

Foreign Demand, Investment And Trade Balance: The Case Of Australia

Jean-François Hoarau, (E-mail: jean-francois.hoarau@voila.fr), University of La Reunion, France

Alain Nurbel, (E-mail: nurbel@univ-reunion.fr), University of La Reunion, France

Nelson Latchimy, (E-mail: nelson.latchimy@netcourrier.com), University of La Reunion, France

Abstract

This paper aims at analysing the relation between real trade balance and foreign demand in the case of a small opened economy, which highly depends upon the rest of the world for productive capital. Theoretical analysis allows us to bring forth a kind of “J-curve” effect. Indeed, when foreign demand for domestic goods increases, the country is to import in a first time in order to improve its productive capacities, resulting in worsening trade balance. However, in a second time, once the cumulated capital inventory became sufficient, the trade balance improves under the pressure of domestic exports high growth. The empirical analysis based on Australia from 1982 (1) to 2001 (1) supports this theory. We show there are negative short term and positive long term elasticities.

1. Introduction

Analysing how exchange rate impacts on trade balance still belongs to an exciting topic of economic literature. Recent studies on Asian economies (Wilson [2001]; Wilson and Tat [2001]; Baharumshah [2001]) still pay attention to Marshall-Lerner-Robinson theorem validity, theorem which typifies the conventional theory. Such an exercise is highly useful under the angle of economic policy, in the sense that it allows to know the extent to which exchange rate is an efficient tool in order to sweep away external trade deficit.

The Marshall-Lerner-Robinson theorem is based on the law of supply and demand. National currency depreciation is to result in decreasing export prices in foreign currency and in increasing import prices. These two opposite movements in external prices are expected to entail exports growth and imports fall respectively. The theorem argues that trade balance improves as soon as the sum of exports and imports elasticities pertaining to exchange rate becomes superior to one.

However, the trajectory trade balance follows once national currency depreciation occurred is represented in a more realistic way by a J-curve. Indeed, national currency depreciation worsens terms of trade in a first period, widening the external trade deficit, insofar as there are in particular several contracts based on the old exchange rate. Only in a second period are agents aware of export price competitiveness gains and import price competitiveness losses, resulting in improving trade balance. The validity of the theorem is likely to be slashed when exporters and importers choose to improve their profitability through “pricing-to-market” strategies instead of improving their market shares positions (Irandoust [2000]; Kikuchi and Sumner [2002]) or when international trade is dominated by non-price competitiveness factors such as quality, technology (Kaldor [1978], Fagerberg [1988]; Amendola, Dosi and Papagani [1993]).

However, as the Marshall-Lerner-Robinson theorem only focuses on the terms of trade channel, it underestimates the real impact foreign demand exerts on trade balance. Indeed, within this theorem, foreign demand

Readers with comments or questions are encouraged to contact the authors via email.

is expected to have a strictly positive effect on trade balance: growth in foreign demand makes outlets more available for domestic products and consequently improves trade balance.

In fact, it is relevant to assume that there is a J-curve effect exclusively ascribed to foreign demand through the national productive capacities channel. Indeed, considering a country with weak productive investment, growth in foreign demand which is synonymous with more outlets for domestic products causes productive investment profitability to increase. So, in a first period, foreign demand negatively impacts on trade balance. In a second period, once the country succeeded in meeting its productive investment needs, these one are no longer imported, while domestic exports are in position to jump in order to meet foreign demand growth. As a result, trade balance improves.

It is this J-curve effect strictly ascribed to foreign demand we aim at testing for Australia from 1982 to 2001. We choose Australia to test our theory because it is an economy which is structurally opened for its capital needs. Moreover, homogenous macroeconomic variables are available for this country. The results we get support our theory, showing that real trade balance elasticities, with regard to foreign demand, are negative in the short term and positive in the long term.

The rest of the paper is structured as follows. After we have expounded the partial equilibrium model our analysis lean on, we specify the empirical model and make the necessary preliminary tests. Then, we will be in position to test the model, before we emphasise the main remarks.

