A Multivariate Cointegration Analysis Of The Role Of Exports To Main Trading Partners In The Malaysian Macroeconomics

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ABSTRACT

This paper investigates determinants of Malaysian export to the United States (US), Japan and Singapore using annual data from 1970 until 2010. Country specific determinants of trade include real gross domestic product, nominal effective exchange rate, inflation and inward foreign direct investment. The aim of this paper is to discern the dynamic causal chain among gross domestic product, foreign direct investment, real effective exchange rate and inflation in the context of Malaysian exports to the United States. The methodology employed applied Augmented Dickey Fuller test, Johansen and Juselius cointegration test and Vector Error Correction Model to capture the Granger-causal chain among the variables. The major findings ;(a) long-run equilibrium relationship(s) exists between Malaysian exports to its main trading partners and its macroeconomic variables, (b) Malaysia macroeconomic variables have significant influence on its exports to its main trading partners. Most specifically, real gross domestic product lead to expansion in exports performance.

Key words: Exports, Gross Domestic Product, Nominal Effective Exchange Rate, Foreign Direct Investment, Consumer Price Index

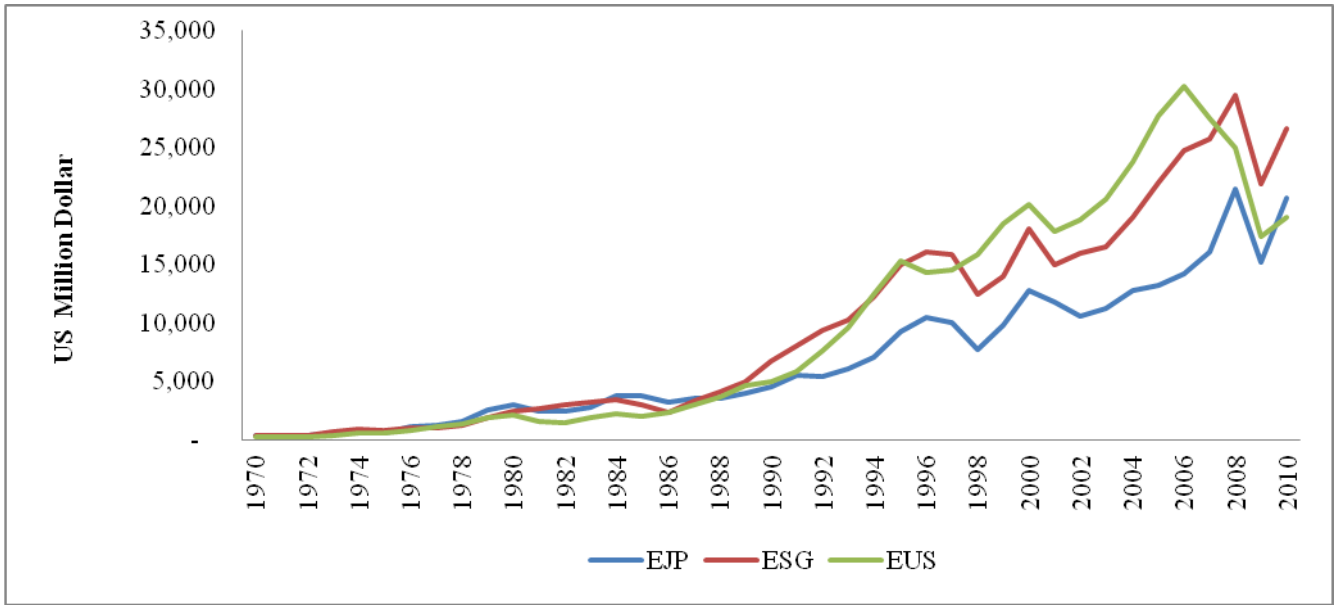
1. INTRODUCTION

Malaysia has a relatively open and small economy. Malaysia has shown a tremendous performance in economics as a result of its liberal outward oriented regime. As a net exporter of oil, Malaysia gains from the rise of the price of global oil. However, Malaysia also suffers the secondary effects of being a trade–dependent economy in case the high prices of oil corrode the growth of global economic. The Malaysian total exports of goods and services grow 61 per cent from 2000 to 2009 (Direction of Trade Statistics, 2010).[1] Major exports include chemicals, liquefied natural gas, petroleum products, electrical machinery and parts, and above all are electronic equipment and semiconductors. As a trade dependent country, Figure 1 shows the principal export markets for Malaysia including the United States (US), Singapore and Japan. According to Figure 1, the Malaysian exports to the United States (US), Japan, and Singapore have been in an upward trend from year 1970 to 2010.

