Journal of Quality Measurement and Analysis *JQMA* 18(3) 2022, 95-109
e-ISSN: 2600-8602 *http://www.ukm.my/jqma*

RELATIONSHIP BETWEEN FOREIGN DIRECT INVESTMENT (FDI) OF THE SERVICE SECTOR AND GDP IN MALAYSIA

(Hubungan antara Pelaburan Langsung Asing (FDI) Sektor Perkhidmatan dengan KDNK di Malaysia)

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ABSTRACT

Foreign direct investment (FDI) has been an important source of economic growth for Malaysia, bringing in capital investment, technology and management knowledge needed for economic growth. Among the sectors in Malaysia, service sector is the main contributor of FDI from other countries. Thus, this study aims to analyse the trend of contributions of FDI from foreign countries in Malaysia. The study also finds the relationship between FDI in service sector and GDP in Malaysia for the year 2010 to 2020 using time series data. Autoregressive Distributed Lag (ARDL) model and empirical analysis are conducted by using quarterly data on FDI in service sector and GDP in Malaysia. The results provide evidence that there is a positive and significant long-run relationship between FDI in service sector and GDP in Malaysia which LFDI rate increase by 1% will lead to the LKDNK rate to increase by 0.15%. However, the empirical evidence has proven that no short-run relationship between FDI in service sector and GDP in Malaysia. Diagnostic tests showed that the residual is normally distributed, free from autocorrelation and heteroscedasticity. This confirms the validity of the ARDL model which is ARDL(3,4).

Keywords: foreign direct investment (FDI); service sector; autoregressive distributed lag (ARDL)

ABSTRAK

Pelaburan langsung asing (FDI) merupakan sumber yang penting dalam pertumbuhan ekonomi di Malaysia. FDI telah membawa masuk modal pelaburan, pemindahan teknologi dan pengurusan sistematik yang diperlukan dalam pertumbuhan ekonomi. Sektor perkhidmatan merupakan penyumbang utama FDI dari negara asing dalam ekonomi Malaysia. Justeru, kajian ini bertujuan untuk menganalisis trend sumbangan FDI dari luar negara di Malaysia. Kajian juga akan mendapatkan hubungan antara FDI dalam sektor perkhidmatan dan KDNK di Malaysia bagi tahun 2010 hingga 2020 menggunakan data siri masa. Model Autoregresif Lat Tertabur (ARDL) dan analisis empirik dijalankan dengan menggunakan data sukuan tahunan bagi data FDI dalam sektor perkhidmatan dan KDNK di Malaysia. Hasil kajian membuktikan bahawa wujudnya hubungan jangka masa panjang yang positif dan signifikan antara FDI dalam sektor perkhidmatan dan KDNK di Malaysia. Peningkatan sebanyak 1% dalam LFDI akan menyumbang kepada peningkatan sebanyak 0.15% dalam LKDNK di Malaysia. Walau bagaimanapun, hasil kajian empirik juga membuktikan bahawa tiada hubungan jangka masa pendek antara FDI dalam sektor perkhidmatan dan KDNK di Malaysia. Ujian diagnostik menunjukkan residual bagi anggaran model adalah tertabur secara normal, bebas daripada masalah autokorelasi dan heteroscedastisiti. Hal ini telah mengesahkan anggaran model ARDL iaitu ARDL(3,4) adalah sesuai digunakan dalam kajian.

Kata Kunci: pelaburan langsung Asing (FDI); Sektor perkhidmatan; Autoregresif Lat Tertabur (ARDL)

1. Introduction

Foreign direct investment (FDI) is defined as an investment involving a long-term relationship and reflecting a lasting interest that control by a resident entity in one economy (foreign direct investor) (UNCTAD 2007).

However, FDI is different from portfolio investment as it refers to investment made in securities and other financial assets such as stocks, bonds and certificate of deposit (Griffin & Pustay 2015). FDI in Malaysia has increased since 1990s due to the implementation of Investment Incentives Act 1968 and Free Trade Zone Act 1970 (DOSM 2020). FDI has become the main component in the economic growth in Malaysia in recent years. The contributions of FDI in Gross Domestic Product (GDP) Malaysia increases from 0.6% in 2001 to 2.2% in 2019. Trend of FDI was quite stable since year 2010 to 2019. (Figure 1) and was at its lowest in year 2009. FDI is brought into Malaysia by the Multinational Companies around the world. They have brought in capitals, technology, and management expertise to Malaysia. Dunning (1973) and Yean *et al.* (2018) mentioned that introduced 'location theory' that stated the main reason multinational companies choose a location is based on the resources available in a particular country. Resources such as labor force, raw materials, infrastructure, regulation barrier and the legislation system are considered. The multinational companies also aim to expand their markets and improve the efficiency of the companies. They find that at the industry level, market size, information communications technology (ICT) infrastructure and human capital have significantly affected FDI inflows into the service sector.

According to the Third Industrial Master Plan (2006-2020), government plans to increase the efficiency and competitiveness of service sector and making it to be the major source of contributor that can increase the GDP in Malaysia (Safik 2013).

