IS INEQUALITY IN FISCAL PERFORMANCE NONLINEAR STATIONARY IN NORTHEASTERN STATES OF INDIA?

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Abstract: This study contributes to the existing literature in two ways. First, a fiscal performance index for northern states of India has been developed to rank the sates according to their fiscal performance. Second, the nonlinear stationary of the fiscal performance of the sates in panel framework has been tested by using a recently developed nonlinear panel unit root test of Ucar and Omay (2009). It has been observed that Arunachal Pradesh ranks first in whole period of study in terms of fiscal performance and fiscal performance of northern sates of India is liner non-stationary

INTRODUCTION

The combined revenues of both centre and state governments were slightly below the growth rate of combined revenue expenditure in 1960s. In the 1970s, the growth of revenue expenditure was well below then the combined revenue. However, at the beginning, the public finance was comfortable but during the period 1979-80 to 1984-85, revenue expenditure grew much faster than the revenue growth. Consequently the combined fiscal defect reached to 9.4 percent of GDP and revenue deficit rose to 4.2 percent by the year 1990-91.The period 1991-92 to 1997-98 shows temporary improvement but the continuous growth of combined fiscal deficit (around 70 percent) in 2001 and 02 with simultaneous deterioration in state government finances since 1997-98 led the policy makers to plan and implement remedial measures(Chelliah 2005)[5].India is federal democracy and the fiscal performance of India depends on the fiscal performance of its constituent states so the policy measures focused on fine-tuning state government finances. The Tenth Finance Commission emphasized on bringing fiscal balance in terms of its Terms of Reference (TOR) (GOI 2000).When it was found that there was hardly any improvement, the Twelfth Finance Commission came with more clear elaboration about fiscal discipline in its TOR. Still then, the performance of state governments was not at all satisfactory. The problem became more serious .The governments at all levels were nursing large and rising revenue deficits than when the centre and some of the better-off states had a surplus (Rangarajan 2004).In between a rule-based fiscal framework i.e The Fiscal Responsibility and Budget Management Act (FRBMA), in 2003 was passed. The basic objective of this act is revenue augmentation and deficit reduction to maintain fiscal discipline at the state level to have micro economic efficiency and macroeconomic stability. Even after such attempts, the detailed State-wise analysis of various fiscal indicators done by RBI (2010)[6] shows that most of the States are facing deterioration in revenue balance and an increase in the level of GFD in 2008-09 (RE) and 2009-10 (BE) as compared to the earlier period of 2005-08. Analysis of the States' budget documents indicates inadequate fiscal transparency across the States. The States need to resume the process of fiscal

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[5] See for details explanation chelliah (2005).
[6] See for details analysis RBI (2010)

correction and consolidation at the earliest through the adoption of revenue augmentation and expenditure rationalization measures

The above scenario in India has been drawing attention of both policy makers and researcher to measure the fiscal performance of states to know about their fiscal sustainability. In connection to this, India is a federal country and there is centre state fiscal relationship. The state governments get fiscal assistance from the centre in terms of loans and grants. There are two groups of states such as general category states and special category states. Because of special problems, the special category states get 90% as grant and 10% as loan. Therefore, it is a general consensus that since the special category states are getting special assistance so why should they maintain fiscal discipline. In addition to this India is a vast country with diversities in terms of geographical location and development. The special category states such as Arunachal Pradesh, Assam, Himachal Pradesh, Jammu and Kashmir, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura are located in the north east part of the country. These states are less developed but endowed with huge natural resources. Therefore, it can be argued that if these states will maintain fiscal discipline and consistent better fiscal performance as whole there will be sound fiscal finance in terms of deficit stability and revenue augmentation which will helpful to accelerate the development process by the state government finances.

In connection to the above core issue of fiscal performance of the state government finances though there are a number of studies have already been done, most of the studies are on general category states or relating to any specific state but there is no study with a special focus on the North Eastern states that are special category states. Our study is in this direction. The rest of the paper is organized as follows.

LITERATURE REVIEW

Several studies have examined fiscal performance of the central government and state governments. Studies based on the fiscal performance of central government are Sthanumoorty (2005), Joshi and Little (1996), Rajaraman (2001). In the context of fiscal performance of the state governments, World Bank Study (1996-97), Rao (2004), Zaidi (2002), Sivram (2003), Chaitanya (2006), RBI Study (2004) and Dholakia (2005) are some of the prominent studies.

