UNIVERSITY OF BOMBAY
DEPARTMENT OF ECONOMICS

INDIA'S TRADE BALANCE IN THE EIGHTIES - AN ECONOMETRIC ANALYSIS

BY
D.M.NACHANE
PRASAD P. RANADE

WORKING PAPER 96/13
JULY 1996

India's Trade Balance In The Eighties - An Econometric Analysis

DM. NACHANE PRASAD
P. RANADE

The paper purports to be an examination of India's trade balance in the 1980's. The approach attempted is of examining the bilateral trade balances of India with nine trading partners from the non-Communist Bloc. The long-run equilibrium relations are studied via two VAR models in Johansen's multivariate cointegration framework. Five hypotheses of interest are singled out for attention. The nominal and real exchange rates consistently emerge as important influences on the trade balance. However, as the exchange rates fail weak exogeneity tests, policy implications are not clear cut.

Keywords - Trade balance, Cointegration, VAR, Exchange rates, Weak exogeneity
J.E.L. classification: F14 and O19

[). M. Nachane and Prasad P. Ranade, are Director & Professor of Quantitative Economics, University of Bombay and Asst. Vice President, Infrastructure Leasing and Financial Services Ltd. Bombay, respectively. The authors wish to record their appreciation of Karl Lopez. Neeraj Hatekar and Ms. Lakshmi R. who helped in the formidable tasks of data collection and software development, errors and omissions are the authors' sole responsibility

I. INTRODUCTION:

India's travails on the Balance of Payments front commenced from the beginning of its Second Five Year Plan (1956) and have persisted over the past four decades with varying degrees of intensity. Following previous studies ***[Ahluwalia** (1986), Rangamjan (1990), Jalan (1993), etc.],* one may distinguish three chronological epochs:

(a) Period I (1956-1976):

> In this phase, India's current account deficit averaged about 1.8% of its GDP and this high level of the deficit was occasioned mainly by sluggish export growth in relation to import requirements. Other aggravating factors were the droughts of 1965-66 and 1966-67, the external wars with China and Pakistan and the **Oil** shock of 1973. However, fiscal conservatism and generous external assistance prevented the current account imbalance, from spilling over into a general balance-of-payments crisis.

(b) Period 11 (1976-79)

> This brief period was a halcyon period for India's external sector, with the current account, posting a small surplus of 0.6% of GDP. The major contributing factor to this"happy state of affairs was a sharp rise in the inflow on "invisibles" account due to remittances from abroad. The trade deficit was also somewhat lower during this period. However, the second oil shock of 1979 once again put the balance of payments situation in jeopardy.

(c) Period I I I (1979-91):

> This period was witness to several structural changes in the external sector scenario. The trade deficit burgeoned, especially after 1985; simultaneously there was a gradual decline in the receipts from "invisibles". As a result, the current account deficit once again reverted back to the 1.8% (of GDP) level characterizing Period I. But in contrast to the situation prevailing in Period I, external assistance was not forthcoming on facile terms and increasing reliance had to be placed on external commercial borrowings with a consequent steep build-up of foreign debt. The situation was further aggravated by indiscriminate fiscal profligacy and matters had assumed crisis proportions by September I! 990, when the IMF stepped in with its bail-out package.

To the foregoing periods, one should logically append a fourth, beginning July 199!^ which saw a newly installed government embark on several bold liberalisation measures on the external and domestic fronts. While some analysts tend to see in these structural reforms nothing but an extrapolation of policies initiated earlier on, in the mid-eighties, the bulk of opinion seems to favour a view of these reforms as marking a significant structural break from the past. The latter view seems particularly appropriate as regards the external sector where reforms of far reaching significance were instituted (such as convertibility of the Indian Rupee on the Current Account, liberalizing foreign investment, accelerated scaling down of import duties on capital goods and intermediates, etc.) ..From an analytical point of view, therefore if is desirable to study this period separately from the others. However, a formal econometric **study** of this (current) period is ruled out because of the dearth of observation points - the impact of the policies initiated in 1991 have begun to be felt only since 1993 and additionally data on trade flows is subject to fairly significant lags.

While from a policy perspective, interest attaches to the balance of payments as a whole, the state of the current account is usually regarded as being of critical importance for adjudging the overall health of the external sector. Within the current account, the trade balance is of predominant importance in LDCs like India, apart from being analytically the more amenable component.

In this paper we propose to examine the behaviour of India's trade balance over the period 1979 to 1991 (Period III above). Whereas, most available studies in this area focus on a country's total trade balance, our analysis focusses on the bilateral trade balances between India and its nine major non-Communist trading partners viz. Australia, Canada, France, Germany, Japan, Netherlands, Sweden, U.K., and U.S.A. This approach has the advantage of highlighting the major influences on the trade, balance in each trading partner's case separately. Since the focus is on long term relations, the multivariate co-integration framework of Johansen and Juselius *[1990]* was resorted to. In most cases, data on the relevant variables was available on a monthly basis and in these cases, we operated with monthly models. For three countries (U.K., France and Australia) data on some of the variables was not forthcoming on a monthly basis, and hence we adopted quarterly models.

II. THE THEORETICAL FRAMEWORK

The relationship between the exchange rate and the trade balance is a key issue in international trade theory.

Four distinct schools of thought may be identified.

(a) Firstly, there is the traditional Mundell-Fleming approach (MundelS *[1963]*, Fleming *[1962]* but also Robinson *[1947]*, Meade *[1951]* and Met/Jer ***[1948]***) which postulates that (subject to the fulfilment of the Marshall-Lerner conditions on export and import elasticities) a nominal devaluation will improve the trade balance in the long run, though the short run effects may be adverse. This is the famous J-curve hypothesis.

(b) The Absorption Approach *[Alexander (1952) and Johnson (1963))* also predicts a J-curve type of effect of nominal devaluations on the trade balance but based on an analytical framework quite distinct from the Mundelt-Fleming approach. The Marshall-Lerner conditions are replaced by the conditions that the " propensity to absorb" is less than unity (see Sodersten *[1990])* for a definition of this propensity). The absorption effect may operate via several factors including the terms-of-trade, production effects, expenditure switching etc.

(c) In direct contrast to the above two approaches "the monetary approach to the balance of payments" *[Dornbusch (1973), Grubel (1976), Frenkel and Rodriguez (1975) etc.]* rules out any impact of nominal devaluations (whether in **the** short or

The other component "invisibles" is notoriously difficult to model both because of sis volatility and its being subject to a scattered host of influences.

the long run) on the trade balance. Any possible impact of nominal devaluations on the balance of payments are essentially via the capital account, involving only portfolio stock adjustments.

(d) In recent years , neo-classical general equilibrium models have shifted the focus from nominal to real exchange rates as the decisive influence on the trade balance *[see Krueger (1978), Bautista (1981), Edwards (1985,1995) etc:]*[2] The real exchange rate is defined as the relative price of tradables to non-tradables, but since this'entity is difficult to estimate in practice, it is usually proxied by the quantity r defined as

$$r = e(p^*/p) \quad , \qquad (1)$$

where e is the nominal effective exchange rate, p the domestic consumer price index (intended to represent'the domestic non-tradable prices) and p* the foreign wholesale price index (representing world prices of tradables).

