

The Impact of Foreign Direct Investment and Real Exchange Rate on Economic Growth in Malaysia: Some Empirical Evidence

Rozilee Asid^a, Mohd Hizar Farhan Abdul Razi^b, Dullah Mulok^c,
Mori Kogid^d and Jaratin Lily^e

^{a,d}Postgraduate students, School of Economics, Faculty of Economics and Management,
Universiti Kebangsaan Malaysia, Malaysia

^{c,e}Faculty of Business, Economics and Accountancy, Universiti Malaysia Sabah, Malaysia

Abstract

This study is an attempt to examine the relationship between exchange rate and foreign direct investment towards economic growth in Malaysia during the periods between 1970 to 2011. The ARDL method was used to establish the long-run relationship as well as the direction of causation between variables. For this purpose two equations were estimated. The standard the bivariate relationship and the trivariate model includes the exchange rate variable. Both models exhibit strong evidence on long-run cointegration relationship. The impact of foreign direct investment in the long run equation found to be positive and significant, whereas the impact of real exchange rate is not. In the short run, both exchange rate and foreign direct investment found to be significant but slightly minimal in the percentage effect. We offer two possible reasons with regards to exchange rate movements in the short run as well in the long run, i.e. the hold-up effect and the price adjustment effect.

Keywords: economic growth, foreign direct investment, real exchange rate, ARDL

JEL classification: F21, F30, O40

1 Introduction and Selected Literature Review

The focus of this study is to examine the relationship between foreign direct investment and exchangerate towards economic growth in Malaysia for the periods of 1970 to 2011. There was some study done in the past but controversies on the empirical findings on the effect of exchange rate and FDI towards economic growth still exist.

There are also mixed results from the previous empirical research on the interaction of exchange rate, foreign direct investment towards economic growth. As for the case of exchange rate, according to study done by Aghion et al. (2009); Coudert & Dubert (2005), the exchange rate regime does play a significant role in affecting the performance of economic growth.

In many empirical studies, FDI generally has a positive effect on economic growth. The benefits of foreign direct investment (FDI) on the recipient countries can only be realized when the country has achieved a stable level of financial development. Stable political environment and sustained economic growth has made Malaysia one of good prospects for the inflow of FD. Strong economic growth remain and continue to be a necessary condition for Malaysia to attract FDI inflows (Ang, 2008). Low inflation and a stable exchange rate also act as a catalyst in encouraging and attracting investment. This will eventually narrow the technology gap among developing countries.

The notion that other factors such as government spending, investment in human capital, the terms of trade as well as comprehensive tax structure also serves as a catalyst and a complement to economic growth. FDI will not only continue to promote economic growth, but also a catalyst for many downstream sectors.

Ang (2008) also argues that if the financial system is robust and transparent the ability to attract FDI will be more efficient and thus exploiting the benefits of that investment. No doubt much of the evidence found in previous studies indicate that FDI has a positive effect on economic growth (Adams, 2009), but the situation in which the negative effects of FDI on growth were also identified (Ang, 2009).

According to Aghion et al. (2009), exchange rate (volatility) does significantly affecting the economic growth when taking into account the level of financial development. This finding is robust when taking into consideration of various measurements of financial development and also its interactions. Additionally the volatility of exchange rate by itself did not play its significant role on the isolation.

According to Miles (2006), the ability of the exchange rate as the financial variables is likely to provide a positive impact on long-term economic growth. However, there is also an empirical study which shows that the exchange rate has the opposite impact.

There are two channels that have been identified in which the exchange rates might stimulate growth. Study conducted by Dornbusch (2001) found that exchange rate risk can only be reduced if the common currency implemented. This is because the common currency can balance between the interest rate and the risk of rising prices. In the meantime, a significant impact on minimized transaction costs in the context of international trade could be observed. Nevertheless, Slaughter (2001) refutes the idea because, according to another study, the effects are sometimes difficult to prove.

A country's competitiveness is often represented by the stable real exchange rate (RER). This is because the RER is an indicator of the level of relative inflation and the relative cost of trading between and across countries. The relationship between RER

behaviour and economic performance is often seen as a key driver among countries such as Japan, Hong Kong, Singapore, South Korea, Taiwan and China (Eichengreen, 2008). The RER has a positive impact on output growth. Growth in output would be increased if RER is allowed to operate through aggregate supply and not aggregate demand channels. Nonetheless, RER instability generates risk and uncertainty, which in turn depresses growth and development of an economy.

