Revisiting the Sustainability of Kerala State Finances

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Abstract

Using yearly data from 1970 - 71 to 2015 - 16, the paper tried to find out whether fiscal sustainability existed in Kerala or not. It also examined whether structural breaks are present in the fiscal policy. Applying cointegration techniques with breaks and no breaks to the inter-temporal budget constraint model, the paper concluded that sustainability of current fiscal policy of Kerala was weak, which implies a long - run risk of debt default in Kerala State finances.

Keywords: **fiscal sustainability, Kerala, cointegration, structural break**

JEL Classification: C5, E62, H6

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Over the decades, Kerala's unique development experience has been overshadowed by the dismal condition of its fisc. Signs of deterioration of the government finances started appearing as early as the Fifth Five - Year Plan (1974 - 79) itself. Since then, continuous ups and downs are witnessed in the revenues and expenditures of the government, leading to the mounting of public debt. The fluctuating trends in the fiscal indicators constitute a danger to the fiscal sustainability. Fiscal sustainability, as defined by Burnside (2005), is the government's ability to pursue the same fiscal policy throughout without any debt default. It implies the capability of a government to continuously follow the present revenue and expenditure policies without any change while the debt servicing is not affected. It is theoretically and empirically proved that maintenance of fiscal discipline is very important for macroeconomic stability. Otherwise, it leads to inefficient allocation and distribution, inflation, peak interest rates led crowding out effect, and debt default risk. External sector sustainability is affected adversely by expansionary fiscal policy (Kubendran, 2018). Also, the two way linkage between fiscal crisis and development crisis trap the government in a vicious circle (George, 1990). That is, shrinking of public expenditure to tackle fiscal crisis will hamper the development process leading to low returns, which in turn aggravate the fiscal crisis. The pro - cyclical behavior of public expenditure of governments also develops a situation of fiscal profligacy (Mohanty & Mishra, 2017). Further, there are constraints in deficit financing and borrowings of the federating governments (Raju, 2009).

The highlights of Kerala's fiscal problem, as identified from the literature, are as follows. In majority of the years during the past four decades, Kerala has remained as a revenue account deficit and capital account surplus state. This points out at the high non - plan revenue expenditure component in the revenue account and high borrowings and low rate of capital formation in the capital account. Also, the fiscal and primary deficits have always been higher than the average of all States taken together. The social services related expenditure with low financial returns dominates the budget than the economic services related expenditure with high returns. Lower mobilization of tax and non-tax revenue is evident in Kerala due to welfare oriented policies, tax evasion, and

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built-in rigidities in tax collection and administration. From 1980 onwards, there was constant reduction in the availability of central grants due to the middle income status of Kerala with record level of social development and also due to the mismatch between the state's needs and allotted centrally sponsored schemes. Further, the major share of liabilities lies in the high interest rate oriented public account which is not healthy for the state finances. Various Pay Revision Commission recommendations and loss making public undertakings also contributed to the debt burden of the state. The white paper on the status of the state finances brought out by the government in 2001 and 2011 clearly depicted the fiscal crisis in Kerala. The deficits were at their peak point ever during the financial year 2003-04, which led to the passing of the Kerala State Fiscal Responsibility Legislation in 2003 to bring back stability and sustainability. However, the rule - based framework has restricted the fiscal space of the government. Every year, Kerala is struggling to meet the targets set by the Central Government and the Finance Commission for fiscal consolidation. Furthermore, the 13th Finance Commission tagged Kerala as a fiscally stressed state along with Punjab and West Bengal. As shown in Table 1, Kerala, though the debt target is within the limit, has missed out the deficit targets set forth by the 14th Finance Commission. Also, Kerala's fiscal indicators have remained higher than all states' averages for the year 2014-15. Along with these issues, the immediate impact of demonetization, the adoption of Goods and Services Tax (GST), and the 10th Pay Revision Commission recommendations have put additional pressure on the state's finances.

Table 1. Major Fiscal Indicators of Kerala

Indicators	Accounts (2014-15)	All States (2014-15)	Accounts (2015-16)	14th F.C. Targets (2015-16)
Debt/GSDP (%)	25.75	21.7	26.75	31.34
Gross Fiscal Deficit/GSDP (%)	3.54	2.6	3.02	3.00
Revenue Deficit/GSDP (%)	2.62	0.4	1.64	0

Source: Compiled from Kerala Budget (2017) and RBI

Against this backdrop, the paper makes an attempt to revisit the sustainability of Kerala State finances. It examines whether the prevailing policy on government finances is sustainable or not, in the presence of structural breaks, using the inter-temporal budget constraint (IBC) model.

Quite a few empirical works have come upon fiscal sustainability that employed the IBC model (Hakkio & Rush, 1991; Hamilton & Flavin, 1986; Haug, 1991; Trehan & Walsh, 1991; Wilcox, 1989). Later, studies on fiscal sustainability have reckoned structural breaks in fiscal variables (Afonso, 2005 ; Martin, 2000 ; Wu, 1998 ; Quintos, 1995 ; Tanner & Liu, 1994). Fiscal sustainability in India has been studied by many researchers using the IBC model (Buiter & Patel, 1992 ; Goyal, Khundrakpam, & Ray, 2004 ; Jha & Sharma, 2004 ; Olekalns & Cashin, 2000 ; Pradhan, 2014 ; Rajaraman & Mukhopadhyay, 2000 ; Shastri, Giri, & Mohapatra, 2017). Kerala based studies on fiscal sustainability with IBC model are only a very few. Raju (2011) examined the sustainability of the finances of 14 major state governments in India separately using the IBC model and deficit indicators approach. The study applied cointegration technique with structural breaks to an annual data from 1970-71 to 2007-08 and identified sustainability for Kerala state finances only in primary revenue balance. Das (2015) assessed fiscal health of Kerala, Punjab, and West Bengal by analyzing both financial stability and sustainability. Using canonical Domar model and cointegration model with mixed order of stationarity for data ranging from 1980 - 81 to 2012 - 13, the study found partial cointegration or imperfect long run equilibrium for Kerala.