Despite the financial crisis that hit Asia in 1997 which had caused turmoil in the Asian economic, Malaysian total exports remain strong and increasing except for a decline from 2000-2001 and 2006-2009. The decline at the former period was due to the lower semiconductors exports that plunged by 10.8 per cent year-on-year. In particular, the exports grew strong due to supportive external and domestic demands along with spectacular improvements in high technology industries. Table 1 presents the Malaysia exports to its trading partner from 1980 to 2009. In 1980, US had become Malaysia's second largest export direction with 20.74 per cent of its total exports and this value decreased to 10.95 per cent in 2009. In the case of Malaysia exports to Japan, the share of exports also decreases from 22.82 per cent in 1980 to 9.84 per cent in 2009. This is also followed by Singapore with reductions from 19.13 per cent to 13.95 per cent share in 2009. The decline indicates the increasing in exports shares to other countries such as new giant economies, China and India also the European Union (EU) countries.

[1] Refer to Direction of Trade Statistics (2008).

FIGURE 1: MALAYSIA EXPORTS TO THE UNITED STATES, 1980-2010



Source: Direction of Trade Statistics, IMF (2011).

TABLE 1: MALAYSIA EXPORTS TO ITS TRADING PARTNER (1980-2009)

Country	1980	1985	1990	1995	2000	2005	2009
WORLD	12,961	15,408	29,421	73,725	98,154	140,977	158,086
Japan	2,958	3,783	4,506	9,199	12,780	13,181	15,549
UK	358	397	1,160	2,982	3,046	2,501	2,029
Singapore	2,480	2,991	6,753	14,960	18,050	22,010	22,057
US	2,688	2,399	5,496	17,981	25,990	34,676	17,309

Source: Direction of Trade Statistics, IMF (2008). The value is in US million dollars.

In addition, Malaysia export to Japan rises by 61.50 per cent from 2000 to 2010 largely contributed by electrical and electronic products, refined and crude petroleum. On the other hand Singapore export to Malaysia increases by 47.35 per cent from 2000 to 2010 mainly due to the exports of E&E products despite sluggish global economic condition. Despite that, factors that affect strong trade linkages between the two countries include geographical proximity, inter-connectivity, complementarities and ease in conducting business. A large body of literatures (Krueger, 1978; Balassa, 1985 and Salvatore & Hatcher, 1991) concerning the role of exports performance in achieving economic growth has triggered the need for this research to compare the relationship between Malaysia exports to its main trading partners with its macroeconomic variables. The relevance of this comparison is made on the basis of country differences including the existence of trade bloc (Free Trade Agreement, FTA) and geographical proximity with Malaysia. In tandem with globalization, the emergence of trade bloc in accentuating the exports performance is emphasized to indicate the interdependence between countries and regions.

The aforesaid discussion highlights on the US, Japan and Singapore as major trading partners for Malaysia, and it is worth noting that international trade plays a very important role towards a country's economic

