Revised: July 1994

FROM CLOSED TO OPEN ECONOMY MACROECONOMICS: THE REAL EXCHANGE RATE AND CAPITAL INFLOWS

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Working Paper #715
July 1994

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INTRODUCTION

With the opening of the Indian economy following the Narasimha Rao-Manmohan Singh reforms, macroeconomic policy needs to be examined in a different analytical framework from the essentially closed economy "structuralist" framework that has hitherto characterized policy discussions in India (see e.g., Pohit and Bhide). A simple but very useful framework is the so-called "Australian" balance of payments model for a small open economy which integrates the real and monetary aspects in a simple general equilibrium framework (see Salter, Corden, Harberger, Lal (Ch. 17)). This paper attempts to apply this framework to India to explain the evolution of major economic variables since 1991, and to identify the key policy instruments which are relevant in determining macroeconomic balance in an economy which is likely to see a large increase in capital inflows.

I.

The Australian model may be unfamiliar in India, so Fig. 1 and its note presents a geometric outline of the model, whilst Appendix III contains a simple algebraic formulation.

As is well known, the model aggregates commodities into two large groups -- traded (T) and nontraded (NT). The former are goods whose domestic prices are set by international prices -- assumed to be given as the country is "small" and hence cannot effect its terms of trade -- and any trade taxes and subsidies. Excess demand (supply) for these commodities is mediated through equivalent changes in the trade account at, ex hypothesi, constant international prices. It is useful to differentiate amongst the group of traded commodities between those which are importables (M) and those which are exportables (X). Assuming constant foreign currency prices (p^{*x} and p^{*m}) for these two tradable goods, and fixed tariff cum subsidy rates (t,s),

they can be aggregated into a composite good labelled tradables (T), whose domestic currency price (P^T) is determined by the nominal exchange rate (e- the domestic currency value of one unit of foreign currency), the foreign currency price of the composite good (p^{*T}) and the composite tariff cum subsidy rate (t). So if the share of exportables in the composite tradable commodity is b, and that of importables (1-b):

$$p^T = e[b \bullet p^{*x}(1+s) + (1-b)p^{*m}(1+t)] = e \bullet p^{*T}(1+t) \qquad (1)$$

The composite nontraded good comprises not only goods which are nontradable, but also tradable goods which have been converted into nontraded goods by prohibitive tariffs or binding import quotas. The domestic currency price of the nontraded good (p^N) will be set by domestic demand and supply.

This yields the key relative price in the Australian model -- the real exchange rate (er), defined as the ratio of the domestic prices of nontraded to traded goods:

$$er = p^N/p^T = p^N/[e \bullet p^{*T}(1+t)] \qquad (2)$$

This real exchange rate needs to be distinguished from the real effective exchange rate (ep) (usually reported in official publications e.g., the Economic Survey), which is based on purchasing power parity (PPP) and corrects the nominal exchange rate (e) for the difference between the domestic and foreign price levels (p^d, p^{*T}). So:

$$ep = p^d/e \bullet p^{*T} \qquad (3)$$

The domestic price level (p^d) is a weighted average of the domestic prices of nontraded goods (p^N) with a weight say of "a", and of traded goods (p^T) of (1-a), hence:

$$p^d = a \bullet p^N + (1-a)p^T \qquad (4)$$

From (1) to (4) we therefore have,

$$ep = (1+t)[a \bullet er+(1-a)] \tag{5}$$

The PPP real effective exchange rate (ep) will thus only be equal to the real exchange rate (er), if there are no nontraded goods (a=0) and the "law of one price" therefore holds, and if there are no tariffs (t=0). Nor will changes in the real effective exchange rate necessarily be surrogates for the changes in the real exchange rate. For logarithmic differentiation of (5) with respect to time yields:

$$\dot{e}p = k \bullet \dot{e}r + \dot{d} \tag{6}$$

where $d = (1+t)$; $\dot{x} = (1/x)(dx/dn)$; $k = er[a \bullet er+(1-a)]$. Thus from (2) a cut in tariffs ($d < 0$) will raise the real exchange rate ($er > 0$), but from (6) will lower the PPP real effective exchange rate ($ep < 0$). Movements in the PPP real effective exchange rate cannot therefore be taken to be proxies for movements in the real exchange rate.

As no estimates are available of the real exchange rate for India, our first task is to derive a real exchange rate series from the wholesale price index (WPI). This is done in Appendix I. The resulting real exchange rate series is charted along with the nominal and real effective exchange rate series which are available from official statistics in Fig. 2. The three series are given in Table 1 for the period 1981-82 to 1993-94.

It should be noted that the WPI does not include some important nontraded services viz., transport, housing and miscellaneous services, which are part of the nontraded good composite. To see if this exclusion makes much difference to our computed real exchange rate indices, based on the WPI, we experimented with grafting on the data from the National Income accounts for private final consumption expenditure on these other nontraded goods (ONT).

This was done as follows. First the series for the implicit deflator for these three nontraded goods was constructed, and is shown as the ONT series in Table 1(A). This was then combined with the nontraded goods series (NT) to give us our composite nontraded goods series (NTS) as follows. Given the share of nontraded goods in the WPI is a_2, and of the other nontraded goods in the final consumption data from the national accounts data is "s", and assuming that the share of these other nontraded goods in the WPI if it had included these goods would also have been "s", the respective weights of the NT, ONT and T series in the "corrected" WPI would be given by $(a_2/1+s)NT$, $(s/1+s)ONT$, and $(1-a_2/1+s)T$. From this the NTS series is readily obtained as:

$$NTS = [(a_2/s)/(a_2/s) + (s/1+s)]NT + [(s/1+s)/(a_2/s)+(s/1+s)]ONT$$

The value of s from the national accounts is 0.3, and for a_2 from the WPI (see Appendix) is 0.74 till 1991-92, and 0.64 thereafter. This gives the following weights for combining the NT and ONT series.

Till 1991-91: NTS = 0.71NT + 0.29 ONT

From 1992-93: NTS = 0.68NT + 0.32ONT.

The real exchange rate computed from this NTS and the traded good series is labelled ers. Its index, and changes in its values are given in Table 1(A), and it is charted along with er (based solely on the WPI) in Fig. 2(A). As is apparent there is not much difference between the two series. Hence our derivation of the real exchange rate based on the WPI is likely to be fairly robust.

II.

The equilibrium value of the real exchange rate is an endogenous variable of the economic system which is determined by real economic fundamentals, like

the pattern of growth, the pattern of demand and net capital inflows. Deviations from this equilibrium level can be caused by domestic monetary and fiscal policy -- usually labelled real exchange rate misalignment -- but they cannot persist, as they will set in motion countervailing effects which will return the rate to its equilibrium level if the fundamentals have not changed (see Edwards).

To see this consider the depiction of the model in Fig. 1. The economy is initially in internal and external balance at A, where the highest attainable indifference curve is tangential to the production possibility curve PP. At A the demand and supply for both traded and nontraded goods is in balance, and domestic output is equal to domestic expenditure (OYOT = OEOT in terms of the tradable good). The real exchange rate is given by the slope of the common tangent at A, er_1.

Now suppose there is a sustainable capital inflow of BC. As part of the increased expenditure this inflow makes possible will be spent on nontraded goods, their relative price must rise, and output expand. The increased expenditure on traded goods being met through a trade deficit. There will have to be a real exchange appreciation, as the production and consumption point shift to the right of A. Moreover as the demand and supply for nontraded goods must be in balance in the new equilibrium, the new consumption point will have to lie vertically above the production point, with the vertical distance between the two comprising the trade deficit, which will be exactly equal to the capital inflow. In this way the transfer of the foreign capital will have been effectuated. The resulting real exchange rate appreciation, and the accompanying trade deficit are equilibrium phenomenon. They must <u>necessarily</u> accompany the absorption of the capital inflow.

But suppose the government in addition expands aggregate demand so that domestic expenditure is greater than domestic output by an amount that is larger than that allowed by the capital inflow. This excess demand will lead to a further appreciation of the real exchange rate. For as before part of the "excess" expenditure will be spent on nontraded goods, whose relative price will have to rise to establish a new short run equilibrium. Assume that this leads to the establishment of the real exchange rate given by the slope of the YT YN and ET EN lines in Fig. 1. Production is at C, and consumption at E, which is vertically above C, and hence the demand and supply of nontraded goods are in balance. There is excess demand for tradables which will spill over into a trade deficit of CE, which is exactly equal to the excess of domestic expenditure of OE'_T over domestic output OY_T (both measured in tradables). Part of this trade deficit and excess expenditure equal to the capital inflow $(BC = Y_T\ E_T)$ is sustainable because the inflow finances it. The excess $E_TE'_T = BE$ is not. It corresponds to the injection from loose fiscal and monetary policy. Without access to unlimited foreign reserves to finance it, this trade deficit (BE) will have to be cured by reducing the excess expenditure $(E_TE'_T)$. In the process, the real exchange rate will have to depreciate from its misaligned level er_2, to the equilibrium level er* ((not drawn) given by the slope of a point on the PP curve between A and C where the vertical difference between the consumption and production point just equals the capital inflow (and hence equilibrium trade deficit) of BC.

Using the real exchange rate as a diagnostic tool, will thus enable us to judge to what extent in an open economy, its movements represent changes in the fundamentals (and hence are unavoidable) or misalignment (which require countervailing monetary and/or fiscal policy corrections).

Secondly, it will also influence the inflationary process. This will depend as can be seen from (1) and (2) above on what policy is followed with respect to the nominal exchange rate (e) and trade taxes (t). For from (2), assuming that the foreign currency prices of tradables (p^{*T}) are constant, the requisite changes in the real exchange rate can come about through changes in the price of nontraded goods, the nominal exchange rate and trade taxes or some combination of them. For, from (2) and (4) assuming that p^{*T} and "a" are constant we have:

$$\dot{p}^d = \dot{er} + \dot{e} + \dot{t} \tag{7}$$

As we have seen the government cannot control er. It can however neutralize the effects of the required change in er on the domestic price level (p^d) by countervailing changes in the nominal exchange rate (e) and/or trade taxes (t). Thus suppose there is an increase in net capital inflows, with no excess demand pressures from monetary and/or fiscal policy. We know from Fig. 1, that the real exchange rate must appreciate ($er > 0$). From, (7) unless there is an equivalent appreciation of the nominal exchange rate ($\dot{e} < 0$) or reduction in trade taxes ($\dot{t} < 0$), the domestic price level will go up, even without any undue monetary and fiscal expansion. Thus the policy reactions to the requisite real exchange rate changes which are unavoidable will be a crucial determinant of the inflationary process.

Thirdly, the changes in the real exchange rate will determine the relative growth of outputs (or levels in the static case) of traded and nontraded goods -- that is the shifts on the production possibility curve PP in Fig. 1 (for the static case) -- through the relative changes in the profitability of producing the two goods these changes in their relative prices induce. Given the unavoidable changes in the real exchange rate, these production effects will also be unavoidable.

III.

We next seek to explain the changes in the real exchange rate between 1981-84 in terms of the Australian model. Attempts to estimate the algebraic version of the model in Appendix III were foiled because the monetary sub-model's central assumption that money determines prices does not seem to be supported by econometric analyses of past Indian data (see e.g., Balakrishnan; Nag & Upadhyay).

