

FOREIGN DIRECT INVESTMENT INFLOWS IN MALAYSIA: A QUANTITATIVE APPROACH

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Submission date: 15 Feb 2018

Accepted date: 01 April 2018

Published date: 20 May 2018

Abstract

This study had been conducted due to realizing the importance of FDI inflows. After considering previous studies, this study aims to (1) examine the relationship between FDI inflows in Malaysia and the macroeconomic variables (gross domestic product (GDP), inflation (INF), trade openness (TRO), exchange rate (ERT), government consumption expenditure (GSE)) and (2) to determine the main macroeconomic variables that affect FDI inflow in Malaysia. The data for the macroeconomic variables were obtained through World Bank Data and the data sampling was drawn from 37 years' time series data (1980 until 2016). Based on the findings that were analyzed using multiple linear regression and time-series approach, this study found that there is a positive relationship between FDI inflows and the two macroeconomic variables which are GDP and INF. While the three other macroeconomic variables (TRO, ERT, and GSE) have not shown any significant relationship towards FDI. Future researchers are suggested to provide different models in order to investigate FDI inflows in Malaysia. The model used in this study could provide evidence on a relationship between FDI inflows and the macroeconomic variables.

Keywords: Foreign direct investment, gross domestic product, inflation, trade openness, government consumption expenditure.

1.0 INTRODUCTION

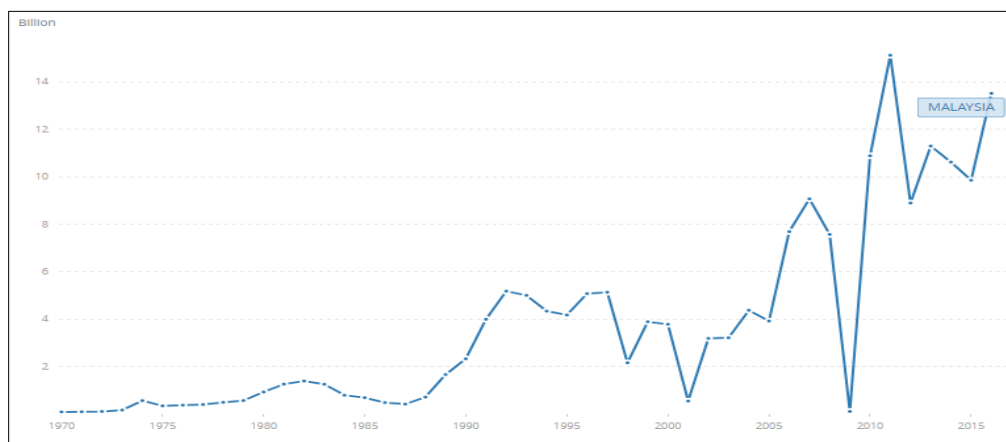
Foreign direct investment (FDI) plays an increasingly important role in the growth and development of Malaysian economy. It brings many benefits such as stable capital inflows, technological know-how, transfer of technology, highly-paying jobs, entrepreneurial and workplace skills. FDI sets a significant movement for expanding and strengthening the global business of developing countries.

Generally, FDI net inflow can be defined as the value of an inward direct investment made by non-resident investors in the reporting economy. Past studies show that Malaysian FDI inflows have a positive causal effect on the financial development and economic growth. The creation of more financial intermediaries

with technological advancement will give a more positive environment to foreign investment (Shahrudin, Zarinah & NurulHuda, 2010).

In the past few decades, Malaysia represented a rising trend of FDI inflows over the years since 1970. In 2016, FDI in Malaysia recorded a higher net inflow of RM47.2 billion (2015 was RM39.4 billion) and the FDI position registered RM546.6 billion. This was supported by higher net inflow in equity and investment fund shares (Department of Statistics Malaysia, 2016). According to Mithani, Ahmad and Adam (2008), the rising trend in the flow of FDI in the country could have been attributed to the shifting policy and the market growing orientation of the country.

