4

Estimating Unaccounted Income: A Monetary Approach

1. Introduction

As noted in Chapter 3, monetary approaches to the estimation of unaccounted income can be broadly classified into three groups:

i. the fixed currency-deposit ratio approach, originally developed by Cagan (1958) and "rediscovered" by Gutmann (1977);
ii. the transactions approach developed by Feige (1979), 1980); and
iii. the currency demand equation technique originally suggested by Cagan and elaborated by Tanzi (1980, 1983).

Applications of the first two approaches to India were asseessed in Chapter 3 and found seriously wanting. In this chapter an attempt is made to adapt Tanzi's approach to the Indian context.

Section 2 summarises Tanzi's basic method. Section 3 discusses some of the problems with this approach. Section 4 applies the method to India and the final section concludes with an interpretation and assessment of the results.

2. The Tanzi Method[1]

The basic elements of the Tanzi method are as follows:

i. The existence and growth of the unaccounted economy is attributed principally to high and growing rates of taxation;

ii. The overwhelming bulk of transactions in the unaccounted economy is assumed to be carried out with currency;

iii. Thus the size and growth of the unaccounted economy directly influences the public's demand for cash. And, since taxation is the principal cause of the unaccounted economy, a properly specified currency demand equation should include the burden of taxation as a key explanatory variable;

iv. Once such an equation has been specified and estimated for the sample period, it allows isolation of that part of the public's currency holding which is attributable to the growth of the unaccounted economy in response to taxation;

v. When the scale of such "illegal currency" has been identified, it can be used, along with assumptions about the income velocity of such currency, to gauge the size of the unaccounted economy.

Tanzi fits equations of the following form to US data:

$$\ln (C/M_2) = a_0 + a_1 \ln T + a_2 \ln (WS/NI) + a_3 \ln R + a_4 \ln Y \quad \ldots\ldots (1)$$

where (C/M_2) is the ratio of currency to broad money (including time deposits), T is the tax variable, (WS/NI) is the share of wages and salaries in national income, R is the rate of interest on time deposits and Y is real per capita GNP. The rationale for T has been given and for R is obvious. Tanzi uses several alternatives for the tax variable, all relating to personal income taxation. Y is used as a proxy for a number of trends which are assumed to accompany economic development and which also influence the public's demand for cash holdings. These factors include growing travel per capita, increasing urbanisation, the spread of commercial branch banking and other financial innovations.

Tanzi includes the variable (WS/NI) because, he argues, that in the US, while interest, dividends and rents are almost always received by cheque, a portion of wage income is typically received in cash; hence the ratio (WS/NI) could be expected to influence the demand for currency.

Tanzi fits his equation to annual time series data for the period 1930-80. Having obtained statistically satisfactory estimates of his equation Tanzi proceeds to estimate unaccounted income for a given year, t, as follows. Taking his "best" equation he obtains the predicted value for currency demand, C'_t, given the observed value for all the other variables in year t. He obtains another prediction of currency demand, C''_t, by setting the value of the tax variable to zero (or, alternatively, to the lowest observed value in the sample period), while retaining the observed values for all the other variables. The difference, $C'_t - C_t$" gives an estimate of "illegal currency", or, more properly, the holding of currency that can be attributed to the increase in taxation. Tanzi then subtracts the estimated value of illegal currency" from the value of "narrow money", M_1, in year t to obtain an estimate of "legal money" in year t. Dividing nominal GNP in year t by the estimate of "legal money" yields an income velocity for legal money. By assuming that the income velocity of "illegal currency" is the same, Tanzi is able to generate an estimate of unaccounted income for year t. In fact, Tanzi (1983) presents estimates of the size of the unaccounted economy for each of the years 1930-80.

3. Some Problems with the Tanzi Method

The first question that arises is, what is the concept of unaccounted income that underlines Tanzi's estimates? In the final paragraph of his 1983 paper—and almost as an afterthought—Tanzi (1983, p. 303) writes:

> "Perhaps a word on what has been measured is necessary. The estimates attempt to measure the incomes that were generated through the excessive use of currency and presumably were not reported to the tax authorities. Whether these incomes were or were not measured by the national

accounts cannot be determined. Presumably, part of these incomes not only evaded the tax net but also may have escaped the attention of the national accounts authorities—but, how large this part was cannot be assessed with the information at hand."

This agnosticism conflicts with the procedure for estimating the income velocity of "legal money", in which the estimated stock of legal money (M_1 minus "illegal currency") is related to measured GNP. The implicit assumption is that none of the "illegal currency" (C' − C") is used to finance transactions relating to recorded GNP, and conversely, all of it is used to finance transactions relating to unaccounted income. But then, the unaccounted income should be wholly additive to measured GNP; there can be no vagueness about whether some of the unaccounted income is already captured in recorded GNP. The choice is clear-cut: either the estimate of unaccounted income is wholly additive to GNP or the procedure for estimating the income velocity of "legal" and "illegal" money (and hence unaccounted income) is logically flawed.

