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Time Series Analysis of Inward Foreign Direct Investment Function in Malaysia

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Abstract

Using unconditional error correction approach, this article investigates equilibrium relationships between FDI inflows and their determinants (i.e., broadest money supply, consumer price index, exchange rates, gross domestic product, and trade). The observed findings reject the null hypothesis of no co-integration between the series. In addition, the results show that exchange rates, gross domestic product, broadest money supply, and trade have positive impact on FDI inflows. These findings could lead to further research questions that seek answers. For example, future work could add more variables to the function of inward FDI in Malaysia, such as unemployment and energy prices.

Keywords: ARDL approach; ERS statistics test; FDI function; Malaysia; new economic policy.

1. Introduction

Today, the literature includes several studies that identified the determinants of inward foreign direct investment (FDI) in developing countries. FDI is an effective channel to foster investment’s function and thereby the economic growth rate (i.e., the real gross domestic product (RGDP)). Agbloyor, Abor, Adjasi, and Yawson (2013), Hassaballa (2014), and Tang, Yip, and Ozturk (2014) argued that FDI inflows raise the RGDP by improving technological spillovers, management technique upgrades, and international trade integration. However, the second half of the twentieth century was enriched by the light of the new growth theory (NGT). Accordingly, the NGT provides an

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interesting experience to study the correlation between FDI and RGDP. Hsiao and Hsiao (2006) differentiated between neoclassical growth theory and the NGT. The neoclassical growth theory considered technological progress and labor growth as exogenous variables, while FDI inflow is the only variable that increases GDP in short-term. Conversely, the NGT argued that the combination of technological progress, labor growth, and inward FDI has a long-term and short-term effect on the RGDP in host country through technological transfer and spillovers.

However, the schools of neoclassical growth and NGTs provided different effects of FDI on GDP. On the other hand, the literature has determined different variables that explain FDI. For example, Bilgili, Tuluce, and Dogan (2012) examined the determinants of FDI inflows in Turkey by employing regime switching models, taking the quarterly time-series data from 1988 to 2012. The results showed that the determinants (i.e., GDP growth, energy prices, exports, imports, country risks, and labor costs) significantly influenced FDI flows into Turkey. Gheorghe and Vasile (2012) analysed the causality patterns between FDI inflows and the macroeconomic factors (GDP, exports, imports, trade balance, current account, and external balance of payments) in Romania by employing a vector error correction model. The findings demonstrated bidirectional causality between FDI inflows and the examined factors. That is, FDI inflows led to the economic recovery and sustainable development in Romania.

Kyrkilis and Pantelidis (2003) investigated the determinants of outward FDI (i.e., real gross national product, exchange rates, technology, human capital, and economic openness) using annual time-series data for nine countries including, five European Union members, namely France, Germany, Italy, Netherlands, and the United Kingdom, and four non-European union countries, namely Brazil, the Republic of Korea, Singapore, and Argentina. The results indicated that real gross national product was the most important determinant of the outward FDI in the examined countries. For India, Singhania and Gupta (2011) employed an autoregressive integrated moving average model to examine the determinants of FDI inflows. The results showed that 63% of FDI flows into India were explained by the examined macroeconomic variables (i.e., GDP, inflation rate, interest rate, patents, money growth, and foreign trade), while the other 37% of FDI flows into India remained unexplained.

With regard to research on the determinants of FDI flows into Malaysia, few studies were conducted in such area (e.g., Ahmed, 2012; Almsafir, Abdul Latif, & Bekhet, 2011; Ang, 2008; Anwar & Sun, 2011; Bakar, Mat, & Harun, 2012; Hitam & Borhan, 2012). Thus, the main purpose of the current paper is to supplement the existing literature on the determinants of inward FDI by bringing a new evidence for the case of a successful FDI recipient country in South East Asia (i.e., Malaysia). To do so, I employed the unconditional error correction approach developed by Pesaran, Shin, and Smith (2001) to examine the hypotheses of equilibrium relationships between FDI inflows and their determinants (i.e., broadest money supply (M3), consumer price index (CPI), ER, GDP, and trade (T)). The remainder of the paper is outlined as the following way. The next Section presents a snapshot of the Malaysian economy, followed by empirical model, data, and methodology in Section Three. The observed findings are given in Section Four, while conclusions and policy implications are provided in Section Five.