So instead we sought to fit the simplified version of the model represented by Fig. 1 econometrically to the data to see if it could explain the changes in the real exchange rate between 1981-94. From the simple model in Fig. 1, it is apparent that the real exchange (er) will be positively related to net capital inflows (K) and any "excess" domestic expenditure (ED). From Fig. 1, (and standard national income accounting identities) it is evident that $K = BC$, and that $ED = EB = Y_T E'_T - BC$. But as the trade deficit $(M-X) = Y_T E_T$, we have excess demand (ED) given by the difference between the trade deficit (M-X) and the net capital inflow (K), that is $ED = (M-X) - K$. Normalizing the trade deficit and capital inflow as ratios of GDP, we then sought to explain changes in the real exchange rate (er) by changes in the share of capital inflows in GDP ($DKY = \Delta(K/Y)$) and changes in the percentage of "excess" demand in GDP ($DED = \Delta(ED/Y)$ with the expectation that both independent variables would have positive signs. Table 2 gives the data for these variables.

Whilst the estimated equation for the whole of the sample period 1981-94, had the correct signs on the independent variables, the coefficients were not significant, and the overall regression represented a very bad fit to the data. Inspection of the data revealed that for the three "crisis" years 1989, 1990, 1991, it was anomalous. Estimating the relationship without these years

yielded the following regression equation:

[RI] $$\dot{er} = \underset{(0.008)}{0.02} + \underset{(1.35)}{3.07}\,DKY + \underset{(2.25)}{2.08}\,DED$$

obs = 9; $R^2 = 0.39$; R^2 adj = 0.19; DWS = 1.75; RHO = 0.53
(figures in brackets are t ratios).

The results using the ers series for the real exchange rate series were:

[R2] $$\dot{ers} = \underset{(0.20)}{0.36} + \underset{(1.40)}{3.17}\,DKY + \underset{(2.30)}{2.19}\,DED$$

obs = 9; $R^2 = 0.39$; R^2 adj = 0.19; DWS = 1.75; RHO = 0.075

There is not much difference between the results. So we shall use the real exchange rate from the WPI (er) as our "correct" er in the rest of the paper.

Fig. 3, charts the observed and the predicted changes in the real exchange rate (er). The estimated equation seems to pick up the turning points fairly well. Moreover though the coefficient on DKY is not significant at the 5% level (whereas that on DED is), we can check its robustness through an indirect derivation based on the parameters of the model outlined in Appendix III.

From equation (A.12) we can derive the following relationship between changes in the real exchange rate and various parameters (see Appendix III for the derivation).

$$\dot{er} = \dot{pn} = [(a_3 \bullet Y/N)/(n^d + n^s(1-a_2)]d(K/Y) \qquad \text{(A12b)}$$

where a_3 = proportion of foreign capital inflow spent on nontraded goods.

$N/Y = N^d/Y = N^s/Y$ = share of nontraded goods in domestic consumption/output.

n^d = elasticity of demand for nontraded goods.

n^s = elasticity of supply for nontraded goods.

a_2 = marginal propensity to consume nontraded goods.

From an estimated import equation for the period 1981-94, the import coefficient in GDP is 0.10. The estimated equation was, with I (imports) and Y (GDP):

$$I = \underset{(2.04)}{-3507} + \underset{(19.5)}{0.10}\,Y \qquad R_2 = 0.989;\ \ DWS = 1.597;\ \ RHO = 0.059$$

Assuming that for foreign capital inflows this propensity is higher, say 0.25, yields a guesstimate for a_3 of 0.75.

The marginal propensity to spend on traded goods, a_2 is taken to be equal to the share of nontraded goods in the WPI. Till 1991-92 $a_2 = 0.74$; 1992-93 and after $a_2 = 0.64$.

a_2 is also the share of nontraded goods in total output, so till 1991-92, $Y/N = 1/0.74 = 1.35$; from 1992-93, $Y/N = 1/0.64 = 1.56$.

The elasticity of demand for nontraded goods will be given by

n^d = (1-share in expenditure of nontraded goods) × elasticity of substitution between nontraded and traded goods.

We already have the values of a_2 (the share in expenditure of nontraded goods) but we have nothing to go on to estimate the requisite elasticity of substitution. Harberger argues that the elasticity of substitution between two large composite commodities such as traded and nontraded goods without good substitutes between them is likely to lie between 0.5 and 1.0. Taking the lower of these estimates, yields a value before 1991-92 of $n^d = 0.13$, and from 1992-93 of $n^d = 0.18$.

We have nothing to go on to provide an estimate of n^s. We assume it lies between 0.5 to 1.

Applying these values in (A12b), we get the following range of estimates of the coefficient (g) of DKY, as the determinant of changes in the real

exchange rate:

$$\dot{e}r = g \bullet DKY$$

Values of g when

	$n_s = 0.5$	$n_s = 1$
Till 1991-92	3.9	2.6
After 1992-93	3.3	2.2

The coefficient of DKY estimated in RI lies within this range, and we thus have some support for the applicability of the reduced form estimate of the Australian model to India.

Finally, we examined whether the government's fiscal deficit had any effect on our measure of "excess" demand. The measure of the deficit we seek is the equivalent of what in the U.K. is termed the public sector borrowing requirement (PSBR). This is obtained as the gap between total outlays and receipts of the central and state governments and public sector undertakings. It is reported in Table 4. We then ran regressions between changes in the ratio of the PSBR to GDP (DPSBR) and the changes in the ratio of the trade deficit (M-X) to GDP (DMXY) for 1981-94. Whilst there was no significant relationship between the two for the whole sample period, there was a steadily improving relationship (which becomes significant after 1988) after 1985-86. These years were the beginning of the opening up of the economy under the Rajiv Gandhi government. So essentially what we find (see Table 5) is that with the steady opening of the economy the budget deficit, spills over into a rade deficit. Hence there is growing link between the budget deficit and the real exchange rate, and thence on the price level.

IV.

We can now briefly outline the macroeconomic story which emerges from our model for the three years since the reforms. Table 6 gives the values of the relevant variables. The two independent (exogenous) variables are the inflows of foreign capital and the overall "excess" demand from the net effects of fiscal and monetary policy. In 1991-92 there was a decline in both, so a small depreciation of the real exchange rate was entailed. Given the large devaluation of the nominal exchange rate, which was partially offset by the accompanying reduction in trade taxes, traded goods prices rose by nearly 14%, and so nontraded goods prices had to rise by a smaller but still substantial amount to give the small real exchange rate depreciation that was required.

In 1992-93 there was a further small decline in net capital inflows, but a substantial increase in "excess" demand, so the real exchange rate had to appreciate. But as the prices of traded goods rose by only 6% (the result of a small devaluation of the nominal exchange rate and rise in the foreign currency prices of traded goods offset by the continuing reduction in net trade taxes), the requisite real exchange rate adjustment occurred with a rise in nontraded goods prices of over 9%.

In 1993-94, there was a large increase in capital inflows, which given our elasticity estimate in R1, would have required a real exchange rate appreciation of about 4.5%. However, this positive impact on the real exchange rate was offset by a substantial reduction in "excess" demand, which only required a modest appreciation. Given the rise in traded goods prices flowing largely from the rise in their foreign currency values, the requisite real exchange rate appreciation required a rise in nontraded goods prices of about 9%. It should be noted that the implicit deflation in 1993-94, was the major way of preventing the large appreciation of the real exchange rate that

would otherwise occurred. This in effect was a means of preventing the full transfer of the capital inflows, whose counterpart was the large rise in foreign exchange reserves.

What of the relative output effects? Assuming that agricultural output is still governed by the weather, the effects of the relative price changes embodied in real exchange rate movements should be reflected in relative movements in the outputs or rates of growth of nontraded and traded manufactures. Unfortunately we do not have a classification of changes in industrial output in terms of these categories. However, from the Economic Survey (Table 6.4) we have data on growth rates of various industrial sectors. As the recent trade liberalization has converted many capital goods into tradables (and possibly also those in the basic goods category), we have roughly divided these sectors into tradable and nontradable as shown in Table 7. As we would expect the real exchange appreciation and deflation of 1993-94 would depress the rates of growth of the tradable sectors, but the nontraded goods sectors would boom. By contrast, the April-Oct 1992-93 data shown, should be reflecting the real exchange depreciation of 1991-92, and the demand boost of 1992-93. Tradable goods growth rate would (as it is) be expected to be higher than that for nontraded goods.

Enough has hopefully been said to show the utility of the Australian model in thinking about macroeconomic policy in an economy which is increasingly open, to both foreign trade and capital. It is with respect to the latter that the model may also be usefully employed to consider the deployment of policy variables to maintain macroeconomic balance whilst absorbing the purported wall of foreign money which is seeking a home in the Indian economy. In the past the economy absorbed less than 1/2% of GDP in the form of capital inflows. This rose to about 2%, in the mid-1980s. In

1993-94, the inflows are estimated to be about 4% of GDP. They could well double over that level in the near future. If they do, and monetary and fiscal policy is neutral, a substantial real exchange rate appreciation to absorb these inflows is unavoidable. The only choice as (2) makes clear is whether this real appreciation comes about through a rise in nontraded goods prices or through a fall in those of traded goods. The latter as is clear from (2) and (7) requires an appreciation of the nominal exchange rate (fall in e) and/or reduction in net trade taxes. For an economy seeking to promote the growth of exports, an appreciation of the nominal exchange rate may seem to be counterproductive in achieving this end. However, as (1) makes clear, the relative price of tradables can be reduced by reducing import tariffs on importables, this will also increase the relative profitability of exporting.

Moreover, India has one other way of painlessly reducing the price of tradables through this route whilst improving the relative profitability of exports. Nearly all consumer goods are non-tradable at present. By removing QR's and replacing them by say a uniform tariff close to the baggage rate (100%), and then reducing the average tariff on them as is required by the requisite real exchange movements induced by capital inflows, the required fall in tradable goods prices can be obtained even with an unchanged nominal exchange rate. Furthermore by converting these nontraded into traded goods the proportion of domestic expenditure on nontraded goods (a_2, and a_3 in our equations) will fall, thereby reducing the multiplier effect of any capital inflow on the real exchange rate.

However, maintaining a relatively constant nominal exchange rate as India has done over the last few months will not be viable if the large capital inflows materialize. The required real exchange rate appreciation will fuel

inflation in nontraded goods prices, even if the stance of fiscal and monetary policy remain neutral. The choice of an appropriate nominal exchange regime therefore becomes a vital policy matter for the future.

This is accentuated by the type of capital inflows that India is most likely to receive. Unlike China and Singapore which have relied on direct foreign investment, or many Latin American countries which in the past relied on borrowing from banks at variable interest rates, the most likely form of foreign capital inflow is likely to be in the form of foreign equity holding. This is better than bank borrowing as the lender bears some of the investment risk, as with direct foreign investment. However, unlike the latter, which cannot be easily liquidated, as it consists of actual factories etc., equity investment can be as volatile as bank lending. If investors are given an implicit or explicit exchange rate guarantee, then the country can suffer a foreign exchange crisis if market sentiments turn averse. By contrast, if the nominal exchange rate is flexible (ideally floating) then it can mediate these flows by making the foreign investors share in both the investment and currency risks associated with their investments. A fully floating rate moreover will choke of these inflows by appreciating, and prevent divestments by depreciating if market sentiments turn bullish or bearish about the country's prospects.

However, until the domestic financial system is reformed, and the government has attained a balance in the public finances, it maybe imprudent to have a fully floating rate. In that case, as a second best, to mitigate the effects on the domestic price level of the real exchange rate changes which will necessarily accompany large capital inflows, perhaps the government should consider a reserve target ((say a year of imports) in managing its floating exchange rate.

