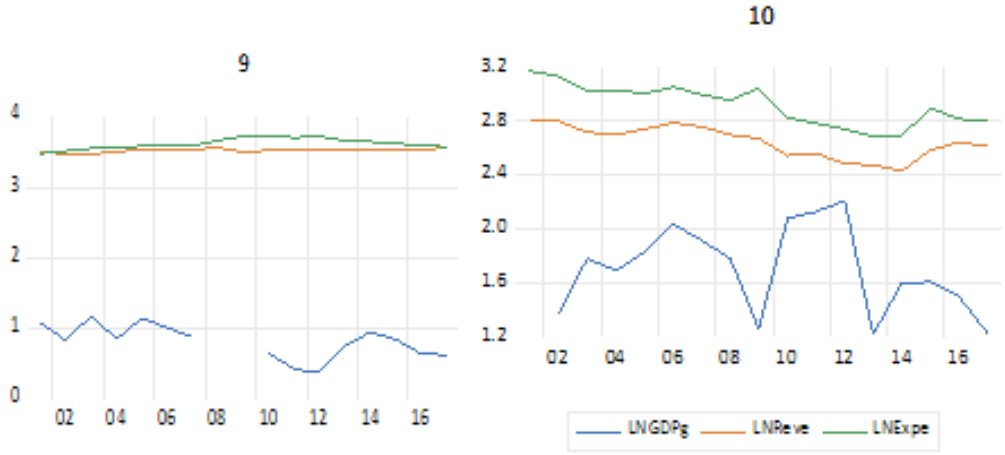

Figure 4. Individual Country Status

Note: Graph No. 9 and 10 consists of United Kingdom and Sri Lanka respectively.

4. Results and Discussion

After specifying the model, the study primarily requires grasping the quality of the model (please see Appendix A, for more). By estimating general regression, the estimates regress panel data (considering Cross-section none and period none and cross-section fixed and period fixed) and perceived that, F - statistics are significant at the less than 1% level and the value of the R^2 is greater than Durbin-Watson Statistic (DW) (0.8845>0.1195, please see Appendix B, for more), that is, regression line is not spurious.

4.1 Unit Root Test

To examine the panel properties of the statistics the Augmented Dickey-Fuller (ADF), the Phillip-Perron (PP) and Levin, Lin & Chu (LLC) tests were exercised to verify the stationarity standpoint of the specified statistics.

Table 1. Results of Unit Root Test at Level and Individual Intercept

Variables	ADF		PP		LLC		IO
	Trend	P-Value*	Trend	P-Value*	Trend	P-Value*	
lngdpg	76.2169	0.0000	89.1579	0.0000	-19.6639	0.0000	I(0)
lnreve	23.4559	0.2670	23.5547	0.2624	-1.64495	0.0500	X
lnexpe	26.0980	0.1626	22.4810	0.3150	-3.37017	0.0004	X

* Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality; ADF, PP and LLC consist of Augmented Dickey-Fuller, Phillip-Perron and Levin, Lin & Chu respectively. Note: *IO* represents Order of Integration

Source: The statistics reflect on the time period of 2001 to 2017 from WDI, ten nations, through the assistance of software Eviews 11 sv (X64).

Table 2. Outcomes of Unit Root Test at First Difference and Individual Intercept

Variables	ADF		PP		LLC		IO
	Trend	P-Value*	Trend	P-Value*	Trend	P-Value*	
lngdpg	120.727	0.0000	172.216	0.0000	–14.6789	0.0000	I(1)
lnreve	103.302	0.0000	115.798	0.0000	–11.0696	0.0000	I(1)
lnexpe	117.552	0.0000	126.823	0.0000	–12.2434	0.0000	I(1)

* Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other analyses assume asymptotic normality. Note: *IO* represents Order of Integration

Source: The statistics reflect on the time period of 2001 to 2017 from WDI, ten nations, through the assistance of software Eviews 11 sv (X64).