development. Recognizing international trade as the catalyst of economy growth, authorities have implemented various trade related policies, in particular the creation of free trade area (FTA) and free trade zone. The FTA formation has led to imports being less expensive than being produced domestically and it enhances the economic welfare for members of FTA as the resources are shifted from unproductive use to a more efficient use[2]. Up to now, there are nine free trade agreements in Malaysia which include five regional free trade agreements (ASEAN-China, ASEAN-Japan, ASEAN-Korea, ASEAN-India and ASEAN-Australia and New Zealand) and four bilateral free trade agreements between Malaysia and Japan, Pakistan, Chile and New Zealand. The Malaysia-Japan Economic Partnership Agreement (JMEPA) takes effect in 2006 aims toward fulfilling the economic complementarities encompasses not only trade in goods and services but also include intellectual property right protection, investment rules, competition policies, business facilitation and cooperation projects for personnel training in Malaysia. The cooperation envisaged under JMEPA would encourage the development of new sectors for instance high-tech industries, such as biotechnology, services including manufacturing related services and ICT and multimedia (Ministry of Trade and International Industry (MITI), 2012).

On the other hand, Singapore-Malaysia bilateral trade is pivotal through ASEAN-FTA (AFTA) in order to enhance ASEAN's competitive edge by the abolishment of tariff and non-tariff barriers within the region. Thus, the free trade give opportunities to a country to move their capital freely and the absence of "trade-distorting" policies such as taxes, subsidies, regulations or laws give some firms, households, and factors of production an advantage over others (Murphy 2004). Despite the US being one of major trading partner to Malaysian trade, there is no free trade agreement between Malaysia and the US. Report by US Trade Representative (2006) highlights that as Malaysia is the US tenth biggest trading partner, the greater entrance to the Malaysia's market by means of FTA will enable an improvement in trade in extensive assortment of industrial as well as agricultural commodities and furthermore expands the chance of employment in US and Malaysia. The FTA between Malaysia and US is beneficial as it also enhances the US-ASEAN relationship that would build a strong energy towards the strength and progress in the region as a whole as well as deepening the tie between the countries. Interestingly, this research contributes to the literature in a sense that the main trading partners have distinct trade relationship with Malaysia as previous studies focuses on the export and import –led growth side. This study attempts to assess the dynamic causal chain among Malaysian export to its main trading partners including the US, Japan and Singapore with its macroeconomic variables namely Malaysia gross domestic product, foreign direct investment, exchange rate and inflation. Then, review of the previous literature is presented; follows by data and methodology, and results in the next section. Finally, conclusion section concludes the paper.

2. LITERATURE REVIEW

A number of studies have investigated the factors determining exports including real gross domestic product (RGDP), inward foreign direct investment (FDI), inflation rates and real effective exchange rates (REER). Reizman, Whiteman and Summers (1996) argued that imports played the role of a confounding variable in causal ordering; that is, imports affect both income and exports. Another study is by Bhagwati (1988) which supported the growth driven exports and that an increase in GDP generally leads to a corresponding expansion of trade, unless the growth-induced supply pattern and corresponding demand creates an anti-trade bias. Hatemi-J and Irandoust (2000) proved that using Johansen's technique and the augmented Granger Causality test, export growth and economic growth are causally related in the Nordic economies in the long run. Real output and real exports which are in terms of quarterly data are used in this study focusing on Denmark, Finland, Norway and Sweden. According to the results of the study, Hatemi-J and Irandoust showed that real output Granger-causes export growth for Denmark while causality runs in both directions in the case of Finland, Norway and Sweden.

[2] William H. Cooper explanation on Jacob Viner's concepts in his report on Free Trade Agreements: Impact on U.S. Trade and Implications for U.S. Trade Policy by CRS (2005).

Gokal and Hanif (2004) elucidated that inflation may as well reduce a country's international competitiveness by making its exports relatively more expensive, thus impacting on the balance of payments. Gylfason (1998) concluded that high inflation and an abundance of natural resources tended to be associated with low exports and slow growth. According to Gylfason, high inflation discourages exports and impedes growth. In a study by Wilamoski and Tinkler (1999) on the trade balance effect on US foreign direct investment in Mexico using empirical estimation proceeds for stationarity and cointegration. The results showed that FDI leads to increased exports and imports. Zhang and Song (2000) did a study on the role of inward FDI promoting exports in China using the panel data at the provincial in the period of 1986 to 1997. Using Generalized Least Estimator (GLS), they found out that increased levels of FDI positively affect provincial manufacturing export performance.

