Discussion Paper No. 107

THE IMPACT OF THE EURO ON NEW ZEALAND'S BILATERAL TRADE WITH THE EUROPEAN UNION

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November 2005

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Abstract

Since 1990, the European Union (EU) is New Zealand's second biggest trading partner after Australia. New Zealand's exports to the EU are mainly in agricultural products, such as sheep-meat, butter, venison, kiwifruit, apples, wools, hides and skins. New Zealand, on the other hand, imports high-technological products from the EU, such as cars, aircraft, telephone equipment, etc. However, the introduction of the European single currency, the euro on January 1999 could significantly impact business and/or trading relations between New Zealand and the EU because of the close trade relations between New Zealand and the EU.

This paper examines whether the introduction of the euro resulted in structural changes on New Zealand import and export relations with the EU-15 member states. The research uses the Augmented Dickey-Fuller (ADF) unit root tests to test the order of integration of the import and export variables and whether all the variables are integrated in the same level, I(1). In addition, the Vector Autoregression (VAR) models and the Johansen maximum likelihood procedures are used to determine the cointegrating relations among the series in the import and export models. The results show instability in both import and export but the instability are more likely explained by the impact of the 1997 Asian Crisis than by the introduction of the euro.

JEL Classification: E10, E60

Key words: *euro, cointegration, general to specific modelling, Chow test*

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1. Introduction

The European Union (EU) is New Zealand's second largest trading partner after Australia. According to the New Zealand Ministry of Foreign Affairs and Trade, the EU is not only an influential negotiating partner on a wide range of regional and multilateral political and strategic issues, but is already New Zealand's largest export market for sheep-meat, butter, venison, kiwifruit, apples and wine. The EU is also New Zealand's second largest market for wools, hides and skins (see Table 1) while export tractors and harvesting equipment to New Zealand. (see Table 2).

Gibbons (2004) observed the trade relationship between New Zealand and the EU from the beginning of European integration in 1957. New Zealand's exports to the EU declined over the period from 1957 to 1991, because of the considerable decrease in exports to the UK. However, following the introduction of the EU single market in 1993, New Zealand's exports to the EU has again increased. Put differently, New Zealand's imports from the EU gradually increased over the period, but its imports from the UK, specifically, declined largely as import prices and the quality of goods became better from other member states. Further, New Zealand's exports to the EU have increased an average 8% per year. And, in terms of imports, the value of imports from the EU has grown $1.3 billion since 1999, or an average of 9% per year (Attewell, 2002).

The EU and New Zealand share many common views in the field of trade and security policy. For example, the 1991 Cooperation in Science and Technology agreement included provisions for cooperation in agriculture, biomass, biotechnology, environment, forestry, renewable energies, and telecommunications and information technologies. Furthermore, both countries signed the Joint Declaration on Relations in 1999, which provides for regular consultations with the EU Presidency. This agreement allows exporting countries to undertake conformity assessments, such as testing, inspection, and certification, rather than to carry out the assessment at the destination. The close relationship in economics, politics, and securities between the EU and New Zealand indicates that any changes in the EU market will bring about both opportunities and risks to New Zealand trade.

This paper examines whether the introduction of the euro in 1999 resulted in structural changes on New Zealand import and export relations with the EU-15 member states. The research uses the Augmented Dickey-Fuller (ADF) unit root tests to test the order of integration of the import and export variables and whether all the variables are integrated in the same level, I(1). In addition, the Vector Autoregression (VAR) models and the Johansen maximum likelihood procedures are used to determine the cointegrating relations among the series in the import and export models.

2. The Single Currency and the Euro

One of the most persuasive reasons in favour of a common currency is the elimination of transaction costs and exchange-rate risks. For example, McKinnon (1963) claimed that in the single currency area, monetary-fiscal policy and flexible external exchange rates can be used to give the best resolution to three objectives: (1) the maintenance of full employment; (2) the maintenance of balanced international payments; (3) the maintenance of a stable internal average price level. Further Walmsley (1996) argued that a single currency would help to save transaction costs, improve efficiency, and remove exchange rate uncertainty for intra-community business and for traders trading with several EU countries. Furthermore, Volcker (2005), former US Federal Reserve Chair, argued that a single global currency eliminates the direct and indirect transaction costs of trading from one currency to another, eliminates the balance of payments or current account problems, and eliminates the uncertainty of changes in value.

While a common currency delivers benefits to the participating economies, it also imposes costs. McKinnon (2002) claimed two reasons why a country should not belong to a common currency regime or a common monetary standard with its trading partners. This includes: (1) the loss of monetary autonomy in response to asymmetric country shocks - the government needs to give up its sovereignty to control the country's financial system if the country belongs to a common currency regime, (2) unstable monetary standard. In reality there is no sufficiently stable monetary standard in the rest of the world.

Alesina et. al. (2002) examined the dollar, euro, and yen in the optimum currency. The authors provided the following reasons for adopting a currency as an anchor currency: (1) closer geographically to the anchor (2) has the same language as the anchor (3) is a former or current colony of the anchor (4) is poorer in terms of per capita GDP (5) is smaller, in terms of population size. The authors concluded that there exist well-defined dollar and euro areas but no clear yen area.

The introduction of the euro in January 1999 allows the EU banks and stock exchanges to carry out transactions in a single currency. It has become the second leading international currency, after the US dollar. There are two main factors supporting the usage of the euro as an international currency: the large size of the euro-area economy, and the stability attached to the euro.[1] In addition, the single currency would help to save transactions cost, improve efficiency, and remove exchange rate uncertainty for intra-community business and for traders trading with several EU countries (Walmsley, 1996).

Vicarelli and Nardis (2003) investigated the impact of the euro adoption on commercial transactions of the European Monetary Union (EMU) countries by using Rose's (2000) model to test the effect of currency unions on trade. Their results show that the adoption of the euro induced an intra-area trade increase and increased external trade by around 6.3% and internal trade by 2.6%. Further, the authors confirmed that the adoption of the euro had a positive but not exorbitant impact on the bilateral trade of European countries.

