STUDY OF SALES TAX IN ANDHRA PRADESH (REVENUE FORECASTING AND TARGET FIXATION)

INTERIM REPORT

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AUGUST, 1988

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PREFACE

The National Institute of Public Finance and Policy is an autonomous non-profit organisation whose primary functions are to undertake research, consultancy and training in the field of public economics and related policy.

The present interim report is a part of the study commissioned by the Government of Andhra Pradesh to enquire into some specific aspects of Sales Tax in the State. The terms of reference are:

1. A rational, realistic method of estimating the sales tax potential in the State and fixing the collection targets/budget estimates;
2. A method of adjusting the above targets with reference to ups and downs in the State's economy through a set of relevant indicators;
3. Estimating leakage of tax by cross-checking with other socio-economic quantitative indicators;
4. Identifying worthwhile new sources of taxation;
5. An algorithm for evaluating requests for concession/exemption; and,
6. Minimising adverse impact of a 'rate war' among neighboring States.

The interim report examines the present methods of budgetary forecasting of sales tax revenue and attempts to suggest improvements so that the revenue targets will be more realistically fixed. It also contains a brief overview of the budgetary trends in the State and the role and potential of sales tax in Andhra Pradesh.

The Governing Body of the Institute does not take any responsibility for the views expressed in the report. That responsibility lies with the Director and more particularly the authors.

Director

A. BAGCHI

ACKNOWLEDGMENTS

We gratefully acknowledge the help and guidance by Dr A Bagchi who went through the draft with meticulous care and was instrumental in improving the presentation.

We are indebted to the Finance Department, Government of Andhra Pradesh, and the Department of Commercial Taxes, in particular, Shri P K Doraiswamy, Shri E A S Sarma and Shri A Rajendra Prasad for their cooperation and help.

We are also thankful to Shri K N Balasubramanian for showing keen interest at various stages. Shri R S Singh rendered able research assistance.

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1. Introduction.

1.1.1 The budgets of both the Centre and the States in India have in recent years been marked by a growing imbalance between receipts and expenditure on the revenue account. While the Centre's revenue budget has been showing a deficit almost from the beginning of the present decade, in the States, revenue account deficit has been a relatively recent phenomenon. Budgets of several States no doubt exhibited some deficits of varying magnitudes in the early seventies. But this phenomenon almost disappeared in the latter half of the decade, due largely to the step up in the flow of federal funds following the Seventh Finance Commission's recommendations. Yet, since 1984-85, nearly one half of the major States have been unable to meet their current expenditure out of current revenues (Table 1.1)

1.1.2 If the devolution component of their current revenues is left out, none of the States is able to meet their current expenditure out of revenue from their own sources (Table 1.2). While this is to be expected in the federal set up envisaged in the Indian Constitution with a clear imbalance in the distribution of the functions allotted to the States and their fiscal powers, the size of the gap between revenue from own sources and revenue expenditure varies widely from State to State. As Table 1.3 would show, as of 1985-86, the latest year for which the actual figures of revenue and expenditure are available, own source revenue as a proportion of revenue expenditures varies from 89 per cent in the case of Haryana to 34 per cent in Assam. Andhra Pradesh comes in between with 66 per cent. Taking the quinquennial average for 1981-82 to 1985-

86, Andhra Pradesh ranks 9th among the States in terms of proportion of revenue expenditure financed out of the States' own revenue (Table 1.4), with an average of 66 per cent while Haryana comes at the top with over 90 per cent. What causes concern is that the proportion of revenue expenditure met out of own revenue in Andhra Pradesh has declined steadily over the years, from an average of 73 per cent in the first half of the 'Seventies to 71 per cent in the second half and 66 per cent in the first five years of the current decade. The ranking of Andhra Pradesh among the States in this respect has also gone down from 8th to 9th.

1.1.4 The obvious reason underlying the phenomenon of growing deficit on revenue account is the faster growth of expenditure than that of revenue. Growth rates of current expenditure, total revenue and own revenue observed during the period 1971-72 to 1985-86 for the major States are set out in Table 1.5. It will be seen that Andhra Pradesh recorded the highest rate of growth of revenue expenditure among all the States in the reference period (17.4 per cent) while its combined revenue grew at the rate of 16.4 per cent and its own revenue at the rate of a little less than 17 per cent.

1.1.5 In terms of growth of revenue from own sources the State ranks third with a growth rate of about 17 per cent. Growth of own tax revenue has been the fastest among the States during the period (17.7 per cent), which is higher than that of revenue expenditures during the fifteen year period ending 1985-86 (*vide* last two columns of Table 1.5). Even so, the gap between own revenue and revenue expenditure has widended because of a sharp rise in expendi-

ture during the first half of the present decade (at the rate of 20.7 per cent) outpacing revenue growth despite an acceleration in the latter as shown in Table 1.6.

1.1.6 Since the additional revenues for financing government expenditures over and above what could be regarded as the national average have to be found from the State's own sources, the question naturally arises can the growth of revenue expenditure at the rate it has taken place in the first half of this decade be sustained?

1.1.7 Despite very rapid growth in recent years the proportion of revenue expenditure to SDP is not yet the highest in Andhra Pradesh. While the ranking of the State has gone up dramatically in the reference period in this regard from 10th in the first half of Seventies to 5th in the first five year of the Eighties (*vide* Table 1.7), Andhra does not yet head the table in this respect. If, however, expenditure keeps growing at this rate, Andhra Pradesh will before long have distinction of having the highest revenue expenditure to SDP ratio among the States. In fact, in 1985-86, this ratio was next only to that of two other States in the country, *viz.*, Karnataka and Kerala.

1.1.8 Faced with rising expenditure the State is also making valiant efforts to raise revenue. As noted already, during the fifteen year period 1971-72 to 1985-86, Andhra Pradesh recorded the highest growth in revenue from own sources. During 1981-82 to 1985-86 too, the growth in own tax revenue of the State went up to a little over 19 per cent which is the highest in the country in recent years. Even so, ranked according to the ratio of own revenue to SDP

Andhra Pradesh stands 6th (taking the averages for 1981-82 to 1985-86) while in terms of own tax revenue to SDP ratio, the State ranked 4th (*vide* Tables 1.8 and 1.9). What seems to have pulled down the growth of aggregate revenue of the State from its own sources is the decline in the growth of non-tax revenues (other than grants) of the State. In the five year period 1981-82 to 1985-86, non-tax revenue growth slumped to 12 per cent as compared to a growth of 27 per cent in the first half of the 1970s. As a result, the proportion of non-tax revenue in the aggregate own source revenue of the State has gone down from 28 per cent in the early Seventies to about 24 per cent at present. If the State is to arrest the current trends, if not reverse it, it has either to restrain the growth of its current expenditure or accelerate the growth of its own revenue and since it is the relative sluggishness in the growth of non-tax revenue which appears to have dampened the growth of revenue from own sources, efforts need to be directed towards improving the yield of non-tax revenue sources among which the return on investments in State enterprises constitutes a major item. However, stepping up the growth of non-tax revenues calls for measures on several fronts and many of them (such as raising the fees and charges for various services provided by government) would take time to implement. Hence ways of improving the yield of tax revenue from its own sources also need to be explored and since sales tax constitutes the most important tax instrument at the disposal of the States, the focus of any such inquiry has to be on sales tax.

1.1.9 It is in this background that the Government of Andhra Pradesh commissioned the present study. Apart from

the growing gap between own revenue and current expenditure, another disturbing feature of budgeting in the States is the wide variation between budget estimates and the actuals of revenue and expenditure. Variations between budget estimates and actuals (as percentage of actuals) for total revenue expenditure, total revenue and own tax revenue for the five years ended 1985-86 for the major States are set out in Tables 1.10, 1.11, and 1.12. The "per cent mean square" of the deviations are given in Table 1.13. It will be noticed that while the variations between budget estimates and actuals measured in this way do not seem to be very large in the case of Andhra Pradesh, at least in respect of revenue expenditure, in the case of own tax revenue the variation seems to be quite large. This suggests that the basis on which the budget estimates are made needs a fresh look. Such an examination would also help to indicate the potential for taxation in the State, to what extent it has been tapped and what scope is left for further taxation. In the absence of a scientific approach to budgeting, there is a possibility of excessive taxation especially in the face of mounting pressure for more and more expenditure and growing revenue gap which can be unsustainable and detrimental to the State's economy in the long run. A study of the sales tax potential in the State with a methodology for forecasting revenue on scientific lines was thus called for. The initiation of this study reflects the State Government's concern in this regard. The terms of reference of the study are as follows:

1. A rational, realistic method of estimating the sales tax potential in the State and fixing the

collection targets/budget estimates;

2. A method of adjusting the above targets with reference to ups and downs in the State's economy through a set of relevant indicators;

3. Estimating leakage of tax by cross-checking with other socio-economic quantitative indicators;

4. Identifying worthwhile new sources of taxation;

5. An algorithm for evaluating requests for concession/exemption; and.

6. Minimising adverse impact of a 'rate war' among neighboring States.

In the first part of this the report we present an overview of the role of sales tax in finances of Andhra Pradesh and a broad assessment of its potential. We also examine the alternative techniques for forecasting available and formulate a method which appears to us to be best suited for scientific and realistic projections of revenue. The other issues raised in the terms of reference will be taken up in the subsequent part of the report.

Table 1.1
Current Budget Deficit of Major States
(Total Revenue - Revenue Expenditure)
(1970-71 to 1985-86)

(Rs.Crore)

S.No.	State	1970-71	1971-72	1972-73	1973-74	1974-75	1975-76	1976-77	1977-78
1	A.P.	-0.43	8.58	4.26	38.97	96.26	147.14	110.86	69.26
2	Kar	-5.81	-4.71	-9.15	6.76	48.18	85.54	63.87	64.64
3	Ker	-12.98	-7.41	-6.95	-19.65	0.31	-3.49	-3.30	28.15
4	Tam	-7.59	6.50	21.05	13.67	-6.08	5.44	0.62	-24.07
5	Mah	-2.01	-17.65	-58.11	-71.67	56.35	129.57	175.97	163.46
6	M.P.	24.09	41.77	48.54	17.45	35.65	118.46	111.83	63.40
7	Ori	-4.05	-23.76	-24.65	-37.85	3.86	1.28	17.63	27.83
8	Asm	-19.74	-24.76	-9.16	-36.50	13.17	22.64	30.96	19.78
9	Bih	-19.75	-35.64	-8.94	-13.29	16.09	96.95	106.77	103.03
10	Guj	2.53	34.53	-1.29	-0.39	24.35	72.10	57.23	123.68
11	Har	5.80	7.84	18.56	25.16	22.32	41.53	46.52	64.79
12	Pun	34.27	15.95	26.56	8.32	29.79	26.14	60.51	63.30
13	Raj	-51.42	-16.07	-8.56	-35.61	14.26	47.16	51.25	25.89
14	Utt	71.54	11.26	5.67	30.64	12.23	141.16	163.41	101.56
15	Wes	-38.89	-19.49	60.67	3.60	-8.39	-16.42	-23.61	1.82

Table 1.1 (Contd.)
Current Budget Deficit of Major States
(Total Revenue - Revenue Expenditure)
(1970-71 to 1985-86)

(Rs.Crore)

S.No.	State	1978-79	1979-80	1980-81	1981-82	1982-83	1983-84	1984-85	1985-86
1	A.P.	117.13	191.29	103.41	80.00	133.57	-85.58	-169.04	-7.31
2	Kar	51.70	80.65	58.56	164.29	41.89	72.91	-143.62	-84.74
3	Ker	43.00	57.93	-27.22	95.96	26.76	-58.20	-13.67	-74.16
4	Tam	47.97	95.30	127.71	81.66	101.94	51.71	17.17	188.57
5	Mah	136.25	195.41	121.02	147.37	209.40	70.76	-212.00	-316.65
6	M.P.	123.09	167.09	117.75	229.26	167.77	176.26	79.13	70.42
7	Ori	45.10	16.66	80.81	27.97	-22.98	0.36	-74.03	-60.09
8	Asm	34.11	-40.73	164.76	-36.78	10.15	-137.21	-135.81	-5.56
9	Bih	118.55	230.51	59.55	-7.02	-37.70	72.14	106.71	297.66
10	Guj	71.03	92.30	121.73	120.31	66.26	132.91	68.26	-69.91
11	Har	53.21	84.32	59.22	50.54	44.76	75.85	29.56	105.11
12	Pun	94.44	77.49	16.13	62.63	102.48	59.27	-9.35	7.34
13	Raj	55.48	18.01	65.32	34.28	54.53	44.65	-75.86	-2.16
14	Utt	141.10	245.06	182.64	353.43	192.37	-105.75	-147.30	174.61
15	Wes	78.89	13.71	23.51	87.81	242.44	206.17	371.94	-82.89

Note: Generally the source for all the tables in the report is RBI Bulletin Various issues.

Table 1.2
Current Budget Deficit of Major States
(Own Revenue - Revenue Expenditure)
(1970-71 to 1985-86)

(Rs.Crore

No.	State	1970-71	1971-72	1972-73	1973-74	1974-75	1975-76	1976-77
1	A.P.	-98.76	-117.24	-141.73	-116.10	-81.73	-74.32	-140.40
2	Kar	-65.29	-79.88	-99.06	-91.57	-40.96	-36.05	-70.93
3	Ker	-67.89	-72.39	-86.43	-102.39	-108.92	-132.47	-135.19
4	Tam	-90.93	-102.13	-106.37	-114.72	-132.56	-149.39	-181.99
5	Mah	-111.97	-164.11	-274.80	-313.30	-104.77	-80.90	-45.22
6	M.P.	-59.96	-67.12	-51.81	-116.61	-97.04	-51.02	-83.37
7	Ori	-73.44	-105.67	-114.99	-128.45	-125.04	-149.65	-149.36
8	Asm	-84.88	-101.85	-79.76	-102.61	-99.72	-97.26	-96.94
9	Bih	-135.55	-179.51	-179.92	-185.55	-164.60	-147.78	-141.37
10	Guj	-59.08	-39.47	-93.95	-115.55	-74.09	-56.42	-73.05
11	Har	-16.01	-17.65	-13.77	-9.12	-10.52	-5.30	6.96
12	Pun	1.78	-27.86	-36.97	-55.45	-17.94	-43.46	-36.33
13	Raj	-125.32	-103.39	-111.50	-155.09	-129.35	-119.23	-135.85
14	Utt	-108.97	-209.26	-254.03	-256.20	-331.88	-245.58	-280.65
15	Wes	-147.67	-229.15	-203.91	-148.71	-172.28	-197.12	-209.49

Table 1.2 (Contd.)
Current Budget Deficit of Major States
(Own Revenue - Revenue Expenditure)
(1970-71 to 1985-86)

(Rs.Crore

No.	State	1978-79	1979-80	1980-81	1981-82	1982-83	1983-84	1984-85
1	A.P.	-233.43	-327.16	-358.22	-420.17	-438.33	-767.14	-917.77
2	Kar	-119.66	-156.17	-218.45	-151.62	-299.05	-340.66	-627.44
3	Ker	-132.67	-120.88	-232.90	-147.99	-226.68	-357.41	-383.59
4	Tam	-182.99	-241.41	-282.57	-373.48	-397.02	-575.56	-696.04
5	Mah	-188.37	-225.08	-349.36	-351.64	-394.91	-649.78	-741.77
6	M.P.	-150.86	-217.62	-366.38	-268.94	-375.14	-506.74	-622.72
7	Ori	-209.08	-275.54	-274.41	-315.00	-546.59	-455.02	-548.04
8	Asm	-140.27	-194.14	-28.96	-255.32	-246.91	-474.37	-562.64
9	Bih	-280.28	-315.32	-556.58	-672.53	-780.07	-761.50	-884.77
10	Guj	-106.61	-142.79	-186.68	-190.06	-274.89	-254.91	-389.23
11	Har	-17.66	-8.72	-47.50	-56.93	-27.65	-77.33	-63.96
12	Pun	5.06	-28.32	-106.13	-72.94	-46.03	-119.36	-209.43
13	Raj	-218.24	-272.33	-258.94	-334.59	-332.37	-389.64	-535.95
14	Utt	-495.24	-617.26	-627.94	-769.35	-1099.56	-1364.31	-1767.67
15	Wes	-406.79	-370.31	-445.66	-595.96	-619.35	-612.57	-1040.91

Table 1.3
State's Own Revenue as Per Cent of Revenue Expenditure
majOr States
(1970-71 to 1985-86)

(per cent)

