Australasian Accounting, Business and Finance Journal

Volume 8 | Issue 5 Article 4

2014

# An Empirical Investigation of Trade Flows Between Australia and its Major Trading Partners

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Recommended Citation

Belicka, Samuel and Saleh, Ali Salman, An Empirical Investigation of Trade Flows Between Australia and its Major Trading Partners, *Australasian Accounting, Business and Finance Journal*, 8(5), 2014, 47-78. doi:10.14453/aabfj.v8i5.4

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## Keywords

Australia; Trade deficit; Trading partners; Net export models; Estimation

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**Samuel Belicka[1] and Ali Salman Saleh[2]**

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This study introduces Net Export (NX) models to examine the determinants of the trade flows between Australia and eight selected trading partner (TP) countries (China, France, Germany, Malaysia, Singapore, Thailand, United Kingdom, United States of America) in four selected Trade Deficit (TD) categories (Pharmaceutical Products; Nuclear Reactors, Boilers, Machinery and Mechanical Appliances; Electrical Machinery and Equipment; Sound Recorders and Producers, and Vehicles Other Than Railway or Tramway Rolling-Stock). A total of 29 NX models are estimated, which are based on both the monetary and Quantity (QTY) values. Findings in this study suggest that macroeconomic variables such as money supply, interest rates and savings rates have no-significant effect in the determination of the NX levels in the selected categories. This highlights that monetary policy cannot influence the NX levels in the selected TD categories in Australia. This study also identifies some policy implications which arise from this paper.

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**JEL Code(s):** F14, O24

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## I. Introduction

Research in the area of trade flows between Australia and China, France, Germany, Malaysia, Singapore, Thailand, United Kingdom and United States of America is scant. To our knowledge, there is only one study (see, for instance, Kyereme, 2002) that examined the key determinants of Net Export (NX) between the United States of America and Australia. Despite the growing Trade Deficit (TD) between Australia and these selected TD and relevant industries (such as Pharmaceutical Products, Nuclear Reactors, Boilers, Machinery and Mechanical Appliances etc.) involved in international trade, there is only very limited research in this area. The existing literature is sporadic and selective in their focus on industries, countries and the export (X) and import (M) determinants/ variables. According to the extensive list of empirical studies such as McColl & Nicol (1980), Labys & Cohen (2006), Swift (2005), Bahmani-Oskooee & Wang (2007), Mulgan (2008), there is strong evidence to show that systematic, intensive and in-depth research has not been undertaken in respect to Australia's trading partners in selected TD categories within the current literature. In this study, our objective is to introduce Net Export (NX) models to analyse the determinants of the trade flows from the theoretical and empirical perspectives between Australia and eight selected Trading partner countries (China, France, Germany, Malaysia, Singapore, Thailand, United Kingdom, United States of America) during the period of 1990-2006. This study has focused on this particular period because during this period, the Australian economy has experienced the longest period of economic growth and the Australian dollar has significantly appreciated, especially during the start of the year 2006 (one of the year of commodity export boom). The NX model estimated will clearly identify which macroeconomic variables are significant in explaining the NX level in the four selected TD categories (*Category 30* - Pharmaceutical Products; *Category 84* - Nuclear Reactors, Boilers, Machinery and Mechanical Appliances; Parts Thereof; *Category 85* - Electrical Machinery and Equipment and Parts Thereof; Sound Recorders and Producers, Television Image and Sound Recorders and Reproducers, and Parts and Accessories of Such Articles and *Category 87* - Vehicles Other Than Railway or Tramway Rolling-Stock, and Parts and Accessories). Additionally, the existing studies (see, for example, Kyereme, 2002 and Duasa, 2007) which estimated the NX models did not incorporate the key variables such as interest rates and savings rates which based on the economic theory playing a significant influence in determination of the NX levels. To our knowledge there are no existing studies which specifically investigate the NX between Australia and its trading partner countries in any of the above specific categories, which generate the need to introduce the NX models in these categories to identify and to better understand the variables responsible for the trade balance in these categories. We believe conducting such analysis is important for policy implications and to ascertain what macroeconomic variables are influencing the NX levels in the selected categories. For example, the existing studies lack the emphasis on the interest rates and saving rates and their effects on the NX levels. As a result, this study will establish the significance of these two variables with respect to the NX levels in these categories and in turn it will clarify its significance for policy makers.

The NX models estimated in this study are concerned with bilateral trade analysis between Australia and the selected trade partner countries in the four selected TD categories. Bilateral trade analysis in comparison to multilateral trade analysis are likely to divulge additional information that are distinctive for each trading partner country analysed and as a result, it is likely to provide supplementary information to the relevant industries and trade policy makers.

The NX in this study refers to the trade balance between Australia and the selected trading partner countries in the selected TD categories. The selected categories in this study are growing industries in Australia in respect to their contribution to Gross domestic Product (GDP) and at the same time Australia is experiencing a significant and growing TD in these categories. All NX models estimated are examined on a bilateral basis in order to establish the patterns and determinants of a two-way trade between Australia and the selected trade partner countries. According to Kyereme (2002), the bilateral trade analyses when compared to the multilateral trade analysis are likely to provide policy makers with more comprehensive trade balance information. This includes ‘country specific’ variables that are significant in trade flows determination, which in turn can assist policy makers to tailor more effective trade policies.

## II. A Review of the Literature

According to the Keynesian open macroeconomic model, a country’s GDP is one of the major determinants of the NX levels, which argues that contractionary fiscal policy reduces the TD, while expansionary fiscal policy increases the TD levels. This method in the current literature is known as the ‘absorption approach’. The ‘absorption approach’ has been pioneered by Harberger (1950), Meade (1951) and Alexander (1959), which specifies that any trade balance improvements can be achieved only by increasing the domestic aggregate income over aggregate expenditure.

Econometric analysis of the NX in the current literature is limited. Investigating the relationship between the trade balance and the net trade flows has been a main focus in the literature (Bahmani-Oskooee (1992), Martín & Velázquez (2002), Kyereme (2002) and Duasa (2007)). Two most relevant empirical studies that have estimated the NX are the studies by Kyereme (2002) and Duasa (2007), while Tang (2008) has reviewed the study by Duasa (2007). The study by Kyereme (2002) estimated the NX between the United States of America and Australia, while the study by Duasa (2007) estimated the NX between Malaysia and the Association of Southeast Asian Nations (ASEAN) countries. The dependent variables used in these two studies by Kyereme (2002) and Duasa (2007) are the United States of America’s NX over the Australian NX and the ratio of the X over M between Malaysia and ASEAN countries respectively.

Kyereme (2002) used four independent variables which include the Gross Domestic Product (GDP), exchange rates (EXR), money supply (MS) and interest rates (IR), while the GDP, MS and IR are all expressed as a ratio of the United States of America’s values relative to the Australian values and the EXR is expressed as value of one unit of the AUD in terms of the USD. The major findings in this study suggest that the IR is the most significant variable, followed by the GDP, MS and EXR. Furthermore, all variables except the MS and the EXR are statistically significant at 1 per cent level, while the MS is significant at a 5 per cent level and the EXR is not statistically significant. Finally, the 3 independent variables (GDP, MS and EXR) have a negative relationship with the NX and the IR is having a positive relationship with the NX.

Duasa (2007) used three independent variables which includes the Malaysian EXR, GDP and MS. The overall finding in this study shows a weak statistical link between the NX and the EXR, while the links between the NX - GDP and the NX - MS are statistically significant at a 1 per cent level of significance. In overall, in the long-run, the independent variables GDP and EXR shows a negative relationship with the NX and the MS shows a positive relationship with the NX. However, the coefficients estimated using the ECM shows a negative relationship between the NX and all these 3 independent variables.

The major difference between these two studies is that Kyereme (2002) compared to Duasa (2007) has used in the model the IR variable as an additional independent variable. Furthermore, Kyereme has taken into account the values of both the domestic and foreign macroeconomic variables, while Duasa has included only the Malaysian domestic macroeconomic variables in the model. Tang (2008) has criticized the approach adopted by Duasa (2007), on the basis that the independent variables the GDP and MS are only observed for the Malaysian economy, while the foreign GDP and MS are not taken into account. In addition, according to Tang (2008), the IR is an important dependent variable and should be included in the NX model; however, Duasa (2007) has omitted this variable.

Both NX models estimated by Kyereme (2002) and Duasa (2007), have used an aggregated X and M volumes as a dependent variable, without reference to any specific category. This approach is likely to have some shortcomings, for instance, different trade categories is likely to respond differently to changes in the macroeconomic variables. Hence, the estimation of the NX models with reference to specific trade categories is likely to reveal more specific information on a category-by-category basis. Kyereme (2002) recognized the potential downsides of his model and clearly suggests that further research in this area is required, which includes and is not limited, to model modification and inclusion of an additional variable(s) in order to develop a more robust NX model. Hence, these above studies suffer from many limitations such as lack of emphasis on variables such as interest rates and savings rates which based on the economic theory playing a significant influence in determination of the NX levels. Furthermore, the existing studies mainly focus on the United States of America and Malaysia, and none of them focus on Australia.

## III. Theoretical Framework and Methodology

In this study we follow Duasa's (2007) approach in determining the dependent variable, where the NX will be expressed as a ratio of the X to M between Australia and the selected TD country, in the selected TD category. This approach as Bahmani-Oskooee (1991) suggested is preferable, since it is not sensitive to the units of measurement and interpretation of such ratio refers to real trade balance. In addition, the usage of the ratio maintains a positive value of the NX, irrespective of whether the trade balance is a positive or negative value; hence, the variables can be expressed in a natural logarithm if required. Due to these advantages, the NX ratio has been used in numerous empirical studies, which includes studies by Bahmani-Oskooee & Brooks (1999), Onafowora (2003) and Duasa (2007).

Existing studies which provide empirical evidence on the relationship between GDP levels and the trade flows include Balassa (1967), Goldstein & Khan (1978; 1985), Silvapulle & Phillips (1985), Arize (1987), Lawrence 1990, Koshal *et al*. (1992), Carone (1996), Warr & Wollmer (1996), Belessiotis & Giuseppe (1997), Baharumshah (2001), Boyd *et al*. (2001); Chinn (2004), Havrila (2004), Lau *et al*. (2004), Kyereme (2002) and Duasa (2007).

Based on the above review of empirical studies, the NX model can be expressed in the following form:

$$X_{D(i)}{}^{t} / M_{D(i)}{}^{t} = f\left[\left(GDP_{D}{}^{t} / GDP_{j}{}^{t}\right)\right] \quad (1)$$

Where: '$X_D$' and '$M_D$' is the Australian (or domestic) X and M respectively, '$i$' is the industry for the category $i$, '$j$' is the foreign country $j$ and '$t$' is the time period.

Another independent variable that is traditionally used in the analysis of the balance of payment and the trade models is the EXR, where the EXR theoretically determines the relative prices of the X and M volumes, and hence the NX levels. This method in the current literature is known as the 'elasticity approach' or as the 'imperfect substitute' model. The 'elasticity approach' attempts to establish whether the devaluation of the country currency improves the country's trade balance according to the Marshall-Lerner condition[3]. Studies that analysed the trade balance using the elasticities approach include Frenkel *et al*. (1969), Dornbusch (1975), Johnson (1976) and Boyd *et al*. (2001) and Xu (2008).

From the point of economic theory, the EXR is likely to have a significant impact on the X and M flows and this is supported by an enormous number of empirical studies (see, for instance, Himarios (1989), Bahmani-Oskooee (2001), Kyereme (2002) and Bahmani-Oskooee & Wang (2007)). These studies have found a significant relationship between the trade balance and the EXR. On the other hand, studies by Greenwood (1984), Mahdavi & Sohrabian (1993), Rahman *et al*. (1997) and Duasa (2007) have found rather weak empirical evidence on the relationship between the EXR and the X and M flows. Based on these empirical findings, inconclusive evidence exists as to whether the EXR are statistically significant in determining the X and M flows. In order to shed some light as to whether the EXR is statistically significant in determining the X and M flows between Australia and the selected TD countries and categories, the EXR variable will be included in the NX models estimated in this study. The EXR variable was also used in the studies by Kyereme (2002) and Duasa (2007), which have estimated the NX between the United States of America, Australia, Malaysia and ASEAN countries respectively. The NX model in this form is presented in Equation 2 as follows:

$$X_{D(i)}{}^{t} / M_{D(i)}{}^{t} = f\left[\left(GDP_{D}{}^{t} / GDP_{j}{}^{t}\right), EXR_{D/F}\right] \quad (2)$$

Where: '$EXR_{D/F}$' is the EXR of the Australian Dollar per one unit of the foreign currency.

Finally, another method used in the analysis of the balance of payments can be viewed from a 'monetary' point of view. This approach puts forward that the MS and demand for money is likely to influence the country's trade balance and other components of the balance of payments. According to the monetary approach, the excess MS in the economy causes a balance of payments deficit and as a result, the balance of payments dis-equilibrium should be addressed with an appropriate monetary policy. Polak (1957), Hahn (1959), Prais (1961) and Mundell (1971) argue that the balance of payment should be viewed primarily from a 'monetary' point of view. Recent empirical studies, which have included money variables in the trade models, include Liew *et al*. (2003), Kyereme (2002) and Duasa (2007). As a result, the MS variable will be included in the NX model and the NX model in this form is presented in Equation 3 as follows:

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[3] The Marshall-Lerner condition stipulates that if the sum of the price elasticity of the X and M (in absolute values) exceed unity, the devaluation of the country's currency will improve the trade balance. However, based on empirical evidence, the relative depreciating of the currency in relations to other trading partners currencies will lead to the improvement in trade balance only in the long-run, while in the short-run, the trade balance will deteriorate. This phenomenon is known as a 'J-curve' (Dornbusch *et al*., 2002); however, the empirical support for the J-curve phenomena is inconclusive, and some studies show the evidence for the J-curve phenomena (Bahmani-Oskooee, 1985), while others such as Himarios (1989) do not.

$$X_{D(i)}{}^{t} / M_{D(i)}{}^{t} = f\left[\left(GDP_D{}^{t} / GDP_j{}^{t}\right), EXR_{D/F}{}^{t}, \left(MS_D{}^{t} / MS_j{}^{t}\right)\right] \quad (3)$$

Where: '$MS_D$' and '$MS_j$' is the Australian and foreign country MS (M3) respectively.

According to Tang (2008, p.128), the independent variables GDP, EXR and MS presented in Equation 3 represents an 'open economy' macro equilibrium variables rather than from the 'absorption approach' and the 'monetary' point of view. Tang (2008) criticised Duasa (2007) for estimating the NX model presented in this above form, and suggested that the IR should be included in the NX model. Following the suggestion by Tang (2008) and the empirical study by Kyereme (2002), the NX model in this study incorporates the IR variable and the NX model in this form is presented in Equation 4 as follows:

$$X_{D(i)}{}^{t} / M_{D(i)}{}^{t} = f\left[\left(GDP_D{}^{t} / GDP_j{}^{t}\right), EXR_{D/F}{}^{t}, \left(MS_D{}^{t} / MS_j{}^{t}\right), \left(IR_D{}^{t} / IR_j{}^{t}\right)\right] \quad (4)$$

Where: '$IR_D$' and '$IR_j$' is the Australian and foreign country IR respectively.

By referring to the Keynesian Investment-Saving and Liquidity Preference-Money Supply (IS-LM), the equilibrium in an open economy is achieved when equilibrium in the goods and money market exists. The Saving (S) is likely to play an important part in the trade balance determination. Based on the S and Investment (I) framework, the Current Account (CRA) = S – I, which can be also expressed as a Trade Balance = S – I (Griswold, 2007 and Tang, 2008). Based on this S and I framework, there is a strong argument to include the SVR as an additional independent variable in the NX model. Tang (2008) suggests the importance of the inclusion of the SVR variable in this model, while Kyereme (2002) suggests that the estimation of NX model without a SVR variable should be subject to a further model modification and/or inclusion of an additional variable(s). Based on this review, an additional independent variable - the SVR will be included in the NX model and the NX model in this form is presented in Equation 5 as follows:

$$X_{D(i)}{}^{t} / M_{D(i)}{}^{t} = f\left[\left(GDP_D{}^{t} / GDP_j{}^{t}\right), EXR_{D/F}{}^{t}, \left(MS_D{}^{t} / MS_j{}^{t}\right), \left(IR_D{}^{t} / IR_j{}^{t}\right), \left(SVR_D{}^{t} / SVR_j{}^{t}\right)\right] \quad (5)$$

Where: '$SVR_D$' and '$SVR_j$' is the Australian and foreign country SVR respectively.

Based on this review, the NX model which will be estimated is presented in Equation 6 as follows:

$$NX_{ij}{}^{t} = \alpha_0 + \alpha_1 GDP^t + \alpha_2 EXR^t + \alpha_3 MS^t + \alpha_4 IR^t + \alpha_5 SVR^t + \varepsilon^t \quad (6)$$

Where: '$\alpha_0$' is the intercept, '$\alpha_1, \alpha_2, \alpha_3, \alpha_4, \alpha_5$' are the slope coefficients, '$\varepsilon$' is a random error, '$NX$' is the ratio of the Australian X over the Australian M, '$GDP^t$' is the ratio of the Australian GDP level over foreign country GDP level, '$EXR^t$' is the EXR of the Australian Dollar per one unit of the foreign currency, '$MS^t$' is the ratio of the Australian MS (M3) over foreign country MS (M3) levels, '$IR^t$' is the ratio of the Australian IR over foreign country IR, '$SVR^t$' is the Australian SVR over foreign country SVR, '$i$' is the industry for the category $i$, '$j$' is a country $j$ and '$t$' is a time period.