However, the euro suffered a dramatic depreciation since its introduction in 1999 but rebound in late 2000. Financial analysts attributed the depreciation of the euro as a result of the strong US economy and the slow development of the Euro-zone (Levin, 2002, and Corsetti, 2000). According to Cote's (2000) findings the depreciation of the euro was reasonable since its interest rates were much lower than the North American. Furthermore, Salvatore (2000) also argued that the value of the euro with respect to the dollar was set too high in autumn 1998. It was forecasted that the growth and interest rates were to fall in the US and rise in Europe, but

[1] This is retrieved from "ECDEL, *Three and a half years on the benefits of the single currency are evident"* http://www.decdel.org.au/euro_and_you/euro_benefits.htm

the opposite occurred from the autumn of 1998 to the spring of 1999. Meanwhile, Salvatore (2000) and Cote (2000) both argued that the depreciation of the euro stimulated exports from a situation of weak growth and very low inflation in spring 1999, without creating an inflationary problem for the Euro-zone. However, Feldstein (2000) argued that the depreciation of the euro served as a reminder that a currency union does not necessary brings about exchange-rate stability.

The euro began appreciating in 2001 and Newberry (2001) explained that the appreciation was because of a softening in the US economy. Furthermore, Cote (2000) and Sowinski (2001) argued that since 2001, except for the unemployment problem, the member-states' economies grew gradually and stabilised. Furthermore, Sowinski (2001) sees less downside risk and more upside potential in the euro. For the euro's long-run movement, Levin (2002) claimed that the future movement of the euro is impossible to predict because of the growth differentials in the twelve countries and growth prospects between the Euro-zone and the US. Although the euro may be volatile, the Euro-zone would not collapse within the Maastricht Treaty – once a country joined the Euro-zone, it will not be allowed to withdraw from the monetary union and return to its currency.

Since its introduction, the euro has become the second most frequently used international currency, after the US dollar. There are two main factors supporting the use of the euro as an international currency: the large size of the euro-area economy, and the stability attached to the euro. Therefore, the success and failure of the euro would impact the global market. For example, Tavlas (1998) concluded that the euro has potential to challenge the role played by the US dollar in global trade and it would depend upon the credibility gained by the EMU in the years leading up to the twenty-first century.

Vicarelli and Nardis (2003) investigated the impact of the euro adoption on commercial transactions of EMU countries by using Rose's (2000) model to test the effect of Currency Unions on trade. They investigated over the period from 1980 to 2000 and considered 11 exporter countries in the Euro-zone, and 30 importer countries. Their results showed that the adoption of the euro increased both external trade by around 6.3% and internal trade by 2.6%.

The authors' findings further confirmed that the euro adoption had a positive but not exorbitant impact on the bilateral trade of European countries.

3. Modelling and Methodology

Changes in macroeconomic variables, such as exchange rates and GDP, can affect domestic and import variables used in determining government agencies' decisions in aggregate demand (AD) across all industries in an economy (Choi, and Harrigan, 2003). When a country's output and standard of living improve, its patterns of trade tend to change. Apart from economic growth, the fluctuations in the level of output and prices would also affect a country's import and export activities. A rise in imports relative to exports will have the opposite effect on a country's macro-economy (Ulbrich, 1983). Further, a change in relative price on import demand will also affect endowments of resources and productive factors, taste, market structure, scale, exchange rates, and trade barriers (Hong, 1999).

Dutta and Ahmed (2001) studied import demand in India postulated that the demand for imports was a function of relative prices and real income. The authors investigated the long-run relationship among three variables- India's import volume, relative import price, and real gross domestic production, and the effect of India's import liberalization policy. Similarly, Narayan and Narayan (2003) also used imports, relative price (calculated as a ratio of import price index to domestic price index), and income to examine the import demand elasticities for Mauritius and South Africa. The authors also investigated a long run relationship between the variables, and test the stability of the cointegration relationship between the variables.

Houthakker and Magee (1969) study showed that a country will experience faster import growth than export growth if the country has a higher income elasticity of demand for its imports than the foreign income elasticity of demand for the country's exports. Such a country will suffer deterioration in its trade balances. In contrast, a country will improve its trade balance if it has a lower income elasticity of demand for its imports. As for relative price elasticity, the authors found that the relative price elasticities estimated for total imports and total exports were fairly small.

According to Aydin et al. (2004), elasticities based on estimating the import and export demand functions, and the trade balance approaches are commonly used to examine the effects of a real devaluation on the trade balance of a country. This research employs the elasticities approach to examine the bilateral trade between New Zealand and the EU. The model specifications are similar to Dutta and Ahmed (2001), and Narayan and Narayan, (2003). The imports demand and exports model for the long-run are given as follow:

$$\text{Imports: } lrim_t = \beta_0 + \beta_1 lrnzgdp_t + \beta_2 lrpim_t + \beta_3 q2 + \beta_4 q3 + \beta_5 q4 + \varepsilon_{1t} \quad (1)$$

$$\text{Exports: } lrex_t = \delta_0 + \delta_1 lreugdp_t + \delta_2 lrpex_t + \delta_3 q2 + \delta_4 q3 + \delta_5 q4 + \varepsilon_{2t} \quad (2)$$

where,

lrim = log of real import

lrex = log of real export

lrnzgdp = log of NZ's real GDP

lreugdp = log of the EU's real GDP

lrepim = log of relative price calculated as a ratio of import price index to NZ's consumer price index (CPI)

lrpex = log of relative price calculated as a ratio of export price index to the EU's CPI

β_1 and δ_1 = the income elasticities

β_2 and δ_2 = the price elasticities.

ε_{1t} and ε_{2t} = the error terms

q2=1 for the second quarter, 0 otherwise

q3=1 for the third quarter, 0 otherwise

q4=1 for the fourth quarter, 0 otherwise

Quarterly dummy variables are included in equations (1) and (2) to capture the seasonality differences.

The models are estimated using quarterly time series data, from 1990:Q2 to 2004: Q3, which provides 59 observations. The data are obtained from Statistics New Zealand, and the Organisation for Economic Co-operation and Development (OECD). The data are presented in real terms computed with base year of 2000 (2000=100 or 2000=1000).