No.	State	1970-71	1971-72	1972-73	1973-74	1974-75	1975-76	1976-77
1	A.P.	62.13	59.65	59.82	72.09	81.00	65.28	77.24
2	Kar	69.30	65.34	69.67	74.55	58.78	91.59	85.68
3	Ker	57.36	60.12	57.70	56.86	62.14	62.69	65.29
4	Tam	68.54	71.42	74.49	75.73	74.91	73.22	71.04
5	Mah	74.15	67.98	57.77	62.82	88.81	91.20	95.60
6	M.P.	69.67	69.60	71.77	65.13	74.97	88.09	53.40
7	Ori	40.63	33.42	40.35	39.54	44.06	45.81	51.53
8	Asm	28.47	27.55	37.00	32.52	38.39	45.77	47.75
9	Bih	42.00	36.81	46.13	46.38	52.63	62.62	65.66
10	Guj	71.37	81.36	67.87	65.68	78.92	84.67	84.72
11	Har	79.48	79.94	88.23	92.92	93.62	97.17	103.33
12	Pun	101.50	79.89	80.46	75.32	91.85	84.38	88.50
13	Raj	39.45	45.50	53.93	48.11	57.75	65.71	66.15
14	Utt	57.89	51.99	55.66	59.74	53.92	69.65	70.20
15	Wes	49.89	41.85	51.02	61.12	61.87	63.76	64.93

Table 1.3 (Contd.)
State's Own Revenue as Per Cent of Revenue Expenditure of
majOr States
(1970-71 to 1985-86)

No.	State	1978-79	1979-80	1980-81	1981-82	1982-83	1983-84	1984-85
1	A.P.	71.78	67.77	69.33	69.69	70.90	62.43	62.73
2	Kar	81.21	78.66	75.59	54.87	75.88	75.95	66.69
3	Ker	72.27	77.35	65.41	50.39	70.81	60.95	65.31
4	Tam	75.71	71.55	75.65	72.54	74.83	69.68	66.51
5	Mah	86.61	85.92	81.75	84.39	84.96	79.58	80.66
6	M.P.	76.50	72.51	63.94	74.05	71.76	66.79	64.06
7	Ori	48.03	38.62	49.23	45.05	33.71	41.87	38.69
8	Asm	45.43	37.36	52.46	38.53	42.43	31.04	32.59
9	Bih	50.53	50.74	40.06	42.35	43.50	46.53	47.56
10	Guj	82.33	80.81	79.33	61.71	78.57	68.13	[illegible]
11	Har	95.73	97.26	85.15	85.37	95.04	87.53	91.59
12	Pun	101.31	93.59	80.32	88.24	93.27	65.44	77.75
13	Raj	59.62	57.14	62.34	59.30	65.18	64.51	56.57
14	Utt	59.43	57.12	51.75	58.59	55.17	50.59	46.31
15	Wes	54.93	62.09	60.04	57.61	49.48	53.38	51.60

Table 1.4
Proportion of State's Own Revenue
to Revenue Expenditure in Major States
(5 Year Average)

(Per Cent)

No. State	1971-72 to 1975-76	Rank	1976-77 to 1980-81	Rank	1981-82 to 1985-86	Rank
1 Andhra	73.37	5	[illegible]	[illegible]	[illegible]	[illegible]
2 Karnat	79.66	3	[illegible]	[illegible]	[illegible]	[illegible]
3 Kerala	68.32	9	[illegible]	[illegible]	[illegible]	[illegible]
4 Tamil	74.05	7	[illegible]	7	71.66	[illegible]
5 Mahara	74.79	6	[illegible]	[illegible]	[illegible]	[illegible]
6 Madhya	75.12	[illegible]	[illegible]	[illegible]	[illegible]	7
7 Orissa	41.35	14	[illegible]	[illegible]	[illegible]	14
8 Assam	[illegible]	15	[illegible]	[illegible]	[illegible]	[illegible]
9 Bihar	49.77	13	[illegible]	14	[illegible]	[illegible]
10 Gujrat	75.78	4	[illegible]	4	[illegible]	4
11 Haryana	91.76	1	[illegible]	1	[illegible]	1
12 Punjab	82.71	2	[illegible]	[illegible]	[illegible]	[illegible]
13 Rajast	[illegible]	12	[illegible]	[illegible]	[illegible]	[illegible]
14 Uttar	[illegible]	10	[illegible]	[illegible]	[illegible]	[illegible]
15 West B	[illegible]	11	[illegible]	[illegible]	[illegible]	[illegible]

Table 1.5
Growth of Revenue and Expenditure in Major States
1971-72 to 1985-86
(annual compound rates)

(per cent)

No.	States	Revenue Expenditure	Rank	Total Revenue	Rank	Own Revenue	Rank	Own Tax Revenue	Rank
1	Andhra Pr	17.45	1	16.37	3	16.98	3	17.71	1
2	Karnataka	16.09	5	15.72	6	15.67	9	17.24	4
3	Kerala	15.16	11	15.46	11	16.25	6	17.56	3
4	Tamil Nad	14.91	14	15.30	12	14.66	14	15.95	11
5	Maharasht	16.02	7	16.07	6	17.33	1	16.53	7
6	M.P.	16.96	3	16.37	4	15.97	8	16.33	8
7	Orissa	14.31	15	15.16	13	14.36	15	16.09	10
8	Assam	15.41	9	15.55	10	16.07	7	13.92	14
9	Bihar	15.94	8	16.62	1	15.66	10	13.35	15
10	Gujrat	16.72	4	16.33	5	16.94	4	17.59	2
11	Haryana	17.20	2	16.61	2	17.25	2	17.11	5
12	Punjab	15.06	12	14.40	14	15.04	12	15.35	12
13	Rajasthan	15.21	10	15.66	9	16.71	5	16.64	6
14	U.P	16.07	6	15.90	7	14.67	13	16.31	9
15	W.B	14.96	13	14.13	15	15.10	11	15.06	13

TABLE 1.6

Growth of Revenue and Expenditure in AP

(Per cent)

Item	1971-72 to 1975-76	1976-77 to 1980-81	1981-82 to 1985-86
1. Own revenue	26.13	14.13	17.89
2. Revenue expenditure	13.93	13.93	20.73
3. Own tax revenue	26.59	14.42	19.18
4. Own non-tax revenue	27.02	13.32	12.15

Table 1.7
Proportion of Revenue Expenditure to SDP in Major Stat
(5 Years Average for 1971-72 to 1985-86)

(Per Cent)

No.	State	1971-72 to 1975-76	Rank	1976-77 to 1980-81	Rank	1981-82 to 1985-86	Rank
1	Andhra Pradesh	10.74	10	15.52	4	18.94	5
2	Karnataka	13.14	5	15.52	3	20.07	2
3	Kerala	14.27	3	17.37	2	20.45	1
4	Tamil Nadu	14.29	2	15.43	6	19.48	3
5	Maharashtra	12.73	7	12.90	9	16.71	9
6	Madhya Pradesh	10.77	9	15.29	7	17.57	7
7	Orissa	14.45	1	18.53	1	19.30*	4
8	Assam	14.06	4	14.76	8	17.61	6
9	Bihar	10.19	13	11.62	14	16.15	10
10	Gujrat	11.08	8	12.32	12	15.39	11
11	Haryana	10.74	11	12.28	11	15.29	12
12	Punjab	10.10	14	10.78	15	12.64	15
13	Rajasthan	12.89	6	15.48	5	16.89	8
14	Utter Pradesh	10.43	12	12.36	10	14.49	13
15	West Bengal	9.83	15	11.94	13	13.97	14

Note: * the period in this case is 1981-82 to 1984-85.

Table 1.8
Proportion of Own Revenue to SDP in Major States
(5 Years Average for 1971-72 to 1985-86

(Per Cent)

No.	State	1971-72 to 1975-76	Rank	1976-77 to 1980-81	Rank	1981-82 to 1985-86	Rank
1	Andhra Pradesh	7.88	9	10.96	7	12.44	6
2	Karnataka	10.47	2	12.43	1	14.60	1
3	Kerala	8.61	5	12.18	2	13.57	4
4	Tamil Nadu	10.58	1	11.20	5	13.94	2
5	Maharashtra	9.52	4	11.26	4	13.38	5
6	Madhya Pradesh	8.09	8	11.11	6	11.81	8
7	Orissa	5.97	12	8.66	11	7.60*	11
8	Assam	5.10	14	8.43	12	6.09	15
9	Bihar	5.07	15	5.94	15	7.54	13
10	Gujrat	8.38	6	10.18	8	11.91	7
11	Haryana	9.85	3	11.67	3	13.80	3
12	Punjab	8.36	7	9.73	9	10.40	9
13	Rajasthan	7.13	10	9.42	10	10.25	10
14	Utter Pradesh	6.15	11	7.27	13	7.39	14
15	West Bengal	5.56	13	7.21	14	7.54	12

* Same as in Table 1.7

Table 1.9
Proportion of Own Tax Revenue to SDP in Major States
(5 years average)

(Per Cent)

No.	State	1971-72 to 1975-76	Rank	1976-77 to 1980-81	Rank	1981-82 to 1985-66	Rank
1	Andhra Pradesh	5.65	8	7.85	5	9.47	4
2	Karnataka	6.39	3	8.37	3	10.58	3
3	Kerala	6.05	6	8.95	1	10.60	2
4	Tamil Nadu	8.07	1	8.60	2	11.98	1
5	Maharashtra	6.99	2	7.93	4	9.36	5
6	Madhya Pradesh	4.79	9	6.48	9	7.16	9
7	Orissa	3.20	15	4.60	13	6.57	10
8	Assam	3.74	14	3.94	15	4.05	15
9	Bihar	3.82	13	4.35	14	4.59	14
10	Gujrat	6.00	7	7.51	7	9.04	6
11	Haryana	6.32	4	7.57	6	8.83	7
12	Punjab	6.24	5	7.21	8	8.08	8
13	Rajasthan	4.36	11	5.50	11	6.52	11
14	Utter Pradesh	3.66	12	5.11	12	5.35	13
15	West Bengal	4.55	10	5.66	10	6.28	12

Table 1.10
Difference between Budget Estimates and Actuals of Revenue Expenditure
As Per Cent of Actuals of
(1981-82 to 1985-86)

(Per Cent)

No.	States	1981-82	1982-83	1983-84	1984-85	1985-86
1	Andhra Pr	-11.20	2.53	3.10	-10.32	4.76
2	Karnataka	-2.69	-4.85	0.43	-7.97	-3.90
3	Kerala	-5.72	7.57	-7.67	-10.42	-14.52
4	Tamil Nad	-16.33	-13.07	-13.45	-11.94	-5.51
5	Maharasht	-8.47	-6.03	-10.34	-10.96	-9.51
6	M.P.	-4.70	-4.52	0.29	4.89	7.71
7	Orissa	-4.53	-22.52	-0.32	-6.82	5.85
8	Assam	-4.12	10.38	-2.77	-9.90	-3.14
9	Bihar	-16.46	-6.52	8.29	0.95	-10.15
10	Gujrat	-6.11	-12.72	-10.13	-8.96	3.79
11	Haryana	-10.54	-13.31	-7.32	-10.15	-2.98
12	Punjab	-14.92	-9.91	-6.86	-9.90	-5.69
13	Rajasthan	-15.80	-7.96	-2.21	-2.49	0.17
14	U.P	-8.50	-7.93	-9.41	-10.37	-4.91
15	W.B	-3.62	-7.25	-1.33	-6.56	0.37

Table 1.11
Difference between Budget Estimates and Actuals of Total Revenue As Per Cent of Actuals
(1981-82 to 1985-86)

(Per Cent)

No.	States	1981-82	1982-83	1983-84	1984-85	1985-86
1	Andhra Pr	-10.55	-0.76	9.81	-0.76	2.66
2	Karnataka	-11.09	-2.34	-1.22	-1.87	-0.02
3	Kerala	-15.13	3.41	-2.54	-5.46	-15.67
4	Tamil Nad	-21.73	-6.47	-9.56	-7.28	-10.23
5	Maharasht	-6.65	-4.11	-6.26	-6.47	-8.55
6	M.P.	-5.90	-5.91	-3.03	10.35	8.45
7	Orissa	-5.36	-17.46	2.05	2.34	13.68
8	Assam	0.55	0.50	1.86	-6.08	-13.67
9	Bihar	-8.55	3.75	-2.04	-1.81	-16.96
10	Gujrat	-6.30	-4.62	-6.82	-4.96	-2.46
11	Haryana	-3.33	1.66	0.51	2.61	-6.15
12	Punjab	-9.89	-0.61	1.23	5.54	-1.01
13	Rajasthan	-15.52	-13.75	-4.80	-3.66	-5.43
14	U.P	-17.96	-11.27	-3.36	-4.41	-11.54
15	W.B	6.03	1.33	-0.64	-1.94	-6.23

Table 1.12
Difference between Budget Estimates and Actuals of Own Tax Revenue As Per Cent of Actuals
(1981-82 to 1985-86)

(Per Cent)

No.	States	1981-82	1982-83	1983-84	1984-85	1985-86
1	Andhra Pr	-9.96	-0.76	16.51	0.96	0.42
2	Karnataka	-16.34	-4.44	4.26	-2.13	-0.38
3	Kerala	-4.77	0.74	-1.60	-6.23	-12.58
4	Tamil Nad	-25.34	-3.56	-6.17	-3.57	-5.54
5	Maharasht	-9.15	-3.69	-2.10	-4.62	-10.32
6	M.P.	-16.31	-10.69	-7.94	-2.95	-0.03
7	Orissa	-7.52	7.52	13.90	5.92	4.00
8	Assam	9.04	-6.90	-14.70	-29.36	-36.10
9	Bihar	-10.43	1.73	-0.41	15.85	-7.95
10	Gujrat	-11.03	-3.97	-7.13	-6.85	0.24
11	Haryana	-6.76	3.70	6.79	10.29	-1.21
12	Punjab	-12.79	0.96	4.93	5.28	0.19
13	Rajasthan	-13.15	-9.57	-1.61	-2.96	0.35
14	U.P	-23.57	-15.07	-5.24	-6.03	-9.91
15	W.B	11.70	7.01	1.02	-5.66	-5.69

Table 1.13
Per Cent Mean Square Error Of Budget Estimates
Revenue Expenditure, Total Revenue, Own Revenue and Own Tax
(1981-82 to 1985-86)

No.	States	Revenue Expenditure	Rank	Total Revenue	Rank	Own Tax Revenue	Rank
1	Andhra Prade	0.5413	5	0.4319	7	0.8866	11
2	Karnataka	0.2195	1	0.2667	4	0.6185	8
3	Kerala	0.9367	11	1.0446	12	0.4472	4
4	Tamil Nadu	1.5827	15	1.5262	15	1.4731	13
5	Maharashtra	0.8513	9	0.4309	6	0.4464	3
6	M.P.	0.2521	3	0.5147	9	0.9043	12
7	Orissa	1.2167	14	1.0607	13	0.7146	9
8	Assam	0.4804	4	0.4559	8	5.0247	15
9	Bihar	0.9722	12	0.7659	10	0.8525	10
10	Gujrat	0.7927	8	0.2765	5	0.4706	5
11	Haryana	0.9074	10	0.1174	1	0.4260	1
12	Punjab	0.9969	13	0.2625	3	0.4335	2
13	Rajasthan	0.6486	6	1.0105	11	0.5535	7
14	U.P	0.7105	7	1.2273	14	1.8897	14
15	W.B	0.2210	2	0.1627	2	0.5032	6

2. ROLE OF SALES TAX IN ANDHRA PRADESH AND POTENTIAL

2.1 Role of Sales Tax in the State's Finances

2.1.1 In line with the pattern observed in other States, Andhra Pradesh derives the bulk of its revenue from sales tax (ST). Currently, ST accounts for about one-third of its aggregate revenue and over 50 per cent of its tax revenue from own sources (Table 2.1). The contribution of sales tax to its own tax revenue has gone up steadily over the years from around 37 per cent in 1970-71 to 52.9 per cent in 1985-86. The predominance of ST in the State's revenue structure is also underlined by the fact that State excises which constitute the next most revenue yielding source, accounts for only about 25 per cent of its own tax revenue (Table 2.2).

2.1.2 ST came to acquire its pre-eminence through sustained growth at a high rate over several years. The growth had accelerated particularly since the Seventies. During the period 1971-72 to 1985-86, ST revenue had registered an annual growth of 23 per cent while in the preceding 10 years the growth was at a rate of barely 15 per cent (Table 2.3). The ST growth witnessed in Andhra Pradesh between 1971-72 and 1985-86 was the highest among the major States. As Table 2.4 would show, the growth in ST revenue in Andhra Pradesh as in other States has been faster than that of the SDP, with a buoyancy of more than 1. Can this growth be sustained in the future and if so, what should be the

strategy? This essentially is the question posed for investigation in this study.

