An Econometric Analysis of Income and Expenditure of Rajasthan State

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Abstract

The study is mainly focused on causal relation between income and expenditure of Rajasthan state for the period of 2000-01 to 2022-23. The secondary data related to total revenue receipt, total capital receipt, total receipt, total revenue expenditure, total capital expenditure and total expenditure were used to construct eight models. The unit root test indicated that all variables are non-stationary at level and stationary at first difference except total capital revenue and total capital expenditure which are stationary at level but the non-stationary variables consist in model 1, 3. 4. 6, 7 and 8 are co-integrated. The Unidirectional Causality running from revenue receipt to revenue expenditure in long run and short run. The bidirectional long run causality existed between capital revenue and capital expenditure and total revenue and total expenditure but there is no short run causality between capital revenue and capital expenditure whereas the bidirectional shorter run causality existed between total expenditure and total revenue.

Keywords: GDP Deflator, Natural Logarithm, Unit Root Test, Co-integration, Granger Causality.

Introduction

In today's modern times, the scope of government activities has changed a lot and its scope has become wide. The economic activities undertaken by the government are classified into two categories: one is the primary responsibility tasks which include tasks like defence, peace and security of the country and the other is the secondary tasks such as providing education to the citizens of the country, construction of roads, bridges, hospitals etc., arrangement of water, electricity etc. To meet all these tasks, the government needs to be competent and efficient. In short, it is necessary to spend enough to successfully carry out all the above activities and to meet this cost, the government also needs to have sufficient financial resources. Thus, the

expenditure and income aspects of the government are included in public finance. (Aschauer and Greenwood,1985, Barro,1990). That is why it is said that public finance is the finance which has a close relationship with the income and expenditure of the government (Schumpeter, 1911; Singh and Mishra, 2014, 2015). According to Findlay Shiraz, *"Public finance is the study of the principles underlying the spending and rising of funds by public authorities"*. Generally, public expenditure is divided into two parts: Revenue Expenditure and Capital Expenditure. Similarly, public income is also divided into two parts: revenue income and capital income. Current expenditure has a period of one year and includes expenditure on providing social services like education, sports, health, family welfare, water supply and sanitation, housing, urban development, expenditure on economic services like agriculture and allied activities, rural development, special area programmes, irrigation and flood control, energy, industry and minerals, transport and communication, science technology and environment, etc., as well as non-development expenditure like tax collection, interest payment, administrative services, pension, etc. Capital expenditures also mostly include the same expenses as above but have a duration of more than one year. Revenue receipts include income received for less than a year such as personal business or agricultural tax, stamp and registration free, property tax, tax on commodities, part of the tax received from the central government as well as non-tax revenue such as interest income, dividends and profits, income received from economic and social services, income received from financial services, grants received from the centre, etc. Capital income includes income received for more than one year such as internal debt, loans received from the Centre, recovery of loans and advances, interstate settlements, State Provident Fund, Reserve Fund, deposits etc. In this study, we considered total revenue expense, total capital expense, total expense, revenue receipt, capital receipt and total receipt.

Econometrics Theories About Relation Between Income and Expenditure

Many economists have analysed the relationship between public expenditure and economic growth, of which two theories are very famous, one is Wagner's theory and the other is Keynes's theory. In 1893, Adolf Wagner proposed the theory of increasing public expenditure, which is known as Wagner's Hypothesis or Wagner's law. Wagner says in this theory that economic growth affects public expenditure, that is, the increase in public expenditure is the result of the increase in economic growth (Demirbas, 1999, Oxley, 1994, Ankitoboy et al. 2006, Abdullah, Maamar, 2010, Bagdigen, Centintas, 2013). In his theory, he has considered public expenditure as an endogenous factor and economic growth as an exogenous factor. Wagner explains his

theory on the basis of three reasons. First, due to increased economic growth, industrialization and modernization increase, due to which the role of the private sector increases and the role of the public sector decreases, so the government has to spend more to regulate the private sector. The second reason is that due to increase in income, the demand for infrastructure facilities like education and health increases and the government has to spend to provide these facilities and the third reason is that to remove monopolies in any sector of the country, the government has to invest in the sector and increase the efficiency of others in that sector.

