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INDIAN ECONOMY UNDER THE NEW REGIME

AN ANALYSIS OF TRADE, PRICE AND EXCHANGE RATE BEHAVIOUR SINCE 1991

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An Analysis of Trade, Price and Exchange Rate Behaviour Since 1991

Abstract

Behaviour of India's foreign trade, consumer price and exchange rate has been studied over the period of liberalisation since the middle of 1991 till the date August 1994 for which the relevant data are readily available. It has been observed that the dollar values of India's exports and imports rose rapidly in deterministic trend-growth paths. These are actually a continuation of the trends of the earlier period. Two doses of devaluation in July 1991 and a de facto devaluation in March 1993 had no effect of acceleration or deceleration in their trend-growth. Occasional devaluation of the rupee was offset by price-inflation which showed a stochastic trend-growth.There was no evidence of 'real' depreciation in the effective exchange rate of the rupee ; rather there exists some evidence of 'real' appreciation during the period under study.

I

The period of so-called New Economic Policy (NEP) started with a 20 per cent devaluation of Indian Rupee in July 1991 : Rs per dollar was 21.19 at the end of June 1991 and it rose to 25.75 by the end of July 1991 ; Rs. per SDR rose from 27.86 to 34.35 during the same period. In the name of introducing free market exchange rate of the rupee, there was another 20 per cent devaluation in March 1993 : from 26.20 at the end of February 1993, Rs per dollar rose to 31.23 by the end of March 1993;Rs per SDR rose from 36.05 to 43.,65 during the same period (*International Financial Statistics*, September 1993, p. 281).

These exchange rate adjustments were a part of structural adjustment programmes dictated by the IMF and the World Bank. In fact, devaluation is one important item of their policy packages. According to one estimate, during 1980-84, about 55 per cent of IMF conditionality included devaluation in the name of 'liberalisation and reforms of exchange rate arrangements' (Avramovic 1988 p.9). Devaluation goes hand in hand with abolition of exchange controls. Since the middle of 1991, India has been experiencing this IMF/World Bank reform package.

In this perspective, the present study examines India's trade, exchange rate and consumer price behaviour since the middle of 1991. In particular, it will be examined whether the exchange rate of the rupee influences the dollar values of India's exports and imports. In an earlier study (Sarkar 1992, 1994a,b), it was observed that the steady depreciation of the rupee during the period, 1971-90/91 did not have any influence on the dollar values of India's exports and imports. But critics pointed out that the period of that study did not take into account the present regime where market forces are allowed to operate more freely (Nag-Upadhya 1994). It is then interesting to examine the relationship between the exchange rate and India's trade values over the period of 'liberal' regime of Narasimha Rao-Manmohan Singh. This will supplement our earlier analysis of the experience of the 'controlled' regime of the past.

II

The period of the present study is only 1991-94. To get a sufficiently large number of observations, monthly data have been collected. Data sources are *International Financial Statistics* (various issues) published by the IMF and the Reserve Bank of India (RBI) Bulletin (various issues). The period of this study extends from June 1991 to August 1994 (upto which date data are readily available).

For studying trends, a log-linear regression is fitted by an Ordinery Least Squares (OLS) method :

$$\log Y_t = a + b.t + u_t \qquad (1)$$

where t stands for time variable (which assumes natural numbers starting from June 1991 = 1) u_t is the regression residuals, a and b are parameters to be estimated and Y_t is the variable under study.

A 12-order Lagrange Multiplier (LM) test has been conducted to check whether there is any higher order serial correlation in the residuals. In no case do we find the problem of higher order serial correlation. Hence an autoregressive error process upto second order, AR (2), has been considered :

$$u_t = \rho_1 u_{t-1} + \rho_2 u_{t-2} + \varepsilon_t \qquad (2)$$

where ρ_1 and ρ_2 are the autoregression coefficients and ε_t is a white-noise error process.

The autoregression coefficients are estimated along with the regression parameters a and b through the Maximum Likelihood (ML) procedure. An appropriate model is chosen on the basis of log-likelihood ratio (LLR) tests – AR(1) vs OLS and AR(2) vs AR(1). An AR(1) process is estimated through Inverse Interpolation Method and an AR(2) process is estimated through Newton-Raphson Iterative Method (Pesaran, 1991).

1. Trends in India's Exports and Imports

Firstly, consider the behaviour of India's exports valued in US dollar (Xdl , during June 1991– August 1994 :

$$\log Xdl_t = \underset{(60.35)}{6.76} + \underset{(5.86)}{0.011}\, t + u_t \qquad (3)$$

Where

$$u_t = \underset{(3.51)}{0.49}\, u_{t-1} + \varepsilon_t$$

$\overline{R^2} = 0.75$, D-W statistic = 1.77 and F(2.36) = 58.42

(t-ratios in parentheses)

Our estimate shows that India's exports rose at the statistically significant monthly rate of 1.1 per cent.

As for imports, the value in terms of dollar (Mdl) rose at the rate of 0.74 per cent per month during the same period[1] :

$$\log Mdl_t = \underset{(109.56)}{7.08} + \underset{(6.74)}{0.0074}\, t + u_t \qquad (4)$$

where $\bar{R}^2 = 0.54$, DW Statistic = 1.92 and F(1.37) = 45.38
(t-ratios in parentheses)

Trends exhibited by the series of India's exports and imports are stable over the whole period : plot of cumulative sum (CUSUM) of squares of recursive residuals in each case shows no sign of instability (see Charts 1 & 2).

Now the question is whether the trends in the dollar values of India's exports and imports are deterministic. Once Nelson and Plosser (1982) argued that macroeconomic time series are 'non-stationary stochastic processes'. In our earlier study (Sarkar, 1994a), India's exports and imports were found to exhibit stochastic trends – random walk with upward drift – over the period 1971-91. But the present study does not lend support to our earlier conclusion. Dicky-Fuller (DF) test suggests that Indian exports and imports data are trend-stationary – trends exhibited by the series are deterministic :

DF statistic for Exports series = –3.62
DF statistic for Imports series = –6.03
(5% critical value is –3.5312)

In view of the problem of first order autocorrelation in the DF test procedure, a first-order Augmented Dicky-Fuller test. ADF(1 has also been conducted in each case. This also suggests trend-stationarity of the two series :

ADF(1) statistic for Exports = -3.6386
ADF(1) statistic for Imports = -4.1148
(5% critical value is -3.5348)

