

# Projection of Quarterly CT and IT Receipts for the FYs 2005-06

A.L. Nagar, Sanjay Kumar and Sayan Samanta

## Tax Receipt Model

The tax-receipt forecasting model is a simple, yet functional tool to monitor and project short-term revenues from major taxes. It captures seasonal patterns of tax collections, and with simple calibration techniques, it provides relatively accurate results that make the model attractive for developing countries. This model requires primarily monthly tax collection data. Typically the receipts model can be used to track and project monthly receipts, but it can also be used for quarterly receipts. The model provides the collections in each quarter or month to date, the projected revenues for each month over the remainder of the year, and the estimated surplus or deficit of taxes. These can be used to monitor collection performance and for cash management.

The tax-receipt forecasting model uses past seasonal tax collection patterns to predict the following years patterns while allowing for increased collections due to economic growth, actual collections to date that deviate from the expected growth rate, allows for expected changes in the seasonal pattern, and adjusts for changes in the effective tax rate between the same months in successive years. The model uses actual receipts data and projected GDP growth – or other tax base proxies (e.g. private consumption or imports) growth – to forecast collection. It allows the analyst to account for changes in real GDP, the price level, effective average tax rates, and any behavioral effects that may be associated with changes in tax rates.

While this model is primarily targeted at short-term forecasting and monitoring monthly tax receipts over a financial year, it contains similar features to a simple macro-model for forecasting one-year or medium-term revenues as long as there are no major changes in the tax structure or economic structure expected over the forecast period.

## Methodology for the Model

A detailed methodology for the Receipt model was given in the earlier paper<sup>1</sup>. But to recapitulate, annual tax receipts for the fiscal year can be expressed as the sum of two parts: (1) actual revenues collected up to the month for which receipts data are available; and (2) forecasted receipts for each of the remaining months of the fiscal year. To project the second part of monthly receipts, the model takes into consideration the actual growth of the year-to-date tax collections as compared with that of the same period in the previous fiscal year and the projected growth of tax base proxies (e.g. GDP, private consumption, imports, etc.). The general form of the monthly tax receipt of fiscal year,  $y$ , is as follows:

$$T_y = \sum_{a=1}^m T_{a,y} + \sum_{\substack{a=m \\ i=m}}^{12} \tau_{i,y} \cdot B_{a,y-1} \cdot (1 + \delta) \cdot \left( \frac{\tau_{i,y}}{\tau_{a,y-1}} \right)^\eta \quad (1)$$

where:  $T_y$  : Annual tax receipts for the fiscal year  $y$ .

---

<sup>1</sup> **Projection of Quarterly Corporate and Income Tax Collection**, A.L. Nagar, Sanjay Kumar and Dev Ashish, Working Paper 24, NIPFP, 2004.

$T_{a,y}$	:	Actual monthly tax receipts in fiscal year $y$ , where tax collection data is available.
$T_{a,y-1}$	:	Actual monthly tax receipts in fiscal year $y-1$ .
$B_{a,y-1}$	:	Actual monthly tax base in fiscal year $y-1$ .
$m$	:	Number of months up to which actual tax receipts data in fiscal year $y$ is available.
$\delta$	:	Growth factor.
$\tau_{i,y}$	:	Projected effective average tax rate in month $i$ of fiscal year $y$ defined as the ratio of tax revenues to the tax base.
$\tau_{a,y}$	:	Actual effective average tax rate in month $i$ of fiscal year $y-1$ defined as the ratio of tax revenues to the tax base.
$\eta$	:	User defined elasticity of the tax base with respect to changes in the tax rate depending on the structure of the tax.

Based on the above model, we proceed to estimate Quarterly CT (Corporate Tax) and IT (personal income tax) receipts from 1995-96 to 2005-06.

### **Estimation of Quarterly CT and IT Receipts for the Sample Period from 1994-95 to 2004-05**

The actual data on quarterly corporate tax (CT) and income tax (IT) revenue from 1994-95 to 2004-05 have been obtained from the Ministry of Finance<sup>2</sup>; see Table A.1 and A.2 in the Appendix. Actual quarterly estimates of GDP at current prices have been obtained from the Central Statistical Organization<sup>3</sup>. These are in Table A.3 of the Appendix.

We use the following notation:

$T_{iy}$	=	tax revenue in the $i$ -th quarter of year $y$ (to be estimated)
$T_{a,y-1}$	=	Actual tax revenue in the $i$ -th quarter of the previous year
$\tau_{iy}$	=	$\frac{T_{iy}}{(GDP)_{i,y}}$ = projected effective average tax rate in the $i$ -th quarter of the fiscal year $y$
$\tau_{a,y-1}$	=	Actual effective average tax rate in the $i$ -th quarter of year $y - 1$

It has been postulated that

$$\frac{T_{iy}}{T_{a,y-1}} = (1 + \delta) \left( \frac{\tau_{iy}}{\tau_{a,y-1}} \right)^{1+\eta}$$

where  $\delta$  signifies the expected growth rate of the tax base (i.e., GDP) and  $\eta$  is interpreted as the elasticity of tax base with respect to the change in tax rate. In order to estimate the parameters  $\delta$  and  $\eta$  we apply OLS to the log-linear model

<sup>2</sup> Website of Controller General of Accounts, Ministry of Finance: <http://cga.nic.in>.

