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Revenue, Expenditure and Causality: An Empirical study of State Government in India

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Abstract:

Using the annual data from 1980-2014, this paper attempts to test the causal relationship between total expenditure and total revenue of state government in India within the empirical framework of causality, co integration and error correction mechanism. During the period 1980 – 2014, this study finds support for a long run relationship between expenditure and revenue following spend-tax hypothesis. However, this study finds evidences of a unidirectional causality from expenditure to revenue thereby invalidating the fiscal synchronization hypothesis, tax-spend hypothesis and institutional hypothesis in state government during the study period. This hypothesis suggests that the unsustainable fiscal imbalances can be mitigated by policies that adjusted government expenditure.

Key Words-: Revenue, Expenditure, Causality, Co integration, Error Correction Mechanism.

1. INTRODUCATION

In developing country, increase the state activities to enhance economic growth and promote human development through adopted the suitable policies. Classical economist assumed that there is minimum interference of state in economic activities i.e. free market economy. The views of the classical economists had countered by J. M. Keynes and they gave the importance of state when the world faces the economic crisis popularly known as the great depression. Keynes supported deficit budgeting for fulfilment of state's development finance. According to wager's law, an increase in state activity is accompanied by an increase in government expenditure as a proportion of National Income. Wiseman peacock explained that critical situation like war, depression require a sizeable increase in their relative share of public expenditure. This shows that the government has to perform a number of functions more efficiently. On the other hand, state has limited source of revenue. In the present economic situation, the role of State as an instrument to remove the fluctuation and distortions in the economy through government finance. The state activities are more important when they represent the huge population like India. However, we need suitable policies to enhance their revenue receipt in our country.

Government expenditures have exceeded their receipts causing budget imbalances. Imposition of higher taxes to meet the rising fiscal deficits has raised a debate between its supporters and critics. Broadly, the supporters believe that higher taxes would help to balance the budget and reduce the negative effects of deficits. While the critics assumed that increasing taxes would only lead to increased Government spending. These arguments culminate into four possible hypotheses on the inter temporal link between Government revenue and expenditures

The causal nexus between revenues and expenditure of government is a classic problem of Public

Economics. There are four hypotheses that can potentially explain observed spending-revenue behaviour. The hypotheses are briefly discussed as follows: the tax-to spend hypothesis suggests that tax may lead to government spending. This view is supported by supply side economist Friedman, (1978) who argued that if change in government revenue lead to change in government expenditure and no deficit. If revenues have a positive impact on expenditure, then decreasing revenues will lead to lower deficit. But Buchanan and Wagner (1977, 1978) presented alternative version of tax spend hypothesis. Tax influenced expenditure but revenue have negative impact on expenditure. Further claims made by supply side economist (Joulfian and Mookerjee (1990) and Bohm (1991), that revenue causes expenditure strengthens the tax spend hypothesis.

Second, spend tax hypothesis suggested that spend may lead to taxes which was explored by peacock and Wiseman (1979). According to them once a relatively high level of taxation and expenditure is set during extra ordinary situation like wars; natural disasters and so on justify increases in expenditure and taxes to pay them. Therefore, change in expenditure leads to change in revenue. Barro (1979, 1986) with his intertemporal tax smoothing model, argued expenditure is considered as a dependent variable to which tax adjust.

Third, Fiscal synchronization hypothesis suggested that government may determine expenditure and revenue concurrently. Meltzer and Richard (1981) examined the relationship between US federal budget outlays and tax receipts found support for bidirectional causality between receipt and expenditures.

Fourth, Institutional separation hypothesis mentioned by Baghestani and McNown (1994) and highlighted by Darrat (1998), relates to the expenditure and revenue decisions of the government. There is no inter- temporal causality between expenditure and revenue. Here, expenditure would be defined on the basis of requirements expressed by the citizenry and revenue would depend on the maximum tax burden tolerated by the population. As a result, the achievement of fiscal equilibrium would merely be a matter of coincidence.

There has been a debate in literature concerning evidence on the above four hypothesis causal relationship may be either one way or two ways. One-way causality implies that one variable determines to other variable. While in two-way causality are determined variable simultaneously.