Previous researches have used the Vector Autoregression (VAR) Models, Vector Error-Correction Models (VECM), and Autoregressive Distributive Lag Models (ARDL) in estimating the import/export demand functions. For example, Narayan and Narayan, (2003) used an ARDL model to estimate the long-run elasticities in the import demand function for Mauritius and South Africa. Aydin et al. (2004), Cheng (2004), Dutta and Ahmed (2001), and Abeysinghe and Choy (2004) used VAR and VECM models to describe the long-run and the short-run relationship between the variables in import demand and export supply functions.

Dan and Papell (1997) investigated 50 countries that experienced statistically significant structural changes in their export-GDP and import-GDP ratios over the period from 1997 to 1995. Their results showed a structural break in most countries' time paths, the coincidence in timing between the import and export breaks did not appear to be particularly strong, and the extent of changes in imports and the extent of changes in exports were not of the same magnitude for most countries.

Chinn (2003) examined the stability of import and export demand functions for the United States over the period from 1975:Q1 to 2001:Q2 using Johansen's maximum likelihood approach and the VECM model to determine whether co-integrating relations exist, and how trade flows respond to deviations in long-run relationships. The author found one break point in 1995:Q1, and import price elasticity was very low. Thus a large movement in the value of the dollar would be required to improve U.S. trade balance.

This research uses the VAR, VECM, and ARDL models to examine the existence of a short-run and long-run relationship between real imports (exports) and its determinants and to draw inferences regarding the impact of the euro on the bilateral trade between New Zealand and the European Union from the results estimated. Following Dan and Papell (1997), this

research also examines the import and export functions separately since structural changes might not appear at the same time period. Furthermore, structural changes might exist in the bilateral trade because of other issues, for example, New Zealand's economic reform or the 1997 Asian Crisis. Thus, in order to make the results more robust, this research uses the CUSUMSQ test to check for breakpoints and the Chow Stability test and Recursive Least Squares to further confirm the findings.

In testing for long-run and short-run relationships amongst the time series (variables), the Augmented Dickey-Fuller (ADF) unit root test is used to determine the order of integration of the variables. The VAR(p) model is then used to determine the number of cointegrating relationships among the series by applying Johansen and Juselius (1990), and Johansen (1991) maximum likelihood procedures. The long-run relationship among the series is formulated by reparameterising the VAR(p) model into a VECM model, which is used to test the restrictions on the long-run cointegrating parameters, including testing for the weak exogeneity of the income and relative price series. As for the short-run relationship among the series, these are derived by forming single-equation error-correction models based on ARDL dynamic models. Finally, the CUSUMSQ Test, Recursive Least Square, and Chow Test are used to test for stability or structural changes.

If there is one unique cointegrating relationship and the income and relative price series are weakly exogenous with respect to the parameters in this relationship, then the appropriate single-equation ECM models are formulated for the import and export series, conditional upon the (changes in) relative prices, incomes, quarterly seasonal dummies and the lagged error correction terms. These equations are expressed on follow:

Imports:

$$dlrim_t = \sum_{i=1}^{11} \beta_{1i} dlrim_{t-i} + \sum_{i=0}^{12} \beta_{2i} dlrnzgdp_{t-i} + \sum_{i=0}^{13} \beta_{3i} dlrpim_{t-i} + \lambda_1 ecmimp_{t-1} + c_1 + \delta_{11} q2 + \delta_{12} q3 + \delta_{13} q4 + u_{1t} \quad (3)$$

Exports:

$$dlrex_t = \sum_{i=1}^{11} \alpha_{1i} dlrex_{t-i} + \sum_{i=0}^{12} \alpha_{2i} dlreugdp_{t-i} + \sum_{i=0}^{13} \alpha_{3i} dlrpex_{t-i} + \lambda_1 ecm\exp_{t-1} + c_2 + \delta_{21} q2 + \delta_{22} q3 + \delta_{23} q4 + u_{2t} \quad (4)$$

where the prefix 'd' indicates 1st differences, *ecmimp* is the ecm term for import demand from the JJ procedure and *ecmexp* is the ecm term for export supply from the JJ procedure. Each equation omits one seasonal dummy variable (q1) to avoid the dummy variable trap. Equations (3) and (4) are in the form of "profligate" ECM models. As this research follows the LSE "General to Specific" modelling strategy, where the initial lag structure is chosen according to the Hannan-Quinn Criterion, then "parsimonious" versions of each equation are obtained by imposing nonrejected restrictions on the short-run β_{ji} and α_{ji} parameters (Mizon, 1995; Enders, 2004).

The CUSUMSQ test and the Chow stability test are used to test for the coefficients' stability and structural changes in the import and export ECM equations. The Chow stability test can be used to further examine the stability. In addition, the Recursive Least Square (RLS) estimates of the coefficients of the parsimonious model are obtained in order to check for evidence of instability in the adjustment coefficient, i.e. $\hat{\lambda}_1$ and $\hat{\lambda}_2$ in equations (3) and (4).

4. Empirical Analysis

4.1 Augment Dickey-Fuller (ADF) Unit Root Test

The time series properties of the series in equations (3) and (4) are examined with the Augmented Dickey-Fuller (ADF) unit root test. Based on the Hannan-Quinn Criterion, Table 3 shows the ADF results and except for logarithm relative price of imports, the variables are non-stationary in level, but stationary in first difference at 5% and 10% level of significance. Therefore, at 5% significance level the logarithm of the relative price of imports is (only just) stationary while the other variables are integrated of order I(1). All series are integrated in level, I(0), or first difference, I(1), so generally the import and export equations are I(1).