2.2 The Potential

2.2.1 Even with the fastest growth in ST over the last fifteen years, per capita revenue from ST as also the ratio of ST to SDP in Andhra Pradesh is not the highest among the States yet (*vide* Tables 2.5 and 2.6). While the rank of the State with respect to ST-SDP ratio has gone up in the ten years ended 1985-86, there are at least five States in the country with a higher ratio with Tamil Nadu coming at the top with a ratio of 12.50 per cent as against 8.00 per cent of Andhra Pradesh (as of 1985-86). Therefore, on the face of it, there seems to be scope for greater exertion on the part of the State to raise more revenue from ST. That Andhra Pradesh could do better in shifting up the yield of sales tax is also underlined by the fact that buoyancy of revenue for ST with respect to SDP is not among the highest in the country, and in fact has declined in the 15 years period 1971-72 to 1985-86 as compared to the preceding ten years (Table 2.4). However, before drawing such a conclusion, it is necessary to look into the tax potential of the State in some more depth, since, as is well know, the level of per capita domestic product, though, important, is not the only determinant of tax potential. There are other important factors like the structure of the economy, the level and pattern of consumption (and not just of SDP), degree of inequality and so on. These must be taken into account before pronouncing any judgment about the relative tax effort of the State or its potential. It is also important to note

that the ST revenue in the State has been growing at the rate of over 20 percent per annum in last 15 years. Further acceleration of the ST revenue growth is thus not going to be easy and may have serious repercussion on the industrial growth of the State and the consumption level of the people, unless the structure of the tax is carefully designed.

2.3 The Structure of the State's Economy and Trends

2.3.1 Andhra Pradesh (AP), formed in 1957 by the merger of Andhra and Telengana regions, constitutes the largest among the four southern States and ranks fifth in India both in terms of area and population. In terms of economic growth, however the State does not rank very high. Per capita income of the State is the lowest among the Southern States and in this respect the State ranks ninth among the fifteen major States of India (Table 2.7). The relative position has more or less remained unchanged for the last two decades.

2.3.2 Following the pattern observed in the country as a whole, the economy of AP is primarily agro-based. Roughly two fifths of the SDP is generated in the primary sector comprising agriculture, mining and quarrying, forestry, logging, and fishing. Agriculture alone contributes over one-third (Table 2.8). Over the years the importance of the primary sectors in general, and agriculture in particular, has been showing a declining trend which again is in line with the trend in the country. The contribution of the primary sectors in the State which used to be nearly 60 per cent in 1970-71 now stands at barely 41 per cent. The share

of agriculture itself has declined from around 55 per cent in 1970-71 to 37 pcer cent in 1985-86. However, it is evident that agriculture still continues to be the dominant sector in the State's economy. This is a factor which has a vital bearing on the sales tax potential of the State.

2.3.3 A notable feature of the State's economy has been the significant contribution of the mining and quarrying. and forestry sectors in the SDP. In this respect. the State ranks higher than many of its neighbours. This should be borne in mind while comparing the sales tax-SDP ratio of AP with other States. since the products of these sectors cannot be taxed beyond a certain limit under the State's General Sales Tax Act. as much of the product is either directly transported out of the State in the form of consingment transfers or it comes under the category of 'declared goods' and the maximum tax leviable on it is 4 per cent only. As much as 90 per cent of the income from mining in AP comes from coal which comes under the category of 'declared goods' and therefore cannot be taxed at more than 4 per cent. This can be one of the factors responsible for the relatively low sales tax revenue-SDP ratio of AP.

2.3.4 The way it is structured in most States. sales tax base originates from the manufacturing and trading sectors. In AP. the size of non-primary sectors has gone up from around 43 per cent in 1970-71 to 59 per cent in 1985-86. but the growth is attributable mainly to the increasing contribution of the services and construction sectors, which to a large extent, is out of the purview of sales taxation. The combined share of the manufacturing and trading sectors in

the SDP has not been more than one-fourth. And this share also has been declining since 1970-71. In terms of industrialisation, the State ranks only twelfth among the fifteen major States.

2.4 Index of Tax Effort

2.4.1 The preceding analysis suggests that *prima facie*, the scope for sales taxation in Andhra Pradesh is relatively limited. The dominance of the primary sectors and the declining share of manufacturing and trading in the State's economy, combined with the limitations arising from the CST Act constrain the State's capacity in raising revenue from sales tax. Indeed, it would appear remarkable that the State has been able to achieve a high growth of ST revenue over the last fifteen years. An econometric exercise carried out to examine the tax effort of the State relatively to its potential also confirms that with the index of tax effort at 116, Andhra Pradesh has done better than the average in the first five years of the present decade (*vide* Table 2.9 and Appendix).

2.4.2 Nevertheless, it would not be correct to conclude that the ST potential of the State has been exhausted. As noted earlier, the ratio of ST to SDP in the State is still not the highest and is way below that of its neighbouring State Tamil Nadu. What is more, as a proportion of consumption expenditure and expenditure on non-food items, sales tax in Andhra Pradesh constitutes about 3.75 per cent and 9 per cent respectively (as of 1983-84, *vide* Table 2.10), as compared with 6.51 per cent and 16.8 per cent in Tamil Nadu.

4.1 per cent and 10.5 per cent in Karnataka and 5.1 per cent and 13 per cent in Kerala. Whether the pattern of production and consumption in the State offers more scope for sales taxation, if so, in which specific sectors or items without causing hardship to the weaker sections and without damaging the growth potential of the State's economy needs further investigation. Whether the yield of ST could be improved with the existing structure and with better administration also needs to be examined carefully. The present study seeks to address these questions. In the chapter that immediately follows, an attempt is made to construct a model which will help to assess the potential of the State's revenue keeping in view the relevant factors and thereby to make projections or forecasts of revenue in the future more realistically than before.

Table 2.1

Share of Sales Tax in states own Tax Revenue in Fifteen Major states

States	1970-71	1975-76	1980-81	1985-86
1.Andhra Pradesh	36.67	43.33	48.49	52.90
2.Karnataka	48.03	49.79	50.00	55.42
3.Kerala	55.04	61.31	60.59	62.75
4.Tamil Nadu	54.98	66.20	71.91	64.13
5.Maharashtra	62.61	63.15	66.31	63.30
6.Madhya Pradesh	47.31	50.71	55.72	50.41
7.Orissa	52.72	55.60	58.01	51.89
8.Assam	41.01	45.81	47.87	57.53
9.Bihar	46.75	50.92	70.06	67.43
10.Gujrat	59.05	66.04	66.63	64.25
11.Haryana	39.67	42.32	45.31	46.71
12.Punjab	43.33	42.33	44.69	46.73
13.Rajasthan	46.26	51.68	63.98	59.25
14.Utter Pradesh	40.73	52.94	54.31	56.86
15.West Bengal	52.67	56.63	58.26	56.06

Source: RBI Bulletin.

Table 2.2
Composition of State's Own Tax Revenue in Andhra Pradesh

(per cent)

Items	1961-62	1966-67	1970-71	1975-76	1980-81	1985-86
1. Sales tax	35.16	40.70	38.67	43.34	48.49	52.91
2. State excise duty	20.73	19.49	26.07	23.32	26.26	26.97
3. Stamp & registration fees	8.10	8.77	7.36	8.17	8.08	4.81
4. Vehicle tax	6.56	11.25	10.93	8.59	9.08	7.82
5. Passenger good tax	-	-	-	-	-	-
6. Land revenue	24.03	14.99	14.79	14.99	5.62	1.48
7. Electricity duty	0.09	0.05	0.05	0.02	1.05	1.46
8. Entertainment tax	3.21	3.63	3.31	4.56	4.32	-
9. Other taxes	3.13	1.11	0.53	0.10	-	3.68

Source: As in Table 2.1

Table 2.3
Growth of Sales Tax Revenue in Major States

(Per Cent)

State	1960-61 to 1985-86	Rank	1960-61 to 1970-71	Rank	1970-71 to 1985-86	Rank
1. Andhra Pradesh	17.63	5	15.14	11	20.50	1
2. Karnataka	18.48	2	20.02	3	16.81	2
3. Kerala	16.99	6	15.39	10	18.47	3
4. Tamil Nadu	17.30	6	16.35	5	17.77	7
5. Maharashtra	16.86	9	17.35	5	17.14	12
6. Madhya Pradesh	17.76	4	20.30	2	17.49	8
7. Orissa	15.61	10	17.32	6	16.64	13
8. Assam	14.67	13	16.41	7	17.28	11
9. Bihar	15.58	11	15.40	9	17.32	10
10. Gujrat	18.36	3	19.41	4	17.94	6
11. Haryana	-	14	-	14	18.35	4
11. Punjab	17.02	7	14.98	12	17.43	9
12. Rajasthan	-	15	-	15	16.37	14
13. Utter Pradesh	18.66	1	22.71	1	16.19	15
15. West Bengal	14.69	12	13.84	13	15.99	15

Table 2.4
Sales Tax Buoyancy & elasticity for Major States*
1961-62 to 1985-86

State	1961-62 to 1985-86				1961-62 to 1970-71				1971-72 to 1985-86			
	Buoy.	Rank	Elast.	Rank	Buoy.	Rank	Elast.	Rank	Buoy.	Rank	Elast.	Rank
1.Andhra Pradesh	1.57	3	1.41	9	1.68	2	1.51	2	1.41	7	1.59	2
2.Karnataka	1.25	13	1.43	8	1.28	14	1.21	10	1.40	8	1.26	7
3.Kerala	1.46	7	1.56	6	1.46	5	1.32	6	1.52	5	1.31	5
4.Tamil Nadu	1.46	8	1.56	7	1.35	10	1.26	8	1.35	9	1.21	9
5.Maharashtra	1.49	5	1.64	4	1.43	6	1.36	5	1.57	4	1.31	4
6.Madhya Pradesh	.13	15	-3.28	15	1.39	9	.02	15	-3.32	15	1.25	8
7.Orissa	1.65	2	1.76	1	1.54	4	1.36	4	1.66	2	1.26	6
8.Assam	1.44	10	1.24	13	1.57	3	1.15	13	1.17	13	1.21	10
9.Bihar	1.35	12	1.62	5	1.27	15	1.23	9	1.48	6	1.17	12
10.Gujrat	1.45	9	1.40	10	1.43	7	1.18	12	1.32	10	1.10	15
11.Haryana	.98	14	.44	14	1.29	13	.89	14	.44	14	1.14	14
12.Punjab	1.49	6	1.66	3	1.41	8	1.44	3	1.68	1	1.34	3
13.Rajasthan	1.79	1	1.74	2	1.90	1	1.60	1	1.65	3	1.69	1
14.Utter Pradesh	1.52	4	1.39	11	1.35	11	1.32	7	1.21	11	1.20	11
15.West Bengal	1.37	11	1.31	12	1.35	12	1.20	11	1.21	12	1.16	13

* With Respect to SDP.

Table 2.5
AP Per capita Sales Tax Revenue as compared to Other Major States

	State	1975-76		1985-86	
		Rs	Rank	Rs	Rank
1	Mah.	180.34	1	306.72	1
2	A.P	103.73	8	113.99	8
3	Guj.	134.52	2	169.66	4
4	Bih.	41.49	14	71.19	12
5	M.P.	64.09	12	83.74	10
6	Kar.	93.64	7	117.06	7
7	Ker.	75.33	5	75.32	11
8	W.B.	69.40	9	125.07	6
9	T.N.	168.11	3	190.75	2
10	Ori.	27.31	13	44.06	14
11	Har.	126.72	6	138.99	5
12	Pun.	142.30	4	163.35	3
13	U.P.	76.22	10	97.07	9
14	Raj.	67.61	11	63.35	13

Table 2.6
Sales Tax as Per Cent of SDP in Major States

(Per Cent)

No	State	1971-72	Rank	1975-76	Rank	1980-81	Rank	1985-86	Rank
1.	Andhra Pradesh	1.81	11	3.34	6	3.92	6	5.97	6
2.	Karnataka	2.69	5	3.81	5	4.44	5	6.81	5
3.	Kerala	3.32	3	4.39	3	5.85	2	7.25	2
4.	Tamil Nadu	3.67	2	5.67	1	7.20	1	12.53	1
5.	Maharashtra	3.96	1	4.82	2	5.39	3	6.34	3
6.	Madhya Pradesh	1.96	10	3.23	7	3.27	11	3.65	11
7.	Orissa	1.67	14	2.19	14	2.66	13	3.43	13
8.	Assam	1.74	13	2.07	15	1.31	15	2.92	15
9.	Bihar	1.79	12	2.34	13	2.97	12	3.25	12
10.	Gujrat	3.28	4	4.22	4	5.34	4	6.66	4
11.	Haryana	2.21	7	3.06	8	3.52	8	4.36	8
12.	Punjab	2.46	6	2.82	11	3.51	9	3.83	9
13.	Rajasthan	2.16	8	2.61	12	3.57	7	4.23	7
14.	Utter Pradesh	1.59	15	2.97	9	2.51	14	2.95	14
15.	West Bengal	2.12	9	2.90	10	3.37	10	3.75	10

Table 2.7
Per Capita State Domestic Product in Fifteen Major States in India.

States	Average Per capita SDP[1] (Rs)	Rank	per capita SDP 1970-71 (Rs)	Rank	Per capita SDP 1984-85 (Rs)	Rank
1. Andhra Pradesh	2050	9	573	9	1944	9
2. Karnataka	2100	7	626	7	2020	8
3. Kerala	2090	8	563	8	2161	6
4. Tamil Nadu	2116	6	570	10	2041	7
5. Maharashtra	3211	3	756	4	3159	3
6. Madhya Pradesh	1799	13	472	12	1652	13
7. Orissa[2]	1585	14	469	14	1504	14
8. Assam	1895	11	407	11	1793	10
9. Bihar	1418	15	393	15	1354	15
10. Gujrat	2814	4	808	3	2911	4
11. Haryana	3324	2	860	2	3197	2
12. Punjab	4089	1	1049	1	3758	1
13. Rajasthan	2013	10	631	6	1783	11
14. Utter Pradesh	1812	12	476	13	1714	12
15. West Bengal	2552	5	706	5	2431	5

Notes: 1. Average for the three years 1983-84, 1984-85 and 1985-86.
2. In the case of Orissa, the period for the average per capita State domestic product is from 1983-84 to 1984-85.

Source: Estimates of State Domestic Product: 1970-71 to 1985-86. CSO, June 1987.

Table 2.8
Sectoral composition of the State Domestic Product in Andhra Pradesh

(Per Cent)

Items	1970-71	1975-76	1980-81	1985-86
A.Primary sector	57.16	49.76	45.24	41.16
1.Agriculture	54.90	46.51	42.47	37.41
2.Mining, quarrying, fishing, forestry, logging	2.26	3.25	2.77	3.77
B.Non-primary sector	42.84	50.24	54.76	58.82
3.Manufacturing	8.75	11.77	11.65	11.41
4.Trade,hotel & restaurants	11.97	14.19	16.51	12.75
5.Others including construction and services	22.09	24.26	26.60	34.66

Source: As in Table 2.6

Table 2.9

Indices Showing the Relative Sales Tax Effort of the Major States.

	State	Index	Rank
1	Andhra Pradesh	116.1	7
2	Karnataka	119.6	6
3	Kerala	124.7	3
4	Tamil Nadu	120.5	5
5	Maharashtra	123.3	4
6	Madhya Pradesh	89.5	11
7	Orissa	84.7	14
8	Bihar	85.1	13
9	Gujrat	113.6	8
10	Haryana	130.2	2
11	Punjab	141.6	1
12	Rajasthan	92.3	9
13	Utter Pradesh	75.6	12
14	West Bengal	84.1	10

Source: Appendix I.

