IMPACT OF MACROECONOMIC VARIABLES ON MANUFACTURING SECTOR GROWTH IN MALAYSIA

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DECLARATION

We hereby declare that:

(1) This undergraduate research project is the end result of our own work and that due acknowledgement has been given in the references to ALL sources of information be they printed, electronic, or personal.

(2) No portion of this research project has been submitted in support of any application for any other degree or qualification of this or any other university, or other institutes of learning.

(3) Equal contribution has been made by each group member in completing the research project.

(4) The word count of this research report is 16,320.

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ADF	Augmented Dickey-Fuller test
AIC	Akaike information criterion
BMNY	Broad money supply
CPI	Consumer price index
ECT	Error correction term
FDI	Foreign direct investment
GDP	Gross domestic product
LnCPI	Log consumer price index
LnFDI	Log foreign direct investment
LnREER	Log real effective exchange rate
OLS	Ordinary least squares
REER	Real effective exchange rate
VAD	Value added to manufacturing sector
VAR	Vector auto-regressive
VECM	Vector error correction model
1MDB	1Malaysia Development Berhad

ABSTRACT

The manufacturing sector has been a core sector economy of Malaysia in recent decades. In the face of a worsening macroeconomic outlook in recent times, it is important to understand the relationships between manufacturing sector growth and the macroeconomic environment in order to combat the adverse developments in the Malaysian political and business climate. This study employs a Vector Error Correction Model (VECM) to analyze the impact of specific macroeconomic variables on manufacturing sector growth in Malaysia and Granger causality test to establish causality between them over a time period of 32 years which is from 1979 to 2010. The result of the study finds that net inflows of foreign direct investment and consumer price index both have significant positive relationships with manufacturing sector growth, while real effective exchange rate has a significant negative relationship with manufacturing sector growth. Broad money supply is found to be statistically insignificant. The government should enact policies to stabilize the political and business climate of the country in order to maintain manufacturing sector growth in this period of increasing political risk and uncertainty.

CHAPTER 1: INTRODUCTION

1.0 Overview

The study of the key drivers of growth in the economies of developing countries has been a hot topic of research ever since the Second World War. In the case of Malaysia, its manufacturing industry has been an important engine of economic growth and prosperity for its post-war economy. Before being granted independence in the 1950s, Malaysia's economy was focused on resource-based development or primary goods, namely tin mining and rubber cultivation, as noted by Sukirno (2004). Although the aforementioned commodities were crucial sources of growth for the pre-independence economy, Malaysia's leaders realized that in order for the nation to stand up and become a developed country, it needed to implement a policy of diversification in order to shift the focus of the economy from agriculture and mining primary goods and raw materials to processing and manufacturing secondary products.

With this in mind, the New Economic Policy was implemented in the 1960's in an effort to wean the country off of its dependency on the import of foreign industrial goods. The new policy's main aims were to erode poverty and create more employment opportunities for citizens by expanding the manufacturing sector (Malaysian Economic Planning Unit, 2015).

1.0.1 How has Malaysia Tried to Grow the Manufacturing Sector? - A Brief History of Malaysia Plans and the Manufacturing Sector

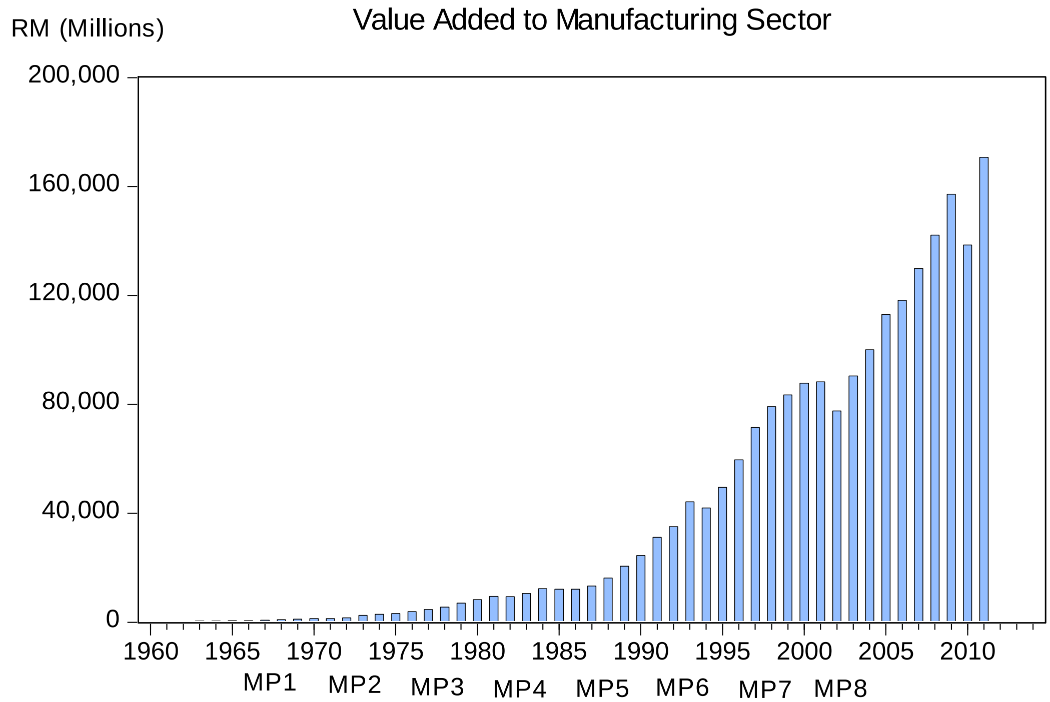


Figure 1.1. Value Added to Manufacutring Sector
(Source: World Bank, 2015).

Figure 1.1 shows the growth of value added to the manufacturing sector as a proxy for manufacturing sector growth. The periods that fall under the individual Malaysia Plans are denoted with the abbreviation 'MP'.

Before we analyze the macroeconomic variables, it is a good idea to first learn about the history of the manufacturing sector, and the best way to do that is to learn about the policies implemented by the government to help grow the sector over the years through the Malaysia Plans.

As can be observed for Figure 1.1, manufacturing sector growth was slow but steadily increasing from MP1 to MP2, a trend which continued into MP3, and from MP4 to MP5, growth slowed down, as seen by the value added staying at roughly the same level for the period of those plans. Starting from MP5, growth increased sharply, and this trend carried on until MP8, at the end of which manufacturing sector growth had nearly doubled since the early years of the Malaysia Plans. So, what were the policy thrusts of each of the Malaysia Plans?

The 1st Malaysia Plan was implemented from 1966 to 1970. The manufacturing sector in peninsular Malaysia was still in its infancy and was involved in activities such as processing agriculture products, manufacturing consumer and intermediate goods with imported raw material and so on. At this point in time the sector was still underdeveloped as the Malaysian economy that was still firmly rooted in the agricultural and mining sectors. The manufacturing sector in Sabah and Sarawak were said to be negligible at the time and remained largely underdeveloped. The Malaysian government promoted Malay entrepreneurship and improved Malaysian management skills for manufacturing ventures, in order to incentivize industrialization, and in 1965, the Federal Industrial Development Authority (FIDA) was established (Henderson, Vreeland, Dana, Hurwitz, Just, Moeller & Shinn, 1977).

Along with FIDA, the Malaysian Industrial Development Finance Bhd. (MIDF) was established as part of the principal agencies intended to oversee and drive investment into the manufacturing and services sectors in Malaysia. Besides that, the government of Malaysia also began initiatives such as implementing tariff protection, pioneer status, and other fiscal incentives and the extension of loans and advances from the commercial banks as well as MIDF to boost the manufacturing sector growth (Malaysian Economic Planning Unit, 2012). As can be seen from Figure 1.1, the effects of this policy did not start to show until the 1970s, when the manufacturing sector value added started to rise steadily.

In the 1970s, with the implementation of the 2nd Malaysia Plan, Perbadanan Nasional (PERNAS), also known as the National Trading Corporation, was established. Its missive was to acquire businesses and engage in joint ventures with private companies with the purpose of building up the economy, including the manufacturing sector (Henderson et al., 1977). Before the 2nd Malaysia Plan, manufacturing sector activities were mostly concentrated on the West of Malaysia, and in order to curb the exodus from rural areas to urban areas, there was significant emphasis on this plan to develop the manufacturing sector in East Malaysia, which was much less urbanized than its Western counterpart. By 1975, 16% of Malaysian GDP was comprised of manufacturing activities - only one percent short of the 2nd Plan target of 17% (Malaysian Economic Planning Unit, 2012).

By observing Figure 1.1, it can be seen that manufacturing sector growth was negligible in the year 1975. This can be attributed to the global recession during that year, in contrast with 15% growth in the previous year of 1974 (Malaysian Economic Plannning Unit, 2012). The significant growth in the sector during this period is due to the creation of free trade zones by the government where goods brought in were not subjected to customs duties, and goods could be exported overseas or transferred to designated zones with freedom (Henderson et al., 1977).

In the following five years, 1976-1980, the 3rd Malaysia Plan was implemented. The main objective of the government at this point wasto boost the efficiency and competitiveness of manufacturing sector in a global context. At the same time, the government continued to support the development of small-scale industries, as they were practical avenues to groom political entrepreneurial talent and leadership as well as to mobilize income savings of the middle class to increase investment in the manufacturing sector (Malaysian Economic Planning Unit, 2012).

When the Malaysia Plan moved into the 4th stage,the policies implemented were focused on developing the less developed states such as Kedah, Kelantan, Perlis, and Pahang. According to the Malaysian Economic Planning Unit (2012), the citizens in these areas, especially theBumiputera, were highly recommended to participate in the manufacturing sector with the use of fiscal incentives. The Industrial Master Plan (IMP) was initiated in 1986 with the development of specific subsectors of the manufacturing industry in mind.

Among the key recommendations of the IMP include the consolidation of fiscal incentives with an aim to encourage investment, with vital improvements implemented so that reinvestments, improved linkages, exports, and training could be obtained. Research and development (R&D) was emphasized.

Figure 1.2. Exports of Goods and Services (Source: World Bank, 2015).

The 5th Malaysia Plan continued the government emphasis on research and development in manufacturing sectors in order to produce more quality and high value added products that could compete in global markets (Malaysian Economic Planning Unit, 2012). As a result, the export of manufactured goods increased its share as the biggest source of foreign exchange revenue in Malaysia, and the exports of goods and services increased dramatically as seen in figure 1.2.

With the 6th Malaysia Plan, the concern was the narrow industrial base of the manufacturing sector. Although sector growth increased rapidly in the preceding years, most of that growth was centered on the two traditional sub-sectors of electronics and textiles. These industries constituted to around 25% of the entire sector's output and grew by 26.8% per annum and 11.5% per annum respectively during the 5th Malaysia plan period (Malaysian Economic Plannning Unit, 2012). Therefore the main thrust of the 6th Malaysia Plan was to broaden the industrial base by creating new sources of growth through sector diversification and provision of a liberal investment environment through liberalization and deregulation of the sector and the promotion of intra-industry linkages.

According to the Malaysian Economic Planning Unit (2012), the policy thrusts of the 7th Malaysia plan aimed to enhance the competitiveness of industries through large scale production in order to cater to the global market and to encourage the production of a wider range of manufactured products in both traditional and new markets, as well as the development of export-oriented small medium industries (SMI). The new approach to industrial policy was to re-orientate the sector, particularly heavy industries, to cater to the global market. The government provided support through specialized services such as MATRADE and the Export-Import (EXIM) bank. Besides that, the plan also further emphasized the development of high value-add, high capital export industries in order to shift the sector towards a high-skill, high-tech platform so that it can compete globally. The establishment of engineering industrial parks was done with this in mine, with the hope that the grouping of industries in such areas would promote R&D institutes to assist industries in the improvement of production techniques, and to intensify R&D and training activities.

According to the Malaysian Economic Planning Unit (2012), the 8th Malaysia plan saw the creation of the Industrial Master Plan 2 (IMP2) which placed emphasis on the development of competitive advantage through the development of information communications technology (ICT) and higher efficiency. The manufacturing sector was supported through increased efforts and policies directed towards R&D to allowindustries to enhance existing products and to create new ones. The SMI development plan was implemented to aid in the establishment of competitive small to medium sized industries in order to improve inter- and intra-industry linkages.

1.1 Research Background

Although it is clear from Figure 1.1 that the Malaysia Plans have coincided with rapid growth in the manufacturing sector, it is uncertain which macroeconomic variables were the strongest factors in influencing the increase of value added in the sector, and what the relationship between those variables and manufacturing sector growth is.

Today, the Malaysian manufacturing sector contributes to more than 36.8% of the country's gross domestic product, and employs 36% of the labor force, with Malaysia being one of the world's biggest exporters of semiconductors, electronic goods and appliances (Wong & Tang, 2007). Seeing as the manufacturing sector is such a vital component of the Malaysian economy, it is important to find out what underlying variables were affected by the policies in the Malaysia Plans in order to determine the cause of the rapid growth of the sector. The major macroeconomic variables will be used in the study are Foreign Direct Investment (FDI), Consumer Price Index (CPI), Real Effective Exchange Rate (REER), Broad Money Supply (BMNY).

In the remainder of this section we will compare the macroeconomic variables to the Malaysia Plans timeline.

1.1.1 Linking the Malaysia Plans to Net FDI Inflows

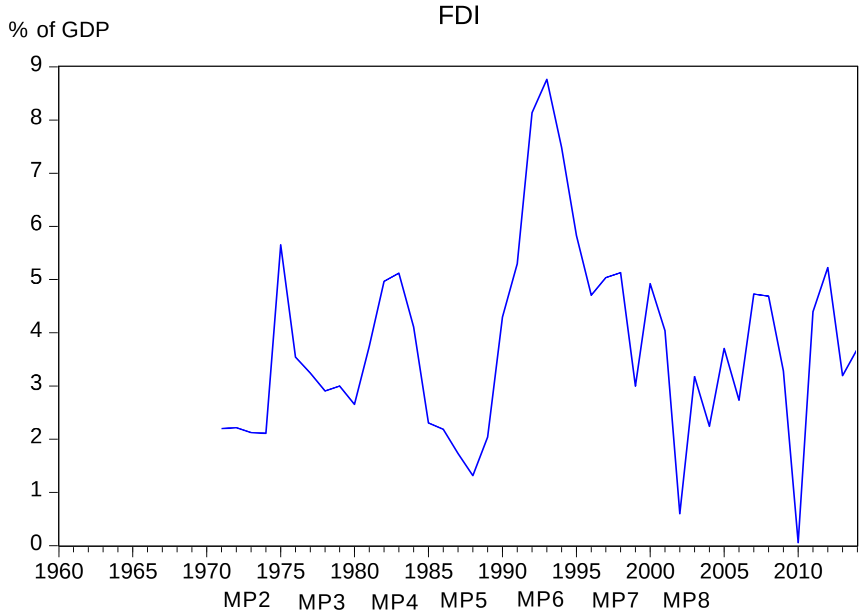


Figure 1.3 Net FDI Inflows in Malaysia

(Source: World Bank, 2015).

Figure 1.3 shows the timeline of net FDI inflows from 1970 to 2013. The periods of the Malaysia Plans are denoted by the abbreviation MP. From figure 1.3, it can be seen that there was a massive spike in FDI inflows around 1975. This can be linked to the opening of Free Trade Zones by the government during the 2nd Malaysia Plan.

From 1975-1980, during the 3rd Malaysia Plan, FDI inflows fell strongly from its peak in 1975. However, with the beginning of the 4th Malaysia plan in 1980, FDI experienced strong growth again for the next few years until it started to fall again at near the end of the plan period. During the 5th Malaysia plan, FDI inflows hit its lowest point since the implementation of the 2nd Malaysia plan.

It is worth noting that net FDI inflows experienced its strongest spike near the end of the 5th Malaysia Plan and well into the 6th Malaysia plan, as FDI inflow experienced massive growth starting from 1987 and peaked during 1993, after which FDI declined sharply during the 7th Malaysia plan, which can be explained by the fact that this drop in FDI coincided with the 1998 Asian Financial Crisis. FDI inflows would not rise again until the 8th Malaysia plan, during which Malaysia's manufacturing sector was already well into its development as a high technology sector.

As we can see from Figure 1.2, there have been massive fluctuations in net FDI inflows over the years. However, according to Figure 1.1 we can see that value added to the manufacturing sector has nearly always maintained an upward trajectory, regardless of the fluctuations of net FDI inflow. By just comparing the visual graphs, it is difficult to come to a conclusion on the relationship between the two variables without performing time series analysis.

So what is the expected impact of net inflows of FDI on manufacturing sector growth? According to the research paper of Chen and Demurger (2002), he concluded that there is significant impact of FDI towards manufacturing sector productivity in the case of China. Castejon and Woerz (2006) also generally believed that the impact of FDI has a positive relationship against manufacturing sector growth, however, the impact differs between countries based on the stage of development. On the other hand, Wong and Tuck (2005) also found that Malaysia has been relying on FDI to boost the growth of manufacturing sectors.