As for the behaviour of the balance of trade (BOT), it does not show any trend of statistical significance :

$$BOT_t = \underset{(-2.89)}{-265.04} + \underset{(1.16)}{4.60}\, t + u_t \qquad (5)$$

where $$u_t = \underset{(2.14)}{0.32}\, u_{t-1} + \varepsilon_t$$

$\bar{R}^2 = 0.11$, DW = 2.02 and F(2.36) = 3.33

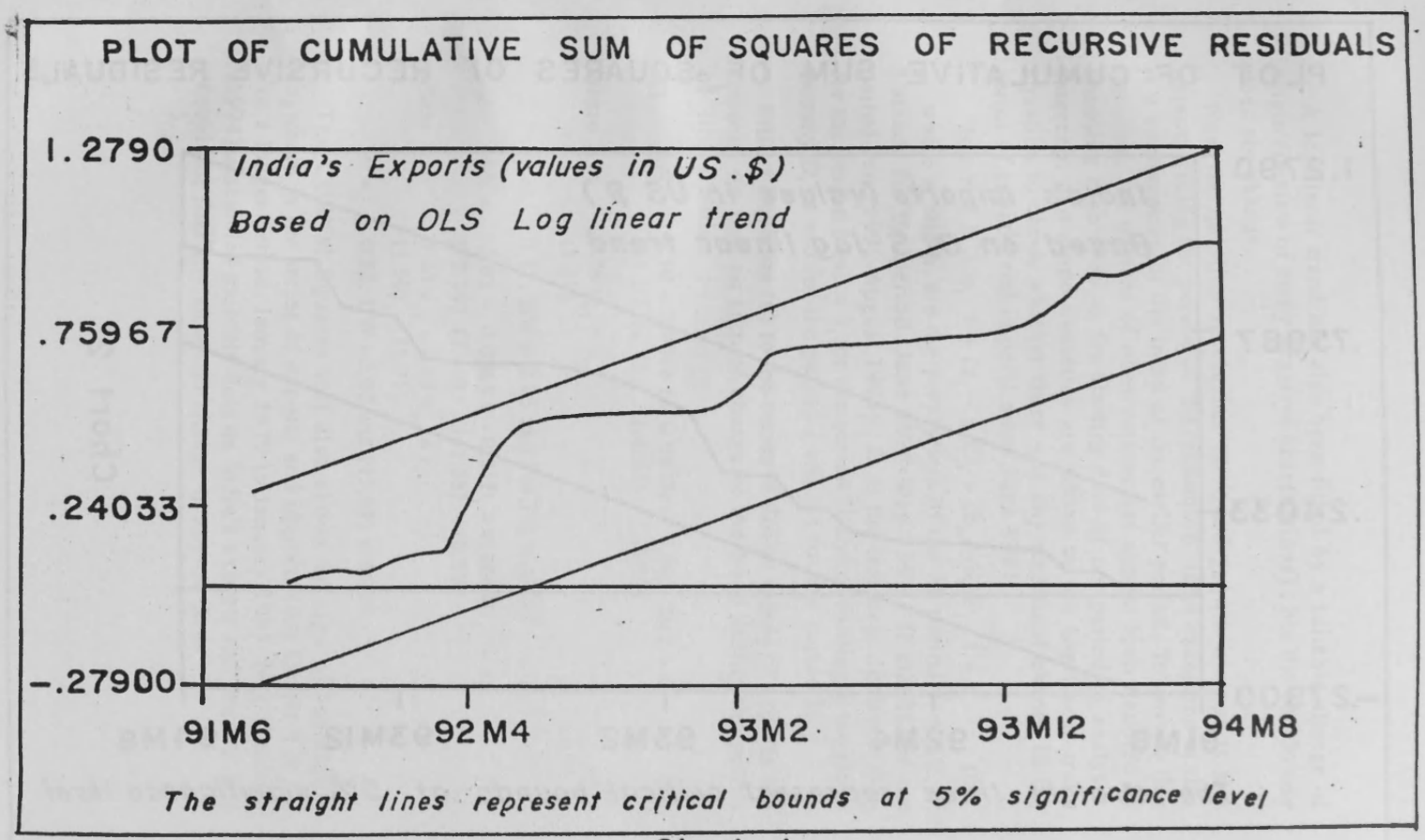
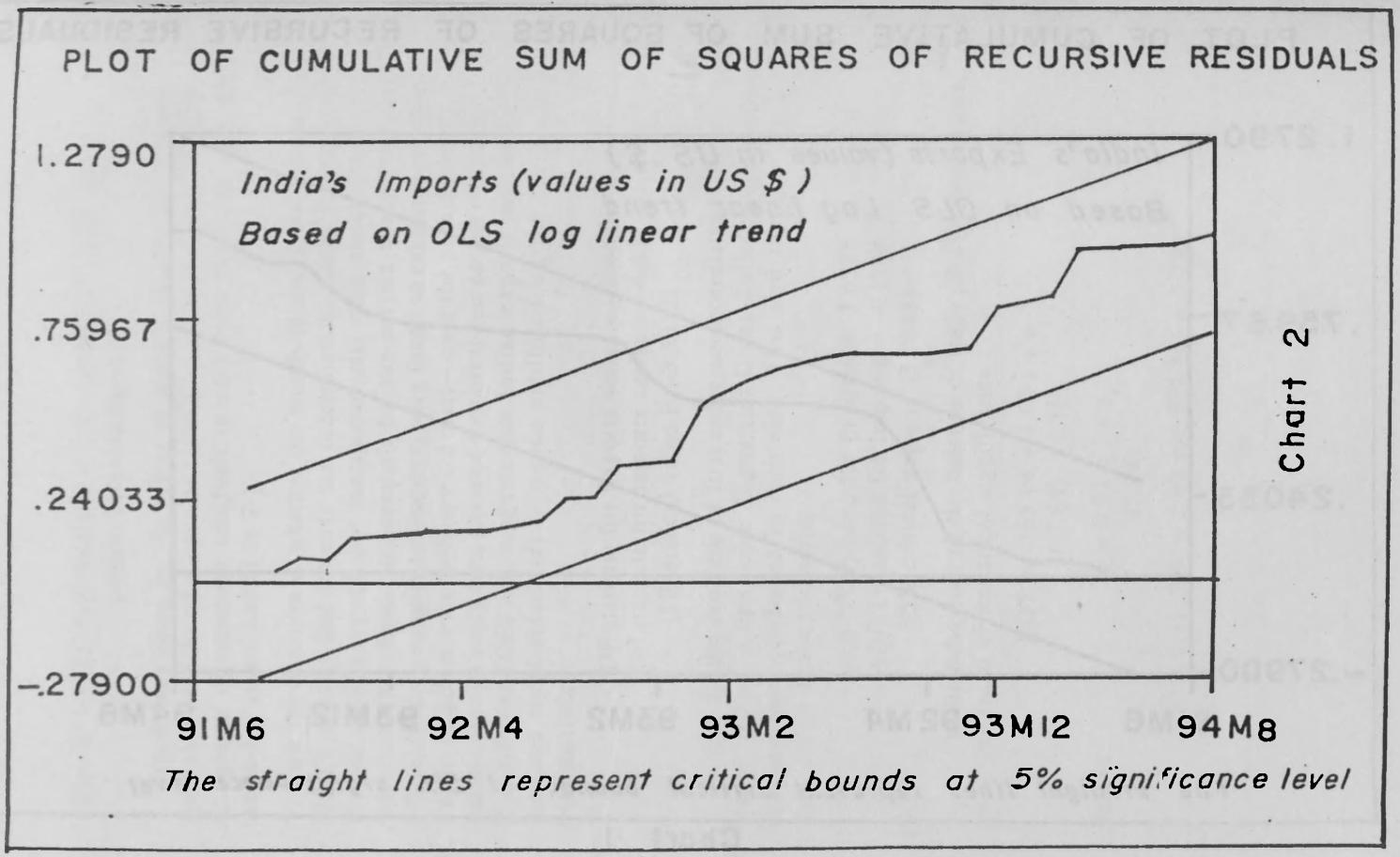

PLOT OF CUMULATIVE SUM OF SQUARES OF RECURSIVE RESIDUALS
1.2790
.75967
.24033
-.27900
India's Exports (values in US.$)
Based on OLS Log linear trend
91M6
92M4
93M2
93M12
94M8
The straight lines represent critical bounds at 5% significance level

Chart 1


PLOT OF CUMULATIVE SUM OF SQUARES OF RECURSIVE RESIDUALS
1.2790
.75967
.24033
-.27900
India's Imports (values in US $)
Based on OLS log linear trend
91M6
92M4
93M2
93M12
94M8
The straight lines represent critical bounds at 5% significance level
Chart 2

A log-linear trend has also been fitted by a suitable change of origin (in view of many negative observations) ; but the conclusion does not change.