Besides, Malaysia government believed that there is potential growth in service sector. Therefore, they liberalized the services' sector to attract more foreign investments and bring more professionals and technology as well as strengthen the competitiveness of the service sector in the local Malaysia Sdn Bhd set-up. The first liberalization of 27 service sub-sectors happened on April 2009 whereas 18 services sub-sectors are liberalized in 2012. Liberalization of service sector allows foreigners to own their business with 100% equity in Malaysia. This opportunity will allow Malaysian companies to expand their business from domestic market into regional markets or global markets. It also provides high quality employment opportunities for the locals as more foreign industries are set in Malaysia. Apart from that, this will also create a conducive business environment to encourage the transfer of specialized expertise and technology into service sectors in Malaysia (Ministry of International Trade and Industry 2019).

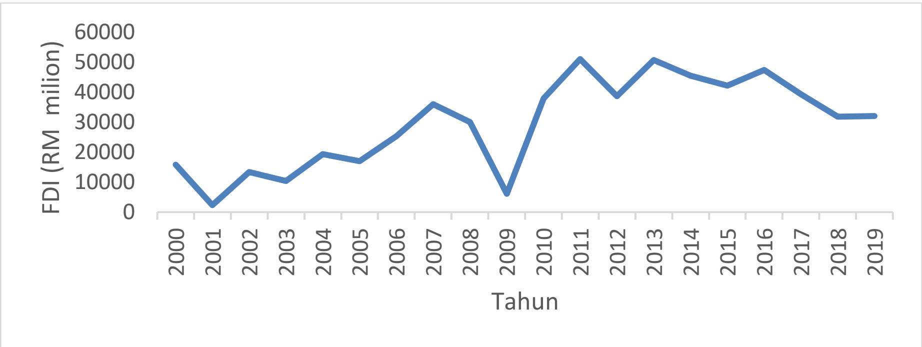

Figure 1: FDI trend in Malaysia (2000 - 2019) (UNCTAD 2007; 2020)

Global FDI inflows fell by 42% to RM 3555.23 billion in 2020 compared to FDI in 2019 that worth RM 7.87 trillion. This decline is mostly from developing countries including Malaysia. Malaysia has experienced a 68% decline in FDI to RM 10.35 billion (UNCTAD 2020). One of the reasons for the decline in FDI was the cancellation of contracts such as East Coast Rail Link (ECRL) with China as well as other contracts (Luqman 2019). Moreover, the unstable politic after the 14th general election has resulted in foreign investors to lose confidence on the ability of governments in managing the economics in Malaysia (Lee 2019). The failure of government in maintaining previously established diplomatic relations as well as inappropriate implementation strategies also contributed to the decline in economic performance in Malaysia in 2020 (Onn 2021; Shuhada 2018).

Figure 2 depicts the net flow of FDI in service sector from year 2010 to 2020 in quarterly form. The trend of FDI is fluctuating from quarter to quarter. Therefore, an empirical analysis is conducted between FDI in service sectors and GDP in Malaysia from year 2010 to 2020.

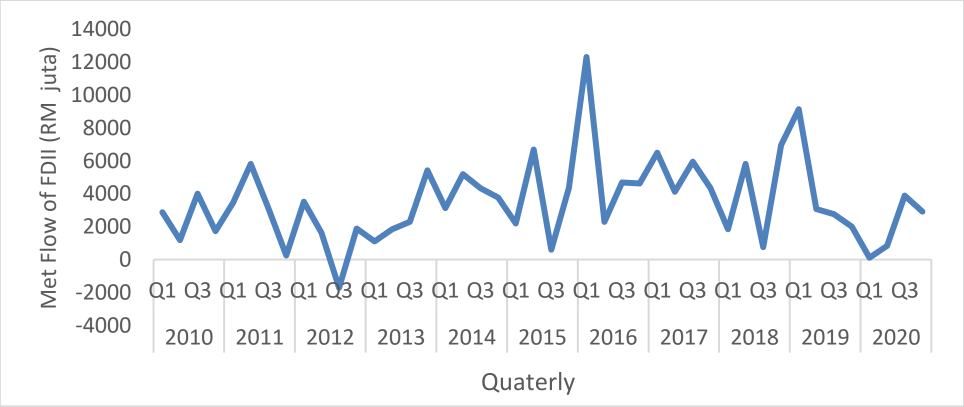

Figure 2: Net flow of FDI in service sector (DOSM 2020)

There are many empirical research related to the factors that attract the inflow of FDI in developing countries. The study of Buckley *et al*. (2002) found that the country with open investment regimes, high savings rate and advanced technology can drive the inflows of FDI. FDI can also cause a negative impact on economic growth in the event of large outflows in the form of dividends and remittances from the multinational companies. The host countries must be economically stable, open markets as well as adequate infrastructure and human capital to ensure capital inflows in the long run (Bengoa & Sanchez-Robles 2003).