1.1.2 Linking the Malaysia Plans to CPI

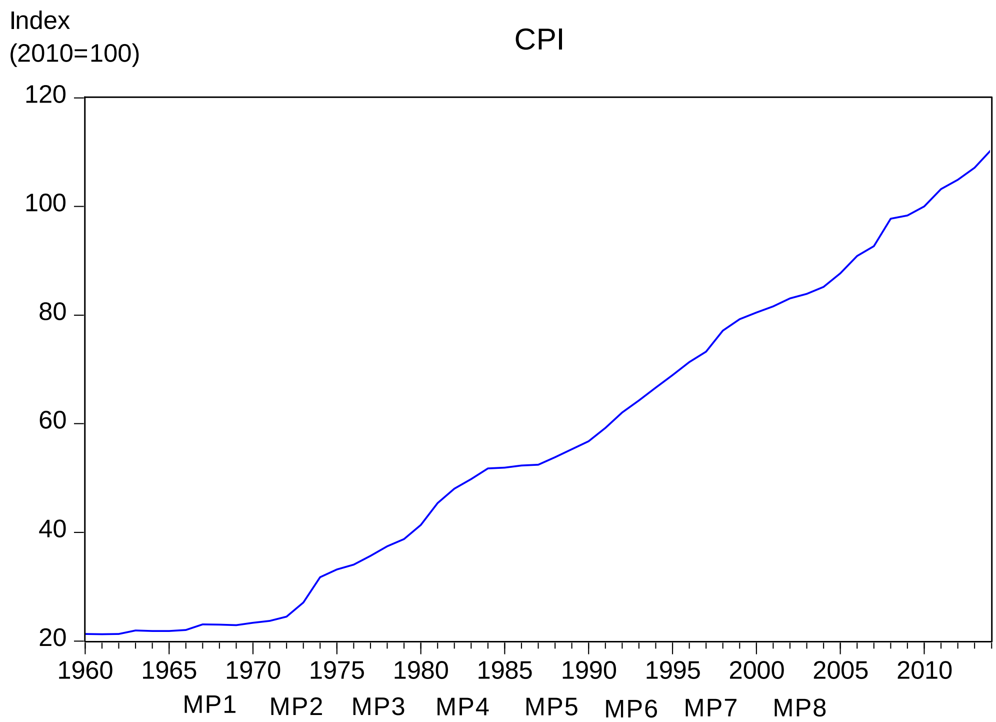


Figure 1.4 Consumer Price Index in Malaysia

(Source: World Bank, 2015).

In Figure 1.4, we can see that CPI in Malaysia has grown steadily since 1960, covering the periods of all the Malaysia Plans to date, from MP1 TO MP8. This indicates that there has been a steady increase in inflation over all the years that the plans have been implemented. The increase in CPI from 1970 to 1980 coincides with the slow growth overseen by MP1 to MP4 in Figure 1.1, implying that the sharp increase in inflation may have impacted the growth of the sector. However, manufacturing sector value added experienced a sharp increase from MP5-MP8, despite the continued increase of inflation, which is in direct contrast with the period of MP1 to MP4.

CPI as a proxy for inflation has been commonly included in much of the existing literature as one of the variables that gives negative impact to the manufacturing sector growth, in theory. Odior (2013) shows that CPI has a negative impact on manufacturing output. An increase in this variables was said to lead to a significant decrease in manufacturing productivity. Following this line of reasoning, Gumbe & Kaseke (2009) concluded that CPI can reduce production, employment opportunities and also the shutting down of plants during periods of high inflation.

1.1.3 Linking Malaysia Plans to Real Effective Exchange Rate

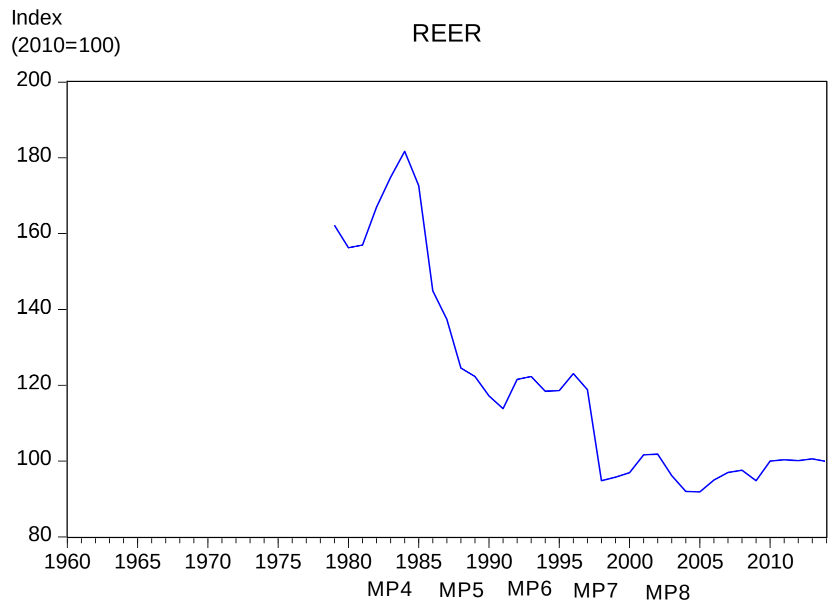


Figure 1.5. Real Effective Exchange Rate in Malaysia
(Source: World Bank, 2015).

Based on Figure 1.5, it can be seen that the Malaysian Ringgit (RM) has depreciated since the 1980s and this coincides with high growth in the manufacturing sector that coincides with MP5 TO MP8, as it stands to reason that the weaker Malaysian Ringgit causes increased demand for exported goods from the country. The rapid growth of the sector during the remaining Malaysia Plans and the shift in emphasis towards export-oriented industries coincides with the weakened Ringgit. This line of thinking is explained by Fung and Liu (2009) who stated that in the case of Taiwan, when exchange rates depreciate, goods and services exported increase. While in the case of Turkey, Caglayan & Demir (2014) also agreed that appreciation in exchange rates can cause negative impact on export oriented manufacturing sectors.

1.1.4 Linking the Malaysia Plans to Broad Money Supply

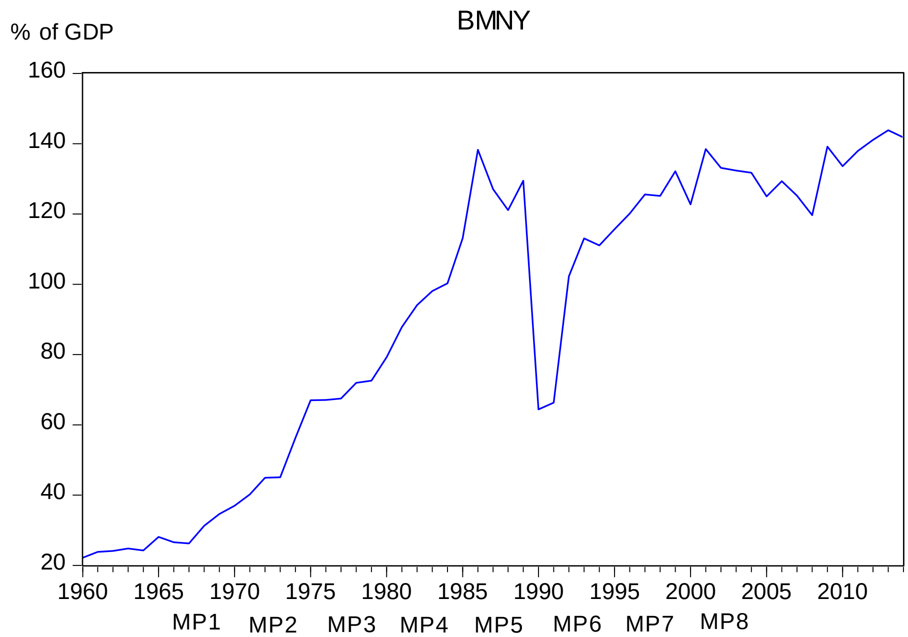


Figure 1.6. Broad Money Supply in Malaysia
(Source: World Bank, 2015).

In Figure 1.6, it can be seen that the broad money supply has increased steadily since the 1960s, starting with MP1 and increasing over the years, which is in line with the investment that the government injected into the sector, with the exception of a downward spike in the 1990s. Broad money supply peaked during the MP4 period, experienced a sharp downward spike during the MP5 period, increased again during the MP6 period, and has remained stable until MP8.

Comparing Figure 1.6 to the manufacturing sector value added shown in Figure 1.1, it is evident that value added in the sector has grown in line with the broad money supply, however, despite the sharp downward spike during the MP5 period, manufacturing value added continued to grow, and was not adversely affected. Thus, it is difficult to conclude the true relationship between broad money supply and manufacturing sector value added without performing time series analysis.

According to Shiryani and Bayram (2013), when broad money supply increases, the manufacturing productions increases as well due to more available loans for investment. Ihsan and Anjum (2013) found in their study of the GDP of Pakistan that although increase in broad money supply tends to cause inflation, it also boosts the growth of the manufacturing sector. It should be noted that since CPI as a proxy for inflation is a variable in our study, Ihsan and Anjum's findings that an increase in broad money supply will lead to increase in inflation means that we may expect a co-integrating relationship between these two variables when we perform testing.

1.2 Problem Statement

The manufacturing sector is a vital catalyst for economic growth in many developing countries worldwide, including Malaysia. The Commission on Growth and Development (2008) identified the common features of countries that have achieved 'episodes of high and sustained growth' since the conclusion of the Second World War, with such a period defined as being one of uninterrupted growth, in GDP per capita, in excess of 7% per annum for 25 years or more. Of the thirteen success stories identified in the publication, ten of them were economies driven by manufacturing-led growth. Malaysia was among the economies mentioned.

In recent times, the macroeconomic variables of the Malaysian economy have taken adverse turns. According to Simkievich (2015), the Malaysian Ringgit hit a multi-year low of RM3.71 against the US Dollar in March 2015, and it is highly likely that the forecasted interest rate hike by the Federal Reserve of the U.S.A. will lead the currency to weaken further in the future, which will cause the REER to fall dramatically.

According to Ramakrishnan (2015), FDI is expected to drop in the near future as well, as investors flee Malaysia's volatile political climate due to the increasing political risk caused by the 1MDB scandal and rising dissent with the existing government. Consumer sentiments are also low because of the introduction of the Goods and Services Tax (GST), and this is causing investors to lose confidence in Malaysia and making them move their money elsewhere.

Ng (2013), says that as a result of the implementation of GST, inflation in Malaysia will rise in 2015 and the following years. The Star Newspaper (2015) reported that inflation in 2015 has been above forecasted inflation rate. This would continue the upward trend of inflation that can be seen in Figure 1.4.

Reuters (2015) have reported that broad money supply in Malaysia as of June 2015 is up 6% on year and is expected to increase.

Since the manufacturing sector is so important to the economy, knowledge of its relationship with the macroeconomic variables present in its economic environment, is crucial. However, as seen from the Figures 1.1 to 1.6, the exact relationship may not be difficult to discern based simply on observation of the data.

Despite the fluctuations of FDI, REER, and BMNY, and the steady growth of CPI, no obvious relationship between those variables and the value added to manufacturing sector can be discerned, as the growth of the manufacturing sector has been increasing steadily over the years, with the total value added during the MP8 period more than doubling the value added during the MP1 period. Without performing time series analysis, the way that the macroeconomic variables interact with manufacturing sector growth will remain ambiguous, and it will be difficult to predict how the recent developments in Malaysia's macroeconomic variables will affect manufacturing sector growth.

1.3 Research Questions

1. What is the relationship between Value Added to Manufacturing Sector (VAD) and FDI?
2. What is the relationship between VAD and CPI?
3. What is the relationship between VAD and REER?
4. What is the relationship between VAD and BMNY?

1.4 Research Objectives

The general objective of this study is to find out how manufacturing sector growth is affected by the macroeconomic environment, while the specific objectives are:

1. To determine the impact of FDI on manufacturing sector growth.
2. To determine the impact of CPI on manufacturing sector growth.
3. To determine the impact of REER on manufacturing sector growth.
4. To determine the impact of BMNY on manufacturing sector growth.

1.5 Significance of Study

This study shows how manufacturing sector growth interacts with the variables in the macroeconomic environment. Although manufacturing sector growth is at the highest it's ever been, as can be seen from Figure 1.1, there is no guarantee that the country can maintain such growth in the sector, especially in light of the recent adverse developments in Malaysia's macroeceonomic environment and political climate. As such, it is important to know how the macroeconomic environment affects the growth of the manufacturing sector, so that such information can aid policy decisions in the future.

CHAPTER 2: LITERATURE REVIEW

2.0 Overview

Despite many of the other factors that could boost the growth of the countries, the contribution of manufacturing sector growth is one of the main concern in our study. As we know, since decades ago, Malaysia government has been applying various policies to enhance the growth of the manufacturing sectors. Therefore, the factors that will affect the growth of manufacturing sector are our main focus.

In this research, four main variables which will give significant effect to the value added to manufacturing sector have been included. These variables are foreign direct investment, real exchange rate, consumer price index, and broad money supply. This study will use as many previous research papers as possible as references to find out the impact of these variables on manufacturing sector growth as well as analyst the relationship between these variables and manufacturing growth before we proceed to form our expected relationships.

2.1 Literature Review of Independent Variables

2.1.1 Manufacturing Sector Growth and Foreign Direction Investment

Foreign direct investments (FDI)'s issues has been continuously examined by many theoretical studies. Hymer (1976) formed a vital part of the literature with his research on the motivations behind FDI. He found that FDI is vital in the economic development of all countries, especially developing ones. Economists believe that FDI create employment, increase productivity, competiveness, and cause spillovers of technology (Denisia, 2010). In general, although FDI was supported by the "spillover" theory that it would generate consecutive positive effects towards the economic growth, but this study would still like to examine in much details on what impact FDI generated on the sectored growth.

According to the study of Castejon and Woerz (2006), Anowor, Oluchukwu, Ukweni, Nnaemeca, Ibiam Francis, Ezekwen and Ogochukwu (2013), Wong (2005), and Nezakati, Fakhreddin and Vaighan (2011) had drawn the same conclusion that FDI generate positive impact on the manufacturing sector growth. Castejon and Woerz (2006) examined the influence of FDI on productivity growth using panel data. The conclusion that they drew is relatively strong as their empirical analysis shown that the impact of FDI on the development of an economy is different depending on the stage of development of the country. Their study indicates that the role for FDI to give significant positive impact is much stronger in developing countries as compared to the undeveloped countries.

Anowor, Oluchukwu, Ukweni, Nnaemeca, Ibiam Francis, Ezekwen and Ogochukwu (2013), used the Ordinary Least Square Regression model to study relationship between foreign direct investments and the Nigerian manufacturing sector. Their results indicate a positive relationship between FDI and manufacturing sector growth, as Nigeria is currently a developing nation. Furthermore, from the empirical results of their study, it can be observed that with emphasis on effective macroeconomic policies such as degree of trade openness and exchange rate policy, FDI's effect on the level of manufacturing sector growth could greatly increase.

In the case of Malaysia, in the study of Wong (2005), time series data was used to study the relationship between FDI and location-specific determinants of the Malaysian manufacturing sector from the years of 1980 to 2002. In this study, the writer states that Malaysia has successfully attracted large amount of FDI which contributed to the on manufacturing sector in Malaysia. Besides, research paper of Nezakati, Fakhreddin and Vaighan (2011) had chosen Malaysia as desirable country to studies its impact of FDI towards the economies as it carries the highest growth and open economy among developing countries. The papers also used time series data to study the relationship between domestic investment and FDI and their impact in the long run. The writers had formed a conclusion which indicate that domestic and foreign direct investment are in a positive relationship and also generating positive impact towards Malaysia economy and productions.

On the contrast side, studies of Liu and Daly (2011) indicated that a negative relationship exists between FDI and growth in the manufacturing sector. Liu and Daly (2011) shows that when the manufacturing sectors are expanding, skilled labor are much preferable and hence the cost of labor will tend to increase. However, high labor cost indicating high production cost which may draw the FDI away from the countries.

The above review of these studies shows contradicting results as some of the researchers support that there exists a positive relationship between FDI and manufacturing sector growth while some of them oppose it. After considering all the limitations and results, this study will focus on testing the impact of FDI given to manufacturing sector growth which is more appropriate in Malaysia. Due to the strong dependence on FDI in growing the Malaysian manufacturing sector, this study expects that FDI will contribute a significant positive relationship to Malaysia manufacturing sector growth.

Since manufacturing sector is a crucial to economic growth, and FDI is found to be the catalyst in boosting manufacturing growth, it is necessary to attract more imbursements of FDI to enhance the growth of manufacturing sector.

2.1.2 Manufacturing Sector Growth and Exchange Rate

Effect of exchange rate movement have been long concerned with international economics on the real economy. According to Dhasmana (2013) exchange rate movement can influence the performance of a firm in a number of ways, such as through the cost of imported input, export price in comparison with foreign competitors, or the cost of external borrowing. In general, the theory of Marshall Lerner condition states that devaluation of a currency is good for the trade balance if the elasticity of demand for imports in the devaluing nation plus the foreign elasticity of demand for the nation’s exports exceeds 1.

Since the general theory indicates that the impact of the exchange rate are very depending, we would like to study more research papers in order to determine the expected relationship between exchange rate and manufacturing growth.

