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# *Finance Commission of India's Assessments: A Political Economy Contention between Expectations and Outcomes*

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## **Abstract**

We explore the normative fiscal assessments of the Finance Commission of India, and realisation of fiscal policy with regard to Central Finances over the period 1990-2012. We employ the Theil's inequality coefficient to investigate the magnitude of assessment errors and its partitioning in to bias, slope and random components. Furthermore, this paper also evaluates the efficiency, biasedness and persistence of forecast errors. The robustness of the efficiency results are confirmed with the application of maximum entropy bootstrap. The objective of this study is to examine the structural basis on which Finance Commissions make their awards rather than examining the predictability of the forecasts. The story of Finance Commissions assessments reflects an interesting political economy theatre of contention between aspirations and outcomes. Our key findings are as follows: Firstly, source of errors for assessments of tax revenue, non-tax revenue, interest payments, defence revenue expenditure, plan revenue expenditure and fiscal deficit is principally due to random component. However the errors in the remaining economic parameters originate due to systemic components i.e. mean and slope errors. Secondly, the expenditure side predictability is lower than the revenue side predictability.

**Keywords:** Forecast Evaluation, Fiscal Marksmanship, Fiscal Federalism, India, Finance Commission.

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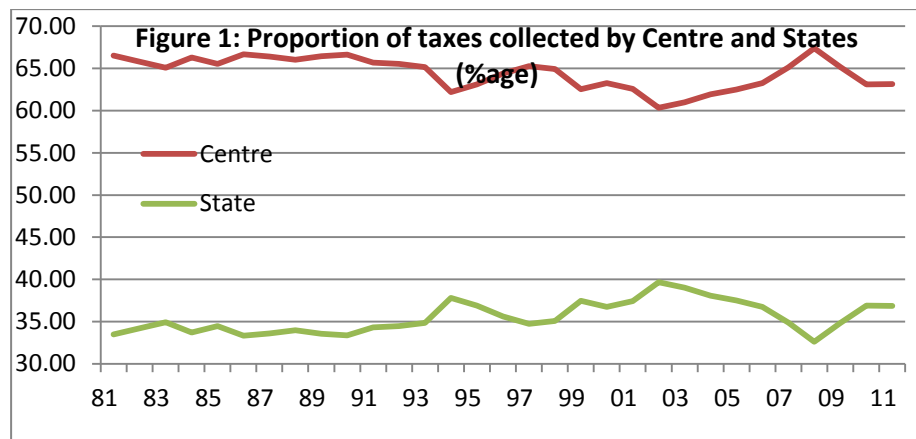
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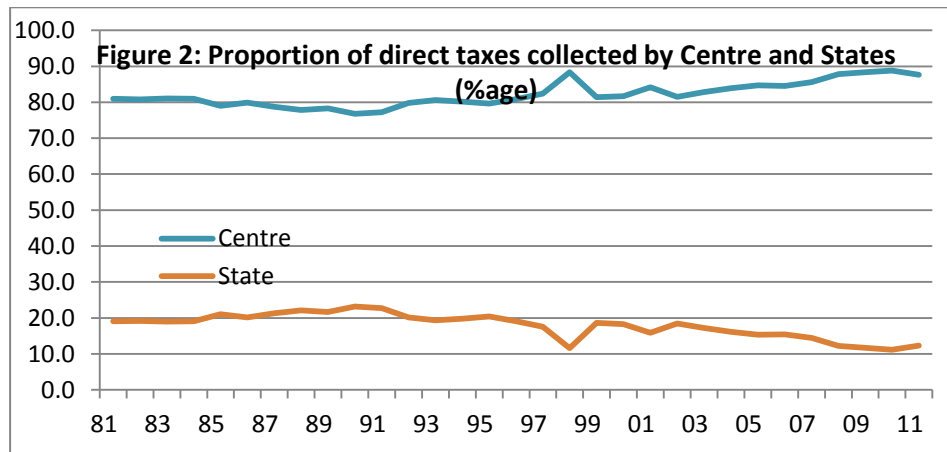
## Introduction

India is a union of States with three layers of governance namely the Central, State and Local Governments. The powers and functions of the Union and State Governments are mentioned in Schedule 7 of the Indian Constitution. The exclusive powers of Centre and the States are enlisted in the Union list and States list respectively. The powers falling under the jurisdiction of both Centre and States are enlisted in the concurrent list. The functions of the central government are those required to maintain macroeconomic stability, international trade and relations and those having implications for more than one State. The major subjects assigned to the States comprise public order, police, public health, agriculture, irrigation, land rights, fisheries and industries and minor minerals. Subjects like public health, agriculture and irrigation involve considerable governmental expenditures. Though there is a large overlap between Centre and the States list, States on account of being closer to the constituents, assume more responsibility for subjects in the concurrent list like education and transportation, social security and social insurance.

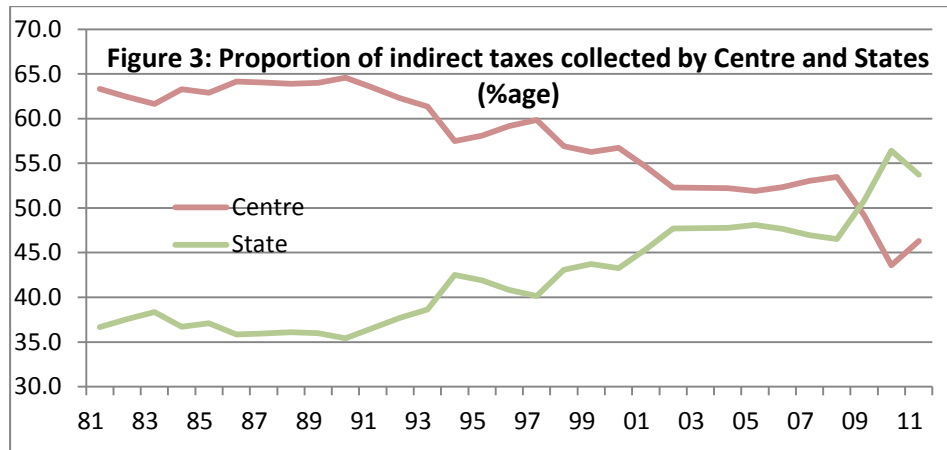
The assignment of tax powers, however, is based on the principle of separation, i.e., tax categories are exclusively assigned either to the Centre or to the States and residual powers being vested with the Centre. Most broad-based taxes have been assigned to the Centre, including taxes on income and wealth from non-agricultural sources, corporation tax, taxes on production (excluding those on alcoholic liquors) and customs duty. Though, a long list of taxes is assigned to the States, only tax on sale and purchase of goods has been a significant revenue earner. Taxes collected by the Centre have almost been double that of those collected by the States (*Figure 1*).



The proportion of direct taxes collected by the Centre has been increasing over time and currently stands at almost ninety percent of the total collections (*Figure 2*).



However, the proportion of indirect taxes collected by the Centre has been falling steadily and now stands at about forty six percent (*Figure 3*).



Constitution recognises that its assignment of tax powers and expenditure functions would create imbalances between expenditure needs and abilities to raise revenue. The imbalances could be both vertical, i.e. among different levels of government, and horizontal, i.e. among different states. Since the formation of the Republic, the assignment of revenues between Centre and States in order to correct the imbalances are not fixed on a permanent basis. The Constitution vide Article 280 provides for Constitution of Finance Commission (FC)<sup>1</sup>. The share of taxes of Centre and States and their allocation among different States are to be recommended by FC every five years. The objectives that FC would have in mind are a) better alignment of resource between Centre and States b) Fiscal capacity vis a vis Fiscal responsibilities c) Horizontal devolution for interstate differences. Apart from the FC, fiscal devolution also happens through the channels of Planning Commission and Central Ministries. However, FC continues to be the channel through which major part of devolution occurs.

According to the terms of reference, the FC shall have regard, to the resources of the Central Government, the demands on the resources of the Central Government, the resources of the State Governments, for the next five years along with the objective of not only balancing the receipts and expenditure on revenue account of all the States and the Union, but also generating surpluses for capital investment in making its recommendations. In this context, FC makes assessments

of revenue and expenditure requirements of both Centre and States for a 5 year period ahead. FC's assessments are guided based on a) historical information available b) formal interaction with Centre and States and public policy ecosystem c) its own judgement regarding parametric changes in next five years influencing the public finances of Centre and States for next five years falling under its tenure. FC first determines the assessments for base year (a year prior to beginning of the tenure of FC) both by applying analytical techniques and judgements to the actuals or budget estimates available. Subsequently, forecasts of the future values of exogenous variables and policy variables such as GDP growth rate, inflation, interest rates etc. are determined. Thereafter, causal relationships are worked out between the exogenous factors and the parameters to be assessed based on assumptions that structural improvements will occur over the tenure. Finally, assessments are made and later re-examined to impart judgemental adjustments with a view to impart more reasonable numbers. Based on the assessments, a scheme of tax devolution and grants is recommended to the Centre.