Now the question is whether the trend-growth in exports and imports during the period of 'liberalisation' is an exception or this is a continuation of the trend of the earlier period. To answer this question, the number of observations has almost been doubled by choosing June 1988 as the starting date of our period of analysis. Intercept and slope dummies are added to the log-linear trend equation to check whether there was any structural change in the series of exports and imports since June 1991 :

$$\log Y_t = a_1 + b_1 . t + (a_2 - a_1)D_t + (b_2 - b_1)D_t . t + u_t \qquad (6)$$

where a_i and b_i are the parameters of the ith period (i = I & II; I stands for the period. June 1988-May 1991 ; II stands for the period June 1991-August 1994) ; D_t is the intercept dummy = 0 –) for the period I and = 1 for the period II and accordingly the slope dummy $D_t . t = 0$ for the period I and = t for the period II.

Fitting Equation (6) to the series of dollar values of exports and imports, we find no sign of change in the trend during the period of 'liberalisation' :

$$\log Xdl_t = \underset{(99.10)}{4.70} + \underset{(4.73)}{0.0094}\, t - \underset{(-0.50)}{0.06}\, Dt - \underset{(-0.22)}{0.001}\, Dt.t + u_t \qquad (7)$$

where $u_t = \underset{(3.31)}{0.36}\, u_{t-1} + \varepsilon_t$

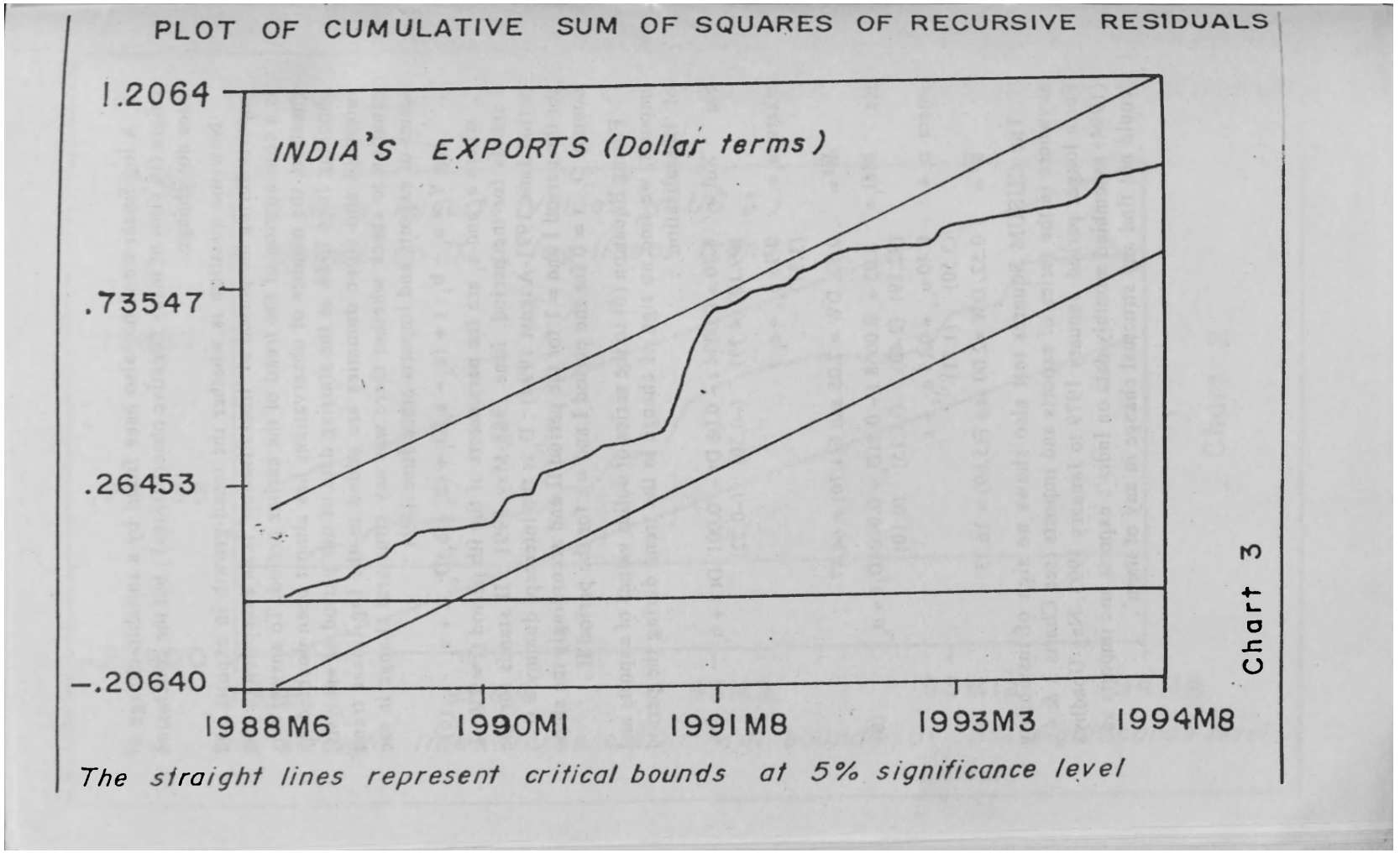
$\bar{R}^2 =$ 0.77, DW = 2.05 and F(4.70) = 64.47