The expected a priory signs for variables in Equation 6 are negative for '$\alpha_1, \alpha_2, \alpha_3$' and positive for '$\alpha_4, \alpha_5$'. For '$\alpha_1$' other things being equal, as the Australian GDP relative to foreign GDP increases by a greater amount, it is expected that the trade balance will worsen (as the M volume tends to increase and as a result the ratio of the Australian X over the Australian M will decrease), hence a negative a priori sign. For '$\alpha_2$' other things being equal, as the Australian dollar appreciates against the foreign currency, it is expected that the trade balance will worsen (as an appreciation of the Australian currency is likely to increase the M levels and to decrease the X levels and as a result, the ratio of the Australian X over the Australian M will decrease), hence a negative a priori sign. For '$\alpha_3$' other things being equal, as the Australian MS increases by greater amounts than the foreign MS, it is expected that the trade balance will worsen (as the M volume tend to increase and as a result, the ratio of the Australian X over the Australian M will decrease), hence a negative a priori sign. For '$\alpha_4$' other things being equal, as the Australian IR increases by a greater amount than a foreign IR, it is expected that the trade balance will improve (as the M volume tends to decrease and as a result, the ratio of the Australian X over the Australian M will increase), hence a positive a priori sign. Finally, for '$\alpha_5$' other things being equal, as the Australian SVR increases by a greater amount than a foreign SVR, it is expected that the trade balance will improve (as the M volume tends to decrease and as a result, the ratio of the Australian X over the Australian M will increase), hence a positive a priori sign.

Having determined the the theoretical NX model, an important aspect to consider is whether to use a linear or non-linear NX model. According to Khan & Ross (1975; 1977) and Salas (1982), when the estimated model is used for forecasting, the linear model is a more suitable form. However, when the purpose of the study is to establish to what degree the changes in the explanatory variables affect the dependant variable overtime, the preferred model is the log-log form. Model estimation in log-log form has been adopted in a vast number of studies (see, for instance, Kyereme (2002) and Duasa (2007)). Hence, the functional form for the NX model, which will be estimated for the selected TD categories and countries, will be in the log-log form. According to Gujarati (2003, p.421), this approach will not only produce elasticities but it is also likely to reduce the problems with heteroscedasticity[4]. The adopted functional form for the NX in the log-log form is presented in Equation 7 as follows:

$$LnNX_{ij}^{\ t} = \alpha_0 + \alpha_1 LnGDP^t + \alpha_2 LnEXR^t + \alpha_3 LnMS^t + \alpha_4 LnIR^t + \alpha_5 LnSVR^t + \varepsilon^t \qquad (7)$$

Where: '$Ln$' is the natural logarithm for the corresponding variables.

The aim of the methodology used in this study is to ensure that all NX models estimated are conforming to the 9 classical model assumptions (Gujarati, 2003), in order to obtain an unbiased estimates for the population parameters. If one or more of these assumptions are violated, it can lead to problems associated with biased coefficient and standard error estimates. This in turn will ultimately affect the validity of the inferential statistics about estimates and finally, the distribution assumed during the tests will become inappropriate. According to Phillips (1986), if these assumptions are violated, the t-tests and F- tests are unlikely to be reliable. On the other hand, if these 9 classical assumptions are satisfied, the regression model is likely to produce the Best Unbiased Estimators (BUE) for the population regression parameters. However, the classical assumptions for the regression model estimation assume that the time-series data for both the dependent and independent variable(s) are stationary. This implies that the mean, variances and autocovariances do not change overtime. On the contrary, this assumption is frequently violated and as a result, it is likely to lead to autocorrelation, a non-normality problem and most importantly to cause spurious regression[5] (Gujarati, 2003).

[4] Heteroscedasticity is a common problem when cross-sectional data is used, which is the case in this study.
[5] A spurious regression produces a high R-square and high t-statistics; however, despite these desirable properties of the overall regression results, they are without any economic meaning. For a more detail explanation of the properties of the spurious regression, refer to Granger & Newbold (1974). According to Gujarati (2003), another indication of spurious regression is when R-square > DW, where DW is Durbin-Watson statistic.

Since the 9 classical assumptions and stationarity are critical, the adopted estimation procedures will commence by testing the variables for the presence of the unit root (non-stationarity). The tests for non-stationarity will include both informal and formal procedures. The informal procedure includes plotting the time-series data and observing the trend (both the linear and non-linear) and any possible relationship and the formal method will include the Dickey-Fuller Test (DFT), Augmented Dickey-Fuller Test (ADFT) (Dickey & Fuller, 1979) and the Phillips-Perron Test (PPT) (Phillips & Perron, 1988).

Once the variables are tested for non-stationarity and if none of the variables have a unit root, the Ordinary Least Squares (OLS) will be applied, followed by the standard diagnostic tests. If some variables have a unit root and some do not, the first difference or second difference (if required) will be taken off the variables which have a unit root. Once these variables (with a unit-root) after differencing becomes stationary, the OLS will be applied followed by the standard diagnostic tests. If all variables have a unit root and such variables are stationary in the first difference form I(1) or in any other form i.e. I(2)[6], I(3), such variables can be potentially cointegrated, consequently, the Johansen Maximum Likelihood Procedure (JMLP) test for cointegration will be carried out. If the JMLP reveals one cointegrating equation, the Error Correction Model (ECM) will be applied followed by the standard diagnostic tests. However, if the JMLP reveals more than one cointegrating equation, the Vector Autoregression Model (VARM) will be applied, followed by the standard diagnostic tests.

## IV. DATA AND DATA SOURCES

The Australian X and M trade data for all the selected trading partner countries and categories are obtained from the Trade Data International (TDI). The Australian GDP (ABS, 2008 d) and the SVR (ABS, 2008a) data are obtained from the Australian Bureau of Statistics (ABS). The Australian EXR[7] for all the selected TD countries except for Thailand (RBA, 2009a), MS (RBA, 2009c) and IR (RBA, 2009d) are obtained from the Reserve Bank of Australia (RBA).

The units of the X and M between Australia and the selected TD countries and categories in the monetary values are expressed in millions of Australian Dollars (AUD) in both the HS-2 and HS-4 (Harmonized Commodity Description and Coding System - Second and fourth Levels of aggregation).

Furthermore, the units of the X and M values based on Quantity (QTY) in all estimated models between Australia and the selected TD countries are in single units. Finally, the Australian GDP and SVR[8] are expressed in millions of AUD, MS is expressed in billions of AUD, and the IR[9] are expressed in percentage per annum.

The data for China is obtained from the Organization for Economic Cooperation and Development (OECD), RBA and The People's Bank of China. The GDP data is are obtained from OECD (2008a), the EXR are obtained from the RBA (2009a), the MS, IR data are obtained from OECD (2008b), and the SVR data is obtained from The People's Bank of China (2009). The GDP[10] and MS[11] are expressed in billions of Chinese Yuan, the SVR[12]

[6] If it is more than 2 '>I(2)', the coefficient(s) estimated cannot be meaningfully interpreted.
[7] The EXR data from the RBA are originally in monthly time-intervals and for the purpose of this analysis converted to quarterly time-series by taking an average of the corresponding 3 monthly EXR's, while the EXR for Thailand are originally in quarterly time intervals. Furthermore, all EXR (except for the TWI) are expressed as value of one unit of foreign currency in terms of the Australian currency.
[8] The Australian SVR originally is expressed in millions of Australian Dollars.; however, these figures are converted to AUD bill. in order to be consistent with most of the other TD countries data.
[9] The lending standard variable rates.
[10] The Chinese GDP data is only available from 1995:Q1 and is expressed in billions of Yuan, while these data are converted to AUD, mill. in order to be consistent with the Australian GDP data.
[11] The Chinese MS (M3) data is converted to billions of AUD in order to be consistent with the Australian MS data.

data is expressed in 100s of millions of Yuan, and the IR is expressed in percentage per annum.

The data for France and Germany are obtained from the Bank of France (BOF), Deutsche Bundesbank, OECD and RBA. The GDP data for France and Germany are obtained from the OECD (2008a), the EXR[13] is obtained from the RBA (2009a), and the MS data for France and Germany are obtained from the BOF (2008a) and Deutsche Bundesbank (2009) respectively. Furthermore, the IR data for France and Germany are obtained from the OECD (2008b) and the SVR data for France and Germany are obtained from BOF (2008b) and OECD (2008b) respectively. The GDP[14] data for both France and Germany are expressed in billions of euro, the MS[15] is expressed in millions of euro and the IR[16] for France and Germany are expressed in percentage per annum. The SVR[17] for France is expressed in millions of euro, while the SVR[18] for Germany is expressed in billions of euro.

The data for Malaysia is obtained from the Department of Statistics Malaysia (DOSM) and the RBA. The GDP data is obtained from the DOSM (2009) and the EXR is obtained from the RBA (2009a), while the Malaysian GDP[19] is expressed in millions of Malaysian Ringgit.

The data for Singapore is obtained from the Monetary Authority of Singapore (MAS), the RBA and the Singapore Department of Statistics. The GDP data is obtained from the Singapore Department of Statistics (2009), the EXR is obtained from RBA (2009a), while the MS (MAS, 2008a), IR (MAS, 2008b) and SVR (MAS, 2008c) data are obtained from the MAS. The GDP[20], MS[21] and SVR[22] are expressed in millions of Singaporean Dollars (SGD) and the IR[23] is expressed in percentage per annum.

The data for Thailand is obtained from the Bank of Thailand (BOT) and the Thailand National Economic and Social Development Board (NESDB). The GDP data is obtained

[12] The Chinese SVR refers to net savings data and is only available from 2000:Q1. The net savings data is originally expressed in monthly intervals and in 100s Yuan, mill. These data are converted to quarterly time intervals (as the values at the end of the period) and to billions of AUD in order to be consistent with the Australian SVR data.

[13] The structural break in the EXR for France and Germany exists, due to the introduction of the Euro currency on January 1, 1999, when France's Franc and Germans' Mark were replaced by the common European currency Euro. Consequently, the EXR for these 2 countries is proxy by the Trade-Weighted Index (TWI). This proxy can be considered reliable, since according to the RBA (2009b), the European Euro is on the third highest position in the TWI table, where the total Australian trade weight with the European countries (which includes France and Germany) accounts for 11.65 per cent of the total Australian trade.

[14] The GDP data for France and Germany is converted to millions of AUD in order to be consistent with the Australian GDP. Furthermore, as the EXR for Euro is not available before January 1999, the period between 1990:Q1 and 1998:Q4 is the EXR estimate only, which has been used for conversion of the France and German GDP to millions of AUD for this period.

[15] The original MS data (M3) for France and Germany are expressed in millions of euro and are in monthly intervals. These data are converted to billions of AUD and to the quarterly time-series (as the values at the end of the period) in order to be consistent with the Australian MS data. Additionally, the MS data for these 2 countries correspond to the MS for the whole Euro Area and are available only from 1997:Q3, consequently the MS for period between 1990:Q1 and 1997:Q2, are again estimates only. The main reason why the whole Euro Area MS data for these 2 countries is used is due to the nature of the MS data for individual European countries (individual European countries MS is available only as a contribution by each country to the total MS for the whole Euro Area). However, since such contribution can be negative (for any individual country contribution), such data are considered not suitable since the log values cannot be taken from negative values. Due to this, the MS data for France and Germany used in this study are those for the whole Euro Area.

[16] The IR data for France and Germany due to breakdowns in series, which are associated with the European Union integration, are proxy by the 10-year government bonds yield.

[17] The France SVR are originally expressed in monthly intervals and in millions of euro; these data are converted to quarterly time intervals (as the values at the end of the period) and are converted to billions of AUD in order to be consistent with the Australian SVR data.

[18] The Germany SVR are originally expressed in quarterly intervals and in billions of euro. These data are converted to AUD, bill. in order to be consistent with the Australian SVR data.

[19] The Malaysian GDP data is obtained from the DOSM on special request. This data is originally expressed in millions of Malaysian Ringgit, which is converted to millions of AUD in order to be consistent with the Australian GDP data.

[20] The GDP data for Singapore is converted to millions of AUD in order to be consistent with the Australian GDP.

[21] The original MS data (M3) for Singapore is expressed in millions of Singaporean Dollars, in monthly intervals and are available from 1991:Q1. This data is converted to billions of AUD, and to the quarterly time-series (as the values at the end of the period) in order to be consistent with the Australian MS data.

[22] The Singaporean SVR is originally expressed in millions of Singaporean Dollars, in monthly intervals and are available from 1991:Q1 This data is converted to the quarterly time-series (as the values at the end of the period) and to billions of AUD in order to be consistent with the Australian SVR data.

[23] The IR data for Singapore is originally in monthly time-intervals, which are converted to quarterly time-series (as the values at the end of the period) in order to be consistent with the Australian IR data.

from the NESDB (2008), while the EXR (BOT, 2008a), the MS (BOT, 2008b), the IR (BOT, 2007a) and the SVR (BOT, 2007b) data are all obtained from the BOT. The GDP[24], MS[25] and SVR[26] are expressed in millions of Thai baht and the IR[27] are expressed in percentage per annum.

The data for the United Kingdom is obtained from the Bank of England (BOE), the OECD and the RBA. The GDP data is obtained from the OECD (2008a), the EXR from the RBA (2009a), the MS from the OECD (2008b), whilst the IR (BOE, 2009a) and SVR (BOE, 2009b) are obtained from the BOE. The GDP[28], MS[29] are expressed in billions of Pound Sterlingand SVR[30] is expressed in millions of Pound Sterling, while the IR is expressed in percentage per annum.

The data for the United States of America is obtained from the OECD, the RBA and the U.S. Board of Governors of the Federal Reserve System. The GDP data is obtained from the OECD (2008a), the EXR from the RBA (2009a), the MS from the OECD (2008b), whilst the IR (The U.S. Board of Governors of the Federal Reserve System, 2008a) and the SVR (The U.S. Board of Governors of the Federal Reserve System, 2008b) are obtained from the U.S. Board of Governors of the Federal Reserve System. The GDP[31], MS[32] are expressed in millions of U.S. dollars (USD) and SVR[33] are expressed in billions of USD, while the IR[34] are expressed in percentage per annum.

[24] The GDP data for Thailand is converted to millions of AUD, in order to be consistent with the Australian GDP, while Thailand's GDP data is available from 1993:Q1.

[25] The original MS data (M3) for Thailand is expressed in millions of Thai baht and are in monthly intervals. This data is converted to billions of AUD, and to the quarterly time-series (as the values at the end of the period) in order to be consistent with the Australian MS data.

[26] Thailand's SVR is originally expressed in millions of Thai baht, in quarterly time intervals and are available from 1992:Q4. This data is converted to millions of AUD, in order to be consistent with the Australian SVR data.

[27] The IR data for Thailand is originally in monthly time-intervals, which are converted to quarterly time-series (as the values at the end of the period) in order to be consistent with the Australian IR data.

[28] The GDP data for the United Kingdom is converted to millions of AUD, in order to be consistent with the Australian GDP.

[29] The original MS data (M3) for the United Kingdom is converted to billions of AUD, in order to be consistent with the Australian MS data.

[30] The United Kingdom's SVR is converted to billions of AUD, in order to be consistent with the Australian SVR data.

[31] The GDP data for the United States of America is converted to millions of AUD, in order to be consistent with the Australian GDP.

[32] The original MS data (M3) for The United States of America is converted to billions of AUD in order to be consistent with the Australian MS data. Furthermore, this data is only available until 2005:Q4 as the Board of Federal Reserve System has ceased the publication of the 'M3' and its components for The United States of America on March 23, 2006. For more information visit: http://www.federalreserve.gov/releases/h6/discm3.htm

[33] The United States of America's SVR is originally in monthly time-intervals, which are converted to quarterly time-series (as an average of the corresponding 3 months period) and to billions of AUD, in order to be consistent with the Australian SVR data.

[34] The IR data for The United States of America is originally in monthly time-intervals, which is converted to quarterly time-series (as the values at the end of the period) in order to be consistent with the Australian IR data.

## V. EMPIRICAL FINDINGS

Table 1 shows the NX models that will be estimated in this section. This table consists of 29 NX models, however, as each of these models are estimated based on AUD and QTY values, the NX models estimated in this study are 58 in total. Tables 2-5 shows all 58 NX models estimated, which includes the estimated coefficients, corresponding t-ratios and diagnostic tests results.