In this paper, we look at the extent to which the FC's assessments were accurate. It is not expected that FC acts as an accurate forecaster. FC assesses the plausible future scenario with respect to macro economic variables and expected trend in revenue and expenditure of different units of government. On the basis of assessments FC comes up with vertical and horizontal devolution for different governments. Typically if such plausible assessments were to be credible then we would expect divergence to be purely random in nature. Systemic errors or biases reflect systemic inaccuracies in forecasting model. These inaccuracies would need to be examined in concrete context of their occurrence. In this paper we therefore seek to identify the nature and pattern of errors in assessments following various fiscal marksmanship exercises. This paper is perhaps, the first attempt to make an ex post facto analysis of the FC's fiscal planning exercise, estimating the error magnitude and source of errors. Theil's inequality coefficient is employed to estimate the magnitude & source of errors for Central Finances. The rest of the paper is organised as follows: *Section 2* presents a literature review spanning across the topics of fiscal marksmanship and assessment of macroeconomic parameters in the context of Indian fiscal federalism, *Section 3* describes the analytical overview, *Section 4* deals with the methodology and provides the results of empirical analysis. Concluding remarks along with policy implications are presented in *Section 5*.

## **2. The Present State of Research**

### **2.a Fiscal Marksmanship Exercise**

An objective of fiscal policy is to achieve macroeconomic stability by achieving appropriate growth levels to facilitate the economy to operate at full employment levels with moderate inflation. Prest (1961), Allan (1965), and Davis (1980), suggested that policy makers should accurately foresee the consequences of their actions in order to achieve the objectives of fiscal policy. As fiscal forecasts influence the expectations of private agents and their behaviour, analysis of forecast accuracy has gained prominence. Evaluating forecast accuracy is relevant for improving forecasts by learning from past errors. A great deal of literature has analysed the fiscal marksmanship of budgetary forecasts of Central Govt. (Zakaria and Ali 2010 for Pakistan, Alessandra et. al 2011 for Italy, Ashiya 2003 for Japan, Neil 2005 for Canada). Though the empirical evidence in this strand of research has been mixed, on a general note, most of the studies discover an underestimation of

expenditure and over estimation of revenue leading to a higher than expected budget deficit. However, when looking at the sub national level in USA, it is observed that States routinely under estimate forecasts (Rodgers and Joyce 1996). The reasons could be to have a cushion in an event of unanticipated downturn in economic conditions coupled with the State government's comparative disadvantage in predicting national economic trends (Mocan and Azad 1995). Similarly, Auld (1970) has investigated forecasting errors in budgetary estimates in the context of Canada, Bird (1970) for Colombia, Rabushka (1976) for Hong Kong, Asher (1977) for Singapore, Morrison (1986) for the US, and Bagdigen (2005) for Turkey. One of the recent studies was by Gastaldi, Giuriato and Sacchi (2011), whose findings suggest that implemented budgetary adjustment falls systematically short of planned adjustment for GDP, for primary balance and overall balance with main determinants being the expenditure parameters.

In the context of India, there exists a plethora of research, on the accuracy of budgetary forecasts of Central Government. Some of the older studies include Paul and Rangarajan (1974), Asher (1978), Pattnaik (1990) and Bhattacharya and Kumari (1988). Among other studies Arsher (1998) and Chakrabarthy & Varghese (1982) revealed that both expenditures and revenues were under estimated. Bhattacharya and Kumari (1988) analysed the budgetary numbers during the period 1961-62 to 1984-85 and found that neither budgetary estimates nor revised estimates of revenue & expenditures satisfy the criteria of rational expectations and unbiasedness of forecasting. There was also no evidence of improvement of forecasting over time. Roy (1993) observed that divergence was principally random in nature and thus related to short term policy variables. One of the recent works in this area by Chakrabarthy and Sinha (2008), suggests that neither revenue nor expenditure forecasts are rational. On employing Theil's inequality coefficient it was observed that proportion of error due to random variation has been significantly higher, while the error due to bias was negligible and there was no significant improvement in the efficiency of forecasts over time.

## **2.b Assessment of Macro Economic Parameters in Context of Indian Fiscal Federalism**

An objective of the Finance Commission is to resolve the vertical and horizontal imbalances along with rewarding tax effort and efficiency of expenditure. In Indonesia, the sub national governments are incentivised to close the revenue gap as the intergovernmental grants are based on the difference between fiscal needs and revenue capacity. Whereas, in Vietnam the transfers are based on expenditure needs and forecasted revenues which are based on previous collections providing a negative incentive (World Bank 2004). In Indian fiscal scenario, the objectives to reward tax effort and expenditure efficiency are underlying in the terms of reference of FC. The ToR until 9th FC were more implicit with the inclusion of phrases like "the scope of economy consistent with efficiency which may be effected by the states in their administrative expenditure", "better fiscal management", and "the need for ensuring reasonable returns on investment in irrigation, power, transport, industries etc." and the FC did not incorporate any incentive/ disincentive structure while formulating the pattern of Centre-State transfers (Bajaj & Viswanathan 1989). The ToR of the NFC led the Commission to adopt a normative assessment of receipts and expenditure of both Centre and States (Bajaj & Viswanathan 1989, Rao 1990). The change in methodology led to a drastic change in the remit of the 9th FC (Guhan 1998). It was expected that this approach would induce incentives for fiscal prudence and bring revenue expenditure within revenue receipts and generate investment surplus.

The traditional approach of the FC assessments had been to make actuals available to provide the basis for the 'base year' on which the assessments were generated. This procedure is inequitable and a disincentive for fiscal discipline (Chelliah 2000). Govt which is innovative enough to identify can gainfully exploit this procedure by either raising their non-plan bill (by increasing the emoluments of staff or subsidies) or by applying less tax effort before the cut-off date to be dubbed deficit. The methodology evolved over the period with the 11th FC and 12th FC starting off by making adjustments to the base year figures (Chelliah 2000a, Rangarajan 2005).

### 2.c Gaps in Literature and Contribution thereof

In the Indian scenario, there has not been any fiscal marksmanship exercise on the assessments of Finance Commission, which form a basis for major part of devolution from Centre to States. Further understanding of the behaviour of states will help the FC to devise better methods of devolution in assisting the States better. The current study's contribution to the existing literature is twofold. First, it is to the best of our knowledge, the first comprehensive examination of Finance Commission's assessments, which is a critical part of the institutional design of inter-governmental fiscal transfers. Second, the emphasis on how the errors occurred will indicate the strength and weakness of the current institutional practice and may raise theoretical questions on the commitment problem of interregional transfers.

## 3. Theoretical Underpinnings to the Fiscal Planning Exercise

Fiscal imbalances can be classified as vertical and horizontal. Vertical imbalances result when federal revenues are in excess relative to its expenditure responsibilities and State accounts are in deficits due to expenditure responsibilities exceeding own revenue sources. Horizontal imbalances arise as a result of differential State level fiscal capacities and location inefficiencies.

On a general note, the objective of equalising transfers is to enable States to provide comparative levels of services at comparable tax rates by offsetting the fiscal disabilities of the States due to lower revenue capacity and higher unit cost of providing services. However, the equalising transfers are not supposed to inculcate moral hazard problem. Different countries address this in different ways. Thus, the equalisation framework in Canada is based on the principle of ensuring equalisation of fiscal capacities with no reference to cost differentials (Rangarajan & Srivastava 2004a). The Australian equalisation framework is different from the one existing in Canada as it attempts at equalisation on both revenue and expenditure ends (Rangarajan and Srivastava 2004b).

In the case of India, Rangarajan & Srivastava (2008) attempted to develop an explicit equalisation methodology out of existing elaborate framework of fiscal transfers followed by FCs. The fiscal transfers of the FC were decomposed as follows:

$$t_i = \underbrace{e - ay_n}_{t^v} + \underbrace{ay_n - ay_i}_{t^h} + \underbrace{res_i}_{t_i^o} \quad res_i \geq 0$$

where  $t^v$  are the transfers made on account of vertical imbalance,  $t^h$  are the transfers made on account of horizontal imbalance and  $t_i^o$  is the residual reflecting

other cost and special need considerations. Transfers are made through grants (g) or tax devolutions (d) and all modes can be given through either route implying  $t^v = g^v + d^v$ ,  $t^h = g^h + d^h$ , and  $t_i^o = g_i^o + d_i^o$ . The vertical fiscal transfer, measured with reference to the richest state is defined as  $[e - a.y_n]$  where e is the per capita expenditure norm, a is the average tax effort,  $y_1, y_2, \dots, y_n$  denotes the per capita income (GSDP) of the States arranged in ascending order and  $N_1, N_2, \dots, N_n$  denotes the corresponding population. Assuming  $e > a.y_n$  and if e is exogenously or normatively determined the total transfer to the highest income state is given by  $N_n[e - a.y_n]$ . Since every State gets at least the amount  $[e - a.y_n]$  in terms of per capita transfers the total vertical transfers can be expressed as  $[e - a.y_n].\Sigma N_i$ . In order to maintain horizontal equity the allocation mechanism must treat equally two states if their criterion values are the same this would imply as follows: If  $b_i = b_{i+1}$ ,  $S_i^* = S_{i+1}^*$ ; If  $b_i < b_{i+1}$ ,  $S_i^* > S_{i+1}^*$ ; where  $b_i$  is per capita income and  $S_i^*$  corresponding per capita share. The amount needed for horizontal transfer is given by  $H = a. (\Sigma N_i(y_n - y_i))$ .