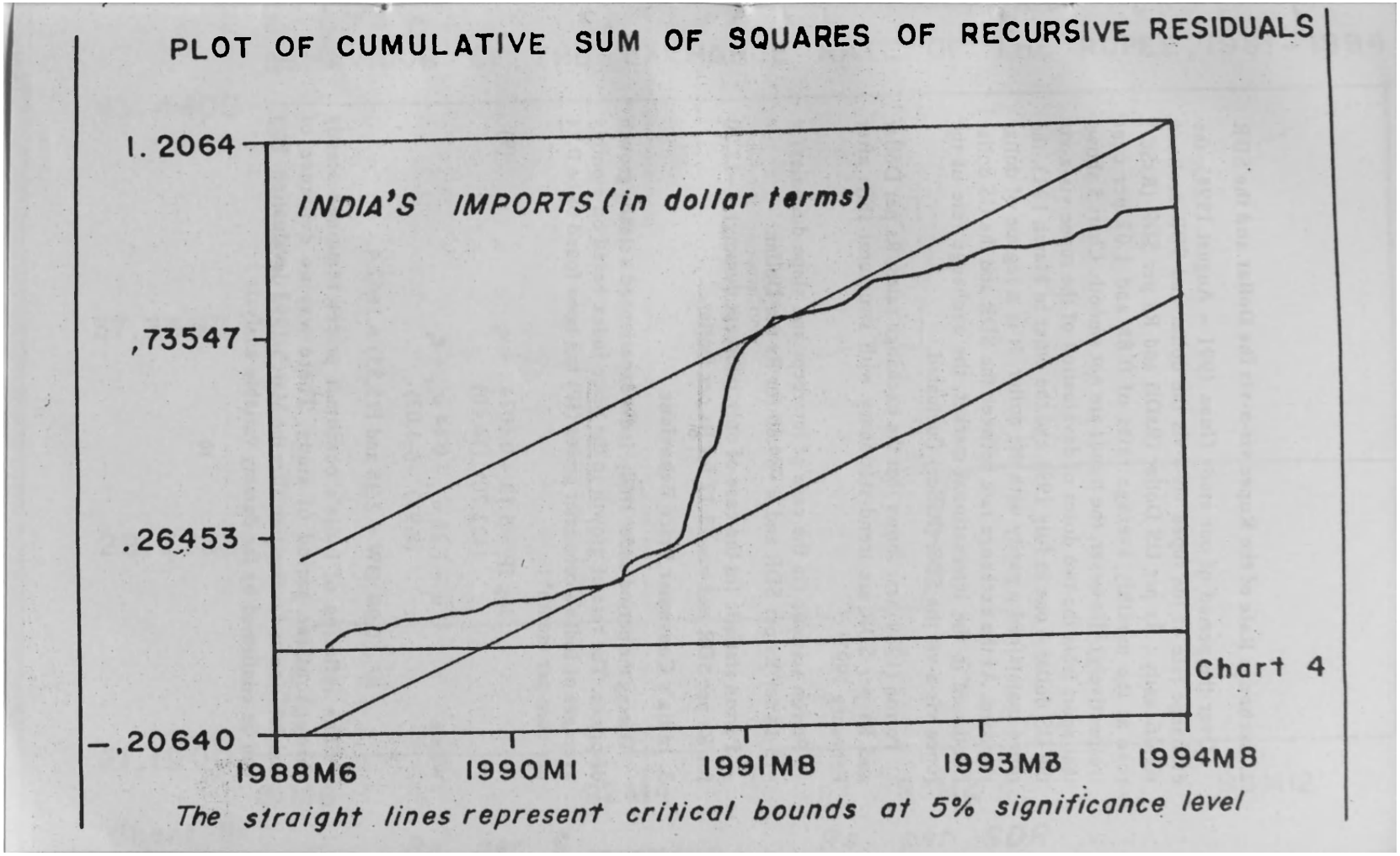
$$\log Mdl_t = \underset{(72.19)}{5.03} + \underset{(2.40)}{0.0068}\, t - \underset{(-1.15)}{0.21}D_t + \underset{(0.10)}{0.0004}D_t.t + u_t \qquad (8)$$

where $u_t = \underset{(3.50)}{0.40}\, u_{t-1} + \underset{(1.71)}{0.19}\, u_{t-2} + \varepsilon_t$

$\bar{R}^2 =$ 0.52, DW =2.00 and F(5,69) = 16.73

The CUSUM Squares test also shows no sign of instability anywhere in the series of exports and imports (see Charts 3 & 4). For a longer period. January 1979 to January 1993, Nag-Upadhya (1994) assembled monthly data on India's exports and imports and 'could not find any structual change in any of them'.


PLOT OF CUMULATIVE SUM OF SQUARES OF RECURSIVE RESIDUALS
1.2064
.73547
.26453
-.20640
INDIA'S EXPORTS (Dollar terms)
1988M6
1990M1
1991M8
1993M3
1994M8
The straight lines represent critical bounds at 5% significance level
Chart 3


PLOT OF CUMULATIVE SUM OF SQUARES OF RECURSIVE RESIDUALS
1.2064
,73547
.26453
-.20640
INDIA'S IMPORTS (in dollar terms)
1988M6
1990M1
1991M8
1993M3
1994M8
Chart 4
The straight lines represent critical bounds at 5% significance level

2. Exchange Rate of the Rupee vis-a-vis the Dollar and the SDR

Over the period of our study (June 1991 – August 1994), the exchange rate of the rupee vis-a-vis the dollar and SDR declined significantly : Rs per US Dollar (RsDl) and Rs per SDR (RsSdr) rose at the monthly average rates of 0.88 and 1.02 per cent (respectively).[2] However, the trends are not smooth. Chart 5 shows that apart from the two doses of devaluation of the rupee vis-a-vis the US dollar – one in July 1991 and the other in March 1993, the rupee maintained a parity with the dollar. It is a regime of dollar standard. As the exchange rate between the SDR and the US dollar fluctuated in the international market, the exchange rate of the rupee vis-a-vis the SDR (RsSdr) fluctuated.

Perron (1989) test shows that the exchange rates, Rs per Dollar and Rs per SDR are trend-stationary with structural shift after February 1993[3] :

Perron statistic (in the case of intercept and slope dummies) = –13.18 for Rs per SDR and = –84.80 for Rs per Dollar.

Perron statistic (in the case of only intercept dummy) = –13.20 for Rs per SDR and = – 77.72 for Rs per Dollar.

3. India's Consumer Price Behaviour

During the period under study, India experienced a steady growth of prices. The rate of growth in the price index based on monthly averages of India's consumer prices (IP) has been found to be 0.74 per cent per month[4] :

$$\log IP_t = \underset{(422.70)}{5.13} + \underset{(14.40)}{0.0074}\, t + u_t \qquad (9)$$

where

$$u_t = \underset{(8.93)}{1.28}\, u_{t-1} - \underset{(-3.07)}{0.44}\, u_{t-2} + \varepsilon_t$$

$\bar{R}^2 = 0.99$, DW = 2.36 and F(3.35) = 1662.4

The inflation of India's consumer prices remained steady throughout the period of study. There was no evidence of acceleration or deceleration after the March-1993 devaluation. This can be confirmed by the dummy variable analysis :