Model, Data, and Methodology

(1) Model : The IBC framework of debt sustainability (Hamilton & Flavin, 1986) is adopted in this paper along with the deficit indicators approach (Raju, 2009). Under the IBC approach, a debt is sustainable when the present

value of expected future surpluses equals the market value of the outstanding debt stock in the current period, assuming no Ponzi financing condition. That is, revenue receipts and expenditures of the government are balanced inter - temporarily to achieve sustainability. Assuming deficits are financed only through bonds, the IBC model is proposed as follows :

The government budget constraint at period *t* is :

$$G_t + (1+i)_t B_{t-1} = R_t + B_t \qquad \text{..... (1)}$$

where, *G* is expenditure of government minus interest payments, *i* is interest rate incurred on past debt, *B* is outstanding debt, and *R* is government revenue receipts. Rearranging the equation :

$$B_t = G_t - R_t + (1+i)_t B_{t-1} \qquad \text{..... (2)}$$

where $G_t - R_t$ is primary deficit. The same constraint is faced by the government for any number of periods. The above equation is normalized by expressing it as a ratio to GSDP, $Y_t = (1+\delta_t)\, Y_{t-1}$, where δ_t is the GSDP (Y_t) growth rate.

$$b_t = g_t - r_t + \lambda_t b_{t-1} \qquad \text{..... (3)}$$

where, $b_t = \frac{B_t}{Y_t}, g_t = \frac{G_t}{Y_t}, r_t = \frac{R_t}{Y_t}, \lambda_t \frac{(1+i_t)}{(1+\delta_t)}$

Iterating forward gives:

$$b_t = \Sigma^n_{j=1} \Pi^n_{k=1} (1+i_{t+k})^{-1} (r_{t+j} - g_{t+j}) + \Pi^n_{k=1} (1+i_{t+k})^{-1} b_{t+n} \qquad \text{..... (4)}$$

For a sustainable debt, the present value of the outstanding debt calculated for $t+n$ periods would become zero as *n* approaches infinity in the limit. That is, the transversality condition should be satisfied. Thus, as $\lim_{n\to\alpha} \Pi^n_{k=1} (1 + i_{t+k})^{-1} b_{t+n} = 0$,

$$b_t = \Sigma^n_{j=1} \Pi^n_{k=1} (1+i_{t+k})^{-1} (r_{t+j} - g_{t+j}) \qquad \text{..... (5)}$$

Equation (5) indicates debt sustainability as described by the IBC model. Here, the present value of anticipated future surpluses is same as the current value of the outstanding debt and the government is solvent or the debt is finally paid off. Equation (5) also implies the necessity of a long run comovement of revenues and expenditures for maintaining sustainability.

Hakkio and Rush (1991) provided an alternative representation of the IBC model, which has got econometric implications and hence is empirically testable. A cointegrating regression best explains the inter-temporal comovement between revenue receipts and expenditures.

$$R_t = \alpha + \beta G_t + u_t \qquad \text{..... (6)}$$

where, *R* is revenue receipts of the government, *G* is expenditures of the government including interest payments, α and β are cointegrating parameters, and *u* is error term.

Assuming interest rate as a stationary series, if *R* and *G* are first difference stationary and *u* is stationary at level, then the deficit is said to be sustainable. In order to have sustainability between non-stationary *R* and *G* variables, they must satisfy the necessary condition of cointegration between them.

Quintos (1995) pointed out that the value of the estimated cointegrating parameter β shows the magnitude of

sustainability which is a necessary and sufficient condition of the IBC model. $\beta = 1$ indicates strong sustainability and $\beta = 0$ indicates no sustainability. Meanwhile, $0 < \beta < 1$ indicates weak sustainability. In case of $\beta < 1$, the tendency of the governments to default is very high and also the government expenditures increase at a higher pace than the increase in revenues.

The paper gives equal stress to primary deficit, revenue deficit, and primary revenue balance rather than examining the gross fiscal deficit alone. Primary deficit shows the true nature of debt burden of the economy whereas the revenue deficit shows the debt burden due to recurring expenditures of states. Primary revenue balance, on the other hand, shows the debt burden that arises solely out of social responsibilities. Hence, studying sustainability of state finances using various types of deficits is important. The composition of each deficit indicator employed in the analysis is:

- *Gross Fiscal Deficit (GFD) = Total Expenditure (TEXP) – Revenue Receipts (RREC)*
- *Primary Deficit (PD) = Total Expenditure less of Interest Payments (TEXP_IP) – Revenue Receipts (RREC) = Gross Fiscal Deficit (GFD) – Interest Payments (IP)*
- *Revenue Deficit (RD) = Revenue Expenditure (REXP) – Revenue Receipts (RREC)*
- *Primary Revenue Balance (PRB) = Revenue Expenditure less of Interest Payments (REXP_IP) – Revenue Receipts (RREC) = Revenue Deficit (RD) – Interest Payments (IP)*

The revenue - expenditure pairs that comprise a deficit are used in the cointegration or sustainability model of that deficit.

(2) Data : An annual time series data spanning a period from 1970-71 to 2015-16 is used to assess the fiscal sustainability status of Kerala State Government finances. Data were obtained from various issues of *Economic Review* and *Budget* brought out by the Government of Kerala and *Handbook of Statistics on State Government Finances* and *Database on Indian Economy* brought out by the Reserve Bank of India. All fiscal variables used in the analysis were considered in nominal terms and as a ratio to gross state domestic product at factor cost (current prices). The Table 2 presents the summary statistics of the data under consideration.