Table 3. Results of Unit Root Test at First Difference and Individual Intercept with Trend

Variables	ADF		PP		LLC		IO
	Trend	P-Value*	Trend	P-Value*	Trend	P-Value*	
lngdpg	86.6438	0.0000	145.049	0.0000	–11.2224	0.0000	I(1)
lnreve	82.6308	0.0000	107.080	0.0000	–10.4957	0.0000	I(1)
lnexpe	73.7646	0.0000	128.336	0.0000	–7.04008	0.0000	I(1)

* Probabilities for Fisher tests are calculated applying an asymptotic Chi-square distribution. All other tests assume asymptotic normality. Note: *IO* represents Order of Integration

Source: The statistics reflect on the time period of 2001 to 2017 from WDI, ten nations, through the assistance of software Eviews 11 sv (X64).

Table 4. Results of Unit Root Test at First Difference and None

Variables	ADF		PP		LLC		IO
	Trend	P-Value*	Trend	P-Value*	Trend	P-Value*	
lngdpg	154.910	0.0000	186.149	0.0000	–16.1203	0.0000	I(1)
lnreve	146.768	0.0000	160.984	0.0000	–12.1063	0.0000	I(1)
lnexpe	159.832	0.0000	163.179	0.0000	–13.5846	0.0000	I(1)

* Probabilities for Fisher analyses are calculated applying an asymptotic Chi-square distribution. All other tests assume asymptotic normality. Note: *IO* represents Order of Integration

Source: The statistics reflect on the time period of 2001 to 2017 from WDI, ten nations, through the assistance of software Eviews 11 sv (X64).

All three statistics for the results of three variables, namely, government revenues, government expenditures, and GDP are exhibited in Table 1, Table 2, Table 3 and Table 4 to test the stationarity standpoint of the panel statistics. In the results of order of integration, that is, other than first difference [I(0)], For the levels of the three tests statistics of the articulated three variables do not decline the null hypothesis of a unit root. Though, the analyses took into account the first difference of each of the variables, statistics acquired higher than their corresponding critical values at the 1% level. Thus, it infer that all three variables (lngdpg, lnreve and lngdpg) are integrated of order one or I(1).

4.2 Cointegration Test

To understand the long run association including the three variables of panel statistics, the experiment engaged three cointegration tests. The tests are a) Johansen Fisher Panel Cointegration Test b) Pedroni Residual Cointegration Test and c) Kao's Residual Cointegration Test. Before studying the Cointegration the study requires to determine lag length of the model.

Lag length fixation

The study find that three variables are stationary at first difference [I(1)], then perform Johansen cointegration test with (p) lags. To do so, the study incorporates and estimates the unrestricted VAR model and then determines level of lag of the model. The lag estimation based on Akaike information criterion (AIC), the outcome of optimal lag is Two. Moreover, LR (sequential modified LR test statistic) and FPE (Final prediction error) both support the findings of AIC. (Please see Appendix C, for more).

4.2.1 The Outcome of Johansen Fisher Panel Cointegration Test

The hypothesis of Johansen Cointegration Test stated that Ho: No Cointegration equation and H_1: Ho is not true. According to the decision criterion of the test, the study compels to decline the null hypothesis and if the value of the Trace and Max is less than 5% critical value, otherwise, fail to reject null hypothesis. The results of the joint analysis explored that Fisher statistics of trace test max-eigen test rejected the hypothesis none of Cointegration equation and also reject the hypothesis at most 1 and at most 2. So, the series are cointegrated, that is exhibited a long run relationship, which infers the series are associated and can be merged in a linear manner.

Unrestricted Cointegration Rank Test (Trace and Maximum Eigenvalue)

Table 5. Johansen Fisher Panel Cointegration Statistics

Hypothesized No. of CE(s)	Fisher Stat.* (from trace test)	Fisher Stat.* (from max-eigen test)
None	134.6***	119.4***
At most 1	115.9***	104.6***
At most 2	826.4***	826.4***

Note: *Probabilities are calculated applying asymptotic Chi-square distribution, Sample: 2001 2017, Incorporated observations: 170, Trend conjecture: Linear deterministic trend, Lags interval (in first differences): 1 2; *** shows the level of significance at 1% level.