During the Asian Financial Crisis, Malaysia has maintained its inward FDI where it provided a useful supplement to domestic investment, with the ratio 12 percent to the gross fixed capital formation (UNCTAD, 2017). However, the Global Financial Crisis in 2007-2009, had led to a collapse of worldwide FDI flows. Malaysian FDI inflows dropped from USD8,594.7 billion in 2007 to USD7,171.80 in 2008 and USD1,453.0 in 2009.



Sources: <https://data.worldbank.org>

Figure 1 FDI Net Inflows 1970-2016 (BoP, Current USD)

As shown in Figure 1, Malaysia is taking the opportunity to change its strategies to guarantee the sustainability of the growth performance after the Global Financial Crisis. Malaysia has strengthened its economy and the FDI inflow was oscillating between USD 9 billion and USD 12 billion in 2010, making the country one of the highest recipients of FDI in its region. After reaching USD 11,121.50 billion, FDI flows dropped to USD 9,928.90 billion in 2016, against the backdrop of a general decline of investments in Southeast Asia (UNCTAD, 2017). Even though FDI is less sensitive to certain crises, the eruption of the financial crisis in East and South-East Asia has, in fact, changed a few major FDI determinants, at least in the short and medium term (UNCTAD, 1998).

Despite these empirical facts, only a few studies have examined the factors affecting FDI inflows primarily from the macroeconomic point of view. Apart from that, most of the studies that have been conducted are outside Malaysia and only focused on the three macroeconomic variables such as gross domestic product, trade, and exchange rate. Hence, the consequence of using only these three macroeconomic variables is that it produces a less explanation about the impact of the macroeconomic towards FDI inflows.

2.0 THE OBJECTIVES OF THE STUDY

The intention of this study is to provide empirical results on the following research objectives (RO):

- (i) To examine the relationship between FDI inflows in Malaysia and the macroeconomic variables. Specifically, this study will examine the relationship between FDI inflows in Malaysia between domestic growth products, inflation, trade openness, exchange rates and government consumption expenditure.
- (ii) To determine the main macroeconomic variables that affect FDI inflow in Malaysia.

The rest of this paper will discuss the literature review of the study, the data collection, the empirical methodology and finally, the results and conclusion of the study.

3.0 LITERATURE REVIEW

3.1 Foreign Direct Investment (FDI)

Over the last decade, Foreign Direct Investment (FDI) has been receiving severe competition for inward FDI inflows in developing countries. Thus, FDI plays an important role in the continuing process of integration and liberalization of the world economy particularly in developing countries. The movement FDI in developing countries is the fastest and highest source of development. Current analyses of effects of FDI on local firms in developing and transition countries propose that foreign investment increases local productivity growth.

Besides, FDI presents a direct influence on economic growth through the transfer of new technologies and know-hows of the human resources structure, integration in the global market, enhance competition, and firm's development and reorganization. The developed countries shift in form of foreign direct investment into developing nations to transform them from agriculture economies to industrial economies, thus this FDI attests to provide the benefit for such countries (Wajid & Zhang, 2017)

Normally, participation in management, joint venture, transfer of technology and expertise will be absorbed in an enterprise operation. FDI is a key component for successful economic growth in developing countries because of the concentration of the economic development in the efficiency of the transfer and the implementation of the best practice across boundaries. A company itself must acquire some of the assets such as products and the power of technology or management and marketing expertise that can be utilized beneficially in the foreign associate in order to invest in production in the foreign market (Klein, Aaron & Hadjimichael, 2001; Kindleberger, 1969)

3.2 FDI and Gross Domestic Product (GDP)

The relationship between FDI and GDP has been a topical issue for several decades. Many researchers have conducted studies to investigate the positive causal relationship between them. GDP is used as the measure of the overall size of the economy and country. It can be described as the amount of good and service produced during a period of the year. GDP can show the host country's ability to bring out their own advantage to the foreign investors. According to Pattayat (2016), GDP is defined as the market value of all the goods and services produced within the geographical boundary of the country. Thus, it helps in determining the total product produced within the country besides reflecting on the standard of living of the people within the domestic territory.