<sup>3</sup> C.S.O., Government of India : <http://mospi.nic.in>

$$\ln\left(\frac{T_{iy}}{T_{a,y-1}}\right) = \ln(1 + \delta) + (1 + \eta)\ln\left(\frac{\tau_{iy}}{\tau_{a,y-1}}\right) + \text{error}$$

as in the earlier paper<sup>4</sup>.

Using data for the sample period 1994-95 to 2004-05 the OLS estimates of regression parameters ( $\delta$  and  $\eta$ ) for corporate tax and personal income tax are shown in Table 1 and 2 respectively.

**Table 1**  
**OLS Estimates of Regression Parameters: Corporate Tax**

Quarter	Estimates of				$\bar{R}^2$
	$\ln(1+\delta)$	$\delta$	$1+\eta$	$\eta$	
1	0.12 (10.52)	0.13	0.99 (44.43)	-0.01	0.995
2	0.12 (10.26)	0.13	1.03 (9.55)	0.03	0.91
3	0.14 (7.92)	0.15	0.72 (7.37)	-0.28	0.86
4	0.10 (7.37)	0.11	1.05 (13.26)	0.05	0.95

**Table 2**  
**OLS Estimates of Regression Parameters: Income Tax**

Quarter	Estimates of				$\bar{R}^2$
	$\ln(1+\delta)$	$\delta$	$1+\eta$	$\eta$	
1 & 2	0.12 (9.92)	0.13	1.00 (15.58)	0.00	0.96
3	0.11 (6.16)	0.12	0.91 (21.17)	-0.09	0.98
4	0.11 (10.83)	0.12	0.96 (15.26)	-0.04	0.96

(The quantities within brackets are the t-ratios.)

We observe that all parameter values are statistically significant at 5% level of significance and the values of  $\bar{R}^2$  are reasonably high. The values of  $\eta$  are negative in the first and third quarter for CT and they are negative in 3<sup>rd</sup> and 4<sup>th</sup> quarters for IT. As discussed in the earlier paper, a possible explanation for this is that the corporates do not respond favorably to the tax payment in the 1<sup>st</sup> and 3<sup>rd</sup> quarter, but they show better response in the 2<sup>nd</sup> and 4<sup>th</sup> quarter.

Using the estimated model, we obtain the estimated CT and IT for each quarter of the sample period. The actual and estimated values of quarterly CT and IT are presented in Tables 3 & 4, respectively. They are shown graphically in Figures 1 to 4 for CT and Figures 5 to 7 for IT in the Appendix. Figures 9 & 8 show the actual and estimated values of **annual** tax receipts from CT and IT, respectively.

<sup>4</sup> ibid 1.

**Table 3**  
**Actual and Estimated Corporate Tax receipts (in Rs. 100 Crores)**

FY	Quarter1		Quarter2		Quarter3		Quarter4		Total	
	Act	Est	Act	Est	Act	Est	Act	Est	Act	Est
1995-96	12.216	11.387	40.391	37.81	46.46	45.05	43.73	43.35	142.79	136.80
1996-97	11.431	11.009	45.941	45.52	55.11	54.39	55.89	52.64	168.37	163.70
1997-98	16.256	16.173	53.841	54.44	67.99	68.51	60.42	59.39	198.50	199.37
1998-99	27.475	27.347	70.626	67.55	69.28	67.00	77.56	76.60	244.94	234.12
1999-00	26.698	26.603	68.329	69.80	94.19	99.00	117.63	119.31	306.84	316.58
2000-01	46.774	48.184	85.958	88.11	105.99	111.04	118.02	123.26	356.75	370.13
2001-02	16.916	17.495	97.964	100.86	112.89	118.86	137.03	139.21	364.80	378.73
2002-03	40.421	41.627	112.221	114.95	142.65	147.46	167.40	170.57	462.69	474.89
2003-04	31.530	32.355	159.200	161.69	191.43	182.99	253.46	255.26	635.62	629.54
2004-05	39.500	39.686	163.870	162.85	293.60	274.98	338.69	338.26	835.66	827.18

**Table 4**  
**Actual and Estimated Income Tax receipts (in Rs. 100 Crores)**

FY	Q1 & Q2		Q3		Q4		Total	
	Act	Est	Act	Est	Act	Est	Act	Est
1995-96	52.98	49.50	40.98	38.79	56.83	55.91	150.79	143.02
1996-97	65.97	64.29	48.17	46.65	57.14	54.29	171.27	166.22
1997-98	74.06	74.25	95.90	91.69	80.07	78.71	250.03	245.21
1998-99	71.29	69.54	51.96	49.27	71.04	70.82	194.30	192.49
1999-00	86.47	87.35	59.25	65.17	100.65	100.25	246.37	252.78
2000-01	126.08	129.55	73.99	75.23	106.95	112.69	307.02	315.05
2001-02	128.85	132.77	82.76	83.60	105.80	108.27	317.41	327.36
2002-03	143.41	147.35	93.23	97.62	122.76	124.92	359.40	370.94
2003-04	145.20	147.96	118.13	113.85	150.46	149.71	413.79	414.55
2004-05	251.75	251.17	66.98	70.36	164.39	163.95	483.12	481.12

### Projection of CT and IT for FYs 2005-06

In order to project the tax receipts for 2005-06, we would require the projected value of the ratio

$$\theta = \frac{\tau_{iy}}{\tau_{a,y-1}}$$

i.e., the ratio of projected average effective tax rate in 2005-06 to the actual average effective tax rate in 2004-05. The values of  $\theta$  in different quarters over the sample period are shown in Table 5 and 6 for CT and IT, respectively.