The results of the individual analysis of the cross section data asserts that, the two statistics of Trace and Max-Eigen value reject all three hypothesis (No cointegration, At most 1 Cointegration relationship and At most 2 cointegration relationship) of Cointegration at 1% level of significance revealed by Bangladesh and India. In terms of Cointegration status Poland, Thailand and Sri Lanka also utters significant at 1% by two null hypotheses. Malaysian and Switzerland also signifies the result of statistics at 1% level by rejecting hypothesis at most two Cointegration relationships. So, eight countries acquired the long run association with the pronounced three variables. The results of the investigates explored that, even if there are distresses in the short run, which might affect the movement in the individual series, they would converge with time, even, in the long run. Hence, there is a possibility to estimate the model both in the short-run and in the long-run. It also asserted that, the suitable guesstimate practices are the vector autoregressive (VAR) and VECMs.

4.2.2 The Outcomes of Pedroni Residual Cointegration Test

There are seven statistics exhibited under two dimensions: within the dimension and between the dimensions of Pedroni residual cointegration test [26]. The results of the analysis statistics are compiled and furnished by *individual Intercept, no intercept and individual intercept and trend*.

The results of cointegration investigates that, out of eleven test statistics in the individual intercept six are significant at 1% level one is significant at 10% level. Similarly, other two indicators of *Pedroni test statistics* also depicted the

Table 6. Cointegration Test: Individual Cross section Outcomes

Panel Code	Cross Section Panel ID	Hypothesis of no Cointegration		Hypothesis of at most 1 Cointegration relationship		Hypothesis of at most 2 Cointegration relationship	
		Trace Test Statistics	Max-Eign Test Statistics	Trace Test Statistics	Max-Eign Test Statistics	Trace Test Statistics	Max-Eign Test Statistics
1.	Bangladesh	102.3905***	59.6671***	42.7233***	34.1065***	8.6169***	8.6169***
2.	India	111.9221***	76.9141***	35.0081***	19.4513***	15.5567***	15.5567***
3.	Israel	NA	NA	17.5413	17.4751	0.0662	0.0662
4.	Malaysia	NA	NA	NA	NA	353.5051***	353.5051***
5.	Poland	99.9526***	66.9763***	32.9764***	30.8900***	2.0863	2.0863
6.	Switzerland	NA	NA	NA	NA	356.3819***	356.3819***
7.	Thailand	NA	NA	628.9432***	323.0598***	305.8833***	305.8833***
8.	United States	(DT)	(DT)	(DT)	(DT)	(DT)	(DT)
9.	United Kingdom	(DT)	(DT)	(DT)	(DT)	(DT)	(DT)
10.	Sri Lanka	59.7047***	45.2211***	14.4836*	13.8388*	0.6448	0.4220

Note: The level of significance is considered by [28] p-values and ***, ** and * show level of significance at 1%, 5% and 10%, respectively, DT consist of Dropped from Analysis.

Table 7. Country Pedroni Cointegration Test

Pedroni Test Statistics	Individual Intercept		Individual Intercept and Trend		No Intercept	
	Statistics	Weighted Statistics	Statistics	Weighted Statistics	Statistics	Weighted Statistics
				Within-dimension		
Panel v-Statistic	–0.9632	–1.466	–2.955	–3.356	0.060	–0.248
Panel rho-Statistic	–1.380*	-0.883	0.029	0.618	–3.207***	–2.424***
Panel PP-Statistic	–6.101***	–4.538***	–6.743***	–5.083***	–5.131***	–4.365***
Panel ADF-Statistic	–5.996***	–4.866***	–5.489***	–5.032***	–5.164***	–4.647***
				Between-dimension		
Group rho-Statistic	0.219		1.605		–1.523*	
Group PP-Statistic	–9.046***		–7.044***		–6.963***	
Group ADF-Statistic	–7.801***		–7.095***		–7.842***	

Note: Null Hypothesis: No Cointegration. For work out of optimal lag lengths used Akaike information criterion (AIC) and Schwarz information criterion (SIC) with maximum lag length 2, bandwidth selection by Newey-West and kernel estimation by Bartlett automatically selected by Eviews software 11sv (***, ** and * show level of significance at 1%, 5% and 10%, respectively).

existence of Cointegration. In the *individual intercept and trend index* represented that six statistics are significant at 1% level and lastly, there are nine statistics of *no intercept* indicator are statistically significant (In the nine significant results, eight statistics are significant at 1% level). So, the study clearly upheld that, there are long run associations existing among the specified variables of revenue income, revenue expenditure and GDP of exclaimed ten countries. So, there is a long run affiliation i.e Cointegration occurs in the model.