The market demand and market size have a positive impact on the FDI because they directly affect the expected revenue of the investment; the larger the market size of economy, the more FDI should attract as they locate new profit opportunities (Hansen & Rand, 2006; Faeth, 2005; Sun, Tong & Yu, 2002). Besides that, Maheswari (2015) found that the increase of growth rate will attract more foreign investment since the economies of scale and optimum utilization of resources in the larger market are not only beneficial to the investors but also to the growth of the country. Modou and Liu (2017) also reported that results from Pedroni's heterogeneous panel long-run relationship analysis show a positive relationship exists between FDI and GDP.

On the other hand, according to Borensztein, Gregorio, and Lee (1998), FDI is an important instrument for the transfer of technology which contributes more to growth (GDP) than domestic investment only when a sufficient advanced technology is available in a host country. Generally, GDP has a positive relationship with FDI on the market size of the host country based on the volume of foreign investment received (Marwah & Takavoli, 2004; Balasubramanyam, Salisu & Sapsford, 1999). Thus, larger GDP of a host country will attract more foreign investment (Faeth, 2005; Pfeferman & Madarassy, 1992).

Previous studies also proposed that the amount of the FDI and the host country's GDP have a positive relationship, suggesting that a larger market size can increasingly attract FDI inflows (Xaypanya, Rangkakulnuwat & Paweenawat, 2015; Ho, 2004; Wei & Liu, 2001; Braunerhjelm & Svensson, 1996; Grosse & Trevino, 1996). In addition, research done by Li and Liu (2005) concluded that there is a strong connection between FDI and economic growth (GDP) in both developed and developing countries.

Although most of the studies found the importance of economic growth on FDI, there are also other studies which failed to validate the hypothesis. For instance, Zakari (2017) did not find a significant effect of GDP on FDI in Nigeria. Kahai (2011) also could not establish a significant relationship between economic growth and FDI using the data from 1998 and 2000 for fifty-five developing countries. Moreover, some of the investigations done by Laura (2003) stated that the FDI in primary sector has significant with negative effect on growth while in manufacturing, there is a positive effect but Moniruzzaman, Kazi, Al-Atiyat, and Mahmood (2014) and David and Jung (2003) in their studies found the effect of FDI to be insignificant.

3.3 FDI and Inflation (INF)

Based on past researchers, Consumer Price Index (CPI) is normally used as a proxy of the inflation rate. Generally, a higher inflation rate may reflect instability of the macroeconomic policy of the host country (Shahrudin et al., 2010). According to Razafimahefa et al. (2005), the volatility of CPI could discourage inflows of FDI because it comes as a sign of an unstable domestic macroeconomic condition.

Aside from that, level of inflation has a positive impact towards FDI inflows into a host country because it directly affects the revenue of investment (Ryan & Veselina, 2017; Xaypanya et al., 2015; Faeth, 2005). Moreover, according to Xaypanya et al. (2015), despite the financial crisis, foreign investors are still interested in investing more in ASEAN countries as these countries have offered attractive investment to them.

Besides positive impact, some of the researchers indicated that inflation rate has less significance towards FDI inflows. Hongtian (2011) stated that inflation is not significant to the FDI inflows in China. Aykut and Sayek (2007) also found that Turkey's success in reducing inflation should not be expected to be a significant role in influencing FDI inflows. Moreover, Rangkakulnuwat et al. (2015) also reported that inflation rate has a negative impact on FDI inflows into the ASEAN region.

3.4 FDI and Trade Openness (TRO)

The effect of trade openness on a country's economic growth can be encouraging and important, primarily due to the accretion of physical capital and technological transfer. Inward FDI can produce a significant role through growing and increasing the source of funds for national investment in the host country. The recent empirical study has proven that FDI and trade contribute significantly to economic growth. The positive impact can be completed through the production chain when external investors buy and sell intermediate inputs to domestic enterprises (Modou & Liu, 2017). Moreover, inward FDI can potentially increase the host country's export volume that leads the developing country to increase their foreign exchange earnings.