The theoretical expressions derived are as follows:  $W.d = a.(y_n - \mu) - g^h - (x)$ ;  $(1 - W - W_2) d = d^v - (y)$ ; Solving (x) and (y) leads to  $d = \frac{[d^v + a(y_n - \mu) - g^h]}{(1 - W_2)}$ . Where d is per capita devolution,  $\mu$  is mean income, W is share of equalising horizontal transfers,  $W_1$  is share of vertical transfers,  $W_2$  is share for cost and special need considerations and  $W_1 + W + W_2 = 1$ ; Indicating that given  $g^h, W_2, y_n, \mu, a$  and  $d^v$  the weight that needs to be given to horizontal and total amount of per capita devolution may simultaneously be determined in order to achieve full equalisation. The parameter of  $g^h, y_n, \mu, a$  and  $d^v$  are implicitly derived out of the assessments of FC. For vertical transfers e is also derived out of the assessments done by the FC.

Keen (1998) raises the issue of concurrence in the context of Tax Policy. Concurrence refers to the possibility of vertical tax externalities arising from concurrence of the same tax base of both levels of Government. Such concurrence can impact the ability of either level of Government to predict future revenues using standard economic models. If these externalities favour Central Government then this can result in an unintended consequence of reverse transfers from the sub-national level to national level. Similarly, Koethenbuerger (2008) shows that forecasts undertaken by Central Government regarding their own fiscal variables may influence fiscal policy action undertaken by sub-national Governments. This has efficiency implications and also implications for the incidence of Central Government fiscal policy.

Jensen (1994) shows that actions by higher levels of Government can influence local policies by pre committing lower levels of Govt. to act in a certain way. Thus uniform matching grants used in several federal systems including India can pre commit State governments to certain policy actions that may not have been taken in the absence of these grants. Jensen shows that policy actions after pre commitment can under reasonable assumptions result in Nash equilibrium that is superior to the choice made without pre commitment. In effect, the GST compensation proposed by the 13<sup>th</sup> Finance Commission was indeed an attempt to generate that pre commitment. Thus, Finance Commission assessments are also shaped to effect such pre commitment by designing their assessments to achieve pareto superior outcomes.

In India's context, for these theoretical questions to be addressed and to assess the effectiveness of equalising transfers, provided by the Finance Commission awards (as explained in Section 2) it would be useful to examine the structural basis on which Finance Commissions make their awards, in particular, the



extent to what the ex-ante FC assessments hold true ex-poste. Here, it is important to remember that the objective is not to examine the predictability of forecasts; these forecasts by nature are not intended to be accurate predictors of the future. In the Indian fiscal equalisation system, Finance Commission of India's framework of normative assessments induce a higher capacity of pre commitment at the Central level as the equalisation transfers are decided ex ante. This is perhaps the reason, as noted by Roy (2011), why 13th FC's analysis finds no moral hazard problem with NPRD awards made by previous Commissions, including no trend of increased inter temporal recourse to the grant in the case of general category States.

In our view, there are three major factors which determine the *raison d'être* for FC forecasts:

- 1) **Context and History:** In India there has been historically a high degree of vertical imbalance between Centre and States and an increase in the size of non-shareable portion of Central revenues receipts. There is, therefore, a need for forecasts to take these into account and to normatively assess how the objective of addressing imbalances and equitable distribution of revenue receipts can be secured. Forecasts are made with these objectives in mind, and therefore, are not contextually neutral.
- 2) The 12<sup>th</sup> and 13<sup>th</sup> Finance Commissions were both enjoined to suggest a road map for fiscal reforms that would address the need for fiscal consolidation five years into the future. The suggested road map would need to be consistent with the forecast future macro and fiscal variables, therefore, these forecasts would not be neutral with respect to this requirement. This is a classic example of the sort of pre commitment Roy (2011) refers to.
- 3) **Limitation of data impacts forecast predictability:** to some extent this is picked up in the fiscal marksmanship analysis which follows. However, the basis for data adjustment varies across the different Commissions. Thus, the use of comparable GSDP estimates, assessments made regarding the tax buoyancies, the calculation of interest payments on future public debt stock etc. are made using somewhat different premises by different Commissions. These would not be reflected in the fiscal marksmanship exercise.

The utility of this paper, therefore, does not lie in predicting the accuracy of Finance Commission forecasts. Rather, the intention is to discern from the analysis, the extent to which the forecasts differ from actuals occurs due to difference between a) policy assumptions or b) actual conduct of policy or c) systematic assumptions that were not borne out. This would provide a basis for further theoretical and empirical enquiries of the sort, undertaken by Keen (1998), Hoyt & Jensen (1995) in Indian context.

## **4. Methodology and Empirical Analysis**

### **4.1. Variables and Data**

Assessments by the Finance Commission of Central Govt. Finances are from financial year 1990-91 till FY 2011-12; i.e spanning the periods under the 9<sup>th</sup>, 10<sup>th</sup>,

11<sup>th</sup>, 12<sup>th</sup> and 13<sup>th</sup><sup>3</sup> FCs. Assessments prior to 9<sup>th</sup> FC, i.e those undertaken by 8<sup>th</sup> FC were not included as they were a) made on the assumption of price stability and b) were made on a cumulative basis for a five year period from FY 1984-85 to FY 1988-89. Variables analysed are Gross Domestic Product (GDP), Gross tax revenue (GTR), Non tax revenue (NTR), Non Plan Revenue Expenditure (NPRE), major components of NPRE such as Interest Payments (IP), Subsidises Expenditure (SE), Defence Revenue Expenditure (DRE); Plan Revenue Expenditure (PRE), Non-Debt Capital Receipts (NDCR), Capital Expenditure (CE), Revenue Deficit (RD), Fiscal Deficit (FD) and Outstanding Debt (OD).

We use the assessment data from FC Reports; actuals data from Economic Survey of India, Budget documents and Bulletin on Indian Public Finance Statistics. Variables like NDCR, CE, FD and OD were not assessed by 9<sup>th</sup> and 10<sup>th</sup> FC, restricting the number of data points to twelve. DRE was not classified separately by 9<sup>th</sup> FC restricting the number of data points to seventeen. Similarly, PRE was not assessed by 10<sup>th</sup> FC restricting the no. of data points to seventeen. RD assessment by 10<sup>th</sup> FC was on non-plan account and hence it is compared with the corresponding actuals for 10<sup>th</sup> FC period.

## 4.2. Theil's Coefficient

4.2.a *Theil's coefficient – Magnitude of errors* ( This section is based on Economic Forecasts and Policy by Henry Theil 1961 and Zakaria & Ali (2010).

Henry Theil in 1958, proposed an inequality coefficient here in after called U1 for measure of accuracy of forecasts which is represented as follows:-

$$U1 = \frac{\sqrt{1/n \sum (Pi - Ai)^2}}{\sqrt{1/n \sum Pi^2 + 1/n \sum Ai^2}}$$

Where P1, P2...Pn being the predictions and A1, A2...An the corresponding actuals. The value of U1 ranges between 0 and 1. U1 attains a zero value in cases when forecasts are perfect, i.e Pi=Ai. Value of U1=1 indicates very bad forecasting, which happens in cases where always zero predictions are made for non-zero actuals or non-zero predictions are made wherein there were zero actual outcomes or positive predictions were made and there were negative actual outcomes and vice versa.

Later, Theil (1966) revised the measure of inequality, which is hereinafter referred as U2. U2 is represented as below:-

$$U2 = \frac{\sqrt{1/n \sum (Pi - Ai)^2}}{\sqrt{1/n \sum Ai^2}}$$

In case of perfect forecasts, value of U2 would be equal to 0, when Pt=At for all observations. However, in case of U2, there is no cap on the value in case of imperfect forecasts. If Pt and At are defined in terms of changes, then no change forecast (Pt=0 for all t) would lead to a value of 1. When U2 equals unity, the forecast has the same accuracy as would have been achieved by means of a "naive non change extrapolation" (Theil 1971).

<sup>3</sup> Two data points of 13<sup>th</sup> FC have been incorporated for analysis on account of non-availability of actuals data for remaining years.