2. Snapshot of the Malaysian economy

Since independence in 1957, Malaysia has embraced liberal policies (i.e., free trade and private property) in an effort to attract FDI. During the (1950−1969) period, Malaysia received a significant amount of aids and, in the 1970s it participated actively in the Eurocurrency market. In the 1980s, Malaysia faced a huge public sector deficit due to the financing of heavy industries, especially during the new economic policy (NEP) period, which increased the amount of government borrowings. The higher financing expenditures to achieve NEP goals, led the Malaysian government to cover the budgetary deficits by utilizing the employee provident fund (Kiong & Jomo, 2005). Government borrowings increased from 3.7% of GDP in 1970 to 11% in 1975, and remained at around 8% of GDP during the (1976−1979) period. In addition, the government borrowing rose around 19% of GDP in 1981 & 1982, and remained in growing around 14% of GDP for the (1983−1987) period (Kiong & Jomo, 2005). Thus, the Malaysian government had attracted FDI to maintain a stable long-term macroeconomic environment and reduce the borrowing capacity. Fig. 1 shows that FDI flows into Malaysia have recorded an annual growth rate of 8.5% for the (1970−2012) period. The continuous flows of FDI into Malaysia stabilized the growth rate of GDP by 6.2% for the same period (see Fig. 2).
3. Empirical model, data, and methodology

The inward FDI function for Malaysia is written as the linear specification form (see (Eq. 1)).

\[ FDI_t = \alpha_0 + \alpha_1 LCPI_t + \alpha_2 ER_t + \alpha_3 LGDP_t + \alpha_4 LM3_t + \alpha_5 LT_t + \varepsilon_t \]  

(1)

Where FDI is the foreign direct investment flows into Malaysia (% of GDP). \( \alpha_0 \) denotes the intercept term. \( \alpha_i \) (i = 1,…, 5) represent the slope parameters. LCPI is the natural log of consumer price index as a proxy of inflation rates. ER is the exchange rates (RM/US$). LGDP is the natural log of gross domestic product (RM billions). LM3 denotes the natural log of broadest money supply in Malaysia (RM millions). LT represents the natural log of total trade (% of GDP). \( \varepsilon_t \) denotes the disturbance term. The time-series variables (i.e., FDI, GDP, CPI, and T) were collected from the World Bank, Development Indicators Databases for annual time-series data (2014). The other time-series variables, ER and M3, were obtained from Bank Negara Malaysia–Kuala Lumpur, Monthly Statistical Bulletin (http://www.bnm.gov.my/). However, the current paper uses the (2005 = 100) and natural log forms to stabilize the variance of time-series variables (see Bekhet & Mugableh, 2013; Bekhet & Mugableh, 2012).

The present paper employs unconditional error correction approach (i.e., the autoregressive distributed lag (ARDL) approach) to analyse long-run and short-run relationships among FDI, LCPI, ER, LGDP, LM3, and LT. The use of this approach is justified since the sample size under consideration is small, 36 observations, for the (1977–2012) period. In addition, the unconditional error correction approach has an advantage to envelop time-series variables at different integration levels: purely I(0), purely I(1), or mutually co-integrated (Bekhet & Al-Smadi, 2014; Bekhet & Matar, 2013; Bekhet & Yasmin, 2013; Mugableh, 2013; Narayan, 2005; Pesaran et al., 2001). The unconditional error correction approach can be enclosed as in Eq. (2).
\[ \Delta FDI_t = \beta_0 + \beta_1 FDI_{t-1} + \beta_2 LCPI_{t-1} + \beta_3 ER_{t-1} + \beta_4 LGDP_{t-1} + \beta_5 LM3_{t-1} + \beta_6 LT_{t-1} + \sum_{a=0}^{h} \lambda_a \Delta FDI_{t-a} + \sum_{b=0}^{h} \lambda_2 \Delta LCPI_{t-b} \]
+ \sum_{c=0}^{h} \lambda_3 \Delta ER_{t-c} + \sum_{d=0}^{h} \lambda_4 \Delta LGDP_{t-d} + \sum_{e=0}^{h} \lambda_5 \Delta LM3_{t-e} + \sum_{f=0}^{h} \lambda_6 \Delta LT_{t-f} + \varepsilon_t \] 