Trade openness in Singapore has played a significant role on the country's sustainable development since the openness in trade has led to lower environmental degradation and directly impacted on higher economic growth as a pillar of FDI (Ridzuan, Ismail & Hamat, 2017). On the other region, investigation on causal relationship in the Eurozone countries shows that these variables are cointegrated thru through the combination of opening the countries have raised inflows on the long run while in the short run, it can boost the economic growth by strengthened strengthening the role of financial development (Pradhan, Arvin, Hall & Nair, 2016).

Moreover, Lord (1999) and Rahmah and Ishak (2003) found that the openness to trade is expected to have a positive correlation with FDI inflow because total trade is the sum of import and export that shows the openness of economic. This is also supported by Xaypanya et al.(2015) who claimed that the level of trade openness has a positive effect towards FDI inflows in ASEAN 3.

According to Balasubramanyam et al. (1996) and Addison and Heshmati (2003), FDI is a major element of economic growth and has a positive impact in developing countries only for countries that have openness and promoting export policy. Moreover, Srinivasan (2011) stated that the openness of trade has a significant positive relationship to the FDI inflows. Most of the investors are keen to invest in a country with high trade openness, good regulatory, economic and investment policies (Rammal, 2006) and in countries that practice open economic policies.

However, due to certain economic factors and trade conditions, trade openness also may have resulted in insignificant effect on the FDI inflows. A study done by Kolstad and Villanger (2008) and Asiedu (2002) for instance, found that trade openness is insignificant towards FDI in Africa than in other developing countries. Their results show that African countries have received lower FDI because of less trade openness.

3.5 FDI and Exchange Rate (ERT)

A proper exchange rate management in many ways can sustain the level of import and export. The main element of the instability of one exchange rate is determined by the demand and supply of the currency itself (Javed & Farooq, 2009). Commonly, when the currency is devalued, the domestic goods become cheaper and the imported goods become expensive.

A study done by Zubair (2003) has shown that FDI and exchange rate has an inverse relationship. Depreciation of the Yuan against the US dollar encourages FDI inflows into China. Moreover, according to Hongtian (2011), depreciation of Yuan will increase FDI and then provide benefits to the export sectors, thus attracting more foreign direct investment inflows in China. However, in contradiction, the study done by Nyarko (2011) and Tuman and Emmert (1999) show that exchange rate has no effect on FDI.

In the case of Malaysia, the findings of relationship between FDI and ERT are mixed. Some of the previous studies suggested that FDI in Malaysia has positive correlations with exchange rates over the years (Ruiz, 2005; Chaudhary, 2012) due to a depreciation of real exchange rate may lower borrowing cost, increased export, and FDI in Malaysia. However, the recent study done by Nasir (2016), shows that exchange rates are negatively correlated with FDI.

3.6 FDI and Government Consumption Expenditure (GSE)

Government consumption expenditure is a transaction of the government expenditure on goods and services that are used for the individual and community's needs. It consists of spending by government to produce and provide services to the public. Ahmad (2015) in his study found that host country welfare captured by general government on final consumption expenditure shows a significant and positive relationship with FDI inflows at ten percent level with a p-value of 0.0595. This finding is consistent with Zenegnaw (2010) who found that government's expenditure positively influences the FDI inflows.

Previous studies have used different proxies in order to measure the government infrastructure development such as the total government spending on transport and communication (James, 2008), infrastructure index (Sahoo, 2006) and government development expenditure (Zubair, 2006). James (2008) included a wider exposure of FDI determinants with data from 1960 to 2005. His study found that government spending on infrastructure is an important determinant of FDI. Increase in development expenditure should have a positive impact on FDI (Moniruzzaman et al., 2014). On the other hand, Xaypanya et al. (2015) also found a positive effect of infrastructure facility (government consumption expenditure) of FDI inflows.