Many of these studies are extensive and theoretical in nature focusing on providing a macro picture of all the states or major states fiscal position and presented in time series analysis form. However, few popular works are restricted to particular states. For example, the study by Zaidi (2002) focuses on the finances of Uttar Pradesh from 1991 to 1999-2000. Similarly, the work of the study of Chaitanya (2006) based on Andhra Pradesh.

Bhide and Panda (2002) came up with another composite fiscal index, made up of five components, for judging the quality of central government budgets and states were ranked on the basis of the value of the index for different years for judging the quality of central government budgets consisting of six different fiscal indicators and the states were ranked on the basis of the value of the index. Venkatraman (2003) did not construct a composite index but did rank the states according to their fiscal achievements by using six indicators. Further, Dholakia (2005) proposed an alternative approach to fiscal performance measurement constructing a composite fiscal performance index using eight indicators.

OBJECTIVE, DATA SOURCE AND METHODOLOGY
Objective: The basic objective of this study is to study the fiscal performance of north eastern

states by developing North Eastern Fiscal Performance Index (NEFPI) and also to see whether the fiscal performances of these states is nonlinear stationary.

Data Source: Data have been collected from the Hand Book of Statistics on State Government Finances-2010 published by the Reserve Bank of India.

Methodology: The study period is 19 years i.e., 1990-91 to 2008-09. To measure the fiscal performance of northeastern states we have develop the North Eastern Fiscal Performance Index (NEFPI) following the approach suggested by Dholakia (2005). The NEFPI is a composite index consisting of three individual indices such as (A) Deficit Indicator Index (DII), (B) Own Revenue Effort Index (OREI) and (C) Expenditure and Debt Servicing Index. Hence, NEFPI is simple average of these three indices. Further, Deficit Indicator Index (DII) is calculated from three components related to deficit such as: i) Gross Fiscal Deficit as a proportion of Total Expenditure (GFD/TEX), ii) Revenue Deficit as a proportion of Net Fiscal Deficit (RD/NFD) and iii) Capital Outlay as a proportion of Net Fiscal Deficit (CO/NFD). Own Revenue Effort Index (OREI) is calculated from two components related to revenue performance of states such as i) Own Tax Collection as Proportion of Revenue Expenditure (OT/REX) and ii) Own Non-Tax Collection as a Proportion of Revenue Expenditure (ONT/REX). And Expenditure and Debt Servicing Index is calculated from the three components of debt performance of the states such as i) Non-Developmental Revenue Expenditure as a proportion of Revenue Receipts (NDRE/RR), ii) Interest Payment as a proportion of Revenue Expenditure (IP/REX) and iii) Debt Repayment as a proportion of Central Fiscal Transfers received by the state (DR/GCFT).

However, the calculation of the three specified indices above is not possible to do with simple average because we have ratios that are with different numerators and denominators. Therefore, to calculate these indices we have followed methodology developed by Morris and Mc-Alpin (1982) used for constructing the Physical Quality of Life Index (PQLI). Accordingly, we first identified the worst and best values of each indicator during the study period of 1990-91 to 2008-09. We defined the best and the worst values in such a way that all the indexes became unidirectional and could be horizontally combined to form the NEFPI. Therefore, an increase in the value of an indicator index would mean improvement in the fiscal performance and vice versa. Further, for each indicator the performance of an individual state has been set between 0 to 100 scale; where 0 represents an absolutely defined worst performance and 100 represents an absolutely defined best performance[7]. As, the worst and best values are based on the 'actual' fiscal achievements of one or more states during the post-reform period; they are neither unrealistic nor over-ambitious. In other words 0 and 100 represent the worst and best 'observed' values of an indicator respectively and not the 'hypothetical' values. In order to aid the calculations, one unit point was added to the best values of the indicators.

Finally, after calculating the NEFPI we have tested the nonlinear stationary property of this index in panel framework. Therefore, for the analysis we have used a more recent test proposed by Ucar and Omay (2009) for heterogeneous panel. They proposed test that is based on the framework of Kapetanios et al. (2003) test of time series.