4.2.3 The Outcome of the Kao's Residual Cointegration Test

In the Kao test assumed no cointegration for null hypothesis. The result found that it rejects the null hypothesis at 1% level of significance. In addition to that, considering first difference of residual variable, it accomplishes reject null hypothesis at 1% level. So, both results unearth that there were long-run relationship exists among revenue income, revenue expenditure and GDP.

Table 8. Kao's Residual Cointegration Test Result

Factor	t-Statistic	Probability
ADF	–3.321043	0.0004
Residual variance	0.460256	
HAC variance	0.127445	

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(RESID)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RESID(–1)	–0.791107	0.074616	–10.60243	0.0000

Note: Null Hypothesis: No cointegration. Trend assumption: No deterministic trend Automatic lag length selection based on SIC with a max lag of 3 Newey-West automatic bandwidth selection and Bartlett kernel.

4.3 The Outcome of Phillips-Peron Cross Section Test

In the Kao test assumed no cointegration for null hypothesis. The result found that it rejects the null hypothesis at 1% level of significance. In addition to that, considering first difference of residual variable, it accomplish reject null hypothesis at 1% level. So, both results unearth that there were long-run association exists amid revenue income, revenue expenditure and GDP.

In the cross section specific results of Phillips-Peron with bandwidth results asserted that all ten countries secured the long run association among the uttered three variables. Unambiguously, six countries explored unique long run relationship considering all three test indexes (individual intercept, individual intercept and trend lastly, no intercept) with more than zero bandwidth results. These countries are Bangladesh, India, Malaysia, Poland, Switzerland and Thailand. Although, the three indicators of Phillips-Peron test are unearthed different results. In the rest of four countries, United States and Israel signifies the said relationship by two test indicators with nonzero bandwidth and United Kingdom and Sri Lanka are exhibited those relationship by one indicator.

4.4 The Outcome of VECM Estimates

The study examined the VECM test to understand the specific performance of each variable of the panel data of ten countries.

The result stated that one percentage change in revenue income (lnReve) affected 1.407 percentage decreases in GDP growth (lnGDPg). On the other hand, to explain government revenue expenditure, one percentage variation in revenue expenditure (lnExpe), upheld in a 0.784 percentage escalation in GDP growth (lnGDPg).

Table 11 specified that the appraised coefficient of

Table 9. Phillips-Peron Cross section Specific Country-wise Result

Panel ID	Individual Intercept	Individual Intercept and Trend	No Intercept	Panel ID	Individual Intercept	Individual Intercept and Trend	No Intercept
	Bandwidth	Bandwidth	Bandwidth		Bandwidth	Bandwidth	Bandwidth
Bangladesh	1.00	1.00	1.00	Switzerland	4.00	4.00	2.00
India	15.00	15.00	12.00	Thailand	13.00	7.00	1.00
Israel	0.00	2.00	1.00	United States	0.00	1.00	1.00
Malaysia	2.00	2.00	2.00	United Kingdom	0.00	2.00	0.00
Poland	2.00	3.00	2.00	Sri Lanka	0.00	8.00	0.00

Note: Cross-sections Included: 10, Null Hypothesis: No Cointegration, Phillips-Peron results (non-parametric)

Table 10. VECM Long-run Estimates

No. of Variables/ Parameter	Cointegrating Equation	CointEq1	Standard Error	t- Statistics
1	LNGDPG(-1)	1.000000		
2	LNREVE(-1)	1.408708	2.07153	[2.07153]
3	LNEXPE(-1)	–0.783761	–1.22197	[–1.22197]
4	C	–3.093423		

Note: Sample (adjusted): 2003 2017, included observations: 129 after adjustments, the statistics reflect on the time period of 2001 to 2017 from WDI, ten nations, through the assistance of software Eviews 11 sv (X64).