In Tanzi's framework it is difficult to sustain the first possibility. His estimated equation does not allow one to deduce that the "illegal currency" is used solely to finance transactions associated with incomes which are unrecorded in GNP estimates. All that the equation tells us is that when the tax burden (however defined) increases, the demand for currency increases, presumably because of the growth of income and transactions *hidden from the tax authorities*. Tanzi is correct in professing agnosticism about whether such incomes also escape *national income authorities*.[2] But if this is so, there is no getting away from the logical flaw in estimating the income velocity of "legal money". To estimate this parameter what we need is not the data on recorded GNP, but rather a series on "legal income", encompassing income which is properly reported to the tax authorities as well as income which need not, legally, have been reported. Such a series is not easy to construct — and it is not offered by Tanzi.

At best, Tanzi's estimate of the income velocity of "legal money" should be seen as an approximation; the closer is the

value of "legal income" to recorded GNP the better is the approximation. The problem lies in not having any ready handle to assess the quality of this approximation.

A second major difficulty with Tanzi's approach is his explicit assumption that the income velocity of "illegal currency" is equal to the income velocity of "legal money". The support he offers for this crucial assumption is disarmingly weak: the assumption, he argues, "is the result of agnosticism. The author is unable to take a position between those who would argue that the velocity of money in the underground economy must be lower than in the legal economy, and those who would argue the contrary" (Tanzi, 1980, note 27).

Third, there is some question regarding the stability of the income velocity of "illegal currency". For example, if an increase in *indirect* taxes leads to additional demand for currency to conduct transactions in cash in order to escape payment of indirect taxes, it is quite possible that this can occur without a substantial change in the *income* that evades tax. This suggests that the relationship between tax-evaded income and "illegal currency" need not be stable, which is another way of saying that the income velocity of "illegal currency" may be unstable.

Fourth, Feige (1980), among others, has challenged the assumption that transactions associated with tax evasion are undertaken solely with cash. Feige argues that many of these transactions occur through the banking system.

Finally, Tanzi's approach is ill-suited to assessing the significance of non-tax causes which might lead to the underreporting of incomes and transactions to tax authorities. For example, incomes earned through illegal activities may generate a demand for cash (and such incomes would normally evade taxation), but we would not expect to observe any relation between the demand for cash and tax rates for this form of undeclared incomes. The same would be true for undeclared incomes stemming from government regulatory measures; these could include a variety of scarcity premia and bribes, both of which might be expected to be transacted in cash, irrespective of the burden of taxation. And, finally,

there are forms of tax evasion which might not generate any incremental demand for cash: take for instance the well-known—and reportedly widespread—practice of charging personal consumption as business expense, a practice which may reduce the tax base for both personal income taxation and business income taxation.

Despite these substantial shortcomings we attempt to apply a variant of the Tanzi approach to the Indian context.

4. Adapting the Tanzi Approach to India

In formulating our currency demand equation for India we adopt three main points of departure from Tanzi's preferred equation. First, instead of using (C/M_2) as the explicand we focus directly on the public's demand for real cash balances, that is (C/P), where P is the price level. Second, we take note of the fact that over 80 per cent of tax revenue in India accrues from indirect taxes. Evasion of commodity taxes can be expected to generate powerful demands for cash to facilitate such evasion.[3] It would, therefore, be inappropriate to confine the scope of the tax burden variable to direct taxes on income. Hence our preferred tax variable is (T/Y), where T encompasses all tax revenues accruing to the governments at the Centre, States and Union Territories and Y is recorded GNP in current market prices.[4] Third, unlike Tanzi, we explore the consequences for currency demand of expectations of price level changes.

The currency demand equation we estimate takes the following form:

$$\frac{C}{P} = a_0 + a_1 + RGNP + a_2 NOCB + a_3 TTR + a_4(R - ERI) + a_5 ERI \quad \ldots\ldots(2)$$

(signs: $+$ for a_1, $-$ for RGNP, $+$ for NOCB, $+$ for TTR, $-$ for a_4, $-$ for a_5)

where the expected signs are noted below each coefficient and the variables are defined as follows:[5]

C = Average annual currency holdings with the public, in Rs crore;

P = Index Number of Wholesale prices with 1970-71 = 100;

RGNP = Real GNP in 1970-71 market prices;

NOCB = Number of commercial bank branches on December 31 of each year;

TTR = Ratio of total tax revenue (of the Centre, States and Union Territories) to current market price GNP;

R = Nominal rate of interest on bank deposits. Two alternative rates were used.
R 12 = Average 12-month commercial bank deposit rate;
RAVE = Average interest rate on commercial bank time deposits.

ERI = Expected rate of inflation in per cent per annum (this is explained in greater detail below).

The *a priori* expectations regarding the signs of the coefficients merit explanation.