However, some empirical analysis results are insignificant towards FDI. Studies done by Moses and Yaoshen (2014) and Azam and Lukman (2010) found that government consumption expenditure is insignificant with the unexpected sign towards FDI inflows for Pakistan, India, and Indonesia. On the other hand, Shahrudin et al. (2010) stated that government infrastructure expenditure, represented by a variable of government development expenditure has insignificant results towards FDI inflows. Furthermore, Safdari, Mehriziand Elai (2011) claimed that an increase in government's public expenditure will decrease the FDI inflows. It can be concluded that government's public expenditure gives a negative impact on FDI. However, the results of the findings are not consistent with Moses and Yaoshen (2014) who found the contradictory findings, where government consumption expenditure was found to be insignificant FDI inflows into Tanzania.

The above literature review raises the question of what the relationships are likely to be on FDI inflows to the macroeconomic variables. Therefore, the following hypotheses are developed based on the objectives and after considering the past research:

- H₁: GDP is significantly related to FDI inflows in Malaysia.
- H₂: INF is significantly related to FDI inflows in Malaysia.
- H₃: TRO is significantly related to FDI inflows in Malaysia.
- H₄: ERT is significantly related to FDI inflows in Malaysia.
- H₅: GSE is significantly related to FDI inflows in Malaysia.

4.0 METHODOLOGY

This study used secondary data obtained from World Bank Data. The sample was drawn from 37-year time series data from 1980 until 2016. The data of this study consist of foreign direct investment (FDI) inflows,

gross domestic products (GDP), inflation (INF), trade openness (TRO), exchange rates (ERT), government consumption expenditure (GSE) and the following table shows its proxy.

Table 1 Variables and Its Proxy

Variables	Proxy	Units	Symbol
Foreign direct investment	Foreign direct investment, net inflows	Percentage	FDI
Gross domestic product	GDP growth (annual)	Percentage	GDP
Inflation	Inflation, consumer prices (annual)	Percentage	INF
Trade openness	Total trade	Percentage	TRO
Exchange rates	Real exchange rates	RM/USD	ERT
Government consumption expenditure	General government final consumption expenditure	Percentage	GSE

In this study, multiple linear regression analysis was used in order to examine the relationship between macroeconomic variables and FDI inflows. The linear relationship between the dependent and the independent variables was examined through time-series approach and inferences were drawn based on the regression model as follows:

$$FDI_t = \beta_0 + \beta_1 GDP_{t,1} + \beta_2 INF_{t,2} + \beta_3 TRO_{t,3} + \beta_4 ERT_{t,4} + \beta_5 GSE_{t,5} + \varepsilon \quad (\text{Equation 1})$$

FDI is the foreign direct investment inflows in Malaysia, β_i is the coefficient measuring the change in FDI inflows, GDP is the value of gross domestic product, INF is the value of inflation, TRO is the value of trade openness, ERT is the value of exchange rate, GSE is the value of government consumption expenditure and ε is the error term.

5.0 DATA ANALYSIS AND FINDINGS

5.1 Descriptive Analysis

Table 2 shows the summarised results of the descriptive analysis for each variable in this study. In this study, all variables that have been used were from raw data. The analysis indicates that on average the dependent variable of this study, which is FDI inflows in Malaysia, was ($\mu = 3.9713$, $\sigma = 1.8485$).

Table 2 Summary Result of Descriptive Analysis

	FDI	GDP	INF	TRO	ERT	GSE
Mean	3.9713	5.8759	3.0024	159.0278	3.1307	13.2262
Minimum	8.7605	10.0027	9.7000	220.4074	4.2982	18.0534
Maximum	0.0567	-7.3594	0.2900	105.0571	2.3048	9.76896
Standard Deviation	1.8485	3.7655	1.9038	37.14809	0.6138	1.94471

Note: All variables measure by raw data; Number of samples for each variable is 37 observations

In terms of independent variables, the analysis reported in Table 2 indicate that, TRO ($\mu = 159.0278$, $\sigma = 37.14809$) had the highest value of the average value among a set of independent variables, followed by GSE ($\mu = 13.2262$, $\sigma = 1.94471$) variable, GDP ($\mu = 5.8759$, $\sigma = 3.7655$), ERT ($\mu = 3.1307$, $\sigma = 0.6138$), and lastly INF ($\mu = 3.0024$, $\sigma = 1.9038$).