Here \( \Delta \) is the back shift operator; \( \beta_0 \) denotes the intercept term; \( \beta_i \) (\( i = 1, \ldots, 6 \)) represent the long-run coefficients to test the null hypothesis (\( H_0 \)) of no co-integration; (\( FDI_{t-1}, LCPI_{t-1}, ER_{t-1}, LGDP_{t-1}, LM3_{t-1}, \) & \( LT_{t-1} \))’ represent the one lagged variables; \( \lambda_i \) (\( i = 1, \ldots, 6 \)) denote the short-run coefficients of variables at lag orders: \( a, b, c, d, e, \) & \( f \) denote the lag length that obtained using Akaike information criterion (AIC); and \( \varepsilon_t \) represents the white noise error term.

4. Observed findings

The current paper utilizes Elliott, Rothenberg, and Stock (ERS, 1996) to check the stationary levels of variables. Table 1 shows that the variables are mutually and purely integrated at \( I(1) \) and \( I(0) \). \( FDI_t, LCPI_t, ER_t, \) and \( LGDP_t \) are stationary at \( I(0) \), while \( LM3_t \) and \( LT_t \) are stationary at \( I(1) \). Thus, the bounds F-statistics would be employed to explore the co-integration among the investigated variables.

| Variable | ERS test statistic | ERS p-statistic critical value | Decision |
|----------|-------------------|-------------------------------|----------|
|          |                   | 1% | 5% | 10% |                                     |
| \( FDI_t \) | 6.69**            |     |     |     | Stationary at \( I(0) \).          |
| \( LCPI_t \) | 12.92*           |     |     |     | Stationary at \( I(0) \).          |
| \( ER_t \) | 13.33*            | 4.22 | 5.72 | 6.77 | Stationary at \( I(0) \).          |
| \( LGDP_t \) | 10.32*           |     |     |     | Stationary at \( I(0) \).          |
| \( LM3_t \) | 10.26*            |     |     |     | Stationary at \( I(1) \).          |
| \( LT_t \) | 5.28***          |     |     |     | Stationary at \( I(1) \).          |

Notes: (1) The analysis is conducted using intercept and linear trend (see Gujarati & Porter, 2009; Matyas & Sevestre, 2008; Newey & West, 1994; Patterson, 2010). (2) The spectral estimation method is based on Parzen Kernel. (3) Three bandwidths are selected based on Andrews’s estimation method. (4) ***, ***, * denote the significance at 1%, 5%, and 10% levels, correspondingly. (5) The modified Andrews’s estimation method has been employed to adjust the number of observations. (6) The output of ERS test is sourced from E-views software package, version 8.1.

Economically speaking, the concept of co-integration mimics the existence of a long-run relationship where there is no intrinsic tendency change since economic variables are in balance, while the short-run represents the disequilibrium status (Kirchgassner & Wolters, 2007). Table 2 demonstrates that the \( H_0 \) of no co-integration among variables in the \( FDI_t \) function is over rejected. \( FDI_t, LCPI_t, ER_t, LGDP_t, LM3_t, \) and \( LT_t \) are mutually co-integrated at the 5% significance level. The bounds F-statistics computed value, 3.79, is greater than the upper bound F-statistics critical value (i.e., \( I[1] = 3.65 \)).

The final step is to analyse long-run and short-run relationships between FDI inflows and their determinants using unconditional error correction approach (see Table 3). It shows that \( LCPI_{t-1} \) is negatively associated with the \( \Delta FDI_t \), while \( ER_{t-1}, LGDP_{t-1}, LM3_{t-1} \), and \( LT_{t-1} \) are positively related to the \( \Delta FDI_t \) in long-run. The error correction term, \( ECM_{t-1} \), is with appropriate sign and highly significant at the 1% level. The \( \Delta FDI_t \) function needs around 11 months (one divided by the ECM_{t-1} coefficient) to adjust back to long-run after disequilibrium in short-run. Table 3 (final panel) shows that the short-run function of \( \Delta FDI_t \) seems to fulfill diagnostic tests. The results display that there is no problem of non-normal distribution of error terms and same inference is drawn for autocorrelation. The heteroscedasticity problem is not present in the \( \Delta FDI_t \) function as well as no problem of misspecification confirmed by Ramsey Reset test.
Bounds F-statistics computed value | Bounds F-statistics critical value at 5% significance level | Decision
---|---|---
3.79* | 2.48 | Co-integrated.