The Keynesian in his theory states that the increase in economic growth is the result of public expenditure (Govindraju et al. 2010). Here, Keynes considers public expenditure as an exogenous factor and economic growth as an endogenous factor. In the Keynesian theory, the causality goes from public expenditure to production.

Review Literature

Dhaval Soni et al (2019) refers to a causal relation between health expenditure and educational expenditure with economic growth with the reference of Gujarat state. The time series data for the period of 1980-81 to 2016-17 regarding state gross domestic product, health expenditure and educational expenditure were used in the econometrics analysis. The result of vector error correction model revealed Existence of unidirectional shot run causality running from State gross domestic product to educational expenditure and health expenditure. At last, the researchers suggested that government should make strong economic policy to effect on health and education at disaggregated level.

Kirandeep Kaur (2018) refers to link between government expenditure and SGDP using time series data of Rajasthan spanning from 1970 to 2014. The log value of selected variables namely revenue expenditure, capital expenditure, government expenditure, SGDP, per capita revenue expenditure, per capita capital expenditure, per capita government expenditure and per capita SGDP were used in the econometrics analysis. The outcome indicated No short run causality existed in all six model but unidirectional long run causality running from SGDP to revenue expenditure in total as well as in per capita term and bi- directional long run causality existed between per capita total government expenditure and per capita SGDP. At last, the researchers suggested that government should increase expenditure with increasing population for the development of society which can increase the level of economic growth. Moreover, government should focus on capital expenditure during making fiscal policy.

Deepak Kumar Behera et al (2017) evaluated the performance of Government held expenditure and examined long run effect of economic growth on health expenditure for the period of 34 years starting from 1980. The result revealed that Gross domestic product and health expenditure of state was increasing during study period, and health was not luxury good. The researcher also concluded that high inequalities in the relative measures of public expenditure in term of gross domestic product in the states so the researchers suggested that government should allocated more budget to healthcare facility and find another source for increasing revenue.

Geetilaxmi Mohapatra et al (2016) investigated causality between various component of public expenditure and GDP of India using time series data of 33 years starting from 1980. The result indicated that GDP was cointegrated with fiscal deficit, development expenditure and gross private investment in a long run and Unidirectional Causality running from development expenditure and fiscal deficit to gross domestic product of India in short run as well as long run. At last, the researchers suggested that government should control on non-development expenditure and focus on development head for the stability of country.

Seema Narayan et al (2012) examined the existence of Wagner's law in 15 states of India which Divided in 9 group based on geographical level and economic development level using panel unit root, panel co integration and panel granger causality test. The researcher found that all group were heterogeneous in term of income and expenditure. The real GDP was significant and positively effect on real expenditure in low income and eastern region states and overall. At last, the researcher found Wagner's law in terms of consumption expenditure.

Mostafizur Rahman (2010) examined the casual relation of GDP with health expenditure and education expenditure using time series data of 29 years spanning from 1990 with reference to Bangladesh. The researcher used log value of selected variable in the unit root test if data are not stationary then co integration was checked and last direction of causality was checked. The outcome shows that the variable was not stationary but co integrated and bidirectional causality found between educational expenditure and GDP but unidirectional causality was found running from health expenditure to GDP.

Objectives

The main objective of study to know direction of the causality between various expenditure and income.

Hypotheses

1) H_0 = The head of Expenditure does not Granger cause to the head of income

H_1 = The head of Expenditure Granger cause to the head of income

2) H_0 = The head of income does not Granger cause to the head of Expenditure

H_1 = The head of income Granger cause to the head of Expenditure

Research Methodology

The secondary data of total revenue expenditure. total capital expenditure, total expenditure, total revenue receipt, total capital receipt and total receipt for the period of 2000-01 to 2022-23 was considered in the study. This data is collected from website of Reserve Bank of India. The nominal value of selected variable converted into real value using GDP deflator and converted into natural logarithm. The stationarity of the variable was checked by using Augmented Dicky-Fuller test and nonparametric test Phillips-Perron (PP) Test. The leg length was decided by using Akaike information criterion (AIC). The bound test was used for the co integration. The vector error correction model was used to check short run and long run causality if variables are Co-integrated. The Toda-Yamamoto Approach was used if variable was not stationary and no cointegrated.