Table 1: **NET EXPORT – ESTIMATED MODELS (AUD & QTY)**

| HS-2 | | | | |
|---|---|---|---|---|
| **AUSTRALIA -** | **30** | **84** | **85** | **87** |
| **China** | **Yes (n=28)[j]** | **Yes (n=28)[j]** | **Yes (n=28)[j]** | **Yes (n=28)[j]** |
| **France** | **Yes (n=68)[a]** | **Yes (n=68)[a]** | **Yes (n=68)[a]** | **Yes (n=42)[g]** |
| **Germany** | **Yes (n=68)[a]** | **Yes (n=68)[a]** | **Yes (n=68)[a]** | **Yes (n=68)[a]** |
| **Malaysia** | **No** | **Yes (n=68)[a]** | **Yes (n=68)[a]** | **Yes (n=68)[a]** |
| **Singapore** | **No** | **Yes (n=64)[b]** | **Yes (n=64)[b]** | **Yes (n=64)[b]** |
| **Thailand** | **No** | **Yes (n=56)[d]** | **Yes (n=56)[d]** | **Yes (n=56)[d]** |
| **United Kingdom** | **Yes (n=68)[a]** | **Yes (n=68)[a]** | **Yes (n=68)[a]** | **Yes (n=68)[a]** |
| **United States of America** | **Yes (n=64)[c]** | **Yes (n=64)[c]** | **Yes (n=64)[c]** | **Yes (n=64)[c]** |

***[a] 1990:Q1 - 2006:Q4; [b] 1991:Q1 - 2006:Q4; [c] 1990:Q1 - 2005:Q4; [d] 1993:Q1 - 2006:Q4; [g] 1996:Q3 - 2006:Q4; [j] 2000:Q1 - 2006:Q4***

Table 2 (Part A): **NET EXPORT MODELS – CATEGORY 30* (AUD & QTY)**

| **AUSTRALIA - CHINA** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **AUD** | **DEPENDENT VARIABLE: Δ(LnX/M)** | | | | | | |
| | **Coefficient** | **t-ratio** | **Diagnostic Results** | | | | **Note:** |
| **Constant** | 3.092 | 0.917 | **$R^2$** | 0.107 | **LMT F(2,19)** | 0.716 | -Incorrect sign for GDP; IR. |
| **LnGDP** | 0.119 | 0.329 | **Adj. $R^2$** | 0.106 | **LMT F(Prob.)** | 0.502 | |
| **Δ(LnEXR)** | -8.877 | -0.890 | **F(5,21)** | 0.5*** | **BPGT F(5,21)** | 1.434 | |
| **Δ(LnMS)** | -8.004 | -0.802 | **F(Prob.)** | 0.072 | **BPGT F(Prob.)** | 0.253 | |
| **Δ(LnIR)** | -1.037 | -1.052*** | **DW** | 2.277 | **RESET F(1,20)** | 0.364 | |
| **LnSVR** | 0.590 | 1.007*** | **AIC** | 2.090 | **RESET F(Prob.)** | 0.553 | |
| | | | **SC** | 2.378 | **JBT $\chi^2$ (2)** | 0.256 | |
| | | | **LL** | -22.22 | **JBT $\chi^2$ (Prob.)** | 0.880 | |
| **QTY** | **DEPENDENT VARIABLE: LnX/M** | | | | | | |
| | **Coefficient** | **t-ratio** | **Diagnostic Results** | | | | **Note:** |
| **Constant** | 8.980 | 1.525*** | **$R^2$** | 0.294 | **LMT F(2,19)** | 1.302 | |
| **Δ(LnGDP)** | -0.447 | -0.707 | **Adj. $R^2$** | 0.126 | **LMT F(Prob.)** | 0.295 | |
| **Δ(LnEXR)** | -46.873 | -2.691** | **F(5,21)** | 1.8*** | **BPGT F(5,21)** | 1.489 | |
| **Δ(LnMS)** | -44.979 | -2.581** | **F(Prob.)** | 0.067 | **BPGT F(Prob.)** | 0.236 | |
| **Δ(LnIR)** | 2.354 | 1.368*** | **DW** | 1.362 | **RESET F(1,20)** | 0.513 | |
| **LnSVR** | 1.792 | 1.752*** | **AIC** | 3.205 | **RESET F(Prob.)** | 0.482 | |
| | | | **SC** | 3.492 | **JBT $\chi^2$ (2)** | 0.151 | |
| | | | **LL** | -37.261 | **JBT $\chi^2$ (Prob.)** | 0.927 | |
| **AUSTRALIA - FRANCE** | | | | | | | |
| **AUD** | **DEPENDENT VARIABLE: LnX/M** | | | | | | |
| | **Coefficient** | **t-ratio** | **Diagnostic Results** | | | | **Note:** |
| **Constant** | 3.351 | 0.510 | **$R^2$** | 0.555 | **LMT F(2,57)** | 1.090 | -Residuals are not normally distributed. -Incorrect sign for GDP; MS; SVR. |
| **Δ(LnGDP)** | 1.056 | 0.940 | **Adj. $R^2$** | 0.510 | **LMT F(Prob.)** | 0.343 | |
| **Δ(LnEXR)** | -0.768 | -0.271 | **F(6,59)** | 12.28* | **BPGT F(5,60)** | 0.679 | |
| **LnMS** | 2.155 | 0.930 | **F(Prob.)** | 0.000 | **BPGT F(Prob.)** | 0.641 | |
| **Δ(LnIR)** | 0.219 | 0.123 | **DW** | 1.835 | **RESET F(1,58)** | 0.749 | |
| **LnSVR** | -0.010 | -0.612 | **AIC** | 2.668 | **RESET F(Prob.)** | 0.391 | |
| **AR(1)** | 0.726 | 8.387* | **SC** | 2.900 | **JBT $\chi^2$ (2)** | 19.272* | |
| | | | **LL** | -81.040 | **JBT $\chi^2$ (Prob.)** | 0.000 | |
| **QTY** | **DEPENDENT VARIABLE: LnX/M** | | | | | | |
| | **Coefficient** | **t-ratio** | **Diagnostic Results** | | | | **Note:** |
| **Constant** | 7.104 | 1.129*** | **$R^2$** | 0.356 | **LMT F(2,57)** | 2.148 | -Model is mis-specified. -Incorrect sign for GDP; MS; SVR. |
| **Δ(LnGDP)** | 16.080 | 4.611* | **Adj. $R^2$** | 0.291 | **LMT F(Prob.)** | 0.126 | |
| **Δ(LnEXR)** | -3.779 | -0.466 | **F(6,59)** | 5.447* | **BPGT F(5,60)** | 0.269 | |
| **LnMS** | 3.683 | 1.663*** | **F(Prob.)** | 0.000 | **BPGT F(Prob.)** | 0.929 | |
| **Δ(LnIR)** | 4.772 | 0.998 | **DW** | 2.137 | **RESET F(1,58)** | 7.238* | |
| **LnSVR** | -0.051 | -1.199*** | **AIC** | 4.521 | **RESET F(Prob.)** | 0.009 | |
| **AR(1)** | 0.334 | 2.775* | **SC** | 4.753 | **JBT $\chi^2$ (2)** | 2.673 | |
| | | | **LL** | -142.2 | **JBT $\chi^2$ (Prob.)** | 0.263 | |

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*DW – Durbin-Watson Statistics; AIS – Akaike Info Criterion; SC – Schwartz Criterion; LL – Log Likelihood; LMT – Lagrange Multiplier (Breusch-Godfrey) Test for Serial Correlation; BPGT – Breusch-Pagan-Godfrey Test for Heteroskedasticity; RESET – Ramsey RESET Test for Model Specification; JBT – Jarques-Bera Test for normality of the residuals; * significant at the 1%, ** significance at 5%, ***significance at 10%*

Table 2 (Continued - Part B): **NET EXPORT MODELS – CATEGORY 30* (AUD & QTY)**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **AUSTRALIA - GERMANY** | | | | | | | |
| **AUD** | **DEPENDENT VARIABLE: Δ(LnX/M)** | | | | | | |
| | **Coefficient** | **t-ratio** | **Diagnostic Results** | | | | **Note:** |
| **Constant** | 0.181 | 0.236 | **$R^2$** | 0.176 | **LMT F(2,57)** | 2.349 | |
| **Δ(LnGDP)** | -1.952 | -1.359*** | **Adj. $R^2$** | 0.093 | **LMT F(Prob.)** | 0.105 | |
| **Δ(LnEXR)** | -2.339 | -1.121*** | **F(6,59)** | 2.1*** | **BPGT F(5,60)** | 0.911 | |
| **LnMS** | -0.047 | -0.171 | **F(Prob.)** | 0.066 | **BPGT F(Prob.)** | 0.480 | |
| **Δ(LnIR)** | 0.484 | 0.452 | **DW** | 2.177 | **RESET F(1,58)** | 0.776 | |
| **Δ(LnSVR)** | 0.004 | 0.479 | **AIC** | 1.950 | **RESET F(Prob.)** | 0.382 | |
| **AR(1)** | -0.359 | -2.863* | **SC** | 2.182 | **JBT $\chi^2$ (2)** | 0.246 | |
| | | | **LL** | -57.36 | **JBT $\chi^2$ (Prob.)** | 0.884 | |
| **QTY** | **DEPENDENT VARIABLE: LnX/M** | | | | | | |
| | **Coefficient** | **t-ratio** | **Diagnostic Results** | | | | **Note:** |
| **Constant** | 16.455 | 3.004* | **$R^2$** | 0.288 | **LMT F(2,57)** | 2.91*** | |
| **Δ(LnGDP)** | 3.490 | 0.842 | **Adj. $R^2$** | 0.215 | **LMT F(Prob.)** | 0.063 | -Residuals are serially correlated. |
| **Δ(LnEXR)** | -3.052 | -0.334 | **F(6,59)** | 3.973* | **BPGT F(5,60)** | 4.104* | -Residuals are Heteroscedastic. |
| **LnMS** | 5.971 | 3.050* | **F(Prob.)** | 0.002 | **BPGT F(Prob.)** | 0.003 | -Incorrect sign for GDP; MS; SVR. |
| **Δ(LnIR)** | 0.502 | 0.092 | **DW** | 2.086 | **RESET F(1,58)** | 0.070 | |
| **Δ(LnSVR)** | -0.064 | -1.693*** | **AIC** | 4.699 | **RESET F(Prob.)** | 0.793 | |
| **AR(1)** | 0.227 | 1.806*** | **SC** | 4.931 | **JBT $\chi^2$ (2)** | 0.235 | |
| | | | **LL** | -148.18 | **JBT $\chi^2$ (Prob.)** | 0.889 | |
| **AUSTRALIA - UNITED KINGDOM** | | | | | | | |
| **AUD** | **DEPENDENT VARIABLE: LnX/M** | | | | | | |
| | **Coefficient** | **t-ratio** | **Diagnostic Results** | | | | **Note:** |
| **Constant** | -1.573 | -16.986* | **$R^2$** | 0.455 | **LMT F(1,58)** | 0.014 | |
| **Δ(LnGDP)** | 0.392 | 0.875 | **Adj. $R^2$** | 0.400 | **LMT F(Prob.)** | 0.905 | |
| **Δ(LnEXR)** | 0.651 | 0.407 | **F(6,59)** | 8.213* | **BPGT F(5,60)** | 1.094 | |
| **Δ(LnMS)** | 1.014 | 0.626 | **F(Prob.)** | 0.000 | **BPGT F(Prob.)** | 0.373 | -Incorrect sign for GDP; EXR; MS; IR; SVR. |
| **Δ(LnIR)** | -0.161 | -0.324 | **DW** | 1.908 | **RESET F(1,58)** | 1.551 | |
| **LnSVR** | -0.001 | -0.184 | **AIC** | 0.187 | **RESET F(Prob.)** | 0.218 | |
| **AR(1)** | 0.651 | 6.569* | **SC** | 0.420 | **JBT $\chi^2$ (2)** | 2.139 | |
| | | | **LL** | 0.820 | **JBT $\chi^2$ (Prob.)** | 0.343 | |
| **QTY** | **DEPENDENT VARIABLE: LnX/M** | | | | | | |
| | **Coefficient** | **t-ratio** | **Diagnostic Results** | | | | **Note:** |
| **Constant** | 2.676 | 3.899* | **$R^2$** | 0.303 | **LMT F(1,58)** | 5.409** | |
| **Δ(LnGDP)** | 1.728 | 0.320 | **Adj. $R^2$** | 0.232 | **LMT F(Prob.)** | 0.024 | |
| **Δ(LnEXR)** | 21.934 | 1.169*** | **F(6,59)** | 4.281* | **BPGT F(5,60)** | 0.934 | -Residuals are serially correlated. |
| **Δ(LnMS)** | 32.546 | 1.714*** | **F(Prob.)** | 0.001 | **BPGT F(Prob.)** | 0.466 | -Model is mis-specified. |
| **Δ(LnIR)** | -8.476 | -1.499*** | **DW** | 2.176 | **RESET F(1,58)** | 4.057** | -Incorrect sign for GDP; EXR; MS; IR; SVR. |
| **LnSVR** | -0.100 | -2.030** | **AIC** | 4.946 | **RESET F(Prob.)** | 0.049 | |
| **AR(1)** | 0.467 | 4.021* | **SC** | 5.178 | **JBT $\chi^2$ (2)** | 1.351 | |
| | | | **LL** | -156.22 | **JBT $\chi^2$ (Prob.)** | 0.509 | |
| **AUSTRALIA - UNITED STATES** | | | | | | | |
| **AUD** | **DEPENDENT VARIABLE: LnX/M** | | | | | | |
| | **Coefficient** | **t-ratio** | **Diagnostic Results** | | | | **Note:** |
| **Constant** | -1.505 | -8.414* | **$R^2$** | 0.501 | **LMT F(2,53)** | 4.164** | |
| **Δ(LnGDP)** | 2.068 | 2.307** | **Adj. $R^2$** | 0.447 | **LMT F(Prob.)** | 0.021 | |
| **Δ(LnEXR)** | 2.718 | 0.722 | **F(6,55)** | 9.220* | **BPGT F(5,56)** | 0.416 | -Residuals are serially correlated. |
| **Δ(LnMS)** | 0.014 | 0.004 | **F(Prob.)** | 0.000 | **BPGT F(Prob.)** | 0.836 | -Model is mis-specified. |
| **Δ(LnIR)** | 0.126 | 0.120 | **DW** | 2.390 | **RESET F(1,54)** | 4.997** | -Incorrect sign for GDP; EXR; MS. |
| **LnSVR** | 0.012 | 1.388*** | **AIC** | 1.447 | **RESET F(Prob.)** | 0.030 | |
| **AR(1)** | 0.635 | 6.135* | **SC** | 1.687 | **JBT $\chi^2$ (2)** | 2.127 | |
| | | | **LL** | -37.84 | **JBT $\chi^2$ (Prob.)** | 0.345 | |
| **QTY** | **DEPENDENT VARIABLE: Δ(LnX/M)** | | | | | | |
| | **Coefficient** | **t-ratio** | **Diagnostic Results** | | | | **Note:** |
| **Constant** | 0.010 | 0.126 | **$R^2$** | 0.262 | **LMT F(2,55)** | 2.311 | |
| **Δ(LnGDP)** | -4.138 | -2.440* | **Adj. $R^2$** | 0.198 | **LMT F(Prob.)** | 0.109 | |
| **Δ(LnEXR)** | -12.105 | -2.009** | **F(5,57)** | 4.053* | **BPGT F(5,57)** | 0.578 | |
| **Δ(LnMS)** | -4.125 | -0.731 | **F(Prob.)** | 0.003 | **BPGT F(Prob.)** | 0.716 | |
| **Δ(LnIR)** | 0.951 | 0.742 | **DW** | 2.409 | **RESET F(1,56)** | 0.175 | |
| **Δ(LnSVR)** | 0.017 | 1.730*** | **AIC** | 1.952 | **RESET F(Prob.)** | 0.678 | |
| | | | **SC** | 2.156 | **JBT $\chi^2$ (2)** | 0.850 | |
| | | | **LL** | -55.48 | **JBT $\chi^2$ (Prob.)** | 0.654 | |

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*DW – Durbin-Watson Statistics; AIS – Akaike Info Criterion; SC – Schwartz Criterion; LL – Log Likelihood; LMT – Lagrange Multiplier (Breusch-Godfrey) Test for Serial Correlation; BPGT – Breusch-Pagan-Godfrey Test for Heteroskedasticity; RESET – Ramsey RESET Test for Model Specification; JBT – Jarques-Bera Test for normality of the residuals; * significant at the 1%, ** significance at 5%, ***significance at 10%*

As shown in Table 2, all 10 NX models in Category 30 are significant. Additionally, in most of the estimated models, the variable SVR is significant, while the variables GDP, EXR, MS and IR are mostly not significant.

The variables GDP and EXR are significant in 4 out of the 10 models, the variables MS and IR are significant in 3 out of the 10 models and the SVR is significant in 7 out of the 10 models. The correct coefficient signs for all the GDP, EXR, MS, IR and SVR are found in 3 out of the 10 models (1 based on AUD and 2 based on QTY), while for these 3 models, the coefficients range for the GDP, EXR, MS, IR and SVR is between (-0.447 and -4.138), (-2.339 and -46.873), (-0.047 and -44.979), (0.484 and 2.354) and (0.004 and 1.792) respectively. Finally, the overall Adj. R-Square for all 10 models in this category ranges between 9.3 and 51 per cent respectively.

In overall, out of the 10 estimated models in this category, 3 models (the NX with Germany based on AUD; the NX with China and The United States of America based on QTY) have the correct signs and have satisfactory passed all diagnostic tests. The NX model with China shows that a 1 per cent growth rate in the GDP, EXR and MS will decrease the NX by 0.447, 46.873 and 44.979 per cent respectively; a 1 per cent growth rate in the IR will increase the NX by 2.354 per cent, on average, while a 1 per cent increase in the SVR will increase the NX by 1.792 per cent. The NX model with the United States of America shows that a 1 per cent growth rate in the GDP, EXR and MS will decrease the NX growth rate by 4.138, 12.105 and 4.125 per cent respectively, while 1 per cent growth rate in the IR and SVR will increase the NX growth rate on average by 0.951 and 0.017 per cent respectively. The NX model with Germany shows that a 1 per cent growth rate in the GDP and EXR will decrease the NX growth rate by 1.952 and 2.339 per cent respectively; a 1 per cent increase in MS will decrease the NX growth rate by 0.047 per cent, while a 1 per cent growth rate in the IR and SVR will increase the NX growth rate on average by 0.484 and 0.004 per cent respectively. For all of these 3 models, the variables GDP, EXR and MS are mostly elastic, while the variable IR and MS are mostly inelastic. Finally, the Adj. R-Square for China, the United States of America and Germany is 12.6, 19.8 and 9.3 per cent respectively.