There are so many works on the causal relationship between revenue and expenditure in the context of state government in India. Nithin (2015) investigated the revenue-expenditure relationship in context of central and general category states in India during the period 1973-2011. In majority of the States, tax and spend hypothesis has been upheld in case of own revenue and expenditure indicating that the size of the government at the state level is determined by the resource supply and not by expenditure demand. Mohanty and mannem (2014) examined the

relationship between revenue and expenditure for Odisha. They found a unidirectional causality from revenue to expenditure. Their study followed Barro's hypothesis. Raju (2008) has desegregated the revenue receipts and expenditure patterns. Her study followed the proposition of spend tax hypothesis. Vadlamannati and Veni (2007) studied about the state of Andhra Pradesh and established a causal relationship from revenue to expenditure. Dhanasekaran (2001) analysed that there has unidirectional causality between revenue and expenditure. He compared granger causality test and Geweke's test. The results showed the absence of co-integration between Government tax revenue and expenditure variables implying no evidence of a stable long run relationship between them Bhat (1993) analyzed the state's total expenditure and tax revenue using data from 1969 to1989 and found evidence of bi-directional causality using Granger causality test as well as the Sims test.

In front of state government, the causal relationship between government expenditures and revenue is one of the important problems. Although there is a vast literature on the causal relationship between government expenditure and revenue but the widely differing conclusions from these literatures has resulted in a subject of debate between this relationship.

The objective of this paper is to examine a causal link between revenue and expenditure of state government during the period of 1981-2014. The rest of the paper is organised as follows: first section presented with the scenario of introduction. Second section explained fiscal position of state in India. Third section discussed with the methodology of Unit root test, Granger causality test, Co integration test and Error Correction Method. Fourth section shows the empirical result of the test of Granger causality. Fifth section contains summary and concluding remarks.

2. FISCAL SCENARIO OF STATE

The growing fiscal imbalance is the one of the major concerns in India at state level. Most of the states have faced deterioration in their fiscal health. The constitution assigns important responsibilities to states in many sectors. The aggregate picture of all the states has shown a sharp deterioration in fiscal health since 1990s.For all the states; the year 1987-88 saw the emergence of a deficit on revenue account. The states' revenue deficit as percent of GDP has raised in1997-98 with 3percent due to the impact of fifth pay commission recommendation. It varied from the slow growth of tax revenue as well as declining non tax revenue, causes for the increase in non-development expenditure and gross inefficiencies in tax and expenditure system and inequality and incentive effects of fiscal transfer from the centre. The states are dependent on market borrowing and central transfer funds, for filling the gap between revenue and expenditure. But these resources are inadequate because state government has to pay large interest on their borrowing. Central transfer is decided by finance commission. The composition of receipt and expenditure of the govt sector in India reveals that while the state government collect about one

third of the total government receipt. They incurred more than half of the total expenditure on economic expenditure. The twelfth finance commission was draw up a fiscal restructuring plan for fiscal consolidation. According to its recommendation, each of the states was required to phase out its revenue deficit and contain the fiscal deficit at 3% of GSDP.The key indicators of the GFD of the states government was 3.2 percentage of GDP in 1990-91which increased to high level of 4.5 percentage in 1999-00 and then declined to 1.8 percentage in 2006-07 but then further increased to 2.9 percentage in 2009-10 which decreased in 2011-12 by 1.8 percentage. As a proportion of GDP, revenue deficit which was 0.9 percentage in 1990-91, which increased to high level of 2.7 percentage in 1999-00 and then turned to surplus in 2006-07 by -.06percentage but the situation has changed in 2009-10 with 0.5 percentage deficit in revenue account which shown surplus in 2011-12 by -0.3 percentage. Expenditure GDP ratio of the state government was 5.2 percentages in 1990-91 which increased to the high level in 2012-13 with 19.6 percentages. Revenue GDP ratio of state was 4.8 percentages to 20.1 percentages at the same time period. The ratio of revenue and expenditure in term of GDP shows that there was huge gap in 1990-91 but in 2012-13, there is no gap between revenue and expenditure. In fact, it generates negative revenue deficit. It shows that state have surplus in revenue account in 2011-12.