**Table 5**  
**Values of  $\theta$  in Different Quarters for Corporate Tax**

<b>FY</b>	<b>Quarter1</b>	<b>Quarter2</b>	<b>Quarter3</b>	<b>Quarter4</b>
1995-96	0.98	1.04	1.04	1.17
1996-97	0.80	1.00	1.03	1.08
1997-98	1.26	1.05	1.12	0.96
1998-99	1.50	1.11	0.81	1.14
1999-00	0.86	0.88	1.36	1.37
2000-01	1.61	1.14	1.04	0.95
2001-02	0.33	1.04	0.97	1.06
2002-03	2.20	1.04	1.20	1.12
2003-04	0.71	1.27	1.17	1.36
2004-05	1.12	0.91	1.37	1.20

**Table 6**  
**Values of  $\theta$  in Different Quarters for Income Tax**

<b>FY</b>	<b>Quarter 1&amp;2</b>	<b>Quarter 3</b>	<b>Quarter 4</b>
1995-96	1.13	1.09	1.19
1996-97	1.08	1.03	0.85
1997-98	1.00	1.80	1.25
1998-99	0.83	0.43	0.79
1999-00	1.09	1.14	1.28
2000-01	1.33	1.16	1.01
2001-02	0.94	1.02	0.91
2002-03	1.02	1.07	1.06
2003-04	0.92	1.11	1.10
2004-05	1.54	0.50	0.98

It would be unrealistic to use the average affective tax rate of CT in Q1 of 2005-06 to project CT for the remaining quarters of the year. The percent relative change in CT of Q1 of 2005-06 over that in the same quarter of 2004-05 is of the order of 182.20%. The average effective tax rate is 0.0154 and  $\theta = 2.52$ . It would be rather ambitious to assume that the same rate of CT collections would continue in the remaining quarters as well.

Since the actual CT receipts in Q2 of 2005-06 are now available as 225.38 (Rs. 100 crore) we should use this information to project CT for Q3 and Q4. The CT collections in Q2 of 2005-06 are 37.54% more than the same in the last year. However, GDP data for this quarter are not yet available. Therefore, using past trends in GDP (at current prices) growth, the projected GDP at 14% is 7400.49 (Rs. 100 crores). The projected average effective tax rate is Q2 of 2005-06 is 0.030 and  $\theta = 1.21$ .

We use  $\theta = 1.21$  (as obtained for Q2) to project CT in Q3 and Q4 as 385.81 (Rs. 100 crores) and 457.27 (Rs. 100 crores), respectively.

The projected CT for FY 2005-06 is the sum of actuals in Q1 and Q2 and projected ones in Q3 and Q4. Therefore, the projected CT for FY 2005-06 is 1179.93 (Rs. 100 crores).

The actual IT receipts in Q1 and Q2 of 2005-06 are 205.33 (Rs. 100 crores) showing a negative relative change of -18.44% over that in 2004-05. GDP for Q1 and Q2 is obtained as the sum of actual GDP in Q1 and projected GDP in Q2 i.e., 14659.94 (Rs. 100 crores). Therefore, the average effective tax rate is 0.0140 and  $\theta = 0.72$ . We use this value of  $\theta$  to project IT in Q3 as 55.18 (Rs. 100 crores) and 133.35 (Rs. 100 crores) in Q4. Therefore, the projected IT receipts at the end of FY 2005-06 is 393.86 (Rs. 100 crores).

Hence, the total revenue collection from CT and IT at the end of FY 2005-06 is 1573.78 (Rs. 100 crores).

## Conclusion

If we take last year's average effective tax rate, CT receipts for the current year will be Rs. 1,10,090 Crores as against the BE figure of Rs. 1,10,573 Crores; for IT receipts, it will be Rs. 66,040 Crores as against the budget target of Rs. 66,239 Crores. Broadly speaking, the budget estimates of CT and IT may seem to be achieved.

But if we see the current year collections trend, which is an important guide for this model, we find that the CT collections in Q1 for 2005-06 were 182.2% more than that in the same quarter for the FY 2004-05, and that for Q2 of 2005-06 was 37.54% more than those for the same quarter of FY 2004-05. If we use these data, and use the projected GDP data for the quarters assuming past trend of 14% growth in GDP (at current prices), the projected average effective tax rate is 0.030 and  $\theta = 1.21$ . Using  $\theta = 1.21$ , the projected CT collection for the FY 2005-06 is likely to be Rs. 1,17,993 crores.