Table 3 (Part A): **NET EXPORT MODELS – CATEGORY 84* (AUD & QTY)**

| **AUSTRALIA - CHINA** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **AUD** | **DEPENDENT VARIABLE: Δ(LnX/M)** | | | | | | |
| | **Coefficient** | **t-ratio** | **Diagnostic Results** | | | | **Note:** |
| **Constant** | -0.716 | -0.736 | **$R^2$** | 0.470 | **LMT F(2,17)** | 0.469 | |
| **LnGDP** | -0.030 | -0.247 | **Adj. $R^2$** | 0.303 | **LMT F(Prob.)** | 0.634 | |
| **Δ(LnEXR)** | -2.671 | -0.737 | **F(6,19)** | 2.81** | **BPGT F(5,20)** | 0.584 | |
| **Δ(LnMS)** | -3.570 | -1.013*** | **F(Prob.)** | 0.039 | **BPGT F(Prob.)** | 0.712 | |
| **Δ(LnIR)** | 0.296 | 1.052*** | **DW** | 2.219 | **RESET F(1,18)** | 0.143 | |
| **LnSVR** | 0.120 | 0.741 | **AIC** | -0.064 | **RESET F(Prob.)** | 0.710 | |
| **AR(1)** | -0.553 | -3.132* | **SC** | 0.275 | **JBT $\chi^2$ (2)** | 1.880 | |
| | | | **LL** | 7.828 | **JBT $\chi^2$ (Prob.)** | 0.391 | |
| **QTY** | **DEPENDENT VARIABLE: Δ(LnX/M)** | | | | | | |
| | **Coefficient** | **t-ratio** | **Diagnostic Results** | | | | **Note:** |
| **Constant** | -1.860 | -0.559 | **$R^2$** | 0.404 | **LMT F(2,17)** | 0.482 | |
| **LnGDP** | -0.017 | -0.040 | **Adj. $R^2$** | 0.216 | **LMT F(Prob.)** | 0.626 | |
| **Δ(LnEXR)** | -6.353 | -0.536 | **F(6,19)** | 2.2*** | **BPGT F(5,20)** | 0.947 | |
| **Δ(LnMS)** | -8.905 | -0.757 | **F(Prob.)** | 0.095 | **BPGT F(Prob.)** | 0.473 | |
| **Δ(LnIR)** | 0.192 | 0.193 | **DW** | 1.639 | **RESET F(1,18)** | 0.407 | |
| **LnSVR** | 0.368 | 0.661 | **AIC** | 2.487 | **RESET F(Prob.)** | 0.532 | |
| **AR(1)** | -0.634 | -3.185* | **SC** | 2.825 | **JBT $\chi^2$ (2)** | 0.197 | |
| | | | **LL** | -25.326 | **JBT $\chi^2$ (Prob.)** | 0.906 | |

***Nuclear Reactors, Boilers, Machinery and Mechanical Appliances; Parts Thereof**

*DW – Durbin-Watson Statistics; AIS – Akaike Info Criterion; SC – Schwartz Criterion; LL – Log Likelihood; LMT – Lagrange Multiplier (Breusch-Godfrey) Test for Serial Correlation; BPGT – Breusch-Pagan-Godfrey Test for Heteroskedasticity; RESET – Ramsey RESET Test for Model Specification; JBT – Jarques-Bera Test for normality of the residuals; * significant at the 1%, ** significance at 5%, ***significance at 10%*

Table 3 (Continued - Part B): **NET EXPORT MODELS – CATEGORY 84* (AUD & QTY)**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **AUSTRALIA - FRANCE** | | | | | | | |
| **AUD** | **DEPENDENT VARIABLE: LnX/M** | | | | | | |
| | **Coefficient** | **t-ratio** | **Diagnostic Results** | | | | **Note:** |
| **Constant** | -2.820 | -2.095** | **$R^2$** | 0.187 | **LMT F(2,57)** | 2.54*** | -Residuals are serially correlated. -Model is mis-specified. -Residuals are not normally distributed. -Incorrect sign for GDP; IR; SVR. |
| **Δ(LnGDP)** | 2.630 | 3.371* | **Adj. $R^2$** | 0.104 | **LMT F(Prob.)** | 0.088 | |
| **Δ(LnEXR)** | -2.417 | -1.351*** | **F(6,59)** | 2.26** | **BPGT F(5,60)** | 0.485 | |
| **LnMS** | -0.263 | -0.556 | **F(Prob.)** | 0.050 | **BPGT F(Prob.)** | 0.786 | |
| **Δ(LnIR)** | -0.228 | -0.216 | **DW** | 2.151 | **RESET F(1,58)** | 5.987** | |
| **LnSVR** | -0.002 | -0.182 | **AIC** | 1.497 | **RESET F(Prob.)** | 0.018 | |
| **AR(1)** | 0.312 | 2.479** | **SC** | 1.729 | **JBT $\chi^2$(2)** | 18.570* | |
| | | | **LL** | -42.399 | **JBT $\chi^2$(Prob.)** | 0.000 | |
| **QTY** | **DEPENDENT VARIABLE: LnX/M** | | | | | | |
| | **Coefficient** | **t-ratio** | **Diagnostic Results** | | | | **Note:** |
| **Constant** | -3.798 | -0.797 | **$R^2$** | 0.279 | **LMT F(2,57)** | 1.884 | -Model is mis-specified. -Incorrect sign for MS. |
| **Δ(LnGDP)** | -0.240 | -0.135 | **Adj. $R^2$** | 0.205 | **LMT F(Prob.)** | 0.161 | |
| **Δ(LnEXR)** | -0.015 | -0.003 | **F(6,59)** | 3.797* | **BPGT F(5,60)** | 1.195 | |
| **LnMS** | 0.151 | 0.090 | **F(Prob.)** | 0.003 | **BPGT F(Prob.)** | 0.323 | |
| **Δ(LnIR)** | 0.611 | 0.230 | **DW** | 2.211 | **RESET F(1,58)** | 3.606** | |
| **LnSVR** | 0.049 | 2.103** | **AIC** | 3.349 | **RESET F(Prob.)** | 0.063 | |
| **AR(1)** | 0.490 | 4.327* | **SC** | 3.581 | **JBT $\chi^2$(2)** | 3.357 | |
| | | | **LL** | -103.52 | **JBT $\chi^2$(Prob.)** | 0.187 | |
| **AUSTRALIA - GERMANY** | | | | | | | |
| **AUD** | **DEPENDENT VARIABLE: Δ(LnX/M)** | | | | | | |
| | **Coefficient** | **t-ratio** | **Diagnostic Results** | | | | **Note:** |
| **Constant** | 0.166 | 0.428 | **$R^2$** | 0.135 | **LMT F(2,57)** | 4.369** | -Residuals are serially correlated. -Model is mis-specified. -Residuals are not normally distributed. -Incorrect sign for GDP; EXR; MS; IR. -Model is not significant. |
| **Δ(LnGDP)** | 0.435 | 0.629 | **Adj. $R^2$** | 0.047 | **LMT F(Prob.)** | 0.017 | |
| **Δ(LnEXR)** | 0.108 | 0.103 | **F(6,59)** | 1.535 | **BPGT F(5,60)** | 2.28 | |
| **LnMS** | 0.064 | 0.462 | **F(Prob.)** | 0.183 | **BPGT F(Prob.)** | 0.158 | |
| **Δ(LnIR)** | -0.536 | -0.993 | **DW** | 2.229 | **RESET F(1,58)** | 2.86*** | |
| **Δ(LnSVR)** | 0.005 | 1.103*** | **AIC** | 0.546 | **RESET F(Prob.)** | 0.097 | |
| **AR(1)** | -0.325 | -2.546** | **SC** | 0.778 | **JBT $\chi^2$(2)** | 10.672* | |
| | | | **LL** | -11.020 | **JBT $\chi^2$(Prob.)** | 0.005 | |
| **QTY** | **DEPENDENT VARIABLE: LnX/M** | | | | | | |
| | **Coefficient** | **t-ratio** | **Diagnostic Results** | | | | **Note:** |
| **Constant** | -1.383 | -0.437 | **$R^2$** | 0.323 | **LMT F(2,57)** | 3.595** | -Residuals are serially correlated. -Model is mis-specified. - Incorrect sign for GDP; MS; SVR. |
| **Δ(LnGDP)** | 2.145 | 1.695*** | **Adj. $R^2$** | 0.254 | **LMT F(Prob.)** | 0.034 | |
| **Δ(LnEXR)** | -4.486 | -1.478*** | **F(6,59)** | 4.694* | **BPGT F(5,60)** | 0.862 | |
| **LnMS** | 0.987 | 0.874 | **F(Prob.)** | 0.001 | **BPGT F(Prob.)** | 0.512 | |
| **Δ(LnIR)** | 0.502 | 0.267 | **DW** | 2.277 | **RESET F(1,58)** | 4.670** | |
| **Δ(LnSVR)** | -0.013 | -1.083*** | **AIC** | 2.645 | **RESET F(Prob.)** | 0.035 | |
| **AR(1)** | 0.501 | 4.209* | **SC** | 2.878 | **JBT $\chi^2$(2)** | 2.145 | |
| | | | **LL** | -80.300 | **JBT $\chi^2$(Prob.)** | 0.342 | |
| **AUSTRALIA - MALAYSIA** | | | | | | | |
| **AUD** | **DEPENDENT VARIABLE: Δ(LnX/M)** | | | | | | |
| | **Coefficient** | **t-ratio** | **Diagnostic Results** | | | | **Note:** |
| **Constant** | -0.046 | -1.427*** | **$R^2$** | 0.163 | **LMT F(2,61)** | 1.343 | -Incorrect sign for GDP; EXR. |
| **Δ(LnGDP)** | 0.250 | 0.363 | **Adj. $R^2$** | 0.123 | **LMT F(Prob.)** | 0.269 | |
| **Δ(LnEXR)** | 0.442 | 0.437 | **F(3,63)** | 4.10** | **BPGT F(3,63)** | 0.703 | |
| **Residuals (-1)** | -0.257 | -3.473* | **F(Prob.)** | 0.010 | **BPGT F(Prob.)** | 0.554 | |
| | | | **DW** | 2.241 | **RESET F(1,62)** | 0.676 | |
| | | | **AIC** | 0.150 | **RESET F(Prob.)** | 0.414 | |
| | | | **SC** | 0.282 | **JBT $\chi^2$(2)** | 0.055 | |
| | | | **LL** | -1.029 | **JBT $\chi^2$(Prob.)** | 0.973 | |
| **QTY** | **DEPENDENT VARIABLE: LnX/M** | | | | | | |
| | **Coefficient** | **t-ratio** | **Diagnostic Results** | | | | **Note:** |
| **Constant** | -2.821 | -29.364* | **$R^2$** | 0.064 | **LMT F(2,60** | 0.348 | -Model is not significant. |
| **Δ(LnGDP)** | -0.344 | -0.252 | **Adj. $R^2$** | 0.019 | **LMT F(Prob.)** | 0.708 | |
| **Δ(LnEXR)** | -0.365 | -0.168 | **F(3,62)** | 1.416 | **BPGT F(2,63)** | 1.039 | |
| **AR(1)** | 0.256 | 2.015** | **F(Prob.)** | 0.247 | **BPGT F(Prob.)** | 0.360 | |
| | | | **DW** | 1.870 | **RESET F(1,61)** | 1.517 | |
| | | | **AIC** | 1.773 | **RESET F(Prob.)** | 0.223 | |
| | | | **SC** | 1.906 | **JBT $\chi^2$(2)** | 1.480 | |
| | | | **LL** | -54.506 | **JBT $\chi^2$(Prob.)** | 0.477 | |

***Nuclear Reactors, Boilers, Machinery and Mechanical Appliances; Parts Thereof***

*DW – Durbin-Watson Statistics; AIS – Akaike Info Criterion; SC – Schwartz Criterion; LL – Log Likelihood; LMT – Lagrange Multiplier (Breusch-Godfrey) Test for Serial Correlation; BPGT – Breusch-Pagan-Godfrey Test for Heteroskedasticity; RESET – Ramsey RESET Test for Model Specification; JBT – Jarques-Bera Test for normality of the residuals; * significant at the 1%, ** significance at 5%, ***significance at 10%*

Table 3 (Continued - Part C): **NET EXPORT MODELS – CATEGORY 84* (AUD & QTY)**

| AUSTRALIA - SINGAPORE | | | | | | | |
|---|---|---|---|---|---|---|---|
| **AUD** | **DEPENDENT VARIABLE: LnX/M** | | | | | | |
| | **Coefficient** | **t-ratio** | **Diagnostic Results** | | | | **Note:** |
| **Constant** | -0.627 | -8.606* | **$R^2$** | 0.298 | **LMT F(2,53)** | 0.381 | -Residuals are Heteroscedastic.<br>-Model is mis-specified.<br>-Incorrect sign for GDP; EXR. |
| **Δ(LnGDP)** | 0.430 | 0.823 | **Adj. $R^2$** | 0.222 | **LMT F(Prob.)** | 0.685 | |
| **Δ(LnEXR)** | 0.583 | 0.523 | **F(6,55)** | 3.896* | **BPGT F(5,56)** | 3.726* | |
| **Δ(LnMS)** | -0.371 | -0.403 | **F(Prob.)** | 0.003 | **BPGT F(Prob.)** | 0.006 | |
| **Δ(LnIR)** | 2.778 | 3.582* | **DW** | 2.121 | **RESET F(2,53)** | 5.394* | |
| **LnSVR** | 0.000 | 0.069 | **AIC** | 0.459 | **RESET F(Prob.)** | 0.007 | |
| **AR(1)** | 0.479 | 4.143* | **SC** | 0.700 | **JBT $\chi^2$ (2)** | 0.073 | |
| | | | **LL** | -7.244 | **JBT $\chi^2$ (Prob.)** | 0.964 | |
| **QTY** | **DEPENDENT VARIABLE: Δ(LnX/M)** | | | | | | |
| | **Coefficient** | **t-ratio** | **Diagnostic Results** | | | | **Note:** |
| **Constant** | -0.162 | -1.186*** | **$R^2$** | 0.395 | **LMT F(2,54)** | 0.273 | -Residuals are Heteroscedastic.<br>-Residuals are not normally distributed.<br>-Incorrect sign for GDP; EXR; MS; SVR. |
| **Δ(LnGDP)** | 1.547 | 0.706 | **Adj. $R^2$** | 0.330 | **LMT F(Prob.)** | 0.763 | |
| **Δ(LnEXR)** | 2.404 | 0.599 | **F(6,56)** | 6.081* | **BPGT F(6,56)** | 5.775* | |
| **Δ(LnMS)** | 1.584 | 0.508 | **F(Prob.)** | 0.000 | **BPGT F(Prob.)** | 0.000 | |
| **Δ(LnIR)** | 0.337 | 0.150 | **DW** | 1.925 | **RESET F(1,55)** | 5.138 | |
| **LnSVR** | -0.044 | -2.638* | **AIC** | 2.878 | **RESET F(Prob.)** | 0.116 | |
| **Residuals (-1)** | -0.473 | -4.020* | **SC** | 3.116 | **JBT $\chi^2$ (2)** | 4.689* | |
| | | | **LL** | -83.65 | **JBT $\chi^2$ (Prob.)** | 0.000 | |
| **AUSTRALIA - THAILAND** | | | | | | | |
| **AUD** | **DEPENDENT VARIABLE: Δ(LnX/M)** | | | | | | |
| | **Coefficient** | **t-ratio** | **Diagnostic Results** | | | | **Note:** |
| **Constant** | -0.016 | -0.377 | **$R^2$** | 0.505 | **LMT F(2,46)** | 0.426 | |
| **Δ(LnGDP)** | -1.393 | -1.503*** | **Adj. $R^2$** | 0.443 | **LMT F(Prob.)** | 0.656 | |
| **Δ(LnEXR)** | -2.868 | -1.449*** | **F(6,48)** | 8.156* | **BPGT F(6,48)** | 1.210 | |
| **Δ(LnMS)** | -0.017 | -0.009 | **F(Prob.)** | 0.000 | **BPGT F(Prob.)** | 0.317 | |
| **Δ(LnIR)** | 0.601 | 1.064*** | **DW** | 2.081 | **RESET F(1,47)** | 0.002 | |
| **Δ(LnSVR)** | 0.148 | 1.415*** | **AIC** | 0.611 | **RESET F(Prob.)** | 0.963 | |
| **Residuals (-1)** | -0.663 | -4.651* | **SC** | 0.866 | **JBT $\chi^2$ (2)** | 0.031 | |
| | | | **LL** | -9.793 | **JBT $\chi^2$ (Prob.)** | 0.985 | |
| **QTY** | **DEPENDENT VARIABLE: LnX/M** | | | | | | |
| | **Coefficient** | **t-ratio** | **Diagnostic Results** | | | | **Note:** |
| **Constant** | -3.478 | -12.451* | **$R^2$** | 0.177 | **LMT F(2,45)** | 1.478 | -Residuals are not normally distributed.<br>-Incorrect sign for SVR.<br>-Model is not significant. |
| **Δ(LnGDP)** | -0.034 | -0.019 | **Adj. $R^2$** | 0.072 | **LMT F(Prob.)** | 0.239 | |
| **Δ(LnEXR)** | -2.170 | -0.397 | **F(6,47)** | 1.687 | **BPGT F(5,48)** | 1.499 | |
| **Δ(LnMS)** | -2.727 | -0.526 | **F(Prob.)** | 0.145 | **BPGT F(Prob.)** | 0.208 | |
| **Δ(LnIR)** | 0.542 | 0.341 | **DW** | 2.160 | **RESET F(1,46** | 4.680 | |
| **LnSVR** | -0.475 | -1.647*** | **AIC** | 2.690 | **RESET F(Prob.)** | 0.036 | |
| **AR(1)** | 0.390 | 2.877* | **SC** | 2.948 | **JBT $\chi^2$ (2)** | 58.650* | |
| | | | **LL** | -65.62 | **JBT $\chi^2$ (Prob.)** | 0.000 | |
| **AUSTRALIA - UNITED KINGDOM** | | | | | | | |
| **AUD** | **DEPENDENT VARIABLE: LnX/M** | | | | | | |
| | **Coefficient** | **t-ratio** | **Diagnostic Results** | | | | **Note:** |
| **Constant** | -0.937 | -23.220* | **$R^2$** | 0.222 | **LMT F(2,57)** | 0.147 | |
| **Δ(LnGDP)** | -1.069 | -2.690* | **Adj. $R^2$** | 0.143 | **LMT F(Prob.)** | 0.864 | |
| **Δ(LnEXR)** | -1.098 | -0.816 | **F(6,59)** | 2.80** | **BPGT F(5,60)** | 0.248 | |
| **Δ(LnMS)** | -1.711 | -1.259*** | **F(Prob.)** | 0.018 | **BPGT F(Prob.)** | 0.939 | |
| **Δ(LnIR)** | 0.151 | 0.385 | **DW** | 1.961 | **RESET F(1,58)** | 0.373 | |
| **LnSVR** | 0.003 | 0.819 | **AIC** | -0.409 | **RESET F(Prob.)** | 0.544 | |
| **AR(1)** | 0.357 | 3.196* | **SC** | -0.177 | **JBT $\chi^2$ (2)** | 2.681 | |
| | | | **LL** | 20.513 | **JBT $\chi^2$ (Prob.)** | 0.262 | |
| **QTY** | **DEPENDENT VARIABLE: LnX/M** | | | | | | |
| | **Coefficient** | **t-ratio** | **Diagnostic Results** | | | | **Note:** |
| **Constant** | -2.329 | -14.652* | **$R^2$** | 0.500 | **LMT F(2,57)** | 0.892 | |
| **Δ(LnGDP)** | -2.806 | -2.903* | **Adj. $R^2$** | 0.449 | **LMT F(Prob.)** | 0.416 | |
| **Δ(LnEXR)** | -3.482 | -1.020*** | **F(6,59)** | 9.816* | **BPGT F(5,60)** | 0.874 | |
| **Δ(LnMS)** | -1.372 | -0.398 | **F(Prob.)** | 0.000 | **BPGT F(Prob.)** | 0.504 | |
| **Δ(LnIR)** | 2.381 | 2.272** | **DW** | 2.092 | **RESET F(1,58)** | 0.404 | |
| **LnSVR** | 0.022 | 2.264** | **AIC** | 1.631 | **RESET F(Prob.)** | 0.527 | |
| **AR(1)** | 0.575 | 4.800* | **SC** | 1.864 | **JBT $\chi^2$ (2)** | 1.690 | |
| | | | **LL** | -46.832 | **JBT $\chi^2$ (Prob.)** | 0.430 | |