Table 3
ADF Unit Root Test Results

Lag Length: E-view 5.0 Automatic based on Hannan-Quinn Criterion, Maximum Lags=4							
Hypothesis: H_0 : has a unit root, H_1 : do not has a unit root							
	Levels			**First differences**			**Order**
Variables	**Lag**	**ADF test statistics**	**P-value**	**Lag**	**ADF test statistics**	**P-value**	
LRIM	2	-0.440871	0.8943	1	-11.18244	0.0000	I(1)
LREX	3	-0.495839	0.8837	2	-23.17980	0.0000	I(1)
LRNZGDP	4	0.153859	0.9669	3	-1.804068	0.0680**	I(1)
LREUGDP	0	-0.947224	0.7659	0	-6.121905	0.0000	I(1)
LRPIM	0	-2.979871	0.0429	0			I(0)
LRPEX	1	-1.424166	0.5641	0	-6.600184	0.0000	I(1)

**LRNZGDP integrated in first difference at 10% confidence level

4.2 Imports and Exports Long-Run and Short-Run Relations

The import and export results are discussed in this section following the statistical steps. It begins with the VAR model followed by VECM for long-run relationship, ECM following by using the ARDL technique for short-run relationship, and further testing for stability.

The selection of the order of the VAR model is initially based on Akaike's Information Criterion (AIC), Schwarz's Bayesian Information Criterion (BIC or SC), and Hanna Quinn (HQ) starting with maximum lag of 4 (given that the data set is quarterly, see Mizon, 1995). Although lag 4 is chosen for the imports VAR model, according to the AIC, when the maximum lag is 4, the Lagrange multiplier (LM) test out to AR(4) indicates residual autocorrelation (rejecting the null of no autocorrelation of each order) on the first ground. Therefore, in order to account for the autocorrelation residuals, this research extends the maximum lag length to 8, and lag 5 is chosen for the imports VAR model based on the AIC. Further, the Lagrange multiplier (LM) test out to AR(4) does not reject the null hypothesis of no autocorrelation of each order. Hence, it indicates no residual autocorrelation on those grounds and the lag length of five is deemed sufficient.

The trace and maximum eigenvalue tests indicate 2 cointegrating relationship among the variables in import VAR(5) model and only 1 cointegrating relationship among the variables

in export VAR(2) model. According to the 2 and the 1 cointegrating relationship, the import VAR(5) and the export VAR(2) models are then reparameterised into VECM(4) and VECM(1) models. The VEC models are then used to test for restrictions on the long run cointegrating parameters and to test for the weak exogeneity of the income and relative price series. Three possible outcomes are found in the joint null tests: (1) the second cointegration in import is restricted as a normalized model; (2) both import and export models, income and relative prices are weakly exogenous with respect to the long run cointegrating parameters of income elasticity and relative price elasticity; and (3) the long run coefficient of the relative prices of import and export are not statistically significant. Thus, this study discusses the first cointegrating relationship for the import equation and the single cointegrating relationship for the export equation.

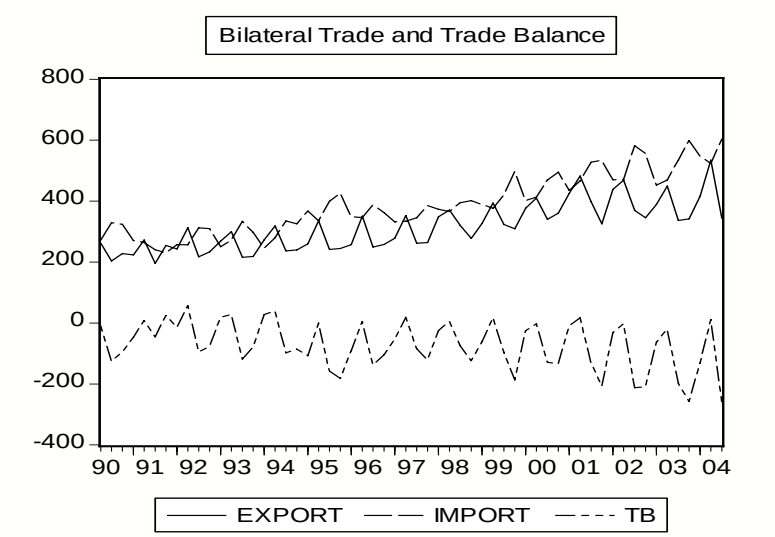
Table 4
Long Run Relations

Dependent Variables	Constant	Independent Variables			
		LRNZGDP	LRPIM	LREUGDP	LRPEX
LRIM	-5.035985	1.258306	--	--	--
		(0.06204)	--	--	--
LREX	-2.176119	--	--	0.521863	--
		--	--	(0.04514)	--

Note: numbers in the ( ) are estimated standard errors

Table 4 shows both the import and export long run relations with their determinants, the levels of imports and exports can be explained by New Zealand's real GDP or the EU real GDP, but the relative prices are not statistically significant in either long-run relationship. In addition, the income elasticity of demand for import is larger than income elasticity of demand for export, so it is not surprising that New Zealand experienced trade deficit with the EU (Houthakker and Magee, 1969). The trade deficit is shown in Figure 1 and the deficit becomes larger gradually over the investigated period.

Figure 1
Imports, Exports and Trade Balance (TB)



The conditional short-run ECM models in equations (3) and (4) can be treated as profligate ARDL models in first differences plus lagged error correction terms. We then use Microfit 4.0 to automatically choose the initial lag structure for the three variables that appear in first difference form. Based on the Hannan-Quinn and AIC criteria (0,4,4) was chosen for the ECM import model, and (4,0,5) for the ECM export model. As expected (see Enders, 2004) the coefficients on many of the lag terms were not statistically significant (details available upon request). Hence, following the general to specific modelling strategy promulgated in Mizon (1995), the more parsimonious import and export ECM models are obtained by deleting non-significant variables and the parsimonious models are estimated by using EViews 5.0. The parsimonious short-run adjustment ECM models are shown in Table 5.