Using the same methodology and using the actual IT receipts in Q1 & Q2 of 2005-06, which showed a negative relative change of (-)18.44% over that in 2004-05, the average effective tax rate will be 0.0140 and  $\theta = 0.72$ . Using this value of  $\theta$  to project IT receipts, the projected IT collection will be Rs. 39,386 Crores. Accordingly, **the total revenue collection from CT and IT for the FY 2005-06 is projected to be Rs. 1,57,378 crores as against the budget target of Rs. 1,76,130 crores.**

This is a sharp fall, close to 10.7%, in the likely tax collections from the budget estimates. It should be mentioned here that the new tax revenue measures such as fringe benefit tax and cash transaction tax are not part of the projections of IT collections here, because this model builds on the past data of the tax collections and we also need appropriate tax base to plug in for that. But that apart, the trend of IT collections does not show much promise unless some appropriate & effective steps are taken to shore it up. Some of the administrative measures such as electronically connecting the TDS payment to the taxpayers' data base may be one such area. This may have some effect on changing the taxpayer's behavior. But whether this in itself will be sufficient for the present fiscal year is not very clear at this stage. Part of the fall in IT collections can be attributed to the changes made in the tax laws, particularly relating to exemption limit for tax payments etc. But that may not be entirely responsible for the fall in IT collections. Possibly the effect of tax administration measures on the taxpayer's behavior and the resulting tax collections will be palpable only after some time. The current trend does not suggest such effect in any significant manner.

## Appendix

Table A.1

### Quarterly Corporate Tax Receipts (in Rs. 100 Crores)

FY	Quarter1	Quarter2	Quarter3	Quarter4	Total	% Change
1994-95	10.33	32.23	38.22	33.20	113.98	
1995-96	12.22	40.39	46.46	43.73	142.79	25.28
1996-97	11.43	45.94	55.11	55.89	168.37	17.91
1997-98	16.26	53.84	67.99	60.42	198.50	17.90
1998-99	27.48	70.63	69.28	77.56	244.94	23.39
1999-00	26.70	68.33	94.19	117.63	306.84	25.27
2000-01	46.77	85.96	105.99	118.02	356.75	16.26
2001-02	16.92	97.96	112.89	137.03	364.80	2.26
2002-03	40.42	112.22	142.65	167.40	462.69	26.83
2003-04	31.53	159.20	191.43	253.46	635.62	37.37
2004-05	39.50	163.87	293.60	338.69	835.66	31.47

Source: Controller General of Accounts, Ministry of Finance at <http://cga.nic.in>.

Table A.2

### Quarterly Income Tax Receipts (in Rs.100 Crores)

FY	Quarter 1&2	Quarter 3	Quarter 4	Total	% Change
1994-95	38.89	32.15	42.54	113.58	
1995-96	52.98	40.98	56.83	150.79	32.76
1996-97	65.97	48.17	57.14	171.27	13.58
1997-98	74.06	95.90	80.07	250.03	45.98
1998-99	71.29	51.96	71.04	194.30	-22.29
1999-00	86.47	59.25	100.65	246.37	26.80
2000-01	126.08	73.99	106.95	307.02	24.62
2001-02	128.85	82.76	105.80	317.41	3.38
2002-03	143.41	93.23	122.76	359.40	13.23
2003-04	145.20	118.13	150.46	413.79	15.13
2004-05	251.75	66.98	164.39	483.12	16.75

Source: Controller General of Accounts, Ministry of Finance at <http://cga.nic.in>.

**Table A.3**  
**Quarterly Estimates of GDP at Current Prices (in Rs.100Crores)**

<b>FY</b>	<b>Quarter 1</b>	<b>% Change</b>	<b>Quarter 2</b>	<b>% Change</b>	<b>Quarter 3</b>	<b>% Change</b>	<b>Quarter 4</b>	<b>% Change</b>	<b>Total</b>	<b>% Change</b>
1994-95	2025.23		1937.81		2568.21		2639.33		9170.58	
1995-96	2432.58	20.11	2338.83	20.69	2995.50	16.64	2965.80	12.37	10732.71	17.03
1996-97	2841.19	16.80	2666.33	14.00	3433.65	14.63	3494.29	17.82	12435.46	15.87
1997-98	3196.65	12.51	2983.58	11.90	3799.09	10.64	3922.16	12.24	13901.48	11.79
1998-99	3612.80	13.02	3514.17	17.78	4791.84	26.13	4417.79	12.64	16336.60	17.52
1999-00	4072.25	12.72	3864.87	9.98	4791.84	0.00	4889.42	10.68	17618.38	7.85
2000-01	4439.63	9.02	4250.21	9.97	5178.02	8.06	5162.13	5.58	19029.99	8.01
2001-02	4824.84	8.68	4662.05	9.69	5693.82	9.96	5634.03	9.14	20814.74	9.38
2002-03	5250.49	8.82	5135.95	10.17	6016.19	5.66	6146.24	9.09	22548.87	8.33
2003-04	5748.57	9.49	5716.96	11.31	6883.88	14.42	6848.43	11.42	25197.84	11.75
2004-05	6436.45	11.97	6491.66	13.55	7729.62	12.29	7646.96	11.66	28304.64	12.33

Source: CSO,GOI at <http://mospi.nic.in>.