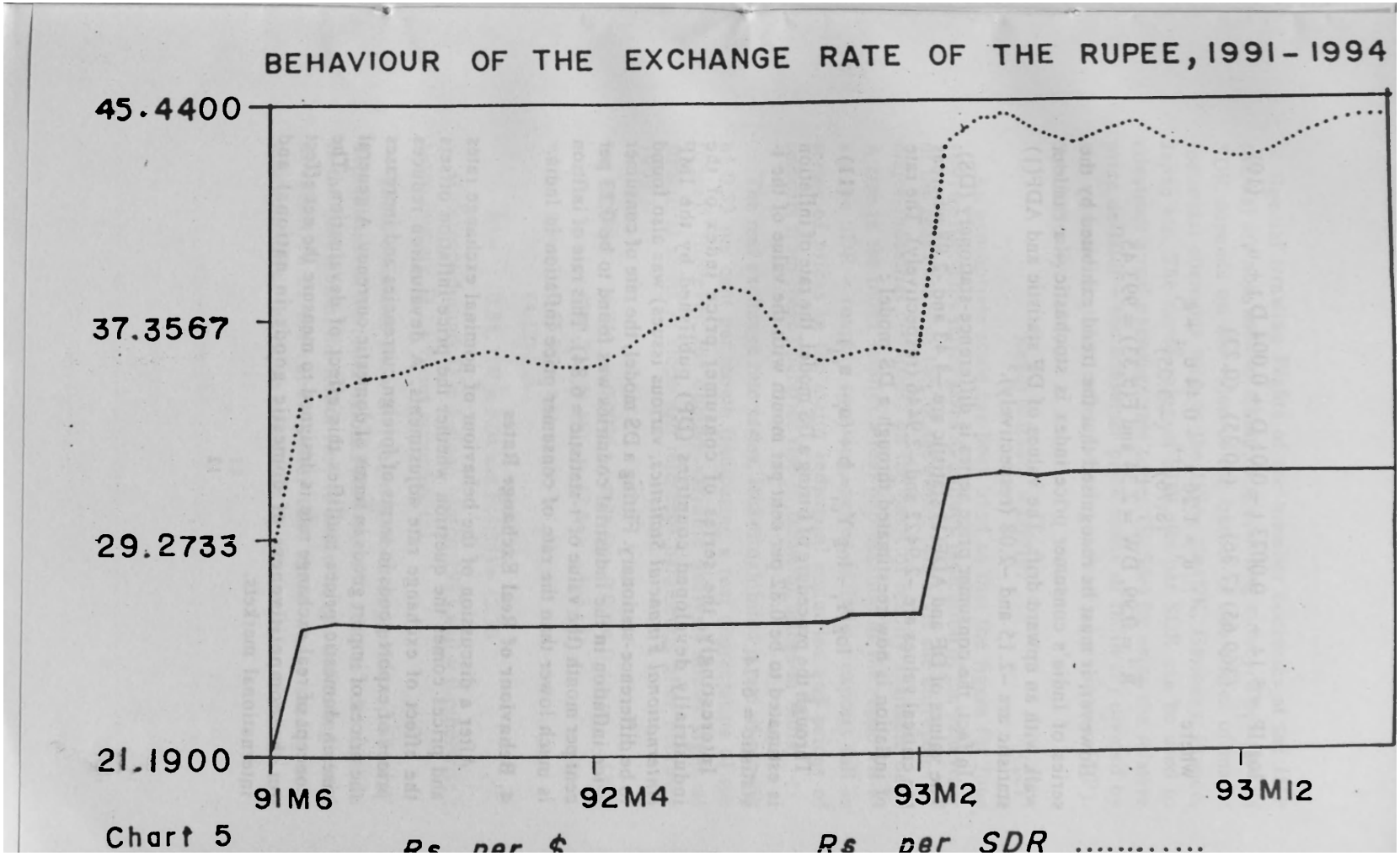

BEHAVIOUR OF THE EXCHANGE RATE OF THE RUPEE, 1991-1994
45.4400
37.3567
29.2733
21.1900
91M6
92M4
93M2
93M12
Rs per $
Rs per SDR

Chart 5

$$\log IP_t = \underset{(369.65)}{5.14} + \underset{(7.36)}{0.0073\ t} - \underset{(-0.35)}{0.01\ D_t} + \underset{(0.23)}{0.004\ D_t t} + u_t \qquad (10)$$

where $$u_t = \underset{(8.76)}{1.26\ u_{t-1}} - \underset{(-3.05)}{0.44\ u_{t-2}} + \varepsilon_t$$

$\bar{R}^{-2} = 0.99$, DW = 2.34 and F(5.33) = 993.45

However, it must be recognised that the trend exhibited by the series of India's consumer price index is stochastic – a random walk with an upward drift. The values of DF statistic and ADF(1) statistic are –2.15 and –2.08 (respectively).[5]

In fact, the consumer price series is difference-stationary (DS). The values of DF and ADF(1) statistic are –4.43 and -2.98 whereas the critical values are –2.9422 and –2.9446 (respectively). The rate of inflation is now reestimated through a DS model :

$$\log Y_t - \log Y_{t-1} = b + (u_t - u_{t-1}) \qquad (11)$$

Through the procedure of fitting a DS model, the rate of inflation is estimated to be 0.82 per cent per month with the value of the t-statistic = 6.74.

Interestingly, the series of consumer price index of the industrially developed countries (DP) published by the IMF (*International Financial Statistics*, various issues) was also found to be difference-stationary. Fitting a DS model, the rate of consumer price inflation in the industrial countries was found to be 0.23 per cent per month (the value of t-statistic = 6.84). This rate of infltion is much lower than the rate of consumer price inflation in India.

4. Behaviour of Real Exchange Rates

After a discussion of the behaviour of nominal exchange rates and prices comes the question whether the price-inflation offsets the effect of exchange rate adjustments. A devaluation reduces prices of export goods in terms of foreign currencies and increases the prices of import goods in terms of domestic currency. A general rise in domestic prices mullifies this effect of devaluation. The concept of real exchange rate is designed to measure the net effect on the competitiveness of domestic goods in national and international markets.

Special Drawing Rights of the member countries at the IMF (SDRs) are now used as a kind of accounting money. The value of SDR depends on the value of the basket of currencies of major industrial countries such as the USA, the UK, Germany, France, Japan etc. The rupee value of SDR, Rs per SDR can be used to construct a real exchange rate series (ReSdr) by using the relative price deflator – the consumer price index of India(IP) divided by the consumer price index of the industrial countries(DP). Symbolically,

$$ReSdr = RsSdr \times DP/IP \qquad (12)$$

An appropriate scale has been used so that the figure for June 1991 is 100. This series gives us a rough indication of the behaviour of the real exchange rate of the rupee (vis-a-vis the currencies of major industrial countries) on the basis of readily available data. A rise in the index implies a real depreciation of the rupee vis-a-vis the SDR – roughly speaking, prices of Indian exports fall in terms of prices in the major industrial countries and prices of imports from these countries rise in terms of prices in India.

The real exchange rate series, ReSdr exhibited a rate of growth of 0.53 per cent per month (indicating a real depreciation of the rupee)[6]. However, the dummy variable analysis shows signs of structural shifts in slope nad intercept parameters after February 1993 :

$$\log ReSdr_t = \underset{(161.71)}{4.74} + \underset{(1.16)}{0.0026}\, t + \underset{(3.84)}{0.35}\, D_t - \underset{(-2.18)}{0.0084}\, D_t.t + u_t \qquad (13)$$

$$\text{where } u_t = \underset{(4.12)}{0.55}\, u_{t-1} + \varepsilon_t$$

$$\bar{R}^2 = 0.81,\ DW = 2.04 \text{ and } F(4,34) = 42.30$$

(Intercept dummy D_t = 1 since March 1993 and = 0 otherwise ; slope dummy, D_t . t varies accordingly).

These estimates show that there is no strong evidence of 'real' depreciation of the rupee before February 1993 ; due to a devaluation in the next month, the ReSdr rose to a new height indicating a real devaluation of the rupee. After that there was a steady real appreciation of the rupee (see Chart 6). The estimate of Perron test