***Nuclear Reactors, Boilers, Machinery and Mechanical Appliances; Parts Thereof***

*DW – Durbin-Watson Statistics; AIS – Akaike Info Criterion; SC – Schwartz Criterion; LL – Log Likelihood; LMT – Lagrange Multiplier (Breusch-Godfrey) Test for Serial Correlation; BPGT – Breusch-Pagan-Godfrey Test for Heteroskedasticity; RESET – Ramsey RESET Test for Model Specification; JBT – Jarques-Bera Test for normality of the residuals; * significant at the 1%, ** significance at 5%, ***significance at 10%*

Table 3 (Continued - Part D): **NET EXPORT MODELS – CATEGORY 84* (AUD & QTY)**

| AUSTRALIA - UNITED STATES | | | | | | | |
|---|---|---|---|---|---|---|---|
| **AUD** | **DEPENDENT VARIABLE: Δ(LnX/M)** | | | | | | |
| | **Coefficient** | **t-ratio** | **Diagnostic Results** | | | | **Note:** |
| **Constant** | 0.009 | 0.774 | **$R^2$** | 0.441 | **LMT F(2,54)** | 1.033 | -Incorrect sign for GDP; EXR; MS; SVR. |
| **Δ(LnGDP)** | 0.436 | 1.727*** | **Adj. $R^2$** | 0.381 | **LMT F(Prob.)** | 0.363 | |
| **Δ(LnEXR)** | 3.158 | 3.571* | **F(6,56)** | 7.367* | **BPGT F(6,56)** | 0.726 | |
| **Δ(LnMS)** | 1.643 | 1.991*** | **F(Prob.)** | 0.000 | **BPGT F(Prob.)** | 0.631 | |
| **Δ(LnIR)** | 0.004 | 0.019 | **DW** | 1.900 | **RESET F(1,55)** | 0.326 | |
| **Δ(LnSVR)** | -0.002 | -1.597*** | **AIC** | -1.881 | **RESET F(Prob.)** | 0.570 | |
| **Residuals (-1)** | -0.596 | -5.489* | **SC** | -1.643 | **JBT $\chi^2$ (2)** | 0.732 | |
| | | | **LL** | 66.240 | **JBT $\chi^2$ (Prob.)** | 0.693 | |
| **QTY** | **DEPENDENT VARIABLE: LnX/M** | | | | | | |
| | **Coefficient** | **t-ratio** | **Diagnostic Results** | | | | **Note:** |
| **Constant** | -3.135 | -31.113* | **$R^2$** | 0.348 | **LMT F(2,53)** | 2.49*** | -Residuals are serially correlated. -Model is mis-specified. -Incorrect sign for GDP; IR; SVR. |
| **Δ(LnGDP)** | 2.774 | 4.125* | **Adj. $R^2$** | 0.277 | **LMT F(Prob.)** | 0.093 | |
| **Δ(LnEXR)** | -0.849 | -0.301 | **F(6,55)** | 4.897* | **BPGT F(5,56)** | 0.383 | |
| **Δ(LnMS)** | -2.126 | -0.783 | **F(Prob.)** | 0.000 | **BPGT F(Prob.)** | 0.859 | |
| **Δ(LnIR)** | -0.465 | -0.619 | **DW** | 2.107 | **RESET F(1,54)** | 6.945** | |
| **LnSVR** | -0.002 | -0.406 | **AIC** | 0.737 | **RESET F(Prob.)** | 0.011 | |
| **AR(1)** | 0.517 | 4.315* | **SC** | 0.978 | **JBT $\chi^2$ (2)** | 3.643 | |
| | | | **LL** | -15.861 | **JBT $\chi^2$ (Prob.)** | 0.162 | |

***Nuclear Reactors, Boilers, Machinery and Mechanical Appliances; Parts Thereof***

*DW – Durbin-Watson Statistics; AIS – Akaike Info Criterion; SC – Schwartz Criterion; LL – Log Likelihood; LMT – Lagrange Multiplier (Breusch-Godfrey) Test for Serial Correlation; BPGT – Breusch-Pagan-Godfrey Test for Heteroskedasticity; RESET – Ramsey RESET Test for Model Specification; JBT – Jarques-Bera Test for normality of the residuals; * significant at the 1%, ** significance at 5%, ***significance at 10%*

As shown in Table 3, out of the 16 NX models in Category 84, 13 models are significant and 3 NX models are not significant. The NX models which are not significant are the NX model with Germany based on AUD and Malaysia and Thailand based on QTY values. Furthermore, for most of the models, the majority of the variables are not significant. The variables GDP, EXR, MS, IR are significant in 7, 5, 3 and 4 out of the 16 models respectively, while the variable SVR is significant in 8 out of the 16 models. The correct coefficient signs for all the GDP, EXR, MS, IR and SVR are found in 6 out of the 16 models (3 based on AUD and 3 based on QTY), while for these 6 models, the coefficients range for the GDP, EXR, MS, IR and SVR is between (-0.017 and -2.806), (-0.365 and -6.353), (-0.017 and -8.905), (0.151 and 2.381) and (0.003 and 0.368) respectively. Finally, overall, the Adj. R-Square or all 16 models in this category ranges between 1.9 and 44.9 per cent respectively.

Overall, out of the 16 estimated models in this category, 5 models (the NX with China, Thailand and the United Kingdom based on AUD; the NX with China and the United Kingdom based on QTY) have the correct signs and have satisfactory passed all diagnostic tests. The NX model with China based on AUD shows that a 1 per cent increase in the GDP will decrease the NX growth rate by 0.03 per cent, a 1 per cent growth rate in the EXR and MS will decrease the NX growth rate by 2.671 and 3.57 per cent respectively, a 1 per cent growth rate in the IR will increase the NX growth rate by 0.296 per cent, on average, while 1 per cent increase in SVR will increase the NX growth rate by 0.12 per cent. The NX model with Thailand shows that a 1 per cent growth rate in the GDP, EXR and MS will decrease the NX growth rate by 1.393, 2.868 and 0.017 per cent respectively, while 1 per cent growth rate in the IR and SVR will increase the NX growth rate by 0.601 and 0.148 per cent respectively in average. The NX model with the United Kingdom based on AUD shows that a 1 per cent growth rate in the GDP, EXR and MS will decrease the NX by 1.069, 1.098 and 1.711 per cent respectively, a 1 per cent growth rate in IR will increase the NX by 0.151 per cent, on average, while a 1 per cent increase in the SVR will increase the NX by 0.003 per cent. The NX model with China based on QTY shows that a 1 per cent increase in the GDP will decrease the NX growth rate by 0.017 per cent, a 1 per cent growth rate in the EXR and MS will decrease the NX growth rate by 6.353 and 8.905 per cent respectively, a 1 per cent growth rate in the IR will increase the NX growth rate by 0.192 per cent, on average, while 1 per cent increase in SVR will increase the NX growth rate by 0.368 per cent. The NX model with the United Kingdom based on QTY shows that a 1 per cent growth rate in the GDP, EXR and MS will decrease the NX by 2.806, 3.482 and 1.372 per cent respectively, a 1 per cent growth rate in IR will increase the NX by 2.381 per cent, on average, while a 1 per cent increase in the SVR will increase the NX by 0.022 per cent  For all of these 5 models, the variables GDP, EXR and MS are mostly elastic, while the variable IR and SVR are mostly inelastic. Finally, the Adj. R-Square for China, Thailand and the United Kingdom based on AUD values is 30.3, 44.3 and 14.3 per cent respectively and for China and the United Kingdom based on QTY, the values are 21.6 and 44.9 per cent respectively.

Table 4 (Part A): **NET EXPORT MODELS – CATEGORY 85* (AUD & QTY)**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **AUSTRALIA - CHINA** | | | | | | | |
| **AUD** | **DEPENDENT VARIABLE: Δ(LnX/M)** | | | | | | |
| | **Coefficient** | **t-ratio** | **Diagnostic Results** | | | | **Note:** |
| **Constant** | -3.977 | -2.427** | **$R^2$** | 0.434 | **LMT F(2,19)** | 0.740 | |
| **LnGDP** | -0.240 | -1.366*** | **Adj. $R^2$** | 0.299 | **LMT F(Prob.)** | 0.490 | |
| **Δ(LnEXR)** | -1.442 | -0.297 | **F(5,21)** | 3.22** | **BPGT F(5,21)** | 0.689 | |
| **Δ(LnMS)** | -4.025 | -0.830 | **F(Prob.)** | 0.026 | **BPGT F(Prob.)** | 0.637 | |
| **Δ(LnIR)** | 0.873 | -1.822*** | **DW** | 2.115 | **RESET F(1,20)** | 0.273 | |
| **LnSVR** | 0.704 | -2.472** | **AIC** | 0.647 | **RESET F(Prob.)** | 0.607 | |
| | | | **SC** | 0.935 | **JBT $\chi^2$ (2)** | 3.912 | |
| | | | **LL** | -2.738 | **JBT $\chi^2$ (Prob.)** | 0.141 | |
| **QTY** | **DEPENDENT VARIABLE: Δ(LnX/M)** | | | | | | |
| | **Coefficient** | **t-ratio** | **Diagnostic Results** | | | | **Note:** |
| **Constant** | 7.125 | 1.519*** | **$R^2$** | 0.264 | **LMT F(2,19)** | 1.839 | -Incorrect sign for GDP; IR. |
| **LnGDP** | 0.041 | 0.081 | **Adj. $R^2$** | 0.089 | **LMT F(Prob.)** | 0.186 | |
| **Δ(LnEXR)** | -9.296 | -0.670 | **F(5,21)** | 1.5*** | **BPGT F(5,21)** | 0.356 | |
| **Δ(LnMS)** | -13.617 | -0.981 | **F(Prob.)** | 0.093 | **BPGT F(Prob.)** | 0.873 | |
| **Δ(LnIR)** | -0.537 | -0.392 | **DW** | 1.637 | **RESET F(1,20)** | 1.928 | |
| **LnSVR** | 1.438 | 1.766*** | **AIC** | 2.750 | **RESET F(Prob.)** | 0.180 | |
| | | | **SC** | 3.038 | **JBT $\chi^2$ (2)** | 0.227 | |
| | | | **LL** | -31.120 | **JBT $\chi^2$ (Prob.)** | 0.893 | |
| **AUSTRALIA - FRANCE** | | | | | | | |
| **AUD** | **DEPENDENT VARIABLE: LnX/M** | | | | | | |
| | **Coefficient** | **t-ratio** | **Diagnostic Results** | | | | **Note:** |
| **Constant** | -3.929 | -2.575** | **$R^2$** | 0.215 | **LMT F(2,57)** | 2.343 | -Model is mis-specified. -Residuals are not normally distributed. -Incorrect sign for GDP; EXR; SVR. |
| **Δ(LnGDP)** | 0.858 | 1.224*** | **Adj. $R^2$** | 0.136 | **LMT F(Prob.)** | 0.105 | |
| **Δ(LnEXR)** | 0.550 | 0.327 | **F(6,59)** | 2.70** | **BPGT F(5,60)** | 2.30 | |
| **LnMS** | -0.390 | -0.725 | **F(Prob.)** | 0.022 | **BPGT F(Prob.)** | 0.116 | |
| **Δ(LnIR)** | 0.054 | 0.053 | **DW** | 2.205 | **RESET F(1,58)** | 7.050** | |
| **LnSVR** | -0.010 | -1.173*** | **AIC** | 1.414 | **RESET F(Prob.)** | 0.010 | |
| **AR(1)** | 0.421 | 3.523* | **SC** | 1.646 | **JBT $\chi^2$ (2)** | 6.566** | |
| | | | **LL** | -39.649 | **JBT $\chi^2$ (Prob.)** | 0.038 | |
| **QTY** | **DEPENDENT VARIABLE: LnX/M** | | | | | | |
| | **Coefficient** | **t-ratio** | **Diagnostic Results** | | | | **Note:** |
| **Constant** | -2.170 | -0.826 | **$R^2$** | 0.164 | **LMT F(2,57)** | 0.141 | -Incorrect sign for GDP; EXR; MS; IR. |
| **Δ(LnGDP)** | 0.173 | 0.102 | **Adj. $R^2$** | 0.079 | **LMT F(Prob.)** | 0.868 | |
| **Δ(LnEXR)** | 4.327 | 1.143 | **F(6,59)** | 1.9*** | **BPGT F(5,60)** | 0.576 | |
| **LnMS** | 1.153 | 1.251 | **F(Prob.)** | 0.090 | **BPGT F(Prob.)** | 0.718 | |
| **Δ(LnIR)** | -4.045 | -1.817*** | **DW** | 1.997 | **RESET F(1,58)** | 0.374 | |
| **LnSVR** | 0.009 | 0.464 | **AIC** | 2.980 | **RESET F(Prob.)** | 0.544 | |
| **AR(1)** | 0.260 | 2.026** | **SC** | 3.212 | **JBT $\chi^2$ (2)** | 3.814 | |
| | | | **LL** | -91.336 | **JBT $\chi^2$ (Prob.)** | 0.149 | |

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*DW – Durbin-Watson Statistics; AIS – Akaike Info Criterion; SC – Schwartz Criterion; LL – Log Likelihood; LMT – Lagrange Multiplier (Breusch-Godfrey) Test for Serial Correlation; BPGT – Breusch-Pagan-Godfrey Test for Heteroskedasticity; RESET – Ramsey RESET Test for Model Specification; JBT – Jarques-Bera Test for normality of  the residuals; * significant at the 1%, ** significance at 5%, ***significance at 10%*