**Table A. 4**  
**Effective Average Tax rate for CT**

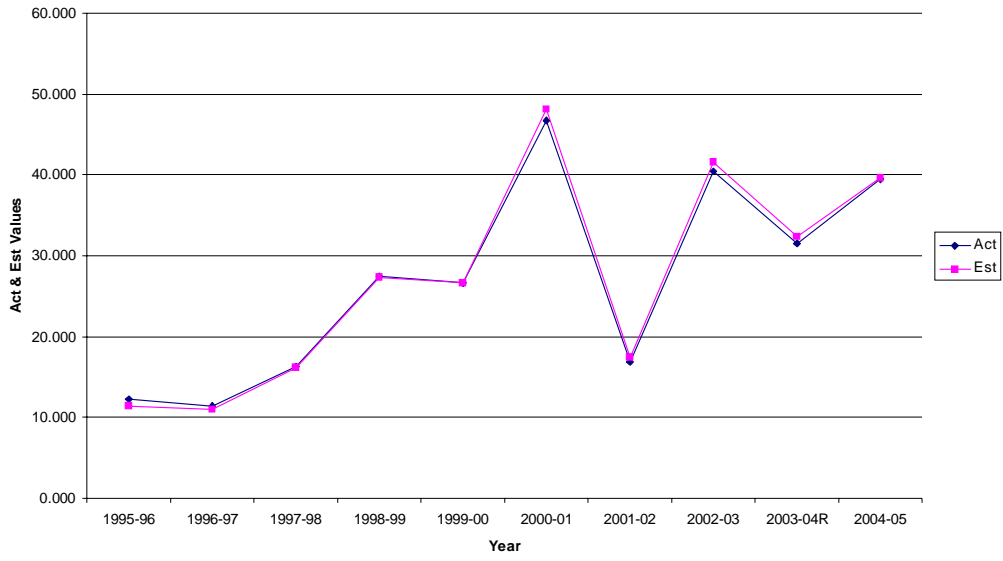
<b>FY</b>	<b>Quarter 1</b>	<b>Quarter 2</b>	<b>Quarter 3</b>	<b>Quarter 4</b>
1994-95	0.0051	0.0166	0.0149	0.0126
1995-96	0.0050	0.0173	0.0155	0.0147
1996-97	0.0040	0.0172	0.0160	0.0160
1997-98	0.0051	0.0180	0.0179	0.0154
1998-99	0.0076	0.0201	0.0145	0.0176
1999-00	0.0066	0.0177	0.0197	0.0241
2000-01	0.0105	0.0202	0.0205	0.0229
2001-02	0.0035	0.0210	0.0198	0.0243
2002-03	0.0077	0.0219	0.0237	0.0272
2003-04	0.0055	0.0278	0.0278	0.0370
2004-05	0.0061	0.0252	0.0380	0.0443



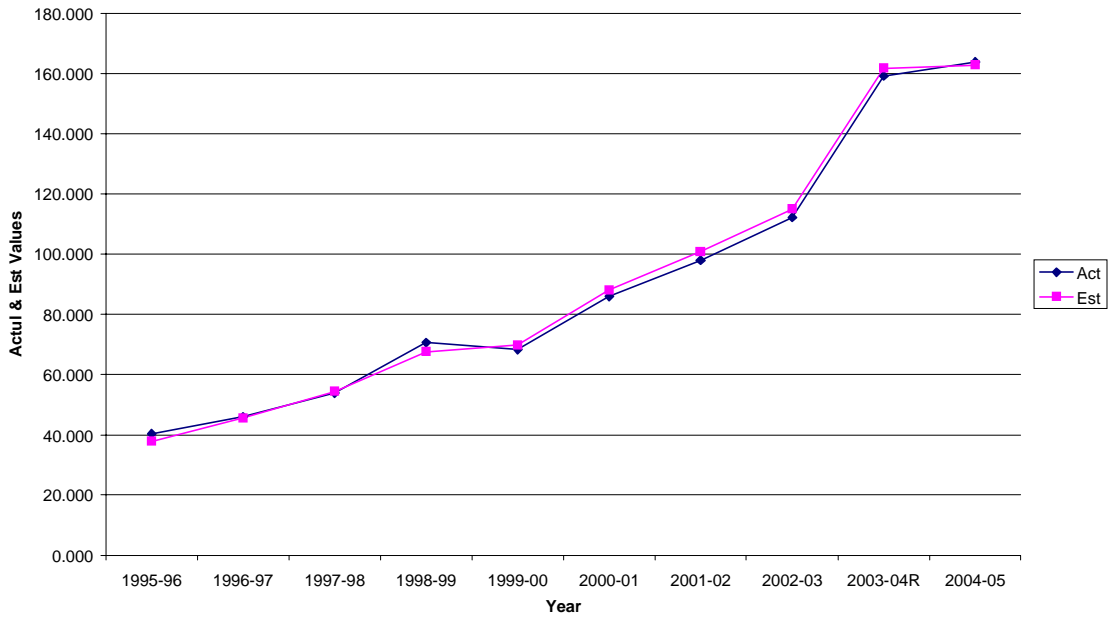
**Table A.5**  
**Effective Average Tax rate for IT**

<b>FY</b>	<b>Quarter 1&amp;2</b>	<b>Quarter 3</b>	<b>Quarter 4</b>
1994-95	0.0098	0.0125	0.0161
1995-96	0.0111	0.0137	0.0192
1996-97	0.0120	0.0140	0.0164
1997-98	0.0120	0.0252	0.0204
1998-99	0.0100	0.0108	0.0161
1999-00	0.0109	0.0124	0.0206
2000-01	0.0145	0.0143	0.0207
2001-02	0.0136	0.0145	0.0188
2002-03	0.0138	0.0155	0.0200
2003-04	0.0127	0.0172	0.0220
2004-05	0.0195	0.0087	0.0215