Table 2. Descriptive Statistics

Variable	Total Expenditure	Total Expenditure less of Interest Payments	Revenue Expenditure	Revenue Expenditure less of Interest Payments	Revenue Receipts
Mean	0.1248973	0.1099235	0.1058066	0.0908328	0.0934405
Median	0.1337468	0.1166267	0.1132235	.0959243	0.0973917
Maximum	0.1623353	0.1410578	0.1363995	.1178262	0.1173353
Minimum	0.067349	0.0617405	0.0589272	.0533187	0.0542469
Std. Dev.	0.0257448	0.0209257	0.0226341	.0169545	0.0147771
Skewness	-0.9865542	-0.9430431	-0.6913574	-.7146485	-1.209773
Kurtosis	2.698191	2.821683	2.224931	2.60884	3.72725
Jarque-Bera	7.636470	6.879142	4.815877	4.208801	12.23426
Probability	0.021967	0.032078	0.090001	0.121919	0.002205
Sum	5.745276	5.056483	4.867102	4.178309	4.298262
Sum Sq. Dev.	0.029826	0.019705	0.023054	0.012935	0.009826
Observations	46	46	46	46	46

Note. All the variables are taken as a ratio to GSDP; the data covers a period from 1970 - 71 to 2015 - 16.

(3) Methodology : As fiscal sustainability requires the condition that revenues and expenditures should not diverge from each other intertemporarily, cointegration techniques are applied to assess sustainability empirically. If two variables are non - stationary at level but *I* (1) and a linear relationship between them or the error term is stationary or *I*(0), then both the variables are cointegrated. Since the difference of variables or error is stationary, they move together in the long - run. Several studies on fiscal sustainability have used cointegration techniques without structural breaks, but as public finance data are often characterized by changes in fiscal regimes, it is better to employ cointegration techniques with structural breaks. Structural breaks in time series results in biased estimation. The paper uses both the techniques for a validity check of the results. Further, the degree of sustainability is assessed from the long run coefficients of the cointegrated system.

(i) Cointegration Technique Without Breaks : Augmented Dickey - Fuller (ADF) test is used prior to the cointegration technique in order to check whether a variable is stationary or not. The Dickey - Fuller (1979) test was extended to form ADF test by including lagged first difference terms to rectify the autocorrelation problem. The null hypothesis of the ADF test is : series has a unit root and the alternative is : series is stationary. Johansen's (1991, 1995) cointegration method based on vector autoregressive (VAR) approach was employed for analyzing cointegration without structural breaks between revenue and expenditure variables. For trace test, the null hypothesis : there are *r* cointegrating vectors is tested against the alternative: there are $r + 1$ cointegrating vectors. For maximum Eigen value test, the alternative is : there are more than *r* cointegrating vectors.

(ii) Cointegration Technique with Breaks : Gregory and Hansen (GH) (1996) cointegration test is applied to show the effect of structural breaks or regime shifts. As pre - test to GH test, Zivot and Andrews (ZA) (1992) structural break stationarity test is used. The ZA test determines a single break endogenously from the data. The null hypothesis is: unit root with no structural break and the alternative is: stationarity with one unknown time break. The GH test examines cointegration with one endogenous break under the null hypothesis : no cointegration and the alternative: cointegration with a single structural break.

(iii) Dynamic Ordinary Least Squares (DOLS) Method : The β coefficient in equation (6) measures the degree of sustainability. The cointegrated models are further subjected to DOLS (Stock & Watson, 1993) method to determine the long-run coefficients of cointegrated models. The method is more suited for cointegration involving deterministic components as it incorporates dummy variables for structural breaks on intercept and slope. The null hypotheses, $\delta_1 = 0$ and $\delta_2 = 0$ test the statistical significance of the dummy variables, denoting the structural stability. The estimated β is tested for the restriction of the null hypothesis of $\beta = 1$ (strong sustainability) as against the alternative of $0 < \beta < 1$ (weak sustainability) using the Wald test, which follows chi - square distribution with one degree of freedom.

Empirical Analysis and Results

(1) A Brief Fiscal Profile : At the outset, a preliminary trend analysis using linear graphs and annual growth rates was carried out in order to get an overview of the relevant deficit, revenue, and expenditure variables in Kerala. The Figure 1 depicts the trends in the major deficit indicators - gross fiscal deficit, primary deficit, revenue deficit, and primary revenue balance of Kerala. During the first decade of the reference period, fiscal, primary, and revenue deficits were in reasonable limits and primary and revenue deficits even turned out to surplus in some years. From 1980 onwards, state finances deteriorated with fiscal, primary, revenue, and capital deficits and in 1986, the Fourth Central Pay Commission recommendations were implemented, followed by a prolonging of overdraft with the RBI in 1987, thus becoming one of the biggest budgetary crises. At the same time, primary

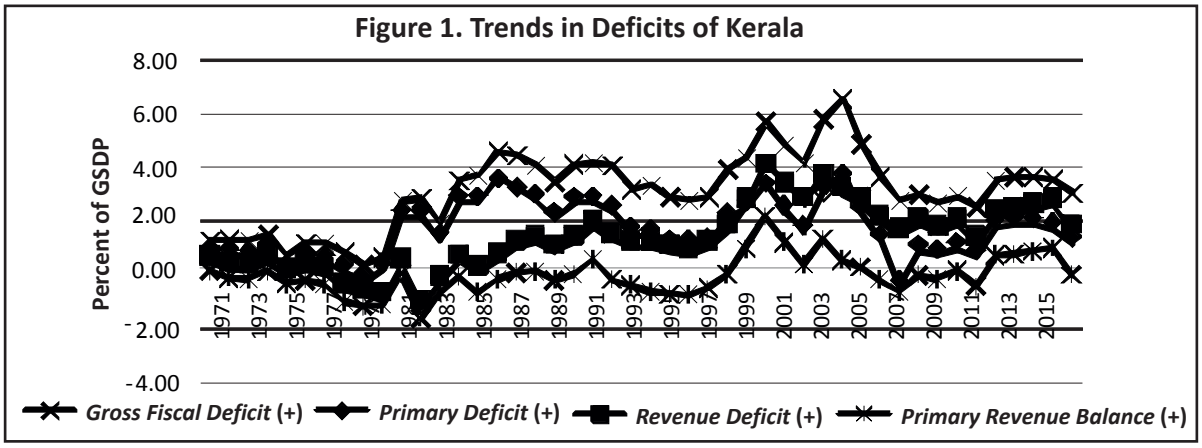
Figure 1. Trends in Deficits of Kerala
8.00
6.00
4.00
2.00
0.00
-2.00
-4.00
Percent of GSDP
1971
1973
1975
1977
1979
1981
1983
1985
1987
1989
1991
1993
1995
1997
1999
2001
2003
2005
2007
2009
2011
2013
2015
Gross Fiscal Deficit (+)
Primary Deficit (+)
Revenue Deficit (+)
Primary Revenue Balance (+)