Table 5
Short Run Relations

Dependent Variables	**Constant**	**Q3**	**Q4**	**ECM**	**Independent Variables**	
					Δ **LRNZGDP**$_{t-2}$	Δ **LRPIM**$_{t-3}$
Δ **LRIM**	-0.086500	0.215316	0.14742	-0.519115	0.52552	-0.316475
	(0.014707)	(0.026261)	(0.033344)	(0.127740)	(0.154622)	(0.151674)
	Constant	**Q3**	**Q4**	**ECM**	Δ **LREX**$_{t-3}$	Δ **LRPEX**$_{t-5}$
Δ **LREX**	0.092649	-0.216509	-0.162462	-0.919162	-0.278592	-0.486230
	(0.012335)	(0.031003)	(0.020431)	(0.104428)	(0.045731)	(0.155321)

Note: numbers in the ( ) are estimated standard errors

In the parsimonious models all coefficients are correctly signed and statistically significant. Moreover the signs and relative magnitudes of the coefficients of both ECM terms indicate valid error correction models.

In addition, the high seasonality also reflects in the long lag length of the significant independent variables. In the short run, the imports can be explained by the history of domestic real GDP and relative price of imports while exports can be explained by previous exports and the relative price of exports (see Table 5). The results of the import and export models are significantly different. This is because the characteristic of the traded goods between New Zealand and the EU are considerably different, that is, New Zealand mainly imports advanced technological and industrial products from the EU and largely exports agricultural products to the EU. In addition, the opposite seasons in Northern and Southern hemispheres can also be a possible explanatory factor affecting trade or business behaviour.

Moreover, the absolute value of the ECM coefficient for the export equation is greater than for the import equation, indicating that the speed of export adjustment to the long run equilibrium is faster than for imports. That is, a shock to the import model takes import about 1.9264 quarters (1/0.519115=1.9264 quarters or 7.7056 months) away from their equilibrium which is more than a shock to the export model (1/0.919162=1.0879 quarters or 4.516 months). On the other hand, the export will converge to the long run equilibrium after a shock faster than the import.

Further, the seasonal dummy variables, q3 and q4, show opposite relationships in the import and export equations respectively; that is, q3 and q4 have a positive relationship with import while q3 and q4 have a negative relationship with export. Thus the trade deficits reach the lowest point over quarter 3 to quarter 4 for each year (see Figure 1). The opposite sign on the coefficients of q3 and q4 in the import and export models shows New Zealand's trade deficit with the EU. In addition, the coefficients of q3 and q4 in the export model are slightly higher than those in the import model; that is, the decrease in New Zealand's export to the EU in q3 and q4 is slightly larger than the increase in New Zealand's import from the EU in q3 and q4.

4.3 Imports Coefficient Instability Tests

The CUSUMSQ test and Chow Stability tests are used to test for coefficient stability and structural changes in the ECM import and export equations (equations 3 and 4). In addition, the recursive least square (RLS) estimates of the coefficients of the parsimonious models are obtained in order to check for evidence of instability in the adjustment coefficient.

According to Figure 2, the CUSUMSQ test shows the line jumps out of the 5% significant bounds over the period from 1995:Q1 to 1999:Q3, implying that structural changes exist in imports over the period (see Brown et. al , 1975).

Figure 2
CUSUMSQ Test for Coefficient Stability-Import

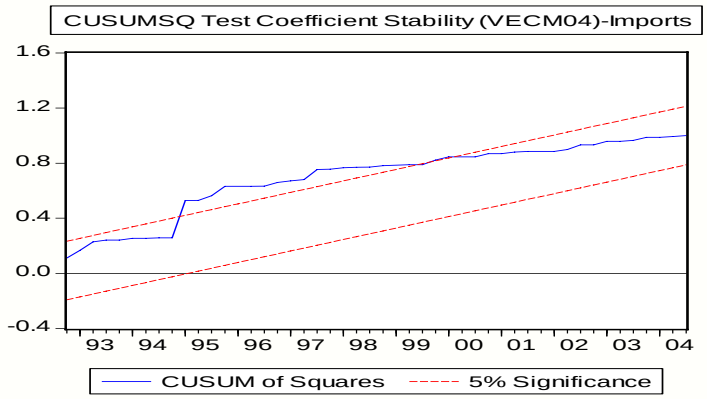


Table 6
Chow Breakpoint Test-Import

Breakpoint	F-Statistic	Probability
1994:Q1	0.913031	0.495069
1994:Q2	1.837029	0.114993
1995:Q1	1.912594	0.101156
1995:Q2	0.561465	0.758347
1997:Q3	0.470179	0.826482
1997:Q4	0.439821	0.847951
1999:Q1	0.619764	0.713297
1999:Q2	0.637665	0.699387
2002:Q1	0.335265	0.914412
2002:Q2	0.333337	0.915501

Subsequently, the Chow breakpoint test is used to test for further evidence of structural changes. However, using those stable time periods found in CUSUMSQ test as breakpoints to

process Chow breakpoint test, the results show the absence of instability (or structural changes).

Seeking further evidence on the question of parameter instability, we estimated the ECM models (equations 3 and 4) recursively and plotted the RLS estimates of the adjustment parameters in Figure 3.

Figure 3
Recursive Estimated Adjustment Coefficient ECM-Import

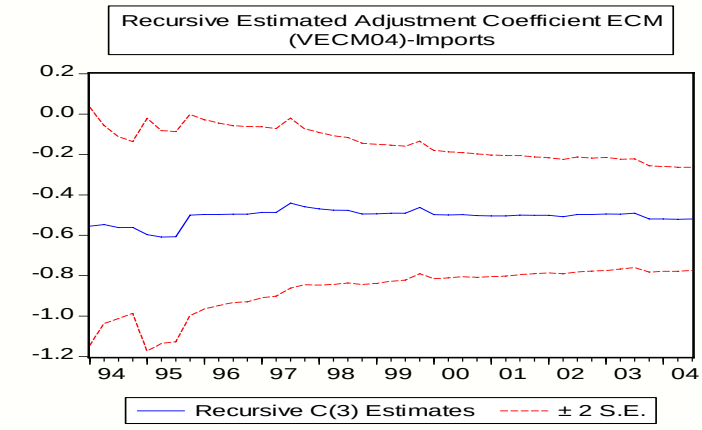


Table 7
Chow Breakpoint and Forecast Test-Import

Chow Breakpoint Test: 2003Q1			
F-statistic	0.485099	Prob. F(6,42)	0.815668
Log likelihood ratio	3.618225	Prob. Chi-Square(6)	0.728180
Chow Forecast Test: Forecast from 2003Q1 to 2004Q3			
F-statistic	0.414251	Prob. F(7,41)	0.887880
Log likelihood ratio	3.690186	Prob. Chi-Square(7)	0.814690