The present study estimated 8 models regarding relation between income and expenditure as follow:

Model No	Function
1	NLOG_TRE = f(NLOG_TRR)
2	NLOG_TCE = f(NLOG_TCR)
3	NLOG_TE = f(NLOG_TR)
4	NLOG_PCTRE = f(NLOG_PCTRR)
5	NLOG_PCTCE = f(NLOG_PCTCR)
6	NLOG_PCTE = f(NLOG_PCTR)
7	NLOG_STRE_IN_TE = f(NLOG_STRR_IN_TR)
8	NLOG_STCE_IN_TE = f(NLOG_STCR_IN_TR)

Description of variable

Short Form	Meaning
NLOG	Natural Logarithm

TRE	Total Revenue Expenditure
TRR	Total Revenue Receipts
TCE	Total Capital Expenditure
TCR	Total Capital receipts
TE	Total Expenditure
TR	Total Revenue
PCTRE	Per Capita Total Revenue Expenditure
PCTRR	Per Capita Total Revenue receipts
PCTCE	Per Capita Total Capital Expenditure
PCTCR	Per Capita Total Capital receipts
PCTE	Per Capita Total Expenditure
PCTR	Per Capita Total Revenue
STRE_IN_TE	Share of Total Revenue Expenditure in Total Expenditure
STRR_IN_TR	Share of Total Revenue receipts in Total receipts
STCE_IN_TE	Share of Total Capital Expenditure in Total Expenditure
STCR_IN_TR	Share of Total Capital receipts in Total receipts

Uses of the study for society or country or Government

This study can play an important role in formulating the fiscal policy and monitoring policy of the Government of Rajasthan. If the financial system of Rajasthan follows the Wagner Law, then the Rajasthan Government will reduce the rates of various taxes or stop some taxes so that the income of the people increases and they can spend more. In the monitoring policy, loans will be provided at low interest rates. In the fiscal policy, the financial fund of the people will increase by purchasing depositories and so that their purchasing power will increase. But if the financial system of Rajasthan follows the Keynesian's theory, then in the fiscal policy, it will also create funds by selling depositories and imposing heavy taxes and use these funds in economic and social activities to increase spending so that the income of the people increases and the country develops. The society also gets its benefits from spending in major economic and social activities.

Findings

Table 1 Shows the descriptive statistics of selected variables' natural logarithm. the mean and median of absolute the value of lie between 15 to 17 which are near to their minimum and

maximum value. Moreover, their standard deviation is near to one. The mean and median of relative value in the form of per capita lie between 8 to 10 which was same as their minimum and maximum value and Standard deviation is near to1. The mean and median of relative value in the form of share 2 to 4. All the relative and absolute measure follow the normal distribution except absolute and relative measure of total revenue expenditure and total revenue receipt.

Table 1: Descriptive Statistics									
Variables	**Mean**	**Median**	**Max.**	**Min.**	**Std. Dev.**	**Skewness**	**Kurtosis**	**Jarque-Bera**	**Probability**
TRE	15.6685	15.4955	16.3813	15.0622	0.4745	0.2719	1.5168	2.3916	0.3025
TRR	15.5647	15.5562	16.2328	14.8453	0.4638	-0.1323	1.7044	1.6756	0.4327
TCE	16.4469	16.9147	17.2216	13.2515	1.1915	-2.0633	5.5491	22.5459	0.0000*
TCR	16.5714	16.9596	17.2390	14.0509	0.9554	-1.9712	5.3081	20.0007	0.0000*
TE	16.9310	17.1917	17.4772	15.2137	0.7003	-1.6791	4.4897	12.9342	0.0016*
TR	16.9317	17.1943	17.4782	15.2350	0.6985	-1.6772	4.4870	12.9025	0.0016*
PCTRE	9.1427	8.9856	9.6884	8.7291	0.3655	0.3615	1.4872	2.6940	0.2600
PCTRR	9.0389	9.0177	9.5508	8.4813	0.3517	-0.1172	1.7020	1.6671	0.4345
PCTCE	9.9212	10.3199	10.6257	6.9256	1.1129	-2.1107	5.6804	23.9632	0.0000*
PCTCR	10.0456	10.3662	10.6432	7.7250	0.8728	-2.0564	5.5425	22.4056	0.0000*
PCTE	10.4052	10.6658	10.8814	8.8877	0.6089	-1.8503	4.9260	16.6793	0.0002*
PCTR	10.4060	10.6659	10.8824	8.9073	0.6071	-1.8492	4.9268	16.6654	0.0002*
STRE_IN_TE	3.3427	3.2226	4.4537	2.8147	0.4867	1.2587	3.6644	6.4964	0.0388**
STRR_IN_TR	3.2381	3.1636	4.2399	2.7386	0.4077	1.4527	4.2465	9.5784	0.0083*
STCE_IN_TE	4.1212	4.3163	4.4226	2.6430	0.5248	-2.1513	5.9262	25.9466	0.0000*
STCR_IN_TR	4.2448	4.3353	4.4372	3.4211	0.2821	-2.1642	6.1258	27.3175	0.0000*
* Significant at 1% ** Significant at 5% *** Significant at 10%									
Source: Author's Computation.									

