University of Mumbai

DEPARTMENT OF ECONOMICS

EXAMINING SUSTAINABILITY OF STATE LEVEL DEFICITS IN INDIA

Swati Raju

DEPARTMENT OF ECONOMICS
UNIVERSITY OF MUMBAI
Vidyanagari, Mumbai 400 098.

Documentation Sheet

<div align="center">

Title:
Examining Sustainability of State Level Deficits in India

</div>

Author(s): Swati Raju	*External Participation:* ---------------------------------------
WP. No.: *Date of Issue:*	*Contents:* 27 P, 7T, --- F, R. *No. of Copies:* 100

<div align="center">

Abstract

</div>

Sustainability of government finances suggests that governments can continue with the existing fiscal policies indefinitely and remain solvent. This paper seeks to determine whether the existing fiscal policies followed by the State governments (consolidated) in India are sustainable. Cointegration tests, Gregory-Hansen and Johansen, are employed to analyze whether the major deficit indicators at the State level viz. revenue deficit, primary deficit, gross fiscal gap and the overall gap are sustainable. The paper contends that if revenues and expenditures are both I(0) or if revenues and expenditures are difference stationary and cointegrated the fiscal position of the States' would be sustainable. Alternatively, if revenues and expenditures are difference stationary but not cointegrated then the fiscal position of States' is deemed to be unsustainable. Evidence for the Indian States' (consolidated) using a time series of annual data for 1971-2005 presents a rather worrying picture and finds that the revenue deficit and the gross fiscal gap are not sustainable. Evidence on the primary deficit is mixed while the overall gap was found to be sustainable.

Key Words: Sustainability, Deficits, Cointegration

JEL Code(s): -E6

Examining Sustainability of State Level Deficits in India

I   Introduction

India is a federation with a constitutionally defined division of functions between the Centre and the States. The seventh schedule of the Constitution specifies the legislative, executive, judicial and fiscal domains of the Centre and States through the union, state and concurrent lists. The Centre, though, is powerful in the Indian federation as all residuary powers have been assigned to the Centre and it also enjoys overriding powers as regards items on the concurrent list. With the 73rd and 74th constitutional amendments in 1992, the Indian federation transformed itself into a three-tier structure. The Indian federation also has multiple channels for inter-governmental resource transfer, namely, the Finance Commission, Planning Commission and centrally sponsored schemes from different central ministries. Federal fiscal relations in India have resulted in considerable vertical fiscal imbalance because of the advantages the Centre enjoys in raising resources while considerable expenditure responsibilities are with the States

The perilous fiscal health of State (sub-national and second tier) governments in India in recent years has led to concerns regarding the sustainability of State level government finances. State finances have shown a progressive deterioration since the late 1990s, though revenue deficits emerged at the State level in the later half of the 1980s and have since then been persistent. Several factors can be attributed to worsening State finances, viz. growing revenue expenditure, particularly wages, salaries and pensions arising out of the implementation of the Fifth Pay Commission award which saw salaries and pensions rising by about 60 percent over three years; losses of state public sector enterprises (especially State Electricity Boards) and declining transfers from the central government. Besides, States were competing with each other in *'exemption proliferating tax competition'* resulting in a fall in the level of States' Own Tax revenue relative to GDP. Further, subsidies provided by States are largely implicit and inadequate user charges have contributed to the deterioration in State fiscal health. The widening gap between revenues and expenditures saw States, consequently, resorting to borrowing at high nominal interest rates resulting in rising debt servicing costs which further exacerbated the worsening fiscal imbalance. For instance the weighted average of interest rates on

State government dated securities was in the range of 12-14% over 1995-96 to 1999-2000 and the internal debt of State governments' more than doubled from Rs.35875 crores in 1994-95 to Rs. 77190 crores by 1998-99.

With a view to improve States' finances, several measures were initiated, namely, the creation of a Fiscal Reform Facility (2000-01 to 2004-05) to provide incentives to States to undertake Medium Term Fiscal Reform; the introduction of a debt swap scheme over 2002-03 to 2004-05 and enactment of institutional measures such as adoption of a rule-based fiscal policy through the enactment of Fiscal Responsibility Legislations (23 States have enacted Fiscal Responsibility Legislations till date); setting up of consolidated sinking funds and guarantee redemption funds. The Twelfth Finance Commission has also prescribed a time bound plan for fiscal restructuring of States' finances - elimination of revenue deficits by 2008-09 and a gross fiscal deficit target of 3% of GDP by 2009-10 - offer hope for achieving successful fiscal consolidation. Apart from these measures, States have also focused on revenue augmentation through broadening and rationalizing tax their tax systems, improving the efficiency of their tax administration, simplification of their tax laws and focusing on better compliance. Simultaneously, States are also involved in expenditure containment by trying to reduce administrative expenditure, non-plan revenue expenditure, non-development expenditure and growing pension liabilities. Further, the awards of Twelfth Finance Commission which see larger devolution of resources to States through an increase in shareable central taxes from 29.5% to 30.5%and overall transfers to States in central gross revenue receipts be increased from 37.5% to 38% may help ease the fiscal situation of the States. These various reform measures seem to have had a favourable impact on the fiscal situation as can be observed from the improvement seen on the different deficit parameters since 2004-05 (Reserve Bank of India, 2006; Reserve Bank of India, 2007).