The demand for real cash balances with the public can be expected to increase as the country's real income increases; hence we anticipate positive value for the coefficient a_1. There has been a remarkable increase in the number of commercial bank branches during the last thirty years from a little over 4,000 at the end of 1951 to over 34,000 at the end of 1980. Much of this eightfold growth reflects a determined effort by the government and the monetary authorities to extend banking services to rural areas. This expansion in branch banking can be expected to reduce the public's demand for cash balances as it induces shifts in the public's asset portfolio, away from currency and in favour of bank deposits, either because such deposits are deemed safer or because they earn interest. Thus the coefficient a_2 is expected to be negative. The coefficient a_3, for the tax ratio is hypothesised to be positive. As the burden of taxation in the economy increases, economic agents are increasingly tempted to evade taxation, an activity which is facilitated by conducting the relevant transactions in cash wherever possible. Thus, other things equal, the public will wish to hold higher real cash balances, the greater the burden of taxation.

The coefficient a_4 relates to the real rate of interest which is defined as the nominal rate of interest on bank deposits,

TABLE 4.4.1

Data Used in the Regressions

Year	C (Rs. crore)	P (1970-71=100)	RGNP (Rs. crore)	NOCB	TTR (Per cent)	R12 (Per cent)
	(1)	(2)	(3)	(4)	(5)	(6)
1951-52	1287	50.4	18882	4119	7.4	1.73
1952-53	1206	44.1	19513	4040	7.0	2.13
1953-54	1235	46.2	20765	4021	6.5	2.77
1954-55	1285	43.0	21460	4032	7.5	2.39
1955-56	1432	40.8	22304	4085	7.5	2.39
1956-57	1561	46.5	23495	4193	7.5	2.94
1957-58	1609	47.9	23272	4375	8.7	3.29
1958-59	1674	49.8	25172	4605	8.1	3.33
1959-60	1814	51.7	25711	4847	8.7	3.23
1960-61	1956	55.1	27054	4939	9.0	3.31
1961-62	2062	55.2	28145	5012	9.7	3.97
1962-63	2235	57.3	28958	5173	11.0	3.99
1963-64	2438	60.9	30716	5419	11.9	4.00
1964-65	2634	67.5	33054	5828	11.3	4.79
1965-66	2841	72.7	31691	6131	12.2	5.50
1966-67	3028	82.8	31660	6595	11.9	6.00
1967-68	3199	92.4	34277	6984	10.8	6.00
1968-69	3436	91.3	35491	7649	11.4	5.50
1969-70	3765	94.8	37755	9051	11.5	5.50
1970-71	4160	100.0	39979	11184	11.9	6.00
1971-72	4576	105.6	40883	12985	12.9	6.00
1972-73	4969	116.2	40590	14739	14.0	6.00
1973-74	5850	139.7	42134	16503	12.6	6.00
1974-75	6326	174.9	42315	18180	13.3	7.65
1975-76	6557	173.0	45483	20455	15.7	8.00
1976-77	7321	176.6	47040	23555	15.5	8.00
1977-78	8276	185.8	58958	26997	14.5	6.33
1978-79	9474	185.3	54331	29505	16.0	6.00
1979-80	10933	217.6	51753	31558	16.5	6.53
1980-81	12374	257.3	55366	34588	15.3	7.04

RAVE (per cent)	ERI 1 (per cent)	FRI 2 (per cent)	ERI 3 (per cent)	ERI (per cent)	ERI 5 (per cent)	ERI 6 (per cent)	ERI 7 (per cent)
(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
2.70	7.16	9.59	9.39	8.62	7.84	7.15	6.59
3.18	7.05	8.89	8.41	7.62	6.98	6.53	6.25
3.26	5.10	4.61	2.14	—0.43	—2.76	—4.89	—6.87
3.38	5.07	4.64	2.92	1.65	1.00	0.90	1.27
3.53	3.87	2.33	—0.03	—1.78	—2.97	—3.80	—4.47
3.80	2.97	0.84	—1.56	—3.12	—4.04	—4.59	—4.93
4.52	4.07	3.46	3.10	3.72	4.96	6.55	8.30
4.25	3.96	3.37	3.07	3.43	3.99	4.42	4.60
3 69	3.96	3.49	3.34	3.65	3.98	4.15	4.16
3.33	3.95	3.56	3.49	3.72	3.90	3.95	3.92
3.69	4.21	4.16	4.41	4.86	5.24	5.53	5.78
4.02	3.81	3.37	3.14	2.99	2.71	2.32	1.86
4.38	3.81	3.45	3.34	3.31	3.25	3.21	3.22
4.91	4.05	4.02	4.22	4.50	4.77	5.05	5.36
6.20	4.73	5.38	6.21	7.04	7.80	8.52	9.20
7.20	5.03	3.85	6.66	7.30	7.75	8.03	8.15
7.39	5.92	7.45	8.83	9.94	10.82	11.55	12.17
7.22	6.48	8.28	9.66	10.60	11.21	11.57	11.76
6.84	5.72	6.39	6.40	5.88	5.01	3.91	2.70
6.86	5.53	5.88	5.63	5.06	4.42	3.86	3.49
7.29	5.52	5.80	5.59	5.23	4.95	4.84	4.89
7.53	5.53	5.76	5.59	5.38	5.28	5.30	5.39
7.76	5.98	6.62	6.93	7.24	7.66	8.14	8.64
9.30	7.41	9.34	10.91	12.43	13.94	15.39	16.75
10.51	9.19	12.51	15.20	17.54	19.57	21.28	22.66
10.93	8.16	9.79	10.31	10.09	9.24	7.86	6.04
10.95	7.55	8.25	7.84	6.89	5.65	4.39	3.27
10.69	7.32	7.64	7.05	6.22	5.43	4.88	4.63
10.74	6.58	6.71	4.94	3.73	2.72	1.95	1.39
10.54	7.64	8.31	8.59	9.09	9.92	11.05	12.40