Theil (1971), has proposed a more rigorous measure of inequality statistic referred as U3 which also incorporates the lags in the actual and the difference of predicted value from the lag of the actual to capture the magnitude of error. U3 is represented as follows:-

$$U3 = \frac{\sqrt{1/n \sum (P(t) - a(t))^2}}{\sqrt{1/n \sum P(t)^2 + 1/n \sum a(t)^2}}$$

Where  $a(t) = A(t) - A(t-1)$  and  $P(t) = P(t) - A(t-1)$

The upper value of U3 would depend on whether or not the direction of change is predicted correctly. If the direction of change is predicted correctly, on average, i.e., when  $\sum [P(t).a(t)] < 0$ , then U3 will be greater than unity. U3 will be exactly equal to unity when the forecast implies no change, i.e. when  $P(t) = 0$  for all t or  $\sum [P(t).a(t)] = 0$ .

In the context of forecast evaluation of FC's assessments U3 cannot be made applicable on the data set as the forecasts are made once in 5 years. Even if actual values are lagged till the base year it may not be an appropriate measure as some set of values are lagged by 2 years (1<sup>st</sup> year of FC's projections) and another set is lagged by 7 years (5<sup>th</sup> year of FC's projections). In view of these constraints, we had not incorporated the U3 inequality coefficient in the analysis. We have therefore used U2 for our analysis.

#### 4.2.b Partitioning of error components.

Forecast Errors can be partitioned as follows:-

$$1 = \underbrace{\frac{(\bar{P} - \bar{A})^2}{1/n \sum (P_i - A_i)^2}}_{U_m} + \underbrace{\frac{(S_p - S_A)^2}{1/n \sum (P_i - A_i)^2}}_{U_s} + \underbrace{\frac{2(1-r)S_p S_A}{1/n \sum (P_i - A_i)^2}}_{U_c}$$

Where P, A,  $S_p$ ,  $S_A$  are the means and standard deviations of the series  $P_i$ ,  $A_i$  respectively and r is the correlation coefficient.  $U_m$ ,  $U_s$  and  $U_c$  can be termed as partial coefficients of inequality due to unequal central tendency, unequal variation and to imperfect co variation. The source of  $U_m$ ,  $U_s$  and  $U_c$  are bias, slope and random variations respectively.

- a)  $U_m = 0$ , as the central tendency lies on the line of perfect forecast.
- b)  $U_s = 0$ , as the orthogonal regression line through n points is parallel to the line of perfect forecasts.
- c)  $U_c = 0$ , implies either a perfect positive correlation or zero variation.
- d)  $U_m = 1$ , if there is either a perfect correlation with slope 1, or no variation at all in P and A.  $U_s = U_c = 0$ .
- e)  $U_s = 1$ , if the centre of gravity lies on the line of perfect forecasts and moreover either the correlation is positive and perfect or one of the variables has zero variation.  $U_m = U_c = 0$
- f)  $U_c = 1$ , if the line of perfect forecasts is the orthogonal regression line  $U_m = U_s = 0$ .

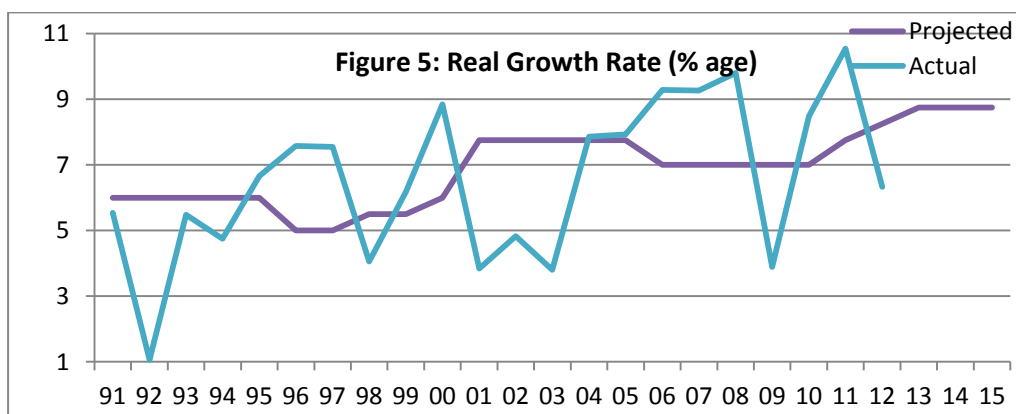
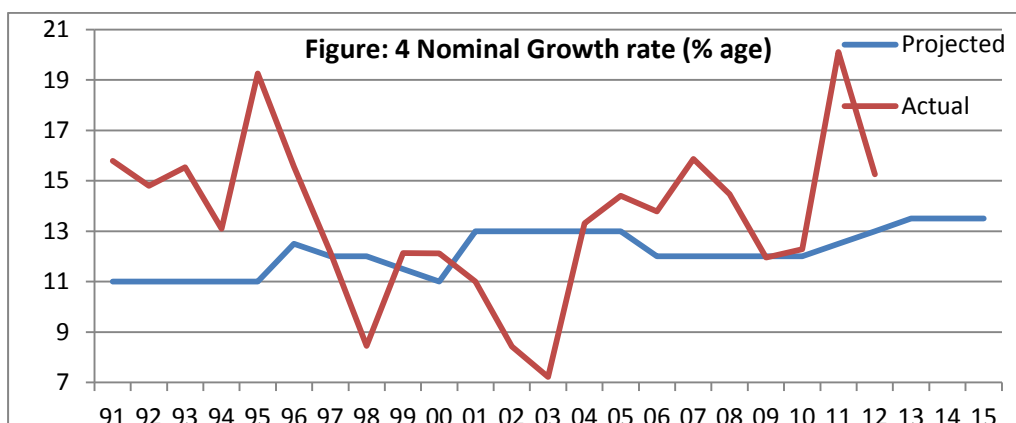
$U_m$  and  $U_s$  comprise the Systemic error and  $U_c$  comprises the unsystematic portion and the desirable distribution of inequality over the three sources is  $U_m = U_s = 0$  and  $U_c = 1$  as it is presumed that the systemic component can be reduced by improved forecasting techniques, while the random component which is due to

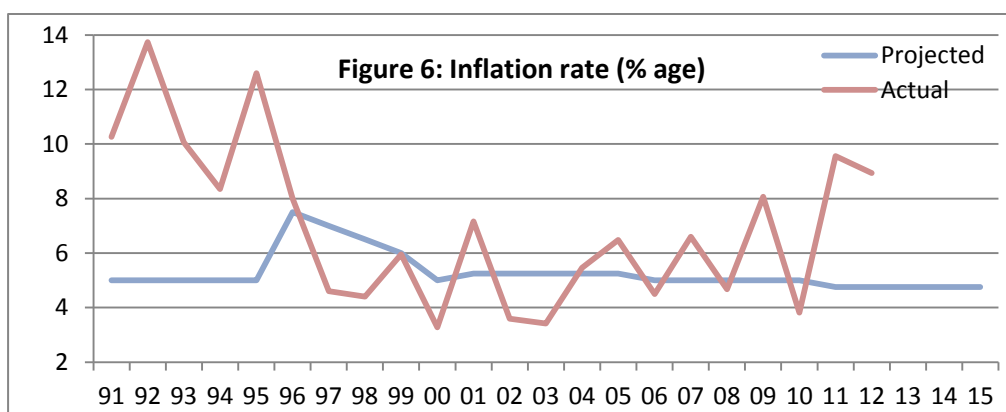
unanticipated and exogenous shocks is beyond the control of forecaster (Intriligator (1978), Pindyck and Rubenfield (1998), Theil (1966)).

#### 4.2.c Results

*Appendix 1* gives a comparison between the Forecasts of the Finance Commission versus the realisations. The magnitude of errors measured by mean errors, Theil's inequality coefficient U2 along with partitioning of error components are given in *table 1*. We choose to term assessments with U2 around 0.25 and below as having lower; between 0.25 and 0.50 with moderate; and above 0.50 with higher magnitude of errors.

**Nominal GDP growth rate** was consistently under estimated, with an exception of 11th FC period. The magnitude of error was moderate with a mean underestimation of 1.48 per cent and U2 statistic recording 0.27. The major source of error was found to be random component. However, the total systemic component contributed to a high 'sixty five percent'. The nominal GDP growth rate was estimated as a sum of real GDP growth rate and inflation. The reason for errors is that the FC had consistently underestimated the inflation rate and slightly overestimated the real GDP growth rate. The mean underestimation of inflation was at 1.62 per cent over the 22 year period, with U2 statistic being in the moderate range recording 0.47. Systemic component of error was a high 'sixty percent'. The real GDP growth rate was slightly over estimated over the period with random component being the major source of error.