Ang (2009) used unrestricted error-correction model (ECM) to study the impact of FDI on the Thai economy from 1970 to 2004. The results showed that FDI had a negative impact on output expansion in the long run. However, Ang also found that the increased in financial development will enhance the inflows of FDI and therefore boost the economic growth in Thailand.

In addition, Autoregressive Distributed Lag (ARDL) model and ECM have been used in studying the long-term and short-term dynamic relationship between FDI and economic growth in China and Pakistan (Naveed *et al*. 2013; Shahbaz & Rahman 2010). Shahbaz and Rahman studied the role of foreign capital inflows and development of domestic financial sector on economic growth in Pakistan. The results showed that foreign capital inflows have positive impact on economic growth in Pakistan. Naveed *et al*. (2013) studied the relationship between FDI and economic growth in China. This study took variables such as GDP in China, gross fixed capital formation, general government final consumption expenditure and FDI.

The results of this study proved that there is long-run and short-run relationship between FDI and the other variables. This positive relationship between FDI and the economic growth in China bridged the gap between theory and practice.

In contrast, there are studies that found insignificant or negative effect of FDI on economic growth in certain countries (Hermes & Lensink 2003; Lee 2010). Hermes and Lensink (2003) found that FDI have negative impact on the host countries based on the 67 developing countries studied. Lee (2010) showed that the economic growth in Japan has a long-term relationship with FDI but not in short-term. Ghazi *et al*. (2017) studied the relationship between FDI and economic growth in several developed countries and developing countries that are members of the Asia Pacific Economic Cooperation (APEC) namely Korea, Singapore, Japan, Malaysia, Thailand and Indonesia. All countries studied have long-term relationship between FDI and economic growth. However, only Korea and Japan have no short-term dynamic relationship between FDI and economic growth.

The study of Har *et al*. (2008) found that FDI have positive and significant relationship towards GDP in Malaysia by using regression method. Besides, Yean *et al*. (2018) mentioned that the inflows of FDI into service sector is affected by market size, infrastructure, ICT, level of education of labor force and human capital in Malaysia. Result from Yean *et al*. (2018) showed that as market size grows, the motivation of the investors to enter the market is high and higher educated workforce is likely to attract more foreign investors into the service sector. One interesting finding is that the regulatory restrictiveness index is insignificant on the inflows of FDI in this study. This result is similar with Noh and Yean (2012) that the liberalization process in service sector was still at a slow pace in Malaysia. This is due to the reason that Malaysian government imposes restrictions on foreign ownership such as Economic Needs Test (ENT) for foreign companies, issues regarding expatriates and other complex restrictions causing the reluctance of foreign investors to expand their market in service sector of Malaysia.

This study aims to analyze the trend of contributions of FDI from foreign countries in Malaysia. The study also finds the relationship between FDI in service sector and GDP in Malaysia. The ARDL bound test is used to study the existence of long-term and short-term dynamic relationships between FDI in service sector and GDP in Malaysia from the year 2010 to 2020.

2. Materials and Methods

The data used in this study are quarterly time series data from year 2010 to 2020 involving 40 observations. The data for net flow of FDI in service sector in Malaysia is obtained from Department of Statistics Malaysia. Data for Malaysia's GDP is obtained from the Knoema.com database. Data on the FDI contributions of foreign countries in Malaysia is obtained from Department of Statistics Malaysia. Then, data cleaning and log transformation is applied on the data for net flow of FDI in service sector and GDP in Malaysia before the analysis. Next, descriptive analysis will be used in this study to describe the basic features of FDI and GDP time series data for both objectives.

2.1 *Augmented Dickey Fuller unit root test*

ADF test is used to check the stationarity of the variables in this study. A variable is said to be stationary if its mean and variance are constant. When unit root exists on the variable, the time series will be non-stationary with non-zero mean and non-constant variance. The stationarity of time series is important in econometric regression process.

ADF test is used to check the existence of unit root in the time series. The existence of unit root means a non-stationary time series. Therefore, the general equation for ADF is:

$$\Delta Y_t = \alpha_0 + \rho_1 Y_{t-1} + \sum_{i=1}^{k} \alpha_1 \Delta Y_{t-i} + \varepsilon_t \qquad (1)$$

with Y_t as dependent variable, Δ as difference operator, t is time, ε is error term, $\{\rho_1, \alpha_1, \dots, \alpha_k\}$ are estimated constant variable and value *k* is the lag selected. Hypothesis test for ADF test is stated as below:

$H_0 : \rho_1 = 0$ (Y_t is not stationary)
$H_1 : \rho_1 < 0$ (Y_t is stationary)

If the *t*-statistics value is greater than critical value, then H_0 is failed to reject. The time series data for the variable is not stationary and first differencing can be done for the data. If H_1 is accepted, then the time series data for the variable is said to be stationary at level, *I*(0).

2.2 *Selection of model for analysis*

The stationarity of each variable obtained of ADF test will be used to select suitable model for analysis of relationship between variables in this study.