The conflicting views about the role of exchange rate adjustments in influencing trade flows are far from being of academic interest only. As noted by Himarios [19#J] among others, such views impinge in a direct fashion on policy issues. " Getting the exchange rate right" has proved to be a major item on the agenda of IMF - led stabilisation packages. Other related policy issues are, of course, the use of nominal exchange rates as an anchor for policy credibility and real exchange-rate targeting.

However, the exchange rate (whether real or nominal) is not the sole influence on the trade balance. Several other factors enter the picture as well. Of these, the three most important are (1) Income variables (2) Monetary variables and (3) Price variables.

(I) Income variables: The impact of a rise in domestic or foreign income levels on a country's exports and imports has received a great deal of attention in the literature. The Houthakker-Magee *[1969]* hypothesis asserted that the elasticities of a country's demand for imports (w.r.t. a rise in domestic incomes) and of the demand for the country's exports (w.r.t. a rise in foreign incomes) are likely to b«? unequal. The hypothesis has been extensively investigated by Hooper *[1980]*, Goldstein and Khan *[1988]* and Marquez[/989]. As a consequence of the hypothesis, the trade balance will be affected whenever there is an equiproportionate rif-c ;n domestic and world incomes - whether the effect will be favourable or adverse will depend on the relative magnitudes ©f the respective elasticties.

A rise in domestic incomes, *o** itself, will usually increase the demand for the **country's** imports but it is also likelv to increase the country's exports if the latter have been supply constrained. This later effect is likely to be particularly important in LDCs. Thus the net impact on the trade balance of a rise in domestic incomes is not certain *h* priori. A rise in foreign incomes, ceteris paribus, is expected however to lead to an increase in the demand for *the* country's exports and thereby to an improvement in the trade balance.

[1] A systematic exposition of this viewpoint may be found in Edwards (1994), where empirical and policy implications of the approach are also examined in detail

(2) Monetary variables: Several analysts have noted the possibility of a real balance effect associated with monetary variables on the trade balance *[Johnson (1973). Dornbusch (1973), Miles (1979) etc.]*. A rise in money supply would be perceived as an increase in domestic wealth leading to an increase jn imports via a spurt in expenditure. Similarly, a rise in foreign money supply is expected to act as a fillip for exports. However, the strength of the real balance effect would depend on the ratio of nominal money balances to the total wealth of the economy.

(3) Price variables: One of the earliest hypothesis relating to the influence of price variables on exports and imports is the MarshalI-Lerner condition. However, in this paper our focus being on the trade-balance rather than on exports and imports separately, we do not enter into the issue of testing this hypothesis. Rather, of more interest to us is the issue originally raised by Orcutt *[1950]*,- which raises the possibility of trade flows responding differentially to the two components of the real exchange rate r viz. the nominal exchange rate e and relative price ratio (p*/p). Krueger *[1983]* attributes this differential response to the existence of a class of domestically produced non-traded goods.[3] The issue has attracted considerable attention and conflicting empirical evidence has been posted by Junz and Rhomberg *[1973]*, Wilson and Takacs [7979] and Bahmani-Oskooee *[1986]*

The foregoing discussion indicates that one may identify the following different hypotheses as being of policy relevance and theoretical interest:

H,: (Neo-classical general equilibrium hypothesis) - Trade balance responds favourably in the long run to a devaluation in the real exchange rate.

H_2: (J-curve hypothesis) - Trade balance responds favourably to a nominal devaluation in the long run (as predicted both by Mundell-Fleming approach and the Absorption approach). The rejection of this hypothesis would favour the monetary approach to the balance of payments.!

H_3: (Houthakker-Magee effect) - An equiproportionate rise in domestic and foreign incomes does affect the trade balance (though the effect does not specify whether favourably or adversely)

H_4: (Income effects) - Trade balance responds (a) favourably to a rise in foreign incomes and (b) adversely to a rise in domestic incomes.

H_5: (Monetary effects) - Trade balance responds (a) favourably to a rise in foreign money supply and (b) adversely to a rise in domestic money supply.

H_6: (Orcutt hypothesis) - Trade balance responds differentially to the nominal exchange rate and the relative price ratio (of foreign to domestic prices)

The goods may be non-traded either due *to* high transport costs or because of government prohibitions on imports / exports of these goods

III. DATA DESCRIPTION

As indicated earlier, we propose to examine the six hypotheses delineated above within a multivariate cointegration framework. For this purpose, we develop two VAR systems for each bilateral trade balance. Typically, for India's trade with the j-th country, we would have the following two systems:

VAR I : (TB)j, InY, InYj*, InHM InHMj*, In_{rj}

VAR II: (TB)j, InY, InY,*, InHM, InHM/, Inej, In(pj*/ p)

where

(TB)j : India's real trade balance with j^{l} trading partner

Y : India's industrial production index

Yj* : j-th country's industrial production index

HM : India's real reserve money

HMj* : j-th country's real reserve money

e, : nominal bilateral exchange rate between Indian Rupee and the j-th country currency (expressed as Rupees per unit of j-th currency)

rj : real bilateral exchange rate between Indian Rupee and the j^-th currency

(Pj*/p) : ratio of j-th country's wholesale price index to Indian wholesale price index

Note that all variables, except (TB)j are in log form

The trade-balance data has been gathered from various issues of the Direction of Trade Statistics (IMF). This data on exports and imports is denominated in terms of US Dollars. We convert this data into the real trade balance (TB)j by a process of double deflation - exports are first deflated by an index of the j^{th} country's nominal exchange rate vis-a-vis the US Dollar and then by the j^{th} country's wholesale price index, whereas imports are deflated by an index of the nominal Rupee rate (vis-a-vis the US Dollar) and India's wholesale price index . The use of wholesale price indices is resorted to , owing to the non-availability of separate unit value indices for exports and imports for each trading partner

So far as the income measures are concerned, the idea! ones would of course be the GDP or GNP. However, our analysis is intended to be on a monthly or quarterly basis and since GDP or GNP figures for India are available only on an annual basis, we resort to the standard practice of using the industrial production index as -a proxy variable for income levels. Data on Y and Yj* is obtained from successive issues of the International Financial Statistics (IMF) database.

In choosing the monetary base as a variable to measure monetary influences, we avoid the problems associated with differing definitions of money supply across countries. Nominal reserve money data is once again sourced from the International Financial Statistics (IPS) Database and is converted to real terms by deflating via the wholesale price index of the country concerned.

The nominal exchange rate is the end-of-period value given by line 'ae" of the IFS. The re/l bilateral exchange rate is given by (1) above.