3. DATA SOURCE

The study is basically based on secondary data sources. The scope of the study limited to tax revenue across the states during from 1981-2012. The data are collected from Handbook of Statistics of Indian Economy, State Finance of RBI, State Budget Documents, Indian Public Finance Statistic, State Finance Commission Reports and other sources. In this analysis, there is some econometrics and the statistics tools are needed. The main econometrics tools those we apply in this analysis is that Unit Root Test, Granger causality test, Co integration test and Error Correction Mechanism techniques.

4. METHODOLOGY

4.1. Unit Root Test

A number of empirical studies have used in time series data to analysis the causal link between total revenue and total expenditure of state government and also in the case of central government. In the process to analysis the state's finance structure time series data are required but it was well known that the series are non-stationary (poses unit root) in level. Broadly, a time series are Non-stationary when the mean, variance, and covariance are increases with time. Since econometrics modeling with the desirable statistical properties of the estimator are given the misleading information, so it has necessary to test the Series are stationary or not before using the econometrics excises. A simple first Order autoregressive process can be expressed by the following equation :

$$Yt = \mu + \alpha Yt - 1 + \varepsilon t \ldots\ldots (1)$$

Where Yt is the stochastic process, μ, and α are parameter and εt is a random disturbance term with white noise properties. The parameter of above equation gives the nature of time series. If μ ≠ 0 and α < 1, then Yt follow a deterministic trend. The presence of autoregressive component with time trend is called the Trend Stationary Process (TSP). If the time series is said to follow a simple random walk then it is called unit root process. Any non-stationary process, which becomes stationary after taking difference, it is called the difference stationary process. There are three different models in time series. The first model is without drift, second model is with drift and third model is with drift plus time trend. The equation of all three models is -:

Without drift and without time trend (Model - 1)

$$Yt = \alpha Yt - 1 + \varepsilon t$$

With drift and without time trend (Model - 2)

$$Yt = \mu + \alpha Yt - 1 + \varepsilon t$$

With drift and with time trend (Model - 3)

$$Yt = \mu + \alpha Yt - 1 + \gamma t + \varepsilon t$$

In the econometrics literature there are several tests for the non-stationary time series. The Dickey-Fuller (DF), Augmented Dickey- Fuller (ADF) and Philips and Perron unit root test. In the above test, we are use the DF and ADF test in this paper.

The Dickey-Fuller and Augmented Dickey-Fuller Tests

Dickey-Fuller test examines whether the value of parameter α=1 in the first equation than the model have unit root. In other words, the first order autoregressive has unit root. Specifically, assuming their absence of trend term in equation (1), and equation (1) can be written as:

$$\Delta Yt = \mu 0 + \delta Yt - 1 + \varepsilon t \quad \text{..... (2)}$$

Where:$\Delta Yt = Yt - Yt - 1$ and $\delta = \alpha - 1$
The null hypothesis is that there is unit root, i.e.
$H0{:}\delta = \alpha - 1 = 0$
More generally, if the time series follows a autoregressive process in order p or even moving average process an extended Dickey-fuller test called augmented Dickey-fuller (ADF) test. In the main problem of Dickey and Fuller test is that the error term are serially correlated. So the ADF is

the modified version of Dickey-Fuller Test (DF) which includes extra lagged terms of the dependent variables in order to eliminate the problem of autocorrelation. The lag length of dependent variable is either determined by Akaike Information Criteria (AFC) or Schwartz Bayesian Criteria (SBC). So before apply the ADF test first checked the lowest25value of AFC or SBC and then determine the lag length of dependent variable as an explanatory variable. So, if the original time series follows AR (p) process, then the augment Dickey-fuller (ADF) test uses the following regression:

$$\Delta Yt = \mu 0 + \delta Yt - 1 + \sum \gamma\, iYt - 1 + \varepsilon t \quad \text{..... (3)}$$

Equation (3), the residual sequence is now white noise and removes the problem of autocorrelation. So ADF is the batter measure to deduct the time series are stationary or not. There is different form of DF and ADF tests, which are possible by including trend (Model 3) and also excluding drift (intercept) term from equation (2) and (3).