There had been much study emphasizing the different impacts of exchange rate on different types of economy. The impact can be divided into positive impact and ambiguous impact which cannot be detected. Firstly, for the positive impact, it has been shown by the study of Fong and Liu (2009) and Campa and Goldberg (1999), Caglayan and Demir (2014) and Tomlin (2010). Fong and Liu (2009) researched the relationship of exchange rate and firm industries in Taiwan during the East Asian Financial Crisis. They stated that depreciation of currency caused a rise in exports, sales in the domestic market, total sales, value added and productivity. Besides, productivity growth of firm was found to be affected by depreciate of exchange rate through firm scale expansion. The researchers used panel data analysis to test the data and the result showed that depreciate home currency has a direct and positive effects on manufacturing firms.

Campa and Goldberg (1999) also pointed out that the appreciation of the US Dollar in the USA showed a positive effect on investment and in turn decreased amount of exports and increased imported input. According to the authors, this might be due to the dependence on imported inputs in US manufacturing industries.

Caglayan and Demir (2014) examined the uncertainty in exchange rate volatility and appreciation real exchange rate will affect manufacturing firm productivity. The study was conducted in Turkey by using firm level panel data and empirical result showed that changes of exchange rate and exchange rate appreciation have negative impact to the growth of firm productivity. They found that only export oriented firms can stay the competitive in market when appreciate of exchange rate but facing severe negative impact on exchange rate volatility. Overall, a volatile exchange rate will cause adverse effect to the manufacturing productivity in long run growth and aggregate output.

Tomlin (2010) applied dynamic structural model to investigate how exchange rate movements affects industry productivity in terms of barriers to entry and exit. Nested-Pseudo Likelihood algorithm and the Method of Simulated Moments were used to estimate the dynamic parameters in the model. The structural parameter estimates proved that when real exchange rate appreciates, the number of firms that stay in the market goes down, and also reduces the growth of firm productivity.

On the other hand, the study of Dhasmana (2013), Tsui (2008) and Swift (2007) shows the impact of exchange rate is ambiguous. Dhasmana (2013) investigated the determinants of exchange rate in Indian manufacturing firms by analyzing the data using Panel Vector Auto Regression (VAR) and empirical result to analyze if exchange rate movements significantly affect industrial productivity. He concluded that the short run impact of a real appreciation is difficult to detect. When foreign equity ownership and domestic equity market enter in the same market, the impact of exchange rate changes is significantly reduced.

Tsui (2008) studied exchange rates and profit margins in term of export rate, imported input rate, and external exposure index which affect the revenue and costs in manufacturing sectors in order to find a relationship. He found that the appreciation of home currency in Taiwan has a positive impact to the manufacturing sector when profit margin is high. In contrast, this effect does not apply to Japanese manufacturing industries, as an appreciation of the Japanese Yen did not just fail to provide a positive effect to the sector, but it actually affects the sector negatively when profit margins are high.

Swift (2007) examined the relationship between exchanges rate and investment toward individual and whole manufacturing sectors in Australia. The results of the study showed that total manufacturing sector growth responded in terms of investment to the currency changes and positively impacted export share and negatively impacted imported input costs. In other words, when exchange rate appreciated it decreased the investment and export share but provided incremental increase in imported input share. However, this impact does not apply in a similar way to individual industries due to the fact that exchange rate only slightly influences investment to domestic market firms.

Since the review of the literature provided various result, this study form expected relationship between exchange rate and manufacturing value added by analyzing the trade in Malaysia. This study expects that the exchange rate will have a negative relationship with manufacturing growth, as Malaysia is more on export oriented. When exchange rate drops, value added rises because demand for goods from foreign consumers increases, and the lower cost of production attracts investors into the market.

2.1.3 Manufacturing Sector Growth and Inflation (Consumer Price Index)

In this era of globalization, the issue of inflation has been greatly discussed by the economist and policy maker in the world. The relationship between inflation and manufacturing sector has been extensively investigated in academic field. “New Keynesian Theory” states that there is always a trade-off between inflation and productions. In the studies of Vaona (2012), the researcher offers a new theoretical model and new empirical evidence on the connection between inflation and growth and the results further confirms that inflation negatively affects growth and no inflation threshold level can be found. Even though the impact of inflation towards the growth are said to be negative, we insist to further study on the impact of inflation in sectored growth, ie: manufacturing sector.

The model we will use in this study will use CPI as a proxy for inflation, because CPI has been shown to have more accurate results over time in similar studies with regression analysis and it shows a more accurate picture of consumers demand in relation to the general price level (Odior, 2013).

Based on the results of many studies done by previous researcher, this study divides the effect of inflation on manufacturing sector growth into three types - negative impact, positive impact and no impact. Firstly, for the negative impact, we have studied the paper of Mwakanemela (2014), Chaudhry, Ayyoub, and Imran (2013), Gumbe and Kaseke (2009), Gopakumar and Salian (2010) and Medee (2015).

Mwakanemela (2014) conducted a research to investigate the relationship among the macroeconmics variables such as FDI, trade openess and inflation rate on the manufacturing export performance of Tanzania from the period of 1980 to 2012. Vector Error Correction Model (VECM) and Ordinary Least Squares (OLS) regression were employed in the research and the result from regression analysis indicated that inflation rate negatively impactws manufacturing performance.

Chaudhry, Ayyoub, and Imran (2013) also studied the impact of inflation on three major sectors – services, agriculture and manufacturing in Pakistan for the period of 1972 to 2010. From the empirical result of their study, it clearly showed that the rise of inflation rate is harmful to the manufacturing sector.

Gumbe and Kaseke (2009) examined the impact of 100 manufacturing firms during the inflation period from 2005 to 2008 in Zimbabwe. They stated that manufacturing sector tend to bear the brunt of inflation and the sector experienced a negative impact where numbers of companies gone through crisis like drastic reduction of production, laid off workers and closed plants to maintain the business and counter the effect of inflation.

Gopakumar and Salian (2010), studied the relationship between inflation and GDP growth in India using error correction models. They observed a negative relationship in the long run between inflation and GDP growth, concluding that inflation is harmful towards growth.

Medee (2015) investigated the impact of manufacturing sector on inflation in Nigeria with the use of co-integration and an error correction mechanism (ECM) methods on time series data from 1980 and 2013. The empirical results show that when manufacturing sector is not performing, inflation is tending to occur. In other words, both of these variables are having negative relationship.

Secondly, for the positive impact of inflation towards manufacturing growth, we have reviewed the study of Adaora (2013). He states that the relationship between inflation and manufacturing sector growth in Nigeria is positive. Data used in the study was obtained from the Central Bank of Nigeria (CBN). The observations that were selected comprised the period between 1981 and 2011. OLS method was used to examine the relationship between money supply, government expenditure and inflation rate which are the independent variables and the manufacturing index as the dependent variable for the model. The empirical result have revealed that inflation rate positively impacts the manufacturing sector where an increase of inflation rate contributes to upsurge in the manufacturing output and the manufacturer should not discouraged by the growth of inflation rate.

Lastly, Kumar, Webber, and Perry (2009) presented an investigation on the effect of inflation and real wages towards the manufacturing productivity in Australia by using the time series data from 1965 to 2007. The empirical results of the research indicate that the inflation has limited statistical significant on manufacturing sector productivity.

The review of the studies shows an indefinite relationship between inflation and manufacturing sector growth. This study assumes that the divergence between the studies are mainly caused by different method used and of course due to the studies are conducted in different countries. Hence, expected sign between inflation and manufacturing growth will be drawn based on Malaysia. It is expected that inflation will negatively affect manufacturing sector growth of Malaysia, insinuating a trade-off between inflation and sector growth.

Inflation is an important element to be closely monitored by the government so that the cost of production would not be raised in abrupt and simultanouesly influence the manufacturing sector growth.

2.1.4 Manufacturing Sector Growth and Broad Money Supply

Every government aims to obtain high employment, stable prices, and sustainable growth in the economy, regardless of whether it is a developing or developed country. One of the key tools a government can use to achieve these goals is the manipulation of money supply through monetary policy. Monetary policy refers to the manipulation of the availability and cost of credit in order to influence monetary and other financial conditions (Friedman, 1959). Thus in order to reflect monetary policy, we have elected broad money supply as a proxy. According to the “quantity theory of money”, a rise in the money supply would cause inflation which would harm the productivity. Based on this theory, we would like to further examine the impact of money supply toward manufacturing growth.

Based on a few studies, money supply are said to generate positive impact however there are also a few writers stand on the opposite point of view. For the positive impact, the study of Sayera (2012), Athukorala (1998), Saygin and Evren (2010), Shaw (1973) and Mckinnon (1973), Rina, Tony and Lukytawati (2010) had been reviewed.

Sayera (2012) investigated the impact of monetary and fiscal policies on Bangladeshi output growth by using broad money supply to act as a proxy for monetary adjustments, and government consumption to act as a proxy for fiscal adjustments. When money supply increases, the availability of loans typically rises with it, which can be used for purchases and investment by individuals and businesses (Shiryani & Bayram, 2013). With more money available, the productions can be increased. Thus, money supply are said to give positive impact.

To support the above statement, Athukorala (1998) has conducted a research according to the Keynesian school of thought. The Keynesian school of thought states that any discretionary change in the supply of money will impact real output permanently by decreasing the interest rate and through marginal efficiency of capital stimulate investment and growth of output.

Later, an alternative school of thought was presented by Shaw (1973) and Mckinnon (1973) where they posited that market forces induces higher interest rates, and hence would increase investment by channeling savings to efficient investments and stimulates growth of real output in capital-intensive sectors such as the manufacturing sector. Both of the thought had concluded money supply actually give positive impact. The results of the above statement are in line with the study of Saygin and Evren (2010). The writers study on the effect of monetary policy on the Turkish manufacturing sector, found through their Vector Autoregressive (VAR) Models that all the manufacturing sectors responded to tightening of money supply with an absolute reduction in total output.

Nneka (2012) also studied the effect of monetary policy on the manufacturing industry using VECM and OLS models and found that money supply positively affects manufacturing output index. Rina, Tony and Lukytawati (2010) also researched the effect of fiscal and monetary policy on the industrial sector and economic growth in Indonesia using a computable general equilibrium (CGE) model. They discovered that fiscal and monetary policy positively influenced macroeconomic performance in the context of GDP change, investment, consumption and rate of return of capital.

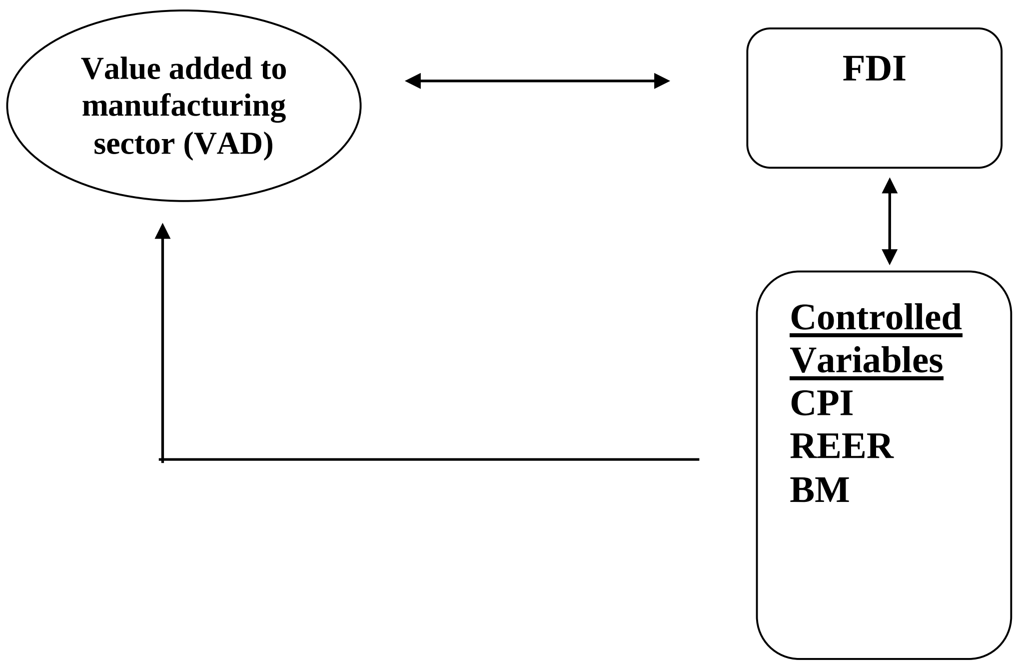
For the negative impact, the study of Alam and Waheed (2006), Imoughele and Ismaila (2015) had been reviewed. Alam and Waheed (2006) examined monetary transmission channels in Pakistan over seven sectors of the economy and found that interest rate shocks caused by change in money supply caused the manufacturing sector to decline. In addition, the study of Imoughele and Ismaila (2015) that broad money supply was statistically significant to manufacturing sector output. They stated that Nigeria government should retain tighten monetary policy since inflation has negative influence on investment and Nigeria growth of the economy.

The results of the literature shows money supply would generate both positive and negative impact. However, this study expects that money supply should generate positive impact on

Malaysia manufacturing sector growth since Malaysia is a developing country. Manufacturing sector need more money in order to make more investment and also on the research and development. Hence, expansionary policies are crucial in order to grow the manufacturing sector in Malaysia.

2.2 PROPOSED THEORETICAL/ CONCEPTUAL FRAMEWORK

Figure 2.1 Theoretical Model



This study concentrates on the macroeconomic variables that would affect the value added to manufacturing sector (VAD) in the case of Malaysia. The main determinant is net inflows of foreign direct investment (FDI) into Malaysia while other determinants such as real effective exchange rate (REER), consumer price index (CPI), and broad money supply (BM) are included as controlled variables. This study is an econometric method based on time series data available in Malaysia for the period of 32 years which is from 1979 to 2010.

The independent variable foreign direct investment (FDI) is measured as a percentage of gross domestic products. This proposed variable is expected to have positive relationship with the dependent variable VAD. According to Anowor, Oluchukwu, Ukweni, Nnaemeca, Ibiam Francis, Ezekwen and Ogochukwu (2013), it was concluded that FDI positively impact the manufacturing sector. The study of Wong (2005) also concluded that FDI generates positive effects on the manufacturing sector of Malaysia.

The independent variable real effective exchange rate (REER) is the indicator of the value of the Malaysia Ringgit. This relationship between the proposed variable and the dependent variable is expected to be positive. The study of Fong and Liu (2009), Campa and Goldberg (1999) and also states that a devaluation in a country currencies will help in boosting economy growth which will in turn favor the manufacturing sector.

The independent variable consumer price index (CPI) is weighted against year 2000 price values (2000=100). It is used as the proxy in measuring inflation rate. The relationship between the proposed variable and the dependent variable is expected to be negative. According to the study of Mwakanemela (2014), the manufacturing export performance of Tanzania has been proved to be negatively influence by inflation. On the other hand, Gopakumar and Salian (2010) has examined the relationship between inflation and GDP growth in India. The same result emerged. A trade-off between the two variables always exists.

The independent variable broad money supply (BM) is measured as a percentage of GDP. The relationship between the proposed variable and the dependent variable is expected to be positive. According to the study of Saygin and Evren (2010) that examine the effect of monetary policy on the Turkish manufacturing industry and also the study of Rina, Tony and Lukytawati (2010) that examined the effect of fiscal and monetary adjustments on industrial sector and economic growth in Indonesia, both the research conclude that tightening monetary policy give no advantages to the economy and also the sectored growth.

2.3 HYPOTHESIS DEVELOPMENT

Hypothesis 1 : FDI will have positive relationship with manufacturing value added.

Hypothesis 2 : CPI will have negative relationship with manufacturing value added.

Hypothesis 3 : REER will have negative relationship with manufacturing value added.

Hypothesis 4 : BM supply will have positive relationship with manufacturing value added.

Hypothesis 5 : There is causality running from CPI to manufacturing value added.

Hypothesis 6 : There is causality running from FDI to manufacturing value added.

Hypothesis 7 : There is causality running from REER to manufacturing value added.

Hypothesis 8 : There is causality running from BM supply to manufacturing value added.

Hypothesis 9 : There is causality running from manufacturing value added to CPI.

Hypothesis 10 : There is causality running from manufacturing value added to FDI.

Hypothesis 11 : There is causality running from manufacturing value added to REER.

Hypothesis 12 : There is causality running from manufacturing value added to BM supply.

CHAPTER 3: METHODOLOGY

3.0 Overview

The primary methodology of research that shall be used in this study shall be discussed in Chapter 3. In this chapter, we will discuss the data collection method, data processing method, treatment of data, and analysis of data will be explained. This will be proceeded by an explanation of our variable analysis and inference analysis methods.
This chapter is divided into three parts, namely: data collection methods, data analysis and empirical framework. In order to ensure the statistical accuracy of our research, we will perform several diagnostic tests in order to check our data.

Firstly, we will perform unit root testing on our time series data to determine the stationarity of the data. The two unit root tests that we have chosen to adopt are the Augmented Dickey Fuller (ADF) test and the Phillips Perron (PP) test. It is important to note that if the variables prove to be non-stationary after running the tests, the usage of said variables in a time series model will lead to a spurious result which is invalid and cannot be trusted. Therefore, we will also test for co-integration of the variables via the use of the Johansen-Juselius test in order to determine the existence of either a short or long run relationship exists between the variables.