One final clarification pertains to the ratio (p*/p). Even though on theoretical grounds, as we had indicated in the discussion following equation (1) a domestic consumer price index is suggested as an appropriate proxy for p, we have chosen the Indian wholesale price index for this role. This is so because in India, there are several different consumer price indexes (for industrial workers, for agricultural labourers, for urban non-manual workers etc.) and purely on a priori grounds, it would have been difficult to choose a particular one as the most appropriate. The IFS database once again provides **data** on **the** wholesale price indices of the various countries.

As indicated in Section 1, a monthly analysis has been undertaken for six of India's trading partners and a quarterly analysis for three. For the latter, the period of analysis has been taken from 1979QI to I991QI11, whereas for the former it is from Jan 1979 to Sept 1991. VAR 1 has been designed specifically for testing H, and VAR II for testing H_2 and H_6. The remaining hypotheses H_3, H_4 and H_5 can be tested in either system and we test them in the more general system VAR II.

IV. ECONOMETRIC FRAMEWORK

The multivariate cointegration framework that we propose to use here has now come to be established as a standard one for VAR systems. The procedure may be summarized as follows (see e.g. Johansen *[1988]* and Johansen and Juselius *[1990])*.

Let X, be an 1(1) vector representing the n-series of interest. A VAR of length p for X, would then be of the form:

$$X_t = \sum_{j=1}^{p} \Pi_j X_{t-j} + \mu + \varepsilon_t \qquad (t=1,2,3,\ldots T) \quad (2)$$

where the fl j are matrices of constant coefficients, *\x* is an intercept (see **discussion** below), E, is a Gaussian error term and T the total number of observations.

The ECM (Error Correction Model) corresponding to (2) is

$$\Delta X_t = \sum_{j=1}^{p} \Gamma_j \Delta X_{t-j} + \Pi X_{t-p} + \mu + \varepsilon_t \qquad (3)$$

where A is the first-difference operator and **the** expression for Fj and FI are as given *in* Johansen and Juselius *[1990]*

For the definition of an l(d) process (non-negative integer), reference may be made to Engle and Granger(1987)

If Rank (II) » r (r<n) then cointegration is indicated (with r cointegrating vectors present) and further, in this case II may be factored as II = $\alpha.p^r$, with the matrix P comprising the r cointegrating vectors and a can be interpreted as the matrix of corresponding ECM weights.

Several comments are in order here.

(a) Firstly, models (2) and (3) could be easily extended to include a vector Z_t of I(O) variables as regressors. Z, could include seasonal dummies as well as other stationary variables. The 1(0) variables pose no additional estimation problems, since they can be simply concentrated out of the likelihood function *[Banerjee et. at. (1993)]*.

(b) Secondly, the lag length p of the VAR system in (2) can be decided upon by **the** likelihood-ratio (LR) test suggested by Sims *[1980]*.

Let

$$S = (T - c) \{ \ln|\Sigma_r| - \ln|\Sigma_u| \} \quad (4)$$

where (I) Σ_r and Σ_u are the restricted and unrestricted covariance matrices respectively (ii) T is the number of observations and (iii) c is the Sims' correction factor defined as the total number of variables in the unrestricted system.

S is distributed as a χ^2 with d.f. equal to the total number of restrictions.

(c) The selection of r (number of cointegrating vectors) can proceed via an examination of the maximal eigenvalue (λ_{max}) and the trace (J_T) statistics ofJohansen *[1988]*,

(d) The treatment of the intercept term u. is quite important. Two possibilities are present - viz. (i) that the intercept term is restricted to enter the ECM only and (ii) that the intercept term is unrestricted. Johansen and Juselius *[1990]* furnish the following statistic for discriminating between the two possibilities,

$$L = -T \sum_{i=r+1}^{n} \ln\left[(1 - \hat{\lambda}_i^*) / (1 - \hat{\lambda}_i) \right] \quad (5)$$

where $\hat{\lambda}_i$ and $\hat{\lambda}_i^*$ denote the eigenvalues (arranged in descending order) of the unrestricted and restricted systems respectively[5] and L is distributed as a χ^2 with d.f, (n-r).

It is important to realise that the critical value of the statistics (λ_{max}) and (J_T) would depend upon the treatment of the intercept term u, - a fact explicitly recognized by Osterwald-Lenum *[1992]* who furnishes the requisite critical values for each treatment 6f μ.

(e) Once the value of r and the treatment of p, have been decide upon , the MLEs of a and β can be derived along the lines drawn out by Johansen-Juselius *[1990]* and several

The exact form of the restriction when the intercept enters only the ECM may be found in Johansen and Juselius (1990) excellent computer packages are available for the same. (We ourselves have used Microfit Version 3.0). Economic theory might suggest several hypotheses on fi and tests on these hypotheses can again be executed.

(0 The BCM weights (x determine the short term error correction responses of the variables to deviations from the long-run equilibrium. A low value of a, indicates that the corresponding variable $X_($ responds slowly to the disequilibrium term and the non-rejection of the hypothesis aj=0 may be interpreted as evidence favouring "weak exogeneity" of Xj to the VAR system. ("Weak exogeneity" is being used in its formal sense as defined by Rngle, llendry and Richard *[1983]).*

V. A: EMPIRICAL RESULTS

As outlined above, this paper attempts to model the bilateral trade balance between India and nine of its major trading partners (accounting for 65 % of its total trade with the non-communist bloc during the decade of the eighties). A monthly analysis was conducted for six out of the nine countries, and a quarterly analysis for the remaining three countries.

It would be cumbersome to present the details of all the statistics of our cointegration exercise. We have therefore decided to present detailed statistics for one selected case viz. India-Australia and summarize the qualitative conclusions of the rest of our calculations in Tables 5 to 9

A. The India -Australia Case

In this case, data was available only on a quarterly basis (1978 *Q* to 1991 Q IIS) leading to a total of 55 observations. As discussed in Section 3, we consider two VAR systems but redefine the variables to accord with the terminology of Section 4.

VAR I - X,,...X_6

with X, - India's real trade balance with Australia
X_2 - India's industrial production index (in logs)
X_3 - Australia's industrial production index (in logs)
X_4 - Real reserve money (India) (in logs)
X_s - Real reserve money (Australia) (in logs)
X_6 - Real exchange rate between Indian Rupees and Australian Dollar (in logs)

VAR II-X,,... X_5, X'_6, X'_7

where X, to X_5 are as in VAR I and

X'_6 - Nominal exchange rate between Indian Rupee and Australian Dollar (in logs)

X'_7 - Ratio of Australian wholesale price index to Indian wholesale price index (in logs)

In addition each VAR system includes centred quarterly seasonal dummies to allow for ' seasonal effects.

We now turn to the detailed results for VAR I and VAR II .

Step I: (Determination of lag length p): The choice of p proceeds via Sims' statistic S, described in Section 4. S is distributed as a χ^2 with d.f. equal to the total number of restrictions. A maximum value of p=4 was considered for both VAR systems. For VAR I, the statistic S for testing p=3 against p=4 worked out to be S= 11.3189. This was compared with the 95% critical value of a χ^2 with 36 d.f. (since in VAR I, one lag of each of six variables in six equations is being restricted). Since this computed value is exceeded by the critical value, the restricted model was preferred. A similar exercise was executed for testing p=3 against p~2 and this time, the restricted model was rejected. We thus fix the value of p=3 for VAR I. For this value of p, it was also checked that the residuals passed standard tests for Gaussian white noise.