Table 11: VECM Short-run Estimates

Error correction/Coefficient	D(LNGDPG)		D(LNREVE)		D(LNEXPE)	
	Coefficient	Std. Error	Coefficient	Std. Error	Coefficient	Std. Error
Cointegrating Eq1	–0.479803*	–6.61511	–0.008681***	–1.24222	0.005954***	0.78946
D(LNGDPG(-1))	–0.013303*	–0.18249	0.017929***	2.55265	–0.005571***	–0.73491
D(LNREVE(-1))	–0.649310	–0.71157	–0.052440*	–0.59646	0.044774*	0.47185
D(LNEXPE(-1))	–0.279102	–0.36270	0.043032*	0.58040	–0.252993*	–3.16168
C	0.038070**	0.82858	0.001277***	0.28835	–0.009307**	–1.94798

Note: Sample (adjusted): 2003 2017, included observations: 129 after adjustments, the statistics reflect on the time period of 2001 to 2017 from WDI, ten nations, through the assistance of software Eviews 11 sv (X64).

the Error Correction Term (ECT) had its anticipated sign and it was significant. This denotes that there is a joint significance of the long-run coefficients. The estimated coefficient of the ECT is -0.479803 which suggests that the speed of adjustment is nearly 48 percent per year. The negative and significant coefficient is a signal that cointegrating association occurs including the variables.

Adjustment Coefficient (–0.4798)

Previous year deviation from long run equilibrium is modified in current period an adjustment speed at 48%. A percentage change in Revenue Income (lnReve) is associated with a point 0.6493 percent (65%) decrease in GDP growth (lnGDPg) in last year on average and other things remaining the same in the short run. Again, Revenue Expenditure (lnExpe) is associated with a point 0.2791 percent (28%) decrease in GDP growth (lnGDPg) in last year on average and other things remaining the same in the short run.

Model Equation Result

All variables of VECM test results are in educational form. The first equation of VECM has stated our study specification model. Rest of two equations (Please see Appendix D, for more) are the probable option of the study. The equations are specified in first difference form.

Specified Equation from VECM

D(LNGDPG)=C(1)*(LNGDPG(-1)+1.4087084999* LNREVE(-1)-0.783760913785*LNEXP(-1) -3.09342258496)+C(2)*D(LNGDPG(-1))+C(3)*D(LNREVE(-1))+C(4)*D(LNEXPE(-1))+ C(5)

In the Specified Model Equation

ECT=LNGDPG(-1)+1.4087084999*LNREVE(-1)-0.783760913785*LNEXPE(-1)- 3.0934225

The coefficient of ECT is C(1)* (in equation marked as Lambda), which is negative in sign (-0.478) (Please see Appendix E, for more)indicate good result and p-value suggested at below 1% level (0.000) of significance. This study explored that there was a long run association existing in the model. In short run analysis the coefficient C(2), C(3), C(4) and C(5) are not significant, so there are no short run casual effect found in the study. In practice, countries have been trying to adjust their revenue income and expenditure in long term tenure with their respective macroeconomic plan (five years or perspective plan).

4.5 Perform Diagnostic Tests

To understand the quality of specified model, the study took into account and performed three Diagnostic Tests. The tests are: a) Serial Correlation Test, b) Pairwise Granger Causality Tests and c) Normality Test.

4.5.1 Serial Correlation Test

In residual performance of the study, in lag two ensured that no serial correlation exists in the model. (Test has taken H_0: No serial correlation at lag 1 and 2, for more, sees the Appendix F).

4.5.2 Pairwise Granger Causality Tests

By rejecting null hypothesis at 5% level of significance, this test exhibited that, Government revenue income of ten countries is Granger caused by the growth rate of GDP of each nation. The test also estimated that government revenue income is Granger caused by revenue expenditure and rejected the null hypothesis by 5% level of significance. The tests are considered six null hypotheses of pairwise Granger causality tests (Please see Appendix G, for more) of panel data of ten countries.

4.5.3 Normality Test

Among the three parts of normality test and three components of each part included uttered three variables. In all three parts of the tests component two, that is, government income variable are normally distributes and it signifies by more than 5% level of significant. (The main result of showed by Jarque-Bera also supported the statement, please see Appendix H, for more).

5. Conclusions

The study established an inter-temporal association among the basic fiscal variables of government revenue income and expenditure with GDP of the ten countries. In the panel data analysis of ten articulated countries the study critically examined Cointegration relationship and find the existence of Cointegration in the model of the three variables: revenue income, revenue expenditure and GDP. The estimates of Cointegration test the study took into account Johansen Fisher panel Cointegration test, Pedroni residual Cointegration test and Kao's residual Cointegration test. With the Fisher statistics of trace and max-eigen test rejected the hypothesis none of Cointegration equation. Furthermore, the results of the individual analysis of the cross-section data affirm that eight countries acquired the long run relationship with the articulated three variables.