If all the variables are stationary at level, *I*(0) then regression model will be used in analysis while Johansen Cointegration test will be selected if all the variables are stationary at first level, *I*(1). However, when the variables are stationary at different level which are the combination of *I*(0) and *I*(1), then Autoregressive Distributed Lag (ARDL) model will be used in the study.

For the selection of lags number, Schwarz Criterion will be used for model estimation. It is important to choose the right number of lags as this will free the model from multi-colinear and heteroscedasticity.

2.3 *Autoregressive distributed lag (ARDL) model*

ARDL model and bound test will be used in analysis when the time series for variables are stationary at different level which are *I*(0) and *I*(1). The ARDL model is used in the study of small sample sizes and to check the existence of a long-term relationship between the dependent variable (GDP in Malaysia, Y_t) and independent variable (Net flow of FDI in service sector, X_t). General equation for ARDL(*p*,*q*) model is stated in equation (2):

$$\Delta Y_t = \alpha_0 + \sum_{i=1}^{p} \alpha_{1i} \Delta Y_{t-1} + \sum_{i=1}^{q} \alpha_{2i} \Delta X_{t-1} + \beta_1 Y_{t-1} + \beta_2 X_{t-1} + \varepsilon_t \qquad (2)$$

Δ is first differencing operator, *p* and *q* are the maximum number of lags in ARDL model, β_1 and β_2 represent long-run elasticity whereas α_{1i} and α_{2i} represent short-run dynamic of the model, ε is the white noise or residual and *t* is the time.

Next, cointegration test or bound test will be conducted to test the existence of long-run relationship between the dependent and independent variables (Pesaran *et al*. 2001). The long-term relationship between the dependent and independent variables are attained by looking at the *F*-statistics in the bound test. The hypothesis of bound test is stated as below:

$H_0 :\ \beta_1 = \beta_2 = 0$ (long-term relationship does not exist)
$H_1 :\ \beta_1 \neq \beta_2 \neq 0$ (long-term relationship exists)

Since there exist different stationary level for each variables, Pesaran *et al*. (2001) suggested two sets of critical value to be calculated from variable $I(0)$ and variable $I(1)$ which are lower bounds critical values (LBC) and upper bounds critical values (UBC). Therefore, conclusions about the existence of cointegration between dependent and independent variables can be obtained by checking the following conditions:

F-statistics value > UBC: Null hypothesis is rejected

F-statistics value < LBC: Null hypothesis is failed to reject

LBC < *F*-statistics value < UBC: No conclusion can be made

If there exists cointegration between dependent and independent variables, the two-steps strategy for ARDL introduced by Pesaran and Pesaran (1997) are applied to check the elasticity of long-term and short-term coefficient in ARDL model. The long-term relationship equation is stated as equation (3):

$$Y_t = \alpha_0 + \sum_{i=1}^{p} \alpha_{1i} Y_{t-1} + \sum_{i=1}^{q} \alpha_{2i} X_{t-1} + \varepsilon_t \quad (3)$$

2.4 *Error correction model (ECM)*

ECM provides information on the causality effect of a negative event to the variables. When long-term relationship exists between the variables, ECM is used to check the short-term relationship between dependent and independent variables. The general equation for ECM is in equation (4):

$$\Delta Y_t = \alpha_0 + \sum_{i=1}^{p} \alpha_{1i} \Delta Y_{t-i} + \sum_{i=1}^{q} \alpha_{2i} \Delta X_{t-i} + \lambda ECT_{t-1} + \varepsilon_t \quad (4)$$

with p and q represent the number of lags in the model, ε_t represents the white noise or residual, ECT_{t-1} represents the error correction term, and λ brings two meaning. First, it measures the speed of adjustment of independent variable converges towards long-term equilibrium. Second, it explains the causality direction among the dependent and independent variables (Asri *et al*. 2015).

As what has discussed, the *ECT* term in the equation is the changes of dependent variable towards independent variable. It represents the deviation of dependent variable in short-term to achieve equilibrium in long-run. If λ shows negative sign and significant, then it confirms the long-run and short-run relationships between the variables in this study.

2.5 *Diagnostic test for residuals*

After the model estimation, diagnostic tests are performed to ensure that the time series data used are appropriate (Dimitrios & Stephan 2007). In diagnostic tests, serial correlation, normality test and heteroscedasticity test are conducted under a sensitivity analysis to determine the authenticity of the data used for the variables included in the model.