By exactly analogous reasoning, for VAR II also, the value of p chosen was p=3.

Slep_2Li_(Unit Root Tests): The next step is to see whether all variables figuring in **VAR** I and VAR II were 1(1). Standard Dickey-Fuller and Phillips-Perron tests were employed for this purpose. All variables in both VARs turned out to be 1(1) indicating that the Johansen procedure could be appropriately applied to this system.[6]

St<u>ep 3</u>: (Determination of r): The choice of r proceeds by an examination of (λ_{max}) and (J_T) statistics. These statistics alongwith their critical values are presented in Tables IA and B (for VAR I) and Tables 2A and B (for VAR II). Both statistics unequivocally indicate that r=l for both VAR I and VAR II i.e. there is a single cointegrating vector in both systems.

<u>Step 4</u>: (Testing the intercept): The next step is to decide whether the intercept term is to be unrestricted or whether it should be restricted to entering the ECM only. The relevant statistic here is L as defined by (5). The value of L for VAR I works out to be 18.1239 which is significant when compared with the 95% critical value of a χ^2 with 5 d.f. (recall that the d.f. are given by (n-r) - for our problem n=6 and r=l). This indicates that the intercept term should be unrestricted.

The value of L for VAR II is 20.2945 which exceeds the 95% critical value of a $\chi^2_{(6)}$ indicating that in this system too, the intercept term should be unrestricted.

Step 5: (Estimation of cointegrating vectors): We are now in a position to estimate the cointegrating vectors for VAR I and VAR II by the MLE method of Johansen and Juselius *[1990]*. We adopt the convention of denoting the i^{th} cointegrating vector of VAR I by β_i and of VAR II by β'_i (with their j-th elements being denoted by β_{ij} and β'_{ij}). Estimates are denoted by a hat superscript as usual. The cointegrating vectors are normalised on the first variable (which in both systems is the trade balance) i.e.
$\hat{\beta}_{i1} = \hat{\beta}'_{i1} = -1$. Noting that there is only one cointegrating vector for both VAR I and VAR II in this case, we may write

In the interests of brevity, the results of these tests are not presented here.

$\hat{\beta}_{1}$ = (-I,+0.2846,-1.4144,+0.1871,+0.1932,+0.0743)

$\hat{\beta}'_{1}$ = (-1.-O.8874,-6.5O38,+3.8314, -1.5658,40.8107,+3.5685)

Step 6: (Hypothesis testing) As decided above, we propose to test H, in VAR I, whereas 11_2 to H_6 are tested in VAR II. These hypothesis translate themselves into hypotheses on the various components of the cointegrating vectors.

$H_1: \beta_{i6} > 0$	(i=1,2,3.....r)	(6)
$H_2: \beta'_{i6} > 0$	(H),2,3,....r)	(7) .
$H_3: \beta'_{i2} + \beta'_{i3} \neq 0$	(1=1,2,3.....r)	(8)
H_4: (a) $\beta'_{i3} > 0$ (b) $\beta'_{i2} < 0$	(i=l,2,3,,...r)	(9)
H_5: (a) $\beta'_{i5} > 0$ (b) $\beta'_{i4} < 0$	(i=l,2,3.....r)	(10)
H_6 $\beta'_{i6} \neq \beta'_{i7}$	(i=1,2,3 ......r)	(11)

Let us now proceed to examine the above hypotheses in the India-Australia context (where r=l). So far as H, is concerned, the likelihood ratio for testing the significance of β_{16} works out to be 16.21. This is distributed as a χ^2 with 1 d.f., and hence is significant (as the 95% critical value is 3.84). Thus, H, derives support from the data.

The LR value for testing the significance of β'_{16} at 7.74 is also significant at 95%, and so H_2 stands its ground too.

The hypothesis of interest H_3 can be tested by first setting up the null of $\beta'_{12} + \beta'_{13} = 0$. Rejection of this null would favour the hypothesis of interest H_v The I,R value for the null works out to be 9.81 which is significant as compared with the 95% critical value of a $\chi^2_{(1)}$. Thus, the null is rejected and this may be interpreted as evidence favouring U,.

Turning to hypothesis H_4 we find from the I β'_{13} tatistic that P',2 is significant but is insignificant and in addition has the wrong sign.

Hypothesis H_5 may be rejected outright since the coeffecient has the wrong ssgrs and turns out to be insignificant.

The hypothesis H_6 has to be tested by first postulating the null of

$$\beta'_{16} - \beta'_{17} = 0 \qquad (12)$$

with a rejection of this null being interpreted as evidence favouring H_6. The LR value at 7.82 exceeds the 95% critical value of a χ^2 with 1 d.f. - pointing to a rejection of the null hypothesis of the equality of the two coefficients and by consequence acceptance of H_6.

We now turn to the economic interpretation of the above hypothesis testing exercise. The trade balance responds favourably to a depreciation in the nominal exchange rate as well as in the real exchange rate. The Houthakker-Magee effect is significant and an equiproportionate rise in domestic and foreign incomes produces an adverse impact on the trade balance. However, as the tests on li_4 show, this adverse impact is wholly attributable to the rise in domestic incomes, the rise in foreign incomes contributing an insignificant term with the wrong sign. (It is of course quite conceivable that the wrong sign may be due to the index of industrial production being a rather imperfect proxy for -{he national income). The monetary variables (in this case) turn out to be insignificant and with the wrong sign - possibly owing to the fact that monetary wealth constitutes a relatively small proportion of total wealth (at least in India). The acceptance of the Orcutt hypothesis serves to underline the fact that a devaluation of the nominal exchange rate and a rise in the ratio of foreign to domestic prices, both impinge favourably on the trade balance but the impact is of differing magnitude. In the India-Australia case, the effect of the price-ratio rise is substantially higher than that of the nominal exchange rate rise.

Step 7: (Weak exogeneity) The crucial question of policy interest is whether the trade balance can be managed to some extent by an appropriate policy of nominal or real exchange rate targeting. This requires in addition to the acceptance of hypothesis H, and H_2, the weak exogeneity of nominal and real exchange rates to the system. Weak exogeneity of these rates would imply the feasibility of targeting them on desired values, without interference from other variables in the system. In addition, it is necessary to check that the trade balance is not exogenous to the system - if weak exogeneity of the trade balance prevailed, then it is outside the ambit of influence of any variables whatsoever in the system.

As discussed earlier, weak exogeneity can be tested via the ECM weights. Let α denote the vector of ECM weights corresponding to the i-th cointegrating vector in VAR I, with a'| the vector of ECM weights (corresponding to the i-th cointegrating vector) in VAR II. The j-th components of these vectors will be denoted by α'_{ij} and α_{ij} respectively and the hat superscript will, as before be used to denote estimates.