Finally, though in this paper, capital inflows have been taken as exogenous, they are likely to be determined by domestic and international real interest rate differentials (as well as the different rates of return on investments). Once financial liberalization is completed, and the economy is fully integrated into the global economy, along with exchange rate and fiscal policy, interest rate policy will become an important policy variable in managing the macroeconomy.

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TABLE 1

Comparison of REER, NEER and eR

Year	NEER	REER	eR	NEER	REER	eR
		1981-82 = 100			1981-82 = 100	
1981-82	100.0	100.0	100.0	-	-	-
1982-83	101.2	96.8	96.4	1.18	-3.17	-3.61
1983-84	101.7	99.8	91.9	0.49	3.05	-4.66
1984-85	98.0	96.5	86.4	-3.61	-3.26	-6.00
1985-86	95.1	94.1	91.3	-2.93	-2.55	5.71
1986-87	82.9	86.4	90.3	-12.83	-8.18	-1.07
1987-88	78.4	81.7	89.2	-5.46	-5.39	-1.24
1988-89	73.0	77.0	83.9	-6.90	-5.79	-5.92
1989-90	69.7	75.1	84.7	-4.51	-2.48	0.95
1990-91	64.9	72.3	83.2	-6.87	-3.62	-1.79
1991-92	50.7	61.4	83.2	-21.88	-15.08	-0.05
1992-93	48.3	63.4	86.4	-4.78	3.18	3.88
1993-94	-	-	87.8	-	-	1.60

SOURCE: RBI

NEER : NOMINAL EFFECTIVE EXCHANGE RATE

REER : REAL EFFECTIVE EXCHANGE RATE

eR : REAL EXCHANGE RATE (DERIVED AS A RATIO OF WPI IN NONTRADED TO TRADED GOODS)

TABLE 1A

Inflation and Real Exchange Rate (eRs) in Traded and Nontraded Goods

INDEX	WPI			% Change			Real Exchange Rate(eRs)	
YEAR	TRADED	NTS	ONT	TRADED	NTS	ONT	6-5	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1981-82	100.00	100.00	100.00	-	-	-	-	100.00
1982-83	107.37	105.39	109.39	7.37	5.39	9.49	-1.98	98.02
1983-84	118.95	112.70	118.60	10.79	6.93	8.42	-3.85	94.25
1984-85	131.30	118.81	126.54	10.38	5.43	6.69	-4.96	89.57
1985-86	132.70	126.16	134.88	1.07	6.18	6.60	5.12	94.16
1986-87	141.26	133.49	143.71	6.45	5.81	6.54	-0.65	93.55
1987-88	153.92	141.98	148.16	8.96	6.36	3.10	-2.60	91.12
1988-89	171.29	151.95	162.07	11.29	7.03	9.39	-4.26	87.24
1989-90	182.62	164.77	179.43	6.61	8.43	10.71	1.82	88.83
1990-91	203.57	181.37	197.96	11.47	10.07	10.33	-1.40	87.58
1991-92	231.93	204.68	218.99	13.93	12.86	10.62	-1.08	86.64
1992-93	246.40	225.30	241.53	6.24	10.07	10.29	3.83	89.96
1993-94	264.93	246.20	265.69	7.52	9.28	10.00	1.76	91.54

NTS = WPI IN NONTRADED GOODS (INCLUDING SERVICES)

eRS = REAL EXCHANGE RATE (AFTER INCORPORATING SERVICES IN NONTRADED GOODS)

TABLE 2

Data For Estimating Excess Demand

	RS CRORES					
Year	M-X	Y	K	ΔED	K/Y	eR
1982-83	5490.0	159395	837.6	-0.78	0.1767	-3.61
1983-84	6060.0	186723	2220.5	-0.86	0.6637	-4.49
1984-85	5390.0	208533	3441.9	-1.12	0.4613	-5.51
1985-86	8763.0	233799	4968.9	0.69	0.4748	4.93
1986-87	7644.0	260030	5989.3	-0.99	0.1780	-0.98
1987-88	6570.0	294851	7607.7	-0.99	0.2769	-1.12
1988-89	8003.0	353517	11650.6	-0.68	0.7155	-5.28
1989-90	7670.0	405827	11611.7	0.06	-0.4344	0.80
1990-91	10645.0	472660	12895.3	0.50	-0.1330	-1.51
1991-92	3810.0	541888	12061.3	-1.05	-0.5024	-0.04
1992-93	9687.0	627913	12642.5	1.05	-0.2124	3.23
1993-94	-511.5	706402	25120.0	-3.16	1.5426	1.38

M-X : IMPORTS-EXPORTS

Y : GDP (AT CURRENT PRICES)

K : NET CAPITAL INFLOW

ED : EXCESS DEMAND = (M-X-K)/Y x 100

eR : REAL EXCHANGE RATE

TABLE 3

Inflation In Traded and Nontraded Goods

	INFLATION		
Year	Traded	Nontraded	Overall
1982-83	7.37	3.76	4.9
1983-84	10.79	6.29	7.5
1084-85	10.38	4.87	6.5
1985-86	1.07	6.00	4.4
1986-87	6.45	5.47	5.8
1987-88	8.96	7.84	8.2
1988-89	11.29	6.00	7.5
1989-90	6.61	7.41	7.4
1990-91	11.47	9.96	10.3
1991-92	13.93	13.89	13.7
1992-93	6.24	9.46	10.2
1993-94	7.52	8.90	8.4

TABLE 4

TITLE???

Year (1)	Δ(X-M)/Y (2)	Δ(K/Y) (3)	(2-3) ΔED (4)	PSBR (5)	Current GDP (6)	(PSBR/GDP) (7)	Δ(PSBR) (8)
1980-81	-	-	-	12282	122427	0.1003	-
1981-82	-0.72	-0.41	-0.31	13313	143216	0.0930	-0.74
1982-83	-0.61	0.18	-0.78	16952	159395	0.1064	1.34
1983-84	-0.20	0.66	-0.86	19840	186723	0.1063	-0.01
1984-85	-0.66	0.46	-1.12	25728	208533	0.1234	1.71
1985-86	1.16	0.47	0.69	27188	233799	0.1163	-0.71
1986-87	-0.81	0.18	-0.99	35967	260030	0.1383	2.20
1987-88	-0.71	0.28	-0.99	38684	294851	0.1312	-0.71
1988-89	0.04	0.72	-0.68	44334	353517	0.1254	-0.58
1989-90	-0.37	-0.43	0.06	54992	405827	0.1355	1.01
1990-91	0.36	-0.13	0.50	65941	472660	0.1395	0.40
1991-92	-1.55	-0.50	-1.05	65536	541888	0.1209	-1.86
1992-93	0.84	-0.21	1.05	76529	627913	0.1219	0.09
1993-94	-1.62	1.54	-3.16	79519	706402	0.1126	-0.93

PSBR = TOTAL OUTLAY-CURRENT REVENUE

(OF CENTER, STATE GOVERNMENTS AND UNION TERRITORIES)

TABLE 5

Results of Regression of ΔPSBN/Y On Δ(M-X)/Y

And Δ(M-X-K)/Y

Sample Period = (1981-1982 to 1993-1994)

Data	Dependent Variable (M-X)/Y			Dependent Variable (M-X-K)/Y		
Beginning	Constant	PSBR	R-Sqr	Constant	PSBR	R-Sqr
1981-82	S	NS	0.52	S	NS	0.37
1982-83	S	NS	0.55	S	NS	0.36
1983-84	S	NS	0.60	S	NS	0.39
1984-85	S	NS	0.58	S	NS	0.45
1985-86	S	NS	0.46	S	NS	0.41
1986-87	S	NS	0.67	S	NS	0.40
1987-88	S	S	0.97	NS	NS	0.63
1988-89	S	S	0.96	NS	NS	0.75
1989-90	S	S	0.94	NS	NS	0.81

NOTE: S STANDS FOR SIGNIFICANT

NS STANDS FOR NOT SIGNIFICANT

The best equation is for the period 1987-88 to 1993-94

$$\Delta(m\text{-}X)/Y = -0.22 + 0.29\ \Delta PBSR/Y$$
$$\text{t-ratios} \quad (-5.37) \quad (4.37)$$

$R^2 = 0.97$, DWS = 2.9; RHO = -0.6

TABLE 6

	$e\dot{r}$	$(-)\dot{e}^a$	DKY	DED	$\dot{p}^d$	$\dot{p}^N$	$\dot{p}^T$	$\dot{p}^{*T^b}$	t^c
1991-92	-0.04	-21.9	-0.50	-1.05	13.7	13.89	13.93	4.6	-12.6
12.6-93	3.23	-4.7	-0.21	1.05	10.2	9.46	6.24	9.3	-7.6
1993-94	1.38	0.0	1.54	-3.16	8.4	8.90	7.52	n.a.	n.a.

[a]A fall in the nominal exchange rate index implies a devaluation, and hence an increase in "e" in our equations in the text.

[b]This has been estimated from the change in the rupee unit value index for exports, less the change in the nominal exchange rate.

[c]This is estimated from the accounting equation:

$$\dot{p}^T = \dot{e} + \dot{p}^{*T} + t$$

TABLE 7

Growth Rates of Industrial Sectors

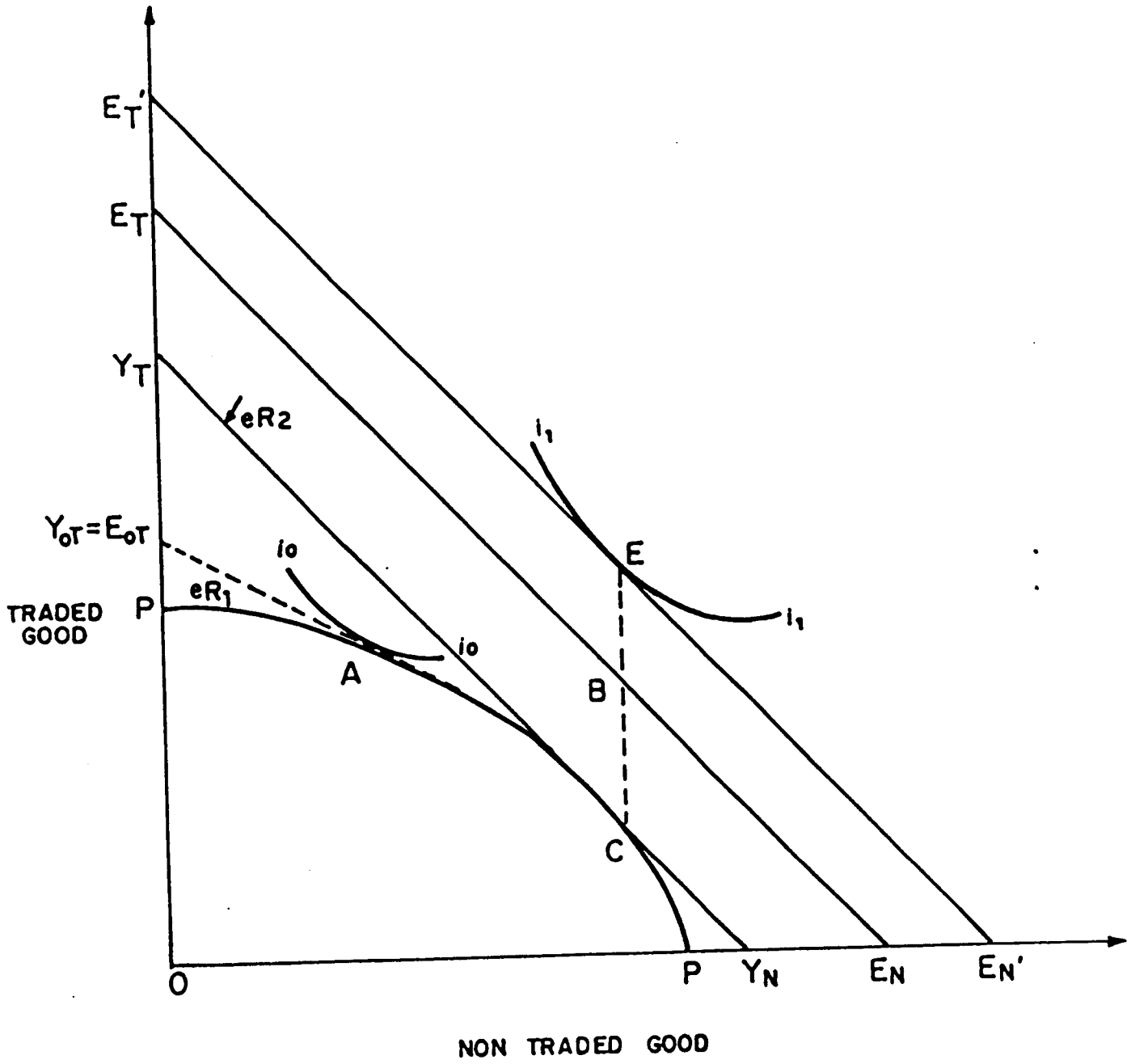
April-October

	Classification	1992-93	1993-94
Basic Goods	T	3.7	2.9
Capital Goods	T	9.0	-8.8
Intermediate Goods	N	4.0	10.4
Consumer Goods	N	0.0	1.4