ERI 8 (per cent)	ERI 9 (per cent)	Year	Year to year change in wholesale price Price Index (per cent)	Year	(per cent)
(15)	(16)	(17)	(18)	(19)	(20)
6.21	6.07	1930-31	—16.14	1960-61	6.58
6.13	6.11	1931-32	—26 29	1961-62	0.18
—8.77	—10.64	1932-33	—5.10	1962-63	3.80
2.05	3.22	1933-34	—6.71	1963-64	6.28
—5.13	—5.91	1934-35	—2.16	1964-65	10.84
—5.12	—5.20	1935-36	9.56	1965-66	7.70
10.15	12.05	1936-37	0.67	1966-67	13.85
4.44	3.91	1937-38	3.33	1967-68	11.59
4.06	3.96	1938-39	—5.16	1968-69	—1.19
3.87	3.83	1939-40	6.25	1969-70	3.82
6.04	6.31	1940-41	—0.51	1970-71	5.49
1.35	0.79	1941-42	9.91	1971-72	5.61
3.31	3.50	1942-43	22.08	1972-73	10.00
3.69	6.00	1943-44	36.83	1973-74	20.22
9.81	10.36	1944-45	10.64	1974-75	25.20
8.12	7.97	1945-46	1.28	1975-76	—1.09
12.74	13.30	1946-47	9.12	1976-77	2.03
11.82	11.76	1947-48	11.63	1977-78	5.28
1.41	0.11	1948-49	22.13	1978-79	0.00
3.35	3.46	1949-50	2.52	1979-80	17.12
5.06	5.29	1950-51	6.26	1980-81	18.20
5.49	5.57	1951-52	6.11		
9.13	9.59	1952-53	—12.50		
18.00	19.16	1953-54	4.76		
23.76	24.60	1954-55	—6.93		
3.88	1.48	1955-56	—5.12		
2.44	2.02	1956-57	13.97		
4.66	4.66	1957-58	3.01		
0.93	0.49	1958-59	3.97		
13.88	15.46	1959-60	3.82		

Source for Table 4.4.1

Column (1) is from Vasudevan (1980, p 16) for all years except 1980-81 which is from RBI bulletins All data are computed as averages of stocks on the last Friday of each month.

Column (2) is from Chandok (1978, p. 171) for all years upto 1977-78 and from the *Economic Survey*, 1982-83. Government of India, for recent years.

Column (3) is from Government of India, CSO (1983, p. 152).

Column (4) is from *Statistical Tables Relating to Banks in India* (RBI), various issues.

Column (5) is based on data on total taxes from *Indian Economic Statistics*: *Public Finance* (published by the Ministry of Finance), various issues, and current market price GNP data from Government of India, CSO (198, p. 150).

Column (6) is from Gupta (1979, p 229) for all years uptil 1976-77 and from information supplied by the Reserve Bank of India for subsequent years.

Column (7) is based on information on interest payments and on average stocks of time deposits obtained from the *Statistical Tables Relating to Banks in India* (RBI), various issues.

Columns (8) through (16) give values of ERI for alternative values of 'p', ranging from 0.1 to 0.9 respectively. These series are based on the application of equation (3) in the text to the information in columns (18) and (20), and starting with an initial value for $pc\text{-}_{t_1}$ 1931-32, which is based on the assumption that pc_{t-1} = the average of the three years 1927-28, 1928-29 and 1929-30 (which was —2.29 per cent).

Columns (18) and (20) are from Srinivasa Madhur, who compiled the series from official data and unpublished work by H.L. Chandok.