**Table 1: Error Magnitude and Partitioning - Central Finances**

Parameter	N	U/O	ME (in %)	U2	Error Partitioning (in %)		
					Bias	UV	Random
GDP growth rate (nominal)	22	17/05	-1.48	0.27	16	39	45
GDP growth rate (real)	22	12/10	0.14	0.35	00	32	68
Inflation rate	22	13/09	-1.62	0.47	21	39	41
Gross Tax Revenue	22	12/10	1.5	0.12	03	21	77
Non Tax Revenue	22	09/13	6	0.26	00	12	88
Non Plan Revenue Exp.	22	18/04	-13	0.27	27	40	33
Interest Payments	22	12/10	-5.5	0.13	09	06	85
Subsidies Exp.	22	22/00	-37	0.53	37	46	17
Defence Rev. Exp. (DRE) <sup>1</sup>	17	12/05	-2.8	0.24	08	25	67
Plan Revenue Exp (PRE) <sup>2</sup>	17	15/02	-14	0.32	03	19	78
Revenue Deficit (RD) <sup>3</sup>	22	21/01	-68.6	0.73	31	24	45
Revenue Deficit (RD) <sup>3</sup>	20 <sup>6</sup>	19/01	-65.4	0.47	39	34	27
Fiscal Deficit <sup>4</sup>	12	07/05	-9.2	0.39	20	24	55
Fiscal Deficit <sup>4</sup>	10 <sup>6</sup>	06/04	-0.7	0.22	05	48	47
Outstanding Debt <sup>4</sup>	12	12/00	-17.2	0.21	68	15	17
Non Debt Capital Receipts (NDCR) <sup>4</sup>	12	06/06	19	0.59	18	60	23
Capital Exp. <sup>4</sup>	12	00/12	38	0.43	69	13	18

1. Defence Expenditure includes Revenue Component only; Defence Expenditure was not assessed separately by 9<sup>th</sup> FC

2. Planned Revenue Expenditure was not assessed by 10<sup>th</sup> FC.

3. RD assessed by 10<sup>th</sup> FC is on non-plan account only, hence compared with corresponding actuals.

4. Assessed by 11<sup>th</sup>, 12<sup>th</sup> and 13<sup>th</sup> FC's only.

5. Excluding the FY's 2008-09 and 2009-10 due to Global Financial Crisis.

6. U/O: No. of Underestimations/ Over estimations

7. ME: Mean Error

**Gross Tax Revenues (GTR)** assessments were nearly perfect with a mean error of one percent and U2 recording 0.12 indicating lower magnitude of errors. The major source of errors was random component. Errors were very small during the 9<sup>th</sup> and 10<sup>th</sup> FC period. However, as GTR is derived out of buoyancy coefficient of GDP, it was overestimated for the 11<sup>th</sup> FC period and underestimated for the 12<sup>th</sup> FC period. The assessment of GTR can be sub divided in to two elements, the assessment of nominal GDP and the assessment of the ratio of GTR to GDP derived out of the buoyancy coefficient. During the tenure of 11<sup>th</sup> FC there was a slowdown in the economy and receipts being endogenous to business cycle fell in the period

ending up in an over estimation by FC. In contrast, there was an underestimation by the Commission during the 12<sup>th</sup> and 13<sup>th</sup> FC period, mainly because of the positive structural break from 2005-06 onwards on the growth front coupled with an increased buoyancy of income tax revenue from 1.22 prior to 2003-04 to 1.50 due to enhanced compliance after the introduction of electronic tax information network (Mundle *et.al* 2011). **Non Tax Revenues (NTR)** were overestimated in the major part of the period with the mean error being six percent and U2 falling in the moderate range. The major source of errors was random component. However, U2 statistic on exclusion of 2010-11 (substantial inflow on account of 3G auction) is 0.15 indicating a lower magnitude of errors.

On the expenditure front, **NPRE** was under assessed by all the FC's with the exception of the 11<sup>th</sup> FC. NPRE was less than assessment during 11<sup>th</sup> FC partially due to a spending restraint by the right-centrist NDA Govt. at the Centre coupled with a slowdown in the economy. NPRE exceeded the assessments in the rest of the period, principally due to the implementation errors on the subsidy front. The underestimation for the period was at 13 percent with the magnitude of U2 being moderate. The major source of error was unequal variation. **Interest payments (IP)** component of NPRE has shown a volatile behaviour with underestimation by 9<sup>th</sup> and 12<sup>th</sup> FC and over estimation during 11<sup>th</sup> FC. Mean under estimation was at 5.5 per cent mainly caused due to a higher than expected accumulation of debt stock and inflation. U2 statistic indicates a lower magnitude of errors with random component being a major source. **Subsidies** portion of NPRE being unproductive expenditure were assessed to remain constant for the rest of the tenure of the individual FCs, ending up in gross under estimation of 37 per cent. The magnitude of errors was very high with U2 at 0.53 and bias being the major source of error. **Defence Revenue Exp.(DRE)** had a low mean error at an underestimation of 2.8 per cent. U2 is recorded to be at a lower level with major source of error being the random component. DRE exceeded the forecast in the later part of the 10<sup>th</sup> FC period due to operation "Vijay" in 1999, later it remained below the assessments throughout the 11<sup>th</sup> FC period. In the later part of 12<sup>th</sup> FC, DRE exceeded the assessments due to the implementation of 6<sup>th</sup> pay commission and payment of arrears thereof in two tranches in FY 2008-09 and FY 2009-10. It remained above the assessments even in the 13<sup>th</sup> FC period due to high wage burden on account of 6<sup>th</sup> pay commission and a faster pace of increase in DA.

**Plan Revenue Exp. (PRE)** also consistently underestimated by all FC's with an exception to 13<sup>th</sup> FC period. Mean underestimation was at fourteen percent. U2 statistic indicates moderate level of errors with random component being the major source of errors. Errors were very large during 12<sup>th</sup> FC's period, mainly due to enactment of *National Rural Employment Guarantee Act (NREGA)*, which increased the total PRE beyond the assessments. During the 13<sup>th</sup> FC, PRE was lower than the assessments as there was an expenditure compression in the plan size due to shortfall of resources, resulted out of a low tax revenue buoyancy (due to global financial crisis in 2008) and an increase in NPRE crowding out PRE in the corresponding period.

**Revenue Deficit (RD)** was underestimated by a huge 'sixty nine percent' which is reflected by U2 statistic recording 0.73, with the random component forming the major source of error. Errors were greater during the 10<sup>th</sup> FC period and later part of 12<sup>th</sup> FC period. The revenue deficit for the Financial Years 2008-09 and 2009-10 could be outliers as rise in deficits was caused due to spurt in public expenditure as a result of fiscal stimulus to counteract the impact of global financial crisis. The exclusion of these two data points leaves the U2 statistic at 0.47 (in the moderate range) and major source of error being systemic component. FC assessments of RD

are driven by the target of incurring no revenue deficits in compliance with FRBM Act by end of the tenure of FC. The most consistent source of unanticipated deficits was not revenue under performance but expenditure over-runs. **Fiscal Deficit (FD)** assessments showed a mixed picture until 2008. However, after 2008 as a result of global financial crisis and the slowdown there after, FD exceeded the assessments. The underestimation of FD was to an extent of nine percent and U2 magnitude was in the moderate range. Random component was the major source of errors. On exclusion of FY's 2008-09 and 2009-10, mean error was almost nil and U2 statistic conveys a lower magnitude with major source of error being unequal variation. In the recent years FC assessments of FD are driven by the FRBM's target of limiting it to 3 per cent by the end of the tenure of Commission. However, as a result of slippage on the Revenue Deficit front mainly due to high NPPE, FD exceeded the assessments. FD would have further exceeded the assessments had the capital expenditure assessments of the Commission being met. **Outstanding Debt (OD)** stock exceeded the estimated amount in the entire period, mainly due to more than expected addition of liabilities on account of slippage on the fiscal deficit targets. There was a mean underestimation of 17 per cent over the twelve year period. U2 statistic indicates a moderate magnitude of errors with bias being the major source.

On the capital account, **Non Debt Capital Receipts (NDCR)** realisation has shown a very high amount of volatility with mean overestimation at around twenty percent. U2 statistic indicates that the assessments were grossly wrong with random component being the major source of errors. However, the systemic component stands at a high fifty four percent. Errors could have resulted due to high volatility of realisations on the disinvestment front which is dependent on the boarder market conditions and low recovery of loans from State Govt.'s and Public Sector Enterprises. **Capital Expenditure (CE)** was consistently over estimated with a mean error of thirty eight percent over the twelve year period. U2 statistic indicates a moderate magnitude of errors with bias being the major source. The major reasons for underestimation are a) crowding out of fiscal space for Capital expenditure due to higher NPPE and PRE b) Lesser than expected realisations of NDCR c) Defence Capital expenditure requirements of Ministry of Defence (MoD) being agreed generously by the FC's and a corresponding delay in procurement by MoD.

#### **4.3. Test of Persistence of Errors**

Absence of auto correlation between forecast errors indicates that the errors are independent and an error made does not lead to an error in the next time period. In case of FC's assessments auto correlation of errors may be a possibility as forecasts are made for a five year horizon.