Table 4 (Continued - Part B): **NET EXPORT MODELS – CATEGORY 85* (AUD & QTY)**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **AUSTRALIA - GERMANY** | | | | | | | |
| **AUD** | **DEPENDENT VARIABLE: Δ(LnX/M)** | | | | | | |
| | **Coefficient** | **t-ratio** | **Diagnostic Results** | | | | **Note:** |
| **Constant** | 0.453 | 0.946 | **$R^2$** | 0.046 | **LMT F(2,59)** | 0.271 | -Residuals are not normally distributed. -Incorrect sign for GDP; MS; IR; SVR. -Model is not significant. |
| **Δ(LnGDP)** | 0.009 | 0.016 | **Adj. $R^2$** | 0.043 | **LMT F(Prob.)** | 0.764 | |
| **Δ(LnEXR)** | -0.566 | -0.501 | **F(5,61)** | 0.451 | **BPGT F(5,61)** | 0.630 | |
| **LnMS** | 0.152 | 0.883 | **F(Prob.)** | 0.811 | **BPGT F(Prob.)** | 0.678 | |
| **Δ(LnIR)** | -0.426 | -0.681 | **DW** | 2.116 | **RESET F(1,60)** | 0.137 | |
| **Δ(LnSVR)** | -0.001 | -0.115 | **AIC** | 0.558 | **RESET F(Prob.)** | 0.713 | |
| | | | **SC** | 0.755 | **JBT $\chi^2$ (2)** | 5.77*** | |
| | | | **LL** | -12.686 | **JBT $\chi^2$ (Prob.)** | 0.056 | |
| **QTY** | **DEPENDENT VARIABLE: Δ(LnX/M)** | | | | | | |
| | **Coefficient** | **t-ratio** | **Diagnostic Results** | | | | **Note:** |
| **Constant** | -0.512 | -0.547 | **$R^2$** | 0.256 | **LMT F(2,57)** | 1.253 | -Residuals are not normally distributed. -Incorrect sign for GDP; IR; SVR. |
| **Δ(LnGDP)** | 3.580 | 2.217** | **Adj. $R^2$** | 0.181 | **LMT F(Prob.)** | 0.293 | |
| **Δ(LnEXR)** | -1.172 | -0.475 | **F(6,59)** | 3.392* | **BPGT F(5,60)** | 0.648 | |
| **LnMS** | -0.200 | -0.596 | **F(Prob.)** | 0.006 | **BPGT F(Prob.)** | 0.664 | |
| **Δ(LnIR)** | -1.985 | -1.541*** | **DW** | 1.852 | **RESET F(1,58)** | 1.449 | |
| **Δ(LnSVR)** | -0.022 | -2.025** | **AIC** | 2.256 | **RESET F(Prob.)** | 0.234 | |
| **AR(1)** | -0.300 | -2.494** | **SC** | 2.488 | **JBT $\chi^2$ (2)** | 234.62* | |
| | | | **LL** | -67.443 | **JBT $\chi^2$ (Prob.)** | 0.000 | |
| **AUSTRALIA - MALAYSIA** | | | | | | | |
| **AUD** | **DEPENDENT VARIABLE: Δ(LnX/M)** | | | | | | |
| | **Coefficient** | **t-ratio** | **Diagnostic Results** | | | | **Note:** |
| **Constant** | -0.019 | -0.584 | **$R^2$** | 0.029 | **LMT F(2,62)** | 0.397 | -Incorrect sign for GDP; EXR. -Model is not significant. |
| **Δ(LnGDP)** | 0.845 | 1.218 | **Adj. $R^2$** | 0.002 | **LMT F(Prob.)** | 0.674 | |
| **Δ(LnEXR)** | 1.372 | 1.334 | **F(2,64)** | 0.950 | **BPGT F(2,64)** | 0.203 | |
| | | | **F(Prob.)** | 0.392 | **BPGT F(Prob.)** | 0.817 | |
| | | | **DW** | 2.085 | **RESET F(1,63** | 0.101 | |
| | | | **AIC** | 0.190 | **RESET F(Prob.)** | 0.752 | |
| | | | **SC** | 0.289 | **JBT $\chi^2$ (2)** | 0.364 | |
| | | | **LL** | -3.367 | **JBT $\chi^2$ (Prob.)** | 0.834 | |
| **QTY** | **DEPENDENT VARIABLE: LnX/M** | | | | | | |
| | **Coefficient** | **t-ratio** | **Diagnostic Results** | | | | **Note:** |
| **Constant** | -4.023 | -6.460* | **$R^2$** | 0.728 | **LMT F(2,60** | 0.737 | -Residuals are Heteroscedastic. -Model is mis-specified. -Incorrect sign for GDP; EXR. |
| **Δ(LnGDP)** | 2.648 | 1.318*** | **Adj. $R^2$** | 0.715 | **LMT F(Prob.)** | 0.483 | |
| **Δ(LnEXR)** | 3.937 | 1.130*** | **F(3,62)** | 55.34* | **BPGT F(2,63)** | 4.419** | |
| **AR(1)** | 0.771 | 12.892* | **F(Prob.)** | 0.000 | **BPGT F(Prob.)** | 0.016 | |
| | | | **DW** | 2.114 | **RESET F(2,60)** | 9.665* | |
| | | | **AIC** | 3.114 | **RESET F(Prob.)** | 0.000 | |
| | | | **SC** | 3.246 | **JBT $\chi^2$ (2)** | 0.611 | |
| | | | **LL** | -98.751 | **JBT $\chi^2$ (Prob.)** | 0.737 | |
| **AUSTRALIA - SINGAPORE** | | | | | | | |
| **AUD** | **DEPENDENT VARIABLE: Δ(LnX/M)** | | | | | | |
| | **Coefficient** | **t-ratio** | **Diagnostic Results** | | | | **Note:** |
| **Constant** | -0.017 | -0.623 | **$R^2$** | 0.119 | **LMT F(2,54)** | 0.906 | -Model is mis-specified. -Incorrect sign for GDP; EXR; IR. -Model is not significant. |
| **Δ(LnGDP)** | 0.332 | 0.671 | **Adj. $R^2$** | 0.025 | **LMT F(Prob.)** | 0.410 | |
| **Δ(LnEXR)** | 0.328 | 0.366 | **F(6,56)** | 1.266 | **BPGT F(6,56)** | 0.247 | |
| **Δ(LnMS)** | -0.368 | -0.506 | **F(Prob.)** | 0.288 | **BPGT F(Prob.)** | 0.959 | |
| **Δ(LnIR)** | -0.144 | -0.271 | **DW** | 2.224 | **RESET F(1,55)** | 0.430 | |
| **Δ(LnSVR)** | 0.002 | 0.623 | **AIC** | -0.089 | **RESET F(Prob.)** | 0.515 | |
| **Residuals (-1)** | -0.188 | -2.396** | **SC** | 0.149 | **JBT $\chi^2$ (2)** | 2.439 | |
| | | | **LL** | 9.799 | **JBT $\chi^2$ (Prob.)** | 0.295 | |
| **QTY** | **DEPENDENT VARIABLE: Δ(LnX/M)** | | | | | | |
| | **Coefficient** | **t-ratio** | **Diagnostic Results** | | | | **Note:** |
| **Constant** | 0.011 | 0.119 | **$R^2$** | 0.366 | **LMT F(2,54)** | 1.889 | |
| **Δ(LnGDP)** | -1.811 | -1.125*** | **Adj. $R^2$** | 0.298 | **LMT F(Prob.)** | 0.161 | |
| **Δ(LnEXR)** | -4.963 | -1.705** | **F(6,56)** | 5.376* | **BPGT F(6,56)** | 0.801 | |
| **Δ(LnMS)** | -2.854 | -1.282*** | **F(Prob.)** | 0.000 | **BPGT F(Prob.)** | 0.574 | |
| **Δ(LnIR)** | 1.248 | 0.723 | **DW** | 2.229 | **RESET F(1,55)** | 1.292 | |
| **Δ(LnSVR)** | 0.009 | 0.718 | **AIC** | 2.260 | **RESET F(Prob.)** | 0.261 | |
| **Residuals (-1)** | -0.585 | -4.925* | **SC** | 2.499 | **JBT $\chi^2$ (2)** | 2.449 | |
| | | | **LL** | -64.206 | **JBT $\chi^2$ (Prob.)** | 0.294 | |

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*DW – Durbin-Watson Statistics; AIS – Akaike Info Criterion; SC – Schwartz Criterion; LL – Log Likelihood; LMT – Lagrange Multiplier (Breusch-Godfrey) Test for Serial Correlation; BPGT – Breusch-Pagan-Godfrey Test for Heteroskedasticity; RESET – Ramsey RESET Test for Model Specification; JBT – Jarques-Bera Test for normality of the residuals; * significant at the 1%, ** significance at 5%, ***significance at 10%*

Table 4 (Continued - Part C): **NET EXPORT MODELS – CATEGORY 85* (AUD & QTY)**

| **AUSTRALIA - THAILAND** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **AUD** | **DEPENDENT VARIABLE: LnX/M** | | | | | | |
| | **Coefficient** | **t-ratio** | **Diagnostic Results** | | | | **Note:** |
| **Constant** | -1.735 | -3.033* | **$R^2$** | 0.744 | **LMT F(3,44)** | 2.115 | -Model is mis-specified. -Incorrect sign for EXR; MS; IR; SVR. |
| **Δ(LnGDP)** | -1.096 | -1.380*** | **Adj. $R^2$** | 0.711 | **LMT F(Prob.)** | 0.112 | |
| **Δ(LnEXR)** | 3.137 | 1.207*** | **F(6,47)** | 22.72* | **BPGT F(5,48)** | 1.686 | |
| **Δ(LnMS)** | 4.052 | 1.633*** | **F(Prob.)** | 0.000 | **BPGT F(Prob.)** | 0.156 | |
| **Δ(LnIR)** | -1.058 | -1.302*** | **DW** | 2.551 | **RESET F(2,45** | 5.698* | |
| **LnSVR** | -0.108 | -0.734 | **AIC** | 1.568 | **RESET F(Prob.)** | 0.006 | |
| **AR(1)** | 0.868 | 11.244* | **SC** | 1.825 | **JBT $\chi^2$ (2)** | 3.248 | |
| | | | **LL** | -35.324 | **JBT $\chi^2$ (Prob.)** | 0.197 | |
| **QTY** | **DEPENDENT VARIABLE: LnX/M** | | | | | | |
| | **Coefficient** | **t-ratio** | **Diagnostic Results** | | | | **Note:** |
| **Constant** | -2.759 | -10.486* | **$R^2$** | 0.305 | **LMT F(2,45)** | 0.339 | -Residuals are not normally distributed. -Incorrect sign for MS; IR; SVR. |
| **Δ(LnGDP)** | -2.784 | -1.659*** | **Adj. $R^2$** | 0.216 | **LMT F(Prob.)** | 0.714 | |
| **Δ(LnEXR)** | -3.398 | -0.676 | **F(6,47)** | 3.434* | **BPGT F(5,48)** | 0.328 | |
| **Δ(LnMS)** | 0.734 | 0.153 | **F(Prob.)** | 0.007 | **BPGT F(Prob.)** | 0.894 | |
| **Δ(LnIR)** | -3.196 | -2.173** | **DW** | 1.937 | **RESET F(1,46** | 0.843 | |
| **LnSVR** | -0.111 | -0.417 | **AIC** | 2.540 | **RESET F(Prob.)** | 0.363 | |
| **AR(1)** | 0.408 | 2.969* | **SC** | 2.798 | **JBT $\chi^2$ (2)** | 10.462* | |
| | | | **LL** | -61.573 | **JBT $\chi^2$ (Prob.)** | 0.005 | |
| **AUSTRALIA - UNITED KINGDOM** | | | | | | | |
| **AUD** | **DEPENDENT VARIABLE: Δ(LnX/M)** | | | | | | |
| | **Coefficient** | **t-ratio** | **Diagnostic Results** | | | | **Note:** |
| **Constant** | 0.010 | 0.326 | **$R^2$** | 0.346 | **LMT F(2,58)** | 0.354 | -Residuals are not normally distributed. -Incorrect sign for GDP; EXR; MS. |
| **Δ(LnGDP)** | 0.803 | 1.264*** | **Adj. $R^2$** | 0.281 | **LMT F(Prob.)** | 0.704 | |
| **Δ(LnEXR)** | 1.484 | 0.798 | **F(6,60)** | 5.295* | **BPGT F(6,60)** | 0.446 | |
| **Δ(LnMS)** | 1.466 | 0.778 | **F(Prob.)** | 0.000 | **BPGT F(Prob.)** | 0.845 | |
| **Δ(LnIR)** | 0.466 | 0.949 | **DW** | 1.903 | **RESET F(1,59)** | 0.013 | |
| **Δ(LnSVR)** | 0.003 | 0.835 | **AIC** | 0.072 | **RESET F(Prob.)** | 0.909 | |
| **Residuals (-1)** | -0.569 | -5.117* | **SC** | 0.302 | **JBT $\chi^2$ (2)** | 8.330** | |
| | | | **LL** | 4.588 | **JBT $\chi^2$ (Prob.)** | 0.016 | |
| **QTY** | **DEPENDENT VARIABLE: Δ(LnX/M)** | | | | | | |
| | **Coefficient** | **t-ratio** | **Diagnostic Results** | | | | **Note:** |
| **Constant** | 0.021 | 0.257 | **$R^2$** | 0.359 | **LMT F(2,58)** | 0.600 | -Residuals are not normally distributed. -Incorrect sign for GDP. |
| **Δ(LnGDP)** | 4.824 | 2.763* | **Adj. $R^2$** | 0.295 | **LMT F(Prob.)** | 0.552 | |
| **Δ(LnEXR)** | -3.340 | -0.665 | **F(6,60)** | 5.608* | **BPGT F(6,60)** | 0.551 | |
| **Δ(LnMS)** | -5.372 | -1.054 | **F(Prob.)** | 0.000 | **BPGT F(Prob.)** | 0.768 | |
| **Δ(LnIR)** | 0.465 | 0.338 | **DW** | 2.117 | **RESET F(1,59)** | 0.763 | |
| **Δ(LnSVR)** | 0.012 | 1.114*** | **AIC** | 2.070 | **RESET F(Prob.)** | 0.386 | |
| **Residuals (-1)** | -0.586 | -5.074* | **SC** | 2.300 | **JBT $\chi^2$ (2)** | 22.386* | |
| | | | **LL** | -62.348 | **JBT $\chi^2$ (Prob.)** | 0.000 | |
| **USTRALIA - UNITED STATES** | | | | | | | |
| **AUD** | **DEPENDENT VARIABLE: Δ(LnX/M)** | | | | | | |
| | **Coefficient** | **t-ratio** | **Diagnostic Results** | | | | **Note:** |
| **Constant** | 0.016 | 0.652 | **$R^2$** | 0.397 | **LMT F(2,54)** | 1.720 | -Model is mis-specified. -Incorrect sign for GDP; EXR; IR; SVR. |
| **Δ(LnGDP)** | 1.575 | 3.077* | **Adj. $R^2$** | 0.333 | **LMT F(Prob.)** | 0.189 | |
| **Δ(LnEXR)** | 0.252 | 0.138 | **F(6,56)** | 6.153* | **BPGT F(6,56)** | 0.657 | |
| **Δ(LnMS)** | -1.468 | -0.860 | **F(Prob.)** | 0.000 | **BPGT F(Prob.)** | 0.684 | |
| **Δ(LnIR)** | -0.229 | -0.575 | **DW** | 2.145 | **RESET F(1,55)** | 3.14*** | |
| **Δ(LnSVR)** | -0.002 | -0.557 | **AIC** | -0.431 | **RESET F(Prob.)** | 0.082 | |
| **Residuals (-1)** | -0.567 | -4.843* | **SC** | -0.193 | **JBT $\chi^2$ (2)** | 1.495 | |
| | | | **LL** | 20.580 | **JBT $\chi^2$ (Prob.)** | 0.474 | |
| **QTY** | **DEPENDENT VARIABLE: LnX/M** | | | | | | |
| | **Coefficient** | **t-ratio** | **Diagnostic Results** | | | | **Note:** |
| **Constant** | -3.958 | -7.086* | **$R^2$** | 0.676 | **LMT F(2,53)** | 4.157** | -Residuals are serially correlated. -Model is mis-specified. -Incorrect sign for EXR; MS; IR. |
| **Δ(LnGDP)** | -1.915 | -1.542*** | **Adj. $R^2$** | 0.640 | **LMT F(Prob.)** | 0.021 | |
| **Δ(LnEXR)** | 0.491 | 0.093 | **F(6,55)** | 19.09* | **BPGT F(5,56)** | 0.552 | |
| **Δ(LnMS)** | 1.773 | 0.344 | **F(Prob.)** | 0.000 | **BPGT F(Prob.)** | 0.736 | |
| **Δ(LnIR)** | -2.124 | -1.417*** | **DW** | 2.503 | **RESET F(1,54)** | 8.934* | |
| **LnSVR** | 0.002 | 0.138 | **AIC** | 2.308 | **RESET F(Prob.)** | 0.004 | |
| **AR(1)** | 0.830 | 11.306* | **SC** | 2.548 | **JBT $\chi^2$ (2)** | 5.785 | |
| | | | **LL** | -64.535 | **JBT $\chi^2$ (Prob.)** | 0.134 | |

***Electrical Machinery and Equipment and Parts Thereof; Sound Recorders and Producers, Television Image and Sound Recorders and Reproducers, and Parts and Accessories of Such Articles***

*DW – Durbin-Watson Statistics; AIS – Akaike Info Criterion; SC – Schwartz Criterion; LL – Log Likelihood; LMT – Lagrange Multiplier (Breusch-Godfrey) Test for Serial Correlation; BPGT – Breusch-Pagan-Godfrey Test for Heteroskedasticity; RESET – Ramsey RESET Test for Model Specification; JBT – Jarques-Bera Test for normality of the residuals; * significant at the 1%, ** significance at 5%, ***significance at 10%*

As shown in Table 4, out of the 16 NX models in Category 85, 13 models are significant and 3 NX models with Germany, Malaysia and Singapore all based on AUD, are not significant. Furthermore, in most of the models, the variable GDP is significant, while the variables EXR, MS, IR and SVR are not significant.

The variables EXR, MS, IR and SVR are significant in 3, 2, 6 and 5 out of the 16 models respectively, while the variable GDP is significant in 11 out of the 16 models. The correct coefficient signs for all the GDP, EXR, MS, IR and SVR are found in 2 out of the 16 models (1 based on AUD and 1 based on QTY), while for these 2 models, the coefficient range for the GDP, EXR, MS, IR and SVR is between (-0.240 and -1.811), (-1.442 and -4.963), (-2.854 and -4.025), (0.873 and 1.248) and (0.009 and 0.704) respectively. Finally, the Adj. R-Square in overall for all 16 models in this category ranges between 0.2 and 71.5 per cent.

Overall, out of the 16 estimated models in this category, only 2 models (the NX with China based on AUD; the NX with Singapore based on QTY) have the correct signs and have satisfactory passed all diagnostic tests. The NX model with China based on AUD shows that a 1 per cent increase in the GDP will decrease the NX growth rate by 0.240 per cent, a 1 per cent growth rate in the EXR and MS will decrease the NX growth rate by 1.442 and 4.025 per cent respectively, a 1 per cent growth rate in the IR will increase the NX growth rate by 0.873 per cent, on average, while a 1 per cent increase in SVR will increase the NX growth rate by 0.704 per cent  The NX model with Singapore shows that a 1 per cent growth rate in the GDP, EXR and MS will decrease the NX growth rate by 1.811, 4.963 and 2.854 per cent respectively, on average, while a 1 per cent growth rate in the IR and SVR will increase the NX growth rate by 1.248 and 0.009 per cent respectively. In these 2 models, the variables EXR and MS are elastic; the variables GDP and IR are mixed, while the variable SVR is inelastic. Finally, the Adj. R-Square for China based on AUD values is 29.9 per cent and for Singapore based on QTY, the value is 29.8 per cent.

