

Tax Revenue and Expenditure: A Causality Test for Gujarat State

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Abstract

The paper examines the causality between Government Expenditure and Tax Revenue of Gujarat State for the period of 1985 to 2010. The empirical analysis employs Unit Root Test, Cointegration and VAR model for examining the causality between Tax Revenue and Expenditure. Gujarat is achieving double digit growth for last couple of years that provides a greater base for collecting Tax Revenue. The higher economic growth needs significant financial resources to be pumped in the economy, leading to expand the size of budget.

The interdependence of Tax Revenue and Expenditure is one of the major obstacles to achieve fiscal discipline and thus, it becomes vital to assess the interrelationship between Tax Revenue and Government Expenditure. The paper concludes that in case of the Gujarat, only unidirectional causality is seen, indicating Tax Revenue influences Government Expenditure. It also reveals that unless the long term relation between Tax Revenue and Expenditure is taken into consideration, it will not be possible to attain fiscal discipline.

Key Words

Tax Revenue, Government Expenditure, Unit Root Test, Causality, Cointegration, VAR Model.

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1 Introduction

The economic development scenario in Gujarat has been very dynamic. During year 2009-10 the Gross State Domestic Product (GSDP) of Gujarat has increased by 16.8% with only manufacturing sector contributing 27% which is higher than the national average (GoG, 2010). Gujarat is able to establish itself as one of the economically advanced states having sound infrastructure, favoring industrialization and attracting foreign investments. Considering the role of the State Government to boost infrastructure and economic development, the State Government expenditure has increased by an average of 17% since 2006-2007 whereas the tax revenue has increased only by an average of 13% during the same period. Infact during the fiscal year of 2009-10 the expenditure increased by 23% from Rs. 387414.5 millions in 2008-09 to Rs. 478054 millions in 2009-10. This also depicts increasing burden of fiscal deficit in the state budget.

The size, composition and growth of the economy determine the revenue potential of the State and thus size of the budget. The size of the budgets determines the level of public expenditure (Gujarat Fiscal Responsibility Act-GFRA, 2005). The present economic and fiscal situation and their interrelationship in Gujarat state raises certain issues such as whether the need to achieve high economic growth rate will increase the Government expenditure. Will there be an additional burden on the state tax payers to meet the requirements of increasing expenditure as there is a legislative restriction on the central transfers. Increasing GSDP provides the larger base for collecting tax revenue, assuming the buoyant nature of the state tax revenue; it will increase the tax revenue of the state. Will this lead to further increase in the expenditure by state Government? Hence, there arises a need to examine whether there is any causal relationship that emerges between the tax revenue and expenditure of the state in the present economic conditions. The above raised questions become important to address considering the statement given in the report of GFRA, which says that the objective of the Fiscal Policy of the State is to increase the capital expenditure to ensure higher investment and social and fiscal infrastructure. To achieve this objective, it is necessary to increase the revenue receipts of the State and contain the revenue expenditure. (GFRA 2005)

The paper aims at examining whether there is any evidence of the causal relationship between state tax revenue and government expenditure. Will the higher tax revenue induces higher spending or will the higher public expenditure to meet the growth requirements of state in turn raises tax revenue or whether both influence each other simultaneously. The study is important in the current economic condition of the state and the global economy where on one side state government is spending heavily on physical and social infrastructure to meet the growing need of industrialization and on the other hand the global recession would push the fiscal stimulus. There are likely chances that

when the expenditure increases it will be followed by high tax revenue either in the form of high taxes or in the form of broader tax base. The causal relationship may also exist in the other direction, where increasing tax revenue will increase the spending capacity of the state government resulting into higher spending rather than reducing deficit.