Regardless of individual intercept, individual intercept and trend, and no intercept signs of Pedroni test endorsed that out of eleven test statistics most of the test index are statistically significant. In the third attempt of the Cointegration test also finds the same result by the Kao's residual Cointegration test. So, therefore, the model revealed a long run relationship, which implies the series are associated and can be pooled in a linear manner. In addition to that, the study clearly upheld that, there are long run association existing amid the specified variables; which finally supported by the fiscal *synchronization hypothesis* . So, the studied ten countries, adjusted their revenue income and expenditure with their growth of GDP.

In the cross section specific country wise results of PP test asserted that all ten countries secured the long run association amid the uttered three variables. All three indexes of PP test satisfied by Bangladesh, India, Malaysia, Poland, Switzerland and Thailand with nonzero bandwidth result. By the examination of the VECM test, the study specified that 0.784 percentage increase in GDP growth through one percentage change in revenue expenditure. Meanwhile, one percentage change in revenue income caused 1.407 percentage decreases in GDP growth. This bidirectional causality of three variables also reinforced the *fiscal synchronization hypothesis*.

Policy Suggestions

To achieve a long run harmonious association concerning fiscal policy instruments and growth of GDP, the government of a particular nation should curtail their nonproductive expenditures. In addition to that, tax policy of a nation compels to maintain the level of optimality with their productive resources. The plan of spending in the public sector requires to be addressed on the maximum return or benefit of public of a particular nation in the long run and short run. The policy maker of a precise nation should be given a concentration to their Public Sector Development Plan (PSDP) and it needs to be harmonizing with investment of the private sector. All PSDP require to be developed and it had better be based on optimal fiscal policy examinations. Finally, the examination needs to be cross checked with the context of a particular economy and its socio-economics patterns.

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Appendices

Appendix A: Basic Features of the Model

Table 12. General Feature of the Variables

	LNGDPG	LNREVE	LNEXPE
Mean	1.242120	2.961679	3.040083
Median	1.382633	2.924452	2.952370
Maximum	2.213161	3.624084	3.792413
Minimum	–3.229709	2.146526	2.028803
Std. Dev.	0.775296	0.424377	0.451478
Skewness	–2.281614	0.002240	–0.111319
Kurtosis	11.69650	1.947982	2.400727
Jarque-Bera	643.0142	7.378416	2.724638
Probability	0.000000	0.024992	0.256066
Sum	198.7392	473.8686	486.4133
Sum Sq. Dev.	95.57238	28.63523	32.40928
Observations	160	160	160

Appendix B: Estimate Equation (Panel Least Squares)

In the ten cross section data the study find 160 observations with 17 year each.

Table 13. Results of Panel Least Squares Equation

Dependent Variable	Panel Options				Panel Options			
	Cross-section None and Period None				Cross-section Fixed and Period Fixed			
	DW	R^2	F-statistic	Prob. of F	DW	R^2	F-statistic	Prob. of F
LNGDPG	0.884519	0.119509	10.65480	0.000046	1.515970	0.567646	6.418714	0.000000

Appendix C: VAR Lag Order Selection Criteria

Endogenous variables: LNGDPG LNREVE LNEXPE
Exogenous variables: C
Date: 06/24/20 Time: 22:23
Sample: 2001 2017
Included observations: 41

Table 14. VAR Lag Order Selection

Lag	LogL	LR	FPE	AIC	SC	HQ
0	–14.50482	NA	0.000471	0.853894	0.979277	0.899551
1	117.4377	238.1402	1.17e–06	–5.143303	–4.641769*	–4.960672*
2	128.5290	18.39540*	1.07e–06*	–5.245319*	–4.367636	–4.925716
3	136.8037	12.51293	1.13e–06	–5.209938	–3.956105	–4.753361
4	144.2000	10.10227	1.27e–06	–5.131709	–3.501726	–4.538159
5	151.5100	8.914566	1.47e–06	–5.049267	–3.043134	–4.318744
6	163.9528	13.35322	1.37e–06	–5.217208	–2.834925	–4.349711
7	170.2149	5.803943	1.81e–06	–5.083654	–2.325221	–4.079185
8	182.1472	9.313026	1.95e–06	–5.226694	–2.092111	–4.085251