A study by Liu, Wang and Wei in 2001 examined the causal relationship between foreign direct investment (FDI) and trade (exports and imports) in China. Their study was according to a panel of bilateral data for China and 19 home countries/regions from 1984 to 1998. Liu, Wang and Wei used the unit roots and causality tests to conduct the study and their results showed that the growth of imports in China was caused by the growth in inward FDI from home country/region which therefore causes the exports growth from China to home country/region. According to a study by Chang (2005) using the vector autoregression (VAR) method of variance decomposition and impulse response function analysis to examine the dynamic relationship among the FDI, economic growth, unemployment and trade in Taiwan, Chang found that economic growth and export both have positive effect on inflow of FDI. The study also found that the expansion of export has negative effect on FDI outflow and FDI inflow has a noticeable positive impact on exports and economic performance. Furthermore, there is a positive relationship between economic growth and exports. Orr (1991) in his study of the trade balance effect of inward FDI to the US discovered that the US FDI in Mexico may initially increase US exports and improve the US trade balance. Nonetheless, Mexico's imports of US goods eventually fall and US imports from US may eventually rise.

Studies prove that an appreciation in exchange rates causes domestic goods less competitive internationally hence reducing exports. This is supported by Sharma (2000, 2003), Lane and Milesi-Ferrettib (2002), Mallick (2003), Thanh and Kalirajan (2006), Fang, Lai and Thompson (2007) and Kandil, Berument and Dincer (2007). In a study by Himarios (1989), he found that in a study of examining the effectiveness of devaluation on trade balance for twenty seven countries including sixty devaluation episodes, the nominal devaluation leads to real devaluation that last for not less than three years and has been a successful policy tool for adjustment of trade balance. According to Sharma (2003), the negative elasticity of export demand with respect to REER implies that the real appreciation of rupee adversely affects Indian exports. Coes (1981) concluded that by using log-level specification to examine Brazilian exports, significant reduction in exchange rate uncertainty in the country's economy during the crawling-peg era had a positive effect on the country's exports after the crawling peg was adopted in 1968.

3. DATA AND METHODOLOGY

3.1. Data and Variables

Annual time series data on Malaysia Real GDP (GDPM), FDI and inflation rate, Malaysian exports to the US, Japan and Singapore over the period 1970-2010 are utilized to identify the determinants. The exports data which is the Malaysian exports to US (EUS), Japan (EJP) and Singapore (ESG) are expressed in terms of millions of US dollar are collected from Direction of Trade Statistics (DOTS), International Monetary Fund (IMF). Meanwhile, the data on Real GDP for Malaysia, Malaysia Inflation and Nominal Effective Exchange Rate are acquired from the IMF's International Financial System 2011 (IFS). The data on Real GDP for Malaysia is in US million dollars. The consumer price index (CPI) data is utilized to represent Inflation rate in Malaysia. The Malaysia Nominal Effective Exchange Rate (NEER) is based on the 2000=100 index. The data of world inward FDI in Malaysia is in US million dollar and acquired

from the World Investment Report 2011 (WIR) and in million of dollar. Each of these data will be transformed to natural logarithm.

3.2. The Empirical Analysis

The objective of this paper is to identify the long run relationship between Malaysian exports to the US, US real GDP, Malaysia real GDP, nominal effective exchange rates, foreign direct investments and consumer price index. The research includes three models with similar macroeconomic independent variables, namely GDPM, FDI, CPI and NEER with three different dependent variables, namely EUS, EJP and ESG. The testing procedures involve Augmented Dickey Fuller (ADF) unit root test, Phillips–Perron (PP) unit root test, Johansen-Juselius cointegration test and Vector Error Correction Model (VECM).The following procedures will be adopted:

- Step 1: Augmented Dickey-Fuller and Phillip-Perron Unit Root test

For individual variables, namely Malaysia exports to US, Japan, Singapore, GDP, FDI, CPI and NEER testing for cointegration is important to test for the presence of the unit root using Augmented Dickey Fuller Test (ADF) and Phillip-Perron (PP) tests. The ADF test (Dickey and Fuller, 1979) is based on the auxiliary regression (1). The ADF auxiliary regression test for the presence of a unit root in y_t specifically the logarithm of all model's variables at time *t*.

$$\Delta y_t = \alpha + \delta t + \beta y_{t-1} + \sum_{i=1}^{k} \gamma \Delta y_{t-1} + u_t \quad (1)$$

The lagged first differences is expressed by the variable Δy_{t-1}, the serial correlation errors are adjusted by u_t, and

$\alpha, \delta, \beta \; and \; \gamma$ are the estimated parameters. The unit root in variable y_t's null and alternative hypotheses are

$$H_0: \beta = 0, H_\varepsilon: \beta < 0. \quad (2)$$

PP test (Phillips and Perron, 1988) differs from ADF primarily in dealing with serial correlation and heteroskedasticity in the errors. The test regression for the PP tests is

$$\Delta y_t = \beta' D_t + \pi y_{t-1} + u_t \quad (3)$$

- Step 2. Cointegration Test.

According to the cointegration technique by Engle and Granger (1986), Hendry (1986) and Granger (1986), the condition for two or more variables to be cointegrated is where they exhibit long-run equilibrium relationship(s) if they share common trend(s). The existence of cointegration rules out "spuriousness" among the variables estimated relationship. This research applied Johansen and Juselius (1990) using two tests namely the Likelihood Ratio Trace Test and the Maximum Eigenvalue Test to determine the number of cointegrating vectors. The Trace Test can be expressed as:

$$\lambda_{trace}(r) = -T \sum_{i=r+1}^{n} \ln(1 - \hat{\lambda}_i) \quad (4)$$

In this case, the null hypothesis is the number of cointegrating vectors is less than or equal to r, where r is 0, 1, 2, and so on. On the other hand, the Maximum Eigenvalue Test can be expressed as:

$$\lambda_{max}(r, r+1) = -T \ln(1 - \hat{\lambda}_{r+1}) \quad (5)$$

In this case the null hypothesis of existence of r cointegrating vector is tested against the alternative of r + 1 cointegrating vector.

- Step 3. Vector Error-Correction Modelling (VECM).

Engle and Granger (1987) demonstrated that once a number of variable are found to be cointegrated, there always exists a corresponding error-correction representation, which indicates that changes in dependent variable are a function of the level of disequilibrium in the cointegrating relationship as well as changes in other explanatory variable(s).

4. RESULTS

4.1.1. Unit Root and Cointegration Test

Table 2 shows the results for ADF and PP unit root Test for the seven variables including EUS, EJP, ESG, GDPM, FDI, CPI and NEER, both at level and at first difference using the Schwartz Information Criterion (SIC). This test is conducted to obtain the order of integration of the variables. ADF and PP tests agree in classifying EUS, EJP, ESG, GDPM, FDI, CPI and NEER as I (1) variables in which variables are stationary only after first differencing. Table 3 presents the results for Johansen-Juselius Multivariate Cointegration Test. For Model (1), it is indicated that there is a cointegration in the long run for both maximum eigenvalue and trace tests. Model (2) indicates two (2) cointegrating vectors in trace test while one (1) cointegrating vector for maximum eigenvalue test. Model (3) indicates two cointegrating vectors and one cointegrating vector for trace test and maximum eigenvalue test respectively. The Johansen and Juselius Cointegration Test (1990) is performed to see whether the long run cointegration exist among the variable. The results in Table 3 suggest that these seven variables are bound together by long-run equilibrium relationship(s). This implies (i) the spurious correlation to be ruled out (ii) the probability of misspecifications as a result of dynamic relationship modelling of ordinary Vector Auto Regressive first-differencing to be ruled out.