The recursive error-correction term looks stable, but some “tricky” peaks exist, for example, an upward jump over late 1995, and peaks at 1997:Q3 (-0.48 to -0.44), 1999:Q4 (-0.49 to -0.46), and a drop at 2003:Q3 (-0.49 to -0.51) (see Figure 3). The 2003:Q3 instability is a new finding in this test which is not found in the CUSUMSQ test, the general recursive least square (RLS) of the residual. However, further tests by Chow Breakpoint and Forecast Test indicate an absence of break in 2003 (see Table 7). In addition, the turbulence over the initial

period, 1994 to 1996 caused by RLS appears at the initial period. In general, following the initial period, the speed of adjustment to the long-run equilibrium is stable and slower.

The two spikes in 1997:Q3 and 1999:Q4 found in both CUSUMSQ and RLS could be the results of the 1997 Asian financial crisis, and the depreciation of the euro, respectively. However, the last part of the RLS (see Figure 3) almost levels off, dropping since 2003:Q3 (-0.49 to -0.51), but this instability is ambiguous. It can be a permanent or a temporary spike similar to the instability in 1997: Q3 and 1999:Q4. A further and longer investigation time period is needed to define the instability in 2003.

Table 8
The Adjusted ECM Imports with Dummy Variables

Dependent Variable: DLRIM Method: Least Squares
Sample (adjusted): 1991Q2 to 2004Q3 ; n= 54 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLRNZGDP(-2)	0.496464	0.153377	3.236891	0.0022
DLRPIM(-3)	-0.357766	0.157596	-2.270153	0.0279
ECM_IMP04(-1)	-0.582514	0.132206	-4.406104	0.0001
C	-0.081669	0.014948	-5.463532	0.0000
Q3	0.212969	0.025821	8.247783	0.0000
Q4	0.154658	0.033459	4.622350	0.0000
D19970104	-0.069478	0.035563	-1.953628	0.0568
D19990301	-0.013255	0.040634	-0.326213	0.7457

R-squared	0.725614	Mean dependent var	0.010342
Adjusted R-squared	0.683859	S.D. dependent var	0.114060
S.E. of regression	0.064132	Akaike info criterion	-2.519793
Sum squared resid	0.189194	Schwarz criterion	-2.225129
Log likelihood	76.03441	F-statistic	17.37812
Durbin-Watson stat	1.852911	Prob(F-statistic)	0.000000

Table 9
The Joint-Null Hypothesis Wald Test Results

Wald Test:

Hypothesis:

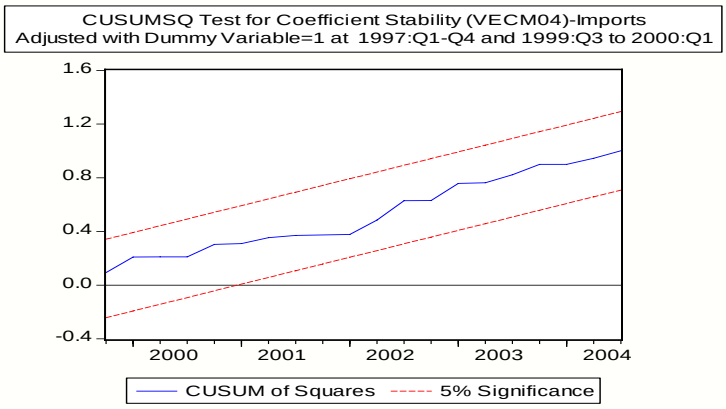
$$H_0 : D19970104 = D19990301 = 0$$

$$H_1 : D19970104 \neq D19990301 \neq 0$$

Test Statistic	Value	df	Probability
F-statistic	1.922111	(2, 46)	0.1579
Chi-square	3.844223	2	0.1463

Although the Chow breakpoint tests show the absence of structural changes, the CUSUMSQ test and RLS indicate instability over the investigated period. Dummy variables are included for the instability periods to adjust for the import short-run dynamic error-correction model. The dummy variables include D19970104 (1997:Q1 to Q4) and D19990301 (1999:Q3 to 2000:Q1).

Figure 4
CUSUMSQ Test for Coefficient Stability-
Imports Adjusted with Dummy



The CUSUMSQ test shows stability with the time dummy variables (see Figures 4). However, none of the dummy variables are significantly different from zero and the joint F-test results further confirm their non-significance (see Tables 8 and 9).

Table 10
The Adjusted ECM Imports with Dummy Variable on ECM Term

Dependent Variable: DLRIM Method: Least Squares
Sample (adjusted): 1991Q2 to 2004Q3 ; n= 54 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLRNZGDP(-2)	0.537885	0.155088	3.468261	0.0011
DLRPIM(-3)	-0.339225	0.153328	-2.212414	0.0318
ECM_IMP04(-1)	-0.512466	0.127893	-4.006982	0.0002
DECM(-1)	0.674255	0.669806	1.006642	0.3193
C	-0.086264	0.014707	-5.865452	0.0000
Q3	0.220840	0.026825	8.232672	0.0000
Q4	0.143357	0.033583	4.268772	0.0001

R-squared	0.708958	Mean dependent var	0.010342
Adjusted R-squared	0.671804	S.D. dependent var	0.114060
S.E. of regression	0.065343	Akaike info criterion	-2.497900
Sum squared resid	0.200678	Schwarz criterion	-2.240069
Log likelihood	74.44330	F-statistic	19.08147
Durbin-Watson stat	1.840560	Prob(F-statistic)	0.000000

Table 11
Wald Test Results on DECM-Import

Wald Test:
Hypothesis:
$H_0 : DECM(-1) = 0$
$H_1 : DECM(-1) \neq 0$

Test Statistic	Value	df	Probability
F-statistic	1.013328	(1, 47)	0.3193
Chi-square	1.013328	1	0.3141

In testing the unsteadiness in 2003, a dummy variable is again used for the period from 2003:Q1 to 2004:Q3 and solely examines the ECM term (DECM). However, the results indicate that DECM is not statistically significant different from zero to the import model. The Wald Test further confirms this (see Tables 10 and 11).