R, minus the expected rate of inflation, ERI. Our estimation of the latter warrants some explanation. We espouse an adaptive expectations approach which is reflected in the following equation:

$$P^e_t = q\, P_{t-1} + (1-q)\, p^e_{t-1} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (3)$$

P^e_t, the expected rate of inflation in year t, depends on the actual rate of inflation in the previous year and the expected rate of inflation in that year. The relative weights of these two components is given by the size of the parameter q. There are two problems to implementing the approach: first, how do we estimate the value of q; and second, for a given value of q, how do we estimate the values of P^e_{t-2}, P^e_{t-3} ... .. etc., which clearly influence P^e_{t-2}? We tackle the first problem by estimating our basic currency demand equation for alternative values of q, ranging from 0.1 to 0.9, and choosing that value of q which minimises the standard error of the estimated regression. Basically, this is a standard grid search approach. The second problem is solved, for each given value of q, by choosing a base period (in the late 1920s) when inflation was negligible and computing the relevant P^e_t series from then forward, on the basis of equation (3) and knowledge of actual rates of inflation in each year.[6]

The value of a_4 is expected to be negative: as the real interest rate increases economic agents can be expected to substitute interest-bearing deposits for currency in their asset portfolio. The coefficient a_5, for the expected rate of inflation, ERI, is also expected to be negative: when the expected rate of inflation rises, asset holders are likely to switch out of cash and into real goods.

Our specification of the currency demand equation, (2), is quite similar, in spirit, to that of Singh *et. al.* (1982) in their recent study conducted under the auspices of the Reserve Bank of India (RBI). The variables real income, real rate of interest and the expected rate of inflation are common to both efforts, though the precise specifications vary. Singh *et. al.* also tried a "direct tax to income ratio" variable, but did not find it statistically significant, even though the coefficient had the predicted

positive sign. As we have argued above, limiting the scope of the tax burden variable to direct taxes is inappropriate for India.[7] A second difference is that we have, for reasons given earlier, included the NOCB variable, which is absent in the RBI study. Third, our use of annual time series (instead of quarterly data used in the RBI monograph) has lessened, if not obviated, the need to specify lags in the adjustment of actual real currency balances to desired values.

Tables 4.4.2 and 4.4.3 summarise the regression results obtained for the sample period 1951-52 to 1980-81. As noted earlier, two alternative variables are used for the rate of interest. Table 4. 4.2 presents the results for the nine regressions with R 12 as the rate of interest variable and with q taking values from 0.1 to 0.9. Table 4.4.3 shows the corresponding results for RAVE. The "best" equation from each set is presented below.[8]

$$\frac{C}{P} = 14.487 + 0.00067\,RGNP - 0.00022\,NOCB + 1.44265\,TTR$$
$$(5.896)^{***} \qquad (-2.756)^{***} \qquad (5.208)^{***}$$
$$- 2.54900\,ER\,I2 - 1.70251\,(R\,12 - ER\,I2) \quad ...(4)$$
$$(-7.798)^{***} \qquad (-4.672)^{***}$$

$\bar{R}^2 = 0.969$; SEE = 1.103; D.W. = 2.390; F = 180.1

$$\frac{C}{P} = 17.652 + 0.00055\,RGNP + 0.00003\,NOCB + 1.15619\,TTR$$
$$(4.359)^{***} \qquad (0.423) \qquad (3.717)^{***}$$
$$- 1.95152\,ER\,I2 - 1.06436\,(RAVE - ERI2) \quad ...(5)$$
$$(-6.249)^{***} \qquad (-2.964)^{***}$$

$\bar{R}^2 = 0.956$; SEE=1.304; D.W.=2.11; F=127.4

A few comments on these equations are in order. First, equation (4), shown above, has strikingly "good" overall statistical properties, as indicated by the standard measures such as the $\bar{R}^2$, the Durbin Watson statistic and the F statistic. What is more important, the signs of the coefficients are exactly as predicted for all five independent variables; the coefficient values are statistically significant, four at the 1% level and one at the 5% level. Equation (5) displays somewhat poorer statistical characteristics. In particular the sign for the NOCB variable is the opposite of that predicted,

TABLE

Regression Results with R 12

Equation No	Value of q	Constant	RGNP	NOCB	TTR
(1)	(2)	(3)	(4)	(5)	(6)
IV. 4.2.1	0.1	19.31637	.00057 (5.93154)***	-0.00010 (-1.17941)	1.29143 (4.56576)***
IV. 4.2.2	0.2	14.48554	.00057 (5.89596)***	-.00022 (-2.75639)**	1.44265 (5.20779)***
IV.4.2.3	0.3	11.41909	.00069 (5.41892)***	-.00032 (-3.58304)***	1.56901 (5.05711)***
IV. 4.2.4	0.4	9.94253	.00071 (4.71005)***	-.00037 (-3.75782)***	1.62803 (4.45858)***
IV. 4.2.5	0.5	9.26441	.00074 (4.27575)***	-0.00040 (-360780)***	1.54513 (3.96525)***
IV. 4.2.6	0.6	8.88547	.00077 (4.10780)***	-0.0042 (-3.49402)***	1.65085 (3.54628)***
IV. 4.2.7	0.7	8.62183	.00081 (4.09316)***	-.00044 (-3.44521)***	1.65249 (3.45967)***
IV.4.2.8	0.8	8.42689	.00084 (4.14549)***	-.00045 (-3.44041)***	1.55301 (3.45397)***
IV. 4.2.9	0.9	8.29037	.00085 (4.21923)***	-.00046 (3.45305)***	1.55256 (3.29431)***