2 Literature Review

There is a presence of quite a good amount of theoretical and empirical research in the area of examining the causality between government revenue and expenditure. The empirical research can be classified on the basis of countries, central and state government analysis and the models or statistical test adopted by the researchers. Particularly 1985 onwards, many researchers have examined this relationship where their studies were restricted to only advanced countries, mainly US. Studies by Ram (1988), Enderson et al. (1986), Blackley (1986) have examined causality between revenue and expenditure of US federal government with Vector Autoregression (VAR) model. They have either proved unidirectional causality or have accepted fiscal synchronization through their empirical work. Whereas Miller and Rusnik (1990) and Jones & Joulfaian (1991) have adopted Error Correction Model and proved bidirectional causality. Baffes and Shah (1993) studied the stationarity of fiscal deficit and granger causality for three countries Argentina, Brazil and Mexico. They found that for Argentina and Mexico strong granger causality runs for both directions. Hondroyiannis and Papapetrou (1996) have run the Cointegration and granger test of causality for Greece.

They prove that the long run spending of the government causes government revenue. Mithani & Khoo (1999) test alternative hypothesis about tax expenditure relationship in Malaysia. They have incorporated the effect of seasonality in examining the causality. The seasonal error correction model result accepts the tax and spend hypothesis. Xiaoming Li (2001) has studied causality using Vector Error Correction Model (VECM) and VAR for China. He concludes the bidirectional causality pattern. Chang et al (2002) have used Cointegration and VAR model to test three hypothesis of tax – spend, spend – tax and Fiscal Synchronization for 10 advanced and developing countries. They found no causal relationship for two countries namely New Zealand and Thailand. Fasano & Wang (2002) examined the direction of causality in oil dependent GCC (Cooperation Council of the Arab States of the Gulf) countries. They accepted the tax – spend hypothesis. Daniel (2004) examines causal relationships between revenue and expenditure of Botswana using Granger causality test. He accepts the unidirectional relationship of revenue granger causing expenditure. Joulfaian & Mookerjee (2006) have studied the causality of twenty two countries of Organisation for Economic Co-operation and Development (OECD). They found greater support for spend and tax hypothesis using VAR model including the effect of GDP gap and inflation rate. Narayan & Narayan (2006) investigated the evidence of

causality in twelve developing countries. They have used the Toda Yamamoto test for Granger Causality. Hasan and Lincoln (2006), using hybrid of Cointegration and Granger Akaik synthesis of modeling strategy, explained the causal relationship between revenue and expenditure. They accept the bidirectional relationship between expenditure and revenue. Wahid (2008) adopted granger causality test for Turkey and proves that government expenditure causes tax revenue to increase and lead to increase in budget deficit. Sriyama (2009) studied the causality using Cointegration and VECM for Indonesia. They found long run bidirectional causality between tax revenue and expenditure whereas unidirectional relations running from tax revenue to expenditure in the short run.

Very few studies have been done at the state level. One of the important research by Marlow & Manage (1987) studied causal relationship at the state and local level government of US. They examined how constitutional and legislative constraints have affected causal relation between tax revenue and expenditure. Payne (1996) examined the temporal relationship between revenue and expenditure of US states using VECM. The tax-spend hypothesis was found in twenty four states out of forty eight states under study. As far as examining causality between expenditure and tax revenue in India very few studies have been done. Bhat et al (1993) finds bidirectional relationship between revenue and expenditure in India using Granger causality test. However other studies on India do not accept the same hypothesis. Dhanasekaran (2001) has examined causality between revenue and expenditure along the lines suggested by Geweke. The study found no evidence of a stable long run relationship between revenue and expenditure. Geweke's test indicated the existence of bi-directional causality, while in the case of expenditure as a dependent variable, the test showed absence of any causal relationship between the variables. Narayan (2005) investigates the evidence of cointegrations and causality between government revenue and expenditure for nine Asian countries. The study uses the bound testing approach to cointegration and F test for granger causality. For India, the study does not accept the causal relationship between revenue and expenditure. Swati Raju (2005) examines causality between various categories of revenue and expenditures with Johansen VECM techniques. The findings prove cointegration between five of the seven revenue expenditure pairs.

A broad understanding from the literature review emerges that very few studies have been conducted to examine the causality between revenue and expenditure of India. No studies are found for Indian states. As far as the statistical model is concerned, the choice is between Engle Granger causality test, VAR or VECM models. Researchers have found the superiority of VAR and VECM over Engle Granger causality test. No single conclusion can be drawn regarding the direction of the causality as different results have come based on the region and the statistical model used.