For normality test, Jarque-Bera test is used to check the normality of residual in the regression. Test statistics for Jarque-Bera measures the sample skewness S and kurtosis K from the time series data observed. The value of S and K is 0 and 3 respectively based on normality theory (Thadewald & Büning 2007). Test statistics for Jarque-Bera, JB is in equation (5):

$$JB = \frac{n}{6} \cdot [S^2 + \frac{(K-3)^2}{4}] \qquad (5)$$

The sample skewness coefficient, $= \hat{\mu}_3 / \hat{\mu}_2^{3/2}$;

The sample Kurtosis, $= \hat{\mu}_4 / \hat{\mu}_2^{2}$;

with $\hat{\mu}_2$, $\hat{\mu}_3$ and $\hat{\mu}_4$ are second, third and fourth central moments respectively. The estimation for $\hat{\mu}_j$ are stated in equation 6:

$$\hat{\mu}_j = \frac{1}{n} \sum_{i=1}^{n} (x_i - \bar{x})^j \ , \ j = 2,3,4 \qquad (6)$$

Hypothesis for Jarque-Bera test is stated as below:

H_0 : Residual is normally distributed
H_1 : Residual is not normally distributed

If the *p*-value is less than 5% significance level, then null hypothesis is failed to reject and it means that the residual of the time series data is normally distributed.

For autocorrelation of the residual, Breusch-Godfrey Serial Correlation LM (Lagrange Multiplier) test is used. According to Mokhtar (1994), autocorrelation usually occurs in cross-sectional data as well as time-series data. In the cross-section data, the neighboring units tend to be similar with respect to the characteristic under study. In time series data, time is the factor that produces autocorrelation. The existence of autocorrelation will reduce the efficiency of parameters of the ordinary least square model. This can cause biasness in the standard error. The test statistics of LM test (Charles 2020) is stated in equation (7):

$$LM = \frac{n-p_1-k-1}{p_1} \cdot \frac{R^2}{1-R^2} \sim F(p_1, n-p_1-k-1) \qquad (7)$$

with *n* represents sample saiz, p_1 is the order for autoregression, *k* represents the number of independent variables, R^2 represents the value of sample residual run from the model using ordinary least square regression and $\{ n - p_1 - k - 1\}$ represents the degree of freedom. Hypothesis for autocorrelation test is stated as below:

$H_0 : p_1 = 0$ (Autocorrelation does not exist among the variables)
$H_1 : p_1 \neq 0$ (Autocorrelation exists among the variables)

If the *p*-value is less than 5% significance level, then null hypothesis is failed to reject and the residual of the time series data is free from autocorrelation.

Breusch-Pagan-Godfrey test is used to check the heteroscedasticity in the estimated model. Heteroscedasticity occurs if the variance of the residual distribution is not constant for the independent variable. The model with heteroscedasticity problem will cause an inaccurate study result and the estimated model will be not suitable to use. The test statistics for Breusch-Pagan-Godfrey test is stated in equation (8):

$$\mathcal{X}^2 = nR_{new}^2 \tag{8}$$

with n represents the number of observations and R_{new}^2 represents the R-squared for the regression model that use squared residual as dependent variable. Hypothesis test for heteroscedasticity test is stated as below:

H_0 : $\sigma_i^2 = \sigma^2$ (Model is free from heteroscedasticity)
H_1 : $\sigma_i^2 \neq \sigma^2$ (Model has heteroscedasticity)

If the $\mathcal{X}^2$ is small and p-value is less than 5% significance level, then null hypothesis is failed to reject. This means that the variance for the residual is the same and the time series data do not suffer from heteroscedasticity.

2.6 *Stability test*

Brown *et al*. (1975) introduced two tests for checking the constancy of parameter. The tests are based on recursive residuals and are known as cumulative sum of recursive residuals (CUSUM) and cumulative sum of squares residuals (CUSUMSQ) tests. The figure plots of recursive residuals give a reliable picture for the analysis of parameter variations and for decision making. Hypothesis test for stability test is stated as below:

H_0 : All parameters in the model are stable
H_1 : At least one parameter in the model is not stable

CUSUM test is calculated using equation (9):

$$W_t = \sum_{r=k+1}^{t} \frac{w_r}{s} \tag{9}$$

CUSUMSQ test is calculated using equation (10):

$$S_t = \frac{\sum_{r=k+1}^{t} {w_r}^2}{\sum_{r=k+1}^{T} {w_r}^2} \tag{10}$$

with W_t represents the recursive residuals, s represents the standard deviation for recursive residual and $t = k+1, \ldots, T$. If the cumulative sum crosses the 5% critical lines, then the null hypothesis is failed to reject and all parameters in the model are stable.

3. Result and Discussion

3.1 *Trend of FDI contributions from foreign countries in Malaysia*

8 countries that contribute the most FDI to Malaysia are selected for trend analyses which are United States of America, Japan, Hong Kong, China, Singapore, Indonesia, Vietnam and Thailand. From Department of Statistics Malaysia, net flow of FDI from foreign countries is listed in few categories which are mining and quarrying, manufacturing, services and other sectors.