Table 2.10
Sales Tax as Proportion of Consumption Expenditure and Expenditure on Non-Food
(1977-78 and 1983-84)

No.	State	1977-78 ST as % Cons-Ex	Rank	1983-84 ST as % Cons-Ex	Rank	1977-78 ST as % NF Con-Ex	Rank	1983-84 ST as % NF Con-Ex	Rank
1	Andhra Prade	3.05	7	3.76	6	7.88	6	9.05	6
2	Karnataka	3.97	5	4.09	5	10.88	4	8.48	13
3	Kerala	4.62	3	5.09	4	12.42	3	7.96	9
4	Tamil Nadu	4.60	4	6.61	2	12.96	2	17.23	2
5	Maharashtra	4.96	2	9.13	1	10.64	5	9.32	8
6	Madhya Prade	3.42	9	1.37	14	8.49	10	10.48	5
7	Orissa	1.63	13	3.10	10	5.32	12	13.02	4
8	Assam	1.45	14	1.62	13	4.91	13	3.55	14
9	Bihar	1.67	12	2.25	11	7.01	9	22.56	1
10	Gujrat	5.06	1	6.33	3	14.05	1	7.29	11
11	Haryana	3.05	8	3.58	7	7.91	7	7.66	10
12	Rajasthan	2.15	11	3.14	8	4.58	14	16.76	3
13	Utter Prades	2.25	10	2.49	12	6.41	11	6.56	12
14	West Bengal	3.33	6	2.97	9	10.85	8	9.15	7

Note: Sales Tax figures do not include Central Sales Tax.

Source: Sarvekshana, National Sample Survey, January, 1986 and April, 1986.

APPENDIX I

A Study of States' Relative Tax Effort in India A Covariance Approach using Pooled Data[1].

There are basically two approaches followed in the literature to measure the tax efforts of states. A simple method is what is known as the 'Representative Tax' method. In its simplest version, this method compares the tax-income ratio of a state with the average tax-income ratio of all the states and interprets the difference as an indicator of the tax effort of that state. The obvious disadvantages of this method are: firstly, the tax revenue variable is rather rigidly linked to the income variable in the sense that the income elasticity is assumed to be unity, and secondly, income is assumed to be the sole determinant of tax revenue.

The other equally well-known method is the 'Regression Approach'. Essentially in this method, tax revenues raised by states are assumed to be a function of their income size and other relevant variables, and that there exists a common tax function for all the states. The deviation of the actual from the estimated value of the dependent variable obtained by using the combined tax function is taken to be an indicator of the degree of tax effort of a particular state. The main limitation of the simple cross-section regression method is as follows:

States differ in raising tax revenues, broadly due to three types of factors: 1. capacity factors, 2. effort factors, and 3. random factors. In other words, tax revenue can be expressed as a function of the above three groups of factors. While capacity factors could be identified and proxied by variables such as SDP, level of industrialisation, structure of trade and so on, effort factors are difficult to identify and quantify. If a combined tax function is

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1. Our thanks are due to Dr. M. Govinda Rao, who was the inspiration for the development and application of the method.

fit on a cross-section data using the capacity factors only, the residual variation in the tax revenues across the states can be attributed partly to the effort factors and partly to the random factors. But it is difficult to seperate and quantify how much variation is due to differences in the effort factors and how much due to random factors.

Within the regression approach, one method to achieve this is to use pooled time-series and cross-section observations and estimate a combined tax function in a general 'Fixed Effects' model framework. The reasons leading to the choice of the fixed effects model are briefly as follows.

Under the assumption that the parameter vector of the tax function varies either across the states (or over the time periods or both) a number of hypothetical models are suggested in the econometric literature. Broadly, these models fall into two groups: (a) Fixed Effects Models, and (b) Error Component Models.

Both the models assume that the variation of the parameter vector across the states arises because of the basic structural differences among states in respect of numerous socioeconomic factors. However, the fixed effect models assume that these structural differences remain fairly stable over the sample period. Similar assumption can also be made for variation over time. In contrast, the error component models assume that the variation of the parameters, either across the states or over the time periods, is not stable or 'fixed' but can be construed as part of the stochastic disturbance term. The choice between the two types of models, naturally, depends on the institutional realities relevant to the problem.

For the purpose of the present study, the fixed effects type models are chosen for estimating the variation in the parameter vector.

The basic tax function considered is: st= f(sdp npsdp lor), where the variables are defined as follows:

ST
PER CAPITA TOTAL SALES TAX REVENUE
CSDP
PER CAPITA SDP AT CONSTANT PRICES
NPSDP
PERCENT OF NON-PRIMARY SDP IN TOTAL
LOR
LORENZ RATIO INDICATING THE INCOME DISTRIBUTION

Within the fixed effects model framework itself a number of alternative hypotheses can be formed depending on varying assumptions regarding the systematic part of the equation as well as regarding the behaviour of the disturbance term. For example, in this study it is specified that only the intercept parameter varies across the states but the slope parameters may be common. Similarly, the behaviour of the disturbance term can be assumed to conform to OLS assumptions or some form of heteroscedasticity can also be assumed. To some extent, the choice of the specification can be made on the basis of statistical tests of structural change. But the specification choice also depends on the purpose of the study.

Also while specifying the tax function, allowance should also be made for changes over time in addition to state-wise variation. This is sought to be achieved in two alternative ways - either by including a time trend variable, or by including year-wise dummy variables. The first method assumes that the time variation is uniform whereas the second method can take care of uneven variation over time. We employ both the alternatives with a view to choose on the basis of their relative accuracy of the regression results.

Further, the question whether to use time trend variable or time dummy variables also looks irrelevant as their RSS figures are not significantly different from each other, which implies that time variation is not uneven.

The combined tax function is estimated with a further linear restriction that the state-wise dummy coefficients add up to unity. This restriction if holds true, would not only directly yield the relative tax effort indices, but also would improve the over

all efficiency of the regression results. The RLS regression results for each tax as well as for the total tax revenue are given below. Table I.1 gives the results of the tax function estimated with the time trend.

The time period covered is 1961-62 to 1985-86. The regressions are corrected for heteroscedasticity by Weighted Least Squares (J.Johnston 1984, pp.301-5). The tax function, ttra = f (csdp, npsdp, lor, trend, state dummies), is estimated with the linear restriction that the state-wise dummy coefficients add up to unity. The RLS results are as follows:

REGRESSION RESULTS OF THE TAX EFFORT EQUATION.

RLS restriction: state dummy coeffs add up to 1.
F(1,51)= 3.89   SIGNIFICANCE LEVEL .5366696E-01

DEPENDENT VARIABLE = ST

R**2	= .999	RBAR**2	= .999
SSR	= .0003	SEE	= .238
DURBIN-WATSON	= 1.25		
Q (24)	= 34.1725	SIGNIFICANCE LEVEL	= .05

NO.	LABEL	COEFFICIENT	STAND. ERROR	T-STATISTIC
***	*******	************	************	************
1	CSDP	.4604	[illegible]	3.6184
2	NPSDP	.3644	[illegible]	1.1959
4	LOR	[illegible]	[illegible]	.0620
5	TREND	[illegible]	[illegible]	5.9062
6	MAH.	[illegible]	[illegible]	4.2343
7	A.P.	[illegible]	[illegible]	4.3774
8	GUJ.	.1994	[illegible]	2.2256
9	BIH.	[illegible]	[illegible]	-4.0237
10	M.P.	-.1415	[illegible]	[illegible]
11	KAR.	[illegible]	[illegible]	[illegible]
12	KER.	[illegible]	[illegible]	[illegible]
13	W.B.	-.1012	.0402	-2.4557
14	T.N.	[illegible]	[illegible]	2.6892
15	ORI.	[illegible]	[illegible]	[illegible]
16	HAR.	[illegible]	[illegible]	[illegible]
17	PUN.	[illegible]	[illegible]	[illegible]
18	U.P.	[illegible]	[illegible]	[illegible]
19	RAJ.	[illegible]	[illegible]	-.0832

The relative tax effort index is computed as follows: Let the tax function for the i'th state be Ri = exp (Si). Yexp(a). bexp(T) where Si denotes the coefficient of the intercept for i'th State, Y, SDP and other capacity factors, and T, the time trend

variable. Due to the linear restriction, the tax function for the average state is R_a = exp (1/n). Yexp(a). bexp(T). The relative distance of the i'th state from the average state is expressed as (Ri/Ra)*100 or exp(Si-1/n)*100. The relative tax effort indices thus derived are given in Table 1.13 in the text.

3. SALES TAX REVENUE PROJECTIONS AND TARGET FIXATION

3.1 Introduction.

3.1.1 Making advance estimates of revenue for the next financial year is one of the key processes of budgetary exercise. The ever-growing governmental activity and the consequent rise in the public expenditure have made it imperative to have revenue estimates as accurate as possible for smooth implementation of the expenditure programes. The accuracy of tax revenue estimates in particular has an important bearing on the entire budgetary structure: as the amount of funds to be raised from other sources such as borrowings crucially depends on the anticipated tax revenues. Further, the direction of future tax policy very much depends on the expected revenue from the existing tax structure. Reliable revenue estimates also facilitate realistic choice of the expenditure policy options.

3.1.2 Apart from influencing the budgetary structure, tax revenue estimates also help in fixing guidelines or targets for tax collectors. Without revenue targets, the tax collectors, however able and zealous they may be, may not know how much tax can be collected given the existing levels of tax evasion (or 'tax delinquency' as Shoup calls it). Revenue targets give tax collecting authorities a sense of perspective and direction as to how much revenue can be collected during the year and whether their efforts are on right lines.

3.1.3 Though the importance of revenue estimates has long been recognised, due attention does not seem to have been paid so far, to make them as realistic as possible. The most common method of budgetary forecasting has been to extrapolate the tax revenues on the basis of its growth observed during the previous few years. At best, the projected estimates are corrected for the assumed change in the inflation rate.

3.1.4 The method currently followed for forecasting sales tax revenue and fixing of revenue targets in Andhra Pradesh (AP), is also on similar lines. The revenue estimates are fixed by the State Finance Department in consultation with the Department of Commercial Taxes. To start with, the Commercial Taxes Department prepares the initial estimates by taking into account the past trends in the revenue collections. Based on these initial estimates the Finance Department determines the final estimates keeping in view the budgetary needs, the likely inflation rate and other judgmental factors. The overall target is then taken as the budget estimate for sales tax revenue. Once the overall target is fixed, the Commissioner of Commercial Taxes (CT) fixes the collection targets for each Division, and the Divisional heads in turn, fix targets for each Circle under their jurisdiction. But at each stage the targets are derived mostly on the basis of the past trends alone.

3.1.5 The method, as noted later in this study, is a simple version of a class of forecasting techniques known as the 'time series' techniques, combined with expert judgment.

and as such, cannot altogether be dismissed as unscientific or wrong. However, the method suffers from at least two limitations: First, since judgmental factors play a major role, the forecasts are subject to the in-built biases thereof. Second, the method does not take into account factors relating to tax capacity. The judgmental biases coupled with the absence of taxable capacity considerations might make the budgetary forecasts unrealistic. These biases are accentuated when, due to pressure for finding resources for meeting the growing government expenditure, the targets are set at levels above what the past growth trends would warrant, while on the other hand, limitations of enforcing agencies tend to depress the estimates below the capacity.

3.1.6 There is a growing feeling in the State Government circles that a more realistic method of estimating future revenue figures and fixing the revenue targets is needed. Hence, the first two terms of reference of the present study enjoin us to suggest "a rational, realistic method of estimating the sales tax potential in the State and fixing collection targets/budget estimates" and a method of adjusting the above targets with reference to ups and downs in the State's economy through a set of relevant indicators.

3.2 The Present Method of Tax Forecasting - An Analysis.

3.2.1 An examination of the past trends in the budget estimates, and the actual realisations of the sales tax revenue in AP brings out at least two major shortcomings in the present method of tax revenue forecasting.

3.2.2 Firstly, the budget estimates differ widely from the actuals. This is evident from the Table 3.1 as well as from the Chart 3.1. The difference between actual sales tax revenue and its budget estimate varied between Rs. -35.06 crore in 1975-76 and Rs. 145.79 crore. The deviation in terms of logarithms[2] was in some years over 30 per cent. The forecast statistics such as the mean square error computed for the errors in the budget estimation also indicates high variation. The deviations were particularly larger during the latter half of seventies and early eighties when the State's economy was under severe stress due to natural calamities and the existing budgetary forecasting mechanism could not incorporate adequately to properly assess the impact of such natural calamities on sales tax revenue.

3.2.3 Secondly, the actual tax revenue figures generally exceed the budget estimates. For example, during the 26 years from 1961-62 to 1986-87, the actual revenue always exceeded the budget estimate except in 6 years (Chart 1). It shows that while preparing the revenue forecasts there is an inherent tendency to underestimate the sales tax revenue. The underestimation was higher during the periods of natural calamities which is probably because of somewhat exaggerated view of the adverse impact.

3.2.4 The tendency to under-estimate revenues appears to be a universal phenomenon and has been observed in the

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2. Logarithmic deviation is akin to per cent deviation and is free from the bias due to size of the base period figure as well as units of measurement.

past by many studies. For instance, a study of total revenues of the Central Government for the period 1949-50 to 1962-63 (Gupta,1967) indicates a consistent under-estimation in the sense that the actual revenue always exceeded the budget estimates. Similar tendency was also observed by other studies such as Premchand (1983) in the context of other countries.

3.2.5 The main source for this tendency appears to lie in the organisational, political and other attitudinal factors. "Organisationally, revenues are estimated by agencies that are responsible for revenue collection and thus are conservative, partly because of a desire to show better actual performance. Such conservative estimates are also preferred by the begetter, as they provide a margin for higher actual expenditures. Conservative estimates also encourage the spending agencies to believe that revenue might actually cover expenditure. In some countries revenue estimation is carried out crudely, without adequate attention on the impact of government expenditure" (Premchand, 1983, p. 76).

3.2.6 The experience of AP in sales tax revenue projections would seem to confirm this prognosis. Sales tax being the most important source of state tax revenue in AP contributing over 55 per cent of the State's own tax revenue, such a high degree of inaccuracy and bias in the budget estimates could in fact trigger off long term imbalances in the Government finances. In the words of Prest ..no government can hope to execute its economic policies successfully if its budgetary forecasting is wildly

inaccurate" (Prest,1962, p.133).

3.2.7 In this context, mention may be made of a recent study by Subrahmanyam and Swamy (undated) which reported some detailed projections of tax, non-tax revenue and expenditures of the State. Sales tax revenue forecasting was also attempted as part of their study. The revenue projections were derived for the period 1981-82 to 1985-86 based on time series data from 1961-62 to 1980-81. Basically, the models employed by them to obtain alternative forecasts are based on two approaches: the compound growth function approach and the determinants approach. Under the latter approach a number of specifications were tested. Without going into details it may be noted that their study suffers from certain limitations pertaining to the choice and specification of the models, as also the interpretation of the results[3].

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3. The main limitations of the Subrahmanyam & Swamy study are as follows:

   a. In the case of the compound growth models, no attempt was made to examine the suitability of such models for tax revenue forecasting. As is well known, the compound growth function is only a special case of the class of models known as Auto Regressive Moving Average (ARMA) or Auto regressive Integrated Moving Average (ARIMA) models. If the restriction on the growth path implied by the CG function do not hold, then one should try to identify a less restrictive ARMA specification. The suitability of the restrictions could be determined on the basis of the regression diagnostics such as DW statistic, the Q statistic and the RMSE, apart from the other summary statistic. The presence of autocorrelation in the CG model might yield biased

Therefore, in what follows a fresh attempt is made to evolve a workable method for forecasting the AP sales tax revenue and empirically test its validity.

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forecasts.

b. In the determinants models, none of the specifications seems to be complete. For example, despite the time trend variable being found significant in the log version of equation 2 (Appendix IA), it was dropped from equation 3 for some unknown reason.

c. Specification of the price effect itself is not adequate. Equation 3 implies that the relative price effect is negligible. Since the relevant price deflator for ST is the whole sale price index, whose movements do not always coincide with that of SDP deflator, the determinants model should, ideally, also contain a variable representing the relative price movements. In the absence of such a variable, the specification cannot be regarded as complete.

d. It was observed by the authors that over 50 per cent of the sales tax revenue come from about 35 commodities produced in the agricultural and the non-agricultural sectors, thereby indicating that the ideal proxy variable for tax base would be SDP excluding the services component. However, equations 4, 5, and 6 have non-agricultural SDP as the proxy base.

e. Excise revenue is used as the 'leading indicator' for the sales tax determination in the equations 7 and 8. However, these equations cannot be used for forecasting for the simple reason that unlike in the case of the macro variables such as SDP and price, excise revenue forecasting itself is a complicated exercise which probably depends upon the movements of SDP and other macro economic variables.

3.3 A Proposed Method for Forecasting AP Sales Tax Revenue

3.3.1 Several techniques are available for forecasting and the choice among them depends on the nature of the variable under study. Before we select a suitable combination, it is useful to take a look at the relevant techniques.