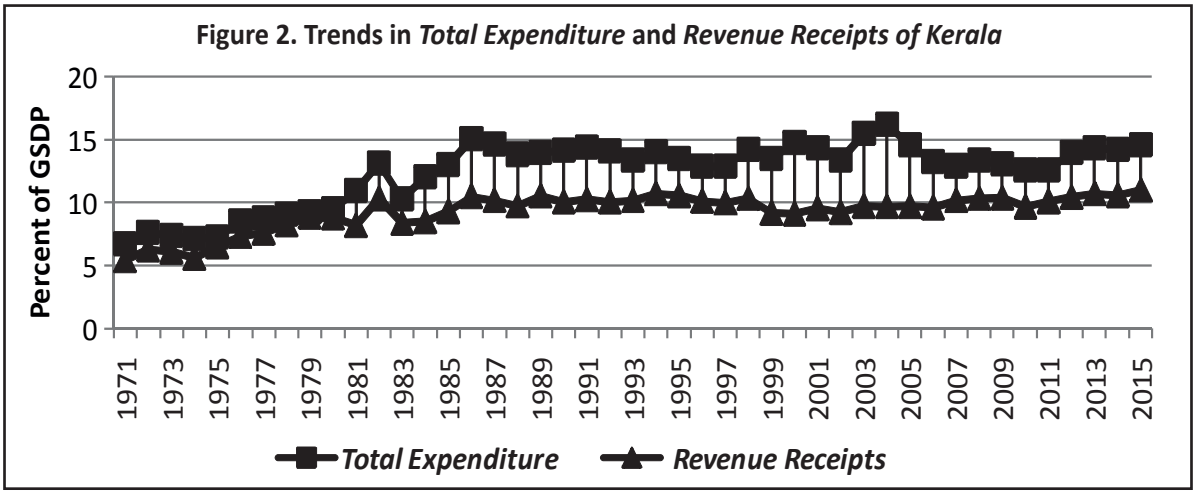
Figure 2. Trends in Total Expenditure and Revenue Receipts of Kerala
20
15
10
5
0
Percent of GSDP
1971
1973
1975
1977
1979
1981
1983
1985
1987
1989
1991
1993
1995
1997
1999
2001
2003
2005
2007
2009
2011
2013
2015
Total Expenditure
Revenue Receipts