2. A Partial Equilibrium Model

A simple way to analyse how foreign demand variations impact on trade balance is to implement a trade elasticities method within a partial equilibrium model (Agenor [2000]). The reduced form of trade balance can be written as follows:

$$b=x(e,y_w)-m(e,c,i) \tag{1}$$

$$\text{with } \frac{\partial x}{\partial e}>0; \frac{\partial x}{\partial y_w}>0 \text{ and } \frac{\partial m}{\partial e}<0; \frac{\partial m}{\partial c}>0; \frac{\partial m}{\partial i}>0$$

The variables x,m,e,c et i are respectively export volumes, import volumes, real exchange rate¹, domestic consumption and domestic investment. We get the traditional result by taking the total differential for (1), resulting in:

$$db=dx-dm=\frac{dx}{de}de+\frac{dx}{dy_w}dy_w-\frac{dm}{de}de-\frac{dm}{dc}dc-\frac{dm}{di}di \tag{2}$$

Dividing (2) by dy_w , we obtain:

$$\frac{db}{dy_w}=\frac{dx}{dy_w}>0 \tag{3}$$

This is strictly positive. Indeed, growth in foreign demand stimulates domestic exports, resulting in improving trade balance, everything being equals. As a result, according to the conventional analysis, a trade (deficit) surplus would originate in favourable (unfavourable) demand conditions abroad.

Nevertheless, this result does not tell the whole story, insofar as it overlooks the extent to which foreign demand impacts on domestic imports through the investment channel. Consequently, in order to sharpen the analy-

¹ It is uncertain real exchange rate, namely a growth in e means real depreciation. Moreover, we assume that the Marshall-Lerner-Robinson condition is fulfilled, namely a real depreciation results in a trade balance improvement.

sis, we are to assume the following hypothesis: growth in foreign demand, making outlets more available for domestic products, calls local firms to invest more². Then, we have the following relation:

$$i=i(y_w) \quad \text{with } \frac{\partial i}{\partial y_w} > 0 \tag{4}$$

Replacing (4) in (1) gives:

$$b=x(e, y_w)-m(e, c, i(y_w)) \quad \text{with } \frac{\partial m}{\partial y_w} > 0 \tag{5}$$

So, foreign demand exerts two opposite effects on trade balance. In the first effect, which pertains to the conventional theory, growth in foreign demand y^w causes exports to increase, resulting in improving trade balance. In the second effect, the same growth in foreign demand enhances domestic investment, so imports of these one increase and trade balance worsens. Consequently, the total effect foreign demand exerts on trade balance is ambiguous.

In order to appraise how foreign demand really impacts on trade balance, we lean on the partial equilibrium method. By applying total differential to (5), we get:

$$db = \frac{dx}{de} de + \frac{dx}{dy_w} dy_w - \left[\frac{dm}{de} de + \frac{dm}{dc} dc + \frac{dm}{di} \frac{di}{dy_w} dy_w \right] \tag{6}$$

Dividing (6) par dy_w , we have:

$$\frac{db}{dy_w} = \frac{dx}{dy_w} - \frac{dm}{di} \frac{di}{dy_w} \tag{7}$$

which can be written as follows:

$$\frac{db}{dy_w} = \frac{x}{y_w} \left[\frac{dx}{dy_w} \frac{y_w}{x} - \frac{dm}{di} \frac{di}{dy_w} \frac{y_w}{x} \right] \tag{8}$$

Then, assuming that external trade is initially at equilibrium such that $x=m$, we get:

$$\frac{db}{dy_w} = \frac{x}{y_w} \left[\frac{dx}{dy_w} \frac{y_w}{x} - \frac{dm}{di} \frac{di}{dy_w} \frac{y_w}{m} \right] \tag{9}$$

which can be framed in another way:

$$\frac{db}{dy_w} = \frac{x}{y_w} \left[\frac{dx}{dy_w} \frac{y_w}{x} - \frac{dm}{di} \frac{i}{m} \frac{di}{dy_w} \frac{y_w}{i} \right] \tag{10}$$

Finally, if we term domestic exports elasticity pertaining to foreign demand by $\eta_{x/y_w} = \frac{dx}{dy_w} \frac{y_w}{x}$, domestic imports

² Productive investment growth occurs because the country is weakly endowed with it and is not in position to meet spontaneously the new external demand.

elasticity pertaining to domestic investment by $\eta_{m/i} = \frac{dm}{di} \frac{i}{m}$ and domestic investment elasticity pertaining to foreign demand by $\eta_{i/y_w} = \frac{di}{dy_w} \frac{y_w}{i}$, we get:

$$\frac{db}{dy_w} = \frac{x}{y_w} [\eta_{x/y_w} - \eta_{m/i} \cdot \eta_{i/y_w}] \tag{11}$$