Table 1: Descriptive analysis for contributions of FDI from selected countries in Malaysia (2010-2020) (RM million)

Country	Mean	Minimum
United States of America	2389.00	-4885.00
Japan	6247.60	2220.00
Hong Kong	4922.00	-718.00
China	1645.80	-95.00
Singapore	5022.10	-816.00
Indonesia	626.20	-74.00
Vietnam	212.20	-221.00
Thailand	536.30	-756.00

Table 1 shows the descriptive analysis on the contributions of FDI from foreign countries in Malaysia from 2010 to 2020. The average contributions of FDI from Japan are the highest during 2010 to 2020 followed by Singapore. Net flow of FDI takes into account the difference in FDI inflows and outflows in Malaysia. The negative value means a loss in FDI flows in Malaysia's perspective. This can be seen from few countries which are United States of America, Hong Kong, Singapore, Indonesia, Vietnam and Thailand. The greatest loss in FDI was from the United States of America worth RM 4885.00 million. Japan is the only country that has no negative FDI from 2010 to 2020. Average contributions of FDI from neighboring countries of Malaysia are the lowest which are RM 626.20 million from Indonesia, RM 212.20 million from Vietnam and RM 536.30 million from Thailand.

Malaysia relies heavily on FDI contributions from foreign countries to generate profits, technology transfer and encouraging foreign investors to open market in Malaysia. Figure 3 depicts the trend of net flow of FDI from selected countries in Malaysia.

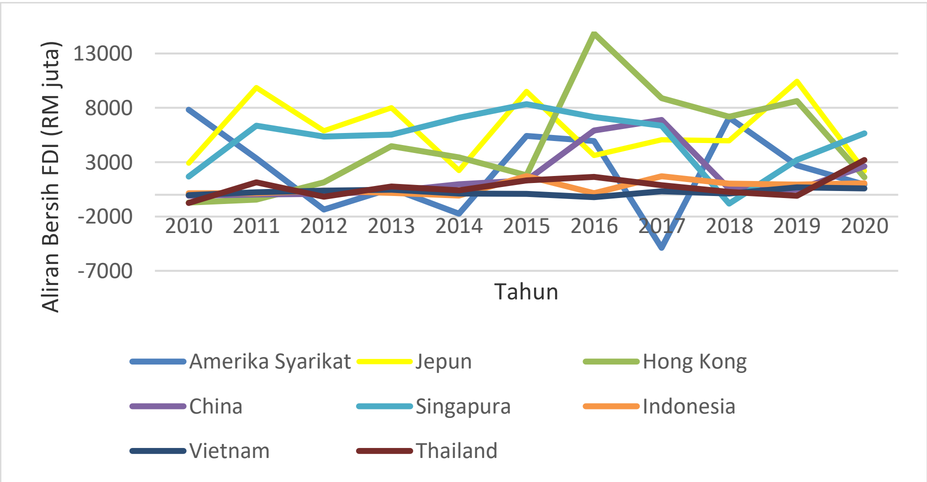

Figure 3: Net flow of FDI from selected countries in Malaysia (2010-2020)

Contributions of FDI of Hong Kong are the highest in 2016, which was RM 14 836.00 million and most of the contributions are from service sector worth RM 12 232.00 million. The United States of America records the lowest FDI contributions (loss) in 2017 which is a loss of RM 4885.00 million. The FDI contribution from Thailand, Indonesia and Vietnam in

Malaysia are the lowest compared to other countries. Indonesia and Vietnam contribute the most in mining and quarrying sector during 2010 to 2020. For Thailand, the contributions of FDI are higher in mining and quarrying sector back in 2015 but change to service sector and manufacturing sectors from 2016 to 2019.

Next, the impact of cancellation of high-cost contracts such as ECRL has led to a fall in FDI contributions from Singapore and China in 2018. This has affected the decision of other countries to invest in Malaysia. The United States of America records a decline in FDI contributions in 2017 after the general election. The contributions of FDI in United States of America are negative value in all sectors, especially in the manufacturing sector which records a loss of RM 3417.00 million.

The economies of the world have experienced a downturn, restricting the financial outflow of all the countries. Malaysian government has declared Movement Control Order (MCO) and restrictions on economic activities in March 2020. Therefore, the contributions of FDI from countries such as Japan, Hong Kong and the United States of America decreased due to MCO. However, there are also countries that still contribute FDI in Malaysia during Covid-19 pandemic in 2020, namely China, Indonesia, Singapore and Thailand, especially in the service sector.

3.2 *Relationship between FDI in service sector and GDP in Malaysia*

The first step is to check whether the variables under consideration are stationary or not by using ADF test. Results of ADF test are shown in Table 2. LGDP represents the time series data for GDP whereas LFDI represents the time series data for FDI after log transformation respectively. The *p*-value for LGDP at level is 0.3649 which is greater than 0.05. Therefore, the null hypothesis is failed to reject and LGDP is not stationary at level. First differencing is applied to LGDP which is D(LGDP), the *p*-value then become 0.0000. Then, null hypothesis is rejected and the D(LGDP) is stationary. Hence, the LGDP series is integrated at first order or $I(1)$.