T = Tradable; N = Nontradable

Data from Table 6.4, Economic Survey 1993-1994.

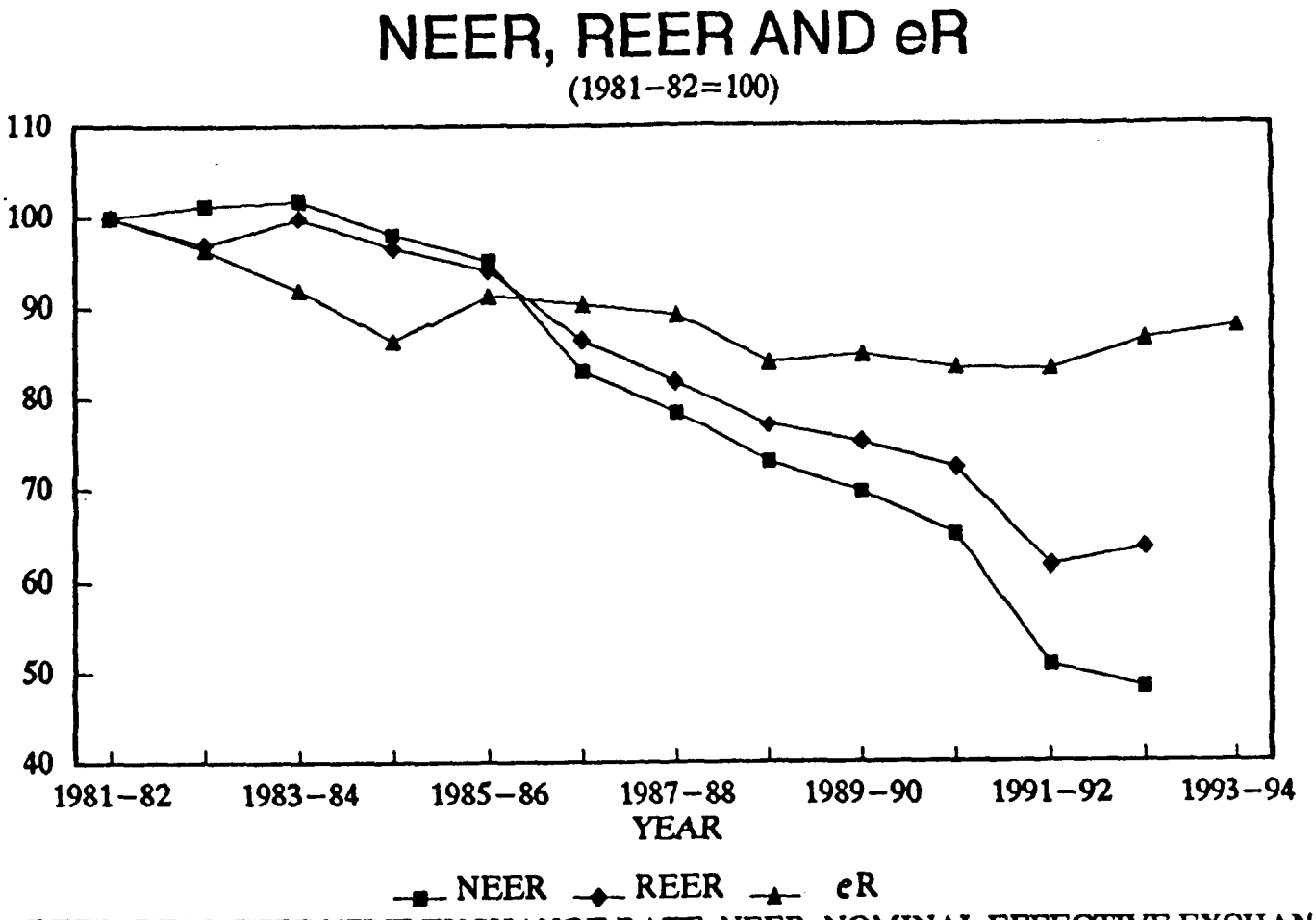
FIGURE 1


E_T'
E_T
Y_T
eR2
i_1
$Y_{oT}=E_{oT}$
io
E
TRADED GOOD
P
eR_1
io
i_1
A
B
C
O
P
Y_N
E_N
E_N'
NON TRADED GOOD

NOTE TO FIG.1.

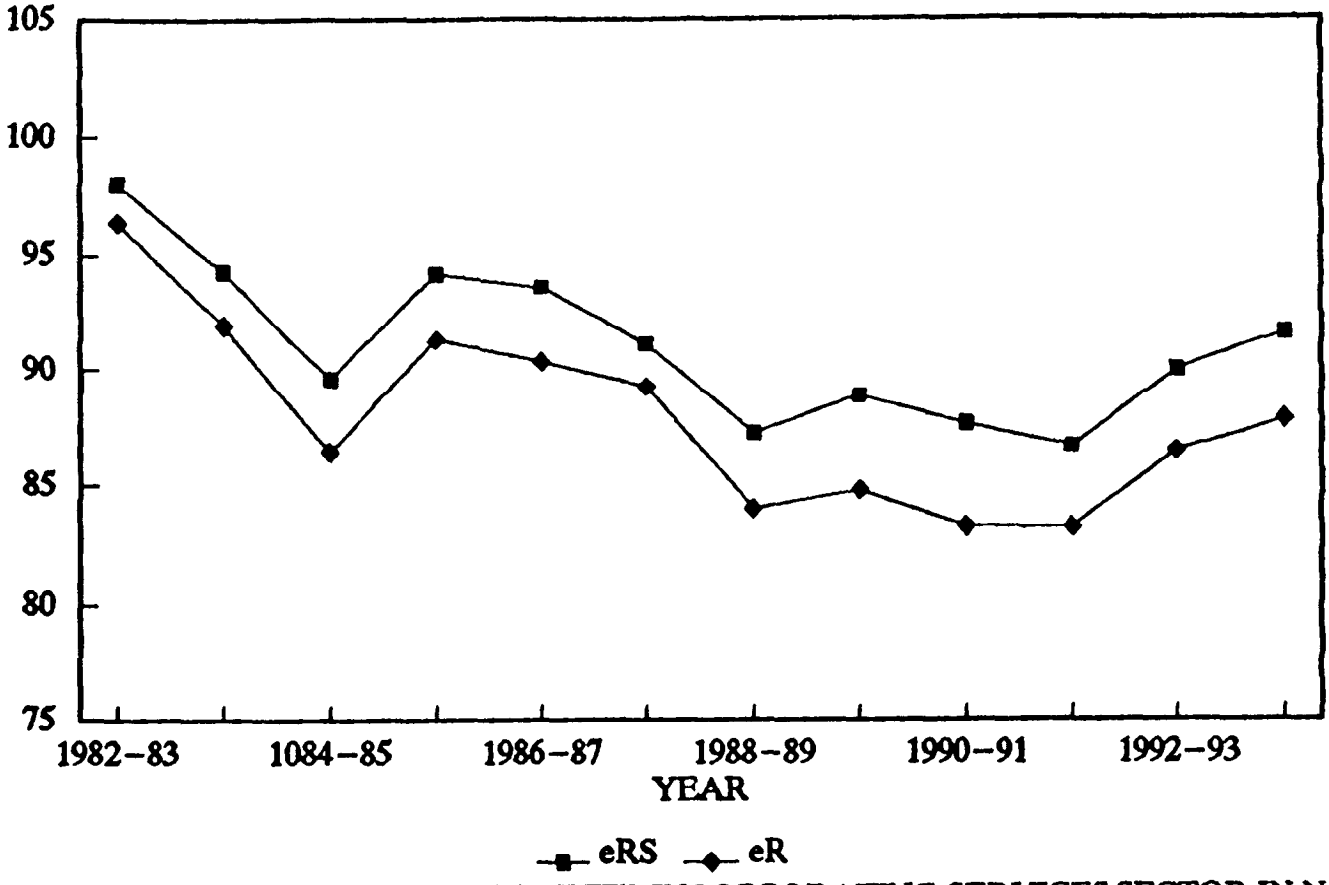
PP is the production possibility frontier for the output of the two composite commodities traded (T) and nontraded (N) goods. Given a set of indifference curves initial equilibrium is at A. The slope of the common tangent to the indifference curve $i_0 i_0$ and the PP curve is the equilibrium real exchange rate er_1. The economy is in internal and external balance as at A domestic output and expenditure are in balance ($OY_{0T} = OE_{0T}$), and there is no trade deficit as the demand and supply for traded goods are also equal. Suppose there is an expansion in aggregate demand to OE'_T. This will lead to an increase in the demand for both traded and nontraded goods. Whereas the former can be met through running a trade deficit, the latter will lead to a rise in the relative price of nontraded goods which will induce an increase in their output and switching of expenditure away towards traded goods. There will be a new (unsustainable) equilibrium at C, where the output of the nontraded good expands to meet the increased demand for it (E is vertically above C), and the excess demand $Y_T E'_T$ spills over into an equivalent trade deficit of CE. The real exchange rate appreciates to that given by er_2. With limited reserves, the excess expenditure will ultimately have to be cut, and the economy will then move back to A. In the process the real exchange rate will depreciate back to its original level er_1.