Then, the final expression can be framed as follows:

$$db = \frac{dy_w}{y_w} x [\eta_{x/y_w} - \eta_{m/i} \cdot \eta_{i/y_w}] \tag{12}$$

We can conclude that trade balance improves when foreign demand increases, namely $b > 0$, under the following condition:

$$\eta_{x/y_w} - \eta_{m/i} \cdot \eta_{i/y_w} > 0 \Rightarrow \eta_{m/i} < \frac{\eta_{x/y_w}}{\eta_{i/y_w}} \tag{13}$$

In other words, the extent to which the national economy is dependent upon the rest of the world for its productive capital needs must be inferior to the ration between export and import elasticities pertaining to foreign demand. Given that Australia is constrained to strongly imports productive capital, this condition is not expected to hold.

In fact, we think the relation between b and y^w rests on a kind of J-curve effect (Figure 1). We bring forth this effect by assuming that the country faces a growth in y^w , but do not possess the necessary capital inventory to meet this shock. In a first time, the country must increase its productive capacities so that domestic products can be made available for the new external demand. Given that the country highly depends on the rest of the world for its capital needs, domestic imports increase and trade balance worsens in the short run. In a second time, once sufficient capital inventory has been cumulated, domestic exports are bound to adjust to foreign demand, resulting in improving trade balance in the long run.

3. Specifying An Empirical Model And Preliminary Tests

The empirical analysis aims at testing the relation between real trade balance and foreign demand for Australia³. We use a quartely data sample for the 1982(1) – 2001(1) period.

3.1 The Vector Error Correction Model

Given our theoretical issue, namely growth in foreign demand increases productive capital in a first time in order to meet domestic exports boom, it is necessary to implement a method which allows to test both short and long run real trade balance elasticities pertaining to foreign demand. We choose an econometric method based on cointegration and error correction model tools (Engle and Granger [1986]; Johansen [1991]). As a result, we simultaneously appraise a long run relation and a short run relation given by the two following equations (14) and (15) respectively:

$$b_t = a_1 y_t^w + a_2 c_t + a_3 e_t + \varepsilon_{1t} \tag{14}$$

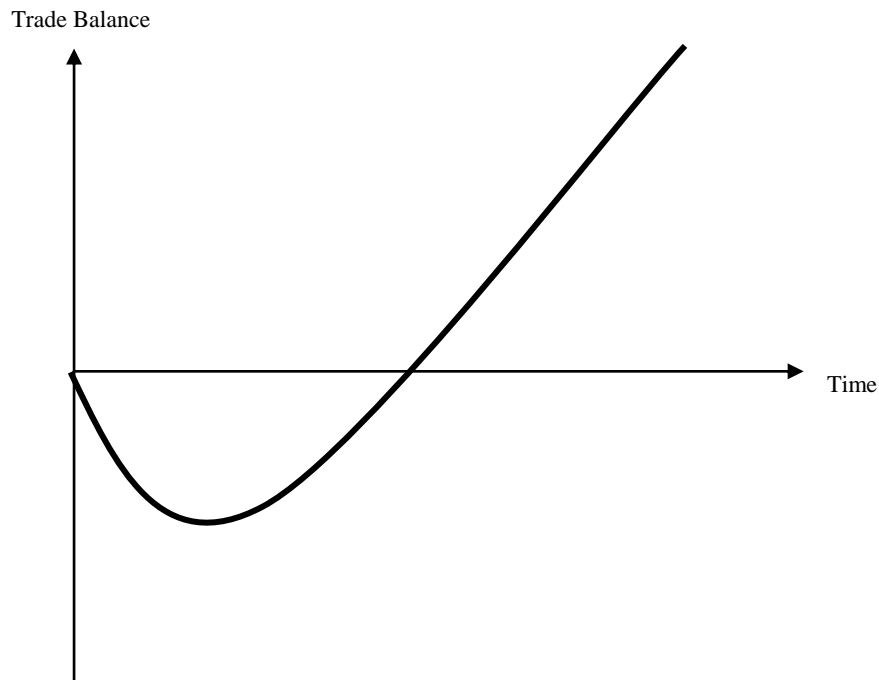
$$\Delta b_t = \alpha (b_{t-1} - a_1 y_{t-1}^w - a_2 c_{t-1} - a_3 e_{t-1}) + \sum_{j=1}^p \mu_j \Delta b_{t-j} + \sum_{j=0}^p \gamma_j \Delta y_{t-j}^w + \sum_{j=0}^p \psi_j \Delta c_{t-j} + \sum_{j=0}^p \tau_j \Delta e_{t-j} + \varepsilon_{2t} \tag{15}$$

³ The data which are used are expounded in annex (A).

with ε_{1t} and ε_{2t} being two random variable identically and independently distributed.