The present research tries to examine the causality between government tax revenue and expenditure for Gujarat state using VAR model.

3 Methodology

The study uses annual data of tax revenue and government expenditure of Gujarat states from 1985 to 2010. The data are obtained from various bulletin of Reserve Bank of India. The tax revenue includes both states' own tax revenue and central transfer. However the issue of central transfer is not taken into consideration in this study. The expenditure includes revenue expenditure both planned and non-planned and developmental and non-developmental. The tax revenue and expenditure data are transformed into logarithm.

As the data are time series, there are high chances of the series being non stationary. To test the stationarity, the traditional Augmented Dickey Fuller test for unit root is conducted. For the purpose of examining the causality the recent researchers used two alternative approaches; VAR or VECM. Certainly the Error Correction Model is superior to Autoregression model in the manner that the sources of causality that cannot be captured in VAR can be captured through VECM. However, the VEC equations require that the time series in the tests be nonstationary or integrated of order greater than zero and be cointegrated. Violation of either one or both of these two conditions would render it impossible to implement the VEC testing procedure, and one has to resort to the VAR technique instead (Xiaoming Li, 2001). With this understanding in this research the VAR model is run because the weak cointegration was found between tax revenue and expenditure. The following basic equations are run under VAR model. Here Y_t is expressed as a linear function of its past value and also the past value of other variable X_t .

$$Y_t = \sum \beta_0 Y_{t-1} + \sum \beta_1 X_{t-1} + U_{1t} \quad \text{..... (1)}$$

$$X_t = \sum \gamma_0 X_{t-1} + \sum \gamma_1 Y_{t-1} + U_{2t} \quad \text{..... (2)}$$

The specific equations are as follows:

$$\text{LogTR}_t = \sum \beta_0 \text{LogTR}_{t-1} + \sum \beta_1 \text{LogExp}_{t-1} + u_{1t} \quad \text{..... (3)}$$

$$\text{LogExp}_t = \sum \gamma_0 \text{LogExp}_{t-1} + \sum \gamma_1 \text{LogTR}_{t-1} + u_{2t} \quad \text{..... (4)}$$

4 Estimation

As mentioned in the previous section, the data are of time series and hence there are high chances of the time series being non stationary. The very fact that tax revenue and expenditure would have grown over a period of time; there are high chances that the data will have a trend and the condition of stationary would not be met. To test whether the time series used here is stationary or not a unit root test is conducted. The unit root

test is conducted for both the times series using constant. The basic form of the model used by the Gretle software is $(1-L)y = b_0 + (a-1)*y(-1) + e$

Table 1: Unit Root Test

	Without Differentiating		First Difference	
	Test Statistic (tau_nc)	P – value	Test Statistic (tau_nc)	P – value
Tax Revenue	-0.829	0.79	- 3.80	0.008*
Expenditure	-1. 464	0.534	-6.94	6.93e-006*

* Significant at 1%.

The above test results indicate that the original time series of tax revenue and expenditure are non stationary and possess an inherent trend. However to obtain the stationarity when the series were differentiated once ($\Delta Y = Y_t - Y_{t-1}$), it shows that the test statistics are significant even at 1 %. This proves that the tax revenue and expenditure series are at I(1). If the regression is run between the two nonstationary time series it may create a spurious relation (Gujarati, 2003). Hence transformation of the nonstationary time series into stationary time series is important. Table 1 indicates that the first difference of both tax revenue and expenditure time series is stationary and thus running the causality test between ΔTR and ΔExp will not create spurious relation.

As discussed in the review of literature, most of studies have run cointegration test as a pre condition of causality to check the evidence of long term relationship between tax revenue and expenditure. However, the cointegration was run and the weak cointegration was obtained between tax revenue and expenditure. Table 2 provides the results for cointegration. We are not able to reject the null hypothesis of unit root ($a = 1$) even at 10% as the test is significant at more than 13% of tolerance level.