Table 1 Major Deficit Indicators of State Governments

(Percent of GDP)

Year	Revenue Deficit	Primary Deficit	Gross Fiscal Deficit
1990-91 to 1994-95	0.7	1.1	2.8
1995-96 to 1997-98	1.0	0.9	2.8
1998-99 to 2003-04	2.5	1.8	4.3
2004-05	1.17	0.7	3.5
2005-06 (RE)	0.5	0.7	3.2
2006-07 (BE)	0.1	0.3	2.8
Source: Reserve Bank of India, Handbook of Statistics on the Indian Economy 2005-06			

Against this backdrop of State finances, this paper seeks to examine the sustainability of State finances in India. The term sustainability often relates to the concept of solvency, of a government's ability to service its debt without explicitly defaulting on them. In other words, fiscal sustainability analysis *'relates to a government's ability to indefinitely maintain the same set of policies while remaining solvent'*. (Burnside, 2005).

The paper studies the fiscal sustainability of State finances in India by looking at the important deficit indicators each of which provides a different facet of fiscal health viz. Revenue Deficit (RD), Primary or Non-Interest Deficit (PD), Gross Fiscal Gap (GFG) and Overall Gap (OG). The major deficit indicators are defined as follows:

RD = Current Expenditures – Current Receipts   (1)

GFG = (Current Expenditure + Capital Expenditure) – Current Receipts   (2)

Following Karnik (2005), capital expenditure includes the discharge of internal debt and the repayment of loans to the Centre as both are committed expenditures of the States' and hence should be included whilst considering the sustainability of State finances.

PD = GFG – Interest Payments   (3)

     = [(Current Expenditure – Interest Payments) + Capital Expenditure] – [Current Receipts]

OG = Total Expenditure – Total Receipts

     = (Revenue Expenditure + Capital Expenditure) – (Revenue Receipts + Capital Receipts)   (4)

The overall gap looks at the difference between the total receipts of the States, including all avenues from where the States' get resources to finance their expenditure, total receipts are inclusive of States' share in central taxes as well as grants that the States' receive from the Centre (both Finance Commission and other grants) and total expenditures (inclusive of interest payments). Since the Indian federation sees considerable vertical fiscal imbalance, the devolution of resources from the Centre to the States' is an important avenue of resources to the States'. Each of these deficit measures is studied for sustainability in nominal terms, real terms and as ratios of GSDP.

Fiscal policy is constrained by the need to finance the deficit and any deficit could be financed if it were possible for the government to borrow without restraint and finance the interest on debt by additional borrowing – engage in Ponzi financing. However, governments face a limit to borrowing in the form of an inter-temporal budget constraint (or a present value borrowing constraint). If the inter-temporal budget constraint is violated then expenditures must be reduced and/or revenues must be increased at some point in time. Hence, as long as government expenditure and revenue are stationary in first differences and are cointegrated, the fiscal position can be termed sustainable. Cointegration between revenue and expenditure limits the extent to which revenues and expenditures can deviate from each other over time and indicates that there is a mechanism that pushes government finances towards the equilibrium level as defined by the inter-temporal budget constraint. Absence of a cointegrating relationship would hence indicate that the fiscal position is not sustainable.

The paper contributes to the literature on sustainability of State level finances in India by examining sustainability of the different deficit indicators using the Hakkio-Rush (1991) approach and applying unit root and cointegration tests that determine stationarity and cointegration for series that could contain a structural break such as the Zivot-Andrews (ZA) and Gregory-Hansen (GH) tests. Sections II and III of the paper provide the theoretical framework and a brief survey of literature while Section IV contains the empirical results and Section V the conclusions.

II Theoretical Framework

Budgetary deficits when incurred by governments are usually money and/or bond financed. Sustainability of the debt/deficit can be ascertained through the inter-temporal

budget constraint. For simplicity, if we assume away money financing (in other words, assume that deficits are only bond financed, then the budget constraint of the government would be as follows:

$$G_t + (1+ r_t)B_{t-1} = R_t + B_t \qquad (5)$$

where, G_t government expenditures $\qquad$ B_t government debt at the end of period t

r_t rate of interest in period 't' $\qquad$ R_t government revenue

If we follow Wilcox (1989), the accounting identity that describes the accumulation of government debt would be:

$$B_t = (1 + r_{t-1})\, B_{t-1} + (G_t - R_t) \qquad (6)$$

$G_t - R_t$ non-interest (primary deficit) of the government

If q_t is the discount factor from period 't' back to period zero and is known at time 't', then

$$q_t = \Pi_{j=0}^{t-1}(1+r_j)^{-1}, q_0 = 1 \qquad (7)$$

If each variable in (6) is discounted by q_t back to period 0 and multiplying (6) throughout by q_t we obtain:

$$q_t B_t = q_{t-1} B_{t-1} + q_t(G_t - R_t) \qquad (8)$$

Let D_t, now be the discounted value of the debt and DEF_t be the discounted value of the non-interest (primary) deficit, then (8) can be written as:

$$D_t = D_{t-1} + DEF_t \qquad (9)$$

i.e. the change in the discounted value of debt should equal the discounted value of the primary deficit

Iterating (9) 'N' periods forward gives

$$D_{t+N} = D_{t-1} + DEF_t + \sum_{j=1}^{N} DEF_{t+j} \qquad (10)$$

$$D_{t+N} = D_t + \sum_{j=1}^{N} DEF_{t+j} \qquad (11)$$

$$D_t = D_{t+N} - \sum_{j=1}^{N} DEF_{t+j} \qquad (12)$$

If the first term (D_{t+N}) of (12) tends to zero in the limit (equation 13), then the current value of the debt equals the sum of expected future non-interest deficits or surpluses.