**Table 2: Persistence of Forecast Errors – Central Finances**

	GDP	GTR	NTR	NPRE	IP	DRE	Sub	PRE	RD	FD	OD	CE	NDCR
N	22	22	22	22	22	17	22	17	22	12	12	12	12
Signif p1=0	0.00	0.00	0.97	0.00	0.0	0.00	0.00	0.02	0.79	0.30	0.01	0.83	0.30
Signif p2=0	0.00	0.00	0.73	0.00	0.0	0.00	0.00	0.07	0.94	0.57	0.02	0.92	0.43
Signif p3=0	0.00	0.00	0.70	0.00	0.0	0.00	0.01	0.04	0.99	0.62	0.05	0.71	0.60
Signif p4=0	0.00	0.00	0.76	0.01	0.0	0.01	0.02	0.01	0.58	0.63	0.08	0.83	0.48

Numbers above 0.05 indicates absence of persistence of errors at the 5 per cent significance level.

Absence of auto correlation is not firmly established in case of GDP, GTR, NPRE, IP, DRE, Sub, PRE and OD, which indicates that there exists a possibility of error committed in the base year feeding to an error in the entire projection horizon. NTR and NDCR are volatile in nature and hence record an absence in persistence of errors. Similarly, as CE, FD, RD and NDCR are residual items their volatility would have established the absence of persistence of errors.

#### 4.4 Test of unbiasedness

The FC's assessments were often quoted to be on the optimistic side with the underlying assumptions of structural changes occurring to improve the macroeconomic scenario. Public authorities viz. the Ministry of Finance of the Central Govt. present a pessimistic view to build in a safety margin. The rationale for this behaviour on part of Central Govt. could be to show a bleak financial scenario to prevent adequate transfers to States. Absence of bias would specifically mean that on average the forecast error is zero, indicating no systemic over or under estimation. It is examined by running a regression on error percentage on a constant ( $\alpha$ ) and an error term.

$$e\%age = \alpha + \mu$$

and the null hypothesis being

$$H_0: \alpha=0$$

In *table 3*, average forecast errors with probability value of Null hypothesis are mentioned. Null hypothesis can be accepted where probability values are larger than 0.05.

**Table 3: Test of Unbiasedness – Central Finances**

	GDP	GTR	NTR	NPRE	IP	Sub	DRE	PRE	RD	FD	OD	NDCR	CE
<b>N</b>	22	22	22	22	22	22	17	17	22	12	12	12	12
<b><math>\alpha</math></b>	-5.5	1.5	5.2	-13	-5.5	-36.8	-2.7	-13.9	-69	-9.2	-17.2	18.6	37
<b>Signif <math>\alpha=0</math></b>	0.01	0.59	0.10	0.0	0.07	0.0	0.56	0.02	0.0	0.27	0.00	0.46	0.00

$\alpha$ : coefficient in the regression  $e = \alpha + \mu$  where  $e$  is the forecast error.

Signif  $\alpha=0$ : significance level of the t-statistic for  $\alpha=0$ . Numbers above 0.05 indicate absence of bias at the 5 per cent significance level.



Absence of bias could not be established in parameters of GDP, NPRE, Subsidies, PRE, RD, OD and CE. Generally, the parameters of GDP, NPRE, IP, Subsidies, DRE, PRE, RD, FD and OD were underestimated and parameters of GTR, NTR, NDCR and CE were overestimated.

#### 4.5 Efficiency of Forecasts

A forecast can be termed as efficient in case its forecast error is not related to the information available. A test of weak efficiency can be represented by the following realisation-forecast equation.

$$R = \alpha + \beta F + \mu$$

With the null hypothesis of

$$H_0: \alpha=0 \text{ and } \beta=1.$$

In case of  $\alpha$  being significantly different from zero and  $\beta$  being significantly different from unity, the forecast will be correlated with forecast error and can be improved with exploiting this information.

**Table 4: Efficiency Test of Assessments – Central Finances**

	$\alpha$	Signif $\alpha=0$	$\beta$	Signif $\beta=1$	Signif $\alpha=0, \beta=1$	RSq	DW	N
GDP	-153176	0.17	1.13	0.00	0.00	0.98	0.45	22
GTR	-15200	0.35	1.08	0.08	0.16	0.97	0.62	22
NTR	-4453	0.63	1.06	0.61	0.88	0.80	2.54	22
NPRE	-27012	0.31	1.33	0.00	0.00	0.89	0.89	22
IP	1428	0.84	1.04	0.52	0.31	0.94	0.92	22
Sub	2724	0.71	1.81	0.00	0.00	0.83	1.47	22
DRE	-5239	0.49	1.18	0.23	0.26	0.81	0.78	17
PRE	34878	0.02	0.76	0.01	0.03	0.85	0.52	17
RD	53426	0.03	1.14	0.68	0.02	0.36	1.25	22
FD	11465	0.86	1.19	0.58	0.28	0.56	1.68	12
OD	7730	0.97	1.23	0.05	0.00	0.93	1.01	12
NDCR	10146	0.65	0.92	0.92	0.51	0.10	1.45	12
CE	15375	0.28	0.61	0.00	0.00	0.81	2.26	12

$\alpha$  and  $\beta$ : coefficients in the regression  $R = \alpha + \beta F + \mu$

Signif (.): significance level of the t-statistic (single test) or F-statistic (joint test) of the null hypothesis; numbers above 0.05 indicate that the null hypothesis can be accepted at the 5 per cent significance level.

GDP assessments were inefficient. The receipts i.e GTR, NTR and NDCR were efficiently assessed. The assessments of expenditure parameters were largely inefficient with an exception to DRE and IP. On the deficit parameters, FD was efficiently assessed, however inefficiency is reflected in the OD and RD assessments. In sum, the receipt assessments were relatively well formulated and the expenditure assessments were inefficient. The intercept term is statistically not different from zero at 95 per cent confidence level with an exception to PRE and RD. In case of all the receipt parameters the coefficient is not different from one. However, in case of expenditure parameters all the coefficients with an exception to IP and DRE are statistically different from one. In case of GDP, the intercept is statistically different from one at the same conventional levels. On the deficit front the coefficient of RD and OD are statistically different from zero. Alternatively, the coefficient of FD is statistically equal to one. However, the results in case of NDCR may not be very reliable in light of a very poor fit (RSQ=0.10). However, we must note that the estimated model is not the best fitting model to explain the dependent variable, and

the small number of observations available for the estimation puts restriction to any effort of including more variables including the multiple AR terms to improve the data generating process. Nevertheless, the estimated relationship postulated earlier, allows us to test for the validity of the hypothesis posed.

#### Robustness Check by Maximum Entropy Bootstrap<sup>4</sup>

Majority of series under consideration are non-stationary with the existence of unit root. The series can be made stationary by differencing, however as assessments of finances underwent structural shifts once in 5 years, differencing across these changes may lead to a loss of crucial information by destroying the original specification and lead to unreliable results. Hence, differencing technique to impart stationarity to the series is not appropriate for this exercise. Unfortunately, another difficulty associated with this exercise is the availability of short time series, downwards of 22, which makes it difficult to assume asymptotic theory.

**Table 5: Maximum Entropy Bootstrap Confidence Intervals**

	$\alpha$		$\beta$	
	2.5%	97.5%	2.5%	97.5%
GDP	-721006	211520	0.99	1.33
GTR	-75420	19846	0.96	1.29
NTR	-15619	12502	0.81	1.22
NPRE	-78581	13913	1.14	1.55
IP	-17824	14633	0.92	1.21
Sub	-13863	9211	1.57	2.41
DRE	-16393	3041	1.01	1.42
PRE	12858	49906	0.65	0.93
RD	32546	58497	0.93	1.77
FD	-113201	75725	0.83	1.88
OD	-618275	415671	1.05	1.52
NDCR	-4880	34225	-0.05	1.52
CE	-7656	33242	0.49	0.78

1. Numbers above indicate the 95 per cent confidence intervals of both coefficient and intercept term
2. Non confirmations are highlighted

In order to overcome the above mentioned issues of non stationarity and shorter time series, we implement the robustness check for the efficiency results by implementing maximum entropy bootstrap introduced by Vinod (2004, 2006, 2009). Robustness check is run over the 999 replicates constructed out of the maximum entropy bootstrap algorithm. The ME bootstrap, unlike the traditional bootstrap does not assume stationary of data and retains the basic shape of the original time series.

The results of maximum entropy bootstrapping are reported in *table 5*. The results are generally robust to meboot, however the result of coefficient equal to one from OLS regressions for OD and DRE is not robust. Alternatively, rejection of hypothesis of coefficient equal to one in case of GDP is confirmed by meboot only at 93 per cent confidence level.