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Appendix D: Results of Model Equation

D(LNREVE)=C(6)*(LNGDPG(-1)+1.4087084999*LNREVE(-1)-0.783760913785*LNEXP(-1) -3.09342258496)+C(7)*D(LNGDPG(-1))+C(8)* D(LNREVE(-1))+C(9)*D(LNEXPE(-1))+C(10)

D(LNEXPE)=C(11)*(LNGDPG(-1)+1.4087084999* LNREVE(-1)-0.783760913785*LNEX PE(-1)-3.09342258496)+ C(12)*D(LNGDPG(-1))+C(13)*D(LNREVE (-1))+C(14)*D(LNEXPE(-1)) +C(15)

Appendix E: Specified Model Equations

Estimation Method: Least Squares
Date: 07/13/20 Time: 21:50
Sample: 2003 2017
Included observations: 135
Total system (unbalanced) observations 398

Table 15. Results of Specified Model Equations

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	–0.478382	0.072197	–6.626031	0.0000
C(2)	–0.013421	0.072653	–0.184723	0.8535
C(3)	–0.634248	0.908632	–0.698025	0.4856
C(4)	–0.259006	0.765230	–0.338468	0.7352
C(5)	0.039755	0.045594	0.871933	0.3838
C(6)	–0.007181	0.006933	–1.035681	0.3010
C(7)	0.018287	0.006947	2.632430	0.0088
C(8)	–0.062016	0.087289	–0.710469	0.4778
C(9)	0.053255	0.073302	0.726520	0.4680
C(10)	0.001317	0.004334	0.303817	0.7614
C(11)	0.006092	0.007772	0.783805	0.4336
C(12)	–0.008906	0.007788	–1.143642	0.2535
C(13)	0.050060	0.097853	0.511585	0.6092
C(14)	–0.232812	0.082173	–2.833213	0.0049
C(15)	–0.005626	0.004858	–1.157916	0.2476
Determinant residual covariance		1.72E-06		
Equation: D(LNGDPG) = C(1)*(LNGDPG(-1) + 1.4087084999*LNREVE(-1) - 0.783760913785*LNEXPE(-1) - 3.09342258496) + C(2)*D(LNGDPG(-1)) + C(3)*D(LNREVE(-1)) + C(4)*D(LNEXPE(-1)) + C(5) Observations: 130				
R-squared	0.318070	Mean dependent var		0.038717
Adjusted R-squared	0.296248	S.D. dependent var		0.616386
S.E. of regression	0.517086	Sum squared resid		33.42228
Durbin-Watson stat	2.195217			
Equation: D(LNREVE) = C(6)*(LNGDPG(-1) + 1.4087084999*LNREVE(-1) - 0.783760913785*LNEXPE(-1) - 3.09342258496) + C(7)*D(LNGDPG (-1)) + C(8)*D(LNREVE(-1)) + C(9)*D(LNEXPE(-1)) + C(10) Observations: 134				
R-squared	0.057575	Mean dependent var		0.001571
Adjusted R-squared	0.028352	S.D. dependent var		0.050691
S.E. of regression	0.049968	Sum squared resid		0.322082
Durbin-Watson stat	2.091592			
Equation: D(LNEXPE) = C(11)*(LNGDPG(-1) + 1.4087084999*LNREVE(-1) - 0.783760913785*LNEXPE(-1) - 3.09342258496) + C(12) *D(LNGDPG(-1)) + C(13)*D(LNREVE(-1)) + C(14)*D(LNEXPE(-1)) + C(15) Observations: 134				
R-squared	0.066484	Mean dependent var		-0.004869
Adjusted R-squared	0.037537	S.D. dependent var		0.057096
S.E. of regression	0.056014	Sum squared resid		0.404753
Durbin-Watson stat	1.626667			

Appendix F: VEC Residual Serial Correlation LM Tests

Date: 06/24/20 Time: 23:00
Sample: 2001 2017
Included observations: 129

Table 16. Result of VEC Residual **Serial Correlation LM Tests**

Lag	LRE* stat	df	Prob.	Rao F-stat	df	Prob.
1	35.58634	9	0.0000	4.153772	(9, 289.8)	0.0000
2	11.51372	9	0.2421	1.289175	(9, 289.8)	0.2422