4.2 Granger Causality Test

C. W. J. Granger (1969) has given causality test in his paper, "Investigating Causal Relationship by Econometrics Models and Cross-spectral Methods". Granger causality test shows the relationship between the variable. "A variable is x is said to be Granger Causes y if and only if the forecast of y is improved by using the past value of x together with the past value of y. in the other words prediction of time series variable (for example Revenue and Expenditure) revenue is a function of past value of revenue and past value of expenditure and vase versa. So in this test involve following regression:

$$Y_t = \sum \alpha_i X_{t-i} + \sum \delta_j Y_{t-j} + U_{1t} \quad \text{..... (4)}$$

$$X_t = \sum \alpha_i X_{t-i} + \sum \delta_j Y_{t-j} + U_{2t} \quad \text{..... (5)}$$

Where Y_t = Expenditure, X_t = Revenue.

Then Granger causality test mention four cause:

1. Unidirectional causality from revenue to expenditure is indicated if the estimated coefficients on the lagged revenue in equation (4) are statistically significant, different from zero as a group and the set of estimated coefficients on the lagged expenditure in equation (5) is not statistically significant different from zero as a group.
2. Unidirectional causality from expenditure to revenue is indicated if the set of estimated lagged revenue coefficients are not statistically significant different from zero. And the set of lagged expenditure coefficients in (5) is statistically significant different from zero.
3. If the sets of revenue and expenditure coefficients are statistically significant, different from zero in both the regression then it is called the bi directional causality between the variables.

4. If the sets of coefficients revenue and expenditure are not statistically significant in both the regressions, then is called no causality relationship between variables.

The steps involved in the Granger causality test are:

1. Calculate the RSSr (Restricted residual sum of square) from run the regression that current expenditure is function of all lagged expenditure terms and other variables but not include revenue variable in the regression.
2. Calculate the RSSur (unrestricted residual sum of square) from run the regression that current expenditure is function of all lagged expenditure, and other variable and lagged revenue terms.
3. Formulate the null hypothesis that is lagged revenue term do not belong in the model.

4. The test hypothesis, rejection and accept the null hypothesis is used the F test is:

$$F = \frac{(\text{RSSr} - \text{RSSur})/\text{m}}{\text{RSSur}/\quad (\text{n} - \text{k})}$$

Which follow the F statistics with m and (n - k) degree of freedom. Where m = number of lagged M terms and k = number of parameters estimated in unrestricted regression.

5. In the decision rule of this test is if the calculated F value exceeds the critical F value at a chosen level of significance, reject in null hypothesis (lagged revenue terms belong in the model) otherwise accepting it. And it is the called revenue granger causes expenditure in India."[1]

4.3 Testing for Co Integration (Engle-Granger (EG) and augmented Engle-Granger (AEG) Methodology)

A number of methods for testing long run relationship between variables. In this paper considered the Dickey-Fuller (DF) test and Augmented Dickey –Fuller (ADF) test on the residual estimated from the co integration regression. Therefore, the DF and ADF tests in present context are known as Engle-Granger (EG) and augmented Engle-Granger (AEG) tests. The model is

$$TR_t = \alpha + \beta EXP_t + u_t \dots\dots\dots\dots (6)$$

Where TR_t= per capita expenditure; PDI_t= per capita disposable income; and u_t= error term.

$$u_t = \rho u_{t-1} + \varepsilon_t \dots\dots\dots\dots\dots (7)$$

Subtract u_{t-1} in both side in equation (2), then

$$\Delta u_t = \delta u_{t-1} + \varepsilon_t \dots\dots\dots\dots\dots\dots (8)$$

Where $\delta = \rho - 1$.

Then null hypothesis H_0: $\delta \geq 0$ then there is no cointegrated relationship between variables and alternative hypothesis H_1: $\delta < 0$or negative. The residual from the regression (1) are I(0), they are stationary. Hence equation (6) is a co integrating relationship and this regression is not

[1] Damodar Gujarati, "*Basic Econometrics*" (New Delhi: Tata McGraw-Hill, 2004), p. 696.

spurious or the regression is meaningful.