Finally, the diagnostic checking that will be used include the Jarque-Bera test for normality of the residuals, Breusch-LM test for autocorrelation of the variables, and the Autoregressive Conditional Heteroscedasticity (ARCH) test.

Following these tests, we will construct a Vector Auto Regressive (VAR) model in order to capture the linear interdependence among different periods of time within the variables in the short run. If it is proven that the variables are co-integrated, we will proceed by constructing a Vector Error Correction (VECM) model.

For this research we have elected to analyse our data and run our tests using E-Views 6.0. We shall further explain the statistical techniques that we have used in the remainder of this chapter.

3.1 Data Collection Method

This study has been conducted using secondary data. The variables that we have chosen to use in our model are as follows – value-added to the manufacturing sector (VAD) as a proxy for manufacturing sector growth, Consumer Price Index (CPI) as a proxy for inflation, net inflows of foreign direct investment (FDI) as a percentage of gross domestic product,), and broad money supply (BM). Data for VAD and CPI were collected from the official portal of the Malaysian Department of Statistics. Data for FDI, and BM was obtained from the World Bank online database.

In our research, the dependent variable is VAD. The independent variables are CPI, FDI, and BM respectively. VAD is measured in millions of Ringgit (RM). CPI is weighted against year 2000 price values (2000=100). FDI is measured as a percentage of domestic GDP. BM supply is measured as a percentage of GDP.

In our model, we have decided to use the natural log of all the variables except broad money. In the studies of Zhou, Bonham and Ganges (2007), they conduct the same method which all variables in log form except one variable. The reason is because the variable data itself is under percentage proxy and small value. It is difficult to log the small value.

3.2 Diagnostic Checking

In the context of time series modelling, it is vital for the researcher to carry out numerous types of diagnostic tests to make sure that the model does not faces any econometric problems and make sure that the model must be BLUE (Best, Linear, Unbiased Estimator).

Econometric problem such as autocorrelation, heteroscedasticity, normality problem and last but not least the model specification problem will normally appear in the model.

3.2.1 Autocorrelation

According to Zovko (2008), autocorrelation also known as serial correlation or lagged correlation and it is use to determine the strength of relationship of a variable with its own past and present values, or in another words, it can explain as correlation of the error term in the present with the error term in the past. Autocorrelation can happen whether in the time series data or cross sectional data. Normally autocorrelation problem caused by internal and external. Internal is due to the distribution of the error term of a true specification of a model and external is due to the wrong functional form or omitted important variables.

In order to test the autocorrelation problem, Breusch-Godfrey serial correlation Lagrange multiplier test or Durbin Watson h-test can be used to detect the presence of the problem. But, normally the LM test will be opt as it has a better explanation on the higher AR model which is the AR(2) and Durbin Watson h-test is biased for the autoregressive moving average models so it is a chance that the autocorrelation is underestimated at the first place (Wealliem, 2009).

Hypothesis Statement:

H0: There is no autocorrelation problem in the model.

H1: There is an autocorrelation problem in the model.

Decision Rule: Reject H0 if p-value less than level of significance. Otherwise, do not reject H0.

3.2.2 Normality Test

Normality test is conducted in a research to examine whether the error term is normally distributed in the model. Jarque-Bera Test is carried out to examine whether the model is normally distributed. With the assumption of normality, the OLS estimators can be easily interpreted, for the reason that the linear function of the variables will normally distributed by itself (Gujarati, 2004).

Hypothesis Statement:

H0: The error terms are normally distributed.

H1: The error terms are not normally distributed.

Decision Rule: Reject H0 if p-value is less than level of significance. Otherwise, do not reject H0.

$$JB = \frac{n}{6}(S^2 + \frac{(K-3)^2}{4})$$

Where n= Sample size; S= Skewness; K= Kurtosis

3.2.3 Heteroscedasticity

Heteroscedasticity problem occurs when the error term variance is different or not constant across the observation or independent variables. If there is a detection of heteroscedasticity problem, the model should be re-estimate by using the weighted or generalized least square method. After the re-estimate process, the model will be more efficient to be estimate compared to the OLS method (Holgersson & Shukur, 2004).

To test for heteroscedasticity problem in the model, the Autoregressive Conditional Heteroscedasticity (ARCH) Test is carried out.

Hypothesis Statement:

H0: There is no heteroscedasticity problem in the model.

H1: There is heteroscedasticity problem in the model.

Decision Rule: Reject H0 if p-value is less than level of significance. Otherwise, do not reject H0.

3.2.4 Model Specification Test

The presence of model specification error in the model is because of the model include any irrelevant variables. Multicollinearity occur when there are irrelevant variable included and it is highly correlated with another independent variables in the model, sense that one can linearly forecast from the others with non-trival degree of accuracy (Molinuevo & Saez, 2014). The multicollinearity problem is most likely to be take place in most of the time series model. We opt to use RAMSEY RESET Test to test whether the model contain any specification errors and correctly specified or not. However, it is noted that Ramsey RESET test can only be used to check the functional form of the variables whether is correct or not.

Hypothesis Statement:

H0: The model specification is correct.

H1: The model specification is incorrect.

Decision Rule: Reject H0 if p-value is less than level of significance. Otherwise, do not reject H0.

3.3 Unit root test

$$Y_t = pY_{t-1} + \varepsilon_t \quad , \qquad \text{where} \quad -1 \leq p \leq 1$$

Stationary process is playing a vital role in investigating time series analysis. Based on the model above, if *p* equals to one, also known as random walk, this means the time series is unit root test with a non-stationary. Whereas, when the $|p| < 1$, model Y_t is not unit root and stationary times series. Typically, stationary stochastic process assumes that variance, mean, and autocorrelation are constant over time without affected by time movement. Non-stationary means a stochastic trend tend to carry out past movement and the mean will be varied or variance will be varied or vary in both of them upon the time invariant. The existence of non-stationarity may leads to a spurious problem in regression which contribute misleading result on estimators and test statistic (Gujarati & Porter, 2009).

According to Granger and Newbold (1974), a regression model with unit root means there is consists of non-stationary which cause a spurious regression problem. Spurious regression means two variables are independent but show a high correlated when trending over the time. For an example, two variables can be high R^2 and high autocorrelation but low Durbin Watson (DW) statistic even both variables are unrelated. As a result, spurious problem happens when R^2 greater than DW test and leads to a unreliable result (Engle & Granger, 1987). In fact, when the regression model ran a first difference can overcome the problem of spurious (Granger and Newbold, 1974).

Unit root test can be classified into 3 types in analyze time series. Dickey-Fuller (DF) unit root test is used when the error term is uncorrelated. ADF test is used when error terms are correlated by adding the lagged of ΔY_t. Whereas, PP unit root test is a non-parametric method to carry a serial of correlation in error term (Gujarati & Porter, 2009).

3.3.1 Augmented Dickey Fuller test (ADF)

The ADF model was developed by Dickey and Fuller (1981). Compare to DF test, this test is conducted in augmented term by the addition of a lagged difference term of dependent variable (ΔY_t) in the model (Gujarati & Porter, 2009). As a consequence, the number of sample size will become larger.

$$\Delta Y_t = \alpha_0 + \alpha_{1t} + \delta Y_{t-1} + \sum \gamma_i \, \Delta y_{t-i} + \varepsilon_t$$

From the model above, Y_t represents to level form of series (FDI, EXC, CPI, DC, M2) and the first difference of the series (ΔFDI, ΔEXC, ΔCPI, ΔDC, ΔM2). While α0 refers the intercept term, $\alpha 1t$ is the trend variable, $\delta\, Yt{-}1$ is the lagged term of series, and $\sum \gamma i \,\Delta Yt{-}i$ is the total lagged different in series. Δ is the first difference operator, where εt refers to white noise error term.

Under the ADF test, the null of hypothesis is unit root or non-stationary when p-value equals to zero. While, alternative hypothesis is stationary when p-value do not equal to zero. If the p-value is smaller than 10%, 5% and 1%, the null hypothesis will be rejected. Otherwise, we do not reject null hypothesis.

3.3.2 Phillips-Perron (PP)

PP test was developed by Phillips and Perron (1988) and it is an alternative procedure for testing unit root. It can overcomes the problem of serial correlation in DF test and minimize the error term by using non-parameter statistic method without adding any lagged length in dependent variable. The equation of PP test is given by :

$$\Delta Yt = \mu + \beta \left(t - \frac{n}{2} \right) + \delta Yt - 1 + \epsilon t$$

One of the advantage to conduct Phillips-Perron is we do not require to identify first difference for the model in order to check the trend (Gujarati & Dawn, 2009). PP test give more powerful estimation while the series has time independent heteroscedasticity and serial correlation. It is an additional function to deal with the problem of heteroscedasticity in the error terms (Phillips & Perron, 1988).

Test statistic in PP test and ADF test are similar. Given the null hypothesis is stationary while alternative hypothesis is no unit root in the time series. If the p-value is smaller than 10%, 5% and 1%, the null hypothesis will be rejected. Otherwise, we do not reject the null hypothesis. But compared to DF and ADF test, PP test only computed a finite sample in the series.

3.4 Cointegration

Co-integration defines two variables are not moving in same direction but they are co-integrated. It indicates the existence of a long term equilibrium relationship between the variables (Granger and Newbold, 1974). In the concept of cointegration, all variables must be integrated of the same order and linear combination of non-stationary variables (Gujarati & Dawn, 2009).

Co-integration testing aims to examine whether the non-stationary series is cointegrated or not cointegrated. Hence, Johansen and Juselius (JJ) Cointegration Test will be applied to determinate the cointegrating relationship among variables. Johansen (1988) and Johansen and Juselius (1990) conducted the JJ test to examine cointegration among the nonstationary variables calculated by observing the ranking of the Π matrix via its eigen values.

3.4.1 Johansen and Juselius (JJ) Test

JJ Cointegration Methodology is advantage in performing any hypothesis tests about the actual cointegratin relationship (with two statistical procedures). It can capture more than one cointegrating vector since two or more variables are included in the model. Besides, JJ test can avoid to treat the variables asymmetrically due to it is hard to define endogenous and exogeneous variables.

There is two ways to approach the JJ test. Trace statistic null hypothesis of r cointegrating relations, where n is the number of variables in the system for r=0, 1, 2... n-1. Trace statistic formula as the below:

$$\lambda trace(r) = -T \sum_{i=r+1}^{m} ln(1 - \widehat{\lambda i})$$

Where λ is the Maximum Eigen value and T is the sample size. Trace statistic value is used to examine all eigen value together in testing the rejection of the null hypothesis for cointegrating vector for the first time. If the null hypothesis for cointegrating vector for the first time is rejected, we need to test the null hypothesis of the number if cointegrating vector for second time. To remove the largest eigen value and sum up the second largest and third largest eigen value in testing the null hypothesis if cointegrating vector for second time. This testing will continue until the null hypothesis is not be rejected.
The Maximum Eigen value statistic test the null hypothesis of r cointegrating relationship against the alternative of r+1 cointegrating relation for r=0, 1, 2… n-1. This equation is computed as:

$$\lambda \max(r) = -T \ln(1 - \lambda \widehat{r+1})$$

λ max test considers use of one eigen value at one time. Johansen and Juselius (1990) pointed that the λ max test is more powerful across to the trace test. According to the power of the test, the test statistic $\lambda\ max$ is recommended due to Maximum statistic can identify the number of cointegrating vector, r more accurate than Trace statistic.

3.5 Vector Autoregressive Model (VAR)

A VAR model is a model in which all of its variables are not only influenced by its own history, but also the histories of the all the other variables. It is a further development of the standard Autoregressive (AR) model, which includes multiple independent variables. The usage of the VAR model will allow us to identify the short run dynamic relationship between the variables in our model.

It is important to determine an appropriate lag length when constructing a VAR model. Gujerati and Porter (2009) explained that including too much lag in the model will consume the degree of freedom inherent in the model, while including too few lags will lead to problems of autocorrelation.

Most VAR models use equal lag length for every variable in the model. The selection of lag length can be made by using Akaike's Information Criterion (AIC) or Schwarz's Information Criterion (SIC). Emiliano, Vivanco, and Menezes (2014) found in their study that AIC is better for extremely small sample sizes downwards of 13 observations, whereas SIC is better for intermediate sample sizes of up to 100 observations. Seeing as the sample size that we are using for this research is of an intermediate size, we have elected to focus more on SIC result over AIC result.

VAR model can be expressed as,

$$At = B1At\text{-}1 + B2At\text{-}2 + \ldots\ldots + BnAt\text{-}n + \varepsilon t$$

Where At is a vector of endogenous variables at time period of t, Bt(i= 1, 2, 3, 4…, p) are coefficient vectors, n is the number of lags included in the model, and εt is a vector of error terms.

The VAR model requires that all the variables be covariance stationary, otherwise it may lead to spurious results. If there is an absence of covariance stationarity, or it is found that any of the variables are cointegrated, we will proceed to estimate our model by using Vector Error Correction Model (VECM).

3.6 Vector Error Correction Model

If our time series variables are not found to be stationary, and have a unit root in level, but are stationary in the first difference, we will construct a VECM model to overcome it. VECM provides more efficient test results of cointegrating vectors because VECM is a perfect information maximum likelihood model. It can test for cointegration in the entire model in a single step. Furthermore, the variables do not have to be normally distributed in VECM. It is able to capture the long run equilibrium relationship of time series variables that are cointegrated. ECT (Error Correction Term) that is used in this method shows how the time series adjusts to disequlibrium, or to put it another way, it is an estimation of the speed of adjustment to equilibrium of the dependent variable from changes in the independent variables. Engle and Granger (1987) said that failing to include ECT will lead to misspecified models and inefficient forecasts.

3.7 Granger Causality Test

According to Gujarati and Dawn (2009), although regression analysis variable may have effects on another variable, but it does not definitely imply causation. The presence of a relationship between variables does not show causality or the trend or influence. However, it might show a different results in regressions that make use of time series data. Granger causality is testing the causality between 2 variables whether unidirectional, bidirectional or no relationship in short run.

The null hypothesis is variable X does not granger-cause the variable Y. We reject the null hypothesis if the p-value of F test statistic is lower than significance level of 1% and 5% and 10%. In another words, it also mean that X granger-cause the variable Y.

3.8 Empirical Framework

We will examine how net FDI inflows, real effective exchange rate, consumer price index, and broad money supply from the years 1979-2010 affect the value added to the manufacturing sector in Malaysia using the VAR model below:

$$\mathbf{VADt = \alpha 0 + \alpha 1\ lnFDIt - 1\ +\ \alpha 2\ lnREERt - 1\ +\ \alpha\ ln3CPIt - 1\ \ +\ \alpha 5\ BMt - 1}$$

Where,

VAD	=	Value added to manufacturing sector
FDI	=	Net inflows of foreign direct investment
REER	=	Real effective exchange rate
BM	=	Broad money supply

If it is found that there is the presence of a unit root in any of the variables in our model, and reach stationarity at the same difference level as well as the presence of a cointegrating vector between the variables in the model, then instead of using the VAR we will switch to the usage of VECM in order to capture the long run relationship between variables. The model will be as follows:

$$\boldsymbol{\Delta VAD_t} = \alpha_0 + \alpha_1 \boldsymbol{\Delta lnFDI_{t-1}} + \alpha_2 \boldsymbol{\Delta lnREER_{t-1}} + \alpha_3 \boldsymbol{\Delta lnCPI_{t-1}} + \alpha_4 \boldsymbol{\Delta BM_{t-1}} + \boldsymbol{ECT_{t-1}}$$

Where ECT is the error correction terms in the model.

CHAPTER 4: DATA ANALYSIS

4.0 Overview

Chapter 4 is to focus on interpret and analyze the estimated results which conducting empirical result based on the methodology discussed in Chapter 3. Firstly, diagnostic checking will be conducted in order to check the efficiency in model. Next, the level of stationary in time series variables is determined by using Unit Root test, Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP). Then, cointegration test is applied to observe the existence of either a short run or long run relationship in the time series variables. After conducted cointegration test only make decision on using VAR model or VECM model. Last but not least, granger causality test is performed to examine the causality of the variables used in this paper.

Table 4.1 which show the results of diagnostic checking. The results of unit root tests are shown in Table 4.2. Next, Table 4.3.1, 4.4, 4.5 report the results of Johansen and Juselius Cointegration Test, VECM approach and Granger causality test respectively which was employed to determine the long run relationship for model and examine the granger causality between independent variables and dependent variable in short run.

4.1 Diagnostic Checking

In this section, in order to get a valid result, we used several diagnostic checking tests which are Breush- Godfrey Serial Correlation LM test (test for Autocorrelation problem), Breush-Pagan Godfrey test (test for Heteroskedasticity problem), Jarque- Bera normality test (test for normality of model) and Ramsey RESET specification test (test for model specification).

Table 4.1: Diagnostic Checking- Summary Statistic

Serial Correlation LM test	2.1820 [0.0921]
Breush Pagan Godfey test	0.4348 [0.7474]
Jarque- Bera normality test	2.9078 [0.2337]
Ramsey RESET Specification test	0.3582 [0.5081]

Note: [ ] refers to probability of p-value

4.1.1 Autocorrelation

In this part, we used the Breusch-Godfrey Serial Correlation LM test to detect whether our model has autocorrelation problem or not.

H0: There is no autocorrelation problem in the model.

H1: There is an autocorrelation problem in the model.