This test can be explained as follows. Let $y_{i,t}$ be Panel Exponential Smooth Transition Autoregressive Process of order one (PESTAR(1)) on the time domain t=1,2,…,T for the cross section units i=1,2,…,N. Now suppose that $y_{i,t}$ follows the data generating process (DGP) with fixed effect (heterogeneous intercept) parameter α_i:

$$\Delta y_{i,t} = \alpha_i + \phi_i y_{i,t-1} + \gamma_i y_{i,t-1}[1 - \exp(-\theta_i y_{i,t-d}^2)] + \varepsilon_{i,t} \quad \ldots\ldots\ldots(1)$$

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[7] Results of all this analysis will be available upon request to the authors.

where d$\geq$1 is the delay parameter and θ_i>0 implies the speed of mean reversion for all i. Further, they set ϕ_i=0 for all i (i.e, $y_{i,t}$ has a unit root process in the middle regime) and d=1, which gives specific PESTAR(1) model :

$$\Delta y_{i,t} = \alpha_i + \gamma_i y_{i,t-1}[1 - \exp(-\theta_i y_{i,t-1}^2)] + \varepsilon_{i,t} ....(2)$$

Therefore, in the equation (2) testing the presence of nonlinear unit root in panel framework is simply to test the null hypothesis θ_i=1 for all i against θ_i>0 for some i under the alternative hypothesis. However, direct testing of the θ_i=0 is somewhat problematic because γ_i is not identified under the null hypothesis. This problem has been sorted out by applying first-order Taylor series approximation to the PESTAR (1) model around θ_i=0 for all i. Hence, we obtain the auxiliary regression

$$\Delta y_{i,t} = \alpha_i + \delta_i y_{i,t-1}^3 + \varepsilon_{i,t} ....(3)$$

$where\ \delta_i = \theta_i \gamma_i$.

Further, they established the hypotheses for unit root testing based on regression (3) as follows:
H0 : $\delta_i = 0$; for all i; (i.e., linear nonstationarity)
H1 : $\delta_i < 0$; for some i; (i.e., nonlinear stationarity)

They proposed a panel unit root test that is computed through taking the simple average of individual KSS statistics. The KSS statistic for the i_{th} individual is simply t-ratio of δ_i in regression (3) defined by

$$t_{i,NL} = \frac{\Delta y_i' M_\tau y_{i,-1}^3}{\hat{\sigma}_{i,NL} (y_{i,-1}' M_\tau y_{i,-1})^{3/2}} ....(5)$$

Where $\hat{\sigma}_{i,NL}$ is the consistent estimator such that $\hat{\sigma}_{i,NL}^2 = \Delta y_i' M_\tau \Delta y_i /(T-1)$, $M_\tau = I_T - \tau_T(\tau_T'\tau_T)^{-1}\tau_T'$. Here, $\Delta y_i = (\Delta y_{i,1}, \Delta y_{i,2},...,\Delta y_{i,t})'$, $y_{i,-1}^3 = (y_{i,0}^3, y_{i,1}^3,...,y_{i,T-1}^3)'$ and $\tau_T = (1,1,...,1)'$. Furthermore, for a fixed T, they defined

$$\bar{t}_{NL} = \frac{1}{N}\sum_{i=1}^{N} t_{i,NL} ....(6)$$

which is invariant average statistic when $t_{i,NL}$ is invariant with respect to initial observations $y_{i,0}$, heterogeneous moments σ_i^2 and σ_i^4 if y_{10}=0 for all i=1,2,…,N.

In addition to that when the invariance property (as just defined above for $t_{i,NL}$ holds for each i) and the existence of moments (by truncating $t_{i,NL}$ distribution) are satisfied (that is the individual statistics $t_{i,NL}$ are iid random variables with finite means and variances) the usual normalization of $\bar{t}_{NL}$ statistic have the limiting standard normal distribution as N$\rightarrow\infty$ such that

$$\bar{Z}_{NL} = \frac{\sqrt{N(\bar{t}_{Nl} - E(t_{i,NL}))}}{\sqrt{Var(t_{i,NL})}} \xrightarrow{d} N(0,1).........................(8)$$

Therefore, they produced critical values of Z_{NL} statistic as well as its truncated version because they may be different from the fractiles of the standard normal distribution, particularly for small N observations, to which they converge as N goes to infinity. Further, just for sake for comparison we have conducted other panel unit root test of linear regression.

DATA ANALYSIS AND INTERPRETATION

First, we have presented the NEFPI for all northern states of India and accordingly ranking of the states has been given in Table-1. It is important to be mentioned that in the table we present

average achievement of sates on the NEFPI during the specified period like 1990-95, 1995-2000, 2000-2005 and 2000-2010.