## 5. Concluding Observations and Policy Implications

What do the results tell us about are the stylised facts highlighted in the review of literature on the subject. The standard global result is that the Government estimates tend to underestimate expenditure and overestimate revenue, perhaps the causes being i) the desire to see a fiscally prudent future that is frustrated by unfolding events and ii) biases in estimation of specific values. The Finance Commission's assessments may also suffer from these biases. But the picture we find is a mixed one. We find consistent underestimation of nominal GDP growth which in turn appears to happen because Finance Commissions underestimate inflation and overestimate real GDP growth. In a growing economy like India, this is quite plausible due to behavioral reasons. Governments have a mandate to maximise growth subject

<sup>4</sup> We thank Lekha Chakraborty for suggesting this approach and Honey Karun for the results.

to moderate inflation; when there is an independent Central Bank then it becomes difficult for the Government to indulge in wishful thinking on the growth inflation trade-off. But this has not been the case for much of India's history. However, this is likely to change now with the increasing tendency of all arms of Government to accept Reserve Bank of India's inflation forecasts.

It is impressive that assessments of tax revenues have been largely accurate even when assessments of the tax base i.e. GDP are not so. This seems to imply that tax buoyancies in India are relatively stable and change only at inflection points; this indeed seems to be reinforced by the fact that 12th and 13th Finance Commissions have underestimated the tax revenues, post 2004-05, tax buoyancy appears to have increased significantly due to tax reforms and the growth effect.

Expenditure trends reveal interesting insights. Non-plan revenue expenditure of the Centre tends to be underestimated. Of its components, Defence revenue Expenditure is reasonably well targeted except in times of military mobilisation and decadal adjustment in military pay. Interest payments tend to be predicted less well in either direction, the main reason being a higher accumulation of debt stock due to higher than expected borrowing and underassessment of interest rate due to higher than expected inflation. Subsidies are consistently underestimated but there is a compelling and interesting reason for this. Since 1991, there is a consensus that bulk of expenditure on subsidies is unproductive and therefore a key element of fiscal consolidation at Centre would involve reduction in subsidies. Such a prescriptive stance has been duly reflected in every Finance Commission's assessment. However, subsidies have been the Achilles heel of Indian fiscal consolidation at the Central Government level. Political economy compulsions and vested interests have pushed back reforms; this, combined with exogenous shocks to oil prices, has consistently inhibited any serious fiscal consolidation on this front. This is consistently reflected in the marksmanship exercise.

In the case of plan revenue expenditure too, a change in Government policy was not captured by many Finance Commissions. This change in policy was to switch plan funds away from investments in capital expenditures in sectors like electricity and transportation towards human development oriented expenditures in sectors like health, education and MGNREGS. This process began in the late 1990s and has continued since. However, this was not picked up in Finance Commissions assessments, though we see that this trend was corrected by the 13th Finance Commission. An important reason why this change in policy was not factored into Finance Commission's assessments is plausibly that the interpretation of the terms of reference led Finance Commissions to focus on assessment of non-plan revenue expenditure, though a residual figure of plan revenue expenditure would obviously exist in the process of making a comprehensive fiscal assessment.

It is interesting that when fiscal deficit assessments were wrong this was largely driven by under-estimation of revenue deficit which is a consistent feature of the period under review. The reason why the fiscal deficit was better predicted than the revenue deficit is that Governments reacted to higher than expected revenue deficits by cutting capital expenditure so as to control the fiscal deficit. This has been a consistent trend and the room for doing so has vanished now. During the period, 2009-14, 74.2 per cent (average) of fiscal deficit was on account of revenue deficit versus 60.5 per cent during the period 2004-08.

Thus, the story of Finance Commissions assessments reflects an interesting political economy theatre of contention between aspirations and outcomes. The aspiration was to secure fiscal consolidation by controlling deficit through expenditure

side adjustments. This did not happen and is duly reflected in the fact that expenditure side predictability of the assessments is much lower than the revenue side predictability. The preponderance of random error relative to systemic error is therefore reflective on this political economy conundrum that remains at the heart of dilemma confronting Indian fiscal consolidation.

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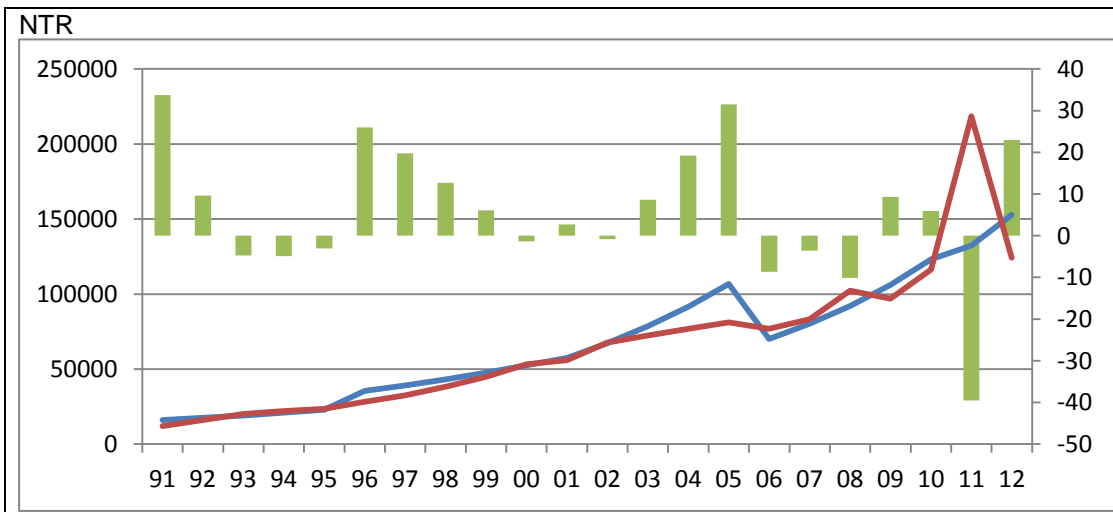
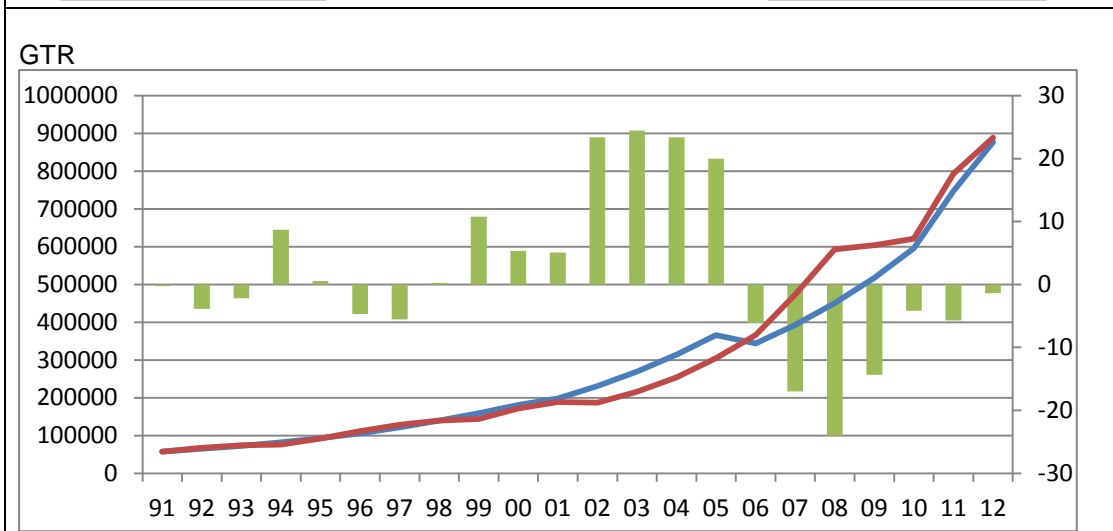
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### Appendix 1:

#### Graphical Representation of Projections and Actuals – Central Finances

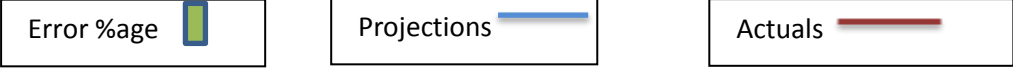
Axis to the left denotes the Quantum in Rs. Crores; Axis to the right denotes the error %age.