Table 2: Results of ADF test

	p-value			
Differencing Order	Level		First Differencing	
	Intercept	Trend dan Intercept	Intercept	Trend dan Intercept
LGDP	0.3649	0.0400	0.0000	0.0000
LFDI	0.0000	0.0000	0.0000	0.0000

Result of ADF test on LFDI shows that *p*-value is 0.0000 at level and it is lesser than 0.05. Null hypothesis is rejected and the LFDI series is stationary at level. Therefore, LFDI is integrated at order 0 or $I(0)$. It can be concluded that LGDP and LFDI are integrated at different order namely $I(1)$ and $I(0)$ respectively. Therefore, ARDL model is used for the following analysis as both variables are integrated at different order. LGDP represents the dependent variable whereas LFDI represents the independent variable.

Table 3 shows the result of optimal lag selection in ARDL model using Schwarz Criterion. The selected model is ARDL(3,4). *P*-value for LFDI is less than 10% significance level, therefore we can say that there is sufficient evidence to show that there is significant relationship between LFDI and LGDP in Malaysia. The coefficient of LFDI is positive, so there is positive impact on LGDP because when LFDI increase by 1%, this will lead the LGDP increase by 0.15%.

Table 3: Model estimation

Variable	Coefficient	*p*-value
Dependent variable = LGDP		
LGDP(-1)	1.2605	0.0000
LGDP(-2)	-0.5158	0.0720
LGDP(-3)*	0.2434	0.0729
LFDI	0.0015	0.0678
LFDI(-1)	0.0002	0.8096
LFDI(-2)	0.0016	0.0475
LFDI(-3)	-0.0012	0.1127
LFDI(-4)*	0.0016	0.0444
C	0.1331	0.0272
Schwaz Criterion = -8.6718		

After model estimation, long-term bound test is used to check the long-term relationship between LGDP and LFDI. Table 4 shows the results of long-term bound test. D(LGDP) is the first differencing for LGDP. The *F*-statistic is greater than all upper bound critical values in all significance level with positive sign in LFDI's coefficient, therefore a positive long-term relationship exists between two variables.

Table 4: Long-term bound test

Dependent variable = D(LGDP)				
Variable		Coefficient		*p*-value
LFDI		0.3104		0.0859
C		11.1671		0.0000
Test Statistics	Value	Signficance Level	Lower Bound	Upper Bound
Statistik-*F*	6.9401	10%	3.02	3.51
		5%	3.62	4.16
		2.5%	4.18	4.79
		1%	4.94	5.58

Next, the result of ECM representation of the selected ARDL model is presented in Table 5. The *p*-value of ECM(-1) exceeds 10% significance level, so the short-term relationship does not exist between LFDI and LGDP even though LFDI is significant. Therefore, we conclude that long-term relationship exists between LFDI and LGDP whereas short-term relationship does not exists between these two variables.

The results of diagnostic tests on the residuals of estimated ARDL model are shown in Table 6. The *p*-value for Jarque-Bera test is 0.6522 which is above the 5% significance level. Therefore, null hypothesis is failed to reject at 5% significance level and this means that the residuals of the estimated ARDL model are normally distributed.

The *p*-value and probability of Chi-Square for Breusch-Godfrey Serial Correlation LM test are 0.7565 and 0.6017 respectively. Both values are greater than 5% significance level, therefore null hypothesis failed to reject and this means that residuals of time series for variables have no autocorrelation.

The *p*-value and probability of Chi-Square for Breusch-Pagan-Godfrey test are 0.0.0787 and 0.1076 respectively. Both values are greater than 5% significance level. Therefore, null hypothesis is failed to reject at 5% significance level and this means that the residuals of time series for variables have no heteroscedasticity.

Table 5: ECM representation for selected ARDL model

Dependent variable = D(LKDNK)		
Variable	Coefficient	*p*-value
C	0.0015	0.7714
D(LGDP(-1))	11.1671	0.0372
D(LGDP -2))	1.0289	0.2325
D(LGDP (-3))	-0.3647	0.3548
D(LFDI)	0.0013	0.0680
D(LFDI(-1))	0.0003	0.7182
D(LFDI(-2))	0.0017	0.1238
D(LFDI(-3))	-0.0007	0.5117
D(LFDI(-4))	0.0016	0.1164
ECM(-1)	-0.6765	0.2549

Table 6: Diagnostic tests for residuals of ARDL(3,4)

Diagnostic Tests			
Test	*F*-statistics	*p*-value	Pr(Chi-Square)
Jarque-Bera	0.8548	0.6522	-
Breusch-Godfrey Serial Correlation LM	0.2846	0.7565	0.6017
Breusch-Pagan-Godfrey	2.2194	0.0787	0.1076

Next, the results of stability test are shown in Figure 4 and 5 which are the plots for CUSUM and CUSUMSQ respectively. The plots of CUSUM and CUSUMSQ does not cross the critical bounds at 5% significance level. Hence, null hypothesis is failed to reject and this means that all parameters in the model are stable.