Note: Null hypothesis: No serial correlation at lag h

Appendix G: Pairwise Granger Causality Tests

Date: 06/25/20 Time: 21:37
Sample: 2001 2017
Lags: 2

Table 17. Results of Pairwise Granger Causality Tests

Null Hypothesis:	Obs	F-Statistic	Prob.
LNREVE does not Granger Cause LNGDPG	129	3.45343	0.0347
LNGDPG does not Granger Cause LNREVE		2.82831	0.0629
LNEXPE does not Granger Cause LNGDPG	129	2.08245	0.1290
LNGDPG does not Granger Cause LNEXPE		0.09989	0.9050
LNEXPE does not Granger Cause LNREVE	149	0.48671	0.6157
LNREVE does not Granger Cause LNEXPE		3.82117	0.0242

Appendix H

Among the three variables No. 1 means LNGDPg, No. 2 consists of LNREVE and 3 for LNEXPE. Here 2, i.e LNREVE is normaly distributed (Which were more than 5% level, in this test Jarque-Bera portion given more emphasized by the researcher, and Joint showed the model is not normally distributed.)

VEC Residual Normality Tests

Orthogonalization: Cholesky (Lutkepohl)
Null Hypothesis: Residuals are multivariate normal
Date: 06/24/20 Time: 22:51
Sample: 2001 2017
Included observations: 129

Table 18. Results of VEC Residual Normality Tests

Component	Skewness	Chi-sq	df	Prob.*
1	–1.256657	33.95250	1	0.0000
2	–0.026211	0.014771	1	0.9033
3	–0.523128	5.883758	1	0.0153
Joint		39.85102	3	0.0000
Component	Kurtosis	Chi-sq	df	Prob.
1	12.83533	519.9432	1	0.0000
2	3.528023	1.498595	1	0.2209
3	8.492181	162.1318	1	0.0000
Joint		683.5736	3	0.0000
Component	Jarque-Bera	df	Prob.	
1	553.8957	2	0.0000	
2	1.513365	2	0.4692	
3	168.0155	2	0.0000	
Joint	723.4246	6	0.0000	

*Approximate p-values do not account for coefficientestimation

8. End Notes

i The tax-and-spend hypothesis advises that modifications in revenues income persuade amendments in government spending's.

ii Once framing a decisiveness in terms of the appropriate levels of government revenues and government expenditures [29] and [30], voters equivalence the marginal benefits and marginal costs of government services. So, revenue income and spending choices are jointly settled under this *fiscal synchronization hypothesis*. Empirically, this hypothesis is categorized by concurrent *feedback or bidirectional causality between government revenues and government expenditures.*

iii Adolph Wagner (1893) was amid the first who perceived the overtime accumulative inclination of public spending. Wagner's Law, states that economic performance has a fundamental positive impact on public sector's growth [31].

iv The Keynesian convention claim that an economy desires a Keynesian-type fiscal stimulus to be assumed temporarily in periods of recession by a functioning government [32], whereas, others, belonging to conventional economics, contend that the government has to be small and not to substitute the market mechanism.

v Guide Line: if six statistics are significant the model depicted a long run Cointegration exists, Pedroni P (2004).

vi **For Long run equilibrium:**

$$ECT_{t-1} = Y_{t-1} + \eta X_{t-1} + \varepsilon_m R_{t-1} + C$$

$ECT_{t-1} = 1.000lnGDPg_{t-1} + 1.4087lnReve_{t-1} - 0.7837lnExpe - 3.0934$

vii **For Short run equilibrium:**

$$\Delta Y_t = \sigma + \sum_{t-1}^{k-1} \gamma_i \Delta Y_{t-i} + \sum_{t-1}^{k-1} \eta_j \Delta X_{t-i} + \sum_{m=1}^{k-1} \varepsilon_m \Delta R_{t-m} + \lambda ECT_{t-1} + U_t$$

$\Delta lngdpg_t = -0.4798ECT_{t-1} - 0.0133\Delta lngdpg_{t-1} -0.6493\Delta lnreve_{t-1} - 0.2791\Delta lnexpe_{t-1} + 0.0380$

viii The fiscal synchronization hypothesis argues that revenues and expenditures decisions are made jointly.