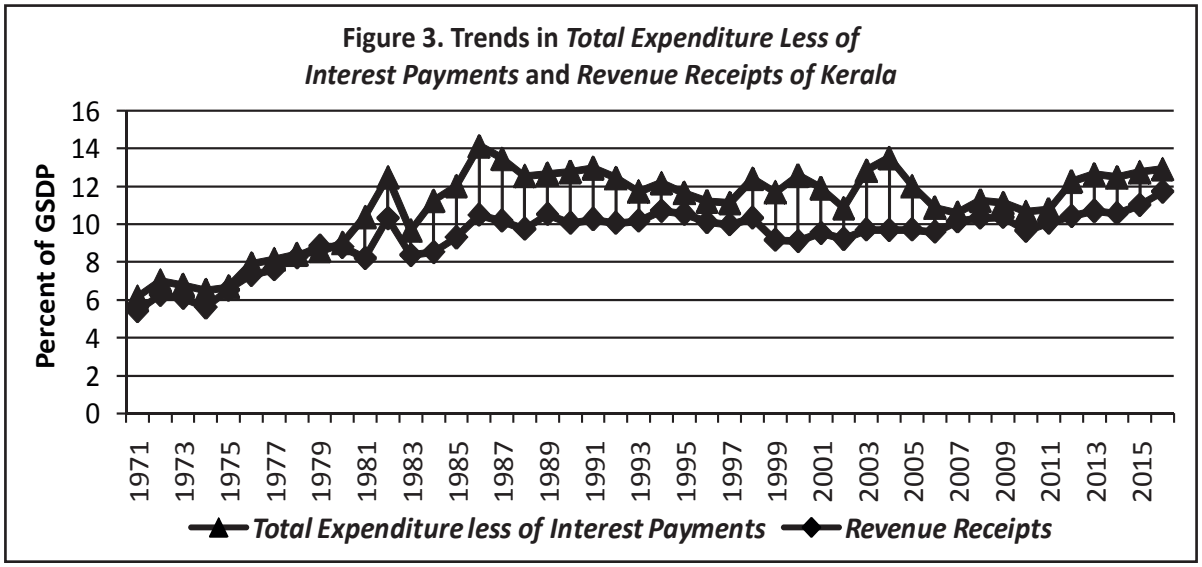
Figure 3. Trends in Total Expenditure Less of Interest Payments and Revenue Receipts of Kerala
16
14
12
10
8
6
4
2
0
Percent of GSDP
1971
1973
1975
1977
1979
1981
1983
1985
1987
1989
1991
1993
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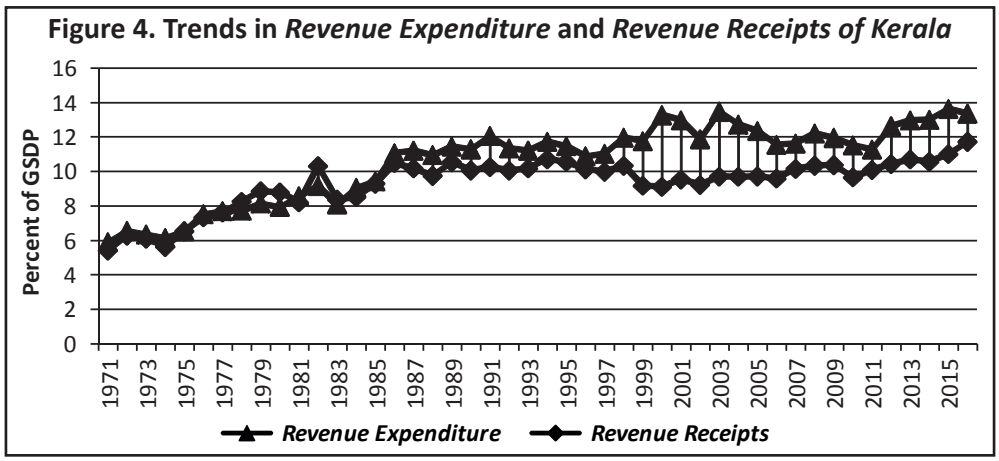
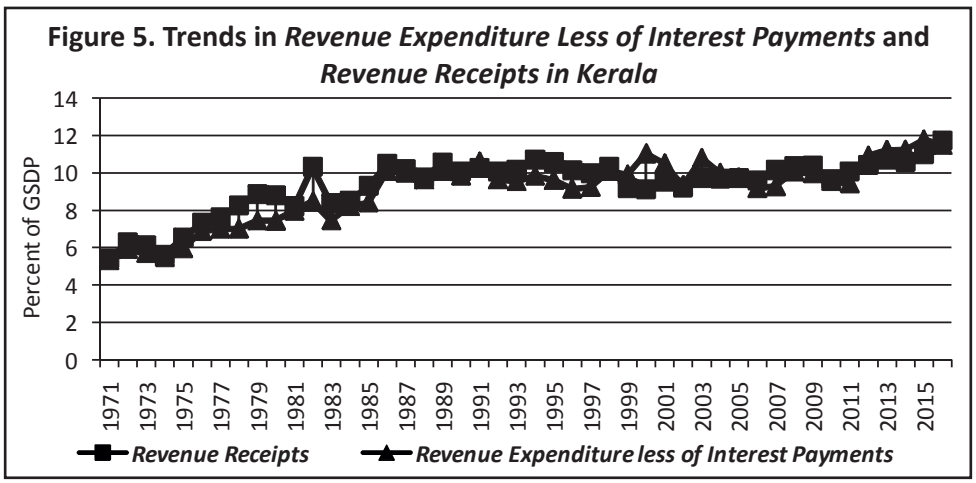
1999
2001
2003
2005
2007
2009
2011
2013
2015
Total Expenditure less of Interest Payments
Revenue Receipts





revenue balance remained a surplus throughout the first two decades. Deficits reached their peak in 1991, the period of India's balance of payments crisis and implementation of the Fifth pay commission awards, with primary revenue balance also showing a deficit. There was improvement in the situation with the New Economic Policy of 1991, but 1997 onwards, a sharp increase in deficits was witnessed with highest points of fiscal deficit in 2000 and 2004. The period also marked a sharp increase in revenue expenditures excluding interest payments as shown by deficit in primary revenue balance. This worsened the fiscal health of the state, which had started to show signs of improvement after the enactment of Fiscal Responsibility Legislation in 2003 and even reached a primary and primary revenue balance surplus in 2006-07, but only to deteriorate again in 2008 following the global financial crisis. With the aid of rule based FRBM framework, the state is trying hard to keep a secular trend in its finances.

The Figures 2, 3, 4, and 5 exhibit respectively the time - series plots of the revenue - expenditure pairs that constitute gross fiscal deficit, primary deficit, revenue deficit, and primary revenue balance. All the four plots show a synchronized behavior of revenues and expenditures, implying a comovement between them. Revenues and expenditures do not appear to diverge much from each other and hence a cointegrating relationship between them can be expected from this preliminary observation.

Further, the annual growth rates of the variables under study as presented in the Appendix Table A1 clearly show that the growth rates of revenue receipts could not keep pace with the highly fluctuating growth rates of expenditures in most of the years.

(2) Results of Analysis : The results of ADF unit root test are reported in the Table 3. The results exhibit that all variables are level non - stationary, but first difference stationary. Hence, it is possible to move onto cointegration regression.

The results of Johansen's cointegration test presented in the Table 4 reject the presence of any cointegrating relationship between revenues and expenditures for all the deficits. Thus, the cointegration test without breaks indicates the existence of an unsustainable fiscal policy in Kerala.

The results of Zivot and Andrews unit root test, as shown in Table 5, find that all variables are stationary at first difference, allowing for a structural break in intercept and both intercept and trend.

The Gregory - Hansen cointegration test in Table 6 reports the presence of cointegration for all deficits allowing for a break in level shift with trend model. Primary revenue balance is found to have cointegration allowing for a break in the level shift model also. The results, therefore, support deficit sustainability for Kerala. The modified ADF and Z_t statistics in the trend shift model are significant at the 5% level for primary deficit and primary

Table 3. Unit Root Test - ADF Test

Variable	At Level				At First Difference			
	Without trend		With trend		Without trend		With trend	
	t - statistic	Lag	*t* - statistic	Lag	*t* - statistic	Lag	*t*-statistic	Lag
Total Expenditure	-2.213	0	-2.280	0	-7.584***	0	-7.615***	0
Total Expenditure less of Interest Payments	-2.398	0	-2.416	0	-7.545***	0	-7.539***	0
Revenue Expenditure	-1.754	0	-2.459	0	-8.353***	0	-8.340***	0
Revenue Expenditure less of Interest Payments	-1.927	0	-2.784	0	-8.490***	0	-8.427***	0
Revenue Receipts	-2.401	0	-2.940	0	-9.007***	0	-8.951***	0
Critical Values	-2.944		-3.520		-2.947		-3.524	

Note. *** indicates significance at 1% level ; critical values mentioned above are at the 5 % level of significance; lag length is chosen using SBIC criterion.