FIGURE 2



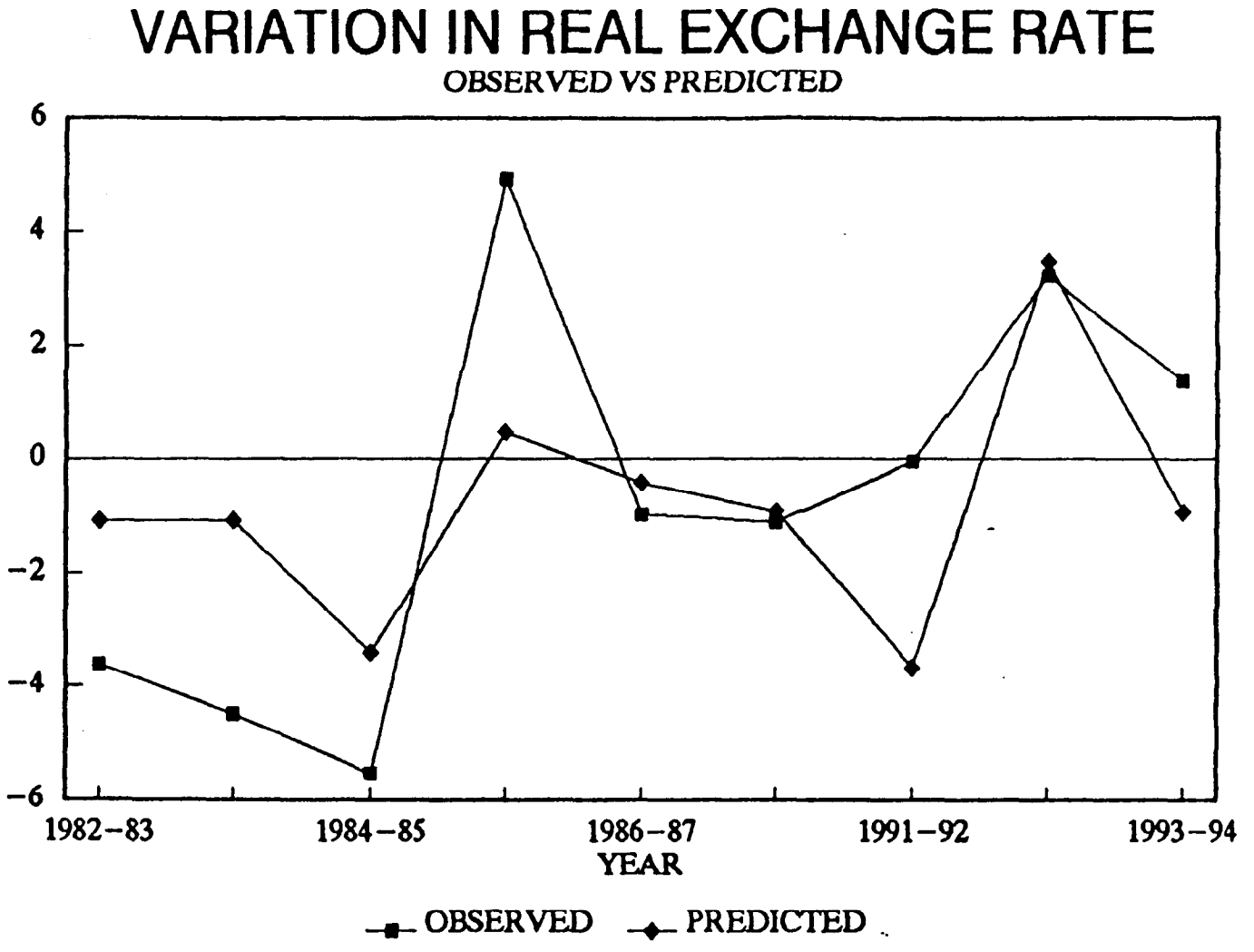
REER: REAL EFFECTIVE EXCHANGE RATE; NEER: NOMINAL EFFECTIVE EXCHANGE RATE
eR : REAL EXCHANGE RATE

Table 2A. Real Exchange Rates eRS and eR



eRS = REAL EXCHANGE RATE AFTER INCORPORATING SERVICES SECTOR IN NO:
eR : REAL EXCHANGE RATE (EXCLUDING SERVICES)

FIGURE 3


VARIATION IN REAL EXCHANGE RATE
OBSERVED VS PREDICTED
6
4
2
0
−2
−4
−6
1982−83
1984−85
1986−87
1991−92
1993−94
YEAR
OBSERVED
PREDICTED

APPENDIX I

A note on the data sources and methodology used for classification of WPI into traded and nontraded goods

The data used in this study has been primarily obtained from the following sources:

- Annual data on Wholesale Price Index (WPI) was obtained from the Ministry of Industry. As final data on the wholesale price Indices for the year 1993-94 was available only up to November 1993, we have:

  (a) used provisional WPI for the months of December and January.

  (b) derived the wholesale price indices for the months of February and March (for which no data was available) so as to give an annual inflation rate of 8.4%.

- For classification of goods into traded and nontraded goods, Export and Import policy documents published by the Ministry of Commerce were used.

- Data on other variables was obtained from various issues of Economic Survey and National Account Statistics.

Disaggregated data on Wholesale Price Indices is available for about 448 odd commodities. For deriving the Real Exchange Rate (defined as the ratio of nontraded to traded goods), the WPI data was classified into traded and non-traded goods. **Traded goods** are those which are exported and imported at the margin. This group includes commodities which are subject to tariff but do not have fixed quota restrictions on them. In other words domestic prices of traded goods are influenced by international prices. In contrast to this the market prices of **nontraded** goods is determined by domestic demand and supply. Items which are canalized or are subject to fixed import quotas are treated as nontraded goods.

Table 1A gives the classification of WPI into traded and nontraded goods. Two distinct time periods for which traded/nontraded classification is made

are as follows:

TIME PERIOD	BASIS OF CLASSIFICATION
1982-83 to 1991-92	Export and Import Policy (April 1990 to March 1993, published on March 30, 1990
1992-93 to 1993-94	Export and Import Policy (April 1992 to March 1997, published on June 30, 1992)

As can be noted, the classification of goods as traded and nontraded remains uniform for the period 1982-83 to 1991-92. This is due to the fact that there has been no major change in trade policy during this period. WPI data from 1992-93 onwards, however, has been differently classified in accordance with the more liberalized trade policy announced in 1992.

The new series of WPI from 1982-83 to 1993-94 (for traded and nontraded goods separately) obtained using the above methodology is given in Table 2A. This table also documents the inflation rates for traded and nontraded goods and the real exchange rates obtained from them.

TABLE 1A

S. No.	Commodity	Weight	YEAR 1982-83 to 1991-92	YEAR 1992-93 to 1993-94
1	Rice	3.685	Non-Traded	Non-Traded
2	Wheat	2.248	Non-Traded	Non-Traded
3	Jowar	0.420	Non-Traded	Non-Traded
4	Bajra	0.178	Non-Traded	Non-Traded
5	Maize	0.191	Non-Traded	Non-Traded
6	Barley	0.053	Non-Traded	Non-Traded
7	Ragi	0.049	Non-Traded	Non-Traded
8	Gram	0.410	Traded	Traded
9	Arhar	0.274	Traded	Traded
10	Moong	0.201	Traded	Traded
11	Masur	0.054	Traded	Traded
12	Urad	0.154	Traded	Traded
13	Potatoes	0.472	Traded	Traded
14	Sweet potatoes	0.068	Traded	Traded
15	Onions	0.156	Traded	Traded
16	Tapioca	0.128	Traded	Traded
17	Ginger (Fresh)	0.082	Non-Traded	Non-Traded
18	Peas green	0.137	Non-Traded	Non-Traded
19	Tomatoes	0.117	Non-Traded	Non-Traded
20	Cauliflower	0.131	Non-Traded	Non-Traded
21	Banana	0.468	Traded	Traded
22	Mangoes	0.964	Traded	Traded
23	Apples	0.379	Traded	Traded
24	Oranges	0.274	Traded	Traded
25	Cashew nuts	0.115	Traded	Traded
26	Coconut/fresh	0.534	Traded	Traded
27	Papaya	0.020	Non-Traded	Non-Traded
28	Grapes	0.044	Traded	Traded
29	Milk	1.961	Non-Traded	Non-Traded
30	Eggs	0.263	Non-Traded	Non-Traded
31	Fish	0.507	Traded	Traded
32	Mutton	0.521	Traded	Traded
33	Poultry chicken	0.375	Traded	Traded
34	Pork	0.117	Traded	Traded
35	Black pepper	0.042	Traded	Traded
36	Chiles (Dry)	0.319	Traded	Traded
37	Turmeric	0.051	Traded	Traded
38	Cardamom	0.055	Traded	Traded
39	Ginger/dry	0.038	Traded	Traded
40	Betelnuts	0.151	Traded	Traded
41	Cumin	0.214	Traded	Traded
42	Garlic	0.077	Traded	Traded
43	Tea	0.564	Traded	Traded
44	Coffee	0.125	Traded	Traded
45	Raw Cotton	1.335	Non-Traded	Non-Traded
46	Raw Jute	0.160	Non-Traded	Non-Traded
47	Mesta	0.050	Non-Traded	Non-Traded
48	Raw hemp	0.011	Non-Traded	Non-Traded

Table 1A (cont.)

S. No.	Commodity	Weight	YEAR 1982-83 to 1991-92	YEAR 1992-93 to 1993-94
49	Raw wool	0.082	Non-Traded	Non-Traded
50	Raw silk	0.116	Non-Traded	Non-Traded
51	Coir fibre	0.037	Non-Traded	Non-Traded
52	Groundnut seed	1.296	Non-Traded	Non-Traded
53	Rape & mustard seed	0.661	Non-Traded	Non-Traded
54	Cotton seed	1.254	Non-Traded	Non-Traded
55	Copra	0.111	Non-Traded	Non-Traded
56	Gingelly seed	0.142	Non-Traded	Non-Traded
57	Linseed	0.101	Non-Traded	Non-Traded
58	Castor seed	0.056	Non-Traded	Non-Traded
59	Nigerseed	0.038	Non-Traded	Non-Traded
60	Safflower(Kardiseed)	0.083	Non-Traded	Non-Traded
61	Sunflower	0.025	Non-Traded	Non-Traded
62	Soybean	0.074	Non-Traded	Non-Traded
63	Mahuaseed	0.020	Non-Traded	Non-Traded
64	Hidesraw	0.096	Traded	Traded
65	Skinsraw	0.078	Traded	Traded
66	Tanning materials	0.001	Traded	Traded
67	Sugarcane	2.706	Non-Traded	Non-Traded
68	Tobacco	0.275	Non-Traded	Non-Traded
69	Rubber	0.114	Traded	Traded
70	Lac	0.036	Traded	Traded
71	Logs & timber	0.571	Traded	Traded
72	Fodder	0.552	Non-Traded	Non-Traded
73	Iron ore	0.154	Non-Traded	Traded
74	Manganese ore	0.048	Non-Traded	Traded
75	Bauxite	0.011	Non-Traded	Traded
76	Chromite	0.018	Non-Traded	Traded
77	Limestone	0.070	Non-Traded	Non-Traded
78	Mica	0.003	Non-Traded	Traded
79	Fluorite	0.004	Non-Traded	Traded
80	Gypsum	0.003	Non-Traded	Traded
81	Fireclay	0.002	Non-Traded	Traded
82	Kasoline	0.004	Non-Traded	Traded
83	Dolomite	0.008	Non-Traded	Traded
84	Magnesite	0.012	Non-Traded	Traded
85	Asbestos	0.040	Non-Traded	Traded
86	Kyanite	0.001	Non-Traded	Traded
87	Rock phosphate	0.083	Non-Traded	Traded
88	Barytes	0.003	Non-Traded	Traded
89	Sulphur & pyrites	0.087	Non-Traded	Traded
90	Steatite	0.002	Non-Traded	Traded
91	Silica sand	0.001	Non-Traded	Traded
92	Imported petroleum crude	3.004	Non-Traded	Non-Traded
93	Indigenous petroleum crude	1.270	Non-Traded	Non-Traded
94	Coking coal	0.353	Traded	Traded
95	Non-coking coal	0.798	Traded	Traded
96	Coke	0.064	Traded	Traded
97	Lignite	0.041	Traded	Traded

Table 1A (cont.)