TABLE 2: ADF AND PHILLIPS-PERRON UNIT ROOT TEST RESULTS FOR SERIES IN FIRST DIFFERENCE

	Augmented Dickey-Fuller		Phillips-Perron	
	Level	First Difference	Level	First Difference
EUS	-1.2813(2)	-4.9577(1)*	-0.5014(4)	-5.1323(4)*
EJP	-2.3248(0)	-3.9783(2)*	-2.1064(3)	-7.9917(4)*
ESG	-1.6607(0)	-5.9615(0)*	-1.6487(2)	-5.9609(3)*
GDPM	-2.8582(0)	-6.2133(0)*	-2.9689(3)	-6.2137(1)*
FDI	-3.4181(0)	-8.1919(0)*	-3.3531(2)	-8.1919(0)*
CPI	-3.2762(1)	-3.6742(8)*	-2.0398(9)	-4.3495(2)*
NEER	-3.0681(1)	-4.7159(0)*	-2.5875(3)	-4.4808(6)*

*Notes: Significance at the 5% level.

4.1.2. Johansen-Juselius Multivariate Cointegration Test Results

TABLE 3: JOHANSEN-JUSELIUS MULTIVARIATE COINTEGRATION TEST RESULTS

Vector					
H0:	H1:	Trace Statistic	5% Critical Value	Max-Eigen Statistic	5% Critical Value
(1) EUS GDPM FDI CPI NEER					
r=0	r=1	83.58*	68.52	39.63*	33.46
r≤1	r=2	43.95	47.21	24.78	27.07
r≤2	r=3	19.17	29.68	12.95	20.97
r≤3	r=4	6.22	15.41	4.33	14.07
r≤4	r=5	1.89	3.76	1.89	3.76
(2) EJP GDPM FDI CPI NEER					
r=0	r=1	102.67*	68.52	50.56*	33.46
r≤1	r=2	52.10*	47.21	25.25	27.07
r≤2	r=3	26.86	29.68	13.99	20.97
r≤3	r=4	12.87	15.41	9.53	14.07
r≤4	r=5	3.34	3.76	3.34	3.76
(3) ESG GDPM FDI CPI NEER					
r=0	r=1	102.20*	68.52	44.49*	33.46
r≤1	r=2	57.72*	47.21	26.68	27.07
r≤2	r=3	31.04*	29.68	17.15	20.97
r≤3	r=4	13.89	15.41	9.03	14.07
r≤4	r=5	4.85	3.76	4.85	3.76

Notes: (*) denotes rejection of the hypothesis at the 5%. The letter "r" represents the number of co-integrating equations. The 5% critical values are based on Osterwald-Lenum (1992). The optimal lag structure of the VAR was selected by minimizing the AKAIKE's FPE criterion.

4.1.3. Vector Error Correction Model Estimation

The direction of causality can be further explained by the VECM test. The VECM test is conducted to discern the causal nexus among the concerned variables in both long run and short run. From the results, it is found that GDPM and NEER endogenous for Model 1. For Model 2, EJP and CPI are found to have significant coefficient for the error correction term. On the other hand, ESG, GDPM and FDI are significant equation for error correction term in Model 3. Hence, this implies that these variables are the initial receptors of exogenous shocks to long-term equilibrium relationship and other variables have to bear the brunt of short-run adjustment endogenously. Several short-run dynamics for the three models are found in addition to the equilibrium relationship adjustments. For Model 1 and 2, a uni-directional short-run causality is found from CPI to FDI and from EJP to CPI respectively. On the other hand, a two-way causation is observed between ESG and FDI in Model 3. Other uni-directional causality takes place from ESG to GDPM, ESG to CPI, and GDPM to CPI, FDI to CPI. In this model, it can be concluded that ESG cause CPI through FDI and GDPM. (ESG→FDI→GDPM→CPI)

TABLE 4: TEMPORAL CAUSALITY RESULTS BASED ON VECTOR ERROR-CORRECTION MODEL (VECM)