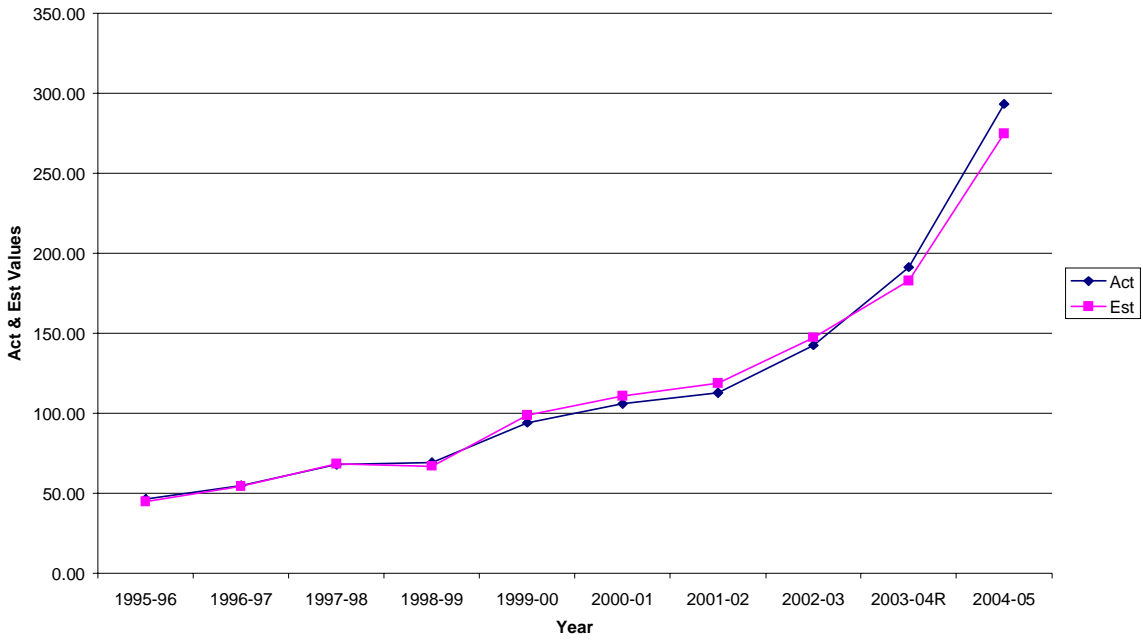
**Figure 1**  
**Actual and Estimated Corporate Tax in Quarter 1**  
**(for 1995-96 to 2004-05)**



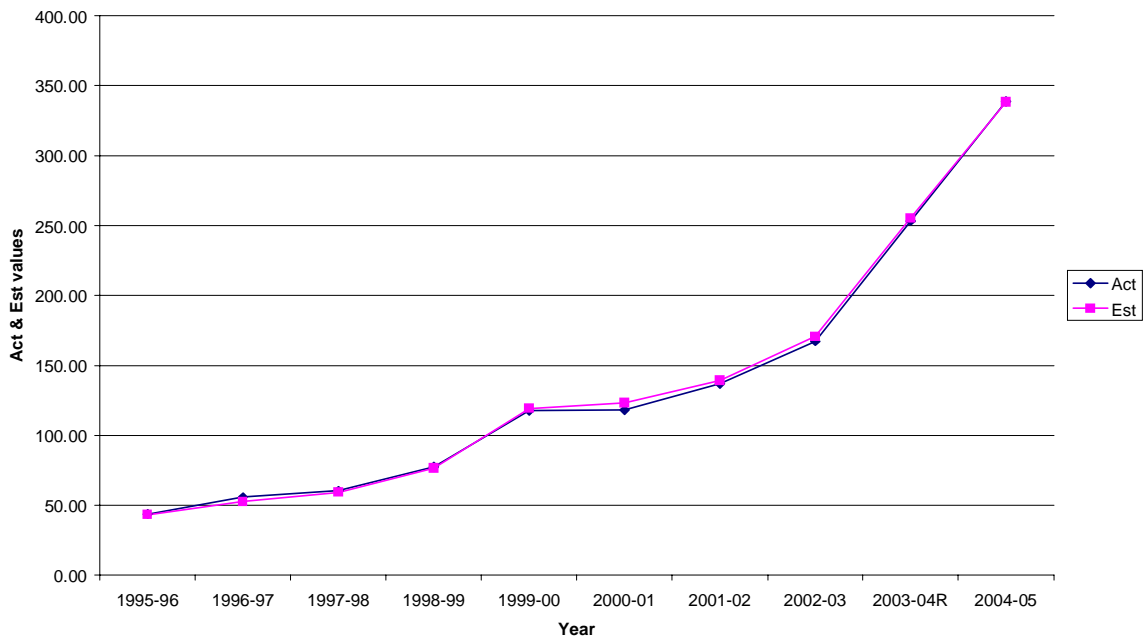
**Figure 2**  
**Actual and Estimated Corporate Tax in Quarter 2**  
**(for 1995-96 to 2004-05)**