The test of analysis is based on two main expected results. First, there must be a positive relation between real trade balance and foreign demand in the long run, namely $a_1 < 0$. Second, there must be in the short run a kind of J-curve effect, namely $\gamma_j < 0$ for $j \in]1, q]$ and $\gamma_j > 0$ for $j \in]q, p]$ with $q < p$.

Figure 1 – Foreign Demand Theoretical Effect On Trade Balance



3.2 Preliminary Tests

According to definition, there is a long-term relation, namely cointegration relation between several variables, when these last one show the same integration order. So, in the first step of our work, we are to test each variable individually in order to appraise their integration order by means of unit root Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests⁴.

Tables 1 and 2 allow us to contend that, first, all variables are non-stationary in level, second, the unit root hypothesis is to be swept away for all first differences variables. Then we can conclude that real trade balance, foreign demand, private demand and real effective exchange rate are integrated at the first order. As a result, it seems that there is really a cointegration or long-term relation between these variables⁵.

In order to ascertain there is a cointegration relation, we make the Johansen maximum likelihood estimation on the VAR model⁶ comprising the endogenous variables b , c , y^w and e .

⁴ To know more about these tests, see Enders [1995].

⁵ This intuition is strengthened by the figures analysis (see annex (C)).

⁶ The optimum time lag number is appraised by means of the Akaike criterion minimisation (AIC).

First, we test the hypothesis according to which the cointegration vectors number (r) is equal to zero, namely the hypothesis $H_0 : r = 0$ versus the alternative hypothesis $H_1 : r > 0$. Given the Johansen statistic (59,09) and critic values at 1% (54,46) and at 5% (47,21), it is necessary to reject the H_0 null hypothesis. As a result, there is at least a cointegration relation. Second, we test the hypothesis: $H_0 : r = 1$ versus the alternative hypothesis $H_1 : r > 1$. The Johansen statistic (15,58) became inferior to the critic values at 1% (35,65) and at 5% (29,68). Given these results, we are able to conclude there is only one cointegration relation between real trade balance, foreign demand, private demand and real effective exchange rate.

4. Testing The Model

As there is a cointegration relation among the variables, we are to test⁷ a vector error correction model by means of the maximum likelihood method without any exogeneity limitations⁸.

The long-term model depicted through Table 4 is consistent with the theory. Indeed, coefficients have got the good signs and are strongly significant for each variable. So, real trade balance negatively depends upon private domestic demand and real effective exchange rate, and positively depends upon foreign demand. This result is consistent with the first part of our intuition. In the long run, given that the country has cumulated the necessary productive capital, foreign demand mainly impacts on exports and enhances trade balance.

Table 1 – Unit Root Tests For Level Variables

Variables	Tests	Statistics
Trade Balance (b)	ADF	-2,5998 (-3,5176)
	PP	-3,6573 (-3,5176)
Foreign Demand (y^w)	ADF	-0,5813 (-3,5164)
	PP	-0,4431 (-3,5164)
National Private Demand (c)	ADF	0,3417 (-3,5164)
	PP	0,5651 (-3,5164)
Real Effective Exchange Rate (e)	ADF	-2,2534 (-3,5164)
	PP	-2,2765 (-3,5164)

All variables, except b, are written in log. Tests are done for 1982(1)-2001(1) period, comprise a constant and a three period maximum time lag. In brackets lie the critical values based on MacKinnon (1994) for 1% rejection threshold. Tests are done by means of Eviews 3.1. Software.

Table 2 – Unit Root Tests For First Differences Variables

Variables	Tests	Statistics
Trade Balance (b)	ADF	-4,3206 (-3,5176)

⁷ The whole results are reported in annex (B).

⁸ As we do not know the accurate structure of the Australian economy, we assume that all variables are endogenous.

	PP	-13,6113 (-3,5176)
Foreign Demand (y^w)	ADF	-3,7603 (-3,5164)
	PP	-8,0297 (-3,5164)
National Private Demand (c)	ADF	-4,8405 (-3,5164)
	PP	-6,5446 (-3,5164)
Real Effective Exchange Rate (e)	ADF	-4,3548 (-3,5164)
	PP	-7,8387 (-3,5164)

All variables, except b, are written in log. Tests are done for 1982(1)-2001(1) period, comprise a constant and a three period maximum time lag. In brackets lie the critical values based on MacKinnon (1994) for 1% rejection threshold. Tests are done by means of Eviews 3.1. software.