After using Breusch-Godfrey Serial Correlation LM Test, we generated the result through E-Views and found out that the p-value 0.0921 is greater than the significant level at 5%. Therefore, we do not reject the null hypothesis and there is sufficient evidence to conclude that there is no autocorrelation problem in the model.

4.1.2 Heteroscedasticity

H0: There is no heteroscedasticity problem in the model.

H1: There is a heteroscedasticity problem in the model.

After all, we need to use Breusch-Pagan-Godfrey LM test to detect our model whether have heteroscedasticity problem or not. We have discovered the result where the p-value 0.7474 is greater than the significant level at Therefore, we do not reject the null hypothesis and there is sufficient evidence to conclude that there is no heteroscedasticity problem in the model.

4.1.3 Normality Test (Jarque-Bera test)

H0: The error term is normally distributed

H1: The error term is not normally distributed

To detect our model fulfill the normality assumption that is the one of the assumption in the Classical Linear Regression Model (CLRM). Therefore, we need to conduct the Jacque-Bera test to examine whether the error term fulfill the normality assumption. As the result of the p-value 0.2337 is greater than the significant level at 5%, Therefore, we do not reject the null hypothesis and there is sufficient evidence to conclude the error term is normally distributed.

4.1.4 Ramsey RESET test

H0: The model specification is correct.

H1: The model specification is incorrect.

To test if the specification of the model is correct, we have to conduct Ramsey RESET test. However, it is noted that Ramsey RESET test can only be used to check the functional form of the variables whether is correct or not. We have discovered the result where the p-value 0.5081 is greater than the significant level at 5%, Therefore, we do not reject the null hypothesis and there is sufficient evidence to conclude that the model correct is correctly specified.

4.2 Unit Root Test

As mentioned, Table 4.2 and 4.3 reported the result of Augmented Dickey-Fuller (ADF) test and Philips-Perron (PP) test at level form and first difference form by taking into intercept or intercept with trend. In the assumption of Richard and Robert (2003), the most appropriate in testing unit root at level form are found to be presence of deterministic components; trend and intercept. It shows unit root can be happened anytime in trend stationary process especially for finite sample sizes. It is reasonable because some unit root process is tend to have stationary than non-stationary.

By applying the concept of researchers, we will run the series with trend at the level form. Since level form with trend and first difference without trend are the main concerns in testing unit root test. According to the table below, we only summarizes the result of unit root test which will interpreting to determinate the series is stationary or non-stationary. For the chosen unit root test, the null hypothesis and alternative hypothesis are as follows:

H0: Series is non-stationary (has unit root)

H1: Series is stationary (has no unit root)

The optimal number of lag lengths is chosen based on Schwarz Information Criteria (for ADF test) and Newey-West Bandwidth using Bartlett kernel spectral estimation method (for PP test).

Then, we will compare the result that we obtained between critical value and p-value of statistic. Null hypothesis will be rejected if critical value greater than p-value at 5% significant level. Otherwise, do not reject H0. If the series is non-stationary at level form after reject H0. We need to proceed to another unit root test with first difference which only include intercept in series. This process will be tested until series contains stationary or no unit root.

Table 4.2: Unit Root Test- Summary Statistics

In Level I-(0)		
	ADF Test	PP Test
Variable	Trend and Intercept	Trend and Intercept
lnVAD	0.9763	0.9763
lnFDI	0.1911	0.1544
lnREER	0.7603	0.5726
lnCPI	0.1872	0.1544
BM	0.1177	0.1028

Note: All variables are in natural logarithms except broad money.

Table 4.2 presents ADF test and PP test in the level form with trend and intercept. According to the result obtained show in the table, the p-value of all variables are insignificant to reject null hypothesis of non stationary at 1%, 5%, 10% significant level. The failure to reject null hypothesis means that the series has one or more unit root. We proceed to another unit root testing at first difference form in order to check for stationary and presence of unit root.

Table 4.3: Unit Root Test- Summary Statistics

First Different I-(1)		
	ADF Test	PP Test
Variable	Intercept	Intercept
lnVAD	0.0043***	0.0045***
lnFDI	0.0000***	0.0000***
lnREER	0.0036***	0.0064***
lnCPI	0.0174**	0.0220**
BM	0.0001***	0.0000***

Note: All variables are in natural logarithms except broad money. *, ** and *** denoted that the reject the null hypothesis of non-stationary at 10%, 5% and 1% significance level respectively.

In table 4.2, we adopt the same process to run the ADF and PP test at first difference with trend. As seems from the table, the p-value of VAD, FDI, REER and CPI are stationary at first difference form by rejecting null hypothesis at 1% significant level. Only CPI stationary at first difference with significant level 5%. Based on both ADF and PP results, we can conclude that all variables in model have reached stationary in first difference instead of level form. It also implies that the whole series have integrated of order one [I(1)] . Therefore, cointegration test analysis is applicable for further approach.

4.3 Cointegration analysis

Cointegration test is to is to estimate either short run or long run relationship happen in series variables. Cointegration test will be employed when Unit Root test exists the same order integrated in data series. We will proceed to run a Vector Error Correction Model (VECM) if there is the existence of an error correction in a cointegrated regression. Otherwise, VAR model will be selected.

In this section JJ test will be conducted as mentioned in Chapter 3. Trace statistic and Maximum Eigen value will continue in testing the null of cointegrating vector until the null hypothesis is not rejected. However, Trace statistic only can test until three times. It cannot be proceed if there is still reject null hypothesis at third times. The JJ test hypothesis testing are as below:

H0: There is no long run equilibrium relationship between the time series variables.
H1: There is long run equilibrium relationship between the time series variables.

Table 4.4 Johansen & Juselius Cointegration Test

Table 4.4 JJ Cointegration - Summary statistic

Trace test

Null hypothesis	Alternative hypothesis	λ_{Trace}	95% Critical Value
r = 0	r > 1	93.7335**	69.8189
r ≤ 1	r > 2	57.2937**	47.8561
r ≤ 2	r > 3	31.0650**	29.7971
r ≤ 3	r > 4	14.2105	15.4947
r ≤ 4	r > 5	2.1543	3.8415

Maximum Eigen Value

Null hypothesis	Alternative hypothesis	λ_{Max}	95% Critical Value
r = 0	r = 1	36.4397 **	33.8769
r = 1	r = 2	26.2287	27.5843
r = 2	r = 3	16.8545	21.1216
r = 3	r = 4	12.0562	14.2646
r = 4	r = 5	2.15431	3.8415

Note: r represents the number of cointegrating vectors in model. ** denoted that reject null hypothesis at 5% critical value.

Table 4.4 represents the JJ test result for all variables whether happen the presence of cointegrated vector. To evaluate the hypothesis that the variables are not cointergrated (r =0) against the alternative of one or even more than one cointegrated vector (r >1), we have to compare the value of λ_{Trace} with critical value at 5% significant level.

From the Trace test result, since λ_{Trace} (0) exceeds the critical value (69.8189) at the 0.5 significance level, we can reject the null hypothesis of one cointegrating vector (r $\leqslant$1) and accept the alternative hypothesis of more than one cointegrating vectors (r >1) at the 0.5 level. We proceed to test another Trace test until do no reject H0 when λ_{Trace} (4) less than the critical value (15.4547) at 0.5 significant level. So that, the trace test showed 3 cointegration equations which indicates the presence of a long run equilibrium relationship in model.

Meanwhile, it is similar to look at the λ_{Max} value and critical value at 5% significant level in Maximum Eigen Value. The test of null hypothesis cannot be rejected at the one cointegrated vector (r=1) because the value of λ_{Max} (1) is less than critical value (27.5843). It means the number of cointegration vector consists of one in the model.

In short, we can conclude that there is a long run equilibrium relationship among the time series variables after we conducted Trace test and Maximum Eigen Value. Hence, VAR model is not applicable to be used in estimating our variables since the model do no consists of short run information. In the research of Johansen (2001) found that the resulf of cointegrated vector is zero and he using VAR model in his empirical studies. In our result, cointegration consists of more than 1. Hence, we proceed to Vector Error Correction Model (VECM) to estimate long run behaviour of the model.

4.4 Vector Error Correction Model (VECM)

VECM model is computed as below:

$$\mathbf{\Delta\, lnVAD = -\,5.7495 - \underset{(0.05670)}{0.4375\, \Delta lnFDI_{t-1}} + \underset{(0.2387)}{1.3202\, \Delta lnREER_{t-1}} - \underset{(0.2122)}{2.1528\, \Delta lnCPI_{t-1}}}$$

$$\mathbf{-\,\underset{(0.0020)}{0.0134\, \Delta BM_{t-1}} - \underset{(0.1828)}{0.2140}}$$

Where,

ΔlnVAD = First difference of value added to manufacturing sector (RM/million) in Malaysia

ΔlnFDI = First difference of net inflow of foreign direct investment in Malaysia (% of GDP)

ΔlnREER = First difference of real effective exchange rate in Malaysia (2010=100)

ΔlnCPI = First difference of consumer price index in Malaysia (2010=100)

ΔBM = First difference of broad money in Malaysia (% of GDP)

Note: ( ) represents p-value

At the previous empirical testing proven that all variables in the model are I (1) and cointegrated. VECM had be chosen after we find out there is cointegrated relationship and then we selected the best lag length in the series model. Due to the stationary variables (variables in the first difference), it can captures the dynamic adjustment toward the long run equilibrium. The speed at which the variables adjust towards the long run relationship can be measured through the error correction Term (ECT). Therefore, the coefficient value of ECT in the model will be our main concern for interpretation.

The ECT in model is statistically significant at 1 % of confidence level and showing negative sign (ECT < -1). According to the model above, we can conclude that there is adjustment of 21.3957% annually of short run dynamics between dependent variables and independent variables towards the long run equilibrium relationship. This indicates that the speed of adjustment is slow in the model due to it requires more than 5 years to make a complete adjustment.

The long run behaviour between dependent variable and independent variable:-

(i) The value of estimator of VAD is -5.7495, which is the intercept of the line, indicates the average level of manufacturing value added when the level of foreign direct investment, real effective exchange rate, consumer price index and broad money is equal to zero.

(ii) The value of estimate of FDI is -0.4375, which implied that the predicted the level of value added to manufacturing sector decrease by 0.4375% on average for each additional 1 percentage in level of foreign direct investment, *ceteris paribus.*

(iii) The value of estimate of REER is 1.3202, which implied that the predicted the level of value added to manufacturing sector increase by 1.3202% on average for each additional 1 index point from 100 in level of real effective exchange rate, *ceteris paribus.*

(iv) The value of estimate of CPI is - 2.1528, which implied that the predicted the level of value added to manufacturing sector decrease by 2.1528% on average for each additional 1 index point from 100 in level of consumer price index, *ceteris paribus.*

(v) The value of estimate of BM is -0.0134, which implied that the predicted the level of value added to manufacturing sector decrease by 0.0134% on average for each additional 1 percentage in level of broad money, *ceteris paribus.*

4.5 Granger Causality Test (Wald Test)

VECM only can determinate the long run behaviour among of dependent to independent variables. According to Gujarati and Porter (2009), regression analysis is only able to reflect the relationship between different variables, but it cannot show whether there is unidirectional or bidirectional causality. To check for causality, we will apply the pair wise Granger Causality test. This test is testing the causality between 2 variables, whether unidirectional, bidirectional or no relationship in short run.

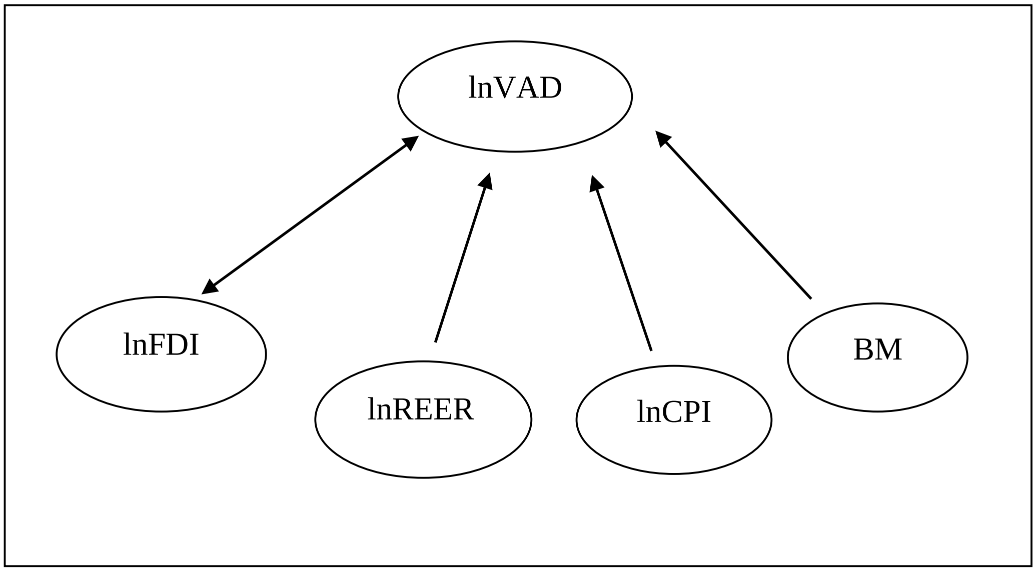
Table 4.5: Granger Causality Test - Summary Statistics

Granger Causality	F-statistcs	Prob [P-value]	Direction
lnVAD to lnFDI	3.09752	0.0628***	lnVAD ⟶ lnFDI
lnFDI to lnVAD	2.63107	0.0918***	lnFDI ⟶ lnVAD
lnVAD to lnREER	2.53998	0.1762	
lnREER to lnVAD	1.86257	0.0990***	lnREER ⟶ lnVAD
lnVAD to lnCPI	7.48788	0.9677	
lnCPI to lnVAD	0.03292	0.0028 **	lnCPI ⟶ lnVAD
lnVAD to BM	3.43759	0.1909	
BM to lnVAD	1.77085	0.0480 **	BM ⟶ lnVAD

Note: *, ** and *** denoted that the reject the null hypothesis or there is short run causality at 10%, 5% and 1% significant level respectively.

The significance of causal effect is determined by using the probability value in Wald test. The result shows all foreign direct exchange and exchange rate are granger causality toward value added to manufacturing sector at 1%, 5% and 10% of significant level. Only consumer price index and broad money granger causes toward value added to manufacturing sector at 1% and 5% of significant level. Whereas, value added to manufacturing sector does not granger towards real effective exchange rate and broad money. It means there is no relationship between them. The granger causality direction will be further explained in Figure 4.5.1.

Figure 4.5 Granger Causality between the variables



Note: ⟶ Unidirectional causal effect

⟷ Bidirectional causal effect

4.5.1 Foreign Direct Investment (FDI)

H0: There is no short run granger causality from VAD to FDI

H1: There is short run granger causality from VAD to FDI

From the Table 4.5 and Figure 4.5.1, bidirectional causality can be seen between VAD and FDI, where VAD is granger causes FDI at 10% significant level with a P-value of 0.0628 or 6.28% and reserve causality with a P-value of 0.0918, 9.18%. Thus, we reject the null hypothesis. Besides, this implies that the changes of value added to manufacturing sector in the past can be used to predict the occurrence of event of FDI.

4.5.2 Real Effective Exchange Rate (REER)

H0: There is no short run granger causality from VAD to REER

H1: There is short run granger causality from VAD to REER

From the Table 4.5 and Figure 4.5.1, a unidirectional causality can be seen between VAD and FDI, where REER is granger causes VAD at 10% significant level with a P-value of 0.0990 or 9.90% Thus, we reject the null hypothesis. Besides, this indicates that the change in value added to manufacturing sector in the past can used to predict the occurrence of event of real effective exchange rate but the change in real effective exchange rate in the past cannot used to forecast the occurrence of the event of manufacturing.

4.5.3 Consumer Price Index (CPI)

H0: There is no short run granger causality from VAD to CPI

H1: There is short run granger causality from VAD to CPI

From the Table 4.5 and Figure 4.5.1, a bidirectional causality can be seen between VAD and FDI, where VAD is granger causes FDI at both 5% and 10% significant level with a P-value of 0.9677 or 96.77% and a reserve causality with a P-value of 0.0028, 2.8%. Thus, we reject the null hypothesis. Besides, this implies that the changes of value added to manufacturing sector in the past can be used to predict the occurrence of event of CPI.

4.5.4 Broad Money (BM)

H0: There is no short run granger causality from VAD to BM

H1: There is short run granger causality from VAD to BM

From the Table 4.5 and Figure 4.5.1, a unidirectional causality can be seen between VAD and BM, where BM is granger causes VAD at 5% significant level with a P-value of 0.0480 or 4.80% Thus, we reject the null hypothesis. Besides, this indicates that the change in value added to manufacturing sector in the past can used to predict the occurrence of event of BM but the change in BM in the past cannot used to forecast the occurrence of the event of manufacturing.

4.6 Conclusion

Chapter 4 basically analyzed the empirical results throughout Unit Root test, Cointegration test, VECM test and diagnostic checking test. All the empirical results have been shown clearly in the tables with precise explanation. The discussion of the whole research will be carried out in Chapter 5.