3.3.2 The available forecasting techniques can be grouped under four categories depending upon their basic approach. They are: A. Judgmental approach. B. Time series approach. C. Econometric approach. and D. Combination approach. Judgmental techniques rely mostly on expert judgments regarding the future movements of the variable. This non-quantitatve approach can be biased unless the expert opinions are based on long experience and informed judgment. The other techniques attempt forecasting in a more objective way. However, some judgmental element is also needed to improve the forecasts made through other techniques.

3.3.3 Both time series approach as well as econometric techniques attempt to forecast a variable on the basis of its past movements. The time series approach views the behaviour of the variable as caused by innumerable factors whose individual effects are too small to perceive and quantify, but the combined effect results in a systematic trend in the movements through time, *albeit* disturbed in the short run by random factors. Hence, the time series methods attempt to first seperate the systematic and random components from the past movements of the variable, identify the systematic pattern in terms of a univariate function, and based on the univariate function, the future values of the vari-

able are forecast.

A. Time Series Models

3.3.4 The commonly used time series models are: a. The Compound Growth (CG) model. b. The Exponential Smoothing (ES) model. and c. The Auto Regressive Integrated Moving Average (ARIMA) model. Of these the CG is the most commonly used model for forecasting economic variables as they appear to grow more or less in proportion to their base values. The ES models are used for business forecasts such as sales forecasting. These models express the current values of the variable under study as a weighted sum of the past values. The conventional moving average model, the adaptive expectations model, the Holt-Winters type of seasonal adjustment models are some of the commonly used ES models.

3.3.5 The ARIMA models. also known as the Box-Jenkins (BJ) models refer to a wide range of models that seem to represent the real world time series variables closely. The CG and ES models are special cases of the ARIMA models. Basically, ARIMA models view the systematic movements of a variable as a result of three types of transformations of a pure random variable or 'white noise'. The first transformation is known as the Auto Regressive (AR) process where the current value of the variable is taken to be finite weighted sum of its past values. The second is termed as the Moving Average (MA) process where the current value of the residual is viewed as or worked as weighted sum of the past residuals. The third process is known as the 'Integration' process wherein a 'stationary' or 'non-

drifting' series is transformed into a non-stationary series. The ARIMA process is a combination of the AR process, MA process, and the integration process through which a 'white noise' series are treated as an input to be transformed into a time series.

B. Econometric Approach

3.3.6 Contrasting with the time series approach, the econometric approach views the movements of a variable as caused by a few exogenous factors, in accordance with a definite causation process. This approach translates theory or a hypothesis regarding a causal relationship into an algebraic equation or system of equations, whose parameters are estimated by econometric methods. Depending upon the assumed causal relation, the econometric models are usually chosen as either single equation models or interdependent system models. The interdependence models need large data base, utmost care in specification, and elaborate estimation procedures. However, the forecasts obtained from these models are found to be very sensitive to any errors therein. Often the forecast accuracy of the multi-equation models is found to be no better than that of other types of models.

3.3.7 The most commonly employed single equation models for tax revenue forecasting are the tax-income response models, namely, the buoyancy and elasticity models. However, the basic purpose underlying these two income response models is more judgmental than to provide a causal relation. Therefore, the policy simulation with them is

also limited. A more useful approach is the determinants approach where the movements of the tax revenue is sought to be explained by a set of relevant determining factors such as the tax base, tax rate, price factors and so on.

3.3.8 Finally, the 'Combination' approach seeks to combine the time series and econometric approaches. Two types of combination methods are in vogue. One method is to combine the forecasts obtained by selected time series methods or econometric methods as a weighted average. The other is the 'Transfer Function' (TF) approach. A TF describes the dynamic (or delayed) response of the dependent variable to changes in an independent variable. A special case of TF which can be suitable for the present purpose is the 'Adaptive Expectations' model. Thus the transfer function approach combines the econometric models with time series processes.

C. Choice of Forecast Models.

3.3.9 A possible set of criteria for evolving reliable forecast models for AP sales tax revenue can be drawn up on the basis of the main requirements spelt out in the terms of reference of the study. According to the terms of reference, the model, firstly, should enable the Government to obtain 'realistic' forecasts. Secondly, the forecasting model should enable them to adjust the forecasts with reference to ups and downs in the State's economy. Thirdly, the terms of reference also imply that the model should facilitate policy simulation so that the effects of any contemplated changes in the tax rate structure will be known in

advance, as also the effects of likely inflation rate. Finally, though not mentioned specially in the terms of reference it should be added that the model should be simple and should take into account the limitations of the available statistical information base in the State.

3.3.10 Keeping these criteria in view, four alternative models were selected from among the forecasting techniques reviewed above. These are: 1. The Compound Growth model, 2. The ARIMA model, 3. The Determinants model, and 4. The Transfer Function and the Adaptive Expectations model. The first two come under the category of 'time series' models, the third belong to the 'multivariate' models, while the remaining are 'combination' models.

3.3.11 The two time series models have been selected with a view to achieving as much accuracy as possible without requiring a large data base. The time series forecasts can also be used as yardsticks for the more elaborate models. Though the time series approach suffers from a serious deficiency, namely, that their use for policy analysis is limited, the limitation can be overcome to some extent through indirect methods. For example, the factors often required to be taken into account in operating a tax revenue forecasting model changes in the tax rate structure and changes in the inflation rate. A possible way of handling this could be to first purge the revenue series of the two effects and apply the time-series methods. For example, the tax rate change effect can be removed by the 'Proportional Adjustment' (PA) method[4]. Similarly, the

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4. The assumption underlying the use of the PA method is

price change effect can be removed by deflating the revenue series by a suitable price index. The two selected time series methods can be then applied to the revenue series thus "cleaned" of the inflation effect and the tax rate change effect. The forecast values of the tax revenue can be adjusted later for any expected changes in the price level as well as for any contemplated changes in the tax rate structure.

3.3.12 In all, four variants of the sales tax revenue series are used in this study: (i) actual series without any adjustments (ST), (ii) actual series adjusted for price changes only (STR), (iii) series adjusted by PA method but not adjusted for price changes (AST), and (iv) cleaned series of sales tax revenue so obtained by adjusting the actual series for tax rate structure effects by the PA method also deflated for price change effect (ASTR). The forecasts obtained by the four variants can be cross-checked against one another.

i. The Compound Growth Model.

3.3.13 The CG model is, by far, the most commonly used model for forecasting economic series. Let the variable un-

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that the effect of the tax discretionary changes is proportional to the total tax revenue. The adjustment mechanism is as follows: Let STt be the tax revenue in tth year and Dt be the additional revenue attributable to the tax rate changes introduced in that year. Assuming that the effect has continued in the future years and is proportional to the total sales tax revenue, the 'cleaned' series can be derived as ASTt where ASTt= [STt- Dt].ASTt-1/STt-1.

der study be x_t which is assumed to grow over time at an annual compound rate r, from a base A. The CG function is of the form

$$x_t = A.(1+r)^t.\exp(u_t) \qquad (1)$$

3.3.14 Essentially the CG model can be regarded as a special case of ARIMA models. For, the equation can be rewritten as $(1-L)z_t = k + (1-L)u_t$, where $z_t = \log x_t$, $k = \log(1+r)$, L is the lag operator, and u_t, the stochastic term. Thus the CG function can be regarded as either ARIMA(Ø,1,1) in log x with the restriction that the MA polynomial parameter is unity, or as ARIMA(1,Ø,1) in log x with the restriction that the parameters of both the AR and MA polynomials are units[5].

3.3.14 Pending the test to determine whether the ARIMA model that fits the sales tax revenue needs such restrictions, the CG function is estimated by OLS in its semi-log form, $\log x_t = a + b.t + u_t$, where $a = \log A$, and $b = \log(1+r)$. The function is fitted for the four alternative series described above.

ii. The ARIMA Model.

3.3.15 The general form of the ARIMA models is as follows.

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5. The explanation is as follows: The CG function determines x_t is $x_t = A.(1+r)^t.\exp(u^t)$. A similar expression can be obtained for x_{t-1}. The ratio $x_t/x_{t-1} = (1+r).\exp(u_t - u_{t-1}$ when expressed in log terms can be written as an ARIMA (Ø,1,1) or ARIMA (1,Ø,1).

$$a(L)_p.(1-L)^d z_t = k + b(L)_q.u_t \qquad (2),$$

where z=x or z=log x depending upon whether the model is linear or multiplicative. a(L) and b(L) are polynomials in the lag operator of degrees p and q respectively. d is the degree of 'differencing' needed to make z 'stationary', k is a constant or a 'level' parameter and u, the stochastic white noise.

3.3.16 Prior to estimation, the model needs to be identified in terms of p, d, and q. To some extent, the autocorrelation and the partial correlation functions can help in identifying the degrees of the AR and MA polynomials, but by and large, these are determined on the basis of trial and error, and also judgments.

iii. The Determinants Model.

3.3.17 Intuitively, a sales tax revenue determinants function can be derived using the identity that total tax revenue is nothing but the product of the sales tax base and the average tax rate. Since it is difficult to obtain accurate data on the tax base variable as specified in the tax laws a proxy base variable has to be used. The proxy base variable in the case of sales tax could be SDP or a relevant component there-of such as consumption expenditure.

3.3.18 Further, the proxy base can be split into real base and the price components in order to evaluate the inflation effect on the revenue yield. The use of proxy deter-

ticular specification of the tax revenue determinants function allows to seperate the effects of changes in the real income, and inflation. Also, the inflation effect is split into two components. It is well known that the nominal sales tax revenue is not only affected by the general inflation in the state income but also by the relative change in the wholesale price index to the state income deflator. The inflation effect is sought to be captured either by including the two price variables in the tax function, or to use the deflated revenue series as the dependent variable in the place of actual revenue series in order to correct the forecasts later for the assumed inflation rate.

3.3.13 The determinants function should ideally also include a suitable proxy representing the changes in the tax rate structure, as tax revenue is affected by such changes. However, the difficulties of finding such a proxy are well known. Studies in the past which followed the determinants approach, have taken recourse to three main alternatives: In the first alternative, dummy variables are employed to mark the years in which the tax rate structure has undergone a substantial change: In the second alternative, the cumulative effect of such discretionary changes is viewed as similar to that of technological change in the production function literature, and accordingly a time trend variable is employed to capture the effect. A more common method has been to first adjust the revenue series by the PA method for the effect of the discretionary changes and then use the adjusted series as the dependent variable in the determinants equation. In the present study, we have tested all the three methods by fitting three variants of the determinants

equation. In the present study, we have tested all the three methods by fitting three variants of the determinants equation. In the first variant intercept dummy variables are employed to mark the major discretionary changes in the tax rate structure that have occurred in the past. In the second variant, the dummy variables are replaced by a time trend variable to capture the effect of tax structure changes. In the third variant, the adjusted nominal tax revenue series are employed as the dependent variable. All this had led to a number of variants of the determinants model whose basic form is as follows:

$$\log x = a_0 + a_1 \log y_c + a_2 \log p_y + a_3 \log(p_w/p_y) + a_4 t \qquad (3)$$

where y_c denotes the proxy base, namely SDP in constant prices, p_y denotes the SDP deflator, p_w denotes the wholesale price index and t denotes the time trend. The determinants function allows the policy simulation in a more convenient way.

iv. The Combination Models.

3.3.19 The time series models assume that the current value of the revenue solely depends on its past values, while the determinants models assume that the current revenue is determined by the current values of the the determining factors. The Combination approach seeks to combine the time series methods with the determinants models

and thereby evolve a forecast model with the accuracy of time series models while facilitating policy simulation. Thus, basically a combination model resembles a determinants model which also incorporates the lagged effects of the determining factors.

3.3.20 In the present context, the need for taking account of the lagged effects and also using the combination models arises from the following considerations. Unlike an excise levy, sales tax is collected at a point of time subsequent to the time of production of a commodity, and there is usually a gap between the time of production and time of sale. If the SDP figures are derived on production basis and sales tax revenue is collected at the time of marketing, the tax base at a given time point need not correspond to the SDP level at the same point of time. Further, the lag increases as the point of sales tax levy is shifted towards the last sale point. In other words, parts of the current year's tax base belong to the income level of the past years.

3.3.21 A simple reason or for incorporating the lagged effect is the lags in the assessments. The sales tax revenue collected in a year need not correspond to the tax base of that year and it is more likely, that current revenue corresponds to the base of the past few years as a result of the assessment delays.

3.3.22 This type of dynamic behaviour of the sales tax revenue in relation to SDP is sought to be captured by two alternative models: A. Transfer function models and B. Adap-

a. Transfer function models.

3.3.23 In general, a transfer function, while postulating a relation between a dependent variable such as tax revenue and an independent variable, say, state income, allows for incorporation of their lagged values as also the auto-correlated error term (the MA lags). The general form of the transfer function is

$$Xt = A + [a(L)/b(L)].yt + ut \qquad (4).$$

where x denotes the independent variable and y the determinant. The transfer function allows for both AR and MA lags and, in addition, allows for incorporating the lagged values of the determining variables.

3.3.24 The estimation procedure for a general transfer function model involves identification of the lags required to be incorporated for the dependent and independent variables, derivation of the initial estimates based on the cross and autocorrelation functions, and if a moving average term is involved, the final estimates of the coefficients are derived by iterative methods. The main limitation of the transfer function model is that the estimation procedures are best developed for equations consisting of a single determinant only. Therefore, the transfer function model in this study is estimated with SDP as the sole determining variable and no attempt is made to seperate the price effects.

b.The Adaptive Expectations Models.

3.3.26 Alternatively, the lagged adjustment behaviour of the sales tax revenue can be viewed as a special case of the transfer functions, namely, the 'Adaptive Expectations Model'(AE), where the tax base (and therefore, the tax revenue) of the current year is assumed to arise from a hypothetical income level, which is derived as a weighted moving average of the current and past actual SDP levels. An appropriate and widely used weight scheme for this purpose could be the Koyck scheme where the weights decline geometrically as the lag increases. A concise representation of the revenue growth path can be put down following Nerlove, as

$$x_t = a + by_t + u_t$$
$$y_t - y_{t-1} = d + (1-c)(y_t - y_{t-1})$$

which reduces to a determinant function with a lagged dependent variable as follows:

$$x_t = d + b(1-c)y_t + cx_{t-1} + u_t - cu_{t-1} \qquad (5).$$

where x is logarithm of the sales tax revenue, y is logarithm of the SDP and u is the error term. The parameter c is called the 'dynamic adjustment lag' and indicates roughly the proportion of the tax revenue raised out of the current year's SDP.

3.4 Empirical Analysis.

3.4.1 The different models selected for our purposes can be regarded as the best representatives of the four broad approaches adopted for forecasting economic entities. The empirical analysis is aimed at testing their validity in general and selecting a workable model from among them for sales tax revenue forecasting in particular.

3.4.2 The time period used for testing the models is the the span of 25 years from 1961-62 to 1986-87. The forecast period considered is from 1987-88 to 1990-91.

3.4.3 The basic series used for the study are the total sales tax revenue (ST) obtained from the annual budget documents of the state. The other three variants are derived from the ST series, the additional revenue mobilisation (ARM) series pertaining to ST, and the whole sale price indices. The adjusted ST (AST) series are derived from the ST series using the PA method with 1986-87 as the base year. Both the ST and AST series are converted into real terms by deflating with the whole sale price indices (1986-87=100) to derive ST real (STR) series and AST real (ASTR) series. The series AST and ASTR thus are supposed to indicate the hypothetical sales tax revenue that would have been obtained if the tax rate-structure in the past had been the same as that of the year 1986-87. The trends in these series are indicative of the effect of the discretionary changes in the tax structure and that of the price rise on the sales tax revenue. The four alternative series are shown in Table 3.3, and are plotted in Chart 3.3.

3.4.4 Column 1 of Table 3.3 shows the trends in the actual sales tax revenue while the others depict the trends under three hypothetical situations explained above. For example, column 2 shows what would have been the sales tax yield in the past, had the price level been the same as in 1986-87. Similarly, column 3 shows what would have been the revenue, had the tax rate structure in the past been that of 1986-87. Finally, the last column shows the likely yield under the hypothetical situation where the price and the tax rate structure in the past stood at the 1986-87 level. Needless to stress that simulated forecasting for expected changes in price and tax structure is simpler with these hypothetical series.

A. Testing of the Time Series Methods.

(i) The CG Model.

3.4.5 The regression results of the CG model for the four variants of the sales tax revenue as well as the statistics indicating their respective forecastability are given in Table 3.4. As in the case of many economic time series variables, the CG function fits to the four variants of the sales tax revenue well, as indicated by their respective R^2 and SEE values. However, the DW statistics indicate positive auto correlation among the regression residuals except in the case of the STR equation for which the DW just managed to be in the inconclusive range. The auto correlation in this case, could as well be due to mis-specification of the form of the equation either in terms of the ex-

planatory variables included or in terms of lags. This is indicative of the fact that perhaps, a more general specification would have yielded better fit and forecastability.