Table 5 (Part A): **NET EXPORT MODELS – CATEGORY 87* (AUD & QTY)**

| **AUSTRALIA - CHINA** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **AUD** | **DEPENDENT VARIABLE: Δ(LnX/M)** | | | | | | |
| | **Coefficient** | **t-ratio** | **Diagnostic Results** | | | | **Note:** |
| **Constant** | -2.508 | -0.566 | **$R^2$** | 0.224 | **LMT F(2,19)** | 0.294 | -Residuals are Heteroscedastic.<br>-Incorrect sign for GDP; EXR; MS.<br>-Model is not significant. |
| **LnGDP** | 0.085 | 0.179 | **Adj. $R^2$** | 0.039 | **LMT F(Prob.)** | 0.748 | |
| **Δ(LnEXR)** | 6.277 | 0.478 | **F(5,21)** | 1.210 | **BPGT F(5,21)** | 2.57*** | |
| **Δ(LnMS)** | 10.684 | 0.814 | **F(Prob.)** | 0.339 | **BPGT F(Prob.)** | 0.058 | |
| **Δ(LnIR)** | 2.425 | 1.871*** | **DW** | 1.947 | **RESET F(1,20)** | 0.000 | |
| **LnSVR** | 0.552 | 0.716 | **AIC** | 2.638 | **RESET F(Prob.)** | 0.992 | |
| | | | **SC** | 2.926 | **JBT $\chi^2$ (2)** | 1.857 | |
| | | | **LL** | -29.609 | **JBT $\chi^2$ (Prob.)** | 0.395 | |
| **QTY** | **DEPENDENT VARIABLE: Δ(LnX/M)** | | | | | | |
| | **Coefficient** | **t-ratio** | **Diagnostic Results** | | | | **Note:** |
| **Constant** | -35.649 | -3.198* | **$R^2$** | 0.565 | **LMT F(2,17)** | 2.096 | |
| **LnGDP** | -2.264 | -1.613*** | **Adj. $R^2$** | 0.428 | **LMT F(Prob.)** | 0.154 | |
| **Δ(LnEXR)** | -3.837 | -0.098 | **F(6,19)** | 4.120* | **BPGT F(5,20)** | 0.486 | |
| **Δ(LnMS)** | -2.105 | -0.054 | **F(Prob.)** | 0.008 | **BPGT F(Prob.)** | 0.783 | |
| **Δ(LnIR)** | 8.250 | 2.560** | **DW** | 2.024 | **RESET F(1,18)** | 0.676 | |
| **LnSVR** | 6.292 | 3.377* | **AIC** | 4.965 | **RESET F(Prob.)** | 0.422 | |
| **AR(1)** | -0.701 | -4.135* | **SC** | 5.303 | **JBT $\chi^2$ (2)** | 1.336 | |
| | | | **LL** | -57.542 | **JBT $\chi^2$ (Prob.)** | 0.513 | |

***Vehicles Other Than Railway or Tramway Rolling-Stock, and Parts and Accessories Thereof**

*DW – Durbin-Watson Statistics; AIS – Akaike Info Criterion; SC – Schwartz Criterion; LL – Log Likelihood; LMT – Lagrange Multiplier (Breusch-Godfrey) Test for Serial Correlation; BPGT – Breusch-Pagan-Godfrey Test for Heteroskedasticity; RESET – Ramsey RESET Test for Model Specification; JBT – Jarques-Bera Test for normality of  the residuals; * significant at the 1%, ** significance at 5%, ***significance at 10%*

Table 5 (Continued - Part B): **NET EXPORT MODELS – CATEGORY 87* (AUD & QTY)**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **AUSTRALIA - FRANCE** | | | | | | | |
| **AUD** | **DEPENDENT VARIABLE: LnX/M** | | | | | | |
| | **Coefficient** | **t-ratio** | **Diagnostic Results** | | | | **Note:** |
| **Constant** | 2.295 | 0.310 | **$R^2$** | 0.787 | **LMT F(2,33)** | 1.970 | -Model is mis-specified.<br>-Incorrect sign for GDP; MS. |
| **Δ(LnGDP)** | 0.787 | 0.940 | **Adj. $R^2$** | 0.748 | **LMT F(Prob.)** | 0.157 | |
| **Δ(LnEXR)** | -1.047 | -0.422 | **F(6,34)** | 20.27* | **BPGT F(5,35)** | 1.691 | |
| **LnMS** | 1.284 | 0.506 | **F(Prob.)** | 0.000 | **BPGT F(Prob.)** | 0.163 | |
| **Δ(LnIR)** | 4.738 | 3.472* | **DW** | 2.257 | **RESET F(2,31)** | 5.065** | |
| **LnSVR** | 0.545 | 2.552** | **AIC** | 1.700 | **RESET F(Prob.)** | 0.013 | |
| **AR(1)** | 0.847 | 10.285* | **SC** | 1.995 | **JBT $\chi^2$ (2)** | 1.563 | |
| | | | **LL** | -26.997 | **JBT $\chi^2$ (Prob.)** | 0.458 | |
| **QTY** | **DEPENDENT VARIABLE: LnX/M** | | | | | | |
| | **Coefficient** | **t-ratio** | **Diagnostic Results** | | | | **Note:** |
| **Constant** | 27.182 | 1.924*** | **$R^2$** | 0.155 | **LMT F(2,33)** | 1.250 | -Incorrect sign for GDP; EXR.<br>-Model is not significant. |
| **Δ(LnGDP)** | 3.978 | 0.802 | **Adj. $R^2$** | 0.034 | **LMT F(Prob.)** | 0.300 | |
| **Δ(LnEXR)** | 0.523 | 0.048 | **F(6,34)** | 1.283 | **BPGT F(5,35)** | 1.950 | |
| **LnMS** | -11.769 | -2.184** | **F(Prob.)** | 0.293 | **BPGT F(Prob.)** | 0.111 | |
| **Δ(LnIR)** | 4.933 | 0.938 | **DW** | 2.130 | **RESET F(1,34)** | 0.507 | |
| **LnSVR** | 0.880 | 0.815 | **AIC** | 4.434 | **RESET F(Prob.)** | 0.481 | |
| | | | **SC** | 4.685 | **JBT $\chi^2$ (2)** | 2.371 | |
| | | | **LL** | -84.898 | **JBT $\chi^2$ (Prob.)** | 0.306 | |
| **AUSTRALIA - GERMANY** | | | | | | | |
| **AUD** | **DEPENDENT VARIABLE: LnX/M** | | | | | | |
| | **Coefficient** | **t-ratio** | **Diagnostic Results** | | | | **Note:** |
| **Constant** | -6.012 | -1.180*** | **$R^2$** | 0.626 | **LMT F(2,57)** | 2.246 | -Residuals are not normally distributed. |
| **Δ(LnGDP)** | -0.873 | -1.342*** | **Adj. $R^2$** | 0.588 | **LMT F(Prob.)** | 0.115 | |
| **Δ(LnEXR)** | -0.552 | -0.347 | **F(6,59)** | 16.47* | **BPGT F(5,60)** | 0.968 | |
| **LnMS** | -0.812 | -0.453 | **F(Prob.)** | 0.000 | **BPGT F(Prob.)** | 0.445 | |
| **Δ(LnIR)** | 1.078 | 1.068*** | **DW** | 2.147 | **RESET F(1,58)** | 1.622 | |
| **Δ(LnSVR)** | 0.002 | 0.236 | **AIC** | 1.597 | **RESET F(Prob.)** | 0.208 | |
| **AR(1)** | 0.809 | 10.454* | **SC** | 1.829 | **JBT $\chi^2$ (2)** | 18.010* | |
| | | | **LL** | -45.703 | **JBT $\chi^2$ (Prob.)** | 0.000 | |
| **QTY** | **DEPENDENT VARIABLE: LnX/M** | | | | | | |
| | **Coefficient** | **t-ratio** | **Diagnostic Results** | | | | **Note:** |
| **Constant** | -10.718 | -1.032*** | **$R^2$** | 0.466 | **LMT F(2,57)** | 0.489 | |
| **Δ(LnGDP)** | -1.358 | -0.561 | **Adj. $R^2$** | 0.411 | **LMT F(Prob.)** | 0.616 | |
| **Δ(LnEXR)** | -11.403 | -1.897*** | **F(6,59)** | 8.568* | **BPGT F(5,60)** | 1.046 | |
| **LnMS** | -2.361 | -0.640 | **F(Prob.)** | 0.000 | **BPGT F(Prob.)** | 0.399 | |
| **Δ(LnIR)** | 1.050 | 0.279 | **DW** | 1.839 | **RESET F(1,58)** | 1.762 | |
| **Δ(LnSVR)** | 0.002 | 0.096 | **AIC** | 4.118 | **RESET F(Prob.)** | 0.190 | |
| **AR(1)** | 0.667 | 6.757* | **SC** | 4.350 | **JBT $\chi^2$ (2)** | 0.538 | |
| | | | **LL** | -128.88 | **JBT $\chi^2$ (Prob.)** | 0.764 | |
| **AUSTRALIA - MALAYSIA** | | | | | | | |
| **AUD** | **DEPENDENT VARIABLE: Δ(LnX/M)** | | | | | | |
| | **Coefficient** | **t-ratio** | **Diagnostic Results** | | | | **Note:** |
| **Constant** | -0.026 | -0.349 | **$R^2$** | 0.237 | **LMT F(2,61)** | 1.598 | -Incorrect sign for GDP; EXR. |
| **Δ(LnGDP)** | 0.810 | 0.512 | **Adj. $R^2$** | 0.201 | **LMT F(Prob.)** | 0.211 | |
| **Δ(LnEXR)** | 1.618 | 0.688 | **F(3,63)** | 6.540* | **BPGT F(3,63)** | 0.479 | |
| **Residuals (-1)** | -0.441 | -4.322* | **F(Prob.)** | 0.001 | **BPGT F(Prob.)** | 0.698 | |
| | | | **DW** | 1.723 | **RESET F(1,62)** | 2.224 | |
| | | | **AIC** | 1.854 | **RESET F(Prob.)** | 0.141 | |
| | | | **SC** | 1.986 | **JBT $\chi^2$ (2)** | 4.272 | |
| | | | **LL** | -58.123 | **JBT $\chi^2$ (Prob.)** | 0.118 | |
| **QTY** | **DEPENDENT VARIABLE: LnX/M** | | | | | | |
| | **Coefficient** | **t-ratio** | **Diagnostic Results** | | | | **Note:** |
| **Constant** | -1.287 | -3.096* | **$R^2$** | 0.253 | **LMT F(2,60)** | 0.640 | -Model is mis-specified. |
| **Δ(LnGDP)** | -2.664 | -0.813 | **Adj. $R^2$** | 0.217 | **LMT F(Prob.)** | 0.531 | |
| **Δ(LnEXR)** | -2.516 | -0.448 | **F(3,62)** | 7.018* | **BPGT F(2,63)** | 1.871 | |
| **AR(1)** | 0.526 | 4.639* | **F(Prob.)** | 0.000 | **BPGT F(Prob.)** | 0.162 | |
| | | | **DW** | 2.109 | **RESET F(1,61)** | 2.87*** | |
| | | | **AIC** | 3.823 | **RESET F(Prob.)** | 0.096 | |
| | | | **SC** | 3.955 | **JBT $\chi^2$ (2)** | 0.901 | |
| | | | **LL** | -<br>122.151 | **JBT $\chi^2$ (Prob.)** | 0.637 | |

***Vehicles Other Than Railway or Tramway Rolling-Stock, and Parts and Accessories Thereof***

*DW – Durbin-Watson Statistics; AIS – Akaike Info Criterion; SC – Schwartz Criterion; LL – Log Likelihood; LMT – Lagrange Multiplier (Breusch-Godfrey) Test for Serial Correlation; BPGT – Breusch-Pagan-Godfrey Test for Heteroskedasticity; RESET – Ramsey RESET Test for Model Specification; JBT – Jarques-Bera Test for normality of the residuals; * significant at the 1%, ** significance at 5%, ***significance at 10%*

Table 5 (Continued - Part C): **NET EXPORT MODELS – CATEGORY 87* (AUD & QTY)**

| **AUSTRALIA - SINGAPORE** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **AUD** | **DEPENDENT VARIABLE: Δ(LnX/M)** | | | | | | |
| | **Coefficient** | **t-ratio** | **Diagnostic Results** | | | | **Note:** |
| **Constant** | -0.031 | -0.669 | **$R^2$** | 0.463 | **LMT F(2,52)** | 2.330 | -Residuals are not normally distributed. -Incorrect sign for IR; SVR. |
| **Δ(LnGDP)** | -0.038 | -0.032 | **Adj. $R^2$** | 0.394 | **LMT F(Prob.)** | 0.107 | |
| **Δ(LnEXR)** | -2.329 | -1.209*** | **F(7,54)** | 6.656* | **BPGT F(6,55)** | 0.243 | |
| **Δ(LnMS)** | -1.817 | -1.349*** | **F(Prob.)** | 0.000 | **BPGT F(Prob.)** | 0.960 | |
| **Δ(LnIR)** | -1.713 | -1.543*** | **DW** | 2.139 | **RESET F(1,53)** | 0.631 | |
| **Δ(LnSVR)** | -0.002 | -0.223 | **AIC** | 1.486 | **RESET F(Prob.)** | 0.430 | |
| **Residuals (-1)** | -0.554 | -4.356* | **SC** | 1.760 | **JBT $\chi^2$ (2)** | 59.248* | |
| **AR(1)** | -0.332 | -2.017** | **LL** | -38.058 | **JBT $\chi^2$ (Prob.)** | 0.000 | |
| **QTY** | **DEPENDENT VARIABLE: LnX/M** | | | | | | |
| | **Coefficient** | **t-ratio** | **Diagnostic Results** | | | | **Note:** |
| **Constant** | 2.873 | 3.835* | **$R^2$** | 0.614 | **LMT F(2,53)** | 1.064 | -Model is mis-specified. -Incorrect sign for IR; SVR. |
| **Δ(LnGDP)** | -2.073 | -1.068*** | **Adj. $R^2$** | 0.572 | **LMT F(Prob.)** | 0.352 | |
| **Δ(LnEXR)** | -5.232 | -1.208*** | **F(6,55)** | 14.61* | **BPGT F(5,56)** | 0.682 | |
| **Δ(LnMS)** | -0.740 | -0.210 | **F(Prob.)** | 0.000 | **BPGT F(Prob.)** | 0.639 | |
| **Δ(LnIR)** | -2.794 | -0.908 | **DW** | 2.273 | **RESET F(2,53)** | 2.77*** | |
| **LnSVR** | -0.033 | -1.262*** | **AIC** | 3.405 | **RESET F(Prob.)** | 0.072 | |
| **AR(1)** | 0.784 | 8.656* | **SC** | 3.646 | **JBT $\chi^2$ (2)** | 1.614 | |
| | | | **LL** | -98.568 | **JBT $\chi^2$ (Prob.)** | 0.446 | |
| **AUSTRALIA - THAILAND** | | | | | | | |
| **AUD** | **DEPENDENT VARIABLE: Δ(LnX/M)** | | | | | | |
| | **Coefficient** | **t-ratio** | **Diagnostic Results** | | | | **Note:** |
| **Constant** | -0.053 | -0.536 | **$R^2$** | 0.176 | **LMT F(2,46)** | 1.914 | -Incorrect sign for EXR; IR; SVR. -Model is not significant. |
| **Δ(LnGDP)** | -1.555 | -0.752 | **Adj. $R^2$** | 0.073 | **LMT F(Prob.)** | 0.159 | |
| **Δ(LnEXR)** | 1.611 | 0.336 | **F(6,48)** | 1.712 | **BPGT F(6,48)** | 0.512 | |
| **Δ(LnMS)** | -2.296 | -0.511 | **F(Prob.)** | 0.139 | **BPGT F(Prob.)** | 0.796 | |
| **Δ(LnIR)** | -1.811 | -1.530*** | **DW** | 1.881 | **RESET F(1,47)** | 0.896 | |
| **Δ(LnSVR)** | 0.039 | 0.174 | **AIC** | 2.264 | **RESET F(Prob.)** | 0.349 | |
| **Residuals (-1)** | -0.171 | -1.779*** | **SC** | 2.519 | **JBT $\chi^2$ (2)** | 2.404 | |
| | | | **LL** | -55.247 | **JBT $\chi^2$ (Prob.)** | 0.301 | |
| **QTY** | **DEPENDENT VARIABLE: LnX/M** | | | | | | |
| | **Coefficient** | **t-ratio** | **Diagnostic Results** | | | | **Note:** |
| **Constant** | -1.609 | -1.205*** | **$R^2$** | 0.764 | **LMT F(2,45)** | 1.559 | -Incorrect sign for GDP; IR; SVR. |
| **Δ(LnGDP)** | 0.360 | 0.186 | **Adj. $R^2$** | 0.734 | **LMT F(Prob.)** | 0.222 | |
| **Δ(LnEXR)** | -4.354 | -0.688 | **F(6,47)** | 25.42* | **BPGT F(5,48)** | 0.283 | |
| **Δ(LnMS)** | -5.852 | -0.969 | **F(Prob.)** | 0.000 | **BPGT F(Prob.)** | 0.920 | |
| **Δ(LnIR)** | -1.611 | -0.814 | **DW** | 2.305 | **RESET F(1,46** | 2.732 | |
| **LnSVR** | -0.765 | -2.135** | **AIC** | 3.343 | **RESET F(Prob.)** | 0.105 | |
| **AR(1)** | 0.863 | 10.423* | **SC** | 3.601 | **JBT $\chi^2$ (2)** | 0.237 | |
| | | | **LL** | -83.269 | **JBT $\chi^2$ (Prob.)** | 0.888 | |
| **AUSTRALIA - UNITED KINGDOM** | | | | | | | |
| **AUD** | **DEPENDENT VARIABLE: LnX/M** | | | | | | |
| | **Coefficient** | **t-ratio** | **Diagnostic Results** | | | | **Note:** |
| **Constant** | -2.463 | -13.987* | **$R^2$** | 0.553 | **LMT F(2,57)** | 3.972** | -Residuals are serially correlated. -Model is mis-specified. -Residuals are not normally distributed. |
| **Δ(LnGDP)** | -0.982 | -1.415*** | **Adj. $R^2$** | 0.508 | **LMT F(Prob.)** | 0.024 | |
| **Δ(LnEXR)** | -0.321 | -0.129 | **F(6,59)** | 12.18* | **BPGT F(5,60)** | 1.199 | |
| **Δ(LnMS)** | -0.971 | -0.385 | **F(Prob.)** | 0.000 | **BPGT F(Prob.)** | 0.321 | |
| **Δ(LnIR)** | 0.313 | 0.399 | **DW** | 2.400 | **RESET F(1,58)** | 10.496* | |
| **LnSVR** | 0.016 | 2.258** | **AIC** | 1.130 | **RESET F(Prob.)** | 0.002 | |
| **AR(1)** | 0.710 | 7.620* | **SC** | 1.362 | **JBT $\chi^2$ (2)** | 6.666** | |
| | | | **LL** | -30.291 | **JBT $\chi^2$ (Prob.)** | 0.036 | |
| **QTY** | **DEPENDENT VARIABLE: LnX/M** | | | | | | |
| | **Coefficient** | **t-ratio** | **Diagnostic Results** | | | | **Note:** |
| **Constant** | -3.170 | -4.058* | **$R^2$** | 0.596 | **LMT F(2,57)** | 3.787** | -Residuals are serially correlated. -Incorrect sign for GDP; MS; IR |
| **Δ(LnGDP)** | 1.586 | 0.650 | **Adj. $R^2$** | 0.555 | **LMT F(Prob.)** | 0.029 | |
| **Δ(LnEXR)** | -12.349 | -1.402*** | **F(6,59)** | 14.51* | **BPGT F(5,60)** | 0.418 | |
| **Δ(LnMS)** | 7.167 | 0.804 | **F(Prob.)** | 0.000 | **BPGT F(Prob.)** | 0.834 | |
| **Δ(LnIR)** | -3.625 | -1.303*** | **DW** | 2.482 | **RESET F(1,58)** | 0.150 | |
| **LnSVR** | 0.008 | 0.330 | **AIC** | 3.707 | **RESET F(Prob.)** | 0.700 | |
| **AR(1)** | 0.765 | 8.931* | **SC** | 3.939 | **JBT $\chi^2$ (2)** | 0.404 | |
| | | | **LL** | -115.37 | **JBT $\chi^2$ (Prob.)** | 0.817 | |