CHAPTER 5: DISCUSSION, CONCLUSION, AND IMPLICATIONS

5.0 Overview

The first part of this chapter will present the summary description of the findings that have been discussed in the previous chapter in table form. Following that, a discussion on the major findings of this paper is provided in order to validate the hypotheses and the research objective. Next, the implication, limitations, recommendation for future research and conclusion of the entire study will be discussed.

5.1 Summary of Statistical Analyses

Table 5.1.1 Summary of Major Findings

Dependent Variables	Independent Variables	Ordinary Least Square	Unit Root Test
LNY	LNFDI	Positive (Significant at 5%)	Stationary
LNY	LNEXC	Negative (Significant at 5%)	Stationary
LNY	LNCPI	Positive (Significant at 5%)	Stationary
LNY	BM	Negative (Insignificant at 5%)	Stationary

Description: Table above shows the relationship of the independent variables and dependent variables, LNY. All the variables are stationary at the first difference and there is no presence of unit root.

Table 5.1.2 Summary of JJ Cointegration Test

Long run relationship test: JJ Cointegration Test	
Trace test	Maximum Eigen Value
Cointegrated at r=3	Cointegrated at r=1

Description: Trace test is cointegrated at r=3 and Maximum Eigen Value is cointegrated at r=1. Both tests indicate that there is a long run equilibrium relationship among the time series variables (Refer Table 4.3)

Table 5.1.3 Summary of Diagnostic Checking

Diagnostic Checking	Discussion on results
Autocorrelation - Serial Correlation LM Test	No autocorrelation problem, passed
Heteroscedasticity - Breusch Pagan Godfrey Test	No heteroscedasticity problem, passed
Normality test - Jarque-Bera Normality Test	Model is normally distributed, passed
Model specification - Ramsey RESET Specification Test	Model is correctly specified, passed

The model in this paper has passed all the diagnostic checking above and is free from any econometric problems.

5.2 Decisions for Hypotheses of Study

Table 5.2 Decisions for Hypotheses of Study

	Hypothesis	Decision
1.	FDI will have positive relationship with manufacturing value added.	Supported
2.	CPI will have negative relationship with manufacturing value added.	Not supported
3.	REER will have negative relationship with manufacturing value added.	Supported
4.	BM supply will have positive relationship with manufacturing value added.	Not Supported
5.	There is causality running from FDI to manufacturing value added.	Supported
6.	There is causality running from CPI to manufacturing value added.	Supported
7.	There is causality running from REER to manufacturing value added.	Supported
8.	There is causality running from BM supply to manufacturing value added.	Supported
9.	There is causality running from manufacturing value added to FDI.	Supported
10.	There is causality running from manufacturing value added to CPI.	Not supported
11.	There is causality running from manufacturing value added to REER.	Not supported
12.	There is causality running from manufacturing value added to BM supply.	Not Supported

5.3 Discussion on Major Findings

5.3.1 Net FDI Inflows

In this study, FDI inflows was found to have a significant positive relationship with manufacturing sector growth. This is consistent with much of the existing literature discussed in Chapter 2 of this study. FDI inflows was also found to have a unidirectional causal relationship with manufacturing sector growth.

Firstly, from the causality direction running from FDI infows to manufacturing sector value added, multiple studies have found FDI to promote output growth (Chenery & Strout, 1966; Dunning, 1970; Todaro, 1982; Kruger, 1987; the World Bank, 1993).

One of the reasons that FDI might positively impact the manufacturing sector in Malaysia may be explained by the fact that it has transitioned into a high-technology, high-efficiency sector focused on the production of exported goods. One of the main reasons why FDI can positively affect manufacturing sector growth is that FDI is an effective channel by which technology is transferred to the receiving country, and this benefit is taken advantage of most by developing countries (Fakhreddin, Nezakati, & Vaighan, 2011). de Mello and Sinclair (1995) also posit that transfers of technology, new knowledge, progressive management practices, and organizational arrangements augments the workforce's skill acquisition rate, leading to increased growth.

From the causality direction of manufacturing sector value added to FDI inflows, some studies have found that GDP growth can induce an increase in FDI inflows (Dowling & Hiemenz, 1982; Lee & Rana, 1986). The explanation is that rapid GDP growth can lead to shortage or high level of requirement of capital, which can attact FDI inflows. Enderwick (2005) said that the rate of growth of an economy is one of the factors that is attractive to FDI.

As such, the findings regarding FDI inflows and manufacturing sector growth in this study are backed up and can be explained by the existing literature. Besides this, Figure 5.1 below shows that manufacturing remains a large attractor of FDI inflows in the country as of 2011, and this coincides with an increase an increase in manufacturing sector value added in recent years as shown in Figure 5.2, which backs up the significance of FDI in manufacturing sector growth.

Manufacturing Sector Continues to be the Largest Contributor to FDI Inflows

FDI INFLOWS TO MALAYSIA BY SECTOR

	2010	2011	Percentage of Growth (%)
	RM million		
Agriculture, Forestry and Fishing	83	123	48.2
Mining and Quarrying	3,138	7,301	132.7
Manufacturing	16,107	16,509	2.5
Services	9,994	8,992	(10.0)
TOTAL	29,322	32,925	12.3

Figure 5.1. Manufacturing sector contribution to FDI inflows. (Source: Malaysia Investment Development Authority, 2012).

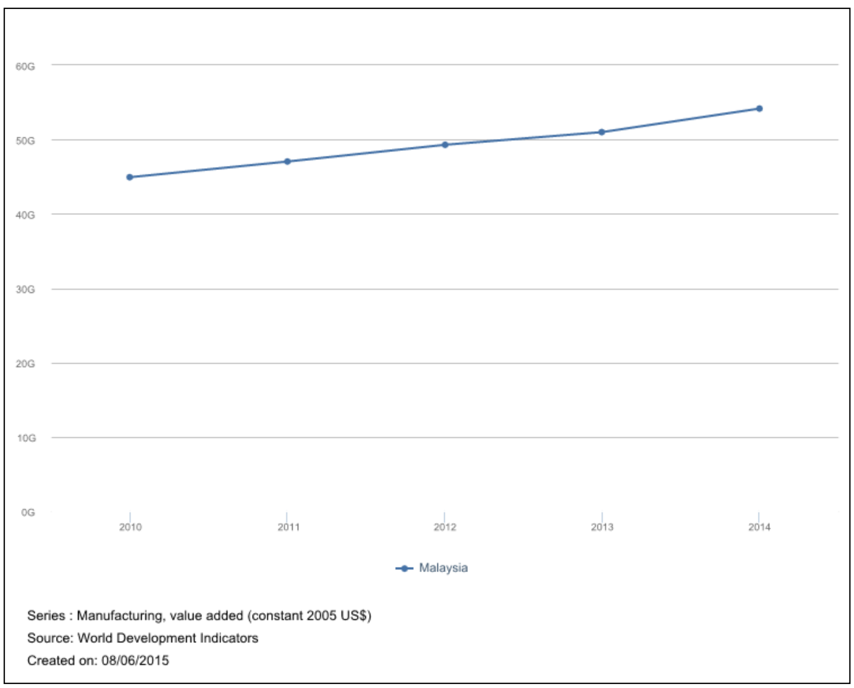


Figure 5.2. Manufacturing Value Added 2010-2014 (Source: World Bank, 2015).

5.3.2 REER

In this study, REER was found to be significant and have a negative relationship with manufacturing value added. This is in line with the existing literature discussed in Chapter 2 that states that lower REER is actually a benefit to an export-oriented manufacturing sector because foreign countries will purchase more goods due to their relative cheapness. This is reinforced by Figure 5.3, which shows that net exports have increased in line with the depreciation of the Malaysian Ringgit in Figure 1.5.

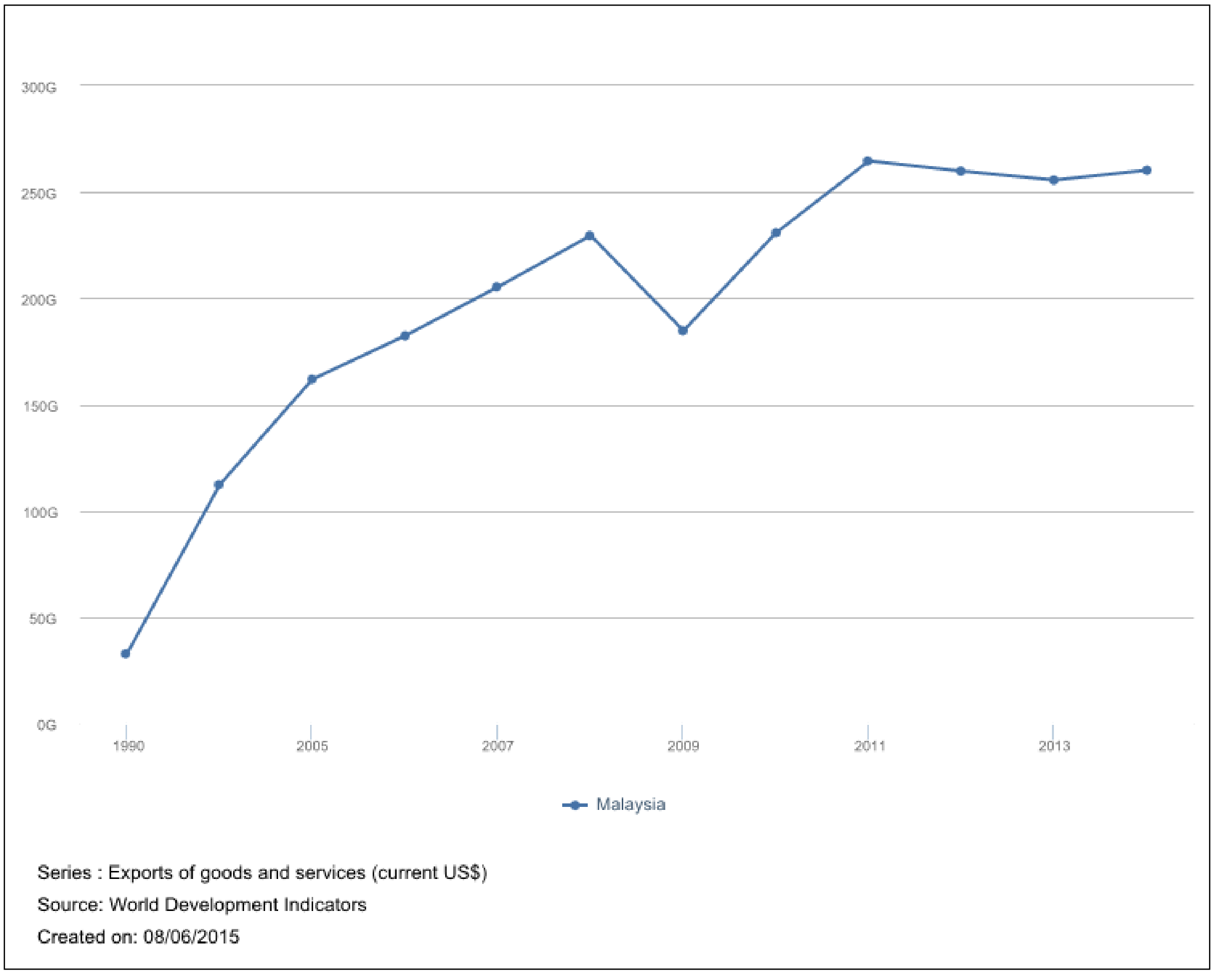


Figure 5.3. Exports of Goods and Services Malaysia
(Source: World Bank, 2015).

The impact of REER on manufacturing sector growth can in part be explained by FDI inflows caused by lower exchange rate. Athukorala and Rajapatirana (2003) found in their study that FDI inflows are associated with depreciation in REER. So besides making Malaysian products more attractive to foreign consumers, the weak Malaysian Ringgit also leads to increased FDI inflows, which as we have already established, has a positive relationship with manufacturing sector growth.

The unidirectional causality between manufacturing sector growth and REER is similar to the study of Nowjee, Poloodoo, Lamport, Padachi, and Ramdhony (2012) where GDP in Mauritius was found to granger cause REER, which implies that fluctuations in economic growth will have an impact on REER. It is however, at odds with the case of Greece, which was found to have a long-run unidirectional causality where economic growth causes REER fluctuations (Dritsakis, 2004).

5.3.3 CPI

In this study, CPI was found to be significant in the model, indicating a significant relationship between manufacturing sector growth and inflation rate. The sign for CPI in the model was found to be positive, therefore manufacturing sector growth is implied to increase as inflation increases. Also, CPI and manufacturing sector value added were found to have unidirectional causality. Chimobi (2010), came to this same conclusion in his research on inflation and the growth of the Nigerian economy.

There are two perspectives to the existing literature. The conventional perception in macroeconomics is that inflation is bad for economic growth, hence low inflation is necessary to encourage high growth (Munir, Mansur, & Furuoka, 2009).

Ahortor and Adenutsi (2009) state that in developing countries, high inflation will discourage savings, as cash today is valued higher than money tomorrow in a high-inflation environment. High inflation makes it difficult for producers to predict how much to produce, as the demand is difficult to predict, and it is also difficult to estimate the average cost of production. Besides that, high inflation rates lead to uncertainty with regards to interest and exchange rates, and price levels in the future, which increases the risks to potential trade partners.

Feldstein (1982), Barro (1995), Hellerstein (1997) Madsen (2003), and Byrne and Davis (2004) found that the increased uncertainty caused by high inflation will lead trade partners to be reluctant to enter contracts, which will hinder investment in the long run, and in turn inhibit capital accumulation which is crucial to a capital-intensive sector such as the manufacturing sector.

However, according to the model in this study, the relationship between manufacturing growth and inflation is in fact, positive. This means that in the case of the Malaysian manufacturing sector as a sub-sector of the Malaysian economy, it may follow the opposing side of the literature, which proposes that high inflation can drive growth through increased investment. The explanation for the positive relationship it holds with inflation may be found in the importance of capital accumulation.

Capital accumulation is essential to the output growth of any economy, more specifically sub-sectors of the economy that require heavy investment in machinery and other fixed assets, such as the manufacturing sector. According to Olanipekun and Akeju (2013), output growth depends on the capital accumulation rate, which in turn depends on the level of savings in an economy.

The level of savings in the economy is highly dependent on the perceived opportunity cost of holding money. The most important research to back up this side of the literature is the study conducted by James Tobin. Tobin (1965) introduced money as an asset alternative to capital in the Solow-Swan model, and as a result, he found that an increase in CPI leads to decreased disposable income, which increases the opportunity cost of holding money, thus this will lead to more money put into investment and capital accumulation, which aids growth.

In recent years, empirical evidence suggests that inflation can create positive Tobin effects by inducing a significant decrease in interest rates, thus encouraging growth through an increase in investments (Ahmed & Rogers, 2000; Rapach, 2003; Rapach & Wohar, 2005; Lioui & Poncet, 2008).

Faira and Carneiro (2001) and Khan and Senhadji (2001) also refute the first line of the literature through the findings in their studies by suggesting that inflation fails to impact long run growth, and that developing countries in particular have a higher threshold where inflation does not adversely affect growth.

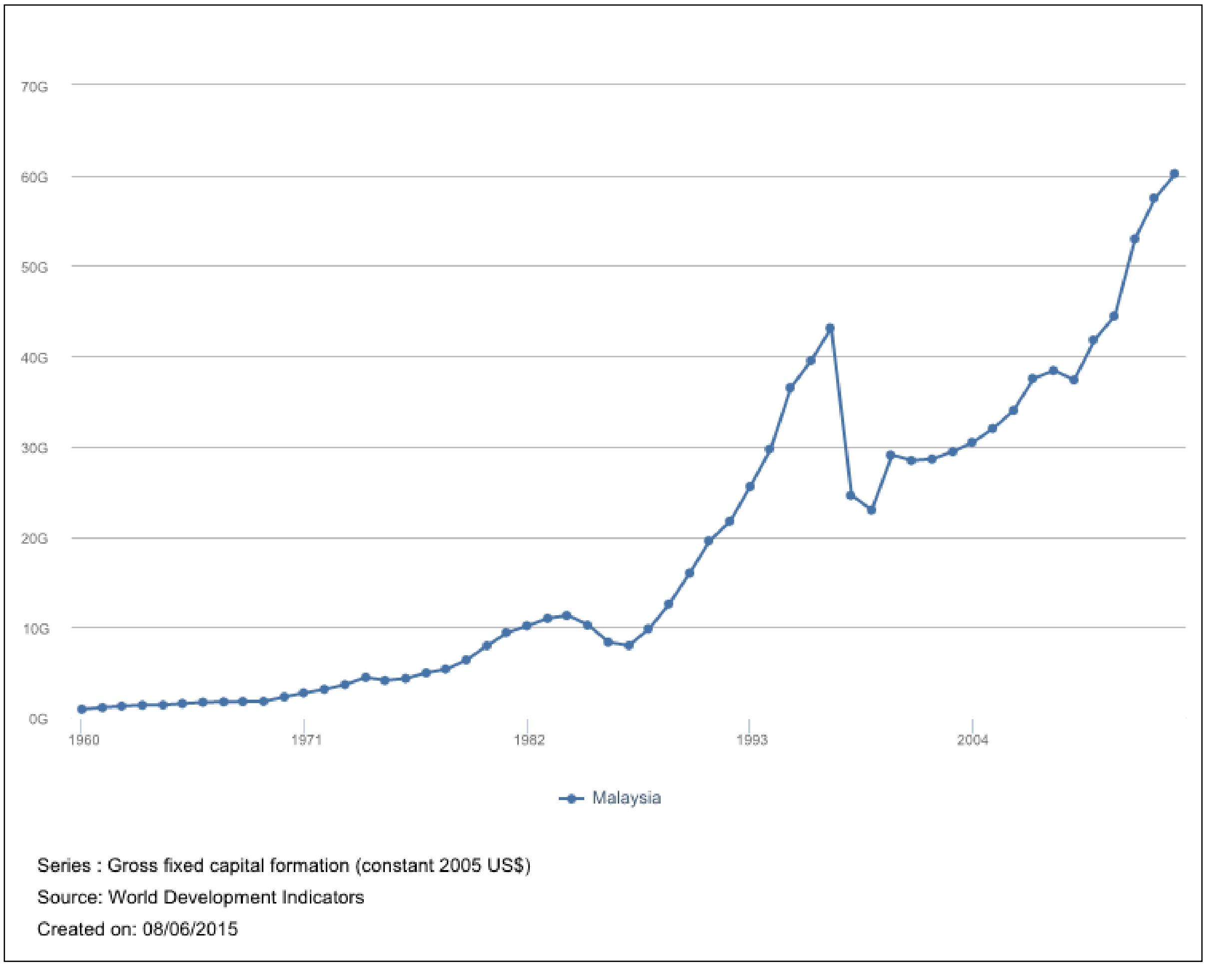


Figure 5.4. Gross Fixed Capital Formation Malaysia
(Source: World Bank, 2015).