Table 2 shows the outcome of the Augmented Dicky-Fuller test. Most of absolute and relative measures of variable are non-stationary at level set share of total revenue receipt total capital receipt in total receipt. These two are stationary at I (0). The remaining variables are stationary at I(1) in constant and in both constant and trend. The unit root test is applied to check stationary of the variable avoid superiority of model. As a robustness check of ADF test and to avoid heteroskedasticity problem, the Nonparametric test Phillips-Perron (PP) test was applied.

Table 2: Augmented Dicky-Fuller test for Unit Root					
Variable	**Level**		**1st difference**		**Order of**
	C	**C & T**	**C**	**C & T**	**Integration**
NLOG_TRE	0.9567	0.4783	0.01*	0.0416**	I(1)
NLOG_TRR	0.8681	0.1643	0.0001*	0.0067*	I(1)
NLOG_TCE	0.0267**	0.3779	0.0038*	0.06***	I(1)
NLOG_TCR	0.0304**	0.4084	0.0035*	0.0502***	I(1)
NLOG_TE	0.0708***	0.4863	0.0008*	0.0005*	I(1)
NLOG_TR	0.0757***	0.5168	0.0012*	0.0008*	I(1)
NLOG_PCTRE	0.9511	0.4662	0.0113**	0.0436**	I(1)
NLOG_PCTRR	0.8688	0.1776	0.0001*	0.0006*	I(1)
NLOG_PCTCE	0.0276**	0.3765	0.0037*	0.0028*	I(1)
NLOG_PCTCR	0.031**	0.4059	0.0034*	0.0501***	I(1)
NLOG_PCTE	0.0654***	0.4791	0.0008*	0.0006*	I(1)
NLOG_PCTR	0.0709***	0.5095	0.0011*	0.0008*	I(1)
NLOG_STRE_IN_TE	0.1201	0.0516***	0.0013*	0.0906***	I(1)
NLOG_STRR_IN_TR	0.0691***	0.0235**	0.0854***	0.0467**	I(0)
NLOG_STCE_IN_TE	0.000*	0.2620	0.0149**	0.0142**	I(1)
NLOG_STCR_IN_TR	0.0089*	0.0033*	0.1410	0.1650	I(0)
* Significant at 1%　　** Significant at 5%　　*** Significant at 10%					
Source: Author's Computation.					

Table 3 shows the result of Phillips-Perron (PP) Test. The variables containing models 2 and 5 are integrated at level in constant and in both constant and trend. Other variables are at first difference which means they are non-stationary at I (0) and stationary at I (1). as per Eagle Granger, error terms are co-integrated if variables are non-stationary at level, then there will be at least one cointegration between the variables in long run. So that we applied ARDL bound test to find co integration in the error term.

Table 3: Phillips-Perron (PP) Test for Unit Root					
Variable	**Level**		**1st difference**		**Order of**
	C	**C & T**	**C**	**C & T**	**Integration**
NLOG_TRE	0.9619	0.5829	0.0102**	0.0419**	I(1)
NLOG_TRR	0.8901	0.1575	0.0000*	0.0000*	I(1)