Table 4. Johansen's Cointegration Test

Equation	Eigen value		Trace	
	H_0: r = 0 against H_1: r = 1	H_0: r = 1 against H_1: r = 2	H_0: r = 0 against H_1: r = 1	H_0: r =1 against H_1: r = 2
Gross Fiscal Deficit				
Revenue Receipts = f (Total Expenditure)	6.9726	4.7996	11.7722	4.7996
Primary Deficit				
Revenue Receipts = f (Total Expenditure less of Interest Payments)	7.1581	5.7452	12.9033	5.7452
Revenue Deficit				
Revenue Receipts = f (Revenue Expenditure)	8.7335	3.0194	11.7529	3.0194
Primary Revenue Balance				
Revenue Receipts = f (Revenue Expenditure less of Interest Payments)	12.2973	3.9537	15.2509	3.9537
Critical Values at 5 %	14.07	3.76	15.41	3.76

Note. ** denote rejection of the null of no cointegration at 5 % level of significance; lag order selection criterion is provided in Appendix Tables A2, A3, A4, and A5.

Table 5. Unit Root Test for Structural Breaks : Zivot - Andrews Test

Variable	Intercept		Intercept & Trend	
	t - statistic	Lag	*t* - statistic	Lag
	At Level			
Total Expenditure	-4.127 [1981]	0	-4.808 [1984]	0
Total Expenditure less of Interest payments	-4.089 [1981]	0	-4.547 [1984]	0
Revenue Expenditure	-4.158 [2004]	0	-4.941 [1986]	0
Revenue Expenditure less of Interest Payments	-3.836 [2001]	0	-4.414 [1992]	0
Revenue Receipts	-3.389 [1997]	2	-2.421 [1982]	2
	At First Difference			
Total Expenditure	-6.327*** [1988]	2	-6.388*** [1988]	2
Total Expenditure less of Interest payments	-7.333*** [1988]	2	-7.272*** [1988]	2
Revenue Expenditure	-8.614*** [1992]	0	-8.672*** [1988]	0
Revenue Expenditure less of Interest Payments	-8.906*** [1988]	0	-8.859*** [1988]	0
Revenue Receipts	-7.516*** [1983]	1	-7.786*** [1996]	1
Critical Values	-4.80		-5.08	

Note. *** indicates significance at 1% level; critical values mentioned above are at the 5 % level of significance; lag length is chosen using SBIC criterion; break points are given in square brackets

Table 6. Cointegration Test for Structural Breaks : Gregory - Hansen Test

Equation	*Gross Fiscal Deficit*	*Primary Deficit*	*Revenue Deficit*	*Primary Revenue Balance*
	Revenue Receipts = f (Total Expenditure)	*Revenue Receipts = f (Total Expenditure less of Interest Payments)*	*Revenue Receipts = f (Revenue Expenditure)*	*Revenue Receipts = f (Revenue Expenditure less of Interest Payments)*
		Level Shift		
ADF*	-3.35 (0)	-3.65 (0)	-3.89(0)	-4.37*(0)
	[2007]	[2005]	[1977]	[1977]
Z_t*	-3.51	-3.94	-3.90	-4.42*
	[2008]	[2007]	[1977]	[1977]
Z_a*	-18.15	-21.71	-24.54	-28.58
	[2008]	[2007]	[1977]	[1977]
		Level Shift with Trend		
ADF*	-4.86*(0)	-5.00 ** (0)	-4.98*(0)	-5.33** (0)
	[1997]	[1997]	[1997]	[1997]
Z_t*	-4.91*	-5.05**	-5.04**	-5.39**
	[1997]	[1997]	[1997]	[1997]
Z_a*	-31.73	-32.78	-32.43	-35.13
	[1997]	[1997]	[1997]	[1997]
		Regime Shift		
ADF*	-3.40 (0)	-3.64 (0)	-3.82 (0)	-4.26 (0)
	[2007]	[2007]	[1980]	[1980]

contd. on next page

Z_t*	-3.50	-3.95	-3.65	-4.31
	[1981]	[2007]	[1980]	[1980]
Z_a*	-19.45	-21.84	-24.10	-28.78
	[1981]	[2007]	[1980]	[1980]

Note. ** and * indicate significance at 5 % and 10 % levels, respectively; ADF*, Z_t*, and Z_a* denote modified residual based tests of cointegration if structural breaks are unknown and the critical values for the test are available in Gregory - Hansen (1996, pp. 109); lags and break points are given in parentheses and square brackets, respectively; lags are selected using SBIC.

Table 7. Dynamic Ordinary Least Squares Approach

Equation	α	β	δ_1	δ_2	$\bar{R}^2$
Gross Fiscal Deficit					
Revenue Receipts = f (Total Expenditure)	0.0386*** (5.6720)	0.4625*** (8.8083)	0.0547** (2.5095)	-0.4251*** (-2.7397)	0.8023
Primary Deficit					
Revenue Receipts= f (Total Expenditure less of Interest Payments)	0.0345*** (4.0838)	0.5479*** (7.5043)	0.0392* (1.6962)	-0.3375* (-1.7266)	0.7739
Revenue Deficit					
Revenue Receipts = f (Revenue Expenditure)	0.0313*** (4.6613)	0.6396*** (9.9984)	0.0786** (2.5548)	-0.7338*** (-2.9287)	0.7767
Primary Revenue Balance					
Revenue Receipts = f(Revenue Expenditure less of Interest Payments)	0.0173** (2.3596)	0.8798*** (11.0052)	0.0597** (2.4734)	-0.6692*** (-2.7806)	0.7872

Note. α, β, δ_1 , and δ_2 denote the intercept, cointegrating vector, coefficient of break dummy variable, and coefficient of slope dummy variable, respectively ; number of leads and lags = 3 (Stock & Watson, 1993) ; break date used for dummy variable is 1997; *t* - statistics are provided in parenthesis; ***, **, and * indicate significance at 1 %, 5 %, and 10 % levels, respectively.