Table 3 – Johansen Cointegration Test

Eigen-value	Likelihood ratio	5% critical value	1% critical value	Hypothesised No of CE(s)
0,435901	59,09883	47,21	54,46	None**
0,134456	15,58691	29,68	35,65	At most 1
0,058289	4,612701	15,41	20,04	At most 2
0,000636	0,048361	3,76	6,65	At most 3

All variables, except b, are written in log. Tests are done for 1982(1)-2001(1) period, comprise a constant and a three period maximum time lag. In brackets lie the critical values based on MacKinnon (1994) for 1% rejection threshold. Tests are done by means of Eviews 3.1. Software. One star means a 5% validity level, two stars 1% validity level. Tests are done by means of Eviews 3.1. Software.

Table 4 – The Long Run Model

Variables	Coefficient	t-statistic
National private demand (c)	-1,45	9,45*
Foreign demand (y^w)	1,58	-8,63*
Real effective exchange rate (e)	-0,46	8,63*

One star means the test is significant at 5% threshold. Results are obtained through Eviews 3.1. software.

Table 5 – The Short Run Model Pertaining To Foreign Demand

Time lag	1	2	3	4	5	6	7	8
Coefficient	-3,007	-3,951	-4,821	-1,240	-0,018	0,876	0,501	1,109
t-statistic	-2,892*	-2,892*	-3,792*	-0,902	-0,015	0,797	0,489	1,114

One star means the test is significant at 5% threshold. Results are obtained through Eviews 3.1. Software.

The short term model provides rich lessons too. We particularly focus on coefficients pertaining to foreign demand variations and given by table (5). Once again, the results are good and consistent with those expected. Indeed, we notice negative and significant coefficients for the first periods, next positive coefficients.

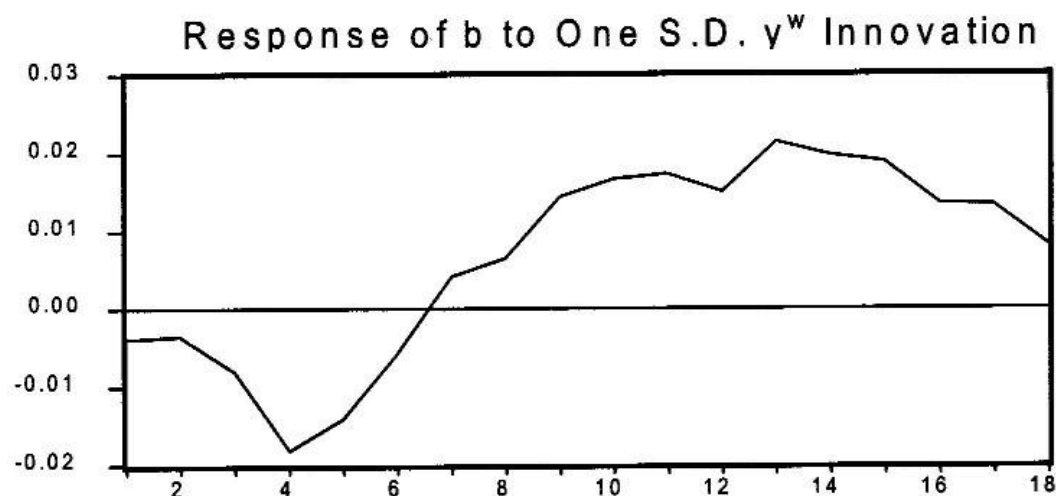
Moreover, the impulse function (Figure 2) proves right that a positive shock on foreign demand initially worsens real trade balance. It is only after six quarterlies, namely one and half year, real trade balance improves. So, we put really forward a kind of J-curve effect strictly exclusively ascribed to foreign demand.

5. Concluding Remarks

The Marshall-Lerner-Robinson theorem considered as the conventional theory dealing with the relation between trade balance and exchange rate emphasises the terms of trade variation channel. So, within this theory, the


J-curve, which is the trajectory commonly accepted as depicting how trade balance varies, results from two successive stages ascribed to terms of trade gains and losses respectively. Within this theory, foreign demand is thought to only positively impacts on trade balance, as it makes more outlets available for domestic products.