If the trade balance is not to be exogenous in either VAR I or VAR II, we require

$$\alpha_{i1} \neq 0 \text{ and } \alpha'_{i1} \neq 0 \quad 1=1,2,..............................r \qquad (13)$$

The weak exogeneity of the real exchange rate can be tested in VAR I by

$$\alpha_{i6} = 0 \quad i=l,2,3,...r \qquad (14)$$

whereas the weak exogeneity of the nominal exchange rate is tested in VAR II via

$$\alpha'_{i6} = 0 \quad i=l,2,3,...r \qquad (15)$$

The tests for various null hypotheses on the ECM weights are given in Johansen [/9<*W| and Johansen and Juselius *[1990]*. These tests are based on the likelihood-ratio (LR). We agree to denote the LR statistic corresponding to the null hypothesis of $\alpha_{ij}=0$ by lj , and that corresponding to the null hypothesis of $\alpha'_{ij}=0$ by !'j.

With this notation, the various LR statistics are in the India-Australia case:

1_1= 37.12 I_6=32.8O

I'_1= 82.10 I'_6= 16.44

Since each 1, and I, are a χ^2 with. 1 d.f.. the above values are all significant, so that

$$* \alpha_{i1} \neq 0, \quad \alpha'_{i1} \neq 0, \quad \alpha_{i6} \neq 0, \text{ and } \alpha'_{i6} \neq 0$$

Thus the trade balance is not exogenous to either of the 2 systems but the weak exogeneity of the real and nominal exchange rates is also ruled out.

Step 8: (Long run impact) An important consequence of the Johansen-Juselius method is that the matrix $\Pi = \alpha\beta'$ furnishes also the long-run impacts in the system. The long-run impact matrices for VAR l.and VAR II in the India-Australia case are presented in Tables 3 and 4 respectively. From Table 3, we can for example infer that a 1% change in,the real exchange rate produces an absolute change of 2.20 in the real trade balance (since the real exchange rate is measured in logs and the trade balance in original units). Similarly Table 4 shows a 1% change in the nominal exchange rate producing a change of 0.23 absolute units in the real trade balance. Such information can be of great use, when a country is contemplating a pronounced change in policy, such as a one-step devaluation, liberalisation of capital or exchange controls etc. Several other long-term impacts can, of course, be marked out from Tables 3 and 4 but most of the other variables are either outside the governments' purview or are policy variables designed primarily to address objectives other than the trade-balance (high powered money changes for example are rarely focussed on the explicit aim of influencing the trade balance). It is because the trade-balance issues are usually assigned to the realm of exchange-rate management that the impacts related to the exchange rate variables assume special significance.

B: OTHER RESULTS

It is not necessary to present results for the other cases in the same details as was done in the India-Australia case, since their derivation and interpretation is very similar. Accordingly, Table 5 presents only the basic features of the VAR models in all the nine cases. Two features are noteworthy in the table, (i) Firstly, the number of cointegrating vectors in most cases turns out to be one, which facilitates interpretation considerably. In the India-Sweden case, there are no cointegrating vectors, pointing to an absence of any long-term equilibrium relations in this case. The India-Sweden case is then dropped from the subsequent analysis, (ii) Secondly, except in two cases, the intercept term emerges to be unrestricted. Separate tables of significance are used for the restricted and unrestricted cases *{Osterwald- Lenum (1992)]*.

The actual cointegrating vectors are presented in Table 6 and likelihood-ratio statistics for tests for various null hypothesis are presented in Table 7. These null hypotheses have been selected with a view to furnishing evidence on H,: (i=l.2,.....6) our economic hypotheses of interest. (The economic hypotheses themselves may not be directly testable in the Johansen cointegrating framework but have to be adjudged by combining the evidence on the null hypotheses in Table 7 with that on the signs of the cointegrating vectors in Table 6)

Table 8 presents the qualitative evidence on the economic hypotheses of interest to us, and the long term impacts of the exchange rate variables on the trade balance are presented in Table 9.

One final point deserves to be noted regarding the weak exogeneity question. We tested the weak exogeneity of the trade-balance in both VAR I and VAR II (for all eight pairs of countries) and found that weak exogeneity was rejected in all cases. Similarly, there was outright rejection of weak exogeneity of the real exchange rate (in VAR I) and of the nominal exchange rate in (VAR II) for all pairs of countries studied. Since weak , exogeneity was rejected across the board, we thought there was no point in presenting all the LR statistics for the weak exogeneity hypotheses.

VI. CONCLUSIONS:

We are now in a position to gather our main conclusions . But before that, it may be well to emphasize what we believe are the major contributions of this study. Several of the hypotheses that we have examined , have been investigated empirically before (though not for India). But they have taken into account the aggregate trade balance, and the analysis is usually with single equation econometric models based on annual data. Our study by contrast breaks new ground by focusing on bilateral trade balances between India and its major trading partners. This shift of emphasis is important for, the factors influencing trade flows differ substantially across India's trading partners. The tariffs and quota restrictions for example (in the decade of the eighties before regional trading blocs arrived.on the scene) vary considerably between the European Countries and North America because of differences in the Multi-Fibre Agreement (MFA) provisions, Generalised Scheme of preferences (GSP) etc. Another major improvement effected by our study over its predecessors is the use of the multivariate cointegration framework *[Johan.sen (1988) and Johansen and Juselius (1990)]*. This framework permits the highlighting of long term equilibrium relationships and avoids several estimation and inferential problems which usually plague non-stationary data in single-equation models. Additionally, we have introduced greater degrees of freedom in our analysis by resorting to monthly (and occasionally quarterly) data rather than annual data as used in most earlier studies. It is hoped that these features imbue our conclusions with a greater degree of reliability as well as flexibility.

One of the major and robust conclusions of our study pertains to the effective role played by the exchange rate in influencing the trade balance. Both the real and nominal exchange rates enter all the cointegrating vectors with the correct sign (see Table 6). Further, the real exchange rate is significant in all cases except Canada (see Table 8, row pertaining to H,) and the nominal exchange rate in all cases except France (see Table 8, row H_2). Thus both the neo-classical viewpoint about the role played by the real exchange rate and the J-curve hypothesis about nominal depreciations derive unstinted support from our exercise. The 'Houthakker-Magee' hypothesis (H_3) is accepted for all the countries studied (except of course Sweden for which no long term analysis was possible owing to the absence of cointegrating relations). The hypothesis however merely predicates that an equiproportionate rise in domestic and foreign incomes does not leave the trade balance unaltered, but does not specify whether such a change affects the trade balance favourably or adversely. We find that for three of India's trading partners the net impact of such a change is adverse, whereas for the remaining five it is favourable, Hypothesis H_4 is concerned with capturing the impact on the trade balance of the income variables. A rise in foreign incomes provides a stimulus to exports and thereby contributes to an improved trade balance. This is the first part of our hypothesis viz, H_4(a). This hypothesis is rejected in a majority of cases (the exceptions being Germany and Japan). The rejection is probably attributable to the quota limitations faced by India's major exports (textiles and clothing) in these countries. But it could also arise because of the low value addition of some of India's traditional exports with purchasers switching over to higher value added goods from **India's** competitors as their (purchaser's) incomes rose. The second part of H_4 (viz. H_4(b)) considers the impact of a rise in domestic incomes. This rise increases imports via the conventional expenditure effect, but in the case of an LDC like India, exports face various supply bottlenecks, which may also be eased by the rise in domestic incomes. Economic theory does not predict which effect is likely to predominate but for the sake of specificity we set up the hypothesis as a rise in domestic incomes adversely affecting the trade balance (i.e. the import effect swamping the export effect). This hypothesis is accepted only for the Australian.case. In the case of U.K. and U.S.. the corresponding coefficient is insignificant but for the remaining five countries (i.e. Canada, France. Germany, Japan and Netherlands) a rise in India's incomes stimulates exports more than imports - a phenomenon underlining both the presence of import controls, (high tariffs and quota restrictions on several categories of imports especially consumer goods) as well as supply bottlenecks in the export sector.