NLOG_TCE	0.0000*	0.0056*	0.0038*	0.0028*	I(0)
NLOG_TCR	0.0000*	0.0108**	0.0035*	0.0023*	I(0)
NLOG_TE	0.0000*	0.2695	0.0008*	0.0004*	I(1)
NLOG_TR	0.0000*	0.2187	0.0012*	0.0006*	I(1)
NLOG_PCTRE	0.9610	0.5662	0.0116**	0.0441**	I(1)
NLOG_PCTRR	0.9242	0.097***	0.0000*	0.0000*	I(1)
NLOG_PCTCE	0.0000*	0.0059*	0.0037*	0.0028*	I(0)
NLOG_PCTCR	0.0000*	0.0114**	0.0034*	0.0023*	I(0)
NLOG_PCTE	0.0000*	0.2969	0.0008*	0.0005*	I(1)
NLOG_PCTR	0.0000*	0.2309	0.0011*	0.0007*	I(1)
NLOG_STRE_IN_TE	0.1201	0.0951***	0.0047*	0.003*	I(1)
NLOG_STRR_IN_TR	0.0597***	0.0112**	0.0035*	0.0029*	I(0)
NLOG_STCE_IN_TE	0.0018*	0.0002*	0.0149**	0.0142**	I(0)
NLOG_STCR_IN_TR	0.0014*	0.0000*	0.0204**	0.0191**	I(0)
* Significant at 1% ** Significant at 5% *** Significant at 10%					
Source: Author's Computation.					

Table 4 indicate the outcome of the ARDL Bound Test for co-integration. the value of F-statistics is greater than I (1) in all models which means there is co integration in the residual of the variables so we can say that there is at least one long run causal relation between variables in all models.

Table 4: ARDL Bound Test for Co-integration					
Model No	**Optimal Lag Length**	**5 % Significant Level**		**F - Statistics**	**Decision**
		I(0)	I(1)		
1	1	3.62	4.16	5.9614	Co-integrated
3	1	3.62	4.16	34.3472	Co-integrated
4	1	3.62	4.16	6.786	Co-integrated
6	1	3.62	4.16	9.7777	Co-integrated
7	1	3.62	4.16	4.5535	Co-integrated
8	1	3.62	4.16	4.5535	Co-integrated
Source: Authors' Computation.					

Table 5 shows the results of VECM for long run causality. All the models have bi directional long run causality except model 2 and model 5. These both models have unidirectional granger causality running from revenue recipe to revenue expenditure for long run.

Model	Direction of Causality			P Value	Causality
1	NLOG_TRR	ð	NLOG_TRE	0.0107**	Unidirectional
	NLOG_TRE	ð	NLOG_TRR	0.9424	
2	NLOG_TCR	ð	NLOG_TCE	0.0000*	Bidirectional
	NLOG_TCE	ð	NLOG_TCR	0.0000*	
3	NLOG_TR	ð	NLOG_TE	0.0001*	Bidirectional
	NLOG_TE	ð	NLOG_TR	0.0001*	
4	NLOG_PCTRR	ð	NLOG_PCTRE	0.0118**	Unidirectional
	NLOG_PCTRE	ð	NLOG_PCTRR	0.9838	
5	NLOG_PCTCR	ð	NLOG_PCTCE	0.0000*	Bidirectional
	NLOG_PCTCE	ð	NLOG_PCTCR	0.0000*	
6	NLOG_PCTR	ð	NLOG_PCTE	0.0001*	Bidirectional
	NLOG_PCTE	ð	NLOG_PCTR	0.0000*	
7	NLOG_STRR_IN_TR	ð	NLOG_STRE_IN_TE	0.0354**	Bidirectional
	NLOG_STRE_IN_TE	ð	NLOG_STRR_IN_TR	0.0042*	
8	NLOG_STCR_IN_TR	ð	NLOG_STCE_IN_TE	0.0045*	Bidirectional
	NLOG_STCE_IN_TE	ð	NLOG_STCR_IN_TR	0.0009*	

Table 5: Results of VECM for Long Run Causality

* Significant at 1%　　** Significant at 5%　　*** Significant at 10%

Source: Author's Computation.

Table 6 indicates the results of VECM short run causality test. there is no short run causality existed in model number 2, 7 and 8. The unidirectional causality running from revenue receipt to revenue expenditure the models 1 & 4. The remaining models follow the bidirectional short run causality running from receipt to expenditure and expenditure to receipt.