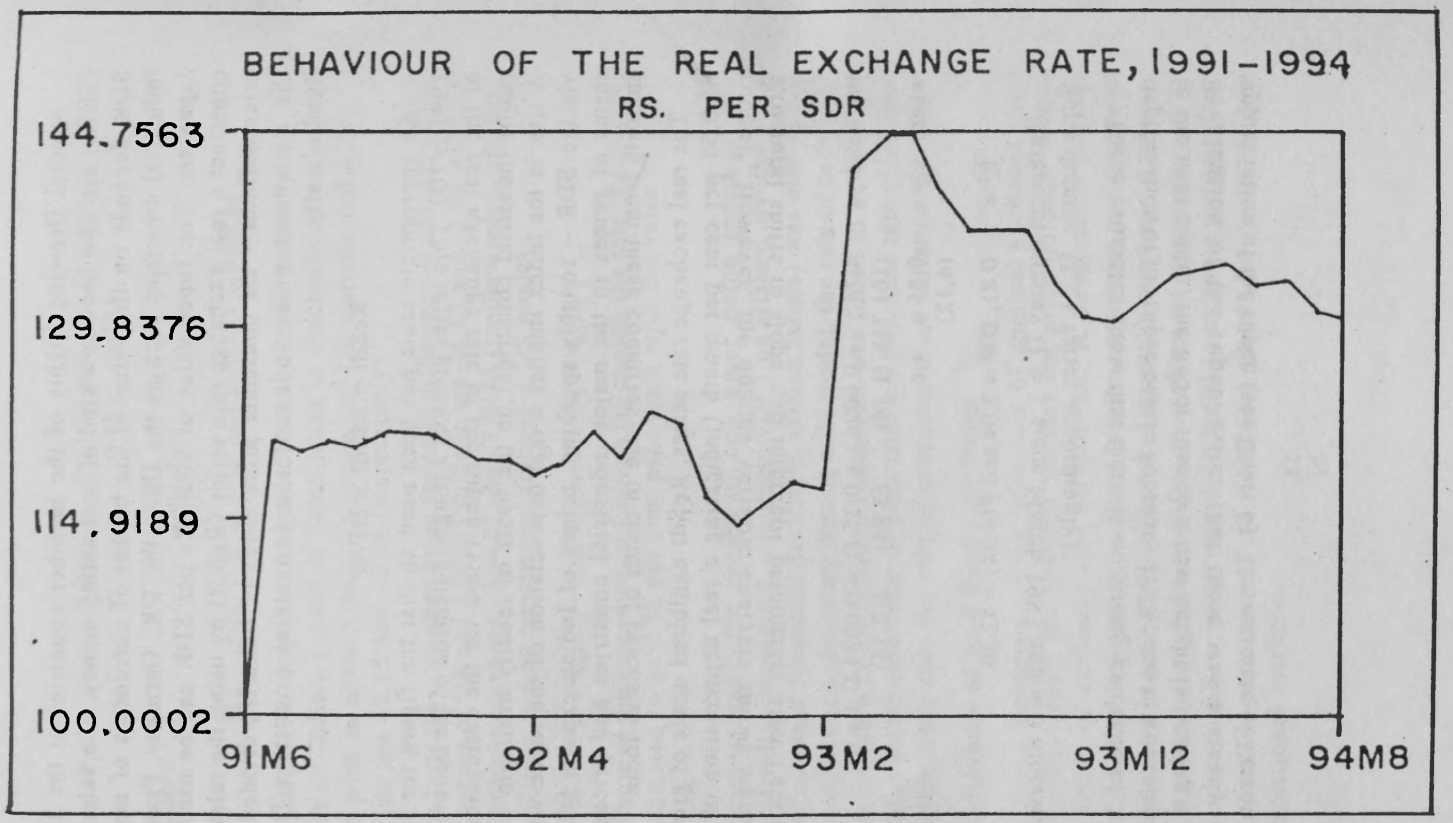

BEHAVIOUR OF THE REAL EXCHANGE RATE, 1991-1994
RS. PER SDR
144.7563
129.8376
114.9189
100.0002
91M6
92M4
93M2
93M12
94M8

Chart 6

statistic (= −13.57) confirms that the residuals of the above regression are stationary.

From this rough measure of real exchange rate behaviour, let us now turn to a more precise measure. From the RBI Bulletin (October 1994), two series of real *effective* exchange rates (based on FEDAI indictive rates) are available over the period, February 1992 to June 1994. In order to calculate the real effective exchange rate, data on bilateral exchange rates of the rupee – the values of Indian rupee in terms of currencies of India's trading partners – are needed. The bilateral exchange rates of the rupee are calculated as SDR-prices of currencies of India's trading partners divided by the SDR-price of Indian rupee. The RBI selected a sample of 36 countries which provided a market for three-fifths of India's exports to and imports from the rest of the world.

For calculation of real efective exchange rate, the SDR-price of currency of each of 36 major trading partners of India is deflated by its consumer price index (which reflects the price Indian exporters face in that country) and the SDR-price of the rupee is deflated by India's wholesale price index (which reflects producers' cost in India). Thus the 'real' SDR-prices of the currencies are obtained. The ratio between the 'real' SDR-price of currency of each of India's trading partners and the 'real' SDR-price of the rupee gives the 'real' bilateral exchange rate of the rupee. The real bilateral rates are aggregated by using appropriate weights. An appropriate scale is chosen so that the base period index becomes 100. For the RBI series, 1985 is the base year.

For weighting purpose, two sets of alternative weights are used. One set of weights is based on the shares of the 36 trading partners as market for India's exports. The other set is based on the shares of these countries in India's total trade (export plus imports). Accordingly, two series of real effective exchange rates (REER) are available – export-weighted REER, REERX and trade-weighted REER, REERT. A rise in the index implies a real appreciation of the rupee.

During the period, February 1992 to June 1994 (for which data are available), export-weighted REER, REERX rose at the monthly

rate of 0.70 per cent whereas the trade-weighted series, REERT rose at the rate of 0.64 per cent.[7] There was no evidence of structural shifts in slopes and intercepts after February 1993 :

$$\log REERX_t = \underset{(143.58)}{3.84} + \underset{(5.89)}{0.0099\,t} + \underset{(0.41)}{0.02D_t} - \underset{(-1.02)}{0.002\,D_t . t} + u_t \qquad (14)$$

where $\bar{R}^2$ = 0.90, DW = 1.42 and F(3,24) = 80.72

$$\log REERT_t = \underset{(162.60)}{3.93} + \underset{(4.64)}{0.0071\,t} - \underset{(-1.14)}{0.04\,D_t} + \underset{(0.60)}{0.001\,D_t . t} + u_t \qquad (15)$$

where $\bar{R}^2$ = 0.90, DW = 1.48 and F(3.24) = 82.43

To compare the behaviour of the real effective exchange rate series with that of our real exchange rate series, ReSdr, the same dummy variable analysis for the latter has been carried out over the period, February 1992 to June 1994. As in the case of REERX and REERT, the real exchange rate series, ReSdr does not show any change in the slope parameter. But there was s strong evidence of an upward shift in the intercept :

$$\log ReSdr_t = \underset{(243.77)}{4.84} - \underset{(-3.75)}{0.0040\,t} + \underset{(11.92)}{0.19\,D_t} + u_t \qquad (16)$$

where $u_t = \underset{(5.23)}{0.90\,u_{t-1}} - \underset{(-2.45)}{0.42\,u_{t-2}} + \varepsilon_t$

$\bar{R}^2$ = 0.96, D-W = 1.81 F(4.23) = 147.98 and Perron Stat. = –8.24

The implication is that the rupee faced a real appreciation (so that the ReSdr series declined) during February 1992 and February 1993; then came a devaluation which shifted the series upwards. If the whole period of our analysis is considered deleting only the June 1991 observation, a clear evidence of this appreciation can be found over the longer period July 1991 – February 1993; devaluation in March 1993 was followed by an acceleration of this process of real appreciation :

$$\log ReSdr_t = \underset{(411.49)}{4.80} - \underset{(-1.90)}{0.0017t} + \underset{(7.39)}{0.25D_t} - \underset{(-2.24)}{0.0032D_t . t} + u_t \qquad (17)$$

where $u_t = \underset{(5.85)}{0.86\,u_{t-1}} - \underset{(-2.80)}{0.41\,u_{t-2}} + \varepsilon_t$

$\bar{R}^2$ = 0.36, DW = 1.92, F(5.32) = 190.17 and Perron Stat. = –13.57.