Figure 2



Source : les auteurs

In our paper, we test for Australia between 1982 and 2001 the theory according to which there is a kind of J-curve effect exclusively related to foreign demand through the national productive capacities channel. Indeed, in the case of a country with low productive investment, growth in foreign demand synonymous with more outlets available for domestic products, causes productive investment profitability to increase and productive investment imports to jump in a first time. In a second time, as the country succeeded in improving its productive investment inventory, it is in position to meet foreign demand growth for domestic exports. As a result, productive investment imports fall, while domestic exports jump, these two movements resulting in improving the trade balance. The results we get for Australia strongly support the theory according to which there are negative trade balance elasticities pertaining to foreign demand in the short term and positive trade balance elasticities pertaining to foreign demand in the long term.

However, in our paper, we assume that foreign demand is an exogenous variable. We do not pay any attention to factors which may cause it to increase. In order to sharpen our analysis, it is highly relevant to ascribe growth in foreign demand to export price competitiveness gains following the national currency depreciation. Consequently, the J-curve would result from two kind of J-curve effects: i) one effect translating terms of trade variation, with a first stage with terms of trade worsening and trade balance worsening and a second stage with terms of trade improving and trade balance enhancing; ii) another effect translating how growth in foreign demand impacts on trade balance, with a first stage where productive capital imports jump in order to improve the national capacities inventory, so worsening the trade balance, a second stage where domestic exports jump as export price competitiveness increases following the national currency depreciation and as the country reached the necessary capital inventory. When a country is weakly endowed with productive capital, the phase where trade balance deficit widens because of terms of trade deterioration is longer. 

References

1. AGENOR, P.R. (2000), "The economics of adjustment and growth", The World Bank, Washington, D.C.
2. AMENDOLA, G., G. DOSI and E. PAPAGNI (1993), "The dynamics of international competitiveness",

- Weltwirtschaftliches Archiv*, vol.133, n°1, pp.104-133.
3. BAHARUMSHAH, A.Z. (2001), "The effect of exchange rate on bilateral trade balance: new evidence from Malaysia and Thailand", *Asian Economic Journal*, vol.15, n°3, pp.291-312.
 4. ENDERS, W. (1995), "Applied econometric time series", John Wiley and Sons, INC.
 5. ENGLE, R.F. and C.W.J. GRANGER (1987), "Cointegration and error correction: representation, estimation and testing", *Econometrica*, 55, pp.251-276.
 6. FAGERBERG, J. (1988), "International competitiveness", *Economic Journal*, 98, pp.355-374.
 7. IRANDOUST, M. (2000), "Exchange rate pass-through in the automobile industry", *International Trade Journal*, vol.XIV, n°1, pp.37-51.
 8. JOHANSEN, S. (1991), "Estimation and hypothesis testing of cointegrated vectors in Gaussian vector autoregressive models", *Econometrica*, vol.59, pp.1551-1590.
 9. KALDOR, N. (1978), "The effect of devaluations on trade in manufactures" in *Further Essays on Applied Economics*, Duckworth, London, pp.99-116.
 10. KIKUCHI, A., M. SUMNER (2002), "Exchange-rate pass-through in Japanese export pricing", *Applied Economics*, 34, pp.279-284.
 11. WILSON, P. (2001), "Exchange rates and the trade balance for dynamic Asian economies – Does the J-curve exist for Singapore, Malaysia, and Korea?", *Open Economies Review*, 12, pp.389-413.
 12. WILSON, P., K. CHOON TAT (2001), "Exchange rates and the trade balance: the case of Singapore 1970 to 1996", *Journal of Asian Economics*, 12, pp.47-63.

A. About Data

The data have been provided by IMF International Financial Statistics and JP Morgan databases for the 1982(1)-2001(1) period. Econometric and statistic works have been driven by means of Eviews 3.1. Software.

The Real Trade Balance (b)

Export and import volumes indexes (relevant year 1985 = 100) have been turned into log. The real trade balance indicator results from the difference between these external trade volumes, called net export volumes too.

The Real Effective Exchange Rate (e)

The real effective exchange rate index (relevant year 1990 = 100), provided with a monthly frequency by JP Morgan database, have been turned into quarterly data. It allows to get an insight into Australia's external trade structure.