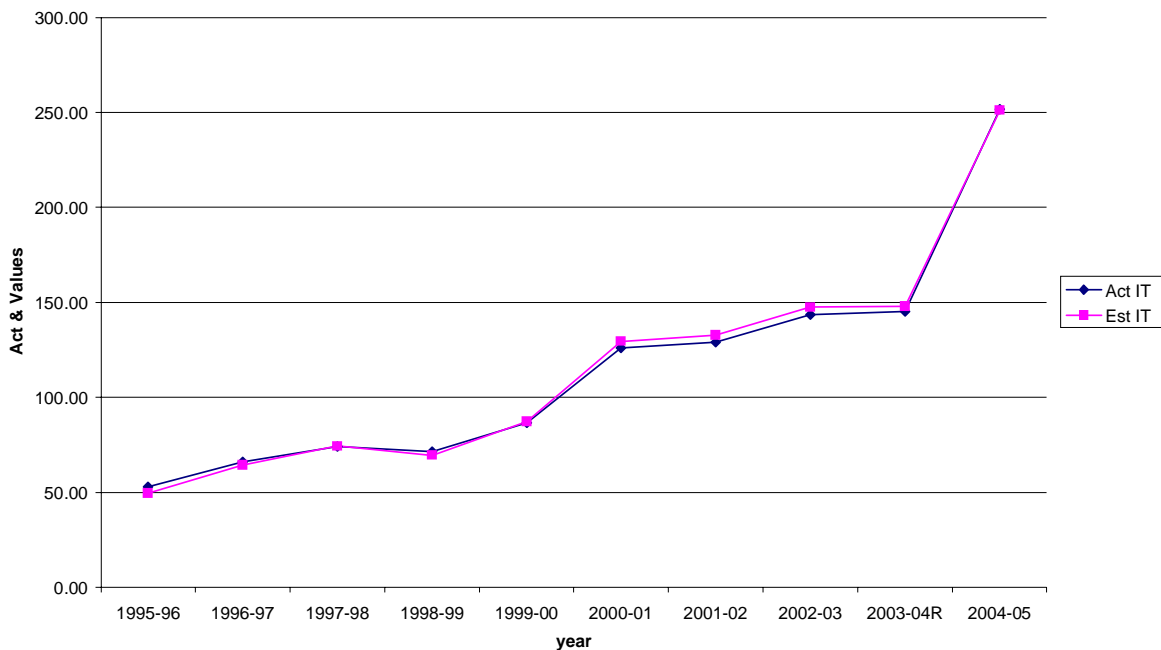
**Figure 3**  
**Actual and Estimated Corporate Tax in Quarter 3**  
**(for 1995-96 to 2004-05)**



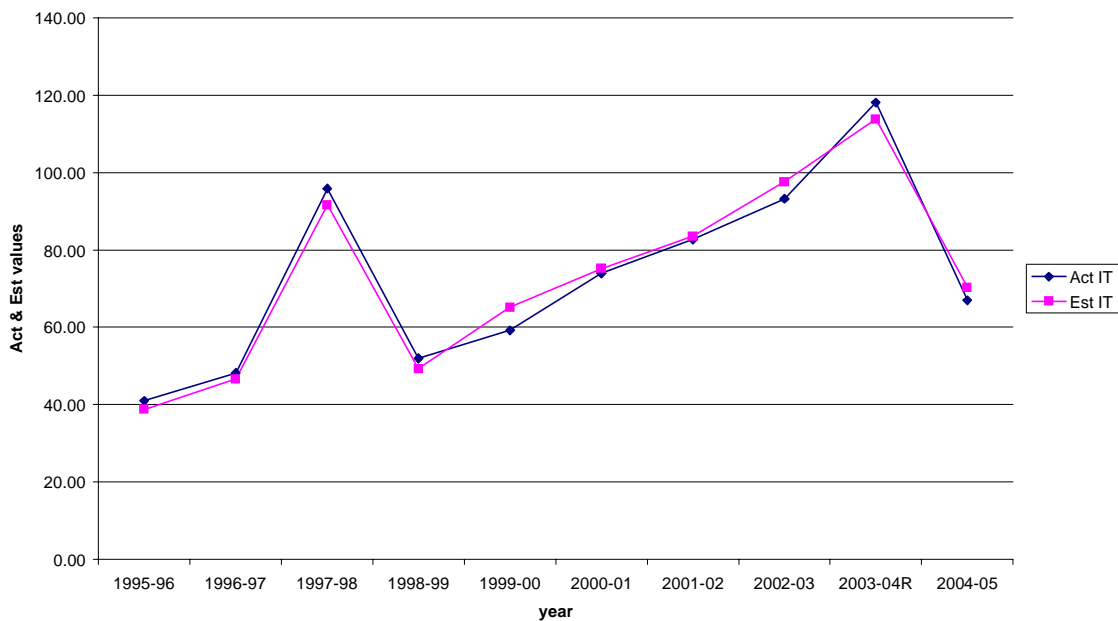
**Figure 4**  
**Actual and Estimated Corporate Tax in Quarter 4**  
**(for 1995-96 to 2004-05)**