$$\lim_{N \to \infty} E_t D_{t+N} = 0 \qquad (13)$$

$$D_t = \sum_{j=1}^{\infty} E_t DEF_{t+j} \qquad (14)$$

Equation (14) is the present value borrowing (or the inter-temporal borrowing) constraint, which holds when the expectation of the discounted debt tends to zero in the limit. Whilst looking at the issue of sustainability of the deficit, we are testing for violations of (13) or (14). According to Hamilton and Flavin (1986), if (13) or (14) were violated in data, they conclude that the borrowing constraint is not satisfied and hence the fiscal position not sustainable. Equation (13) does not allow for Ponzi financing and hence the current debt has to be financed by surpluses in the future. Under the Ponzi scheme, government issues new debt when the old debt retires and still continues to finance deficit though issuance of debt. Therefore if the limit term is not zero in (13) then government indulges in a Ponzi scheme Alternatively, while equations (13) and (14) may exclude a permanent primary deficit, they may not exclude the permanent occurrence of a deficit measure inclusive of interest payments as long as the debt stock grows at a rate that is less than the rate of interest (Olekalns and Cashin, 2000).

III   Brief Review of Literature

Hamilton and Flavin (1986) test whether the present value borrowing constraint holds for the United States over 1960-84 and their framework suggests that the stationarity of discounted debt would indicate towards a sustainable fiscal policy. Hamilton and Flavin find stationarity of the debt process and conclude that the present value borrowing constraint is not violated for the post war years in the United States. Later work in this area, however, found that deficit sustainability was sensitive to the presence of structural breaks in the deficit process. Wilcox (1989) used the Hamilton and Flavin data and examined sustainability in the presence of a structural break and found that for the period

prior to 1974 there is no evidence of the violation of the budget constraint but that stationarity of the deficit process did not hold for the period after 1974 and hence concludes that the recent structure of fiscal policy is not sustainable.

Hakkio and Rush (1991) provide an alternative framework to test for sustainability of the government budget constraint. According to Hakkio and Rush the deficit is sustainable when government revenues and expenditures inclusive of interest payments are each I(1) processes and cointegrated. They estimate the following cointgerating regression between federal government revenue and expenditure for the United States over the period 1950:II to 1988:IV and for two sub-samples :1964:I to 1988:IV and 1976:III to 1988:IV

$$R_t = a + bGG_t + \varepsilon_t \tag{15}$$

Where, R- federal government revenues GG- federal government expenditure inclusive of interest on debt

They seek to determine if $\hat{b} = 1$ in equation (15) and ε_t are stationary i.e. are GG and R cointegrated. When GG and R are non-stationary then cointegration is a necessary condition to satisfy the present value borrowing constraint. However, Hakkio and Rush (p.433) show that when $\hat{b} < 1$ the limit of the undiscounted value of debt equals infinity and as the undiscounted value of debt gets large the incentive to default on part of the government increases especially when revenues and expenditures are expressed relative to real GNP or population. Thus, though $\hat{b} < 1$ is consistent with a strict interpretation of the government's inter-temporal budget constraint, it is inconsistent with the requirement that the debt-GNP ratio must be finite and therefore the government will find it difficult to market its debt. The cointegrating regression above (equation 15) been estimated for three variants of revenue and expenditure, viz. real revenues and real expenditures, real revenues and expenditures relative to GNP and real revenues and expenditures relative to population. The results, however, indicate that while cointegration may be obtained over the entire sample; no cointegration is observed between revenues and expenditures for 1976:III to 1988:IV. Further, even for the entire sample period the estimated $\hat{b}$ (the cointegrating factor) is significantly less than 1. Hence, they concluded that the recent spending and tax policies of the government are not sustainable.

Haug (1991) examines whether the debt and surplus variables are cointegrated using the Engle-Granger procedure for the United States for 1960:I to 1987:IVand regresses surplus (S) on debt (B) :

$$S_t = c + \alpha B_{t-1} + e_t \qquad\qquad (16)$$

Surplus is defined as the difference between real tax revenue and real government expenditure (not inclusive of interest payments on debt) while debt refers to real market value of government debt held by the public. The paper finds cointegration between debt and surplus and concluded that government debt is sustainable.

Quintos (1995) also addresses the issue of deficit sustainability alongside trying to determine if there are structural shifts in United States fiscal policy over 1947:II to 1992:III using the Hakkio and Rush (1991) approach. Further, the paper introduces the 'strong' and 'weak' conditions for deficit sustainability. The 'strong' condition conforms to the Hamilton and Flavin (1986) and Hakkio and Rush (1991) requirement that revenues and expenditure have to be cointegrated and b =1 (as in equation 15 above). The 'weak' condition, however allows the limit term to tend to zero at a slower rate. Therefore, cointegration according to the 'weak' condition is only a sufficient condition with the necessary and sufficient condition being that the debt process grows slower than the growth rate of mean interest rates. In other words, the deficit would be sustainable as long as the growth rate of debt does not exceed the growth rate of the economy. While such a debt process may be sustainable, the government may find it difficult to market its debt in the long run. The paper seeks to examine whether the strong or weak condition holds between federal government real revenues and expenditures (inclusive of interest paid on government debt) and employs the rank constancy tests to determine structural shifts, if any, in fiscal policy. The paper looks at the issue of sustainability for the United States over 1947-1992. with the break at 1981:IV. The paper estimates the model for no break and with break for real revenues and expenditures and for per capita real revenues and expenditures.. Deficits are sustainable in the weak sense for the full sample (i.e. the model without break). However, when the model with structural break is estimated, the results indicate to existence of a cointegrating relationship using the Johansen procedure between revenues and expenditures only for the pre-break period and not for the post

break period with 0<b<1 and supports the weak condition for sustainability hence concludes that 1980s saw a shift in deficit policy and that the deficit is sustainable.