3.4.6 Among the four variants of the model, the equations fitted to the two unadjusted series, ST and STR, are relatively better than the other two adjusted series, AST and ASTR, both in terms of regression accuracy as well as forecastability. This raises doubts regarding the overall reliability of the PA method for removing the effect of discretionary changes in the tax rate structure.

(ii) The ARIMA Model.

3.4.7 As stated above, the ARIMA models are fitted to only the logarithms of the four tax revenue variants. Different lag structures are experimented with. Basically, the identification of the lag structure is done in accordance with their respective auto and partial correlation functions. However, in addition, some more specifications are also tried in order to improve the fit and forecastability.

3.4.8 In general, even with first degree differencing, the correlation functions in all the four cases damped out quickly, thus indicating that the series do not need any differencing when considered in logarithmic terms. The fitted regression results also support this. The correlation functions indicate that at least three AR lags and one MA lag are needed to describe the growth path of the vari-

able under study. However, the model has yielded better results with just two AR lags and one MA lag. The regression results of selected ARIMA models for the four variants are given in Table 3.5.

3.4.9 Looking at the Table 3.5, one notices firstly, that the ARIMA models describe the movements in the sales tax revenue better than the OG models, thereby indicating that the somewhat restricted growth pattern implied by the latter is not valid in the present context. The OG model assumes that the growth is uniform throughout the period under study which the ARIMA functions prove to be not true. Secondly, the ARIMA models fitted to the unadjusted revenue series have yielded better results than when fitted to the 'cleaned' series. Though the explanatory power of the latter equations turned out to be better than the former in terms of R^2 and SEE, the estimated coefficients are greater than unity which violates the stationarity condition of the ARIMA function[6]. This could be an indication that the adoption of the PA method for cleaning the revenue series may be creating certain jumps in the growth path instead of removing those caused by the discretionary changes. Further, the regression fits are better with the series in current prices than in constant prices, which could also be an indication of an erroneous adjustment for the price changes. In other words, the price elasticity in this case many not be unity and therefore the simple division by the price index is not a correct procedure to convert the series into real terms.

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6. For a detailed and more vigorous discussion see Box and Jenkins (1976) and Granger and Newbold (1977).

3.4.10 Apart from these general observations, the ARIMA models fitted to the unadjusted variant of the sales tax revenue series, particularly the ARIMA (2 0 0), and ARIMA (2 0 1) holds much promise for our forecasting exercise.

(iii) The Determinants Model.

3.4.11 Among the different variants of the determinants model estimated with the four alternative dependent variables, the equations with the unadjusted sales tax revenue yielded better fit compared to the other variants as in the case of the univariate models (Table 3.6). The income and the two price variables have turned out to be highly significant in these equations. However, attempts at separating out the effects of discretionary changes have not succeeded. The time trend variable which is supposed to capture the discretionary effects is not significant. Nor did the intercept dummy variables representing the eight major changes in the tax rate structure turn out to be of importance. These results indicate that either the changes in the tax rate structure have not been properly captured with the proxies, or the latter have not been able to induce any discernible shifts in the revenue function. This inference is further supported by the two equations in which the 'cleaned' revenue series are employed as the dependent variables. The explanatory power of the two equations is the least among the tested determinant models. The forecasting power or a efficiency of the estimated equations other than those with the unadjusted revenue series as the dependent variable, leaves much to be desired. However,

none of the determinants equations matches the ARIMA models in terms of the forecast accuracy.

(iv) The Combination Models.

3.4.12 Among the two combination methods, the TF model was tried with the actual sales tax revenue as the dependent variable and the SDP at current prices as the independent variable. The standard Box-Jenkins method of fitting the TF did not yield good results. Also the cross-correlations between the two 'pre-whitened' series has turned-out to be insignificant.

3.4.13 The AE method, in contrast, yielded some interesting results. Most of the equations used under the determinants method are re-estimated with the lagged dependent variable as one of the independent variables. As the model prescribes a MA(1) disturbance term the equations are estimated by GLS iterative procedures rather than by the OLS method. The regression results are presented in Table 3.7.

3.4.14 As can be observed from the Table, there is an improvement in the over all goodness of fit as compared to the regression results of the Table 3.6. The improvement is noticeable especially in two aspects which are important from the forecasting point. They are firstly, that the RMSE is generally lower than their counterparts in Table 6, and that the DW statistic now shows a reduction in the autocorrelation. But the more interesting fact is that the lagged dependent variable turns out to be significant in all the

equations and thus, by and large, supporting the applicability of the AE model for the growth of the sales tax revenue in the State. The coefficient of the lagged dependent variable indicates the extent of sales tax revenue raised from the current year's SDP. For example, the first equation shows that roughly 35 per cent of the current sales tax revenue is raised from the current SDP, the remaining being raised from the past years' income. Also, as in the case of the determinants approach the equations fitted with actual sales tax revenue series as dependent variable turn out to be better than the other variants. Accordingly, the first two variants are retained for forecasting purposes.

3.5 The Forecasts.

3.5.1 The above empirical exercise provides some clear indications as to which model can be used for accurate forecasting of the sales tax revenue in the State. An attempt is made in this section to obtain revenue forecasts with the help of those equations which fit the data better than others and also exhibit better forecasting ability. As is evident, the best fitting equations in each case are those that are estimated with the actual sales tax revenue series without any adjustments either for the tax discretionary changes or for price change. This makes the forecasting job simpler as there is no need to re-adjust the series for the above changes.

3.5.2 In addition, two indicators of forecasting efficiency are computed, namely, the root mean square error

(RMSE) and the Theil's U statistic, on the basis of forecasts from the regression results obtained for the sub-period, 1961-62 to 1980-81, which can be considered as an 'honest' test of forecastability. Interpretation of the RMSE statistic is more straight forward in the sense, that a low RMSE value would indicate better ability of the equation to forecast for future, while interpretation of the Theil's U statistic is not so straight forward. The U statistic compares the forecasts in relation to a hypothetical 'no-change' forecast. While a value of U statistic which exceeds unity would show that the reliability of these models for forecasting may not be very high a low value for the statistic need not necessarily indicate better forecasting however.

3.5.3 The last two columns in tables 3.4 through 3.7 contain the two forecast statistics for the respective equations. It is clear from these statistics, that the forecastability is higher for those equations which generally fitted the data better. The forecast statistics of the best fitting equations from among the four alternative approaches are shown in Table 3.8. This Table shows that the forecastability is higher in the case of the selected ARIMA models, followed by the AE models, and the determinants models, in that order, compared to the compound growth model. The forecast errors plotted in charts 3.3 through 3.6 along with the budget forecast errors bring out more clearly the forecastability differences among the alternative models.

3.5.4 For purposes of forecasting for future it seems advisable to retain the first two ARIMA models (Table 3.5)

and the first two AE models (Table 3.7). This suggestion is made keeping two objectives in view. Firstly, though the ARIMA models have the best forecastability among the alternative models, the AE models facilitate conditional forecasting for hypothetical changes in the independent variables, namely, the income, the price factors as well as the tax rate structure.

3.5.5 The second objective is slightly more ambitious. A comparison of the trends in the forecast errors by the ARIMA on the one hand, and the adaptive expectations models and the determinants models on the other, reveals certain significant points. As can be seen from the forecast error plots the determinants models as also the adaptive expectations models tended to under-forecast the sales tax revenue, from around the year 1983-84. If these forecasts from the determinants models are regarded as capacity related forecasts, the revenue actually collected over and above them could be viewed as indicative of an extra effort being put in by the tax department to raise more revenue. For the future forecast period that is, 1987-88 to 1990-91, the forecasts obtained by the ARIMA models by virtue of their ability to represent the trends in the actual revenue figures more faithfully, and also being independent of the capacity factors, can be regarded as akin to the actual revenue figures. Thus the difference between the ARIMA forecasts and the forecasts obtained by the adaptive expectations models could be an indicator of the extra effort required on the part of the tax department to maintain the revenue trends in future.

3.5.6 The forecast period considered is the five years starting from 1987-88 to 1990-91. In both the cases, point as well as interval forecasts are obtained. These forecasts are presented in tables 3.9 and 3.10.

3.5.7 The dynamic forecasts based on the ARIMA models show that the sales tax revenue in the State would be between Rs. 1114.05 and 1135.69 Crore in 1987-88 and is likely to touch Rs. 2000 Crore mark by 1990-91. This of course, is based on the assumption that the same conditions which prevailed in the past would also continue. This assumption also implies that whatever additional efforts were undertaken by the department to improve revenue growth, will continue at the same pace.

3.5.8 Forecasts derived from the AE models have turned out to be more conservative. According to these models, the sales tax revenue will be Rs. 827 Crore to Rs. 840 Crore for the year 1986-87 and will be a little over Rs. 1550 Crore by 1990-91.

3.5.9 As explained earlier, the difference between the ARIMA forecasts and those obtained from the AE models can be interpreted as an indicator of the additional effort required to be put in by the tax department to increase the revenue yield of sales tax. The ARIMA forecasts have turned out to be higher than the forecasts obtained from the AE models. The difference ranges from Rs.80 Crore to Rs.111 Crore. As a per cent of the ARIMA forecasts the difference varies between 9 to 12 for the year 1986-87. Further, the forecast differences increased with the forecast horizon im-

plying that, by the year 1990-91, the extra effort required will be as much as 21 to 24 per cent.

3.6 Summary and Recommendations

A. Summary

3.6.1 Though revenue forecasting is one of the key processes of the annual budgetary preparations, due attention does not seem to have been paid to this task so far in most states. Andhra Pradesh is no exception.

3.6.2 An examination of the past trends in the budget estimation reveals that the budget estimates in the past differed widely from the actuals. Further, they were also prone to considerable under-estimation in the sense, that the actual tax revenue figures has tended to exceed the estimates. In view of these shortcomings in the present budget estimation procedures, an attempt is made in this study to evolve a more scientific and workable method for forecasting the sales tax revenue in AP.

3.6.3 A number of techniques are available for forecasting economic series but the choice among them depends upon the nature of the variable under study and the purpose of forecasting. In general, depending upon the basic approach adopted, the available forecasting techniques can be grouped under four broad types: A. Judgmental techniques, B. Time series techniques, C. Econometric techniques, and D. Combination techniques.

3.6.4 Keeping in view the terms of reference of the study a set possible criteria was drawn up for choosing among the plethora of forecasting techniques. The criteria implied by the terms of reference required that the model, apart from being simple and flexible should enable accurate forecasting and, should facilitate policy simulation.

3.6.5 Keeping these criteria in view, four alternative methods were examined: 1. Compound Growth method, 2. The ARIMA method, 3. Determinants method, and 4. Transfer function method. Methods 1 and 2 come under the category of the time series techniques while methods 3 and 4 belong to the econometric approach and the combination approach, respectively.

3.6.6 The time series models are known to yield more accurate forecasts than others and therefore were selected to achieve as much accuracy as possible despite their limitation for policy simulations. Also, four variants of the sales tax revenue series were used to achieve some amount of conditional forecasting for price change effect and the effect of change in the tax rate structure. The four variants are; (i) actual series without any adjustments (ST), (ii) actual series adjusted for price changes only (STR), (iii) hypothetical series adjusted by PA method but not adjusted for price changes (AST), and (iv) "cleaned" sales tax revenue obtained by adjusting the actual series for tax rate structure effects by the PA method and by also deflating for price change effect (ASTR).

3.6.7 The basic determinants function used consists of SDP in real terms, the SDP deflator, and ratio of SDP deflator to the wholesale price index as the main determinants for the sales tax revenue. The latter two determinants were included to capture the price effects. However, inclusion of the independent variables from among the above depended upon the sales tax revenue variant used. Also among the determinants models alternative methods were tried to capture the changes in the tax rate-structure. But the empirical results show that the discretionary changes do not seem to have significant effect on the growth of the tax revenue.

3.6.8 The time series models assume that the current value of revenue solely depends on its past values, while the determinants models assume that the current revenue is determined by the current values of the the determining factors. The Combination approach seeks to combine the time series methods with the determinants models and thereby help evolving a forecast model with the accuracy of time series models and which also facilitates policy simulation. Thus, basically a combination model resembles a determinants model which also incorporates the lagged effects of the determining factors.

3.6.9 The combination models basically incorporates lagged variables into the determinants models. There is also an economic rationale for incorporating lagged variables. The need to include lagged effects arises mainly because the tax base at a given time point may not correspond to the SDP level at the same point of time. This type of

dynamic behaviour is captured best by using the combination models. Two combination models were tried: a. Transfer function model, and b. Adaptive expectations model. However, only the latter yielded sensible results.

3.6.10 The alternative models were estimated using the sales tax revenue series for the past 26 years from 1961-62 to 1986-87. The revenue forecasts were made for the next four years, that is, from 1987-88 to 1990-91.

3.6.11 The main characteristics of the estimated models are as follows. Though the CG function well fits the four variants of the sales tax revenue it suffers from severe autocorrelation. The ARIMA models are fitted to the logs of the revenue variants. The versions of the ARIMA models containing two AR lags and with one MA lag yielded better fits. Among the different variants of the determinants model estimated with the four alternative dependent variables, the equations with the unadjusted sales tax revenue yield better fit compared to the other variants as in the case of the univariate models. The real income and the two price variables turned out to be highly significant as also the lagged dependent variable indicating the lagged effects. However, attempts to capture the effects of the changes in the tax rate structure were not successful.

3.6.12 For forecasting purposes among the various models fitted, the two ARIMA models and the two AE models were selected. The ARIMA forecasts turned out to be higher than those obtained from the AE models.

5.6.13 Also, a significant point to note is that if the forecasts obtained from the AE models can be interpreted as indicator the capacity related forecasts, the fact that they were lower than those obtained from the ARIMA models can be taken to be an indication of the growing divergence between the capacity and the targets fixed in accordance with the past revenue trends.

B. Recommendations

5.6.14 The fact that the ARIMA model with two AR lags yielded a good fit shows that the revenue forecasts for budget, which also serve as the targets, are basically derived on the basis of the previous two years' revenue figures. However, the large errors in the budget estimates could be due to attempts to modify them further. Therefore, our first recommendation would be that such further modifications of the revenue forecasts should be minimised.

5.6.15 The second recommendation pertains to the method of forecasting itself. The empirical exercise gives a clue to the reason for the growing divergence between the forecasted revenue by the growth rate methods and the capacity related forecasts. The targets fixed by the present method cannot be expected to be fulfilled unless the tax base also grows commensurately. However, if the growth rate based targets continue to be relied upon in future it might lead to strains in the working of the tax department. Therefore, a change from the present forecasting methods to capacity related forecasting is called for, using the deterministic methods (or adaptive expectations methods) which

take into account the growth of the tax base and other related factors.

3.8.18 The primary requirement of realistic forecasting with the determinants models is a reliable statistical data with detailed information on the sales tax base. At present, even the estimates of the revenue effect of the year to year discretionary changes in the tax structure appear to be defective. This was clear from the divergent empirical results obtained from the different methods employed in the determinants and AE models to capture the impact of the discretionary measures. The Proportional Adjustment method of cleaning the tax revenue series of the discretionary effects has yielded an income-elasticity coefficient estimate higher than the bucyancy estimate which is rather unusual (Table 2.4, see estimates pertaining to the period 1971-85). On the other hand, both the dummy variables as well as the time trend variable which were alternatively used as proxies for the discretionary effects have turned out to be statistically insignificant, thereby indicating that these changes have no perceptible impact on the growth of sales tax revenue (Table 3.6). Thus there exists a clear need to improve the statistical data base which will not only improve the estimation of the revenue effect of the discretionary measures in the tax structure but will facilitate a more realistic forecasting of the overall tax revenue.

Table 3.1

Trends in AP Sales Tax Revenue and its Share in Own Tax Reven 1970-71 TO 1986-87

(Rs.Crore)

year	total sales tax revenue (accounts) (Rs crore)	per cent share in own tax revenue (%)
1961-62	14.81	34.04
1962-63	13.00	24.87
1963-64	19.02	28.06
1964-65	23.00	32.06
1965-66	24.57	33.59
1966-67	31.60	42.77
1967-68	34.76	41.04
1968-69	40.33	37.01
1969-70	43.60	40.16
1970-71	49.90	36.67
1971-72	50.01	36.21
1972-73	56.60	42.74
1973-74	73.85	36.70
1974-75	111.01	45.26
1975-76	141.08	43.33
1976-77	149.91	44.52
1977-78	159.65	44.19
1978-79	181.44	43.93
1979-80	220.22	44.69
1980-81	278.85	48.49
1981-82	341.66	49.17
1982-83	406.35	50.26
1983-84	503.38	52.14
1984-85	606.93	52.06
1985-86	761.33	52.27
1986-87	803.21	53.11

Source. AP State Budget documents.