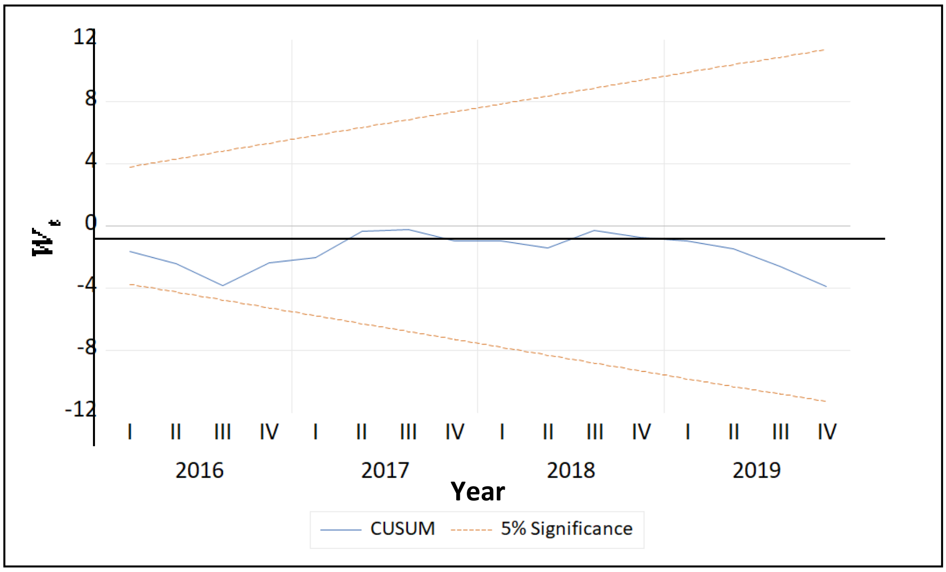

Figure 4: CUSUM plot

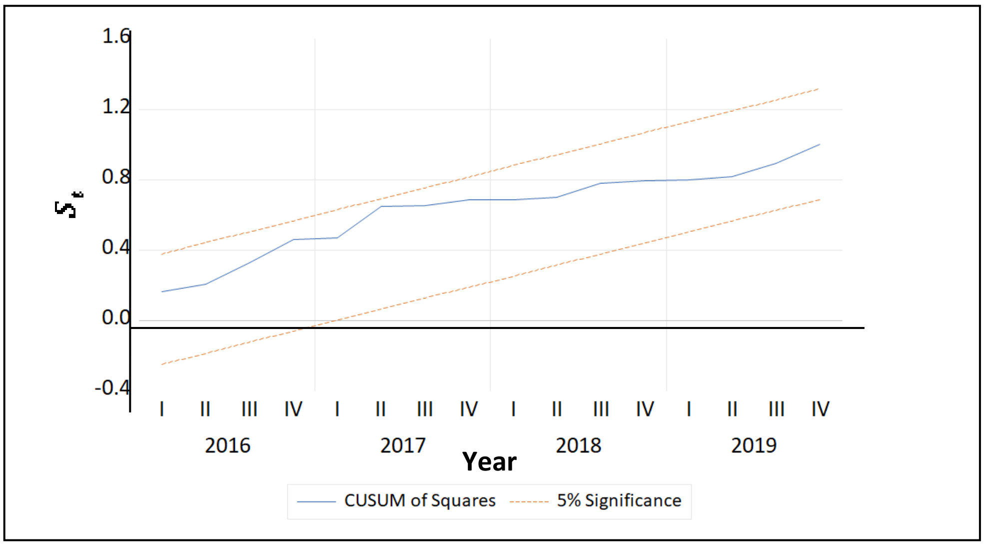

Figure 5: CUSUMSQ plot

4. Conclusion

FDI inflows from foreign countries have contributed extensively to the economy in Malaysia. According to the trend analysis from 2010 to 2020, the major contributions of FDI from foreign countries are in the service sector from Japan, China, Hong Kong, Singapore and Thailand.

Next, this study also seeks to find out the relationship between FDI in service sector and GDP in Malaysia. Since both variables, LFDI and LGDP are stationary in different level, therefore ARDL model is used to conduct the analysis. The results from ARDL and ECM indicate that a positive long-term relationship exists between LFDI and LGDP with 1% increase in LFDI causing an increase of 0.15% in LGDP. However, the short-term relationship does not exist between the variables. The findings of this study is consistent with the results of Ghazi *et al*. (2017) that a long-term relationship between FDI and economic growth exists while a short-term relationship does not exist for Japan and Korea. Short-term relationship that does not exist indicates that there will not be any adjustment on the GDP in Malaysia if there’s any unexpected event causing the deviation of FDI in service sector. Besides the residuals in the model pass all the diagnostic tests and this indicates it is normally distributed, free from autocorrelation and heteroscedasticity. The stability test also shows that all parameters in the model are also stable. Therefore, this confirms the validity of the estimated model which is ARDL(3,4).

Based on the results of this study, it can be concluded that the policy makers need to understand the relationship between FDI in service sector and GDP in Malaysia. Policy makers need to be alert and sensitive to any changes that will affect the economy in Malaysia and respond to the situations efficiently.

Acknowledgement

We are grateful for all the data and information provided by the Department of Statistics in Malaysia and UNCTAD in this research.

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Received: 9 October 2022
Accepted: 8 November 2022

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