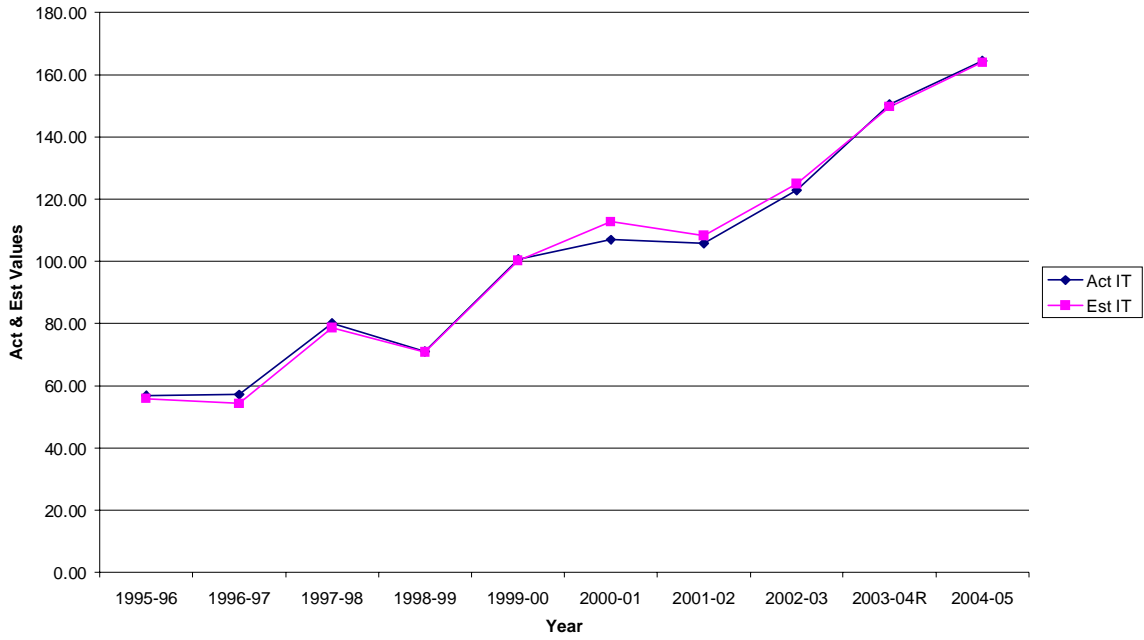
**Figure 5**  
**Actual and Estimated Personal Income Tax in Q1 and Q2**  
**(for 1995-96 to 2004-05)**



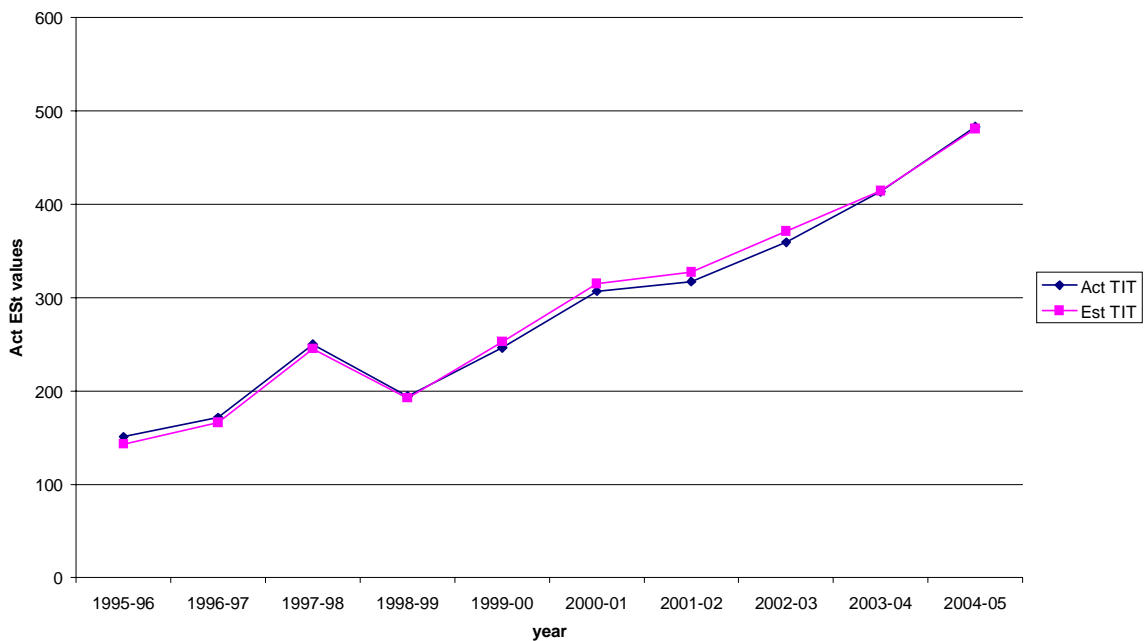
**Figure 6**  
**Actual and Estimated Personal Income Tax in Quarter 3**  
**(for 1995-96 to 2004-05)**



**Figure 7**  
**Actual and Estimated Personal Income Tax in Quarter 4**  
**(for 1995-96 to 2004-05)**



**Figure 8**  
**Actual and Estimated Total Personal Income Tax**  
**(for 1995-96 to 2004-05)**



**Figure 9**  
**Actual and Estimated Total Corporate Tax**  
**(1995-96 to 2004-05)**