Table 8. Wald Test

Equation	β	Chi - Square (1)
Gross Fiscal Deficit		
Revenue Receipts = f(Total Expenditure)	0.4625	104.7834*** (0.00)
Primary Deficit		
Revenue Receipts = f (Total Expenditure less of Interest Payments)	0.5479	38.3562*** (0.00)
Revenue Deficit		
Revenue Receipts = f (Revenue Expenditure)	0.6396	31.7476*** (0.00)
Primary Revenue Balance		
Revenue Receipts = f(Revenue Expenditure less of Interest Payments)	0.8798	2.2592 (0.13)

Note. Degrees of freedom = 1; *p* values are given in parentheses; ***indicates rejection of null : β = 1 at 1 % level of significance.

revenue balance and significant only at the 10% level for fiscal and revenue deficits. This suggests for reduction in interest payments, as sustainability is more likely to be achieved in expenditures without interest payments. The break date of level shift with trend model corresponds to 1997 for all deficits, indicating that the debt burden

may be due to the Fifth Central Pay Commission recommendations and the loss making public undertakings. There was a sharp increase in the deficits during 1997 - 2003, which points to the relevance of the estimated break date. The modified Z_a test finds no significant model and this may be due to the weak predictive power of the test. The significant results of primary revenue balance in the two models are similar to the findings of Raju (2011), who checked fiscal sustainability of Kerala for a period from 1970-71 to 2007-08. Therefore, it can be inferred that as data points are extended, other deficits also start following a sustainable path.

The Table 7 presents the dynamic OLS method estimates with the break year (1997) as selected by the GH test. The coefficients of dummy variables are identified to be statistically significant and different from zero. This shows that the fiscal expansion of 1997 has caused structural instability. The negative coefficients of the slope dummy variable indicate worsening of the state finances due to the policies undertaken in 1997 and thus leading to a deviation from strong sustainability. The long run cointegrating vector β is positive and significant for all the deficits. But the Wald test statistics in Table 8 show that $0 < \beta < 1$ for all deficits except primary revenue balance. This means that Kerala State finances are only weakly sustainable in majority of the deficit indicators. It implies expenditures grow more than revenues and the deficit is financed through debt, leading to a spur in interest rate and hence, the risk of defaulting is very high. Strong sustainability exists only in primary revenue balance, a deficit measure without capital expenditures and interest payments.

Conclusion

The paper employs the IBC model and deficit indicators approach to identify the presence of fiscal sustainability, allowing for structural breaks, in Kerala. For this purpose, a time - series data of revenue - expenditure pairs that comprise of various deficits, ranging from 1970 -71 to 2015-16 was subjected to cointegration techniques with and without structural breaks. The results of Johansen's cointegration test without breaks reveal that the state finances are unsustainable, while the results of Gregory - Hansen cointegration test with breaks find it sustainable. The cointegration test accounting for breaks yields more valid results and hence the state finances are considered to be sustainable. However, further analysis of the degree of sustainability using the dynamic OLS approach reveals that the requirement of strong sustainability is not satisfied in all the deficit indicators, except one and ,therefore, the state finances are only weakly sustainable.

Research and Policy Implications

Weak sustainability implies a debt default risk as the public expenditures grow faster than the revenues, leading to a high level of debt and high interest rates. This means that the state finances may not face any immediate impact due to the current fiscal policies, but may end up defaulting the debt in the long run, if the policies are not reconsidered. The implementation of destination based Goods and Services Tax and the recent budget (2017-18) proposals like Kerala Infrastructure Investment Fund Board, Integrated Financial Management System, Medium Term Planning and Budgeting Analysis, etc. are all ways forward in this direction. The paper suggests for fiscal prudence rather than fiscal fundamentalism in budgetary policies as the latter may lead to a development crisis.

Limitations of the Study and Scope for Further Research

The study is limited by the fact that it has not employed multiple structural break models and therefore, the effect of the major break year is only considered in the study. A comparative study of Kerala and other fiscally stressed states will be able to provide more insights into the nature of fiscal sustainability.