			Independent Variable			
Dependent	ΔEUS	ΔGDPM	ΔFDI	ΔCPI	ΔNEER	ECT
ΔEUS	-	-1.123	-0.081	-2.637	-0.161	-0.053*
		(-0.633)	(-1.244)	(-1.881)	(-0.202)	(-2.088)
ΔGDPM	0.011	-	-0.002	-0.463	0.003	-0.006
	(0.227)		(-0.135)	(-1.449)	(0.017)	(-1.027)
ΔFDI	-0.235	-1.670	-	3.549	1.524	-0.027
	(-0.266)	(-0.219)		(0.590)	(0.448)	(-0.251)
ΔCPI	-0.030	-0.234	-0.015*	-	0.141	-0.014*
	(-1.341)	(-1.205)	(-2.064)		(1.630)	(-4.848)
ΔNEER	-0.012	0.456	-0.017	0.644	-	0.002
	(-0.145)	(0.652)	(-0.649)	(1.165)		(0.176)
			Independent Variable			
Dependent	ΔEJP	ΔGDPM	ΔFDI	ΔCPI	ΔNEER	ECT
ΔEJP	-	-1.243	-0.038	-3.403*	0.044	-0.084*
		(-0.640)	(-0.523)	(-2.202)	(0.054)	(-2.357)
ΔGDPM	-0.046	-	-0.003	-0.242	-0.020	-0.006
	(-0.934)		(-0.183)	(-0.740)	(-0.113)	(-0.778)
ΔFDI	-1.219	1.624	-	5.503	2.210	-0.103
	(-1.325)	(0.213)		(0.906)	(0.685)	(-0.739)
ΔCPI	-0.020	-0.208	-0.010	-	0.145	-0.016*
	(-0.788)	(-1.004)	(-1.360)		(1.658)	(-4.090)
ΔNEER	0.013	0.628	-0.016	0.910	-	0.016
	(0.155)	(0.922)	(-0.617)	(1.678)		(1.272)
			Independent Variable			
Dependent	ΔESG	ΔGDPM	ΔFDI	ΔCPI	ΔNEER	ECT
ΔESG	-	3.372*	-0.127*	-4.383*	-0.588	-0.597*
		(2.525)	(-2.028)	(-3.449)	(-1.001)	(-4.508)
ΔGDPM	0.111	-	-0.010	-1.0439*	-0.0367	-0.092*
	(1.463)]		(-0.518)	(-2.717)	(-0.204)	(-2.302)
ΔFDI	2.131*	5.236	-	-15.651*	0.157	-1.566*
	(1.973)	(0.913)		(-2.866)	(0.062)	(-2.752)
ΔCPI	0.070	-0.103	-0.001	-	0.032	-0.004
	(1.560)	(-0.432)	(-0.073)		(0.301)	(-0.179)
ΔNEER	0.077	0.619	-0.047	0.386	-	-0.134763
	(0.575)	(0.873)	(-1.414)	(0.572)		(-1.916)

Note: The values in parentheses are chi-square. In the table, *shows that coefficients are significant at 5% level.

5. SUMMARY AND FINDINGS OF THE STUDY

This study applied the VECM analysis to analyze the relationship between GDPM, FDI, CPI and NEER in the case of Malaysia main trading partners namely, the US, Japan and Singapore over the period 1970-2010. The conclusion can be found based on the empirical evidence as follows. First, it is found that these models have long run cointegrating relationships implying that these variables in the models are bound together by common trends or long run equilibrium relationship ruling out possibilities of spuriousness. Secondly, it is found that CPI, GDPM and FDI are endogenous variables while NEER is the exogenous variable in the three models. Hence, this study recommends that policies should be targeted to promote international trades mainly in enhancing its global competitiveness towards more liberalize trade with the US, Japan and Singapore. This is by increasing the openness to trade and therefore allowing more FDI which will be the main source of capital formation. This implies that managing floating tool, which is applied by the Malaysian government, allows for intervention to influence the value of the currencies thus encouraging greater trade with its trading partners, in this case the US, Japan and Singapore. Third is to form economic cooperation with countries with different economic background to construct a strong economic collaboration through comparative advantages. Finally, more economic variables can be included for a further extensive research in this area to identify the trade relationship between Malaysia and its trading partners.

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