Interestingly, all the RBI series on effective exchange rates exhibit stochastic trends. This can be checked on the basis of DF and ADF tests. But our sereis, ReSdr are trend-stationary with evidence of structural shifts. This trend-stationarity holds good over different sub-periods, July 1991-August 1994 and February 1992 – June 1994. Fitting DS models to the effective exchange rate series, it has been found that the series exhibited no trend of statistical significance.

To sum up, during the current 'liberal' regime, the rupee did not show any evidence of depreciation in real terms. If at all there was a trend that was one of real appreciation. This is a clear departure from the experience of the 1980s when the nominal and real effective exchange rates of the rupee showed a tendency to depreciate (RBI Bulletin, July 1993, p.968).

5. Relationship between Exchange Rates and Trade

Now we come to the question as to whether the exchange rate behaviour has influenced the values of exports and imports. One clue to the answer is the fact that the values of exports and imports exhibited a trend-growth without any sign of accelertion or deceleration after the devaluation of July 1991, as noted in Equations (7) and (8). This can be confirmed again by analysing the impact of March-1993 devaluation through the dummy variable analysis over the period June 1991 – August 1994 :

$$\log Xdl_t = \underset{(128.05)}{7.21} + \underset{(1.89)}{0.0082t} + \underset{(0.39)}{0.07D_t} + \underset{(0.03)}{0.0002D_t . t} + u_t \qquad (18)$$

where $u_t = \underset{(3.28)}{0.47}\, u_{t-1} + \varepsilon_t$

$\bar{R}^2 = 0.75$, DW = 1.77 and F(4,34) = 28.83

$$\log Mdl_t = \underset{(212.17)}{7.36} + \underset{(3.02)}{0.0083t} - \underset{(-1.27)}{0.14\, D_t} + \underset{(0.81)}{0.0036\, D_t . t} + u_t \qquad (19)$$

where $\bar{R}^2 = 0.54$, DW = 2.06 and F(3.35) = 15.98

(Intercept dummy, $D_t = 1$ after February 1993 and = 0 otherwise; slope dummy, $D_t . t = t$ after February 1993 and = 0 otherwise).

Further circumstantial evidence has been provided by the

CUSUM squares test which shows no structural break anywhere in the series of exports and imports during the two overlapping periods, June 1988-August 1994 and June 1991-August 1994.

For the sake of more rigorous analysis, a multiple regression equation is fitted :

$$\log Y_t = a + b.t + e.\log r_t + u_t \qquad (20)$$

where r_t is the exchange rate series.

The estimates of the parameters are given in Table 1. The nominal and the real exchange rate sereis, RsSdr and ReSdr and the real effective exchange rate series, REERX and REERT are the four alterntive explanatory variables over and above the time trend. There was no statistically significant reltionship between any of the four exchange rate series and the dollar value of exports. The same also holds good in the case of the import series in dollar values.

In view of the problem of non-stationarity of the residuals of the equation (20) fitted in each case, a first difference equation has been chosen :

$$d\log Y_t = b + e\ d\log r_t + du_t \qquad (21)$$

whre d stands for first differencing.

The equation (21) has been fitted to the series of exports and imports for each of the four exchange rate series. Results are reported in Table 2. These show again that the real exchange rate movements did not influence the dollar values of exports and imports.

Table 1

Regression Analysis of India's Exports and Imports
June 1991-August 1994
(Based on log-values)

Dependent variables & Regressors	Regression Coefficients (t-values)		$\bar{R}^2$	DW stat.	F stat.	Procedure*
I. Exports Values in US $) – log values						
Intercept, a	5.92	(6.53)				
Time, t	0.0075	(2.42)				
log RsSdr	0.36	(1.39				
			0.76	1.78	40.51	AR(1)
Intercept, a	5.28	(4.32)				
Time, t	0.0090	(4.17)				
log ReSdr	0.40	(1.56)				
			0.76	1.78	41.11	AR(1)
Intercept,a	3.48	(1.44)				
Time, t	0.0061	(1.24)				
log REERX	0.94	(1.51)				
			0.76	2.41	23.43	AR(2)
Intercept, a	3.61	(1.41)				
Time, t	0.0069	(1.46)				
log REERT	0.90	(1.38				
			0.76	2.42	22.95	AR(2)
II. Imports (Values in US $) – log values						
Intercept, a	8.30	(10.28)				
Time, t	0.0099	(4.10)				
log RsSdr	-0.27	(-1.17)				
			0.54	1.88	23.59	OLS
Intercept, a	9.12	(8.84)				
Time, t	0.0091	(6.16)				
log ReSdr	-0.37	(-1.70)				
			0.56	1.92	25.30	OLS
Intercept, a	10.56	(3.86)				
Time, t	0.01	(2.04)				
log REERX	-0.81	(-1.15)				
			0.23	1.99	5.08	OLS

Contd.....

Table 1 (Contd.)

Dependent variables & Regressors	Regression Coefficients (t-values)		$\bar{R}^2$	DW stat.	F stat.	Procedure*
Intercept, a	8.77	(2.78)				
Time, t	0.0075	(1.33)				
log REERT	–0.35	(–0.43)				
			0.20	1.89	4.32	OLS

* The procedure has been selected on the basis of log-likelihood ratio tests of AR(1) vs OLS and AR(2) vs AR(1).

Table 2

Regression Analysis of India's Exports and Imports
June 1991–August 1994
(Based on log-differences)

Dependent variables & Regressors	Regression Coefficients (t-values)		$\bar{R}^2$	DW stat.	F stat.	Procedure*
I. Exports – log-differences						
Intercept, a	0.01	(0.73)				
dlog RsSdr	0.293	(1.01)				
			0.00	2.18	1.03	OLS
Intercept, b	0.012	(0.86)				
dlog ReSdr	0.329	(1.12)				
			0.01	2.18	1.26	OLS
Intecept, b	–0.004	(–0.27)				
dlog REERX	1.084	(1.45)				
			0.04	1.49	2.12	OLS
Intercept, b	– 0.004	(–0.22)				
dlog REERT	1.08	(1.37)				
			0.03	1.49	1.88	OLS

Table 2 (Contd.)

Dependent variables & Regressors	Regression Coefficients (t-values)		$\bar{R}^2$	DW stat.	F stat.	Procedure*
II. Imports – log-differences						
Intercept, b	0.013	(1.87)				
dlog RsSdr	–0.32	(–1.33)				
			0.45	1.92	9.11	AR(2)
Intercept, b	0.011	(1.76)				
dlog ReSdr	–0.372	(–1.56)				
			0.41	1.92	9.50	AR(2)
Intercept, b	0.099	(1.17)				
dlog REERX	–0.64	(–0.98)				
			0.42	2.04	7.18	AR(2)
Intercept, b	0.0088	(1.03)				
dlog REERT	–0.54	(–0.74)				
			0.41	2.02	6.92	AR(2)

* The procedure has selected on the basis of the loglihood ratio tests of AR(1) vs OLS and AR(2) vs AR(1).

III

During the current regime of increasing liberalisation and free trade, the rupee was devalued a number of times. The day-to-day exchange rate of the rupee is now market-determined (although the RBI reserves the right to operate in the market). In this scenario, the real exchange rate of the rupee in terms of SDR appreciated with occasional real devaluation. However, both the export-weighted and trade-weighted real effective exchange rate series exhibited stochastic behaviour perhaps with a drift towards 'real' appreciation. India's consumer price index series also exhibited stochastic trend growth.