Figure 5.4 indicates that there may be a Tobin-effect in play in the Malaysian economy, as the gross fixed capital formation in the country exhibits a general upward trend of growth in line with the upward trend of inflation of CPI, which indicates a positive relationship.

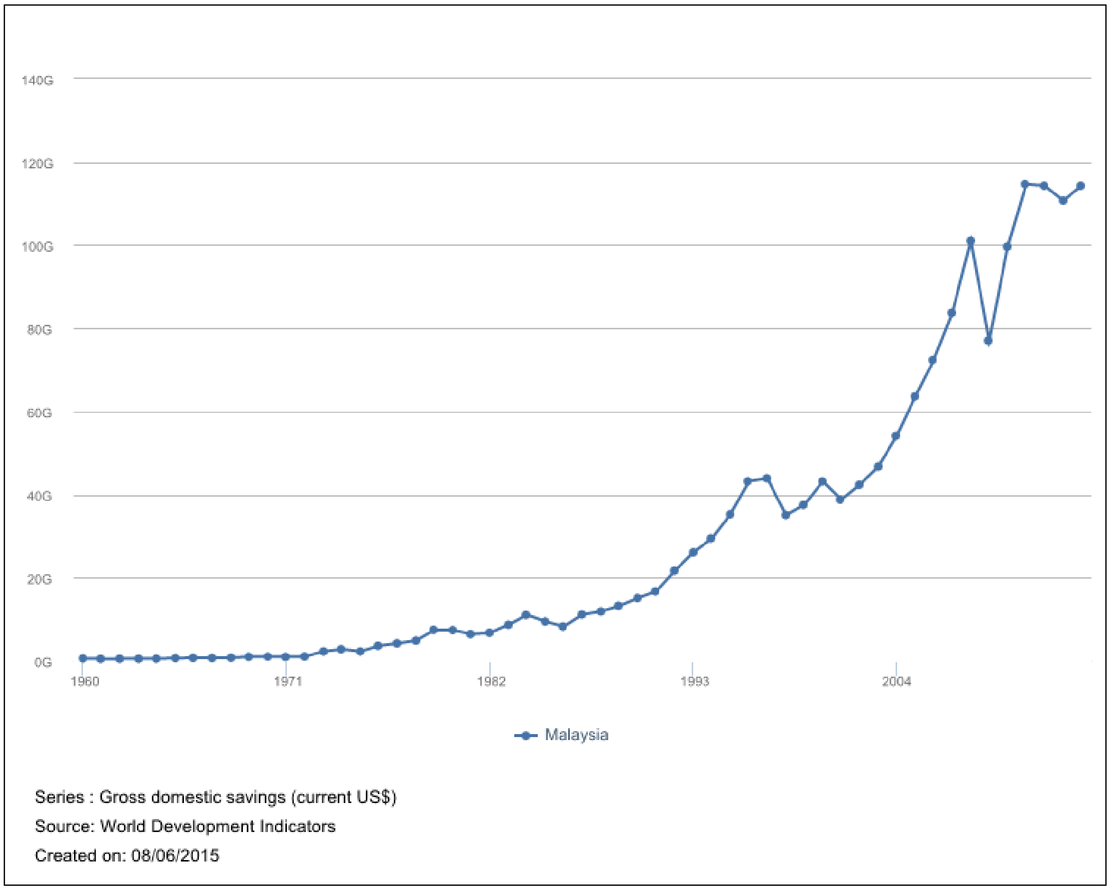


Figure 5.5. Gross Domestic Savings Malaysia
(Source: World Bank, 2015).

Likewise, in Figure 5.5, gross domestic savings exhibits an upward trend as well, though from the period encompassing the 1960s to the 1980s savings did not experience any significant growth and gross domestic savings only started to grow significantly from the 80s and onwards. This can partially be explained by the low increase in inflation from the 1960s to the 1970s which can be seen from Figure 1.

Based on the results of our model and the existing literature, it can be assumed that CPI is significant in the model with a positive relationship to manufacturing sector growth due to the existence of a Tobin-effect in the economy which means that inflation causes an increase in investment and capital accumulation, which in turn boots manufacturing sector growth.

5.3.4 Broad Money Supply

In this study, broad money supply was found to be insignificant in the model. This implies that fluctuations in the broad money supply do not affect manufacturing value added. This is inconsistent with the existing literature that either says that broad money supply will either affect manufacturing sector growth positively or negatively. In contrast to the existing literature, relatively few studies have come to the conclusion that money supply is insignificant to manufacturing sector growth.

Sidrauski (1967) introduced the money-in-utility function into the neoclassical growth model and found that his specification changes in the rate of growth of money supply posed no effect on the steady state level of capital stock. As we have posited previously that a capital-intensive sector such as the manufacturing sector is heavily reliant on capital accumulation for growth, this study seems to align with the finding of insignificant broad money supply in this study.

In a study of the effect of the reformation of the financial sector on manufacturing growth in Nigeria, Itiveh (2014) found that although the reform of the Nigerian banking sector positively influenced the manufacturing sector by providing more money for use in capital formation, the increased supply of money ultimately proved to be insignificant in driving economic activity in the country.

Besides this, in the study of Ahmed and Suliman (2011), it was discovered that in the case of the Sudanese economy, there is no causality between real GDP and money supply for the observation period of 1960-2005. Since manufacturing sector output is a component of real GDP of the country, it is assumed that it may be linked with this study. Also, there exists many similarities between Ahmed and Suliman’s study and this study, in that both

Malaysia and Sudan are developing countries and the observed time period is similar, although in the case of this study, observations were limited to 32 due to limited number of obtainable observations for the REER variable.

Rajan and Zingales (1998) designed a multiple regression model to test the impact of development of the financial sector on industry-specific growth and found that industries that are reliant on external finance experience relatively higher growth than industries in countries which possess well-developed financial systems. Perhaps in the case of Malaysia, the manufacturing sector falls under this hypothesis, as Malaysia does possess a robust financial system that is well-capitalized and governed (Trotsenburg, 2013), thus meaning that manufacturing growth experiences relatively little direct influence from money supply fluctuations managed by the financial sector.

5.4 Implications of Study

5.4.1. FDI

Since FDI is significant and positive in boosting growth of the manufacturing sector, it is important that the country provides a healthy investment climate in order to attract investors to invest in the sector. As a result of current events involving the 1MDB scandal, investors have begun to flee the country due the perceived increased political risk.

Schneider and Equippe (2010) state that low political risk is associated with high FDI inflows, and favorable business conditions result in increased FDI inflow. A similar case to Malaysia lies in Pakistan. Although it is rich in resources, the political instability inherent in the country drives investors away, leading to low FDI inflow (Shahzad, Mithani, Al-Swidi, & Fadzli, 2012).

In order to overcome this recent development in the Malaysian economy and to avoid further leakage of FDI from the country, the government must seek to stabilize the political climate as soon as possible. Thorough and transparent investigation into the 1MDB scandal should be performed in order to restore investor confidence by showing that the government is serious about stamping out corruption.

5.4.2. REER

This study has found REER to have a significant negative relationship with manufacturing sector growth. As of 2015, the Malaysian Ringgit is the worst performing currency in Asia, falling past RM 3.9000/dollar for the first time in 17 years (Reuters, 2015). The revised Budget 2015 has done little to restore investor confidence, as the country is hit by low global crude oil prices as well as a secular shift to the US Dollar as globally investors expect the US Federal Reserve to announce higher interest rates in the latter part of 2015. (Kok, 2015)

This means that Malaysia can take advantage of the weakened Malaysian Ringgit by exacting policies and incentives to net increase exports, as the lower REER means that goods produced in Malaysia will be cheaper to foreign consumers, thus driving increased demand which can be met with increased output in the manufacturing sector and thus increased growth. Lahiri and Vegh (2000) also say that in the case of depreciated currency, two actions may be taken to stabilize the currency depending on the cost of intervention. If intervention is costless, then the optimal course of action for policymakers it to not let the currency fluctuate at all through an appropriate mix of interest rate policy and intervention. If it is costly to intervene, it is more optimal to allow the currency to fluctuate while using a more precise policy mix to stabilize the currency.

5.4.3. CPI

This study has found CPI to have a significant positive relationship with manufacturing sector growth. As such, it is optimal to capitalize on the upward trend of inflation in the country by providing incentives to save and aid to the manufacturing sector in order to take advantage of the Tobin-effect that is inherent in the economy, increasing gross fixed-capital formation in the process.

5.4.4. BMNY

This study has found BMNY to have an insignificant negative relationship with manufacturing sector growth. This means that in order to influence manufacturing sector growth, the government should shift its focus away from monetary policy and instead focus on fiscal policy which can affect variables such as CPI and FDI.

5.5 Limitation of the Study

Firstly, the data for Foreign Direct Investment (FDI) is incomplete. According to the data collected from Bank Negara Malaysia, the data for FDI is missing on year 2009. Furthermore, the data for the dependent variable, value added that collected from the Department of Statistics Malaysia is missing for two different years which are 1980 and 1999. Thus, it has created a trouble for this paper to run the diagnostic checking test. In order to overcome this problem, the average for the years 1979 and 1981, and the years 1998 and 2000 were used to fill in for the empty years 1980 and 1999 respectively.

It should also be noted that the sample size used in this study is relatively small at 32 observations. A higher amount of observations could not be used due to the fact that data for REER could only be found starting from 1979.

5.6 Recommendation for Future Research

One of the recommendations provided to future researchers is to extend research on the effect of macroeconomic variables on the growth of manufacturing sector by examining other macroeconomic variables such as real effective interest rate, domestic credit available, and size of the workforce in the research.

In addition, future researchers can use larger sample size of data in order to gain a much better understanding of the dynamics between macroeconomic variables and manufacturing sector growth. Frequency of data can be increased by using weekly or monthly frequencies to raise the sample size and to get a more in depth look at the factors affecting manufacturing sector growth.

5.7 Conclusion

The objective of this study is to study the impact that the various macroeconomic variables investment (FDI), consumer price index (CPI), exchange rate (REER) and broad money supply (BMNY) have on manufacturing value added (VAD). Referring to our major findings, BMNY was found to have an insignificant negative effect with VAD. CPI and FDI were found to have significant positive relationships with VAD, with CPI having a unidirectional causal relationship with VAD as CPI granger causes VAD, and FDI having a bidirectional relationship with VAD. REER was found to have a negative significant relationship with VAD and to also have a unidirectional causal relationship with VAD with REER granger causing VAD. Moreover, CPI which brings the largest impact on VAD in the VECM model with a coefficient of -2.1528.

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Appendix

Appendix 1: Diagnostic Checking Results

1 .1 Breush Godfrey Serial Correlation LM Test (Autocorrelation)

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	2.189851	Prob. F(2,25)	0.1329
Obs*R-squared	4.770316	Prob. Chi-Square(2)	0.0921

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 08/06/15 Time: 21:24
Sample: 1979 2010
Included observations: 32
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNFDI	-0.018413	0.050275	-0.366250	0.7173
LNREER	0.063569	0.230461	0.275833	0.7849
LNCPI	0.064010	0.214384	0.298577	0.7677
BM	-0.000579	0.001696	-0.341515	0.7356
C	-0.484411	1.854631	-0.261190	0.7961
RESID(-1)	0.397740	0.207176	1.919817	0.0664
RESID(-2)	0.025912	0.217194	0.119305	0.9060

R-squared	0.149072	Mean dependent var	1.44E-15
Adjusted R-squared	-0.055150	S.D. dependent var	0.114819
S.E. of regression	0.117942	Akaike info criterion	-1.246601
Sum squared resid	0.347760	Schwarz criterion	-0.925971
Log likelihood	26.94561	Hannan-Quinn criter.	-1.140321
F-statistic	0.729950	Durbin-Watson stat	1.813995
Prob(F-statistic)	0.629931		

1.2 Breush Pagan Godfrey Test (Heteroskedasticity)

Heteroskedasticity Test: Breusch-Pagan-Godfrey

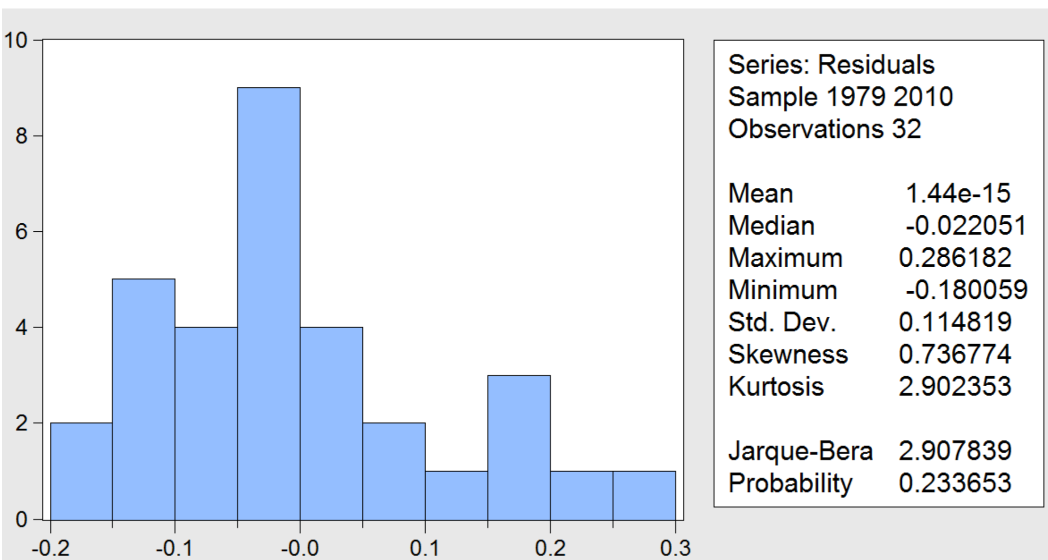
F-statistic	0.434834	Prob. F(4,27)	0.7822
Obs*R-squared	1.936673	Prob. Chi-Square(4)	0.7474
Scaled explained SS	1.311430	Prob. Chi-Square(4)	0.8594

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 08/06/15 Time: 21:25
Sample: 1979 2010
Included observations: 32

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.177740	0.281530	-0.631338	0.5331
LNFDI	0.004778	0.007754	0.616192	0.5429
LNREER	0.030127	0.034971	0.861475	0.3966
LNCPI	0.004333	0.032264	0.134291	0.8942
BM	0.000193	0.000256	0.754519	0.4571

R-squared	0.060521	Mean dependent var	0.012771
Adjusted R-squared	-0.078661	S.D. dependent var	0.017897
S.E. of regression	0.018587	Akaike info criterion	-4.990061
Sum squared resid	0.009328	Schwarz criterion	-4.761039
Log likelihood	84.84097	Hannan-Quinn criter.	-4.914147
F-statistic	0.434834	Durbin-Watson stat	1.734471
Prob(F-statistic)	0.782237		

1.3 Jarque- Bera Godfrey Normal Distribution



1.4 Ramsey Reset Specification Test

Ramsey RESET Test:

F-statistic	0.358247	Prob. F(1,26)	0.5547
Log likelihood ratio	0.437910	Prob. Chi-Square(1)	0.5081

Test Equation:
Dependent Variable: LNVAD
Method: Least Squares
Date: 08/06/15 Time: 21:23
Sample: 1979 2010
Included observations: 32

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNFDI	0.152085	0.076563	1.986409	0.0576
LNREER	-1.293662	0.581853	-2.223349	0.0351
LNCPI	4.136354	1.886994	2.192034	0.0375
BM	-0.001501	0.001981	-0.757533	0.4555
C	1.321753	2.776982	0.475967	0.6381
FITTED^2	-0.017183	0.028708	-0.598538	0.5547

R-squared	0.987343	Mean dependent var	10.57422
Adjusted R-squared	0.984909	S.D. dependent var	1.013638
S.E. of regression	0.124519	Akaike info criterion	-1.161357
Sum squared resid	0.403129	Schwarz criterion	-0.886532
Log likelihood	24.58172	Hannan-Quinn criter.	-1.070261
F-statistic	405.6532	Durbin-Watson stat	1.136469
Prob(F-statistic)	0.000000		

1.5 Ordinary Least Squares (OLS)

Dependent Variable: LNVAD
Method: Least Squares
Date: 08/06/15 Time: 21:22
Sample: 1979 2010
Included observations: 32

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNFDI	0.118418	0.051321	2.307419	0.0289
LNREER	-0.974877	0.231472	-4.211634	0.0003
LNCPI	3.014350	0.213556	14.11501	0.0000
BM	-0.000908	0.001695	-0.535677	0.5966
C	2.541751	1.863445	1.364007	0.1838

R-squared	0.987169	Mean dependent var	10.57422
Adjusted R-squared	0.985268	S.D. dependent var	1.013638
S.E. of regression	0.123030	Akaike info criterion	-1.210173
Sum squared resid	0.408684	Schwarz criterion	-0.981152
Log likelihood	24.36276	Hannan-Quinn criter.	-1.134259
F-statistic	519.3204	Durbin-Watson stat	1.149725
Prob(F-statistic)	0.000000		

Appendix 2: Unit Root Test Result

2.1 Augmented Dickey- Fuller at level form with trend and intercept

Null Hypothesis: LNVAD has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic based on SIC, MAXLAG=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.531833	0.9763
Test critical values:	1% level	-4.284580	
	5% level	-3.562882	
	10% level	-3.215267	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LNFDI has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic based on SIC, MAXLAG=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.851349	0.1911
Test critical values:	1% level	-4.284580	
	5% level	-3.562882	
	10% level	-3.215267	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LNREER has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic based on SIC, MAXLAG=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.623263	0.7603
Test critical values:	1% level	-4.284580	
	5% level	-3.562882	
	10% level	-3.215267	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LNCPI has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic based on SIC, MAXLAG=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.863656	0.1872
Test critical values:	1% level	-4.284580	
	5% level	-3.562882	
	10% level	-3.215267	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: BM has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic based on SIC, MAXLAG=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.128115	0.1177
Test critical values:	1% level	-4.284580	
	5% level	-3.562882	
	10% level	-3.215267	

*MacKinnon (1996) one-sided p-values.