The empirical evidences of the relationship between exchange rate and FDI flows are mixed. Froot and Stein (1991) argued that the presence of the capital market imperfections motivates the firms to invest abroad if their home currency appreciates because their relative wealth increases and will make external finance more costly than internal finance. Therefore, the study revealed that a real depreciation of the US dollar increases the FDI inflow in the US for the period 1973 – 1988. The relationship seemed to be more prominent in the industries with a higher level of potential information asymmetry such as chemical and machinery industries.

On the contrary, Stevens (1998) found a weak empirical support and showed evidence of serious instability in the Froot and Stein (1991) hypothesis. The study findings showed that the significant relationship between the exchange rate and FDI inflows disappear as the time series extended for an important sub period of the 1973 – 1988 periods and when the sample series extended through 1991.

Using the data from 1976 – 1986 periods, Kogut and Chang (1996) also concluded that the real appreciation of the Japanese yen lead to more entries of Japanese firms into the US. According to Blonigen (1997) the real exchange rate between the Japanese yen and the US dollar had a positive relationship with the number of Japanese acquisitions (proxy for FDI) in the US, especially in the manufacturing sectors.

The remainder of this article is organized as follows. Section 2 explains the methodology. The empirical results presented in section 3. The last section 4 concludes.

2 Data and Methodology

2.1 Data and Measurements

All data are gathered from trusted sources. Data on exchange rates, foreign direct investment (net inflow) and economic growth were obtained from the International Financial Statistics (IFS). All data observed annually from 1970 to 2011.

Data on exchange rates is the nominal (official) exchange rates denominated to US dollar, the annual monthly average. Data on foreign direct investment (net FDI

inflow) is based on the balance of payment on current US dollar. Data on economic growth¹ is proxied to industrial production index (IPIDX). The IPIDX is the total production of manufacturing sector, the annual monthly average (2005 = 100).

In various literatures, there is a growing tendency of approximating industrial production index, total energy production (or total electricity generated) and volume of stock market traded each year as a close proxy to economic growth. However, the uses of such proxy are subject to its pros and cons. For the purposes of our research we tested only industrial production index (IPIDX).

The use of IPIDX as a close proxy to growth instead of real GDP was made after taking into considerations few factors such as types of data frequency and the most important one is based on theoretical aspect on the interactions between variables. Obviously, there are differences in types of data observed for both exchange rate and IPIDX.

Data on IPIDX basically recorded on monthly basis. Whereas data for exchange rate is basically observed in high-frequency mode normally on daily, weekly or monthly basis. As all data in our research is based on annual observations, therefore for data with basically observed in high-frequencies like IPIDX and exchange rate would probably exhibits obvious discrepancies in the mean-deviations as a results of averaging process. Thus affecting the precisions of the final results.

The nominal exchange rate transformed into real exchange rates (RER). The RER basically the nominal exchange rates times a price ratio between foreign and domestic¹. In this case, price ratio is proxied to the consumer price index (CPI) of the two countries². The value of RER will reflect the competitiveness in the world market. Higher (lower) value of RER will reflect the improvement (deterioration) of the domestic economy³. In other words, a rise (fall) in the real exchange rate index indicates a real depreciation (real appreciation) of the local currency value of RER will reflect the improvement (deterioration) of the domestic economy⁴. In other words, a rise (fall) in the real exchange rate index indicates a real depreciation (real appreciation) of the local currency

¹ We also use real GDP per capital as to reflect the economic growth, however the sign on RER is surprisingly unsupported.

² $RER = NER \left(\frac{WPI}{CPI} \right)$

³ Price index for foreign country basically referred to the United States of America using wholesale price index (WPI) with 2005 = 100.

⁴ There are some studies using real effective exchange rate (REER) instead of RER, however basically the sign and magnitude of the results is almost similar.

2.2 Model Specification

The basic functional form adopted in this study is based on methods pioneered by Pesaran et al. (2001), the autoregressive distributed lag model or shortly ARDL. The ARDL method used to establish the direction of causation between variables using a single reduced form equation. Testing for cointegration between series is also a bit different to the conventional methods as proposed by Johansen (1988, 1995).