5.2 Test of Multicollinearity – Variance Inflation Factors

The summary results of this assessment were reported in Table 3. indicated that, there is no multicollinearity issues among the independent variables used in this study since the central value of the VIF for each independent variable were below 10 (Range: 1.1725 to 4.1858) as suggested by Lazim (2007) and also by Gujarati and Porter (2010).

Table 3 Summary Results of Multicollinearity Analysis

Variables	Coefficient Variance	Uncentered VIF	Centered VIF
C	27.0965	561.5408	NA
GDP	0.0041	4.1067	1.1725
INF	0.0163	4.2405	1.1924
TRO	0.0001	72.7905	3.6697
ERT	0.2870	60.4779	2.1800
GSE	0.0549	203.1783	4.1858

5.3 Result on Multiple Linear Regression

A multiple regression analysis was performed between a set of chosen macroeconomic variables (i.e. GDP, INF, TRO, ERT, and GSE) towards FDI inflows in Malaysia. The multiple regression model used is specified as in Equation 1:

$$FDI_t = \beta_0 + \beta_1 GDP_{t,1} + \beta_2 INF_{t,2} + \beta_3 TRO_{t,3} + \beta_4 ERT_{t,4} + \beta_5 GSE_{t,5} + \varepsilon$$

Table 4 Summary Results of Multiple Regression Model (Equation 1)

Variables	Coefficient	P-Value
C	8.318710	0.1202
GDP	0.236109	0.0009***
INF	0.407731	0.0032***
TRO	-0.003103	0.7888
ERT	-0.508202	0.3502
GSE	-0.368544	0.1259
R-squared	0.550044	
Adjusted R-squared	0.477470	
F-statistic	7.579117	
P-value (F-statistic)	0.000095***	
Durbin Watson	1.246623	

Note: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

The analysis reported in Table 4 indicated that, GDP ($\hat{\beta} = 0.2361$, $p < 0.01$) and INF ($\hat{\beta} = 0.4077$, $p < 0.01$) were positively significant effect towards FDI inflows. However, the TRO ($\hat{\beta} = -0.0031$, $p = 0.7888$), ERT ($\hat{\beta} = -0.5082$, $p = 0.3502$) and GSE ($\hat{\beta} = -0.3685$, $p = 0.1259$) were not having a significant effect towards FDI inflows, since the probability value for each independent variable was above than significant levels.

Besides coefficients, the above regression model could provide sufficient evidence of fitness of the data since the F-test was significant ($F = 7.5791$, $p < 0.01$). It also can be concluded that at least one chosen microeconomic variable in this study was able to predict or gives an effect to FDI inflows in Malaysia. On

another hand, the value of R^2 of the regression model above was 0.5500. Hence, it is indicated that the set of chosen macroeconomic variables could explain about 55.00 percent of variance towards FDI inflows in Malaysia, whereas the remaining about 45.00 percent of FDI inflows total variation were explained by other factors.

From the above results, based on the significant macroeconomic variables, the proposed multiple linear regression model for predicting the FDI inflows in Malaysia can be determined as follows:

$$\widehat{FDI}_t = 8.3187 + 0.2361 \widehat{GDP}_t + 0.4077 \widehat{INF}_t$$

Where \widehat{FDI}_t is the predicted value of the foreign direct investment inflows in Malaysia, \widehat{GDP}_t is the value of gross domestic product and \widehat{INF}_t is the value of inflation.

5.4 Residuals Model Normality Analysis

The first discussion of the regression model was about the normality assessment of the residual model. Referring to the Figure 2, it is indicated that, the residuals of the regression model were normally distributed since the Jarque-Bera Normality test was not significant (Statistic = 0.1979, $p = 0.9058$) which is higher than significant level of one percent ($p > 0.01$), hence the null hypothesis of this test (i.e. the variable was normally distributed) is failed to be rejected.