The influence of monetary variables in the trade balance are sought to be encapsulated in the hypothesis H_5. On theoretical grounds, an expansionary monetary stance in a foreign country is reflected in an improvement in India's trade balance with that country <H,(a)) whereas a domestic money supply expansion is expected to produce the contrary effect (H_6(b)). Both components of the hypothesis get strong support from our exercise (see fable 8). Of the four countries which fail H_s(a), only France does so with a significant and wrong sign (the remaining three fail the hypothesis by virtue of insignificant coefficients) and in the case of H_5(b), only Canada, among the three rejections, exhibits a significant perverse effect. Thus, by and large, our results do indicate , an important role for monetary variables in influencing the trade balance.

The Orcutt hypothesis (H_6) is not strongly favoured by our analysis, For five out of the eight countries considered there seems to be no substantial difference between she impact of a nominal devaluation and of a relative price change on the trade balance.

A final word ought to be said about the results of our weak exogeneity tests. As mentioned earlier, weak exogeneity is rejected throughout for the three variables trade balance, nominal exchange rate and the real exchange rate. Taken in conjunction with the results of our hypothesis H, and H_2. this may be taken to imply that even **though** exchange rates (both real and nominal) can influence the trade balance **significantly,** there may be constraints in manipulating them freely as policy variables. The latter observation accords well with the experience of the Reserve Bank of India, which **has** found it a daunting task to effect deadbeat targeting of either the real or **the nominal** exchange rate of the Rupee.

Our study is certainly not without its limitations. Firstly, a significant portion of India's trade during the early eighties (about 23%) was with the Soviet and East European bloc. However, this trade was considerably out of alignment with market signal and would have been difficult to analyse with models of the type discussed here. Secondly, even within the **group** of non-Communist trading partners, our selection of countries is far from complete. A few important trading partners in Asia and **Europe** had to be omitted because **of** lack of availability **of** data **for the** relevant variables on a consistent time-series basis. (As mentioned earlier, the included group of countries accounted for 55 % **of** India's total trade and for 65 % of trade **with** the non-Communist world). Thirdly, our analysis does not permit reliable inferences about the trade possibilities in the post-1991 liberalization scenario, owing to a paucity of data points..

Subject to the above limitations, it is hoped that our analysis has satisfactorily worked out the testable implications **of** several interesting hypotheses and thereby contributed to some understanding of the web of complex issues enmeshing India's foreign trade sector.

REFERENCES

Ahluwalia, M.S. (1986): "Balance of payments adjustments in India, 1970-71 to 1983-84" World Development. Vol. 14, No.8, pp 937-962

Alexander, S.S., (1952): "Effects of devaluation on a trade balance" IMF Staff Papers. Vol. 2, pp 263-278

Banerjee, A., Dolado, J.J., Oalbraith, J.W. and Hendry, D.F. (l993):Cointegration. Error Correction and the Econometric Analysis of Non-Stationary Data. Oxford University Press.Oxford

Bahmani-Oskooee, M. (1986): "Determinants of international trade flows: The case of developing countries" Journal of Development Economics. Vol. 20. No.l,pp 107-123

Bamista, R.M. (1981): "Exchange Rate changes and LDC export preferences under generalised currency floating" Weltwirtschafliches Archiv Vol.117, No.3, pp 443-468

Dornbusch, R. (1973): "Devaluation, money and non-traded goods" American Economic Review. Vol. 63, No.5,pp87l-880

Edwards, S. (1985): "Stabilisation with liberalisation and evaluation often years of experiment with free market policies - 1973-1983" Economic Development and Cultural Change , Vol. 32, No.I, pp 223-254

Edwards, S. (1995): Capital Controls, Exchange rates and Monetary Policy in the World. Cambridge University Press, Cambridge

Engle, R.F., D.F.Hendry and J.F. Richard (1983):" Exogeneity" Econometrica. Vol.51, No.2, pp 227-304

Engle, R.F. and C.W.J. Granger (1987): "Cointegration and error correction: Representation, estimation and testing" Econometrica Vol.55, No.2, pp 251 -276

Fleming, M..J. (1962): "Domestic financial policies under fixed and under floating exchange rates" IMF Staff Papers Vol. 9, No.3, pp 369-380

Frenkcl, J.A.and C.A. Rodriguez (1975): "Portfolio equilibrium and the balance of payments: A monetary approach" American Economic Review. Vol. 65, No.4, pp 674-688

Goldstein, M. and M.S.Khan (1988): " Income and price effects in foreign trade" in R.W.Jones a»id P.B.Kenen (ed.) Handbook of International Economics, Vol. 2, North-Holland Pub. Co., Amsterdam

Grubel, H.G. (1976): Domestic Origins of the Monetary Approach to the balance of payment,essay in tnternational finance,no 117, Princeton University.

Himarios. I) (1985): 'The effects of devaluation on the trade balance: A critical view and re-examination of Miles' 'now results'" , Journal of International, Money and. Finance. Vol 4. No.4. pp 553-563

*

Hooper, P. (1980) "The stability of income and price elasticities in U.S. Trade 1957-1977" International Finance Division Paper No I 19. Board of Governors of the Federal Reserve System

Houthakker, IIS. and P. Magee (1969): "Income and price elasticities in world trade", the_Re.yjew_pf Economics and Statistics. Vol. 51, No.2. pp 111-128

International Monetary Fund – Direction of trade Statistics . (various issues)

International Monetary Fund - Internationa! Financial stastics. . (various issues)

Jalan, B. (ed.) (1992): The Indian economy problem ..and.. Prospects.. Penguin Rooks, New Delhi, India

Johansen, S. (1988): "Statistical analysis of cointegrating vectors", Journal of economic dynamic and Control. Vol. 12, No. 2/3 , pp 23 1-254

* i

Johansen, S. and Juselius, K. (1990): "Maximum likelihood estimation and inference on cointegration - with applications to the demand for money" Oxford Bulletin of Economics and Statistics, Vol. 52. No 2. pp 169-210

Johnson, 11.(1. (1963): "Recent developments in monetary theory" Indian Economic Review. Vol 6, No 3, pp 29-69