4.4.2.

as the Interest Rate Variable[1]

ERI	(R12-ERI)	R^{-2}	SEE	F	D.W.
(7)	(8)	(9)	(10)	(11)	(12)
-3.40395 (-10.66065)***	-1.75215 (-4.89978)***	0.96925	1.09229	183.79218	2.48231
-2.54900 (-7.79790)***	-1.70251 (-4.67185)***	0.96863	1.10316	180.09561	2.38973
-2.20021 (-5.74077)***	-1.57141 (-3.69512)***	0.96034	1.24048	141.42551	2.05005
-2.06560 (-4.41163)***	-1.58415 (-3.06681)**	0.94522	1.45785	101.07080	1.59808
-2.10921 (-3.85714)***	-1.75357 (-2.93445)**	0.92889	1.66093	76.76407	1.26177
-2.25882 (-3.76167)***	-2.00438 (-3.08887)***	0.91538	1.81189	63.73930	1.05965
-2.43702 (-3.87940)***	-2.25718 (-3.36351)***	0.90531	1.91153	56.78023	0.95385
-2.59479 (-4.07242)***	-2.46632 (-3.56331***	0.89972	1.97238	53.03942	0.90633
-2.71481 (-4.27143)***	-2.51999 (-3.94025)***	0.89612	2.00751	51.03288	0.88847

Note: 1. $\frac{C}{P}$ is the dependent variable in all equations. The table presents the P coefficient values: t-statistics are given in parentheses, '***' '**' and '*' represent 1 per cent, 5 per cent and 10 per cent levels of significance respectively.

TABLE

Regression Results with RAVs as the

Equation No.	Value of q	Constant	KGQ	NOCB	TTR
(1)	(2)	(3)	(4)	(5)	(6)
IV. 4.3.1	0.1	23.00983	.00053 (3.96003)***	.00016 (1·87182)	.96415 (2.93335)**
IV. 4.3.2	0.2	17.65242	.00055 (4.35898)***	.00003 (.42329)	1.15619 (3.71674)***
IV. 4.3.3	0.3	13.96579	.00060 (4.77211)***	—.00008 (—1.02190)	1.34414 4.27885)***
IV. 4.3.4	0.4	12.20749	.00063 (4.60624)***	—.00013 (—.149361)	1.43621 (4.13859)***
IV. 4.35	0.5	11.60555	.00066 (4.31047)***	—.00014 (—1.40398	1.45442 3.75652)***
IV. 4.3.6	0.6	11.50840	.00063 (4.09539)***	—.00013 (—1.17520)	1.43873 (3.41316)***
IV. 4.3.7	0.7	11.58980	.00070 (3.97035)***	—.00011 (—.95293)	1.41106 (3.15266)***
IV. 4.3.8	0.8	11.72082	.00072 (3.90711)***	—.00009 (—.77102)	1.38077 (2.96165)**
IV. 4.3.9	0.9	11.85517	.00073 (3.88125)***	—.00006 (—.63042)	1.35184 (2.82223)**

4.4.3

Interest Rate Variable [1]

ERI	(R12—RI)	R^{-2}	SEE	F	D.W.
(7)	(8)	(9)	(10)	(11)	(12)
—2.72532 (—8.29888)***	—.99018 (—2.56659)**	0.95173	1.36844	115.35835	2.03513
—1.95152 (—6.24910)***	—1.06436 (—2.96442)**	0.95616	1.30419	127.43935	2.11087
—1.76921 (—5.51331)***	—1.10726 (—3.08249)**	0.95542	1.31511	125.30093	2.14018
—1.74351 (—4.90119)***	—1.23040 (—3.15029)***	0.94605	1.44666	102.71574	1.86504
—1.79350 (—4.52831)***	—1.39933 (—3.27238)***	0.93319	1.60997	82.00998	1.55430
—1.87685 (—4.37580)***	—1.57388 (—3.44878)***	0.92092	1.75150	68.54736	1.33205
—1.96705 (—4.34903)***	—1.73184 (—3.64436)***	0.91079	1.66038	60.21264	1.18794
—2.04957 (—4.38015)***	—1.86403 (—3.63242)**	0.90301	1.93979	54.99870	1.09525
—2.11865 (—4.43232)***	—1.96937 (—3.99930)***	0.89734	1.99570	51.69513	1.03436

Note 1. $\frac{C}{P}$ is the dependent variable in all equations. The table presents the coefficient values; t = statistics are given in parentheses *****, and * represent 1 per cent, 5 per cent and 10 per cent level of significance, respectively.

though, judging by the corresponding t-statistic, the coefficient is not statistically distinguishable from zero. Nevertheless, in both regressions the coefficient values for the other four variables are of the same order of magnitude, suggesting some underlying stability in the specifications. This point about the stability of the estimated coefficient is reinforced when we turn our attention to the full set of regressions reported in Tables 4.4.2 and 4.4.3. As the value of q alters within each set, the estimated coefficients do change, but not in a dramatic or haphazard manner. Finally, it is noteworthy that both equations relate to values of $q=0.2$. If we accept these results it means that the adjustment of expected to actual inflation is rather slow in India, with earlier years seriously influencing current inflationary expectations. Given the historical variability of the rate of inflation in India, this may not be implausible.