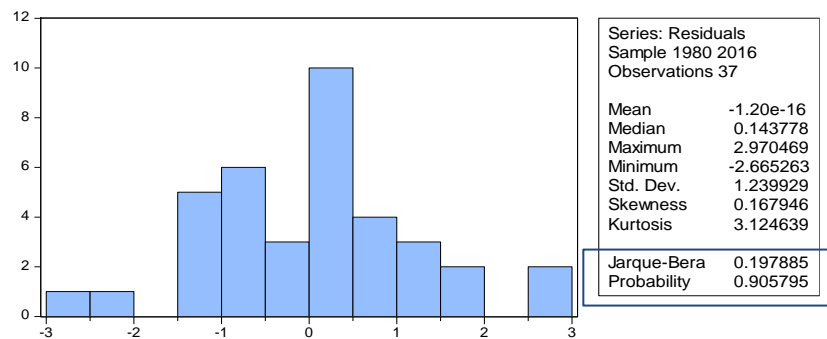


Figure 2 Summary Results of Residuals Model Normality Analysis

6.0 DISCUSSION AND CONCLUSION

This study found a positive relationship between FDI inflows and GDP (Xaypanya et al., 2015; Li et al., 2005; Ho, 2004; Wei et al., 2001; Balasubramanyam et al., 1999; Braunerhjelm et al., 1996; Grosse et al., 1996). Moreover, positive relationship between FDI inflows and inflation in study occurs as it directly affects the revenue of investment in a country (Ryan & Veselina, 2017; Xaypanya et al., 2015; Faeth, 2005).

On the other hand, three independent variables namely trade openness, exchange rate, and government consumption expenditure are insignificant towards FDI inflows. Generally, in order to achieve higher GDP in a host country, the larger trade openness needs to be done. The larger trade openness will create the greater inflow of FDI inflows in a host country. When many manufacturers are involved in export and import sector, this will lead to the larger trade openness. However, FDI inflows and trade openness in this study proved insignificant result (Kolstad et al., 2008; Asiedu (2002) where there is no relationship between FDI and trade openness.

Subsequently, the result on the exchange rate in this study is supported by previous researchers, Nyarko et al. (2011); Tuman et al. (1999) where the exchange rate has no effect towards FDI inflows. The lower currency would give benefit to the foreign investors because exchange rates are also affected by the located decision. The insignificant relationship would lead lower inflows of investment made by the foreign investors into Malaysia. This would also affect the gross domestic product in the host country as lower market demand and size gives an impact on the FDI because it affects the expected revenue of the investment of the country.

The government consumption expenditure is important in the determination of FDI inflows. The increase in government's public expenditure will decrease the FDI inflows (Safdari et al., 2011). However, this study found the insignificant relationship between FDI inflows and government consumption expenditure. This result is supported by Safdari et al. (2011), Azam et al. (2010), Shahrudin et al. (2010) in which government infrastructure expenditure has insignificant relationship towards FDI inflows.

Table 5 below shows the results of hypotheses testing that is in line with research objective according to the multiple linear regression analysis.

Table 5 Results of Hypothesis Testing and Research Objective (RO)

RO (i)	Hypotheses	Decision	Statistical Analysis
To examine the relationship between FDI inflows in Malaysia and the macroeconomic variables.	H ₁ : Gross Domestic Products	Accepted	Multiple Linear Regression
	H ₂ : Inflation	Accepted	
	H ₃ : Trade Openness	Rejected	
	H ₄ : Exchange Rates	Rejected	
	H ₅ : Government Consumption Expenditure	Rejected	

For Research Objective (ii), Table 6 shows the results of this objective.

Table 6 Results of Ranking and Research Objective (RO)

RO (ii)	Ranking	Statistical Analysis
To determine the main macroeconomic variables effects of FDI inflows in Malaysia.	<ol style="list-style-type: none"> 1. Gross domestic product 2. Inflation 	Multiple Regression Analysis

For future researchers, it is suggested to provide recent data and models to investigate FDI inflows in Malaysia. The model used in this study is too empiric and does not attempt to explain in depth about the best determinants of FDI inflows. Further empirical evaluations, however, are needed to replicate the findings in different contexts and surroundings.

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