S. No.	Commodity	Weight	YEAR 1982-83 to 1991-92	YEAR 1992-93 to 1993-94
98	Liquified petroleum gas	0.677	Non-Traded	Non-Traded
99	Petrol	0.806	Non-Traded	Non-Traded
100	Kerosene	0.868	Non-Traded	Non-Traded
101	Aviation turbine fuel	0.341	Non-Traded	Non-Traded
102	High speed diesel oil	2.154	Non-Traded	Non-Traded
103	Light diesel oil	0.203	Non-Traded	Non-Traded
104	Naptha	0.342	Non-Traded	Non-Traded
105	Bituman	0.181	Non-Traded	Non-Traded
106	Furnace oil	0.641	Non-Traded	Non-Traded
107	Lubricants	0.453	Non-Traded	Traded
108	Elec. for domestic purposes	0.362	Non-Traded	Non-Traded
109	Elec. for power purposes	0.527	Non-Traded	Non-Traded
110	Elec. for irrigation purposes	0.317	Non-Traded	Non-Traded
111	Elec. for industrial purposes	0.825	Non-Traded	Non-Traded
112	Elec. for special purposes	0.024	Non-Traded	Non-Traded
113	Elec. for other purposes	0.686	Non-Traded	Non-Traded
114	Tinned Milk Powder	0.145	Non-Traded	Non-Traded
115	Butter	0.053	Non-Traded	Non-Traded
116	Ghee	0.256	Non-Traded	Non-Traded
117	Baby Food (All Kinds)	0.085	Non-Traded	Non-Traded
118	Skimmed Milk Powder	0.103	Non-Traded	Non-Traded
119	Canned Juices	0.053	Traded	Traded
120	Jams/Jellies/marmalades	0.015	Traded	Traded
121	Canned fish	0.126	Traded	Traded
122	Maida	0.297	Traded	Traded
123	Sooji (Rawa)	0.149	Traded	Traded
124	Atta	0.763	Traded	Traded
125	Bran (All kinds)	0.321	Traded	Traded
126	Bread & Buns	0.145	Non-Traded	Non-Traded
127	Biscuits	0.097	Traded	Traded
128	Non-levy sugar	0.000	Non-Traded	Non-Traded
129	Levy-sugar	0.000	Non-Traded	Non-Traded
130	Sugar	2.013	Non-Traded	Non-Traded
131	Khandsari	0.300	Non-Traded	Non-Traded
132	Gur	1.746	Non-Traded	Non-Traded
133	Manufacture of common salt	0.035	Non-Traded	Non-Traded
134	Cocoa, Chocolate, sugar & Confectionery	0.088	Non-Traded	Non-Traded
135	Hydrogenated vanaspati	0.517	Non-Traded	Non-Traded
136	Gingelly oil	0.235	Non-Traded	Non-Traded
137	Kardi oil	0.075	Non-Traded	Non-Traded
138	Mahua oil	0.025	Non-Traded	Non-Traded
139	Solvent extracted groundnut oil	0.021	Non-Traded	Non-Traded
140	Rape & Mustard Oil	0.276	Non-Traded	Non-Traded
141	Coconut Oil	0.171	Non-Traded	Non-Traded
142	Groundnut Oil	0.526	Non-Traded	Non-Traded
143	Cotton seed oil	0.064	Non-Traded	Non-Traded
144	Rice bran oil	0.067	Non-Traded	Non-Traded
145	Imported Edible oil	0.468	Non-Traded	Non-Traded
146	Rape & mustard seed cake	0.041	Traded	Traded
147	Groundnut cake	0.110	Traded	Traded

Table 1A (cont.)

S. No.	Commodity	Weight	YEAR 1982-83 to 1991-92	YEAR 1992-93 to 1993-94
148	Cottonseed oil cake	0.135	Traded	Traded
149	Deoiled cake	0.079	Traded	Traded
150	Linseed oil cake	0.003	Traded	Traded
151	Coconut oil cake	0.034	Traded	Traded
152	Gingelly oil cake	0.024	Traded	Traded
153	Caster oil cake	0.006	Traded	Traded
154	Packed tea	0.127	Traded	Traded
155	Instant coffee	0.109	Traded	Traded
156	Cattle feed	0.061	Traded	Traded
157	Poultry feed	0.042	Traded	Traded
158	Maize starch	0.034	Non-Traded	Non-Traded
159	Glucose & dextrose	0.050	Non-Traded	Non-Traded
160	Malted food	0.053	Non-Traded	Non-Traded
161	Rectified spirit	0.034	Non-Traded	Non-Traded
162	Indian made foreign spirit	0.065	Non-Traded	Non-Traded
163	Malt liquor	0.059	Non-Traded	Non-Traded
164	Soft drink & carbonated water	0.066	Non-Traded	Non-Traded
165	Bidi	1.086	Non-Traded	Non-Traded
166	Cigarettes	0.556	Non-Traded	Non-Traded
167	Zerda	0.283	Non-Traded	Non-Traded
168	Hanks	0.616	Traded	Traded
169	Cones	0.616	Traded	Traded
170	Longcloth/sheeting	0.360	Traded	Traded
171	Poplin/shirting	1.127	Traded	Traded
172	Coating/Drill	0.295	Traded	Traded
173	Dhoties, sareas & voils	1.188	Non-Traded	Non-Traded
174	Miscellaneous	0.189	Traded	Traded
175	Cotton cloth (Powerloom)	0.906	Traded	Traded
176	Cotton cloth (Handloom)	0.740	Traded	Traded
177	Khadi cloth	0.056	Non-Traded	Non-Traded
178	Viscose staple fiber	0.163	Traded	Traded
179	Polyester staple fiber	0.239	Non-Traded	Non-Traded
180	Viscose filament yarn	0.314	Non-Traded	Non-Traded
181	Filament yarn synthetic	0.574	Non-Traded	Non-Traded
182	Blended mixed cloth	1.573	Non-Traded	Non-Traded
183	Art silk cloth	0.058	Non-Traded	Non-Traded
184	Woollen yarn	0.140	Non-Traded	Non-Traded
185	Woollen cloth	0.045	Traded	Traded
186	Suiting cloth	0.076	Traded	Traded
187	Woollen hosiery	0.078	Traded	Traded
188	Hessain cloth	0.200	Traded	Traded
189	Hessain & sacking bags	0.456	Traded	Traded
190	D.W. tarpaulin	0.033	Traded	Traded
191	Cotton Hosiery	1.186	Traded	Traded
192	Shirts/bushshirts	0.174	Traded	Traded
193	Coiryarn	0.097	Traded	Traded
194	Coirmats & mattings	0.046	Traded	Traded
195	Plywood commercial planks	0.188	Traded	Traded

Table 1A (cont.)

S. No.	Commodity	Weight	YEAR 1982-83 to 1991-92	YEAR 1992-93 to 1993-94
196	Resawan & hewan timber planks railways sleepers & others	1.010	Non-Traded	Non-Traded
197	Pulp	0.090	Traded	Traded
198	Printing paper white	0.226	Traded	Traded
199	Map, litho paper	0.059	Traded	Traded
200	M.G. paper poster	0.036	Traded	Traded
201	Kraft paper	0.143	Traded	Traded
202	Newsprint	0.137	Non-Traded	Non-Traded
203	Duplex board	0.115	Traded	Traded
204	Straw & mill board	0.125	Traded	Traded
205	Other boards (All kinds)	0.200	Traded	Traded
206	Printing & publishing of newspaper, periodicals, etc.	0.740	Non-Traded	Non-Traded
207	Sheep & goat skin	0.388	Traded	Traded
208	Sole leather	0.277	Traded	Traded
209	Footwear Western type	0.353	Non-Traded	Non-Traded
210	Giant tires	0.499	Traded	Traded
211	Motor tires	0.085	Non-Traded	Non-Traded
212	cycle tires	0.053	Non-Traded	Non-Traded
213	Tractor tires	0.060	Traded	Traded
214	Giant tubes	0.031	Non-Traded	Non-Traded
215	Cycle tubes	0.038	Non-Traded	Non-Traded
216	PVC pipes & tubing	0.315	Traded	Traded
217	Decorative laminates	0.127	Traded	Traded
218	Rubber & canvas footwear	0.108	Traded	Traded
219	Camelback	0.039	Traded	Traded
220	Hoses	0.097	Traded	Traded
221	Tooth brushes	0.002	Non-Traded	Non-Traded
222	Rubber belting	0.138	Non-Traded	Non-Traded
223	Sodiumhydroxide (Caustic soda)	0.300	Non-Traded	Traded
224	Sodium carbonate (Soda ash)	0.149	Non-Traded	Traded
225	Oxygen	0.051	Non-Traded	Non-Traded
226	Calicum carbide	0.047	Non-Traded	Traded
227	Sodium phosphate	0.046	Non-Traded	Traded
228	Nitric acid	0.025	Traded	Traded
229	Titanium dioxide	0.027	Non-Traded	Traded
230	Sulfuric acid	0.075	Non-Traded	Traded
231	Liquid chlorine	0.044	Non-Traded	Traded
232	Benzene	0.066	Non-Traded	Traded
233	Low density polyethylene	0.240	Non-Traded	Traded
234	Acrylic fiber	0.086	Non-Traded	Traded
235	Formaldehyde	0.032	Non-Traded	Traded
236	Acetylene	0.028	Non-Traded	Traded
237	Ammonium sulphate N_content	0.040	Non-Traded	Non-Traded
238	Urea N_content	0.992	Non-Traded	Non-Traded
239	Complex fertilizers N_content	0.138	Non-Traded	Non-Traded
240	Di_ammonium phosphate N-content	0.052	Non-Traded	Non-Traded
241	Superphosphate P2o5 content	0.064	Non-Traded	Traded
242	Ammonium phosphate P2o5 content	0.115	Non-Traded	Traded

Table 1A (cont.)