The CUSUMSQ Test and recursive error correction term showed instabilities in the import model during the investigated period from 1990:Q2 to 2004:Q3. These instabilities are found in 1994:Q1, 1995:Q1, 1997:Q1 to Q4, 1999:Q3, and 2003:Q3. However, the Chow Breakpoint test indicates the absence of instability and none of the variables is statistically significant. Consequently, the instabilities did not result in long term import structural changes, but caused some temporary spike to New Zealand's import from the EU. In general, New Zealand's macroeconomic reform and the 1997 Asian financial crisis are more likely to be the origins of the instability since those shocks have overwhelmingly affected New Zealand's macroeconomic structure.

4.4 Exports Coefficient Instability Tests

According to Figure 5 the CUSUMSQ test on the export model is stable since there is no outlier. The introduction of the euro in 1999 and issuing of the euro in 2002 did not jump out off the stable area. Further test by Chow Breakpoint test shows the results fail to reject the null hypothesis and indicate no structural change either (see Table 12).

Figure 5
CUSUMSQ Test for Coefficient Stability-Export

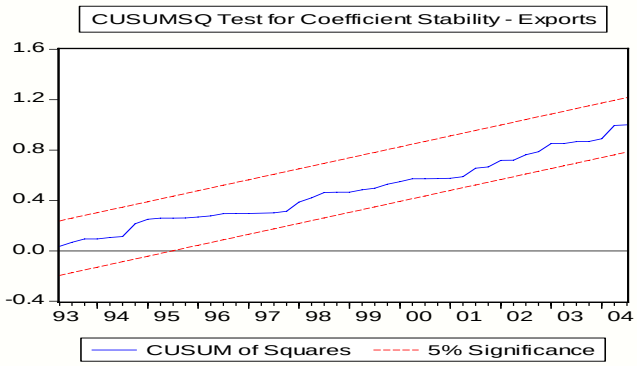
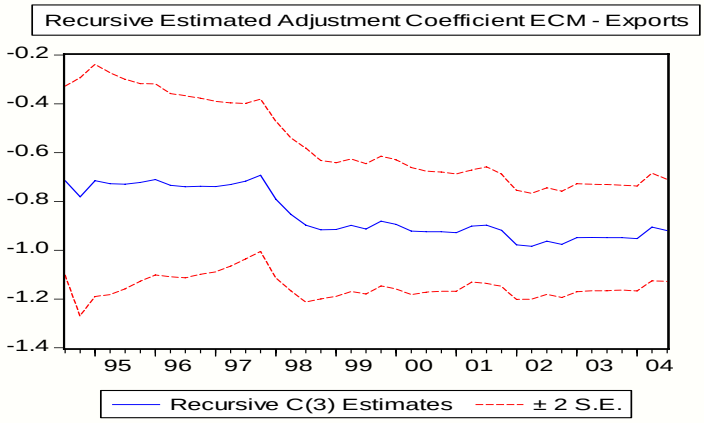


Table 12
Chow Breakpoint Test-Exports

Breakpoint	F-Statistic	Probability
1997:Q4	1.085136	0.387759
1999:Q1	0.527841	0.783756
1999:Q2	0.631997	0.703754
2002:Q1	0.925129	0.487413
2002:Q2	0.993855	0.442651

Figure 6
Recursive Estimated Adjustment Coefficient ECM-Export



However, when the CUSUMSQ and Chow tests consistently show the absence of instability there is a considerable drop in the RLS estimated ECM adjustment over the period 1997:Q4

to 1998:Q3 (see Figure 6). The sharp drop indicates that the speed of adjustment to the export long-run equilibrium becomes much faster. It offers a possible significant break for structural change in the exports function, but according to the results shown in Tables 12 amd 13, the Chow Breakpoint and Forecast tests again do not reject the null hypothesis of stability (no structural changes).

Table 13
Chow Forecast Test Results for Export Break in 1997

Chow Forecast Test: Forecast from 1997Q3 to 2004Q3			
F-statistic	1.372486	Prob. F(29,17)	0.249564
Log likelihood ratio	62.73072	Prob. Chi-Square(29)	0.000279
Chow Forecast Test: Forecast from 1997Q4 to 2004Q3			
F-statistic	1.487545	Prob. F(28,18)	0.191484
Log likelihood ratio	62.30345	Prob. Chi-Square(28)	0.000205

Table 14
The Adjusted ECM Exports with Dummy Variables

Dependent Variable: DLREX Method: Least Squares Sample (adjusted): 1991Q4 2004Q3 ; n= 52 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLREX(-3)	-0.286967	0.048529	-5.913350	0.0000
DLRPEX(-5)	-0.491872	0.156847	-3.136004	0.0030
ECMEXP(-1)	-0.892818	0.115602	-7.723215	0.0000
DECMEX(-1)	-0.066404	0.120642	-0.550423	0.5848
C	0.091809	0.012523	7.331478	0.0000
Q3	-0.214461	0.031462	-6.816586	0.0000
Q4	-0.159806	0.021146	-7.557342	0.0000
DLREX(-3)	-0.286967	0.048529	-5.913350	0.0000
R-squared	0.935212	Mean dependent var		0.004605
Adjusted R-squared	0.926573	S.D. dependent var		0.202553
S.E. of regression	0.054887	Akaike info criterion		-2.842446
Sum squared resid	0.135564	Schwarz criterion		-2.579778
Log likelihood	80.90359	F-statistic		108.2613
Durbin-Watson stat	1.773329	Prob(F-statistic)		0.000000

Table 15
Wald Test Results on DECMEX-Export

Wald Test:

Hypothesis:

$H_0 : DECMEX(-1) = 0$

$H_1 : DECMEX(-1) \neq 0$

Test Statistic	Value	df	Probability
F-statistic	0.302965	(1, 45)	0.5848
Chi-square	0.302965	1	0.5820

To verify the speed of adjustment to the export long-run equilibrium in 1997 (see the drop of export ECM in Figure 6), another interactive dummy variable is used to test for the instability in 1997:Q3, which solely examines the ECM term (DECMEX). The export instability in 1997 is not statistically significantly different from zero even though the drop appears substantively significant as shown in Figure 6 (see Tables 14 and 15). Thus, the 1997 spike found in the export instability did not lead to export structural change.