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APPENDIX

Table A1. Annual Growth Rates of Revenues and Expenditures

Year	*TEXP*	*TEXP_IP*	*REXP*	*REXP_IP*	*RREC*
1971-72	16.17	16.51	13.86	14.01	18.83
1972-73	9.71	9.41	9.57	9.20	10.16
1973-74	16.02	15.51	16.16	15.56	10.29
1974-75	15.51	16.78	21.18	23.32	32.27
1975-76	27.94	28.45	25.22	25.54	22.15
1976-77	9.09	8.88	8.13	7.80	9.78
1977-78	9.98	9.72	6.78	6.18	15.22
1978-79	11.30	11.74	15.21	16.12	17.35
1979-80	16.77	19.54	11.39	14.09	13.30
1980-81	34.04	33.76	25.16	24.24	8.18
1981-82	27.02	27.19	13.02	12.22	32.97
1982-83	-8.29	-9.14	3.71	3.44	-4.82
1983-84	32.73	31.55	26.69	24.65	15.31
1984-85	18.91	17.97	14.82	13.11	20.45
1985-86	25.25	26.95	26.87	29.47	21.87
1986-87	9.80	7.76	14.53	12.14	9.63
1987-88	4.12	2.67	7.61	6.09	5.52
1988-89	11.99	11.68	15.72	15.82	19.61
1989-90	14.60	14.06	11.50	10.41	7.96
1990-91	16.86	16.91	22.93	23.89	17.33
1991-92	18.63	16.05	13.84	10.02	18.68
1992-93	8.94	8.46	13.68	13.90	16.37
1993-94	17.76	16.52	17.42	15.84	18.17
1994-95	15.98	15.46	18.01	17.75	18.97
1995-96	16.16	16.72	15.00	15.45	16.25
1996-97	14.75	14.04	16.51	15.97	13.29
1997-98	23.61	24.74	21.41	22.34	15.83
1998-99	8.08	7.42	11.98	11.89	1.12
1999-00	21.57	19.45	25.34	23.54	10.34
2000-01	1.93	-0.52	2.70	0.06	9.93
2001-02	-0.13	-2.29	-1.82	-4.66	3.72
2002-03	29.20	31.74	26.53	28.75	17.42
2003-04	16.51	17.27	5.01	3.04	11.11
2004-05	2.56	1.35	10.80	11.41	14.26
2005-06	4.14	3.92	7.31	7.89	13.30
2006-07	9.68	9.55	13.03	13.74	18.91
2007-08	17.70	20.88	19.53	23.61	16.06
2008-09	13.37	14.45	13.39	14.60	16.13
2009-10	10.24	9.65	10.30	9.66	6.52
2010-11	13.86	15.03	11.35	12.13	18.70
2011-12	31.21	34.75	32.83	37.19	22.65
2012-13	16.37	16.64	16.17	16.43	16.12
2013-14	11.85	11.45	13.08	12.83	11.42
2014-15	15.85	15.52	18.62	18.68	17.84
2015-16	13.41	13.36	9.68	9.04	19.12

Note. For calculation, variables are taken in absolute terms.

Table A2. VAR Lag Order Selection Criteria

Sample: 1971-2016
Endogenous variables: *RREC TEXP*
Exogenous variables: Constant
Included observations: 42

Lag	LL	LR	FPE	AIC	HQIC	SBIC
0	258.875	NA	1.7e-08	-12.2321	-12.2018	-12.1494
1	303.93	**90.111***	2.4e-09	-14.1872	**-14.0962***	**-13.9389***
2	308.518	9.1757	2.3e-09*	-14.2152*	-14.0635	-13.8014
3	310.891	4.746	2.5e-09	-14.1377	-13.9254	-13.5585
4	313.976	6.1695	2.6e-09	-14.0941	-13.8211	-13.3494

Note. LL: Log likelihood; LR: sequential modified LR test statistic; FPE: Final prediction error; AIC: Akaike information criterion; HQIC : Hannan-Quinn information criterion; SBIC: Schwarz Bayesian information criterion; NA: Not applicable; * indicates lag order selected by the criterion.

Table A3. VAR Lag Order Selection Criteria

Sample: 1971-2016
Endogenous variables: *RREC TEXP_IP*
Exogenous variables: Constant
Included observations: 42

Lag	LL	LR	FPE	AIC	HQIC	SBIC
0	267.424	NA	1.1e-08	-12.6393	-12.6089	-12.5565
1	306.599	**78.349***	2.1e-09	-14.3142	**-14.2232***	**-14.066***
2	310.883	8.5682	2.1e-09*	-14.3278*	-14.1761	-13.914
3	313.464	5.1634	2.2e-09	-14.2602	-14.0479	-13.681
4	316.29	5.651	2.4e-09	-14.2043	-13.9313	-13.4596

Note. LL: Log likelihood; LR: sequential modified LR test statistic; FPE: Final prediction error; AIC: Akaike information criterion; HQIC: Hannan-Quinn information criterion; SBIC: Schwarz Bayesian information criterion; NA: Not applicable; * indicates lag order selected by the criterion.

Table A4. VAR Lag Order Selection Criteria

Sample: 1971-2016
Endogenous variables: *RREC REXP*
Exogenous variables: Constant
Included observations: 42

Lag	LL	LR	FPE	AIC	HQIC	SBIC
0	260.952	NA	1.5e-08	-12.3311	-12.3007	-12.2483
1	316.791	**111.68***	**1.3e-09***	**-14.7996***	**-14.7086***	**-14.5513***
2	320.383	7.1845	1.3e-09	-14.7802	-14.6285	-14.3664
3	322.21	3.6528	1.5e-09	-14.6766	-14.4643	-14.0974
4	326.03	7.6405	1.5e-09	-14.6681	-14.3951	-13.9234

Note. LL: Log likelihood; LR: sequential modified LR test statistic; FPE: Final prediction error; AIC: Akaike information criterion; HQIC: Hannan-Quinn information criterion; SBIC: Schwarz Bayesian information criterion; NA: Not applicable; * indicates lag order selected by the criterion.

Table A5. VAR Lag Order Selection Criteria

Sample: 1971-2016
Endogenous variables: *RREC REXP_IP*
Exogenous variables: Constant
Included observations: 42

Lag	LL	LR	FPE	AIC	HQIC	SBIC
0	279.927	NA	6.1e-09	-13.2346	-13.2043	-13.1519
1	320.659	**81.463***	**1.1e-09***	**-14.9838***	**-14.8928***	**-14.7355***
2	323.25	5.1818	1.1e-09	-14.9167	-14.765	-14.5029
3	325.326	4.1534	1.3e-09	-14.8251	-14.6128	-14.2458
4	328.827	7.0005	1.3e-09	-14.8013	-14.5283	-14.0566

Note. LL: Log likelihood; LR: sequential modified LR test statistic; FPE: Final prediction error; AIC: Akaike information criterion; HQIC: Hannan-Quinn information criterion; SBIC: Schwarz Bayesian information criterion; NA: Not applicable; * indicates lag order selected by the criterion.

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