Payne (1997) adopts the Hakkio and Rush (1991) approach to examine the sustainability of budget deficits for the G7 countries over 1949-1994. As in Hakkio and Rush, this paper too examined the cointegration relationship using the Engle-Granger procedure between revenues and expenditures for the three variants, namely, real revenues and real expenditures, real expenditures and revenues normalized to GNP and real expenditures and revenues normalized to population. The results indicate budget deficits for Germany are sustainable while that for France, Italy and Japan are not sustainable. For the United States and the United Kingdom, while the results indicate to the presence of a cointegrating relation between revenues and expenditures - in levels and when normalized to population – the estimated b's (as in equation 15) were significantly less than one suggesting that government spending is growing faster than government revenues and hence the question of sustainability remains.

Olekalns and Cashin (2000) also adopt the Hakkio and Rush (1991) approach to examine the issue of sustainability of budgetary deficits at the level of the Central Government in India over the period 1951-1998. The paper seeks to examine if the inter-temporal budget constraint is breached for India using real revenues and expenditures (inclusive of interest payments) and does not find cointegration with either the Engle-Granger test nor with the Gregory-Hansen procedure. Hence, the paper concludes that the current stance of India's fiscal policy is not sustainable though the size of the fiscal deficit as a proportion of GDP has fallen since 1991.

Jha and Sharma (2001) re-look the issue of the sustainability of the Indian fiscal deficit for 1872-1997 with Independence providing a natural break in the chosen data set. The paper contends that if public expenditure and public revenues are both stationary (I(0) processes) public debt is sustainable but if they are non-stationary and not cointegrated or have a cointegrating vector different from (1,-1) public debt would not be sustainable. While the standard ADF tests reveal that public revenues and public expenditures in India are I(1) processes when public expenditures and revenues are tested for stationarity in the face of a structural break, for the post Independence period public expenditures and

revenues are actually stationary (I(0)) processes with either one or two structural breaks. The paper, hence, concludes that the public debt situation in India is sustainable.

IV   Evidence

The paper employs annual data over 1970-71 to 2004-05 and tests for the sustainability of the fiscal position for States' (consolidated) of India using the Hakkio and Rush (1991) approach. Data on the revenue and expenditure variables is obtained from various issues of the Reserve Bank of India's Handbook of Statistics of the Indian Economy. The variables employed in the study are listed in the Appendix B. Appendix A details the Zivot-Andrews test and the Gregory-Hansen test.

Results of Unit Root Tests

The initial step would be to determine the order of integration of the revenue and expenditure variables and the results for the different variants of the revenue and expenditure variables are in Tables 2a, 2b and 2c. Results in Table 2a are for when the variables are considered in nominal terms and reveals that by the Augmented Dickey-Fuller (ADF) test (Rows 1-5) all the revenue and expenditure measures are difference stationary or I(1) processes. The estimated test statistic of the KPSS test (Row 6) for all the variables being higher than the critical value, the KPSS test too rejects the null of stationarity indicating that the revenue and expenditure variables are I(1) processes. The results of the KPSS test, thus, conform with the results of the ADF test. The Zivot-Andrews (ZA) test (Rows 7-9), with a null of - series are I(1) without a structural break, reveals that the variables LTRECS, and LRRS reject the null and hence are I(0) processes with a single structural break while the other variables - LTEXPS, LTEXPA and LREXPS accept the null hypothesis and hence are I(1) processes.

The results of the unit root tests when the variables are considered in real terms are presented in Table 2b and indicate that all the revenue and expenditure variables are found to be difference stationary (Rows 1-5) by the ADF test. The KPSS test also supports the results of the ADF test and finds the results to be difference stationary processes. The ZA test which tests for stationarity of variables in the face of a structural break also finds all variables to be I(1) processes and reveals that when considered in real

terms, there is no evidence of a structural beak for any of the revenue and expenditure variables.

Table 2a Results of Unit Root Tests

(Nominal terms)

Rows	Statistic	LTEXPS	LTEXPA	LTRECS	LREXPS	LRRS
ADF Test (Levels) Null: Series has a unit root
1	τ_T	-1.85	-1.56	-1.72	0.36	-0.45
2	φ_3	2.51	3.72	2.28	2.19	1.86
3	φ_1	20.63	15.96	35.65	8.95	9.92
4	τ_μ	-1.28	-2.26	-1.28	-2.07	-1.94
	Lag(s)	1	2	1	1	2
ADF Test (1st Differences) Null: Series has a unit root
5	τ_μ	-6.83**	-4.99**	-9.33**	-4.49**	-5.07**
	Lag(s)	1	1	1	1	1
KPSS Test Null: Series is level stationary
		LTEXPS	LTEXPA	LTRECS	LREXPS	LRRS
6		0.282**	0.337**	0.276**	0.283**	0.363**
	Lag(s)	1	1	1	1	1
Zivot and Andrews (ZA) Test Null: Series is I(1) without a structural break
		LTEXPS	LTEXPA	LTRECS	LREXPS	LRRS
7	ZA$_A$	-4.55 (1981)	-3.56 (1981)	-2.95 (1997)	-0.98 (1983)	-2.75 (1999)
	Lag(s)	0	2	2	0	2
8	ZA$_B$	-4.06 (1993)	-3.63 (1989)	-4.68** (1994)	-2.36 (2000)	-5.20** (1996)
	Lag(s)	0	2	2	0	2
9	ZA$_C$	-4.63 (1981)	-3.48 (1981)	-4.47 (1992)	-2.31 (1999)	-4.79 (1994)
	Lag(s)	0	2	2	0	2
Critical Values at 5% level of significance ADF Test: τ_T -3.41, τ_μ -2.86, φ_1 4.59, φ_3 6.25 KPSS Test: 0.146 ZA Test: ZA$_A$ -4.80, ZA$_B$ -4.42, ZA$_C$ -5.08 ** indicates rejection of null hypothesis at 5 % level of significance Years mentioned in parentheses are the break points using the ZA procedure. Lag length is determined using AIC criterion.