2.2 Augmented Dickey- Fuller at first difference with trend

Null Hypothesis: D(LNVAD) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic based on SIC, MAXLAG=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.013526	0.0043
Test critical values:	1% level	-3.670170	
	5% level	-2.963972	
	10% level	-2.621007	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LNFDI) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic based on SIC, MAXLAG=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.144054	0.0000
Test critical values:	1% level	-3.670170	
	5% level	-2.963972	
	10% level	-2.621007	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LNREER) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic based on SIC, MAXLAG=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.077880	0.0036
Test critical values:	1% level	-3.670170	
	5% level	-2.963972	
	10% level	-2.621007	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LNCPI) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic based on SIC, MAXLAG=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.436214	0.0174
Test critical values:	1% level	-3.670170	
	5% level	-2.963972	
	10% level	-2.621007	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(BM) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic based on SIC, MAXLAG=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.677354	0.0001
Test critical values:	1% level	-3.670170	
	5% level	-2.963972	
	10% level	-2.621007	

*MacKinnon (1996) one-sided p-values.

2.3 Philips-Perron (PP) at level form with trend and intercept

Null Hypothesis: LNVAD has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 0 (Newey-West using Bartlett kernel)

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-0.531833	0.9763
Test critical values:	1% level	-4.284580	
	5% level	-3.562882	
	10% level	-3.215267	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LNFDI has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 3 (Newey-West using Bartlett kernel)

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-2.976941	0.1544
Test critical values:	1% level	-4.284580	
	5% level	-3.562882	
	10% level	-3.215267	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LNREER has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 2 (Newey-West using Bartlett kernel)

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-2.011286	0.5726
Test critical values:	1% level	-4.284580	
	5% level	-3.562882	
	10% level	-3.215267	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LNCPI has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 3 (Newey-West using Bartlett kernel)

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-2.976612	0.1544
Test critical values:	1% level	-4.284580	
	5% level	-3.562882	
	10% level	-3.215267	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: BM has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 1 (Newey-West using Bartlett kernel)

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-3.200480	0.1028
Test critical values:	1% level	-4.284580	
	5% level	-3.562882	
	10% level	-3.215267	

*MacKinnon (1996) one-sided p-values.

2.4 Philips-Perron (PP) at first difference with intercept

Null Hypothesis: D(LNVAD) has a unit root
Exogenous: Constant
Bandwidth: 1 (Newey-West using Bartlett kernel)

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-3.992943	0.0045
Test critical values:	1% level	-3.670170	
	5% level	-2.963972	
	10% level	-2.621007	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LNFDI) has a unit root
Exogenous: Constant
Bandwidth: 1 (Newey-West using Bartlett kernel)

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-7.161295	0.0000
Test critical values:	1% level	-3.670170	
	5% level	-2.963972	
	10% level	-2.621007	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LNREER) has a unit root
Exogenous: Constant
Bandwidth: 7 (Newey-West using Bartlett kernel)

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-3.853431	0.0064
Test critical values:	1% level	-3.670170	
	5% level	-2.963972	
	10% level	-2.621007	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LNCPI) has a unit root
Exogenous: Constant
Bandwidth: 1 (Newey-West using Bartlett kernel)

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-3.335532	0.0220
Test critical values:	1% level	-3.670170	
	5% level	-2.963972	
	10% level	-2.621007	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(BM) has a unit root
Exogenous: Constant
Bandwidth: 3 (Newey-West using Bartlett kernel)

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-5.776204	0.0000
Test critical values:	1% level	-3.670170	
	5% level	-2.963972	
	10% level	-2.621007	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	253.7391
HAC corrected variance (Bartlett kernel)	186.4475

Appendix 3: Johansen & Juselius Cointegration Result Test

Date: 08/06/15 Time: 21:40
Sample (adjusted): 1981 2010
Included observations: 30 after adjustments
Trend assumption: Linear deterministic trend
Series: LNVAD LNFDI LNREER LNCPI BM
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.703188	93.73346	69.81889	0.0002
At most 1 *	0.582842	57.29372	47.85613	0.0051
At most 2 *	0.429828	31.06498	29.79707	0.0356
At most 3	0.330934	14.21047	15.49471	0.0773
At most 4	0.069293	2.154309	3.841466	0.1422

Trace test indicates 3 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.703188	36.43974	33.87687	0.0242
At most 1	0.582842	26.22873	27.58434	0.0737
At most 2	0.429828	16.85451	21.13162	0.1790
At most 3	0.330934	12.05616	14.26460	0.1086
At most 4	0.069293	2.154309	3.841466	0.1422

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

LNVAD	LNFDI	LNREER	LNCPI	BM
5.085941	-3.183304	6.106324	-9.182117	-0.097876
-7.322631	-0.118025	-15.42103	18.53900	-0.025709
-4.152043	2.429313	-3.460974	14.12310	-0.042759
-4.782944	0.213357	5.656121	25.44453	-0.002353
-4.853700	-0.127654	-1.873883	14.64236	-0.017716

Unrestricted Adjustment Coefficients (alpha):

D(LNVAD)	-0.024774	0.001971	0.005890	-0.011311	0.018898
D(LNFDI)	0.152690	0.179525	-0.200231	-0.032828	0.024924
D(LNREER)	-0.004377	0.034916	0.017599	-0.001527	-0.005499
D(LNCPI)	0.000316	-0.002534	0.001834	-0.008851	-0.001093
D(BM)	9.261567	-1.679306	5.742102	1.484444	0.928084

1 Cointegrating Equation(s): Log likelihood 34.84671

Normalized cointegrating coefficients (standard error in parentheses)

LNVAD	LNFDI	LNREER	LNCPI	BM
1.000000	-0.625903	1.200628	-1.805392	-0.019244
	(0.09016)	(0.36219)	(0.35179)	(0.00296)

Adjustment coefficients (standard error in parentheses)

D(LNVAD)	-0.125998
	(0.08137)
D(LNFDI)	0.776574
	(0.43807)
D(LNREER)	-0.022259
	(0.06058)
D(LNCPI)	0.001608
	(0.01752)
D(BM)	47.10378
	(12.4056)

2 Cointegrating Equation(s):	Log likelihood	47.96107		
Normalized cointegrating coefficients (standard error in parentheses)				
LNVAD	LNFDI	LNREER	LNCPI	BM
1.000000	0.000000	2.083213	-2.513506	0.002940
		(0.31944)	(0.29622)	(0.00219)
0.000000	1.000000	1.410100	-1.131348	0.035443
		(0.76056)	(0.70526)	(0.00521)
Adjustment coefficients (standard error in parentheses)				
D(LNVAD)	-0.140434	0.078630		
	(0.14259)	(0.05095)		
D(LNFDI)	-0.538023	-0.507248		
	(0.69161)	(0.24711)		
D(LNREER)	-0.277932	0.009811		
	(0.08406)	(0.03003)		
D(LNCPI)	0.020165	-0.000707		
	(0.03034)	(0.01084)		
D(BM)	59.40072	-29.28418		
	(21.5216)	(7.68956)		

3 Cointegrating Equation(s):	Log likelihood	56.38833		
Normalized cointegrating coefficients (standard error in parentheses)				
LNVAD	LNFDI	LNREER	LNCPI	BM
1.000000	0.000000	0.000000	-10.11748	0.140781
			(1.80377)	(0.02878)
0.000000	1.000000	0.000000	-6.278375	0.128746
			(1.34819)	(0.02151)
0.000000	0.000000	1.000000	3.650116	-0.066168
			(0.86570)	(0.01381)
Adjustment coefficients (standard error in parentheses)				
D(LNVAD)	-0.164891	0.092939	-0.202065	
	(0.15683)	(0.06388)	(0.27018)	
D(LNFDI)	0.293345	-0.993673	-1.143093	
	(0.64301)	(0.26192)	(1.10774)	
D(LNREER)	-0.351004	0.052564	-0.626067	
	(0.08542)	(0.03479)	(0.14715)	
D(LNCPI)	0.012549	0.003749	0.034662	
	(0.03326)	(0.01355)	(0.05730)	
D(BM)	35.55927	-15.33482	62.57748	
	(20.6148)	(8.39709)	(35.5142)	

4 Cointegrating Equation(s): Log likelihood 62.41641

Normalized cointegrating coefficients (standard error in parentheses)

LNVAD	LNFDI	LNREER	LNCPI	BM
1.000000	0.000000	0.000000	0.000000	-0.102927
				(0.01720)
0.000000	1.000000	0.000000	0.000000	-0.022486
				(0.00904)
0.000000	0.000000	1.000000	0.000000	0.021756
				(0.00384)
0.000000	0.000000	0.000000	1.000000	-0.024088
				(0.00380)

Adjustment coefficients (standard error in parentheses)

D(LNVAD)	-0.110790	0.090526	-0.266043	0.059404
	(0.17248)	(0.06327)	(0.28171)	(0.56311)
D(LNFDI)	0.450358	-1.000677	-1.328770	-1.736971
	(0.71108)	(0.26085)	(1.16142)	(2.32159)
D(LNREER)	-0.343698	0.052238	-0.634706	0.897171
	(0.09492)	(0.03482)	(0.15503)	(0.30989)
D(LNCPI)	0.054882	0.001860	-0.015400	-0.249187
	(0.03099)	(0.01137)	(0.05062)	(0.10119)
D(BM)	28.45925	-15.01810	70.97368	2.693810
	(22.6720)	(8.31680)	(37.0304)	(74.0210)

Appendix 5: Vector Error Correction Model (VECM)

Vector Error Correction Estimates
Date: 08/06/15 Time: 21:49
Sample (adjusted): 1981 2010
Included observations: 30 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1
LNVAD(-1)	1.000000
LNFDI(-1)	-0.437514 (0.05670) [-7.71578]
LNREER(-1)	1.320172 (0.23874) [5.52967]
LNCPI(-1)	-2.152769 (0.21227) [-10.1415]
BM(-1)	-0.013404 (0.00203) [-6.61066]
ECT(-1)	-0.213957 (0.18275) [-1.17074]
C	-5.749482

Error Correction:	D(LNVAD)	D(LNFDI)	D(LNREER)	D(LNCPI)	D(BM)	D(ECT)
CointEq1	-0.164218	0.540590	-0.096621	0.002234	73.07670	-0.271166
	(0.12221)	(0.65710)	(0.08717)	(0.02559)	(17.5109)	(0.15438)
	[-1.34378]	[0.82269]	[-1.10842]	[0.08728]	[4.17321]	[-1.75651]
D(LNVAD(-1))	0.685799	5.710007	0.595556	0.223562	-139.7837	-0.074280
	(0.86040)	(4.62640)	(0.61373)	(0.18018)	(123.288)	(1.08692)
	[0.79707]	[1.23422]	[0.97039]	[1.24076]	[-1.13380]	[-0.06834]
D(LNFDI(-1))	-0.011312	-0.643699	-0.067546	-0.005127	18.69086	0.000461
	(0.09799)	(0.52690)	(0.06990)	(0.02052)	(14.0413)	(0.12379)
	[-0.11544]	[-1.22166]	[-0.96634]	[-0.24984]	[1.33113]	[0.00372]
D(LNREER(-1))	0.515373	2.432384	0.746240	0.149824	-126.1058	0.597620
	(0.83428)	(4.48592)	(0.59509)	(0.17471)	(119.544)	(1.05391)
	[0.61775]	[0.54223]	[1.25399]	[0.85755]	[-1.05489]	[0.56705]
D(LNCPI(-1))	-0.972932	-13.06749	-0.508911	-0.088725	408.3026	0.319899
	(2.61718)	(14.0726)	(1.86684)	(0.54808)	(375.016)	(3.30618)
	[-0.37175]	[-0.92858]	[-0.27260]	[-0.16188]	[1.08876]	[0.09676]
D(BM(-1))	-0.002235	0.001953	-3.99E-05	0.000119	0.229319	-0.002082
	(0.00132)	(0.00710)	(0.00094)	(0.00028)	(0.18916)	(0.00167)
	[-1.69274]	[0.27515]	[-0.04234]	[0.42892]	[1.21231]	[-1.24869]
D(ECT(-1))	-0.541174	-4.872101	-0.602334	-0.149781	93.03201	-0.148976
	(0.85761)	(4.61138)	(0.61174)	(0.17960)	(122.887)	(1.08339)
	[-0.63102]	[-1.05654]	[-0.98463]	[-0.83398]	[0.75705]	[-0.13751]
C	0.064046	-0.173779	-0.050392	0.010926	1.420225	0.003344
	(0.03572)	(0.19208)	(0.02548)	(0.00748)	(5.11878)	(0.04513)
	[1.79284]	[-0.90470]	[-1.97758]	[1.46052]	[0.27745]	[0.07411]

R-squared	0.345077	0.298843	0.246534	0.365583	0.517330	0.291480
Adj. R-squared	0.136693	0.075748	0.006795	0.163723	0.363754	0.066042
Sum sq. resids	0.179888	5.200947	0.091528	0.007889	3693.468	0.287070
S.E. equation	0.090425	0.486217	0.064501	0.018936	12.95704	0.114231
F-statistic	1.655964	1.339531	1.028343	1.811075	3.368549	1.292948
Log likelihood	34.18114	-16.28280	44.31653	81.08414	-114.7650	27.17026
Akaike AIC	-1.745409	1.618854	-2.421102	-4.872276	8.184334	-1.278017
Schwarz SC	-1.371756	1.992506	-2.047449	-4.498623	8.557987	-0.904364
Mean dependent	0.093935	0.000000	-0.014823	0.029720	1.833333	-0.008914
S.D. dependent	0.097321	0.505748	0.064721	0.020707	16.24401	0.118200

Determinant resid covariance (dof adj.)	3.81E-11
Determinant resid covariance	5.93E-12
Log likelihood	132.3516
Akaike information criterion	-5.223437
Schwarz criterion	-2.701282

Appendix 6: Granger Causality

Pairwise Granger Causality Tests
Date: 08/05/15 Time: 22:52
Sample: 1979 2010
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
LNFDI does not Granger Cause LNVAD	30	2.63107	0.0918
LNVAD does not Granger Cause LNFDI		3.09752	0.0628

Pairwise Granger Causality Tests
Date: 08/05/15 Time: 22:53
Sample: 1979 2010
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
LNREER does not Granger Cause LNVAD	30	1.86257	0.1762
LNVAD does not Granger Cause LNREER		2.53998	0.0990

Pairwise Granger Causality Tests
Date: 08/05/15 Time: 22:53
Sample: 1979 2010
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
LNCPI does not Granger Cause LNVAD	30	0.03292	0.9677
LNVAD does not Granger Cause LNCPI		7.48788	0.0028

Pairwise Granger Causality Tests
Date: 08/05/15 Time: 22:54
Sample: 1979 2010
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
BM does not Granger Cause LNVAD	30	1.77085	0.1909
LNVAD does not Granger Cause BM		3.43759	0.0480