National and Foreign Demand (c and y^w)

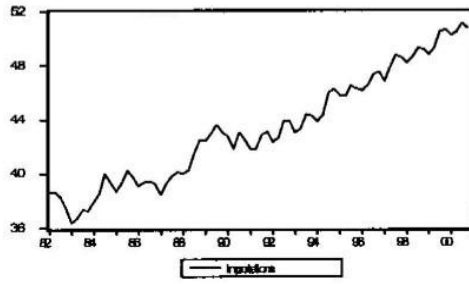
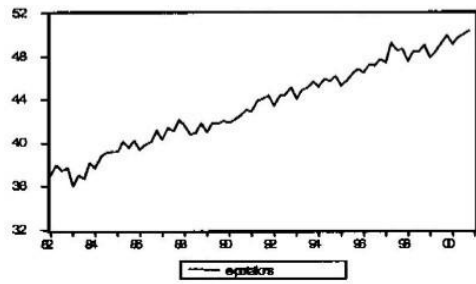
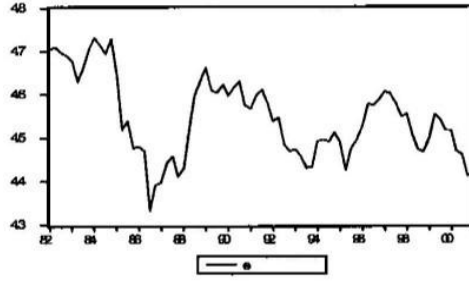
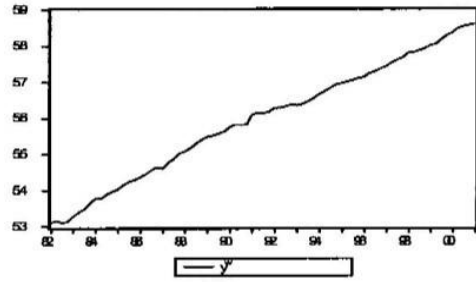
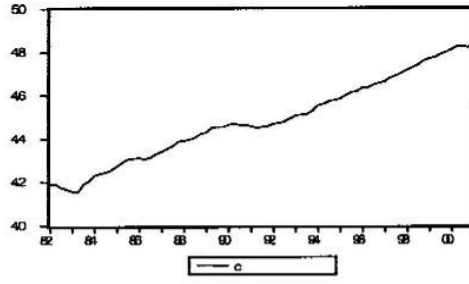
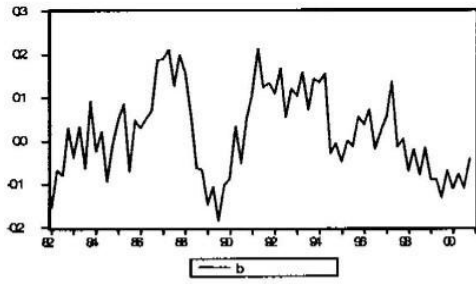
Australia's national demand level has been gauged through Australian gross domestic product volume (relevant year 1995 = 100). Foreign demand level has been build by adding together USA, UK and Germany gross domestic product volumes (relevant year 1995 = 100).