The CUSUMSQ and Chow tests show no structural changes over the investigated period, but the fast adjustment in the long-run export equilibrium is evidenced in the recursive least square estimates of the coefficients of the ECM export term. The decrease starts in 1997:Q4 and the Asian financial crisis took place in the middle of 1997. Thus, in terms of exports, it can be explained that the 1997 Asian financial crisis impact New Zealand's export with the EU rather than the introduction of the euro. Many industrial countries suffered adverse effects on economic growth because of the 1997 Asian financial crisis since those countries had significant trade links with Asia (see OECD, 1998; WEO, 1999) and the crisis was a contagion crisis.

In summary, we used the CUSUMSQ test, the Chow Test, and Recursive Least Square (RLS) ECM coefficients search for instabilities in the import and export models. These tests are

used to determine whether the introduction of the euro resulted in structural changes in New Zealand bilateral trade with the EU. The results are summarized in Table 16.

Table 16
Test of Instability: Import and Export Models

Stability Tests	Import	Export
CUSUMSQ Test	Instability Found: over 1995 to 1999	No Instability
Chow Test	No Structural Change	No Structural Change
Recursive Least Square of ECM coefficient	Instability Found: in 1997, 1999, and 2003	Instability Found: in 1997

Some temporary instability has been found in the import and export models by CUSUMSQ test and RLS of ECM coefficients. The instability has been more prominent in imports than in exports. The Chow stability test, however, indicates absence of instability in both import and export models.

5. Conclusion

This study examines the existence of a short-run and long-run relationship between real imports (exports) and their determinants. It also examines whether the introduction of the euro resulted in structural changes in New Zealand's export and import relations with the EU. In terms of the long run relations, the income elasticity of demand for imports is larger than income elasticity of demand for exports, which showed New Zealand experienced trade deficits with the EU. In order to improve the trade deficits, New Zealand should improve its trade relationship with the EU beyond agriculture products.

The 1997 Asian financial crisis has an overwhelming impact on the New Zealand economy, and the results showed that the crisis simultaneously impacts on New Zealand's bilateral trade with the EU. In addition, the instability found in 1999 in imports by RLS of the import ECM, could be caused by the depreciation of the euro. Therefore, the empirical results did show some weak evidence of a structural break in New Zealand's bilateral trade with the EU, but the 1997 Asian financial crisis impacted on New Zealand's bilateral with the EU more

than the introduction of the euro. And, the depreciation of the euro from 1999 to 2000 also affected New Zealand's imports from the EU.

The findings in the long-run and short-run relations in New Zealand's imports and exports with the EU show that exports converge to a long-run equilibrium state after a shock faster than for imports. In addition, the instability has been more prominent in imports than in exports, and New Zealand's trade deficit with the EU is more prominent when New Zealand's income elasticity of the import demand is greater than the income elasticity of the export supply. These findings may help policy makers respond to an unexpected shock immediately, and make appropriate changes to current trade policies. For example, New Zealand needs to improve its trade relationship with the EU beyond agricultural products in order to improve its trade deficit. Furthermore, the relative price in the short run affects New Zealand's import and export relations with the EU and New Zealand could use appropriate monetary policy to insulate from the foreign exchange market against the euro in order to indirectly influence the country's trade balance when a shock occurs.

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Table 1
New Zealand Exports to the European Union: Top 20 (NZ$000 FOB)

Description	2000 Export FOB	2001 Export FOB	2002 Export FOB
Sheep meat	1,201,402	1,390,376	1,478,107
Wool	385,748	320,001	336,726
Butter	285,986	295,406	303,936
Apples, pears	242,208	192,644	271,616
Kiwifruit	306,146	292,218	258,454
Casein	166,506	223,024	193,126
Cheese	133,030	218,065	148,167
Venison	129,459	202,481	143,899
wine	110,737	131,612	140,582
Fish fillets	100,313	132,801	126,739
Leather of bovine	119,561	139,040	117,883
Onions	41,678	55,702	77,646
Milk powder	8,468	11,859	72,960
Molluscs	66,395	89,075	72,664
Frozen fish	51,214	68,797	57,707
Aluminium	8,577	31,793	55,248
Raw skins, sheep	61,610	73,595	47,105
Raw hides and skins	34,447	41,279	43,191
Medical or vet instruments	29,761	39,071	40,494
Human blood	16,940	28,511	36,029

Source: Statistics New Zealand

Table 2
New Zealand Imports from the EU-15: Top 20 (NZ$000 CIF)

Description	2000 Import CIF	2001 Import CIF	2002 Import CIF
Cars	409,649	558,836	692,754
Medicaments	285,935	323,152	318,169
Tractors	136,367	228,334	269,508
Aircraft	107,793	32,268	144,229
Trucks and vans	103,997	142,355	140,965
Telephone equipment	95,689	89,814	75,590
Harvesting machinery	45,760	54,941	74,943
Paper and paperboard	77,986	78,357	72,984
Motor vehicles parts	52,300	61,493	67,633
Taps, cocks, valves	53,752	55,105	60,427
Insecticides etc.	50,465	52,716	59,209
Plastic plates, sheets, etc	50,702	44,594	56,211
Medical or vet instruments	49,309	55,718	55,918
Air or vacuum pumps	40,628	50,464	54,685
Records, tapes	37,256	45,299	52,330
Undenatured ethyl alcohol	51,389	52,937	51,377
Printers	36,332	51,377	50,209
Books etc	53,892	54,873	49,141
Pumps	45,522	54,480	48,974
Switching gear	42,616	42,705	47,354

Source: Statistics New Zealand