Table 2b Results of Unit Root Tests

(Real Variables)

Rows	Statistic	LTEXPR	LTEXAR	LTRECR	LRER	LRRR
		ADF Test (Levels)				
		Null: Series has a unit root				
1	τ_T	-1.72	-1.85	-1.88	-1.77	-2.89
2	φ_3	1.66	1.84	1.84	2.43	4.46
3	φ_1	7.98	6.34	11.11	7.76	8.90
4	τ_μ	0.41	0.27	0.18	-1.43	-0.99
	Lag(s)	1	1	1	2	1
		ADF Test (1st Differences)				
		Null: Series has a unit root				
5	τ_μ	-3.73**	-3.69**	-3.37**	-6.59**	-3.80**
	Lag(s)	1	1	1	1	1
		KPSS Test				
		Null: Series is level stationary				
		LTEXPR	LTEXAR	LTRECR	LRER	LRRR
6		3.34**	3.31**	3.33**	3.40**	3.35**
	Lag(s)	0	0	0	0	0
		Zivot and Andrews (ZA) Test				
		Null: Series is I(1) without a structural break				
		LTEXPR	LTEXAR	LTRECR	LRER	LRRR
7	ZA_A	-3.07 (1992)	-3.21 (1992)	-3.88 (1992)	-3.69 (1985)	-2.72 (1996)
	Lag(s)	0	0	0	0	2
8	ZA_B	-3.31 (2000)	-2.76 (2000)	-4.15 (2000)	-3.40 (1976)	-3.29 (1980)
	Lag(s)	0	0	0	0	2
9	ZA_C	-3.66 (1996)	-3.23 (1993)	-4.65 (1993)	-3.63 (1985)	-2.50 (1981)
	Lag(s)	0	0	0	0	2

Critical Values at 5% level of significance
ADF Test: τ_T -3.41, τ_μ -2.86, φ_1 4.59, φ_3 6.25
KPSS Test: 0.146
ZA Test: ZA_A -4.80, ZA_B -4.42, ZA_C -5.08
** indicates rejection of null hypothesis at 5 % level of significance
Years mentioned in parentheses are the break points using the ZA procedure.
Lag length is determined using AIC criterion.

When the revenue and expenditure variables are considered with respect to the size of the States' economy (as ratios of GSDP), it is observed from Table 2c that all the unit root tests – ADF (Rows 1-5), KPSS (Row 6) and ZA (Rows 7-9) find that all the variables are

I(1) processes and no evidence of a structural break in any of the revenue and expenditure variables under consideration.

Table 2c Results of Unit Root Tests

(As ratios of GSDP)

Rows	Statistic	TEXPG	TEXAG	TRECG	REXPG	RRG
		ADF Test (Levels) Null: Series has a unit root				
1	τ_T	-1.74	-1.92	-1.82	-1.79	-2.19
2	φ_3	1.52	1.84	1.65	2.51	2.51
3	φ_1	1.97	2.42	2.07	3.68	2.90
4	τ_μ	-1.31	-1.96	-1.37	-2.03	-2.29
	Lag(s)	1	1	1	1	1
		ADF Test (1st Differences) Null: Series has a unit root				
5	τ_μ	-3.05**	-3.03**	-3.48**	-3.17**	-3.62**
	Lag(s)	1	1	1	1	1
		KPSS Test Null: Series is level stationary				
		TEXPG	TEXAG	TRECG	REXPG	RRG
6		1.1**	0.51**	1.13**	1.06**	0.56**
	Lag(s)	1	1	1	2	2
		Zivot and Andrews (ZA) Test Null: Series is I(1) without a structural break				
		TEXPG	TEXAG	TRECG	REXPG	RRG
7	ZA_A	-3.23 (1993)	-3.25 (1993)	-3.83 (1993)	-2.97 (1994)	-2.86 (1996)
	Lag(s)	0	0	0	0	2
8	ZA_B	-2.25 (1981)	-2.37 (1981)	-2.98 (1980)	-3.18 (1989)	-2.98 (1980)
	Lag(s)	0	0	0	0	2
9	ZA_C	-2.74 (1996)	-2.94 (1979)	-3.96 (1996)	-3.47 (1985)	-2.88 (1979)
	Lag(s)	0	0	0	0	2
Critical Values at 5% level of significance ADF Test: τ_T -3.41, τ_μ -2.86, φ_1 4.59, φ_3 6.25 KPSS Test: 0.463 ZA Test: ZA_A -4.80, ZA_B -4.42, ZA_C -5.08 ** indicates rejection of null hypothesis at 5 % level of significance Years mentioned in parentheses are the break points using the ZA procedure. Lag length is determined using AIC criterion.						

Cointegration Results

Since we seek to examine the fiscal sustainability of the States' or in other words seek to determine if the present set of fiscal policies of the States' governments can be continued indefinitely with States' continuing to remain solvent through a look at the important deficit measures viz. the revenue deficit (RD), the primary deficit(PD), the fiscal deficit or the gross fiscal gap (GFG) and the overall gap/deficit (OG), it is of interest to determine whether the concerned revenue and expenditure variables are cointegrated. In Section I of the paper we contend that as long as the revenue and expenditure series are cointegrated then the fiscal situation is sustainable. While absence of a cointegrating relationship would indicate that the fiscal position is not sustainable. Cointegration is sought to be established by the standard Johansen test and by the Gregory- Hansen (GH) test. The GH test looks at cointegration between variables when there is a structural break or regime shift at an unknown point in time, where the exact timing of the break or regime shift is not known (and is to be determined as the outcome of the estimation procedure).