The ARDL approach does not involve pre-testing variables, in which tests on the existence of relationship between variables in levels is applicable irrespective of whether the underlying regressors are purely I(0), I(1) or mixture of both. This feature alone, given the characteristics of the cyclical components of the data. Thus makes the standard cointegration technique unsuitable when the existing unit root tests to identify the order of integration are in question. Furthermore, the ARDL method avoids the larger number of specification to be made in the standard cointegration test.

Amongst other advantages, the ARDL method of cointegration analysis is also unbiased and efficient for small samples (Narayan, 2004). One can also estimate the long- and short-run components of the model simultaneously, removing problems associated with omitted variables and issue on autocorrelations. Finally, the ARDL method can distinguish the dependent and explanatory variables. In what follows, the methodology is detailed.

The model is *autoregressive*, in the sense that y_t is explained by lagged values of itself. It also has a *distributed lag* component, in the form of successive lags of the explanatory variable. Sometimes, the current value of x_t itself is excluded from the distributed lag part of the model's structure.

The process of dynamic adjustment is characterized by the following conditional error correction model (ECM), which can be used to test the existence of a long run relationship using the Autoregressive Distributed Lag (ARDL) bounds test as proposed by Pesaran et al. (2001).

$$\Delta y_{t-1} = \alpha_0 + \beta_0 y_{t-1} + \sum_{j=1}^k \beta_j X'_{j,t-1} + \sum_{i=1}^p \gamma_{0i} \Delta y_{t-1} + \sum_{i=0}^p \sum_{j=1}^k \gamma_{ji} \Delta X'_{j,t-1} + \varepsilon_t \quad (1)$$

where X'_t is a vector of the determinants on y . The optimal lag length of p is determined by Schwarz Bayesian Criteria (SBC).

The null hypothesis of the non-existence of a long-run relationship in equation 1 is tested as the accumulated F -test of $H_0 : \beta_0 = \dots = \beta_k = 0$ against the alternative hypothesis using the *wald* test of linear restriction.

⁵ The estimation is subject to provided all the variables are integrated of order 1, I (1).

If the accumulated F -test is rejected at the prespecified critical value (normally 5%), then there is a strong evidence of long-run relationship (cointegration) and the equations estimating the long run equation is specified as Equation.2⁵;

$$y_t = \alpha_0 + \sum_{i=1}^p \theta_i y_{t-1} + \sum_{i=1}^p \sum_{j=1}^k \omega_{ji} X'_{j,t-i} + \mu_t \quad (2)$$

The test involves asymptotic critical value bounds, depending whether the variables are $I(0)$ or $I(1)$ or a mixture of both. Two sets of critical values were used which one set refers to the $I(1)$ series and the other for the $I(0)$ series. Critical values for the $I(1)$ series are referred to upper bound critical values; while the critical values for $I(0)$ series are referred to the lower bound critical values.

The causality version of ECM-ARDL at each p lag specification in the short-run with long-run dynamics (with unrestricted constant) is derived as the following form:

$$\Delta y_t = \alpha_0 + \sum_{i=1}^p \theta_i y_{t-1} + \sum_{i=0}^p \sum_{j=1}^k \gamma_{ji} \Delta X'_{j,t-i} + \eta EC_{t-1} + e_t \quad (3)$$

The coefficient η , denoting the speed of adjustment for long run convergence as well as long-run causality coefficient. Whereas the coefficients of θ_i and γ_{ji} denoting the short run dynamics towards the convergence to equilibrium. The EC_{t-1} component entering equation 3 is a residual derived from the long run equation of Eq.2. The causality effect for each variable is now easily tested using the accumulated F -statistics of Eq.3.

Each of the variables $X'_{j,t-i}$ is said ‘granger caused’ y_t if each coefficient of $\sum_{i=1}^p \sum_{j=1}^k \gamma_{ji}$ statistically significant at the optimal lag of p order.

3 Empirical Results

In general, time series data often exhibit component trend which is nonlinear that changes over time. The preliminary views of the $IPIDX$, FDI and RER are shown by Figure 1, Figure 2 and Figure 3 respectively.