Table 6: Results of VECM Short Run Causality Test				
Model	**Direction of Causality**		**P Value**	**Causality**
1	NLOG_TRR ð NLOG_TRE		0.0516***	Unidirectional
	NLOG_TRE ð NLOG_TRR		0.5870	
2	NLOG_TCR ð NLOG_TCE		0.1051	No
	NLOG_TCE ð NLOG_TCR		0.1082	
3	NLOG_TR ð NLOG_TE		0.0000*	Bidirectional
	NLOG_TE ð NLOG_TR		0.0000*	
4	NLOG_PCTRR ð NLOG_PCTRE		0.0496**	Unidirectional
	NLOG_PCTRE ð NLOG_PCTRR		0.6512	
5	NLOG_PCTCR ð NLOG_PCTCE		0.0578***	Bidirectional
	NLOG_PCTCE ð NLOG_PCTCR		0.0576***	
6	NLOG_PCTR ð NLOG_PCTE		0.0000*	Bidirectional
	NLOG_PCTE ð NLOG_PCTR		0.0000*	
7	NLOG_STRR_IN_TR ð NLOG_STRE_IN_TE		0.4220	No
	NLOG_STRE_IN_TE ð NLOG_STRR_IN_TR		0.4213	
8	NLOG_STCR_IN_TR ð NLOG_STCE_IN_TE		0.1391	No
	NLOG_STCE_IN_TE ð NLOG_STCR_IN_TR		0.2050	
* Significant at 1% ** Significant at 5% *** Significant at 10%				
Source: Author's Computation.				

Conclusion

In the study we constructed eight models which consist of absolute and relative pairs of six variables such as total revenue receipt, total capital receipt, total receipt, total revenue expenditure, total capital expenditure and total expenditure. First, we confirmed the stationarity of variable at individual level you think the ADF test and PP test. In the unit root tests, most of variables are non-stationary at level except absolute and relative form of total capital receipt and total capital expenditure but these variables are stationary at first difference. The ARDL bound test applied to those models which consist of non-stationary variables and this test confirmed the existence of cointegration between residual of variables which means at least one long run causality exist between variables. The revenue receipt and revenue expenditure

follow unidirectional causality running from income to expenditure in long run and short run which means this variable follow Wagner's law , so that the government should find another source to create revenue income like increasing tax, fees etc. The capital receipt and capital expenditure as well as total receipt and total expenditure follow the bidirectional long run causality. Moreover, there is no short run causality between absolute form of capital receipt and capital expenditure in the case absolute measures but the bidirectional short run causality existed between relative measures of capital receipt and capital expenditure and relative and absolute measure of total receipt and total expenditure.

Annexure 1: Nominal value of selected variable (In lakh)

YEAR	TRR	TCR	TR	TRE	TCE	TE
2000-01	2869514	1265383	4134896	3478869	568922.1	4047791
2001-02	2800449	1436852	4237301	3675079	701821.4	4376901
2002-03	2814854	1955652	4770505	3661325	973818.2	4635143
2003-04	3388102	13099077	16487179	4140336	12359970	16500306
2004-05	3345878	12583401	15929279	3749447	12203359	15952806
2005-06	3760960	16679694	20440654	3880077	16523448	20403525
2006-07	4289084	16388265	20677349	4182094	16449648	20631742
2007-08	4761950	19785427	24547377	4506225	20183684	24689909
2008-09	4764728	24570654	29335382	4882434	24375411	29257845
2009-10	4669683	25525218	30194901	5296160	24925981	30222140
2010-11	5447983	22566435	28014419	5322858	22626680	27949537
2011-12	5701076	20635535	26336611	5365331	20965101	26330432
2012-13	6162738	26092446	32255184	5844878	26417511	32262389
2013-14	6571271	21072292	27643563	6662972	20976259	27639231
2014-15	7736287	23198401	30934688	8008634	22923944	30932578
2015-16	8289955	30676588	38966543	8782146	30146536	38928681
2016-17	8554019	27606859	36160877	9975227	26224208	36199435
2017-18	9603442	28377886	37981328	11001583	26979233	37980815
2018-19	9729986	27284161	37014147	11769531	25250357	37019889
2019-20	9503833	24357385	33861218	11970876	21883638	33854514
2020-21	8786368	25052667	33839036	11664931	22179475	33844406
2021-22	11215687	27375758	38591445	12793271	25783087	38576357

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