S. No.	Commodity	Weight	YEAR 1982-83 to 1991-92	1992-93 to 1993-94
243	Complex fertilizers NPKcontent	0.322	Non-Traded	Traded
244	Calicum ammonium nitrate N-content	0.025	Non-Traded	Non-Traded
245	Pesticides	0.202	Non-Traded	Non-Traded
246	Paints (Except alum paints)	0.106	Non-Traded	Traded
247	Enamels	0.113	Non-Traded	Traded
248	Varnishes	0.021	Non-Traded	Traded
249	Vat dyes (Indigo solubilized & others)	0.160	Non-Traded	Traded
250	Reactive dyes	0.077	Non-Traded	Traded
251	Organic pigments	0.078	Non-Traded	Traded
252	Optical whitening agents	0.021	Non-Traded	Traded
253	Vitamin tablets (A,B,C,D & Others)	0.061	Non-Traded	Non-Traded
254	Vitamin capsules	0.030	Traded	Traded
255	Vitamin liquids	0.043	Traded	Traded
256	Chloramphenicol	0.028	Traded	Traded
257	Penicillin (Vials,tablets & other products)	0.047	Non-Traded	Non-Traded
258	Streptomycin (Vials & other products)	0.034	Non-Traded	Non-Traded
259	Tetracycline (In capsules, vials & others)	0.068	Non-Traded	Non-Traded
260	Powder/granular other than vitamin	0.027	Traded	Traded
261	Liquid oral other than vitamin	0.116	Traded	Traded
262	Liquid Injectable other than vitamin	0.084	Traded	Traded
263	Capsule other than vitamin & antibiotics	0.047	Traded	Traded
264	Tablet except vitamin & penicillin	0.300	Traded	Traded
265	Ointments	0.063	Non-Traded	Non-Traded
266	Syrup	0.030	Non-Traded	Non-Traded
267	Drugs & pharmaceuticals n.e.c.	0.054	Non-Traded	Non-Traded
268	Ayurvedic medicines liquid	0.033	Traded	Traded
269	Household laundry soap	0.594	Non-Traded	Non-Traded
270	Toilet soap	0.121	Non-Traded	Non-Traded
271	Synthetic detergents	0.165	Non-Traded	Non-Traded
272	Agarbatti	0.134	Non-Traded	Non-Traded
273	Tooth paste	0.070	Non-Traded	Non-Traded
274	Tooth powder	0.025	Non-Traded	Non-Traded
275	Powder talc/face	0.016	Non-Traded	Non-Traded
276	Hair oils	0.038	Non-Traded	Non-Traded
277	Glycerine	0.027	Non-Traded	Non-Traded
278	Resins	0.014	Non-Traded	Non-Traded
279	Cream snow	0.011	Non-Traded	Non-Traded
280	Synthetic resins	0.065	Non-Traded	Traded
281	Synthetic rubber	0.066	Non-Traded	Traded
282	Polyethylene molding powder	0.105	Non-Traded	Traded
283	Rubber chemicals	0.048	Non-Traded	Traded
284	P.V.C. resins	0.070	Non-Traded	Traded
285	P.V.C. sheets	0.019	Non-Traded	Traded
286	Caprolactum	0.082	Non-Traded	Traded
287	Polystyrene	0.022	Non-Traded	Traded
288	Safety Matches	0.233	Non-Traded	Non-Traded
289	Blasting powder	0.054	Non-Traded	Non-Traded

Table 1A (cont.)

S. No.	Commodity	Weight	YEAR 1982-83 to 1991-92	YEAR 1992-93 to 1993-94
290	Cine color positive	0.044	Non-Traded	Non-Traded
291	Printing ink	0.040	Non-Traded	Non-Traded
292	Carbon black	0.083	Non-Traded	Non-Traded
293	Fatty acids	0.076	Non-Traded	Non-Traded
294	Fire works	0.030	Non-Traded	Non-Traded
295	Napthols	0.024	Non-Traded	Non-Traded
296	Castor oil	0.119	Non-Traded	Non-Traded
297	Essential oils	0.020	Non-Traded	Non-Traded
298	Linseed oil	0.117	Non-Traded	Non-Traded
299	Flavoring essence	0.016	Non-Traded	Non-Traded
300	Firebricks	0.091	Non-Traded	Non-Traded
301	Basic refractories	0.067	Non-Traded	Non-Traded
302	Building bricks	0.454	Non-Traded	Non-Traded
303	Ceramic tiles	0.037	Non-Traded	Non-Traded
304	Non-ceramic tiles	0.046	Non-Traded	Non-Traded
305	Bottles	0.069	Non-Traded	Non-Traded
306	Sheet glass	0.040	Non-Traded	Non-Traded
307	High tension insulators	0.041	Non-Traded	Non-Traded
308	Tumblers	0.034	Non-Traded	Non-Traded
309	Bangles	0.023	Non-Traded	Non-Traded
310	Crockery	0.017	Non-Traded	Non-Traded
311	Sanitary ware	0.072	Non-Traded	Non-Traded
312	Cement	0.860	Non-Traded	Non-Traded
313	Lime	0.056	Non-Traded	Non-Traded
314	Mica products	0.041	Traded	Traded
315	Asbestos cement corrugated sheets	0.089	Traded	Traded
316	Asbestos cement pressure pipes	0.069	Traded	Traded
317	Ports & poles	0.028	Traded	Traded
318	Grinding wheels	0.045	Traded	Traded
319	Coated abrasive	0.015	Traded	Traded
320	Electrodes	0.261	Traded	Traded
321	Hume pipes	0.022	Traded	Traded
322	Basic pig iron	0.023	Non-Traded	Non-Traded
323	Foundry pig iron	0.031	Non-Traded	Non-Traded
324	Other pig iron	0.033	Non-Traded	Non-Traded
325	Steel ingots (plain carbon)	0.330	Non-Traded	Traded
326	Blooms	0.090	Non-Traded	Traded
327	Billets & slabs	0.277	Non-Traded	Traded
328	Skelps	0.040	Non-Traded	Traded
329	Oro mild steel tensile plate	0.126	Non-Traded	Traded
330	Angles, channels & sections	0.218	Non-Traded	Traded
331	Joist & rolls	0.035	Non-Traded	Traded
332	Bars & rods	0.955	Non-Traded	Traded
333	Defective cutting	0.023	Non-Traded	Traded
334	Scrap (all kinds)	0.084	Non-Traded	Traded
335	Carbon tools & high speed steel	0.063	Non-Traded	Traded
336	Stainless steel	0.113	Non-Traded	Traded
337	Malleable castings	0.084	Non-Traded	Non-Traded
338	Ordinary castings	0.307	Non-Traded	Non-Traded

Table 1A (cont.)

S. No.	Commodity	Weight	YEAR 1982-83 to 1991-92	YEAR 1992-93 to 1993-94
339	Non-ferrous castings (all kinds)	0.025	Non-Traded	Non-Traded
340	Stamping & forgings	0.225	Non-Traded	Non-Traded
341	Heavy Light structurals	0.215	Non-Traded	Non-Traded
342	Heavy rails (23 Kgs. upwards)	0.057	Non-Traded	Non-Traded
343	Tin plates	0.058	Non-Traded	Non-Traded
344	Sheets	0.301	Non-Traded	Non-Traded
345	Bright bars	0.032	Non-Traded	Non-Traded
346	Axles, wheels & tires	0.029	Non-Traded	Non-Traded
347	Pipes & tubes	0.569	Non-Traded	Non-Traded
348	Spun pipes	0.077	Non-Traded	Traded
349	Steel wire	0.073	Non-Traded	Non-Traded
350	Wire	0.095	Non-Traded	Traded
351	Ferro manganese	0.049	Traded	Traded
352	Ferro silicon	0.045	Traded	Traded
353	Alloy steel, stainless steel	0.102	Traded	Traded
354	Aluminum ingots	0.206	Traded	Traded
355	Aluminum Sheets & Strips	0.034	Traded	Traded
356	Aluminum bars & rods	0.078	Traded	Traded
357	Aluminum foils	0.064	Traded	Traded
358	Aluminum rolled products	0.072	Traded	Traded
359	Copper brass & rods	0.181	Non-Traded	Traded
360	Brass sheets & strips	0.050	Non-Traded	Traded
361	Tin	0.060	Traded	Traded
362	Lead	0.053	Non-Traded	Traded
363	Nickel	0.032	Traded	Traded
364	Zinc	0.097	Traded	Traded
365	Calcined alumina	0.098	Non-Traded	Traded
366	Barrels	0.081	Non-Traded	Non-Traded
367	Drums	0.062	Non-Traded	Non-Traded
368	Tin boxes/containers	0.420	Non-Traded	Non-Traded
369	Bolts & nuts	0.293	Non-Traded	Non-Traded
370	Utensils	0.552	Non-Traded	Non-Traded
371	Hurricane lanterns	0.009	Non-Traded	Non-Traded
372	Steel files	0.025	Non-Traded	Non-Traded
373	Twist drills	0.024	Non-Traded	Non-Traded
374	Spanners	0.026	Traded	Traded
375	Locks	0.029	Non-Traded	Non-Traded
376	Steel furniture	0.252	Non-Traded	Non-Traded
377	Razor blades	0.020	Non-Traded	Non-Traded
378	Collapsible tubes	0.030	Non-Traded	Non-Traded
379	Tractors	0.343	Non-Traded	Non-Traded
380	Dumpers	0.027	Non-Traded	Non-Traded
381	Boilers, its parts & accessories	0.387	Non-Traded	Traded
382	Internal combustion engines	0.214	Non-Traded	Traded
383	Diesel engines (stationary types)	0.325	Non-Traded	Traded
384	Road rollers	0.018	Non-Traded	Non-Traded
385	Mining machinery	0.079	Non-Traded	Traded
386	Machinery for cotton & synthetic	0.134	Non-Traded	Traded
387	Ring spinning & doubling frames	0.335	Non-Traded	Traded

Table 1A (cont.)

S. No.	Commodity	Weight	YEAR 1982-83 to 1991-92	YEAR 1992-93 to 1993-94
388	Powerlooms (automatic & others)	0.206	Non-Traded	Traded
389	Tea machinery	0.038	Traded	Traded
390	Refrigerators (domestic)	0.105	Non-Traded	Non-Traded
391	Power driven pumps	0.208	Traded	Traded
392	Air & gas compressors	0.130	Non-Traded	Non-Traded
393	Ball bearings	0.362	Traded	Traded
394	lathes	0.208	Traded	Traded
395	Typewriters	0.038	Non-Traded	Non-Traded
396	Computing machines	0.033	Non-Traded	Non-Traded
397	Sewing machines	0.053	Traded	Traded
398	Air Conditioners	0.034	Non-Traded	Non-Traded
399	Components & accessories of generators	0.098	Non-Traded	Traded
400	Transformers	0.267	Non-Traded	Traded
401	Switch gears	0.158	Non-Traded	Traded
402	Components & accessories of switch gears	0.172	Non-Traded	Traded
403	Electric motors phase one HP	0.114	Non-Traded	Traded
404	Electric motors phase three HP	0.157	Non-Traded	Traded
405	Starters	0.087	Non-Traded	Traded
406	Alternators	0.052	Non-Traded	Traded
407	Electric motor contractors	0.042	Non-Traded	Traded
408	Enamelled copper wires	0.102	Non-Traded	Traded
409	P.V.C. insulated cables	0.359	Non-Traded	Traded
410	Paper insulated cables	0.095	Non-Traded	Traded
411	Drycore cables	0.042	Non-Traded	Traded
412	Wires	0.057	Non-Traded	Traded
413	Rubber insulated & other cables	0.073	Non-Traded	Traded
414	Batteries	0.067	Non-Traded	Non-Traded
415	Dry cell	0.164	Non-Traded	Non-Traded
416	Table fans	0.063	Non-Traded	Non-Traded
417	Ceiling fans	0.170	Non-Traded	Non-Traded
418	Glass lamps	0.139	Non-Traded	Non-Traded
419	Fluorescent tubes	0.052	Non-Traded	Non-Traded
420	Transistor sets	0.165	Non-Traded	Non-Traded
421	T.V. sets AC	0.157	Non-Traded	Non-Traded
422	Electronic automatic indicators	0.139	Non-Traded	Non-Traded
423	Broad gauge diesel locomotives	0.124	Non-Traded	Non-Traded
424	Broad gauge passenger carriages	0.088	Non-Traded	Non-Traded
425	Broad gauge open wagons	0.062	Non-Traded	Non-Traded
426	Truck chassis (diesel)	0.683	Non-Traded	Non-Traded
427	Car chassis assembled	0.214	Non-Traded	Non-Traded
428	Bus chassis (diesel)	0.228	Non-Traded	Non-Traded
429	Body manufactured for buses	0.076	Non-Traded	Non-Traded
430	Body manufactured for trucks, vans etc.	0.060	Non-Traded	Non-Traded
431	Diesel fuel pumps	0.039	Non-Traded	Traded
432	Gears (All kinds)	0.050	Traded	Traded
433	Jeeps	0.101	Non-Traded	Non-Traded
434	Three wheelers	0.039	Non-Traded	Non-Traded
435	Motorcycles	0.094	Non-Traded	Non-Traded
436	Scooters	0.105	Non-Traded	Non-Traded

Table 1A (cont.)