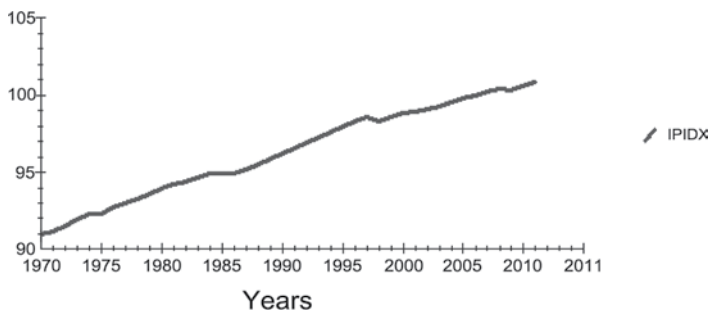


Figure 1 Industrial production index

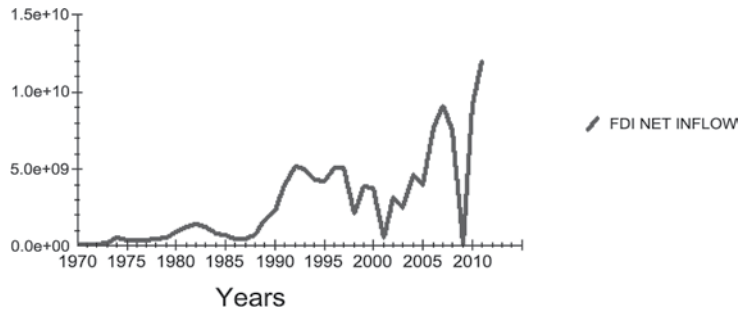


Figure 2 Foreign direct investment net inflow

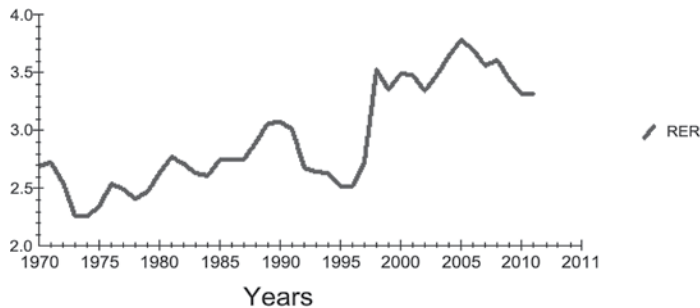


Figure 3 Real exchange rate

It can be clearly seen that the *IPIDX* trend increases over time from 1970 to 2011. On the contrary, both *FDI* and *RER* show an obvious fluctuating cycle over time, with *RER* being slightly more volatile.

To avoid any problem related to spurious regression and biasedness of the results because of the uncertainty, instability and stationarity problems of the time series data, we conducted unit root tests such as ADF (Dickey & Fuller, 1979) and KPSS (Kwiatkowski et al., 1992) in order to check for the robustness of the stationarity of the variables. The results show that all variables series are stationary at first difference with both constant and constant and trend included in the test equations, except for *RER* which is found to be stationary at level using KPSS test when constant and trend (C T) is included in the test equation.

Although any other methods such as Engle-Granger (Engle and Granger, 1987) and Johansen (Johansen, 1988) techniques can be used to test for long-run cointegration relationship, but it only be used if all variables are $I(1)$ or $I(2)$. Since in our study there is one variable is found to be $I(0)$ i.e the *RER*, therefore the use of ARDL is the suitable methods. The bound test approach proposed by Pesaran et al. (2001) will produce accurate cum stable estimations and the method is also proven to be suitable for a small or finite sample size as well.

The results are presented in Table 1 to 4. Table 1 shows the unit root test of each variables. As we can see there are mixed integrated degree of each variable. Table 2 shows the evidence of long run cointegration based on ARDL model as presented by equation 1. Whereas, Table 3 reports the LR equation as depicted by equation 2. Finally Table 4 reports the ECM-ARDL based model as presented by equation 3 together with the causality test.

Table 1 Unit root test

Series	Term	ADF	KPSS
lnFDI	C	- 1.838(8)	0.702**(5)
	CT	- 2.582(8)	0.138*(3)
ΔlnFDI	C	- 3.589**(9)	0.274(3)
	CT	- 3.840*** (9)	0.270(6)
lnRER	C	- 1.238(1)	0.678*** (5)
	CT	- 2.731(1)	0.087(4)
ΔlnRER	C	- 4.651*** (0)	0.118(2)
	CT	- 4.594*** (0)	0.118(2)
lnIPIDX	C	- 2.554(0)	0.812*** (5)
	CT	- 2.165(0)	0.156** (4)
ΔlnIPIDX	C	- 5.457*** (0)	0.378(3)
	CT	- 6.053*** (0)	0.063(2)

Notes: C: Test with constant term, CT: Test with constant and trend. Figure in parenthesis denotes lag length used for the unit root estimation. For KPSS, H_0 is testing stationarity of series against unit root in H_1 . *, **, *** significant levels at 10%, 5% and 1% respectively.