Consequently a cointegrating regression between revenues and expenditure of the form of equation 15 (the Hakkio-Rush (1991) approach) was tested between the revenue and expenditure variables that comprise the different deficit measures. As noted from the results of Table 2a, we can conclude that the cointegrating regression cannot be estimated in nominal terms for the deficit indicators mentioned above as the concerned revenue and expenditure variables are of different orders of integration. However, it is possible to proceed to test for cointegration for all the four deficit indicators when variables are considered in real terms and as ratios of GSDP (Tables 2b and 2c) as the concerned revenue-expenditure variables are integrated of the same order.

When considered in real terms, as can be seen from results in Table 3a, no cointegration is observed either by the Johansen test or the GH test for three of the four deficit measures – gross fiscal gap, primary deficit and revenue deficit, i.e. there is no tendency in the long run for the different revenue-expenditure pairs to move towards the inter-temporal budget constraint and would therefore indicate that the fiscal position of the

States as defined by these deficit indicators is not sustainable. However, the overall gap when considered in real terms the overall gap/deficit between total expenditures (inclusive of interest payments) and total receipts (inclusive of States' share in central taxes and grants) is found to be significantly cointegrated by both the Johansen test and the GH test – Model II (level shift with a trend model) and hence suggests that in real terms the overall gap/deficit of the States' (consolidated) is sustainable.

Table 3a Cointegration Results
(Real Terms)

Variable	LRRR-LTEXPR (GFG)	LRRR-LTEXAR (PD)	LRRR-LRER (RD)	LTRECR-LTEXPR (OG)
A. Johansen Test				
Trace Statistic	8.90	8.01	7.67	20.82[#]
Max Eigen Statistic	8.32	7.86	8.02	19.14[#]
Lags	1	1	1	1
B. Gregory-Hansen Test				
Model I	-2.50 (1982)	-2.64 (1990)	-3.49 (1990)	-3.73 (1988)
Model II	-3.49 (1997)	-3.20 (1997)	-3.56 (1990)	-5.05** (1997)
Model III	-2.44 (1997)	-3.03 (1992)	-3.74 (1992)	-4.40 (1982)
Critical Values:** 5% level of significance: Trace Stat: 15.41, Max Eigen Stat: 14.07 # At 1% level of significance: (ii) Trace Stat: 20.04, Max Eigen Stat:18.63 Critical Values GH test: ** 5% level of significance (iii) Model I -4.61, Model II -4.99, Model III -4.95 Years in parentheses indicate the break points using the GH procedure Lag length determined using Akaike Information Criterion				

Results of the Johansen and GH tests presented in Table 3b indicate that the gross fiscal gap and the revenue deficit as ratios of GSDP continue to be unsustainable while cointegration (consequently sustainability) is established by the GH test for the primary deficit (Model II level shift with trend model) and by the Johansen test for the overall gap/deficit when considered as a ratio of GSDP. Further, as can be observed from Tables 3a and 3b, the shift in has taken place in 1997 which is covered by the Tenth Finance Commission and spans the period 1995-96 to 1999-2000 and saw fiscal transfers from

Centre to States decline from 40.3% during the Ninth Finance Commission period to 35.8% of gross revenue receipts of the Centre during the Tenth Finance Commission period. Also, fiscal transfers to States as a percent of GDP at market prices declined from about 5% during the Eighth Finance Commission period to 4.1% during the Tenth Finance Commission. This fall was largely due to a fall in the ratio of the Centre's gross tax revenue relative to GDP which declined from 10.6% in 1987-88 to less than 9% at the end of the 1990s (Government of India, 2004).

Table 3b Cointegration Results

(As ratios of GSDP)

Variable	TEXPG-RRG (GFG)	TEXAG-RRG (PD)	REXPG-RRG (RD)	TEXPG-TRECG (OG)
A. Johansen Test				
Trace Statistic	6.8508	12.0332	7.9894	18.6548**
Max Eigen Statistic	6.6482	9.1389	6.0021	17.7909**
Lags	1	1	1	1
B. Gregory-Hansen Test				
Model I	-2.501 (1997)	-2.348 (1989)	-4.451 (1997)	-3.463 (1985)
Model II	-3.387 (1997)	-5.013** (1997)	-3.946 (1997)	-4.830 (1999)
Model III	-4.576 (1997)	-4.579 (1997)	-3.518 (1999)	-4.423 (1982)
Critical Values: 5% level of significance: Trace Stat: 15.41, Max Eigen Stat: 14.07 # At 1% level of significance: (ii) Trace Stat: 20.04, Max Eigen Stat:18.63 Critical Values GH test: ** 5% level of significance (iii) Model I -4.61, Model II -4.99, Model III -4.95 Years in parentheses indicate the break points using the GH procedure Lag length determined using Akaike Information Criterion				

Table 4 summarizes the results of our empirical exercise and highlights the worrying scenario of State level finances in India. The unsustainability of the revenue deficit and the gross fiscal gap, measured both in real terms as well as ratios of GSDP is a cause of concern as the revenue deficit reflects the extent of saving/dis-saving of the government and the extent to which governments' finance current expenditure through

borrowing. State governments' in the late 1990s had resorted to extensive borrowing at high interest rates exacerbating the problem of State finances. Likewise, the gross fiscal gap indicates the total borrowing requirement of State governments' arising out of its fiscal operations. The empirical evidence on the primary deficit, which reflects the non-interest deficit of the government is mixed. The primary deficit is found to be unsustainable when measured in real terms but when considered as a ratio of GSDP (or the size of the economy) the primary deficit is found to be sustainable. The evidence in favour of sustainability of the overall gap for both variants, in real terms as well as a ratio of GSDP suggests that finances of States' when inclusive of resource transfers from the Centre are sustainable. This validates the dependence of States on resources from the Centre and the also the existence of vertical imbalance observed in federal fiscal relations in India. For instance, in 2005-06 state governments could raise only 49.49% of total current revenues as states' own revenues (approx 50.51% of their current revenues came from the Centre) while they could finance only 47.68% of their current expenditure from their own current revenues.