Error Correction Mechanism (ECM)

Once the long run relationship exists between the variables then in the short sun there may be disequilibrium. This disequilibrium is corrected by the ECM. The ECM equation is

$$\Delta TR_t = \alpha_0 + \alpha_1 \Delta EXP_t + \alpha_2 u_{t-1} + \varepsilon_t \dots\dots\dots\dots (9)$$

Where Δ denotes the first difference operator, ε_t is a random error term, and u_{t-1} is the one period lagged value of the error from the co integration regression.

The error correction equation states that if disequilibrium in the model then restores the equilibrium by the error correction terms.

5. Empirical Analysis

This section deals with the issue of econometrics modelling of the causal relationship between revenue and expenditure of states in India. In this purpose, Granger Causality Test is suitable econometrics technique for direction of causality.

Table .1 Unit Root Test for Revenue of States

Model (revenue)	None	Drift / constant	Constant and trend	Process of integration
Level	2.58 (0.99)	-1.43 (0.55)	-2.10 (0.47)	Null is accepted
First Difference	-0.64 (0.42)	3.84 (0.00)*	-3.50 (0.06)***	Null is rejected /I (1)process

Note: **significant at the 1% level **significant at the 5% level ***significant at the 10% level. #Own Calculation*

Table 1 presents the result of the ADF tests on revenue variable in levels and first difference. The unit root test carried out by assuming both constant and linear trend in data. In the case, when variables are in level from, the null hypothesis of non-stationarity cannot be rejected for any of the series, the calculated value is less than the critical value of the test statistics for series, therefore, and the series are non-stationary at levels. Applying the same test for first difference variables to determine the order of integration, then critical value is greater than calculated value of the test statistics for the variables. The null hypothesis can be accepted for the series at first difference with constant. We conclude that the series contain a constant without deterministic time trend.

Table .2 Unit Root Test for Expenditure of States

Model (expenditure)	None	Drift / constant	Constant and trend	Process of integration
Level	19.67 (1.00)	0.18 (0.96)	-1.18 (0.63)	Null is accepted
First Difference	-0.18 (0.60)	-4.13 (0.00)*	-4.06 (0.01)**	Null is rejected/I (1) process

Note: **significant at the 1% level **significant at the 5% level ***significant at the 10% level. #Own Calculation*

Table (2) presents the result of the ADF tests on expenditure variable in levels and first difference. The unit root test carried out by assuming both constant and linear trend in data. In the case, when variables are in level from, the null hypothesis of non-stationarity cannot be rejected for any of the series, the calculated value is less than the critical value of the test statistics for series, therefore, and the series are non-stationary at levels. Applying the same test for first difference variables to determine the order of integration, then critical value is greater than calculated value of the test statistics for the variables. The null hypothesis can be accepted for the series at first difference with constant. We conclude that the series contain a constant without deterministic time trend. We use the Akaike Information Criterion (AIC) to determine the appropriate lag lengths for government revenue and government expenditure.

Table 3: Granger Causality Test between Revenue and Expenditure in India

At lag	Dependent variable	F –statics/ Wald test	AIC	SBC	Direction of causality
Lag (1)	Y_t	9.96 (0.00)*	-4.33	-4.19	Unidirectional Causality
	X_t	0.74 (0.39)	-3.60	-3.46	
Lag (2)	Y_t	8.46 (0.00)*	-4.52	-4.29	Unidirectional Causality
	X_t	0.47 (0.62)	-3.39	-3.26	
Lag (3)	Y_t	6.07 (0.00)*	-4.44	-4.11	Unidirectional Causality
	X_t	1.58 (0.22)	-3.49	-3.39	
Lag (4)	Y_t	4.52 (0.00)*	-4.32	-3.89	Unidirectional Causality
	X_t	1.34 (0.29)	-3.37	-2.94	
					Cont..