Table 2 The ARDL evidence of long run cointegration - bound test

ARDL Model	F_{stat}	Diagnostic
lnI PINDX ^(0,0) (lnFDI)	9.2486***	LM(2) serial=0.190 ARCH(2)=0.934
lnIPIDX ^(0,0,0) (lnFDI, lnRER)	11.3470***	LM(2) serial=0.615 ARCH(2)=0.502

Notes: LM serial refers to χ^2 LM test of residual serial correlation, whereas ARCH refers to χ^2 heteroscedasticity test based on the regression of squared residuals on squared fitted values. Both values refer to the level of significant.

Table 3 Long run ARDL equations

Model	Coefficient	t-stats
lnIPIDX (1, 0)		
lnFDI	0.1942***	5.1507
C	4.2140***	8.1825
lnIPIDX (1, 0, 1)		
lnFDI	0.1997***	4.1025
lnRER	0.0295	0.9712
C	4.2229***	8.2478

Notes: *, ** and *** indicate significance at the 10, 5 and 1 per cent levels respectively.

Table 4 ECM-ARDL and causality test

ECM-ARDL model	Coefficient	t-stat (sig. level)
$\Delta \ln \text{IPIDX}(1,0)$		
$\Delta \ln \text{FDI}$	0.0843***	3.5854 (0.001)
ΔC	0.1829***	4.3516 (0.000)
$\text{EC}_{t-1} - 0.0434***$	-4.3571	(0.000)
Causality test		
$\Delta \ln \text{FDI} \Rightarrow \Delta \ln \text{IPIDX}$	12.8554***	
$\Delta \ln \text{IPIDX}(1,0,1)$		
$\Delta \ln \text{FDI}$	0.0673***	3.0249(0.005)
$\Delta \ln \text{RER}$	0.0737***	3.4684(0.001)
ΔC 0.1431	2.7811	(0.009)
EC_{t-1}	-0.0339***	-2.7827(0.009)
$\Delta \ln \text{FDI} \Rightarrow \Delta \ln \text{IPIDX}$	9.1501***	
$\Delta \ln \text{RER} \Rightarrow \Delta \ln \text{IPIDX}$	12.0299***	

Notes: ** and *** indicate significance at the 10, 5 and 1 per cent levels respectively.

It is worth to mention that in the long run, the effect of real exchange rate found insignificant even the sign is found to be positively related to growth. In the short run however, the effect of real exchange rate towards growth is significant. As the theory suggested, an improvement or real depreciation on exchange rate would significantly increase the aggregate output, in which the relationship only observed in the short run. In both models, the speed of adjustment for long run convergence as estimated by η coefficient of the EC_{t-1} variable only explains to approximately less than 5% which is marginally slow at high significant level.

A big question is now why in the short run the RER significantly affected the economic growth and not in the long run? We offer two explanations which are discussed in the following subsections.

3.1 Possible Break in Time Series

A closer investigation on the trend on RER shows that, there are possibilities of break in the data. One break observed in the periods of 1990 to 1997 and the second break was observed in the periods of 2005 to 2011. These two breaks were associated with strong exchange rate of Ringgit against the Dollar. The jump-up of the ringgit only happened during the periods of financial crisis started in mid-July 1997 until 2001 (i.e. the exact ringgit was pegged to US\$ dollar started in 1999 until 2004 as exhibited in the data set.)

An additional test carried out whether the break in the time series does really exist. There are several well-known tests had been developed. We use the procedure of Zivot and Andrews (1992) and Perron (1997). These procedures test any break in trend on time series data at an unknown time, but the results do not show any serious and significant break even though there are break detected in the series.

Intuitively, the tendency of real exchange rate to appreciate in the long run does not giving enough impact to growth over time as the real depreciation of ringgit over US\$ dollar is constantly increase over time. As the real depreciation of the Ringgit diminished by the effect of real appreciation over time, such interaction had continuously led to some kind of delayed or hold-up effect in the long run.