S. No.	Commodity	Weight	YEAR 1982-83 to 1991-92	YEAR 1992-93 to 1993-94
437	Bicycles	0.132	Non-Traded	Non-Traded
438	Shock absorbers	0.010	Non-Traded	Non-Traded
439	Radiators	0.021	Non-Traded	Non-Traded
440	Pistons	0.017	Non-Traded	Non-Traded
441	Trailers	0.022	Non-Traded	Non-Traded
442	Gaskets	0.016	Non-Traded	Non-Traded
443	Springs	0.062	Non-Traded	Non-Traded
444	Other automobile spare parts	0.462	Non-Traded	Non-Traded
445	Wristwatch	0.352	Non-Traded	Non-Traded
446	Gramophone records	0.189	Non-Traded	Non-Traded
447	Fountain pen	0.409	Non-Traded	Non-Traded
448	House service meter	0.022	Non-Traded	Non-Traded

TABLE 2A

Annual Data on Inflation Rates for Traded and Nontraded Goods

And Real Exchange Rate

Year	WPI Traded (1)	WPI Nontraded (2)	INFLATION Traded (3)	INFLATION Nontraded (4)	Real Exchange Rate (eR) % Change (4)-(3) (5)	Real Exchange Rate (eR) INDEX 1981-82=100 (6)
1981-82	100.00	100.00		-	-	100.00
1982-83	107.37	103.76	7.37	3.76	-3.61	96.39
1983-84	118.95	110.29	10.79	6.29	-4.49	91.90
1984-85	131.30	115.66	10.38	4.87	-5.51	86.38
1985-86	132.70	122.60	1.07	6.00	4.93	91.32
1986-87	141.26	129.31	6.45	5.47	-0.98	90.34
1987-88	153.92	139.45	8.96	7.84	-1.12	89.22
1988-89	171.29	147.82	11.29	6.00	-5.28	83.94
1989-90	182.62	158.78	6.61	7.41	0.80	84.74
1990-91	203.57	174.59	11.47	9.96	-1.51	83.22
1991-92	231.93	198.84	13.93	13.89	-0.04	83.18
1992-93	246.40	217.66	6.24	9.46	3.23	86.41
1993-94	264.93	237.03	7.52	8.90	1.38	87.79

For the year 1993-94, wholesale price indices, inflation rates and real exchange rates were worked out on a monthly basis as well. Table 3A gives these results.

TABLE 3A

Monthly Data on Inflation Rates For Traded and Nontraded Goods

And Real Exchange Rate

		TRADED		NONTRADED		Real Exchange Rate (eR)
Year	Month	WPI	% Change	WPI	% Change	(6)-(4)
(1)	(2)	(3)	(4)	(5)	(6)	% Change (7)
1993	JANUARY	249.88	-	220.33	-	-
1993	FEBRUARY	253.29	1.36	220.23	-0.04	-1.40
1993	MARCH	252.60	-0.27	221.00	0.35	0.62
1993	APRIL	253.89	0.51	222.65	0.75	0.24
1993	MAY	256.00	0.83	225.04	1.07	0.24
1993	JUNE	256.87	0.34	228.72	1.63	1.29
1993	JULY	261.80	1.92	231.81	1.35	-0.57
1993	AUGUST	265.46	1.40	236.01	1.81	0.41
1993	SEPTEMBER	266.80	0.50	240.70	1.99	1.49
1993	OCTOBER	267.99	0.45	242.86	0.90	0.45
1993	NOVEMBER	268.45	0.17	241.89	-0.40	-0.57
1993	DECEMBER*	267.67	-0.29	240.44	-0.60	-0.31
1994	JANUARY*	267.40	-0.10	241.12	0.29	0.39

NOTE: Results for the months of December 1993 and January 1994 are based provisional data.

APPENDIX II

The program used for obtaining the weighted WPI for traded and nontraded goods is given below:

```
C ***     PROGRAM TO COMPUTE WEIGHTED PRICE INDEX OF TRADED
C         AND NONTRADED GOODS
          IMPLICIT DOUBLE PRECISION (A-H,O-Z)
          CHARACTER*12 FNAME
          WRITE (*,10)
10        FORMAT(1X,'PLEASE ENTER THE NAME OF THE DATA FILE: '\)
          READ(*,50) FNAME
50        FORMAT(A)
          OPEN(5,FILE=FNAME)
          OPEN(6,FILE='OUTP',STATUS='NEW')
          SUMWT = 0.0
          SUMWNT = 0.0
          TRADP = 0.0
          TRADNP = 0.0
70        READ(5,20,END=100)IYEAR,ICOM,COMWT,PINDX
C         IYEAR IS THE YEAR CODE
C         ICOM IS COMMODITY CODE (1=TRADED, 2=NONTRADED)
C         COMWT IS THE WEIGHT OF THE RESPECTIVE COMMOFITY IN OVERALL WPI
C         PINDX IS THE WHOLESALE PRICE INDEX
20        FORMAT(I5,I2,2F10.0)
          IF(ICOM.EQ.1) THEN
          Y = COMWT*PINDX
          TRADP = Y + TRADP
          SUMWT = SUMWT + COMWT
          ENDIF
          IF(ICOM. EQ.2) THEN
          Z = COMWT*PINDX
          TRADNP = Z + TRADNP
          SUMWNT = SUMWNT + COMWT
          ENDIF
          GO TO 70
100       WPIT = TRADP/SUMWT
          WPINT = TRADNP/SUMWNT
          WRITE(6,71)SUMWT,SUMWNT
71        FORMAT(1X,3F15.4)
          WRITE(6,30)IYEAR,WPIT
30        FORMAT(2X,'YEAR =',I7,5X,'WEIGHTED WPI FOR TRADED GOODS='
          #,F10.2,//)
          WRITE(6,40)IYEAR,WPINT
40        FORMAT(2X,'YEAR =',I7,5X,'WEIGHTED WPI FOR NONTRADED GOODS='
          #,F10.2,//)
          CLOSE(5)
          CLOSE(6)
          END
```

APPENDIX 3

AN ALGEBRAIC VERSION OF THE AUSTRALIAN MODEL

We can formalize the small economy macroeconomic model depicted by the Figure, to obtain the determinants of the money price of nontraded goods (P_N), for any given external terms of trade (given P_f) and the level of foreign borrowing (B_o), as follows.

The demand (N^d) and supply (N^s) for the nontraded goods is given by

$$N^d = a_o - a_1(P_N - P_T^d) + a_2Y + a_3B_o + a_4(M^s - M^d) \quad (A.1)$$

$$N^s = b_o + b_1(P_N - w) \quad (A.2)$$

$$N^d = N^s \quad (A.3)$$

where in addition to our previous notation Y is the domestic output at market prices, w is the money wage rate, M^s the supply of money (nominal) and M^d the demand for money (nominal).

The demand (T^d) and supply (T^s) for traded goods, and the balance of payments, are given by:

$$T^d = a_o - a_1(P_Td - P_N) + (1-a_2)Y + (1-a_3)B_o + (1-a_4)(M^s - M^d) \quad (A.4)$$

$$T^s = c_o + c_1(P_Td - P_N) \quad (A.5)$$

$$B_o = T^d - T^s \quad (A.6)$$

Domestic output at market prices is given by:

$$Y = T^d - T^s \quad (A.7)$$

The money demand function is given by:

$$(M^d/N \bullet P_d) = k(Y/N)^a \quad (A.8)$$

where N is the population. The money supply process is determined from

the following accounting relationship of the consolidated banking system, and a behavioral import function

$$\Delta M^s = \Delta NFA + D \tag{A.9}$$

$$\Delta NFA = X - I + B_o \tag{A.10}$$

$$I = d_o + d_1 \bullet (YP_d) \tag{A.11}$$

where ΔNFA is the change in net foreign assets of the consolidated banking system, D the change in total domestic credit of the banking system, X the value of exports, assumed to be given exogenously, and I the level of imports.

From (A.1) to (A.3), and substituting y in (A.1) from (A.2), (A.5) and (A.7), and rearranging yields an expression for the determinants of P_n as

$$\begin{aligned} P_N &= \text{constant} \\ &+ \frac{b_1(1-a_2)-a_2c_1}{a_1+b_1(1-a_2)} w + \frac{a_1+a_2c_1}{a_1+b_1(1-a_2)} p_T^d \\ &+ \frac{a_3}{a_1+b_1(1-a_2)} B_0 + \frac{a_4}{a_1+b_1(1-a_2)} (M^s - M^d) \end{aligned} \tag{A.12}$$

We can use this expression to estimate the required change in the nontraded good price (P_N) for the observed change in foreign borrowing (B_o), and compare that with actual (P_N) to see whether the nontraded goods price rose by more than that was required for equilibrium (with a constant w and P_T^d, and with $M^s = M^d$). Next, we can estimate the required change in P_N for the observed changes in money wages (w), price or tradables (P_T^d) and any excessive monetary expansion $(M^s > M^d)$, to judge weather and to what extent the current real exchange rate in India deviated form the equilibrium rate e_{r1} in the Figure.

In the second of the above exercises it will also be necessary to judge the extent of any excessive monetary expansion $(M^s > M^d)$. To do this empirically, consider the following derivations form the monetary submodel in (A.8)-(A.11). The question we ask is: What would have been the required monetary expansion for the observed changes in the level of capital inflows (B_o) and exports (X), so that there was equilibrium in the overall balance of payments, that is for $\Delta NFA = 0$?

First note that from (A.8), we can derive the standard quantity theory relationship

$$YP_d = v \bullet M \qquad \text{A.8a)}$$

where v, the income velocity of money is given by

$$v = 1/(k \bullet y^{a-1}) \qquad \text{(A.8b)}$$

with $y = Y/N$, per capita income.

Next, from (A.10) with $\Delta NFA = 0$, we have

$$X + B_o - I = 0 \qquad \text{(A10.a)}$$

substituting for I from (A.11), for (YP_d) from (A.8a), and for M form (A.9) yield after some manipulation, the required expansion in domestic credit $(D)^{req}$, for an exogenous change in exports and foreign capital inflow $(X+B_o)$, which leads to $\Delta NFA = 0$, as

$$D^{req} = (X+ B_o)/v \bullet d_1[(X+B_o)(k \bullet y^{a-1})]/d_1 \qquad \text{(A.13)}$$

Comparing the actual expansion in credit from the required for monetary stability for the observed changes in exports and foreign capital inflows as estimated from (A.13) will provide our estimate of (M^s-M^d) in (A.12).

We can also derive a relationship from (A.12) between P_N and dB,

$$P_N = [a_3/a_1+b_1 + (1-a_2)]dB \qquad \text{(A.12a)}$$

Denoting the elasticity of demand and supply of nontraded goods by n^d and n^s respectively, we have from (A.1) and (A.2) that

$$a_1 = N^d \bullet n^d;\ b_1 = N^s \bullet n^s$$

Making use of (A.3), after substituting for a_1 and b_1 as above, and dividing the numerator and denominator of the RHS of (A.12a) by real output Y, yields

$$P_N = [(a_3 \bullet Y/N)/(n^d + n^s(1-a^2))]dB/Y \qquad \text{(A.12b)}$$

where $N = N^d = N^s$ and

$$dW = dP_{Td} = d(M^s - M^d) = 0$$