Table 1: North East Fiscal Performance Index(NEFPI)								
State	1990-95		1995-2000		2000-2005		2005-2010	
	Value	Rank	Value	Rank	Value	Rank	Value	Rank
Arunachal Pradesh	50.44	1	51.59	1	43.84	1	44.55	1
Assam	37.62	4	33.29	6	33.01	4	37.24	5
Himachal Pradesh	29.24	7	33.42	5	22.45	8	28.57	8
Jammu and Kashmir	34.8	5	36.24	4	29.47	6	37.13	6
Manipur	44.22	2	38.22	3	31.38	5	40.34	2
Meghalaya	23.86	9	24.34	9	15.37	10	28.05	9
Mizoram	42.46	3	40.29	2	34.41	3	40.03	3
Nagaland	32.53	6	30.45	7	27.29	7	37.55	4
Sikkim	21.8	10	29.45	8	37.25	2	30.05	7
Tripura	26.67	8	24.09	10	18.96	9	26.5	10
Source: Authors' calculation								

From Table -1 it is evident that Arunachal Pradesh ranks 1 in whole period of study as Arunachal Pradesh has been able to maintain his position consistently. Assam has experienced fluctuation in the ranking. Himachal Pradesh, Jammu and Kashmir and Tripura have experienced deterioration in terms of fiscal performance over period. Nagaland and Sikkim have experience improvement in the performance. Manipur, Meghalaya and Mizoram are still on the same position on which they were 20 years back.

Finally, to test that whether their fiscal performance is stationary in nonlinear framework we applied a more recent panel unit root test developed by Ucar and Omay (2009) for heterogeneous panel. Results of this test are reported in the following Table 2.

Table 2: Results of nonlinear unit root analysis				
Intercept	T^*_{NL}	Z^*_{ANL}	T^*_{NBAR}	W^*_{NBAR}
Lag 1	-3.2837 (0.000)	-6.1456 (0.000)	-3.0663 (2.0000e-004)	-5.8142 (2.0000e-004)
Lag 2	-3.2837 (0.000)	-6.1456 (0.000)	-3.0663 (2.0000e-004)	-5.8142 (2.0000e-004)
Lag 3	-2.9285 (1.0000e-004)	-4.8255 (1.0000e-004	-2.6813 (3.0000e-004)	-4.3544 (3.0000e-004)
Trend and intercept				
Lag 1	-0.3363 (0.6971)	7.4484 (0.6971)	-0.4159 (0.5194)	6.5613 (0.5194)
Lag 2	-0.3890 (0.6407)	7.1449 (0.6407)	-0.4712 (0.4600)	6.2367 (0.4600)
Lag 3	-0.4440 (0.5910)	6.8286 (0.5910)	-0.5264 (0.3915)	5.9121 (0.3915)
Note: p-values in parenthesis with 10000 bootstrap replications.				
Source: Authors' calculation				

It is evident from table 2 that when our model includes constant and constant and trend both term in the regression liner (i.e., IPS test) and nonlinear (i.e., Ucar and Omay 2009 test) unit root results shows the same results with bootstrap p-values. The difference in the findings is that when we include only constant term our null hypothesis is getting rejected however, when we include constant and trend term simultaneously both test do not reject the null hypothesis and hence favor the null hypothesis implying that fiscal performance of northern states of Indian is liner no stationary. However, our conventional test shows that in both cases i.e., when constant is included and when constant and trend is included in the analysis null hypothesis is rejected implying that fiscal performance is stationary.

CONCLUSION

This study attempted to fulfill two objectives. To measure the fiscal performance of northeastern states and check out the ranking of states and to evaluate the stationary property of fiscal performance of northern states during post reform era. To measure the fiscal performance of northeastern states and give ranking we have develop the North Eastern Fiscal Performance Index (NEFPI) following the approach suggested by Dholakia (2005). To check the stationarity property of fiscal performance of these states we have used a more recently developed panel unit root test developed by Ucar and Omay (2009) for heterogeneous panel. For the analysis, we have collected data from the Hand Book of Statistics on State Government Finances-2010 published by the Reserve Bank of India. The study period is 19 years i.e., 1990- 91 to 2008-09.

We find that Arunachal Pradesh ranks first in whole period of study; Assam experienced fluctuation in the ranking; Himachal Pradesh, Jammu and Kashmir and Tripura experienced deterioration in terms of fiscal performance over period; Nagaland and Sikkim experienced improvement in the performance Manipur; Meghalaya and Mizoram are still on the same position on which they were 20 years back. Our stationary test reveals that when we include only constant term our null hypothesis is getting rejected however, when we include constant and trend term simultaneously both test do not reject the null hypothesis and hence favor the null hypothesis implying that fiscal performance of northern states of Indian is liner nonstationary. Therefore, we can conclude that fiscal performance of these states is liner nonstationary. This finding has very-very important policy implications for the central and state level government of India in order to improve the performance of these states in one hand and have a proper balance on fiscal and monetary policy coordination on the other hand.

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