Table 3.2
AP Sales Tax Revenue Budget Estimates, Revised and Actuals, 1970-71 TO 1986-87

(Rs Crore)

year	budget estimates(b)	accounts (a)	difference	
			(b - a)	(ln b - ln a)
1961-62	0.00	14.81		
1962-63	14.03	13.00	1.03	0.08
1963-64	15.14	19.02	-3.88	-0.23
1964-65	18.99	23.00	-4.01	-0.19
1965-66	22.00	24.57	-2.57	-0.11
1966-67	27.20	31.60	-4.40	-0.15
1967-68	33.13	34.76	-1.63	-0.05
1968-69	35.48	40.33	-4.85	-0.13
1969-70	44.00	43.60	0.40	0.01
1970-71	45.62	49.90	-4.28	-0.09
1971-72	48.24	50.01	-1.77	-0.04
1972-73	59.40	56.60	2.80	0.05
1973-74	60.14	73.85	-13.71	-0.21
1974-75	81.18	111.01	-29.83	-0.31
1975-76	106.00	141.08	-35.08	-0.29
1976-77	150.69	149.91	0.78	0.01
1977-78	170.00	159.65	10.35	0.06
1978-79	163.29	181.44	-18.15	-0.11
1979-80	188.66	220.22	-31.36	-0.15
1980-81	231.18	278.85	-47.67	-0.19
1981-82	309.99	341.66	-31.67	-0.10
1982-83	406.00	406.35	-0.35	-0.00
1983-84	501.30	503.38	-2.08	-0.00
1984-85	615.69	606.93	8.76	0.01
1985-86	770.09	761.33	8.76	0.01
1986-87	950.00	803.21	146.79	0.17

Source: AP State Budgets.

Chart 3.1 AP Sales Tax Revenue Errors in BE.

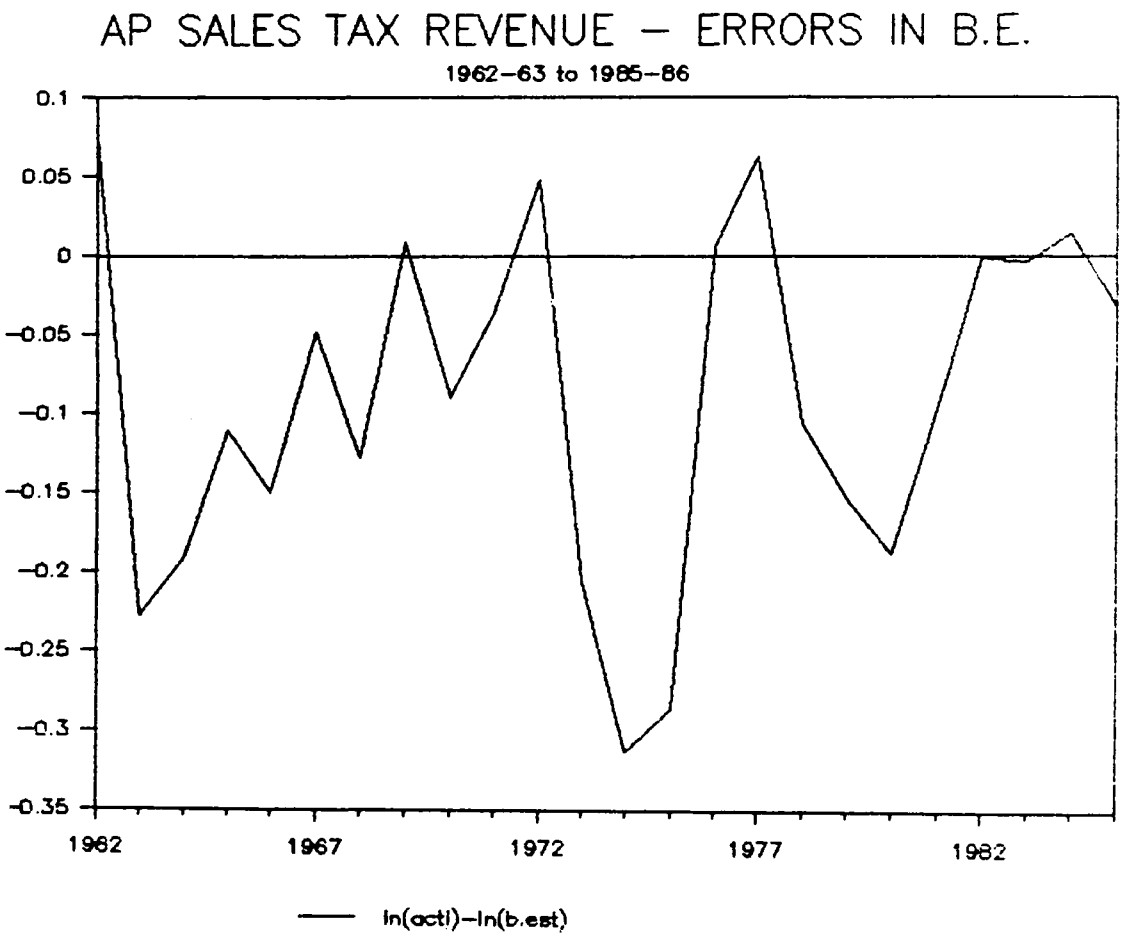

Table 3.3

AP Sales Tax Revenue, Accounts and its Three Variants
(1961-62 to 1986-87)

(Rs.Crore)

year	accounts	at 1986-87 whole sale price level	adjusted for changes in tax rate structure	adjusted for both price changes and changes in tax rate structure
1961-62	14.81	96.70	23.35	152.48
1962-63	13.00	81.77	20.49	128.94
1963-64	19.02	112.56	29.99	177.50
1964-65	23.00	122.81	36.26	193.66
1965-66	24.57	121.81	38.74	192.08
1966-67	31.60	137.55	49.82	216.90
1967-68	34.76	135.59	48.16	187.97
1968-69	40.33	159.21	55.13	217.65
1969-70	43.60	165.76	59.60	226.61
1970-71	49.90	179.85	66.21	245.87
1971-72	50.01	170.69	68.36	233.34
1972-73	56.60	175.56	77.37	240.00
1973-74	73.85	190.53	100.95	260.47
1974-75	111.01	228.76	151.75	312.73
1975-76	141.08	293.92	180.55	376.16
1976-77	149.91	305.95	190.39	388.58
1977-78	159.65	309.70	202.76	393.34
1978-79	181.44	351.97	230.43	447.02
1979-80	220.22	364.76	271.43	449.60
1980-81	278.85	392.14	325.21	457.34
1981-82	341.66	437.76	360.99	462.54
1982-83	406.35	507.31	429.34	536.01
1983-84	503.38	574.15	503.38	574.15
1984-85	606.93	646.44	606.93	646.44
1985-86	761.33	770.34	761.33	770.34
1986-87	803.33	803.21	803.21	803.21

Chart 3.2 Trends in AP Sales Tax Revenue.

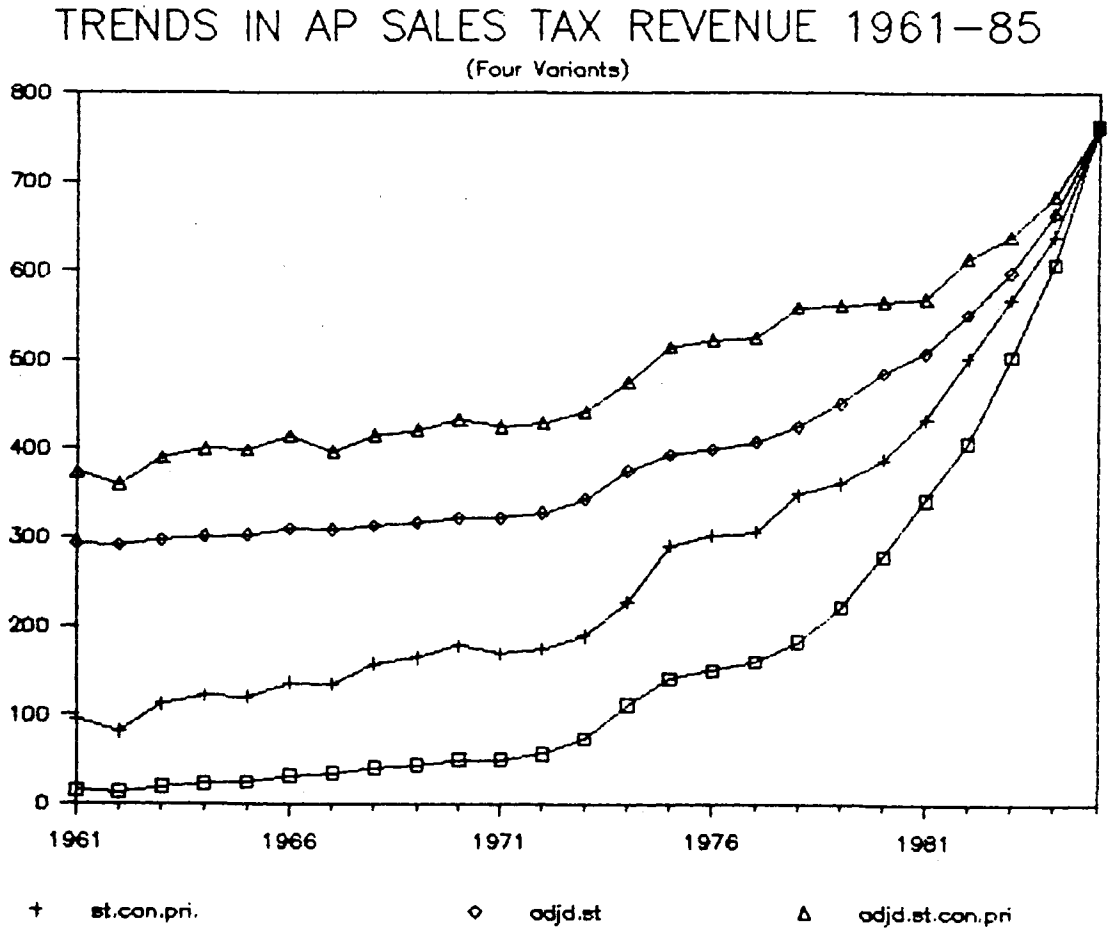

Table 3.4
Regression Results of The Compound Growth Models

Sales tax variant	Eq. no.	Regression results 1961-62 to 1986-87					Forecast statistics 1961-62 to 1980-81	
		Const.	Trend coef	R^2	SEE	DW	RMSE	Theil's U
ST	1	2.34	0.16	0.98	0.13	0.81	0.21	1.07
STR	2	4.34	0.06	0.97	0.10	0.96	0.19	1.39
AST	3	5.49	0.04	0.87	0.10	0.14	0.26	2.92
ASTR	4	5.82	0.03	0.93	0.53	0.55	0.11	1.57

Note. All the coefficients are significant at 5% level.

Chart 3.3 Forecast Errors CG Model

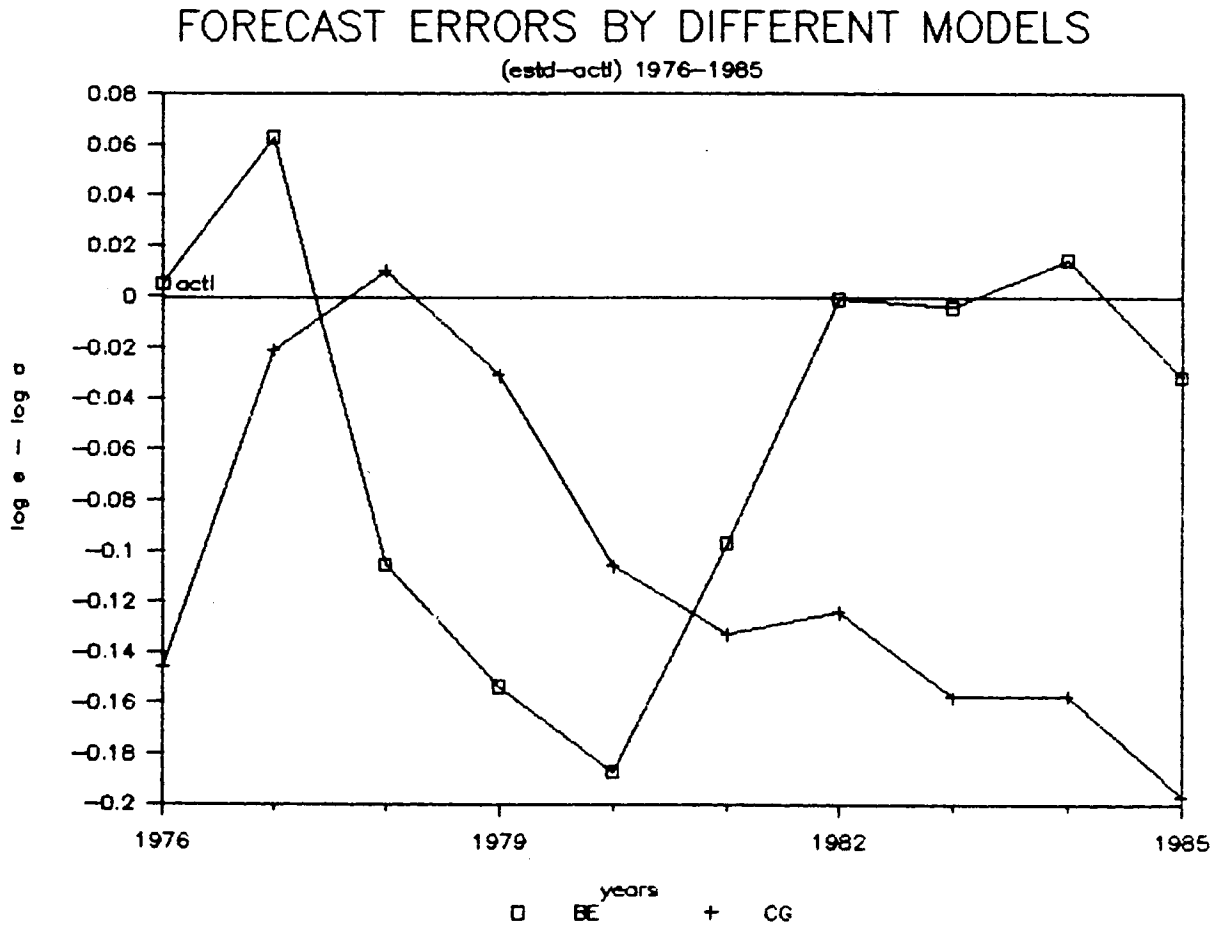

Table 3.5
Reggression Results of The ARIMA Models.

Sales Tax Revenue Variant	Eq. no.	ARIMA Specificaton. p d q	AR lags. Const	AR(1)	AR(2)	MA lag MA(1)	R^2	SEE	DW	Forecast stats. RMSE	Theil's U
ST											
	1.	0 1 1	0.182*			0.340	0.056	0.096	1.79	0.027	0.135
	2.	1 0 1	0.166*	1.018*		-0.070	0.990	0.116	1.73	0.074	0.367
	3.	2 0 0	0.181*	0.978*	0.024		0.992	0.103	1.24	0.022	0.109
	4.	2 0 1	0.222*	0.742*	0.261	0.494	0.993	0.096	1.75	0.021	0.106
	5.	3 0 1	0.165*	1.196*	-0.357	0.184 0.117	0.993	0.090	1.97	0.101	0.501
STR											
	6.	2 0 0	0.119*	0.757*	0.257		0.978	0.087	1.30	0.053	0.388
	7.	2 0 1	0.135*	0.594*	0.420*	0.408	0.979	0.084	1.81	0.051	0.368
AST											
	8.	1 0 1	0.043*	1.130*		0.310	0.995	0.019	1.94	0.802	8.423
	9.	1 1 1	0.007	0.969*		-0.304	0.575	0.024	1.80	0.024	0.255
	10.	2 0 0	0.034*	1.372*	-0.274		0.995	0.021	1.70	0.588	6.175
ASTR											
	11.	1 0 1	0.031*	1.074*		-0.236	0.965	0.037	1.75	0.450	6.521
	12.	2 0 0	0.038*	0.893*	0.179		0.965	0.037	1.54	0.430	6.291
	13.	2 0 1	0.047*	0.630	0.459	0.370	0.965	0.037	1.79	0.540	7.820

Note. The coefficients are significant at 5% level.