Thus, on balance, equations (4) and (5) can serve as acceptable working hypotheses for depicting the demand for real cash balances in India in the period 1951-52 to 1980-81.

The next stage in implementing Tanzi's method is to use these equations to predict currency demands, C', for given years, on the basis of observed values of all other variables and then to juxtapose these results with the predictions obtained, C", when the tax burden variable is set to zero. The difference between these two values measures the tax-induced demand for currency (TICD)[9]. Table 4.4.4 summarises the results for our two chosen equations when applied to the years 1955-56, 1960-61, 1965-66, 1974-71, 1975-76 and 1980-81. It also presents the estimates of tax-induced currency demand (TICD) as per cent shares of total currency with the public and M_1. Some comments are warranted. First, the estimates of TICD are sizeable, both in absolute magnitudes and in relation to total currency holdings of the public (C) and M_1. This suggests that the tax burden variable is an important determinant of currency demand. Second, because of the steady increase in the tax ratio over time, the estimates of TICD also show a clear upward trend. Third, for any given year, the estimates of TICD vary quite

TABLE 4.4.4

Estimates of Tax-Induced Currency Demand (TICD)

Financial year	Predicted Currency C' (Rs crore)	Predicted Demand C'' (Rs crore)	TICD (C' — C'') (Rs crore)	Currency with public C (per cent)	TICD as per cent of C (Rs crore)	Narrow Money M_1 (Rs crore)	TICD as Per cent of M_1
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
1960-61							
Equation (4)	1975.95	1260.54	715.41	1954	36.58	2669	26.80
Equation (5)	2004.72	1431.37	573.35	1954	29.31	2689	21.48
1965-66							
Equation (4)	2766.46	1486.92	1279.54	2841	45.04	3853	33.21
Equation (5)	2762.60	1737.13	1025.47	2841	36.10	3853	26.61
1970-71							
Equation (4)	4078.71	2361.97	1716.74	4160	41.27	5941	28.90
Equation (5)	4121.70	2745.84	1375.86	4160	33.07	5941	23.16
1975-76							
Equation (4)	6695.10	2927.16	3767.94	6557	57.46	10166	37.06
Equation (5)	6748.73	3728.15	3020.15	6557	46.07	10166	29.71
1980-81							
Equation (4)	12152.28	6422.21	5730.07	12374.33	46.31	20869	27.46
Equation (5)	12412.15	7860.52	4551.63	12374.33	36.78	20869	21.31

Source : Columns (1) to (3) are based on the estimated equations, column (4) is from Table 4.4.1 and column (6) is from Singh, *et. al.* (1982, p.110).

substantially. In particular, the estimates based on equation (4) are about 25 per cent higher than those based on equation (5).

5. Interpretation and Assessment of the Results

In Table 4.5.1 we present estimates of unaccounted income worked out on the basis of Tanzi's procedure. These estimates suffer from all the problems already noted earlier. In particular, the procedure for estimating the income velocity of "legal money" involves, at best, an approximation. What is more important, the method entails the crucial assumption of equality in the income velocities of "legal money" and "illegal currency" (or TICD in our lexicon). As we have seen, the empirical basis for this assumption is notable by its absence. It is interesting to note that Cagan (1958, p.315) believed "that the amount of currency held against a dollar of unreported income is much greater, on the average, than the amount of money held against a dollar of regular income. Unreported income produces an abnormal demand for currency to hoard". But Cagan was unable to produce any empirical justification for his claim. Quite clearly, a great deal depends on the distribution, across types of economic agents, of the initially generated unaccounted income. For example, there is likely to be a higher proportion of currency hoarding from unaccounted income accruing to professionals than when the unaccounted income accrues to traders and manufacturers. Purely for illustrative purposes, we present in Table 4.5.1, estimates of unaccounted income on the assumption that the income velocity of "illegal currency" is *half* of that estimated for "illegal money". We should reiterate that the numbers and ratios shown in colums 7 to 10 of Table 4.5.1 are the product of quite arbitrary assumptions. They are in the nature of "if—then results", for those willing to accept the validity of the strong, and very "iffy", assumptions.