It is not clear how much importance should be attached to this finding of stochastic behaviour. In fact, the early enthusiasm of finding stochastic time trend in almost every macroeconomic time series has subsided. Most of the series that had been found to exhibit

stochastic trends by Nelson and Plosser (1982) have been later shown to be trend-stationary with structural shifts due to the impact of Great Depression or the World War II (Perron, 1989). In our study, the possibility of structural shift was given due consideration. But the question remains in regard to the power of the DF and ADF tests – the lower the number of observations, the less is the power.

Moreover, there is the Baysian criticism of the DF-ADF tests of stationarity – the tests based on the null hypothesis of non-stationarity of residuals are biased against the alternative hypothesis of stationarity. A test has been devised where the null hypothesis is one of stationarity of residuals. Conducting this type of test, the conclusion of stochasticity by Nelson and Plosser (1982) was questioned (for reference see Maddala, 1994). It is beyond the scope of the present study to use this type of test. Hence all that we can say is that the effective exchange rate of the rupee showed no sign of real depreciation. If at all there was a trend, that was one of appreciation.

The behaviour of consumer prices in India and in the industrial countries needs further investigation. If it is decisively found that the prices exhibit stochastic trends, it will have serious implication for price theory. For our purpose, it is taken for granted that the period of 'liberalisation' experienced a high rate of price inflation; it is much higher than the rate of inflation in the developed countries.

In this scenario of price inflation and 'real' appreciation of the rupee, India's exports in dollar terms showed a deterministic course of trend growth. Dollar values of India's imports also showed a similar deterministic course of trend growth. But the balance of trade figures showed no trend towards improvement or deterioration.

It has also been observed that the trend-growth in exports and imports of the current period of 'liberalisation' is actually a continuation of that of the earlier period. There was nothing in the trend-behaviour of exports and imports in the earlier period that called for a change of regime. A cursory look at Chart 7 reveals

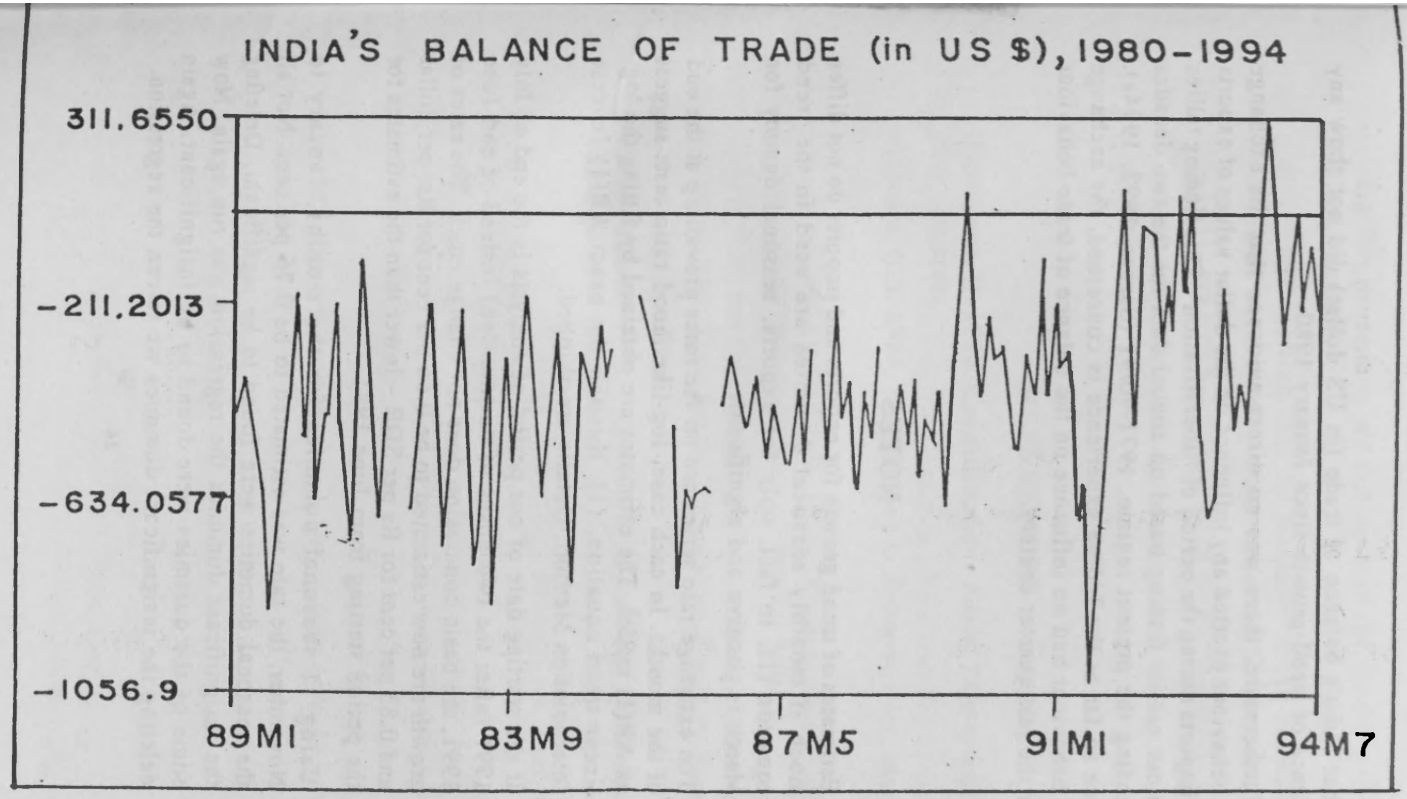

INDIA'S BALANCE OF TRADE (in US $), 1980-1994
311.6550
-211.2013
-634.0577
-1056.9
89M1
83M9
87M5
91M1
94M7

Chart 7

that India's balance of trade (in US dollar) did not show any evidence of trend-growth since January 1980.

Furthermore, there was no direct evidence that the exchange rate behaviour exerted any influence on the dollar values of exports and imports during the period of 'liberalisation'. This finding tallies with our earlier finding based on annual data for the two decades preceding the present regime, 1971-90/91 (Sarkar, 1992, 1994a). Hence so far as the Indian experience is concerned, the exchange rate behaviour had no influence on the balance of trade behaviour over the last quarter century.

NOTES

1. Estimates of trend growth for exports and imports do not differ much if monthly seasonal dummies are used in the trend equation (1). In fact, only for exports, seasonal dummy for March is positive and significant.

2. The exchange rate series are on the rates prevalling at the end of the months. In each case, log-likelihood ratio tests suggest an AR(1) model. The estimates are obtained by fitting the log-linear trend equation, (1), through the exact AR(1) Inverse Interpolation Method. Details are skipped.

3. If the starting date of our period of analysis is the end of July 1991 (after the two doses of devaluation) instead of end-June 1991, the basic conclusion does not change much. The rates of growth are now estimated to be 0.66 per cent for Rs. per dollar and 0.83 per cent for Rs per SDR – lower than the estimates for the period starting from June 1991.

4. Using 11 seasonal dummies for the months, January to November, the rate was estimated to be 0.76 per cent. Not all the seasonal dummies were found to be significant. Deleting the insignificant dummies the regression was run again. Now some of the dummies were found to be insignificant. Again deleting the insignificant dummies we re-run the regression.

Following this procedure, we end up with the model without any seasonal dummy.

5. LM(12) test confirms that the residuals of the augmented DF equation do not have any higher order serial correlation.

6. An AR(1) process has been used to fit Equation (1).

7. An exact AR(1) process was chosen to fit the log-linear trend equation, (1).

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