Notes: (1) The Bounds F-statistics critical values are obtained from Pesaran and Pesaran (2009. P. 544, Case II: Intercept and no trend). (2) * denotes the significance at 5% level. (3) The output of the bounds F-statistics computed value is extracted from Micro-fit software package, version 5.1.

Table 3: Equilibrium relationships analyses results (∆FDI function)

| Variable | Coefficient | Standard error | t-ratio | p-value | Significance level |
|---|---|---|---|---|---|
| LCPI_{t-1} | -2.34 | 6.77 | -0.35 | 0.05 | 5% |
| ER_{t-1} | 1.83 | 0.95 | 1.93 | 0.07 | 10% |
| LGDP_{t-1} | 3.33 | 1.25 | 2.66 | 0.03 | 5% |
| LM3_{t-1} | 4.21 | 2.01 | 2.09 | 0.01 | 1% |
| LT_{t-1} | 3.78 | 2.27 | 1.67 | 0.01 | 1% |

33 observations employed for estimating short-run relationships and ECM_{t-1}. The lag order = 1, 2, 2, 2, 0, 0 is based on the AIC (see Hamdi, Sbia, & Shahbaz, 2014; Kivyiro & Arminen, 2014; Sbia, Shahbaz, & Hamdi, 2014).

Diagnostic tests: $R^2 = 0.89; \ R^2 = 0.90; \ F$-statistics = 12.17 (0.00); $\chi^2$ Normality = 0.10 [0.95]; $\chi^2$ Autocorrelation = 0.38 [0.54]; $\chi^2$ Heteroscedasticity = 0.4 [0.50]; $\chi^2$ Ramsey Reset = 0.07 [0.79].

Notes: (1) Figures in parentheses, ( ), represent the probability value of F-statistics. (2) Figures in brackets, [ ], denote the probability values of the chi-square ($\chi^2$). (3) C denotes the intercept term. (4) The output is sourced from Micro-fit software package, version 5.1.

5. Conclusions and policy implications

This paper examines equilibrium relationships between FDI inflows and their determinants using 36 observations for the (1977−2012) period. The results of the ERS test show that the examined variables are stationary at $I(0)$ and $I(1)$, which means that the ARDL approach can be used to test for co-integration and equilibrium relationships. FDI inflows, consumer price index, exchange rates, and gross domestic product are stationary at $I(0)$, while broadest money supply and trade are stationary at $I(1)$. The findings of bounds F-statistics demonstrate that the variables are co-integrated in the FDI inflows function. However, the results of the ARDL approach suggest that exchange rates, gross...
domestic product, broadest money supply, and trade augment the flows of FDI into Malaysia, while consumer price index decline them. These results are in line with verdicts obtained for Malaysia (see Almsafir et al., 2011; Ang, 2008; Anwar & Sun, 2011).

Decreasing the consumer price index in Malaysia increases the value of FDI inflow. That is, the multinational corporations would have confidence to invest in Malaysia as the decreases of consumer price index stabilize the macroeconomic and financial environments. Appreciation of exchange rates depresses the flow of FDI into Malaysia due to their negative effects on exports. Increases in output values stimulate the flow of FDI into Malaysia. Specifically, the growth of gross domestic product in the host country improves the macroeconomic environment, which invites overseas investors. The current paper treats the broadest money supply as a proxy of financial development in Malaysia (see Hsueh, Hu, & Tu, 2013). Increasing the broadest money supply raises the domestic market capitalization of listed corporations, which induces international corporations’ confidence in the Malaysian financial system. Anwar and Sun (2011) argued that the confidence in the financial system encourages households to save more, which increases the funds that would be available to international investors. Therefore, the Malaysian policy makers ought to pay attention to the determinants of FDI inflow. (1) The stabilization of the broadest money supply is necessary to control the consumer price index through the monetary policies adopted by Bank Negara Malaysia. (2) Depreciating exchange rates would, in turn, induce international trade and attract FDI flow into Malaysia. (3) Ultimately, concentration on the total factor productivity strategy would improve the quality of output and increase the output value.

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