3.2 Price Adjustment

The other explanations that we could offer is that, there is a slight delay in the market clearing process in both financial and goods market. As according to some economist, even though the transmission mechanism will eventually clear all markets in the economy when the gap exist (as assumed by Walrasian approach), the response time between the two market react is different, goods market react a bit slow due to the price friction in the goods market.

The frictions in the goods market most probably disappear when consumers adjust their consumption bundle between domestic and foreign goods as the real exchange rate appreciate. However at in this particular point, as the substitution effect between foreign and domestic consumption goods was not easily observed due to the price ratio changes, the trade balance between consumption of imported goods and exported goods translated into low marginal increments on total aggregate demand.

4 Conclusion

The effect of FDI towards growth is indeed important as we can see from both equations in the short run as well as in the long run. The contributions of FDI towards growth in the long run were estimated approximately around 0.2%, whereas the effect of RER insignificantly low around 0.03%.

In the short run, both FDI and RER found to be significantly affecting production growth. The effect of FDI and RER estimated around 0.07% respectively with (marginally) slow speed of adjustment to reach long run convergence. The error-correction term was estimated around 5% and significant.

This slow adjustment process to reach a convergence in the long-run as shown by the ECM-ARDL in Table 4 has two possible implications towards production growth.

Firstly, the slow adjustment might probably due to possible break in the data i.e. the up and down trend in the time series of RER has at least slows the interaction process towards growth in the long run. Another possibility is that, there is a slight delay in reaching equilibrium in both markets i.e asset market and goods market. As asset market adjusts almost instantaneously to reach equilibrium but the goods markets is not. This would lead to some delay for both markets to interact in the long run. We refer this as a hold-up effect which triggered primarily through some delay in between the process of price adjustment.

References

- Adams, S. (2009). Foreign direct investment, domestic investment, and economic growth in sub-saharan Africa. *Journal of Policy Modeling*, 31 (6), 939 – 949.
- Aghion, P, Bacchetta, P, RanciAre, R., & Rogoff, K. (2009). Exchange rate volatility and productivity growth: The role of financial development. *Journal of Monetary Economics*, 56 (4), 494 – 513.
- Ang, J. B. (2008). Determinants of foreign direct investment in malaysia. *Journal of Policy Modeling*, 30 (1), 185 – 189.
- Ang, J. B. (2009). Financial development and the Fdi-growth nexus: The Malaysian experience. *Applied Economics*, 41(13), 1595 – 1601.
- Blonigen, B. A. (1997). Firm-specific assets and the link between exchange rates and foreign direct investment. *The American Economic Review*, 87 (3), pp. 447 – 465.
- Coudert, V, & Dubert, M. (2005). Does exchange rate regime explain differences in economic results for Asian countries? *Journal of Asian Economics*, 16 (5), 874 – 895.
- Dickey, D., & Fuller, W. (1979). Distribution of the estimators for autoregressive time series with a unit root. *Journal of the American Statistical Association*, 74, 427 – 431.
- Dornbusch, R. (2001). Fewer monies, better monies. *The American Economic Review*, 91 (2), 238 – 242.

- Eichengreen, B. (2008). *The real exchange rate and economic growth*. The International Bank for Reconstruction and Development / The World Bank.
- Froot, K. A., & Stein, J. C. (1991). Exchange rates and foreign direct investment: An imperfect capital markets approach. *The Quarterly Journal of Economic*, 106 (4), 1191 – 1217.
- Johansen, S. (1988). Statistical analysis of cointegration vectors. *Journal of Economic Dynamics and Control*, 12 (2), 231 – 254.
- Johansen, S. (1995). *Likelihood-based inference in cointegrated vector autoregressive models*. New York.
- Kogut, B., & Chang, S. J. (1996). Platform investments and volatile exchange rates: Direct investment in the US by Japanese electronic companies. *The Review of Economics and Statistics*, 78 (2) . 221 – 231.
- Kwiatkowski, D., Phillips, P. C. B., Schmidt, P., & Shin, Y. (1992). Testing the null hypothesis of stationarity against the alternative of a unit root: How sure are we that economic time series have a unit root? *Journal of Econometrics*, 54 (1 – 3), 159 – 178.
- Miles, W. (2006). To float or not to float? currency regimes and growth. *Journal of Economic Development*, 31 (2), 91– 105.
- Narayan, P. K. (2004). Fiji's tourism demand: The Ardl approach to cointegration. *Tourism Economics*, 10 (2), 193 – 206.
- Perron, P. (1997). Further evidence on breaking trend functions in macroeconomic variables. *Journal of Econometrics*, 80 (2), 355 – 385.
- Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics*, 16 (3), 289 – 326.
- Slaughter, M. J. (2001). Trade liberalization and per capita income convergence: A difference in differences analysis. *Journal of International Economics*, 55 (1), 203 – 228.
- Zivot, E. & Andrews, D. W. K. (1992). Further evidence on the great crash, the oil-price shock, and the unit-root hypothesis. *Journal of Business and Economic Statistics*, 10 (3), 251 – 270.