B. Estimating The VECM Model (8)

Cointegrating Eq:	b(-1)	c(-1)	y ^w (-1)	e(-1)	cste
CointEq1	1	1.4534 (9.4477)*	-1.5773 (-8.6322)	0.4567 (8.6282)	0.2095
Error Correction:	D(b)	D(c)	D(y ^w)	D(e)	
CointEq1	-1.4459 (-5.4678)*	0.0460 (0.8624)	0.0002 (0.0085)	0.3408 (1.1990)	
D(b(-1))	0.8434 (3.9764)*	-0.0420 (-0.9810)	0.0135 (0.5059)	-0.1583 (-0.6944)	
D(b(-2))	0.8021 (4.1579)*	-0.1029 (-2.6400)*	-0.0239 (-0.9843)	-0.2298 (-1.1085)	
D(b(-3))	0.6702 (3.3843)*	-0.0253 (-0.6341)	0.0427 (1.7145)	-0.2068 (-0.9714)	
D(b(-4))	0.9908 (5.5303)*	-0.0340 (-0.9403)	0.0178 (0.7914)	-0.0906 (-0.4709)	
D(b(-5))	0.6502 (2.8487)*	-0.0603 (-1.3094)	-0.0014 (-0.0491)	-0.4018 (-1.6382)	
D(b(-6))	0.6257 (3.4434)*	0.0055 (0.1511)	0.0257 (1.1251)	-0.3125 (-1.6002)	
D(b(-7))	0.3234 (1.9678)*	-0.0286 (-0.8631)	-0.0236 (-1.1425)	-0.1187 (-0.6722)	
D(b(-8))	0.3079 (2.0838)*	-0.0112 (-0.3761)	0.0066 (0.35776)	-0.1494 (-0.9410)	
D(c(-1))	3.0441 (3.3331)*	0.1284 (0.6961)	0.1111 (0.9669)	0.2586 (0.2634)	
D(c(-2))	1.6406 (1.7735)	0.0903 (0.4835)	-0.0895 (-0.7684)	-1.0397 (-1.0457)	
D(c(-3))	0.5039 (0.5525)	-0.1447 (-0.7855)	0.0580 (0.5055)	-0.7555 (-0.7707)	
D(c(-4))	1.5258 (2.0807)*	-0.4456 (-3.0089)*	0.0347 (0.3767)	-0.1431 (-0.1816)	
D(c(-5))	0.7265 (0.9400)	-0.0719 (-0.4606)	-0.0480 (-0.4938)	-0.1662 (-0.2001)	
D(c(-6))	1.4691 (2.0731)*	0.2544 (1.7771)	0.0905 (1.0144)	-0.5575 (-0.7320)	
D(c(-7))	0.2822 (0.3942)	-0.2371 (-1.6391)	0.0713 (0.7916)	-0.9578 (-1.2444)	
D(c(-8))	-0.4613 (-0.7011)	-0.0544 (-0.4095)	-0.0075 (-0.0915)	0.8293 (1.1726)	
D(y^w(-1))	-3.0066 (-2.3513)*	0.5422 (2.0986)*	0.2167 (1.3462)	0.5178 (0.3766)	
D(y^w(-2))	-3.9510 (-2.8920)*	0.2230 (0.8079)	-0.0986 (-0.5734)	1.9880 (1.3538)	
D(y^w(-3))	-4.8214 (-3.7928)*	0.0202 (0.0787)	-0.0324 (-0.2028)	0.2865 (0.2097)	
D(y^w(-4))	-1.2402 (-0.9028)	-0.0161 (-0.0582)	0.2351 (1.3597)	0.9079 (0.6149)	
D(y^w(-5))	-0.0175 (-0.0147)	-0.0905 (-0.3756)	-0.2719 (-1.8120)	-0.5563 (-0.4342)	
D(y^w(-6))	0.8755 (0.7967)	0.1849 (0.8327)	0.2037 (1.4726)	-0.8819 (-0.7467)	
D(y^w(-7))	0.5014 (0.4887)	0.0077 (0.0374)	0.0189 (0.1468)	0.0358 (0.0325)	
D(y^w(-8))	1.1085 (1.1141)	0.1643 (0.8176)	-0.1318 (-1.0523)	-0.9103 (-0.8512)	
D(e(-1))	0.4591 (2.5863)*	-0.0405 (-1.1291)	-0.0084 (-0.3800)	0.1020 (0.5348)	
D(e(-2))	0.3483 (1.9468)	0.0225 (0.6249)	0.0264 (1.1724)	-0.2485 (-1.2925)	
D(e(-3))	0.0614 (0.3920)	-0.0477 (-1.5074)	-0.0031 (-0.15919)	0.1338 (0.7943)	
D(e(-4))	0.3057 (1.9975)*	-0.0050 (-0.1642)	-0.0039 (-0.2050)	-0.2712 (-1.6483)	
D(e(-5))	0.2484 (1.6337)	-0.0504 (-1.6425)	-0.0051 (-0.2676)	0.2018 (1.2347)	
D(e(-6))	0.0528 (0.3282)	0.0168 (0.5170)	0.0055 (0.2722)	-0.2034 (-1.1756)	
D(e(-7))	0.11702 (0.7599)	-0.0243 (-0.7829)	0.0128 (0.6627)	-0.1113 (-0.6725)	
D(e(-8))	-0.0906 (-0.5946)	-0.0411 (-1.3358)	-0.0309 (-1.6105)	-0.2435 (-1.4860)	
Cste	0.0104 (0.6468)	0.0048 (1.4955)	0.0042 (2.1014)*	0.0040 (0.2361)	

Une étoile indique que le coefficient est significatif au seuil de 5%. Les résultats sont obtenus par le logiciel Eviews 3.1.

C. Variables On Figures



Source : Les auteurs

Notes