Chart 3.4 Forecast Errors ARIMA Models

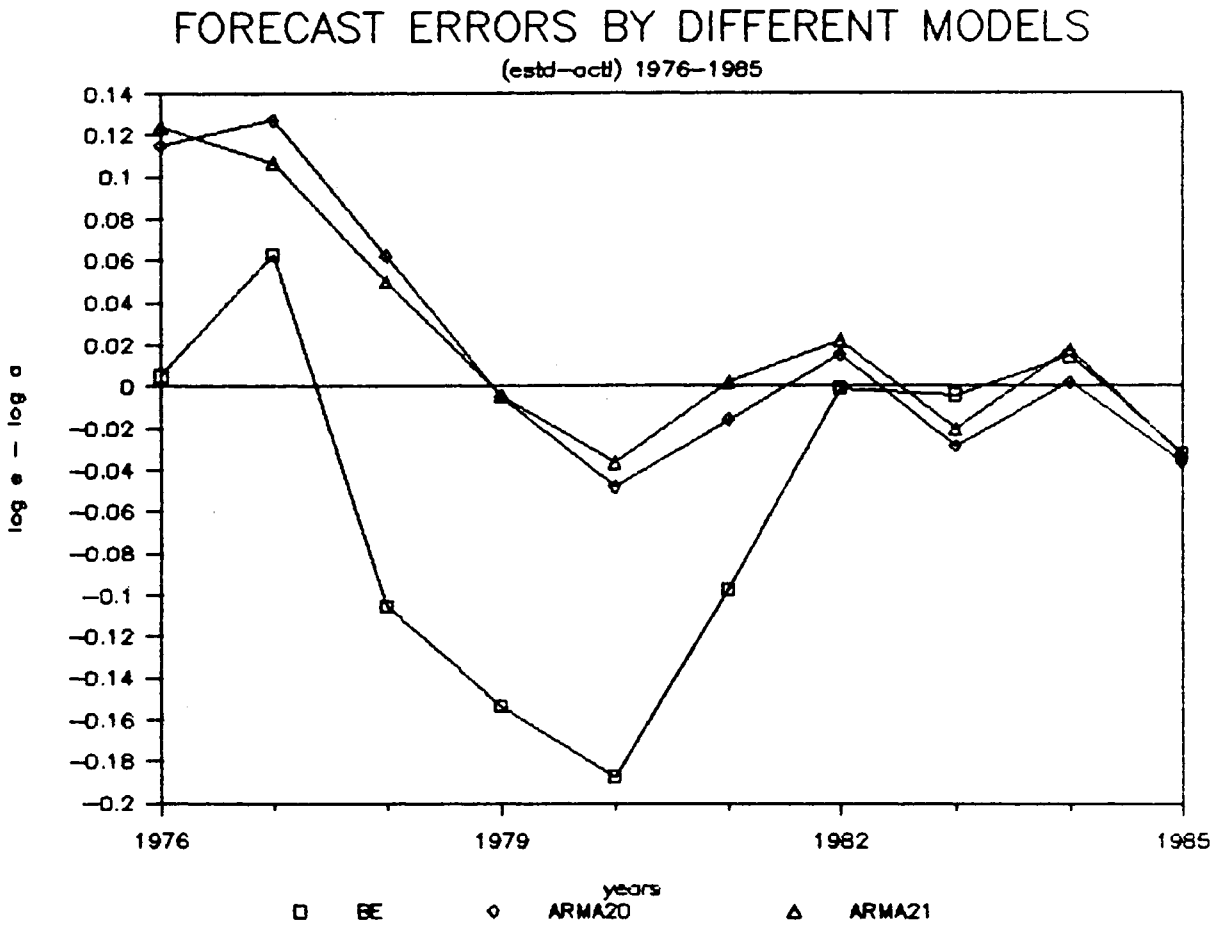

Table 3.6
Regression Results of The Determinants Models.

sales tax revenue variant	Eq. no.	Reg. Coeffs. Const.	SDP in 1985 prices	SDP defltr /whole sale price index	SDP defltr	trend	Regn sum stats. R^2	SEE	DW	Forecast stat RMSE	Theil U
ST	1.	-10.16*	0.72*	1.27*	1.82*		0.995	0.066	1.34	0.088	0.44
	2.	- 8.95*	0.68*	1.20*	1.61*	0.02	0.995	0.065	1.36	0.089	0.44
	3.[1]	- 8.51*	0.41	1.31	2.02*		0.996	0.074	1.79	0.039	0.19
STR	4.	0.12	0.56			0.07*	0.975	0.098	1.12	0.166	1.22
	5.[2]	- 3.28	1.04*				0.965	0.117	1.65	0.094	0.66
AST	6.	- 0.46	0.71*	0.36	0.11		0.915	0.081	0.76	0.218	2.29
ASTR	7.	- 0.06	0.78*				0.920	0.050	1.39	0.077	1.11

Notes: 1. The coefficients of the eight dummy variables are.
-0.11, -0.04, 0.01, 0.02, 0.11, -0.08, -0.11, and 0.14 respectively.

2. The dummy coefficients are.
0.13, 0.16, 0.31*, 0.07, 0.04, 0.02, -0.01, 0.02.

* indicates that the coefficient is significant at at least 5% level.

Chart 3.5 Forecast Errors Determinants Models.

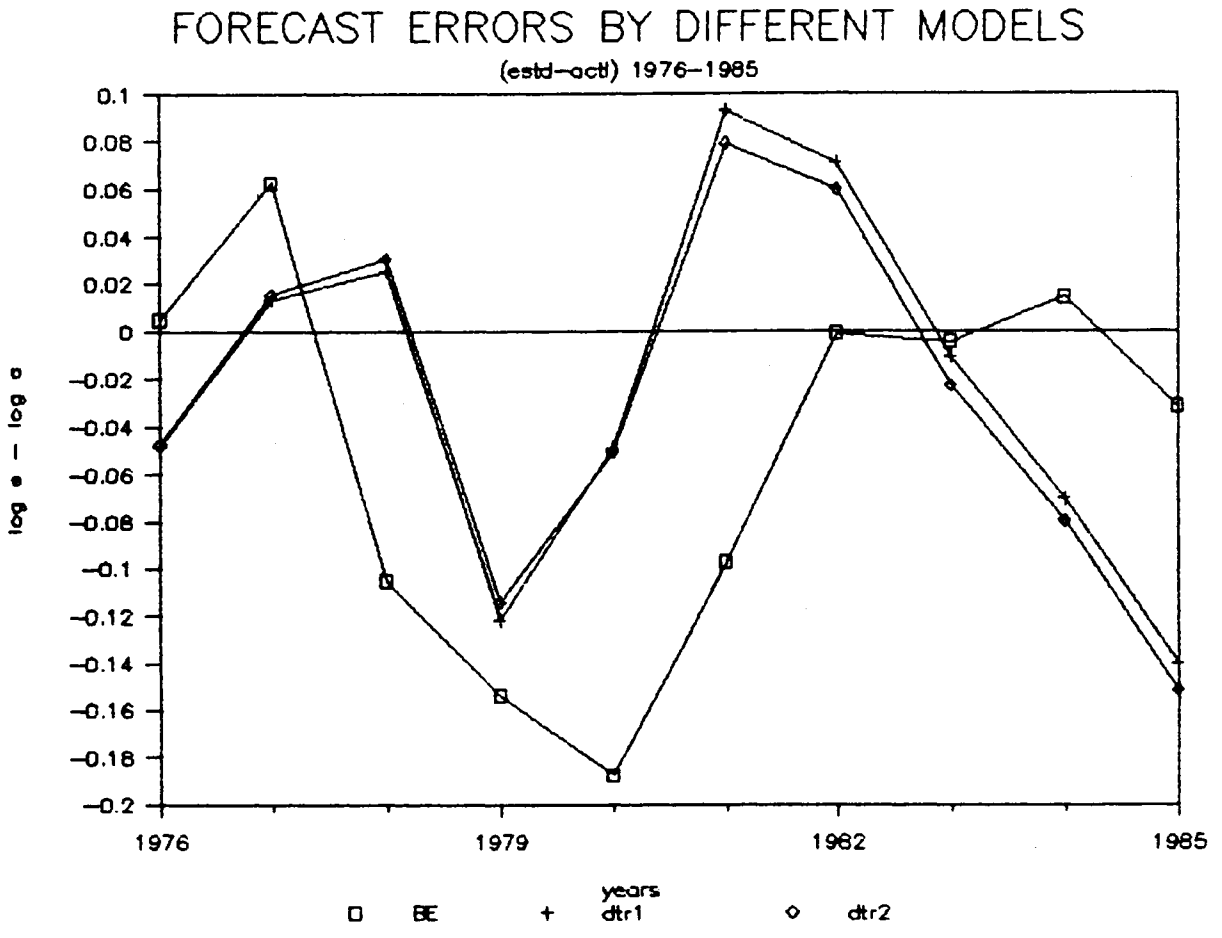

Table 3.7
Regression Results of The Adaptive Expectations Models.

sales tax revenue	Eqn. no.	Reg. Coeffs.						Regn summ stats.			Forecast stat	
		Const.	SDP in 1985 prices	SDP defltr /whole sale price index	SDP defltr	trend	lagged dependent	R^2	SEE	DW	RMSE	Theil U
ST	a.	-7.72*	0.62*	0.64*	1.10*		0.54*	0.995	0.060	1.58	0.063	0.346
	b.	-9.01*	0.68*	0.62*	1.36*	-0.03	0.42*	0.995	0.061	1.75	0.063	0.353
STR	a.	-0.97	0.43			-0.03	0.49*	0.980	0.087	1.76	0.086	0.790
	b.[1]	-2.53	0.59				0.58*	0.972	0.102	2.13	0.040	0.361
AST	a.	-1.19*	0.07	0.01			1.12*	0.995	0.018	1.70	0.025	0.326
ASTR	a.	-0.45*	0.20*				0.82*	0.969	0.035	2.09	0.036	0.687

Notes: 1. The coefficients of the eight dummy variables are,
-0.01, 0.11, 0.21, -0.06, -0.006, 0.02, 0.03.

* indicates that the coefficient is significant at at least 5% level.

Chart 3.6 Forecast Errors Adaptive Expectations Models.

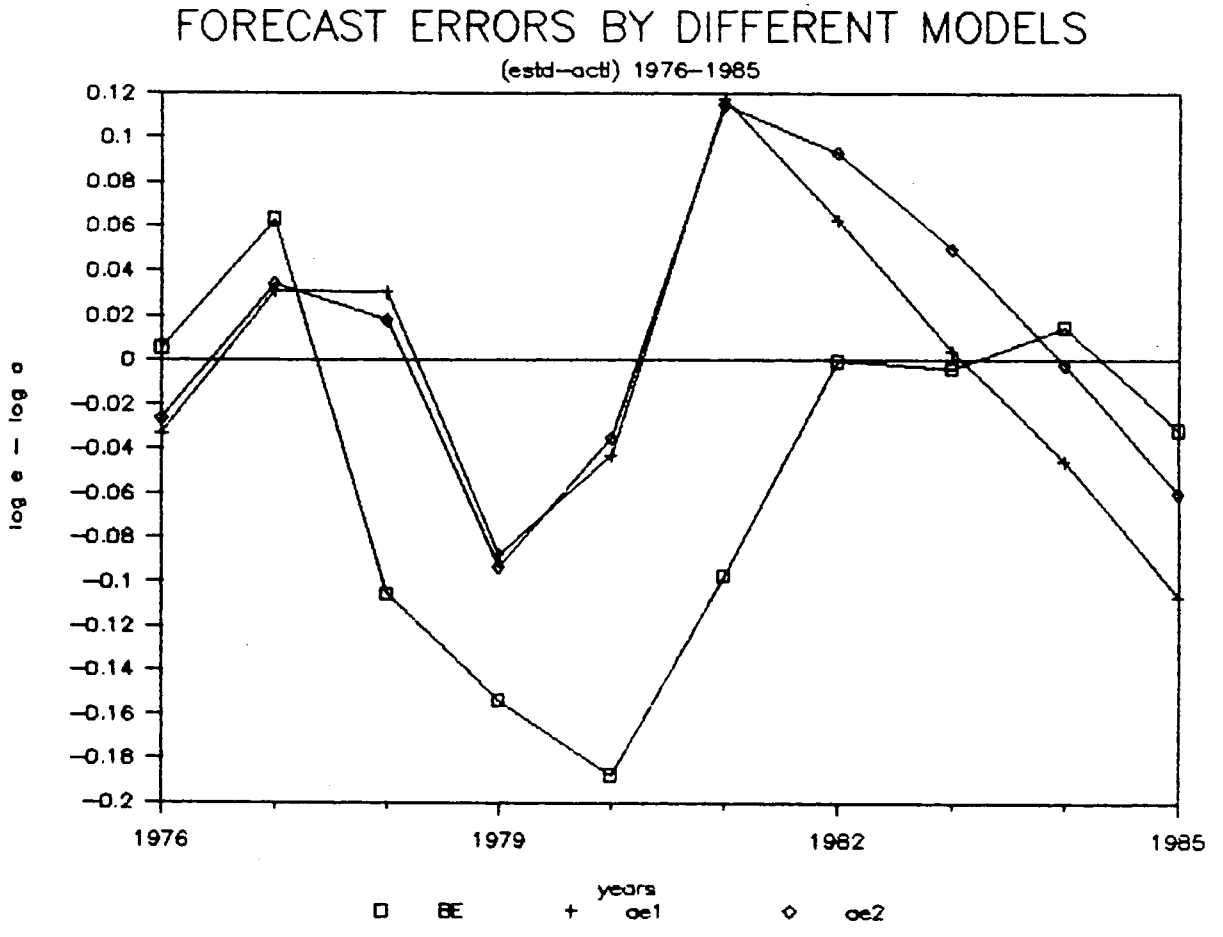

Table 3.8
Forecast Statistics of Selected Equations.
(Computed over the period 1975-76 to 1985-86)

Model	eqn.no.	RMSE	Theil's U
A. Compound Growth	1	0.210	1.072
B. ARIMA	3	0.022	0.109
	4	0.021	0.106
C. Determinants	1	0.088	0.440
	2	0.089	0.491
	3	0.039	0.192
D. Adaptive expectations	1	0.063	0.348
	2	0.063	0.353

Source. Tables 4 to 7. selected equations.

Table 3.9
AP Sales Tax Revenue Forecasts 1987-88 to 1990-91
by ARIMA Models

Eq.	3. ARIMA 200				4. ARIMA 201			
year	dynamic		simulated		dynamic		simulated	
	point	interval	point	interval	point	interval	point	interval
1987-88	1114.05	838.92-1479.46	1001.68	754.29-1330.20	1135.69	841.83-1532.13	1408.40	1043.97-1900.03
1988-89	1349.05	954.08-1907.58	1350.01	954.74-1908.91	1381.89	951.93-2006.04	1442.74	993.85-2094.37
1989-90	1634.26	1095.85-2437.21	1607.73	1078.06-2397.63	1680.16	1086.82-2597.43	2120.39	1371.59-3278.00
1990-91	1980.57	1266.94-3096.16	1880.15	1202.70-2939.19	2044.56	1251.97-3338.91	2319.48	1420.32-3787.87

Source. Table 3.5, equations of ST.

Table 3.10
AP Sales Tax Revenue Forecasts 1987-88 TO 1990-91
by Adaptive Expectation Models

eqn no.	1		2	
year	point	interval	point	interval
1987-88	951.36	805.60-1123.26	965.33	811.95-1147.67
1988-89	1115.46	943.85-1318.26	1129.33	947.72-1345.72
1989-90	1316.37	1113.73-1555.67	1330.93	1116.46-1586.60
1990-91	1556.69	1317.21-1840.17	1573.39	1319.76-1875.77

Source. Table 7. equations of ST.

Table 3.11
Actual and Capacity Forecasts and The Required Tax Effort
1987-88 to 1990-91

(Rs.Crore)

year	range forecasts			
	actual	capacity related	required additional effort	as % of actual
1987-88	1114.05-1135.69	951.38- 965.33	148.72-184.31	13.35-16.24
1988-89	1349.05-1381.89	1115.46-1129.33	219.72-266.43	16.29-19.28
1989-90	1634.26-1680.16	1316.37-1330.93	303.33-363.79	18.56-21.65
1990-91	1980.57-2044.56	1556.89-1573.39	407.18-487.67	20.56-23.85

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