Error %age 
Projections 
Actuals

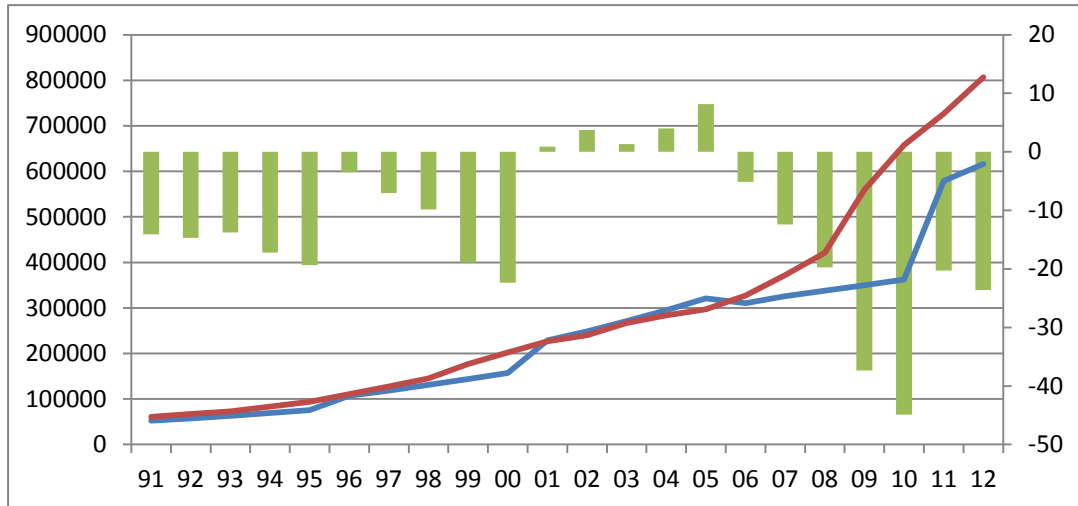




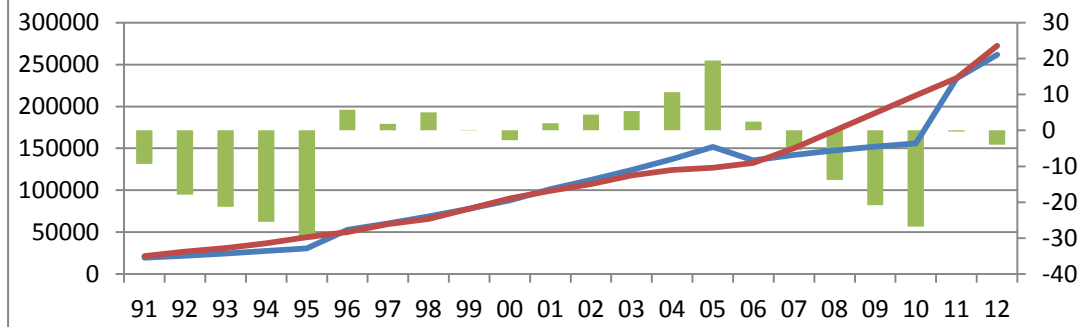
Axis to the left denotes the Quantum in Rs. Crores; Axis to the right denotes the error %age.



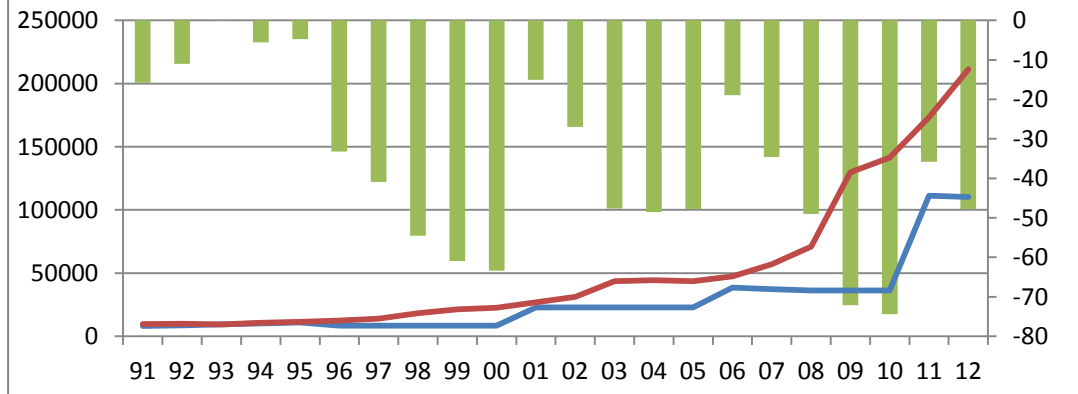
**NPRE**



**IP**



**SUB**

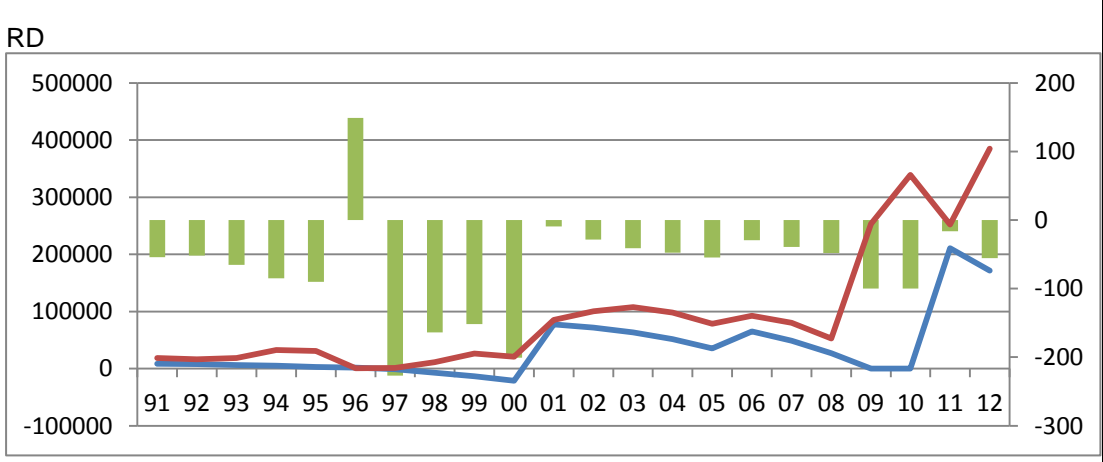
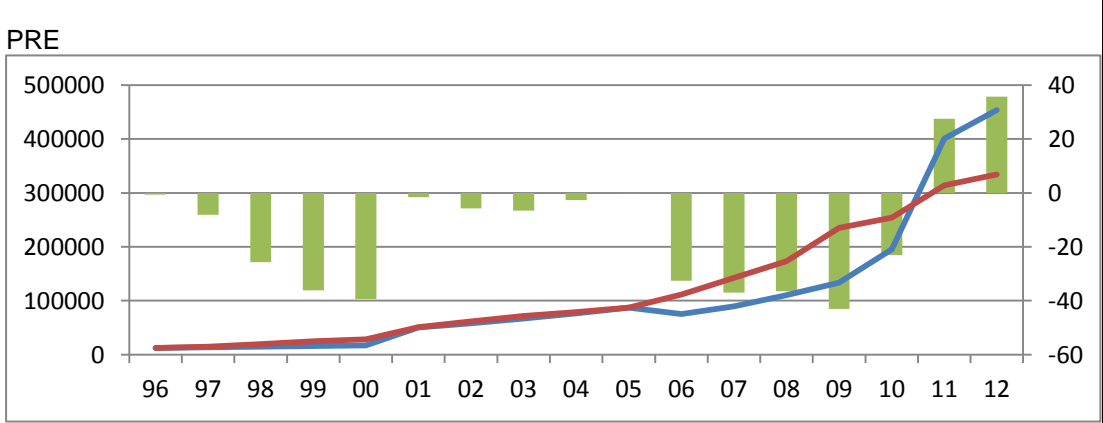
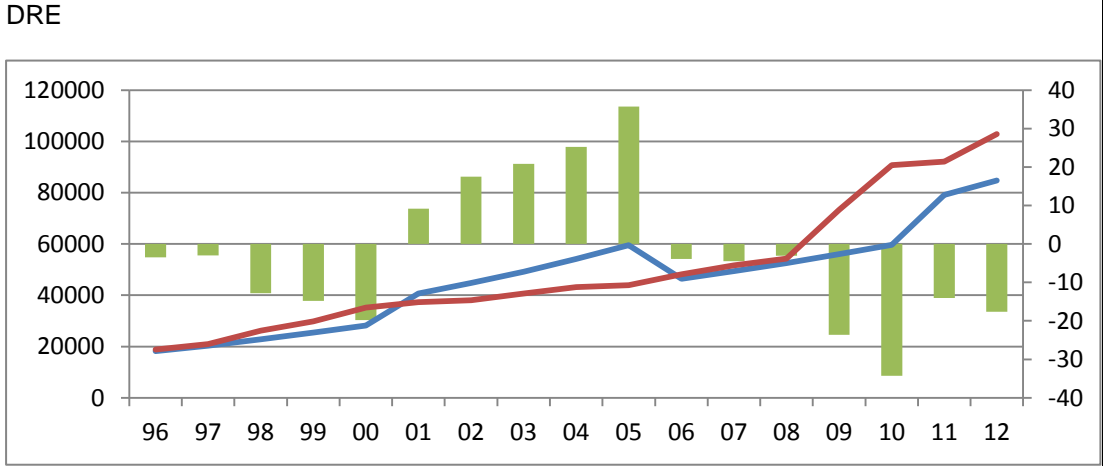


Axis to the left denotes the Quantum in Rs. Crores; Axis to the right denotes the error %age.

Error %age

Projections

Actuals



Axis to the left denotes the Quantum in Rs. Crores; Axis to the right denotes the error %age.