Lag (5)	Y_t	2.94 (0.00)*	-4.12	-3.59	Unidirectional Causality
	X_t	1.48 (0.24)	-3.30	-2.77	
Lag (6)	Y_t	2.84 (0.05)**	-4.13	-3.50	Unidirectional Causality
	X_t	0.78 (0.60)	-3.13	-2.50	

Note: **significant at the 1% level **significant at the 5% level ***significant at the 10% level. #Own Calculation*

The Granger causality test is used on annual data of total expenditure and total revenue of state government. This test is also analysed on the actual data in log series and relationship tested between expenditure and revenue in table.3. This table summarized the result of granger causality test to find out the relation between revenue and expenditure at different lags. In granger test, for the equation with expenditure as a dependent variable, the null hypothesis is that the lagged valued of revenue receipt does not granger cause expenditure. For the equation with revenue as a dependent variable, the null hypothesis is that the lagged value of expenditure does not granger causes revenue receipt. For granger causality economic variable must be stationary which have been proved by the unit root test that total expenditure and total revenue are stationary at 1st difference with constant. The result of causality represents that expenditure as a dependent variable are cause by revenue as an independent variable at lag 1 but inversely revenue as a dependent variable are not cause by expenditure at same lag. It is insignificant at lag 1. This same result has found at different lags. So the result supports unidirectional causality at lag1 to lag 6 that unidirectional causality between expenditure and revenue receipts.

ENGLE GRANGER CO INTEGRATION TEST

The co integration test shows the long run relationship between variables. There are several methods to develop to estimate the long run relationship between variables with given certain conditions. This paper estimate the long run relationship between the government expenditures and receipts for use the Engle Granger co integration technique. So the estimated results are-:

$$LNTt = \ 0.3289 + .9767LNEXt + vt \ \ldots\ldots (1)$$

$$t \ \ statics \ \ (1.56)(76.86) *$$

$$Adjusted \ \ R2 = 0.994$$

$$F = 5908.93 \qquad Prob = 0.00$$

In equation (1), the estimated coefficient of LREXt is positive. Therefore, the estimated coefficient of LREXt suggests that 1 per cent change in real government expenditure leads to 0.9767 per cent change in real government revenue. Here the coefficient of government expenditure is positive and significant which indicates that economic activity enhances as government increases its expenditure as a result tax base and tax revenue also increases because of high income.

$$\Delta u_t = -0.2839\ u_{t-1} + \varepsilon_t$$
$$t = (-2.570807)^*$$
$$R^2 = .26 \qquad d = 1.76$$

In second step, we used the EG and AEG test for the stationarity of the residual. Here the computed value is much more negative critical value at 1 percent level of significance the residual is stationary. So the results confirms that the long run relationship between revenue and expenditure.

ERROR CORRECTION MECHANISMS

We showed that revenue and expenditure are co integrated and there is a long run relationship between the two. Of course, in the short run there may be disequilibrium. Therefore one can treat the error term as the equilibrium error.

$$\Delta TR_t = -118359. + 1.050434\Delta EXP_t - 0.196162u_{t-1}$$
$$t\ statics \quad (-0.301127) \quad (13.82839)* \quad (-1.691696)***$$
$$Adusted\ R2 = 0.8727 \qquad F\ Statistic$$
$$= 95.97 \qquad Prob = 0.00$$

ECM equation states thatΔTR_t depends on ΔEXP_t and also on the equilibrium error term.$\alpha_2$is expected to be negative, the term $\alpha_2 u_{t-1}$ is negativeand therefore, ΔTR_t will be negative to restore the equilibrium. That is, if $\Delta TR_t$is above its equilibrium value, it will start falling in the next period to correct the equilibrium error. Statically, the equilibrium error term is negative at 10 percent level of significance, suggesting that ΔTR_t adjusts to change in EXP_t in the same period.

SUMMARY AND CONCLUSION

In this paper, we investigate the causal relationship between revenue and expenditure by using the annual data 1981-2012. This paper applies Granger co integration technique for long run relationship between variables and Granger causality test to test the causal relation between state government revenue and expenditure during the period 1981- 2012. The unit root test based on ADF test proposed by Dickey & Fuller (1979) shows that the variables are non-stationary in levels but stationary in the first difference with constant but not linear trend is accepted for variables. The Granger estimation technique of co integration is to identify to check stationarity of residual by with the help of ADF. Stationarity of residual shows that there is Co integration relationship between the variables, which suggests that there is a long-run relationship between state government revenue and expenditure. The results from Granger causality test suggest unidirectional causality between government revenue and government expenditures. In the long-run, it support the "spend tax hypothesis". Therefore the state government decide spend first and then raise tax revenue and request for grants to finance its expenditure rather than adopting the method of raising funds first and collect revenue and take decision to spending later according the revenue.

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