Table 2: Cointegration Test

	Coefficient	Std. Error	t-ratio	P-value
Constant	0.621709	0.283888	2.190	0.0385 *
LogTR	0.979419	0.0316040	30.99	7.19e-021 **

* Significant at 5 %, ** Significant at 1 %.

Table 3: Descriptive Statistics (Cointegration Test)

1st-order autocorrelation coeff. for e	-0.028
lagged differences: F(3, 18)	= 3.500 [0.0369]
test statistic: tau_c(2)	-2.91676
asymptotic p-value	0.1314
Model form $(1-L)y = b_0 + (a-1)*y(-1) + \dots + e$	

As discussed above the cointegration between two time series is a precondition for using VECM model and hence in this study the causality is examined using the VAR model. To assess whether the tax revenue causes expenditure or the expenditure causes the tax revenue two different equations have been used.

Table 4 provides the estimates of VAR for the tax revenue influencing government expenditure. The conclusion of the VAR model is drawn from the traditional F statistics. In this test the F statistics is also significant at 1% indicating the existence of causality running from tax revenue to expenditure. The coefficient of the variable (TR) is also statistically significant and hence tax revenue is statistically significantly influencing government expenditure.

**Table 4: VAR for Expenditure Dependent Variable
(Equation 3, Revenue Causing Expenditure)**

	Coefficient	Std. Error	t-ratio	p-value
Constant	0.433266	0.141174	3.0690	0.00562*
LogExp _{t-1}	0.75835	0.0892565	8.4963	<0.00001*
LogTR _t	0.219713	0.0887948	2.4744	0.02154**

* Significant at 1 %. ** Significant at 5 %

**Table 5: Descriptive Statistics VAR System, Lag Order 1
(Equation 3, Revenue Causing Expenditure)**

Mean dependent variable	9.439940	S.D. dependent variable	0.923288
Sum squared residual	0.101414	S.E. of regression	0.067895
R-squared	0.995043	Adjusted R-squared	0.994592
F(2, 22)	2208.127	P-value(F)	4.44e-26
rho	0.062866	Durbin-Watson	1.857413

Table 6 provides the results of VAR for the hypothesis of expenditure causing tax revenue. Here the F test is statistically significant at 1 % indicating overall model is explaining the variations in tax revenue. However, the individual variable coefficient of Expenditure is not statistically significant; leading to an inference that expenditure is not statistically significantly influencing tax revenue.

**Table 6: VAR for Tax Revenue Dependent Variable
(Equation 4, Expenditure Causing Tax Revenue)**

	Coefficient	Std. Error	t-ratio	p-value
Constant	0.274096	0.170747	1.6053	0.12269
LogExp _{t-1}	-0.0239339	0.107954	-0.2217	0.82659
LogTR _{t-1}	1.00912	0.107395	9.3963	<0.00001*

* Significant at 1 %.

**Table 7: Descriptive Statistics, VAR System, Lag Order 1
(Equation 4, Expenditure Causing Tax Revenue)**

Mean dependent variable	8.999563	S.D. dependent variable	0.937402
Sum squared residual	0.148352	S.E. of regression	0.082117
R-squared	0.992966	Adjusted R-squared	0.992326
F(2, 22)	1552.733	P-value(F)	2.09e-24
rho	0.193787	Durbin-Watson	1.490667

Thus, based on the above VAR model it is observed that there is unidirectional causality between tax revenue and expenditure of the state government. With one lag variable unidirectional causality exist in the form of Tax – Spend.

5 Conclusion

The research concludes that in case of the Gujarat state the unidirectional causality is observed from tax revenue to expenditure. This one way causality has important fiscal implications particularly for a growing state like Gujarat. With continuously enjoying higher growth of the tax base in the form of higher Gross State Domestic Product the state is relatively in a better position to raise higher own tax revenue. However, this instead of leading to reduction in the fiscal deficit of the state would actually lead to higher expenditure. With this result the study may conclude that with the efforts and possibility of raising tax revenue by Government of Gujarat, we are not targeting at reducing fiscal deficit but utilizing the resources to further expenditure which may also result into increase in the general price level. Unless this long term relationship is understood the fiscal discipline is difficult to achieve by the state government.

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