Table 4 Summary of Cointegration Results

	Johansen Test	Gregory-Hansen Test	Result	Prognosis
Real Terms				
Revenue Deficit	✘	✘	No Cointegration	Not Sustainable
Primary Deficit	✘	✘	No Cointegration	Not Sustainable
Gross Fiscal Gap	✘	✘	No Cointegration	Not Sustainable
Overall Gap	✔	✔	Cointegration	Sustainable
As Ratio of GSDP				
Revenue Deficit	✘	✘	No Cointegration	Not Sustainable
Primary Deficit	✘	✔	Cointegration	Sustainable
Gross Fiscal Gap	✘	✘	No Cointegration	Not Sustainable
Overall Gap	✔	✔	Cointegration	Sustainable
✔ denotes cointegration ✘ denotes no cointegration				

V   Conclusion

The paper, thus, seeks to address the sustainability of State finances in India and tries to examine whether State governments in India can continue on their current revenue-expenditure paths indefinitely and maintain solvency.

The paper has adopted the Hakkio-Rush (1991) approach to study sustainability of the major deficit indicators, namely the revenue deficit, primary deficit, gross fiscal gap and overall gap, in nominal terms, real terms and as ratios of gross state domestic product. When considered in nominal terms, however, it was not possible to examine any measure of deficit for sustainability as the concerned revenue and expenditure variables were of different orders of integration. When considered in real terms and as ratios of gross state domestic product, the paper finds evidence indicative of unsustainable fiscal policies adopted by state level (sub-national) governments in India and serious concern about the fiscal health of state level governments in India. Each of the deficit measures considered in the paper reveals a different facet of fiscal health and state governments (consolidated) have scored poorly on almost all except the overall gap indicator. Unsustainability of the revenue deficit and the gross fiscal gap, viewed alongside the sustainability of the primary or non-interest deficit as ratio of GSDP is a pointer that States' need to be cautious whilst resorting to borrowing to finance current expenditure. Further, as per the recommendations of the Twelfth Finance Commission, state governments would henceforth access the market directly and each State's capability in raising resources will be market determined and based on their respective financial health. The results of this paper reinforce the concern expressed by the Report of the Twelfth Finance Commission (2004) and the World Bank Report on State Fiscal Reforms in India: Progress and Prospects (2005). The need to undertake immediate corrective action has been recognized by both the Central and State governments' who have initiated several corrective measures to overcome the fiscal crisis elucidated in Section I of the paper. These initiatives have resulted in an improvement in State finances in recent times as in an increase in revenue receipts as a ratio of GDP, increase in own tax receipts of States alongside efforts at expenditure containment. While State finances have seen consolidation since 2004-05, continued efforts by State governments could help improve the sustainability of State finances.

References

Burnside, C. (2005): Theoretical Pre-requisites for Fiscal Sustainability Analysis in Craig Burnside (ed.) *Fiscal Sustainability in Theory and Practice: A Handbook*, World Bank, Wahington D.C.

Government of India (2004): *Report of the Twelfth Finance Commission (2005-2010).*

Gregory, A.W. and B.E. Hansen (1990): Residual –based tests for Cointegration in Models with Regime Shifts, *Journal of Econometrics*, vol.70, pp.99-126.

Hakkio, C.S. and M. Rush (1991): Is the Budget Deficit "Too Large?", *Economic Inquiry*, vol. 29, pp.429-445.

Hamilton J.D. and M.A. Flavin (1986): On the Limitations of Government Borrowing: A Framework for Empirical Testing, *American Economic Review*, vol. 76, pp.808-819.

Haug A.A. (1991): Cointegration and Government Borrowing Constraints: Evidence for the United States, *Journal of Business and Economic Statistics*, vol.9, pp. 97-101.

Jha, R. and A. Sharma, (2001): *Structural Breaks and Unit Roots: A Further Test of the Sustainability of the Indian Fiscal Deficit*, ASARC Working Paper, September 2001.

Karnik, A. (2005): State Finances: Continuous Deterioration, Bleak Prospects, *Journal of the Indian School of Political Economy*, vol. 17, pp. 403-427.

Mills, T.C. (1999): *The Econometric Modelling of Financial Time Series*, Cambridge University Press, United Kingdom, Second Edition.

Olekalns, N. and P. Cashin, (2000): *An Examination of the Sustainability of Indian Fiscal Policy*, University of Melbourne, Department of Economics, Working Paper No.748, May 2000.

Payne, J.E. (1997): International Evidence on the Sustainability of Budget Deficits, *Applied Economic Letters*, vol.4, pp.775-779.

Qunitos, C.E. (1995): Sustainability of the Deficit Process with Structural Shifts, *Journal of Business and Economic Statistics*, vol.13, pp.409-417.

Reserve Bank of India (2007): Finances of State Governments-2006-07: Highlights, Reserve Bank of India Bulletin, March, vol.61, pp. 259-294.

Reserve Bank of India (2006): *Annual Report 2005-06*.