***Vehicles Other Than Railway or Tramway Rolling-Stock, and Parts and Accessories Thereof**

*DW – Durbin-Watson Statistics; AIS – Akaike Info Criterion; SC – Schwartz Criterion; LL – Log Likelihood; LMT – Lagrange Multiplier (Breusch-Godfrey) Test for Serial Correlation; BPGT – Breusch-Pagan-Godfrey Test for Heteroskedasticity; RESET – Ramsey RESET Test for Model Specification; JBT – Jarques-Bera Test for normality of the residuals; * significant at the 1%, ** significance at 5%, ***significance at 10%*

Table 5 (Continued - Part D): **NET EXPORT MODELS – CATEGORY 87* (AUD & QTY)**

| **AUSTRALIA - UNITED STATES** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **AUD** | **DEPENDENT VARIABLE: LnX/M** | | | | | | |
| | **Coefficient** | **t-ratio** | **Diagnostic Results** | | | | **Note:** |
| **Constant** | -0.858 | -4.239* | **$R^2$** | 0.633 | **LMT F(2,53)** | 0.148 | -Model is mis-specified. |
| **Δ(LnGDP)** | -2.784 | -4.065* | **Adj. $R^2$** | 0.593 | **LMT F(Prob.)** | 0.863 | |
| **Δ(LnEXR)** | -0.947 | -0.326 | **F(6,55)** | 15.84* | **BPGT F(5,56)** | 0.966 | |
| **Δ(LnMS)** | -3.556 | -1.252*** | **F(Prob.)** | 0.000 | **BPGT F(Prob.)** | 0.446 | |
| **Δ(LnIR)** | 1.093 | 1.339*** | **DW** | 1.932 | **RESET F(1,54)** | 5.446** | |
| **LnSVR** | 0.013 | 1.852** | **AIC** | 1.032 | **RESET F(Prob.)** | 0.023 | |
| **AR(1)** | 0.749 | 8.365* | **SC** | 1.272 | **JBT $\chi^2$ (2)** | 0.514 | |
| | | | **LL** | -24.995 | **JBT $\chi^2$ (Prob.)** | 0.773 | |
| **QTY** | **DEPENDENT VARIABLE: LnX/M** | | | | | | |
| | **Coefficient** | **t-ratio** | **Diagnostic Results** | | | | **Note:** |
| **Constant** | 0.079 | 0.234 | **$R^2$** | 0.482 | **LMT F(2,53)** | 2.81*** | -Residuals are serially correlated. -Residuals are not normally distributed. -Incorrect sign for GDP; EXR; MS; IR; SVR. |
| **Δ(LnGDP)** | 1.014 | 0.742 | **Adj. $R^2$** | 0.425 | **LMT F(Prob.)** | 0.069 | |
| **Δ(LnEXR)** | 3.220 | 0.557 | **F(6,55)** | 8.517* | **BPGT F(5,56)** | 1.566 | |
| **Δ(LnMS)** | 0.310 | 0.055 | **F(Prob.)** | 0.000 | **BPGT F(Prob.)** | 0.185 | |
| **Δ(LnIR)** | -0.713 | -0.444 | **DW** | 2.009 | **RESET F(1,54)** | 1.223 | |
| **LnSVR** | -0.005 | -0.397 | **AIC** | 2.353 | **RESET F(Prob.)** | 0.274 | |
| **AR(1)** | 0.703 | 7.268* | **SC** | 2.593 | **JBT $\chi^2$ (2)** | 6.819** | |
| | | | **LL** | -65.952 | **JBT $\chi^2$ (Prob.)** | 0.033 | |

***Vehicles Other Than Railway or Tramway Rolling-Stock, and Parts and Accessories Thereof***
*DW – Durbin-Watson Statistics; AIS – Akaike Info Criterion; SC – Schwartz Criterion; LL – Log Likelihood; LMT – Lagrange Multiplier (Breusch-Godfrey) Test for Serial Correlation; BPGT – Breusch-Pagan-Godfrey Test for Heteroskedasticity; RESET – Ramsey RESET Test for Model Specification; JBT – Jarques-Bera Test for normality of the residuals; * significant at the 1%, ** significance at 5%, ***significance at 10%*

As indicated in Table 5, out of the 16 NX models in Category 87, 13 models are significant and 3 NX models with China and Thailand based on AUD; and France based on QTY, are not significant, while in most of the models, the majority of the variables are not significant.

The variables GDP, EXR, MS, and SVR are significant in 5, 4, 3 and 3 out of the 16 models respectively, while the variable IR is significant in 8 out of the 16 models. The correct coefficient signs for all the GDP, EXR, MS, IR and SVR are found in 6 out of the 16 models (3 based on AUD and 3 based on QTY), while for these 6 models, the coefficient range for the GDP, EXR, MS, IR and SVR is between (-0.873 and -2.784), (-0.321 and -11.403), (-0.812 and -3.556), (0.313 and 8.250) and (0.002 and 6.292) respectively. Finally, the Adj. R-Square in overall for all 16 models in this category ranges between 3.4 and 74.8 per cent respectively.

In overall, out of the 16 estimated models in this category, only 2 models (the NX with China and Germany both based on QTY) have the correct signs and have satisfactory passed all diagnostic tests. The NX model with China shows that a 1 per cent increase in the GDP will decrease the NX growth rate by 2.264 per cent, a 1 per cent growth rate in the EXR and MS will decrease the NX growth rate by 3.837 and 2.105 per cent respectively, a 1 per cent growth rate in the IR will increase the NX growth rate by 8.25 per cent, on average, while a 1 per cent increase in SVR will increase the NX growth rate by 6.292 per cent. The NX model with Germany shows that a 1 per cent growth rate in the GDP and EXR will decrease the NX by 1.358 and 11.403 per cent respectively, a 1 per cent increase in the MS will decrease the NX by 2.361 per cent, on average, while a 1 per cent growth rate in the IR and SVR will increase the NX by 1.05 and 0.002 per cent respectively The variables GDP, EXR, MS and IR in these 2 models are all elastic and the variables SVR is mixed. Finally, the Adj. R-Square for China and Germany in these 2 models is 42.8 and 41.1 respectively.

## VI. Empirical Summary and Policy Implications

Overall, 49 out of the 58 models are significant, while the remaining 9 models[35] are not significant. The correct coefficient signs for all the variables GDP, EXR, MS, IR and SVR are found in 17 out of the 58 models (8 based on AUD and 9 based on QTY). Furthermore, for these 17 models, the coefficient range for the GDP, EXR, MS, IR and SVR is between (-0.017 and -4.138), (-0.321 and -46.873), (-0.017 and -44.979), (0.151 and 8.250) and (0.002 and 6.292) respectively. Finally, the Adj. R-Square in overall for all of the 58 models ranges between 0.2 and 74.8 per cent.

Overall, out of the 58 estimated models, 12 models (the NX with Germany for Category 30 - based on AUD values; China and the United States of America for Category 30 - based on QTY values; China, Thailand and the United Kingdom for Category 84 - based on AUD values; China and The United Kingdom for Category 84 - based on QTY values; China for Category 85 - based on AUD values; Singapore for Category 85 - based on QTY values; China and Germany for Category 87 - based on QTY values) have the correct signs and have satisfactory passed all diagnostic tests. Furthermore, for these 12 models, the coefficients range for the variables GDP, EXR, MS, IR and SVR are between (-0.017 and -4.138), (-1.098 and -46.873), (-0.017 and -44.979), (0.151 and 8.250) and (0.002 and 6.292) respectively. Additionally, the variables GDP, EXR, MS, IR and SVR in these 12 models are also significant finally, the Adj. R-Square for these 12 models ranges between 9.3 and 44.9 per cent respectively.

Almost all NX models estimated are significant, and the estimated models produced similar results based on both AUD and QTY values. Further, overall results suggest that the relative GDP, EXR and the relative MS are elastic variables, which show that relative changes in income, EXR and the MS are very responsive to the level of the NX (trade balance) in these selected TD categories. The most responsive (elastic) variables to the level of the NX is the EXR, followed by relative income, MS and IR. The elasticity for the relative IR is mixed, while the relative SVR is the least responsive variable, as it is mostly inelastic.

On the other hand, the most significant variables in the determination of the NX for all TD categories are a relative SVR; followed by a relative IR, MS and income, while the EXR variable proved to be the least significant. However, the significance and the responsiveness of the individual variables to the NX levels differ when estimated coefficients are observed on a category-by-category basis.

For Category 30, the most significant variables in the determination of the NX level is the relative SVR, followed by the relative income and the EXR, while the variables relative MS and IR are the least significant. In addition, relative MS and the EXR are the most responsive (elastic) variables to the NX levels in this category, followed by the relative income, interest and the SVR.

For Category 84, the most significant variables in the determination of the NX level is the relative SVR, followed by relative income, EXR and the IR, while the variable relative MS is the least significant. In addition, the EXR is the most responsive (elastic) variable to the NX level in this category, followed by the relative MS, income, IR and the SVR.

For Category 85, the most significant variables in the determination of the NX level is the relative income, followed by the relative IR, the SVR and the EXR, while the variable relative MS is the least significant. In addition, the EXR is the most responsive (elastic)

[35] Germany for the Category 30 - based on AUD, Malaysia and Thailand for the Category 30 - based on QTY, Germany, Malaysia and Singapore for the Category 85 - based on AUD, China and Thailand for the Category 87 - based on AUD and France for the Category 87 - based on QTY.

variable to the NX levels in this category, followed by the relative MS, income, interest and the SVR.

For Category 87, the most significant variables in the determination of the NX level is the relative IR, followed by the relative savings, the income rates and the EXR, while the variable relative MS is the least significant. In addition, the relative IR and the EXR are the most responsive (elastic) variables to the NX levels in this category, followed by the relative income, MS and the SVR.

In summary, the overall results in the estimated NX models that did not satisfactory pass all diagnostic tests should be viewed with caution; as these NX models require further improvements. These improvements include and are not limited to further corrections, adjustments and/or even considerable modification of most of the models in order to obtain more reliable models which will in turn, make it possible to get a clearer understanding of the determinants of the NX with the selected TD countries in the selected TD categories. Despite, these limitations the estimated NX models which did not satisfactory pass all diagnostic tests are revealing valuable information that can be utilized by trade policy makers and various parties involved in international trade in these selected TD categories.

Finally, by observing only 12 models (5 based on AUD and 7 based on QTY values) that have the correct a-priory signs and have satisfactory passed all diagnostic tests, the main findings are rather different to the remaining 46 models. The most significant variables in the determination of the NX for all TD categories in these 12 models is a relative income and the EXR; followed by a relative MS and IR, while the relative SVR variable proved to be the least significant. Additionally, the most responsive (elastic) variables to the level of the NX in these 12 models is the EXR, followed by a relative MS, income and IR, while the relative SVR is the least responsive variable.

The most important findings of this study for the models which have satisfactorily passed all diagnostic tests that relationship between the NX (trade balance) and the GDP, EXR and MS is positive, while the relationship between the NX and the IR and SVR is negative. This finding for the independent variables GDP, EXR and MS is consistent with earlier studies conducted by Kyereme (2002) and Duasa (2007) and also with the theoretical expectations. However, the independent variable EXR in this study found to be the second most significant variable (after the GDP, which found to be the most significant variable) in determining the NX in these TD categories, while the studies by Kyereme (2002) and Duasa (2007) found a rather weak or non-existent relationship between the NX and the EXR. This inconsistent finding could be due to numerous reasons; one of the reasons could be that unlike the existing studies which analyse aggregated X and M volumes, this study analyses the specific TD categories. This suggests that the relationship between the NX and the EXR is important in determination of the NX volumes and hence supports for the ‘elasticity approach’ or as ‘imperfect substitute’ model when the NX models are estimated. Furthermore, this finding also suggests that the relationship between the NX and the EXR is likely to require further research before definite conclusions are being made. Finally, another important finding in this study is that, the SVR is the least significant and the least responsive variable to the NX levels in these selected TD categories.

Overall the major findings in this study suggests that changes in the relative income and the EXR can have a significant effect on the trade volume in the selected TD categories, while the relative SVR does not have significant effect on the NX levels in these categories.

## VII. Conclusions

Overall, the NX models in this study is examined from absorption, elasticity and a monetary perspective, in order to divulge the determinants of the trade balance between Australia and the selected TD countries in the selected TD categories.

The three major differences between this study and the existing ones that estimate the NX models could be summarised as follows: Firstly, unlike the existing NX models in the literature which uses the dependent variable of the overall aggregated X, and M volumes, the dependent variable in this study refers to the specific TD categories. This approach reveals that the specific information as to which variable(s) are significant in the determination of the X and M levels on a category-by-category basis. Secondly, unlike existing studies which only estimate the NX on monetary values, this study estimates the NX based on both the monetary and QTY values for each selected TD category. This allows for a comparison of the disparities (comparative analysis) and an evaluation of the corresponding results from 2 different perspectives. Thirdly, unlike existing NX models, this study incorporates the SVR as an additional independent variable. According to IS-LM framework, the inclusion of such as variable is justifiable. This approach to the best of our knowledge, has not been used in any previous studies, which at the same time, is one of the significant contributions of this study.

Overall, 49 out of 58 NX models are significant, while 12 out of 58 models (5 based on AUD and 7 based on QTY) have the correct signs and have satisfactory passed all diagnostic tests. The most significant explanatory variables in the determination of the NX in these models are the relative income and the EXR; closely followed by relative MS and IR, while the relative SVR variable is the least significant. Furthermore, in respect to the most responsiveness to the NX levels, the most responsive variable in these models is the EXR, followed by relative MS, income and IR, while the relative SVR is the least responsive variable.

In summary, the overall findings suggest that, most of the estimated NX models require further improvements. These improvements include and are not limited to further corrections, adjustments and/or even considerable modification of most of the models, in order to obtain more reliable models. This in turn will make it possible to get an overall understanding of the determinants of the NX with all selected TD countries and in all selected TD categories.

Despite these shortcomings, the overall results in this study provide valuable information that can be utilized for trade policy makers when assessing the growing TD deficit in these categories between Australia and the selected TD countries and relevant industries involved in the international trade in these categories. The findings in this study ascertain what the macroeconomic variables and the extent to which these are influencing the NX levels in the selected categories. Findings in this study suggest that macroeconomic variables such as money supply, interest rates and savings rates are having an insignificant effect in the determination of the NX levels in the selected categories. This highlights that domestic monetary policy cannot influence the NX levels in the selected TD categories in Australia. Hence, fiscal policy is more powerful in influencing the NX levels in Australia. It is advisable that governments pay particular attention to the effectiveness of fiscal policy in influencing the NX levels in Australia.

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