Johnson, HG.(j (1973): "The monetary approach to the balance of payments" in M Connoly and A. Swoboda (ed.). International Trade and Money. univ. of Toronto Press, Toronto

Junz, H. and R. Rhomberg (1973) "Price competitiveness in export trade among industrial countries" American Economic Review. Papers and Proceedings, Vol. 63, No.2, pp. 412-418

Krueger. A.O (1978): Foreign Trade, Regimes and Economic Development: Liberalization Mempts and Consequences. Ballinger Publishing Co . Cambridge

Krueger, A.O. (1983): Trade and Employment in Development country} Vol. 3, Univ. of Chicago Press. Chicago

Marquez, J. (1989): "Income and price elasticities of foreign trade flows: I'conomeinc estimation and analysis of the U.S. trade deficit" in L.R.Klein and J. Marque/ (ed). Economics in Jlicwjs'juii! Practice : An Eclectic Approach. Kluwer Academic Publishers, Amsterdam

Meade, J.I-L (1951): The Balance qf Payments. Oxford University Press, Oxford

Metzler, L. (1948): "The Theory of International trade" in Il.S.KIIts (ed.) A Survey pf Contemporary Economic, Vol. !, Blakiston, Philadelphia

Miles, M.A. (1979): "The effects of devaluation on the trade balance and the balance of payments; Some new results". Journal of Political Economy. Vol. 8?, No.3, pp 600-620

Mundell, R.A. (1962): "The appropriate use of monetary and fiscal policy for internal and external stability" IMF Staff Papers Vol. °, No. I, pp 70-79

Orcutt. (j.H. (1950): "Measurement of price elasticities in international trade"; Review of Economics ■ and_Statistics. Vol. 32, No.2, pp 1 I M32

Osterwald-l.enum, M. (1992): "A note with fractiles of the asymptotic distribution of the maximum likelihood cointegration rank test statistics: lour cases" Oxford Bulletin of Economic and Statistics, Vol. 54, No.4, pp 461-72

. Besaran, M.H. and B. Pesaran (1991): Microsoft Q: An Interactive Econometric Software Package. Oxford University Press, Oxford.

Rangarajan C (1990): "The Balance of payments scenario" Seventh G.L. Mehta Memorial Lecture, The Indian Institute of Technology. Mumbai.

Robinson, J. (1947): "The foreign exchanges" in H.S.Ellis and I .A. Metzler (ed.) Reading in.the Theory of International Trade, Allen and Unwin, Philadelphia Sims C.A (1980): "Macroeconomics and reality" E£QnLQmetric3 Vol 48, No.l, pp 1-48

Sodersten, B. (1990): International Economic. Macmillan. London

Wilson, J. F. and W. R. Tackacs (1979): "Differential responses to price and exchange rate influences in the foreign trade of selected industrial countries" Review of Economics And Statistics Vol. 61, No.2, pp 267-279

TABLE I A

λ_{max} statistic for VAR I (India-Australia)

Null Hypothesis	Alternate Hypothesis	λ_{max}	95% critical value
r - 0	r=l	39.6197	39.3720
r≤ 1	r=2	21.7245	33.4610
r≤2	r=3	17.8584	27.0670
i ≤3	r=4	11.5315	20.9670
r≤4	r=5	10.0391	14.0690
r≤5	r=6	0.2182	3.7620

TABLE 1 B

J_T statistic for VAR I (India-Australia)

Null Hypothesis	Alternate Hypothesis	J_T	95% critical value
r = 0	r ≥ 1	100.3914	94.1550
r≤ 1	r≥ 2	61.3717	68.5240
r≤2	r≥ 3	39.6472	47.2100
r≤3	r≥ 4	21.7888	29.6800
r≤4	r≥ 5	10.2573	15.4100
r≤5	r= 6	0.2182	3.7620

TABLE 2A

λ_{max} statistic for VAR II (India-Australia)

Null Hypothesis	Alternate Hypothesis	"'max	95% critics! value
r = 0	r = 1	50.4091	45.2770
r ≤l	r= 2	36.5258	39.3720
r ≤2	r= 3	27.3209	33.4610
r ≤3	r= 4	17.9372	27.0670
r ≤4	r= 5	11.0922	20.9670
r ≤5	r= 6	10.3090	14.0690
r ≤6	r= 7	1.7608	3.7620

a

TABLE 2B

J_T statistic for VAR II (India-Australia)

Null Hypothesis	**Alternate Hypothesis**	**J_T**	**95% critical value**
r = 0	**r> 1**	155.3551	124 2430
r ≤l	**r ≥ 2**	92.9460	94.1550
r≤2	**r ≥ 3**	68.4202	68.5240
r≤3	**r ≥ 4**	41.0992	47.2100
r≤4	**r ≥ 5**	23.1620	29.6800
r≤5	**r ≥ 6**	12.0698	15.4100
r≤6	**r = 7**	1.7608	3.7620

TABLE 3

Long run impact Matrix 11 for VAR I (India-Australia)

	X,	**X_2**	**X,**	**X_4**	**X_5**	**X_6**
X,	-1.2464	-1.7629	0.3547	0.2408	0.0926	2.2026
X_2X_3	0.0849 -	0.1202	-0.0242	-0.0164	-0.0063	-0.0159
X_4	-0.0178	-0.0253	0.0051	0.0035	0.0013	0.0033
	0.0161	0.0228	-0.0046	-0.0031	-0.0012	-0.0030
X_s	0.0019	0.0028	-0.0005	-0.0004	-0.0001	-0.0003
X_6	0.0319	0.0451	-0.0091	-0.0062	-0.0024	-0.0059

Note: In the above matrix the (ij)' entry shows the impact on $X_($ of a 1% change in Xj. The impact is absolute if $X_}$ is measured in original units and in % terms if $X_($ is in logs

TABLE 4

Long run impact Matrix 11 for VAR I! (India-Australia)

	X_1	X_2	Xj	X_4	X_5	X_6	X_7
X.	-0.6183	-4.0216	-0.5487	-0.9682	0.5013	0.2332	2.3691
X_2	0.0535	0.3482	0.0475	0.0838	-0.0433	-0.1910	-0.2051
X3	-0.0907	-0.5898	-0.0805	-0.1420	0.0735	0.3236	0.3474
X4	-0.0207	-0.1344	-0.0183	-0.0324	0.0166	0.0737	0.0792
X5	0.0375	0.2439	0.0332	0.0587	-0.0304	-0,1339	-0.1437
X_6	-0.0255	-0.1658	-0.0226	-0.0399	0.0207	0.0909	0.0977
X_7	0.0393	0.2558	0.0349	0.0616	-0.0319	-0.1404	-0.1508

Note: In the above matrix the $(i,j)^{th}$ entry shows the impact on X; of a 1% change in Xj.. The impact is absolute if X, is measured in original units and in.% terms **if Xj** is **in** logs