Reserve Bank of India: *Handbook of Statistics* (various issues)

Wilcox, D.W. (1989): The Sustainability of Government Deficits: Implications of the Present Value Borrowing Constraint, *Journal of Money, Credit and Banking*, vol.21, pp.291-306.

World Bank (2005): *State Fiscal Reforms in India: Progress and Prospects*, Macmillan India Ltd, New Delhi.

Zivot, E. and D.W.K. Andrews, (1992): Further Evidence on the Great Crash, the Oil Price Shock and the Unit Root Hypothesis, *Journal of Business and Economic Statistics*, vol.10, pp.251-270.

APPENDIX A

(i) Zivot and Andrews Test

The standard ADF test does not take into account the presence of structural break in the series and this could at times lead an error when the null hypothesis is not rejected. Hence, a series could be tested for unit root in the presence of structural break. A major problem while testing for stationarity in the presence of structural break is the timing of the break. ZA (1992) propose a test procedure in which the break point, *k*, is treated as an outcome of the estimation procedure designed to fit x_t to a certain trend stationary representation rather than exogenously. ZA consider the null hypothesis to be: a series x_t is I(1) without a structural break and the alternative hypothesis is that the series x_t can be represented by a trend stationary process with a single break in trend occurring at an unknown point in time. According to the ZA procedure the break point *k* is the one which minimises the ADF* unit root test statistic computed from the following regressions:

Model A: Break (intercept)

$$\Delta x_t = \mu_1^A + \gamma_1^A t + \mu_2^A DU_t(k) + \theta^A \Delta x_{t-1} + \sum_{j=1}^{k-1} \beta_j \Delta x_{t-j} + \varepsilon_t \qquad (A.1)$$

Model B: break (trend)

$$\Delta x_t = \mu_1^B + \gamma_1^B t + \gamma_2^B DT_t^*(k) + \theta^B \Delta x_{t-1} + \sum_{j=1}^{k-1} \beta_j \Delta x_{t-j} + \varepsilon_t \qquad (A.2)$$

Model C: break (intercept and slope)

$$\Delta x_t = \mu_1^C + \gamma_1^C t + \gamma_2^C DT_t^*(k) + \mu_2^C DU_t(k) + \theta^B \Delta x_{t-1} + \sum_{j=1}^{k-1} \beta_j \Delta x_{t-j} + \varepsilon_t \qquad (A.3)$$

Where $DU_t(k) = 1$ and $DT_t^*(k) = t-k$ if $t>k$, and 0 otherwise with the regressions being estimated over the range of the sample (0.15T..0.85T), T is the total number of observations. Model A allows for a change in the level of the series, Model B allows for a change in the slope of the trend of a series and Model C estimates for both change in level and the slope of the trend (Mills, 1999, pp.92-93)

(ii) The Gregory- Hansen Cointegration Test

This test looks at cointegration between variables even when there is a structural break or regime shift at an unknown point in time. Gregory- Hansen (GH) (1996) test the null hypothesis of no cointegration, with the alternative being: the presence of cointegration with a structural break or regime shift where the exact timing of the break or regime shift is not known (and to be determined as the outcome of the estimation procedure). The structural break can take any of the following forms:

Model I: Level Shift Model

$$y_t = \mu_1 + \mu_2 Dum(\tau) + \beta_1 x_t + \varepsilon_t \qquad\qquad (A.4)$$

Model II: Level Shift with trend Model

$$y_t = \mu_1 + \mu_2 Dum(\tau) + \alpha t + \beta_1 x_t + \varepsilon_t \qquad\qquad (A.5)$$

Model III: Regime Shift Model

$$y_t = \mu_1 + \mu_2 Dum(\tau) + \alpha t + \beta_1 x_t + \beta_2 x_t Dum(\tau) + \varepsilon_t \qquad\qquad (A.6)$$

Where, $\tau = T_B/T$ and T_B represents a possible break point and T the total number of observations. *Dum* is the dummy variable which takes the value of 0 for if $t \leq \tau$ and 1 for all t> τ. Model I, the level shift model, indicates that the variables x_t and y_t have shifted in a parallel fashion and that the slope remains unchanged by the shift. μ_1 is the intercept before the shift while ($\mu_1 + \mu_2$) is the intercept after the level shift. Model II characterises a model where the level shift relationship may also contain a time trend, such that the cointegrating relationship is stationary around a fixed trend whilst Model III represents a Regime shift model wherein, the level as well as the slope between the variables x_t and y_t has changed. The μ's represent the intercept before and after the level shift while β_1 and ($\beta_1 + \beta_2$) are the cointegrating slope coefficients before and after the regime shift respectively.

APPENDIX B

List of variables used in the paper. Prefix 'L' denotes variables considered in logarithmic form

Variables in Nominal Terms	
LTEXPS	Total Expenditure of States'
LTEXPA	Total Expenditure exclusive of interest payments of States'
LTRECS	Total Receipts of States'
LREXPS	Revenue Expenditure of States'
LRRS	Revenue Receipts of States'
Variables in Real Terms	
LTEXPR	Real Total Expenditure of States'
LTEXAR	Real Total Expenditure exclusive of interest payments of States'
LTRECR	Real Total Receipts of States'
LRER	Real Revenue Expenditure of States'
LRRR	Real Revenue Receipts of States'
Variables as a Ratio of GSDP	
TEXPG	Total Expenditures as a ratio of GSDP
TEXAG	Total Expenditures exclusive of Interest payments as a ratio of GSDP
TRECG	Total Receipts as a ratio of GSDP
REXPG	Revenue Expenditure as a ratio of GSDP
RRG	Revenue Receipts as a ratio of GSDP