For ourselves, we are content with more limited conclusions. These are as follows. We believe that our estimates of currency demand equations provide substantial grounds

TABLE 4.5.1

Estimates of Unaccounted Income by Tanzi's Method

Financial Year	M_1	"Legal money" $M_1 \div (C' - C'')$	GNP at Current market prices Y	Income velocity of "legal money" $\frac{Y}{L_L M_1 - (C^1 - C'')}$	TICD	Unaccounted Income $V_L(TICD)$	Unaccounted Income $2(V_L\ TICD)$	Unaccounted Income as per cent of GNP at market price $[(7) \div (4)] \times 100$	Unaccounted Income as per cent of GNP at market price $[(8) \div (4)] \times 100$
	(Rs crore)	(Rs crore)	(Rs crore)		(Rs crore)	(Rs crore)	(Rs crore)	(per cent)	(per cent)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1960-61									
Equation (4)	2669	1953.59	14946	7.65	715.41	5472.89	2740.02	36.5	18.3
Equation (5)	2669	2095.65	14946	7.13	573.35	4087.99	2043.99	27.4	13.7
1965-66									
Equation (4)	3853	2573.46	23948	9.31	1279.54	11912.52	5962.66	49.7	24.9
Equation (5)	3853	2827.53	23948	8.47	1025.47	8685.73	4342.85	36.3	18.1
1970-71									
Equation (4)	5941	4224.26	39979	9.46	1716.74	16240.36	8120.18	40.6	20.3
Equation (5)	5941	4565.14	39979	9.76	1375.16	12052.53	6026.27	30.2	15.1
1975-76									
Equation (4)	10166	6398.06	73829	11.54	3767.94	43482.03	21741.01	58.2	29.5
Equation (5)	10166	7145.42	73829	10.32	3020.58	31202.59	15601.30	42.3	21.2
1980-81									
Equation (4)	20869	15138.93	128524	8.49	5730.07	48648.29	24352.80	37.9	19.0
Equation (5)	20869	16317.37	128524	7.88	4551.63	35866.84	17933.42	27.9	13.0

for believing that much of the public's demand for currency arises from the need to undertake transactions in a manner which facilitates evasion of direct and indirect taxes. Thus these equations bolster the case that tax evasion is a quantitatively "important" phenomenon in India. Since we lack and empirical basis for the crucial missing link—the income velocity of the estimated TICD—we refrain from committing ourselves to any particular set of estimates of unaccounted income based on the application of Tanzi's approach to India. Second, our currency demand equations do suggest that the absolute significance of the phenomenon of unaccounted income has grown over time, as the tax burden has steadily increased. This tentative conclusion follows from the estimated equation, the trend in the tax ratio and the assumption that the income velocity of "illegal currency" (TICD) has not changed significantly over time—a much weaker assumption than attaching a particular value to it.

Finally, we should reiterate our agreement with Tanzi (1983) on the notion of unaccounted income that is associated with this approach. It is income which should have been reported to the tax authorities, but was not. Part of this income could be included in recorded GNP, while the rest escapes national income accounting. Much depends on the sources and methods of national income accounting. The point is that since the "additional" demand for cash is predicated on the motive to avoid taxes, it is income and transactions unreported to tax authorities that constitutes the defining characteristic—not reporting to national account authorities.

Notes

1. This and the next section are based on Acharya (1984b).
2. It is interesting to note that in his first paper (1980) propagating the currency demand equation approach Tanzi had espoused an opposite view in which he equated tax-evaded income with unrecorded GNP. Though his recent paper has corrected the earlier conceptual error, its influence continues to linger in his procedure for estimating the income velocities of "legal" and "illegal" money.

3. Note that evasion of some commodity taxes is normally associated with evasion of income taxes, even when the primary motive for evasion stems from the indirect taxes.

4. Subsequent to our work on this chapter we received a draft study on the demand for currency and deposits by Lahiri, Purkayastha and Wadhwa (1984), which also finds our kind of tax variable to be significant in their currency demand equations. Incidentally, a case can be made for restricting the notion of income in the denominator to monetised GNP. Since no comparable time series for monetized GNP was readily available, we could not try this alternative definition of the tax variable.

5. The underlying data and sources are given in Table 4.4.1.

6. We are indebted to Srinivasa Madhur for suggesting the approach and supplying the data.

7. The need to include indirect taxes in monetarist approaches to estimating unaccounted income has also been recognised in the United Kingdom [see Mathews (1982)].

8. Strictly speaking, going by the standard error of the estimate equation (4) is marginally worse than the one for $q = 0.1$. But since the R^2 is 0.969 in both cases and since the significance tests for the regression coefficients perform better for equation (4), we have chosen to deem it as the "best" equation in its set.

9. In his 1980 paper Tanzi had expressed a preference for estimating the tax-induced demand by setting the tax variable for the lowest value observed in the sample period rather than to zero "as it is unrealistic to conceive of an economy without taxes..." But this does not seem to provide a compelling reason to truncate the estimate of tax-induced currency demand in such an arbitrary manner. In his later work Tanzi (1983) appears to accept this logic and discards any use of this lowest observed value in the sample period,