TABLE 5

Summary Features Of Var Models

Country Pair	Model Type	Data Frequency	Lag length	Treatment of intercept	Number of cointegrating vectors r
India	Var **I**	Quarterly	**3**	Unrestricted	r = **1**
Australia	Var **II**	Quarterly	**3**	Unrestricted	r = **1**
India	Var **I**	Monthly	**4**	Restricted	r = **1**
Canada	Var 11	Monthly	**3**	Unrestricted	r = **1**
India	Var **I**	Quarterly	**3**	Unrestricted	r = **I**
France	Var **II**	Quarterly	**2**	Unrestricted	r = **1**
India	Var **I**	Monthly	**3**	Unrestricted	**r= 1**
Germany	Var **II**	Monthly	**3**	Unrestricted	**r = 2**
India	Var **I**	Monthly	**2**	Unrestricted	**r= 1**
Japan	Var **II**	Monthly	**2**	Unrestricted	r = **1**
India	Var **I**	Monthly	**4**	Restricted	r = **1**
Netherlands	Var **II**	Monthly	**3**	Unrestricted	**r= 1**
India	**Var I**	Monthly	**3**	Unrestricted	r = **0**
Sweden	Var 11	Monthly	**3**	Unrestricted	r = **0**
India - UK	Var **I**	Quarterly	**2**	Unrestricted	**r= i**
	Var **11**	Quarterly	**1**	Unrestricted	r = **1**
India - US	**Var I**	Monthly	**4**	Unrestricted	**r =1**
	Var **11**	Monthly	**3**	Unrestricted	r = **1**

TABLE 6

Cointegrating vectors for VAR I and VAR II

Country - Pair	Model Type	Number of cointegrating Vectors	Cointegrating vectors (normalised on **the** trade balance)
India - Australia	VarI Var II	1 1	P, =|-l..2846.-l 4144.0 1871.0 |932.OO743| ^ P[=[-1.-0.8874,-6.5038.3.8314.-1.5658,0.8107,3.56851
India - Canada	VarI Var II	1 1	P, =[-1,0 8770.-0 5876. -1.0656,3.2152.0 2587); intercept +4.1759 ^ P | =|-1.0.3125.-0.9645,0.8505,1.4772,0.4617.0.58611
India - France	VarI Var II	1 1	^ t P, =1-1.-15 3853.196 0921.-2 2837, -162.6952.21 9763| ^ P| =[-1.36 8434.57687,-35.3357. -20.5732.6 6256,10.9939J
India - Germany	VarI Var II	1 2	^ P , =|-1.3 2477.-12 77| 3,-2 5966.8 9064,4.3176| ^ P| =|-l.l 8357,17.8628,-6.1417,14.1771,18 7442,13.2675! ^ Pj 1-1,3.2617,1.9975,-4.5476.0.1183,3.5647,1.3795]
India-Japan	VarI Var II	1 1	^ P, 1-1,326.2957,795 5^33 -2027.1,1431 2.101.3936| ^ P| =|-l,333 11X9,804 1608.-2177.2,1627.1,104 7768.147 5062]
India - . Netherlands	VarI Var II	1 1	^ P, =|-l, -2.2815,-7.1322. V2590. -0.1852,0.78151; intercept 1410744 ^ P| =1-1.0.8728,-2.7899. -1.8867.1.4814.2.0636.1.6117J
India - UK	VarI Var II	1 1	P , =1-1.8.3331,4 3390.-8.9502.3 2043.0 32I5| ^ PI =1-1.2.5110.2.1796. -3.6694.3.9578,1.2630,4.4975]
India - US	VarI Var II	1 1	^ P , = [-1.3.6155.1.5638.-7.2095.7.8805.3 O774| ^ PI =[-1,1.4662.3.5810. -0.5576,2.8099,2.8220,6.7020]

^ t

Note: The India-Sweden case does not figure above, since there are no cointegrating vectors

Table 4

LR statistics for **Null** hypotheses **on** elements of β_i and β'_i

Null Hypothesis

Country Pair	Pi6=0	Pi6=0	P'i2 + P',V=0	P'*=Q	P'i2=0	p'i5-0	P'M=0	P'*=P' 17
India - Australia	16.21**	7.74** ft	9.81**	2.09	5.86*	0.93	1.66	7.82*
India - Canada	0.13	7.031**	8.63**	18.64**	5.16*	28.61**	25.03**	1.08
India - France	5.78*	3.16	18.04**	0.07	19.53**	4.48*	19.52**	8.26**
India - Germany	18.76**	*11.42***	*16.83***	*6.24**	*7.42**	*34.08***	*7.74**	*2.13*
India- Japan	4.69*	4.82*	34.73**	7.93**	7.69**	14.83**	18 12**	0.88
India - Netherlands	21.55**	8.24**	14.91**	2.85	4.04*	3.72	6.94**	1.47
India - UK	20.78**	3.63	16.29**	3.13	2.25	12.94**	4.21*	2.65
India - US	31.79**	15.89**	25.43**	2.74	0.94	0.57	0.0!	14.73**

Note:

1) (*) and (**) denote significance at 5% and 1% levels respectively

2) All LR statistics are distributed as $x,^2$ with 1 d.f. except the statistics on **VAR** II in the India-Germany case which are distributed as $x^?$ with 2 d.f.. These latter statistics have been italicized for convenience.

\

TABLE 8

Qualitative Summary Of Main Results

Hypothesis	India's trading partners for which:	
	Hypothesis is not rejected	**Hypothesis is rejected**
H,	Australia, France, Germany, Japan, Netherlands, U.K., U.S.	Canada
H_2	Australia, Canada, Germany, Japan, Netherlands, U.K., U.S.	France
H_3	Adverse - Australia. Canada and Netherlands Favourable - France. Germany. Japan, U.K., U.S.	Nil
H_4 (a)	Germany, Japan	Australia, France, Netherlands, U.K., U.S., Canada
(b)	Australia	Canada, France, Germany, U.K., U.S., Japan, Netherlands
H, (a)	Canada, Germany. Japan, U.K.	Australia, Netherlands, U.S., France
(b)	France, Germany, Japan, Netherlands, U.K.	Australia, U.S., Canada
H_6	Australia, France, U.S.	Canada, Germany, Japan, Netherlands, U.K.

Notes:

1I) For a description of the hypotheses, see text (Section 2)

(2) For H3we distinguish between the cases where an equiproportionate rise in domestic and foreign incomes affects the trade balance adversely and favourably

Table 9

Long Run Impact Of Exchange Rate Variables On The Real Trade Balance

Country-Pair	Real Exchange Rate	Nominal Exchange Rate
India-Australia	2.20	0.23
India-Canada	0.29	0.01
India-France	2.16	0.35
India-Germany	2.64	0.28
India-Japan	0.0056	0.000027
India-Netherlands	1.24	0.06
India-UK	1.22	0.36
India-US	1.02	0.45

Note:

(1) The figures show the absolute changes in the real bilateral trade balance corresponding to a 1% change in the (bilateral) exchange rate variable

(2) The Table is based on the long-run impact matrices FI (of the type presented in Tables 3 and 4 for the India-Australia case)