Appendices

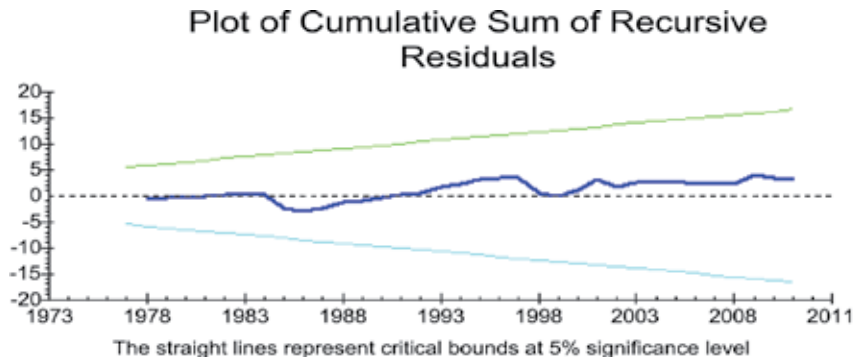


Figure A.1 Cusum (IPIDX-FDI)

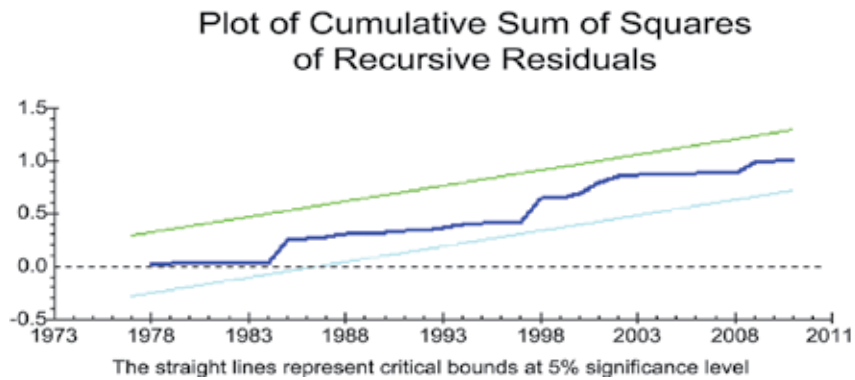


Figure A.2 CusumSQ (IPIDX-FDI)

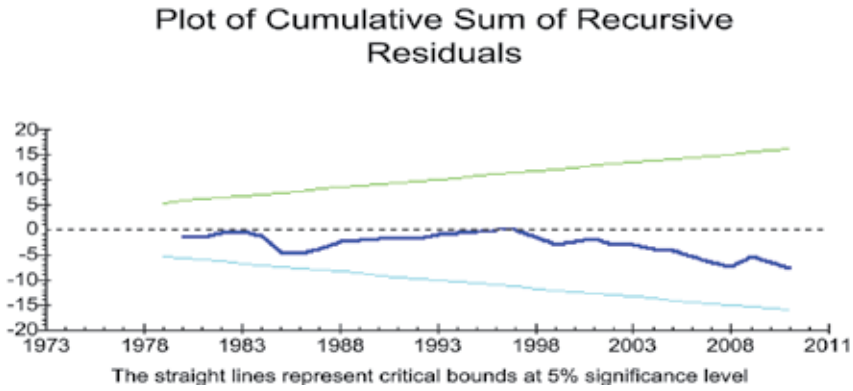


Figure A.3 Cusum (IPIDX-FDI-RER)

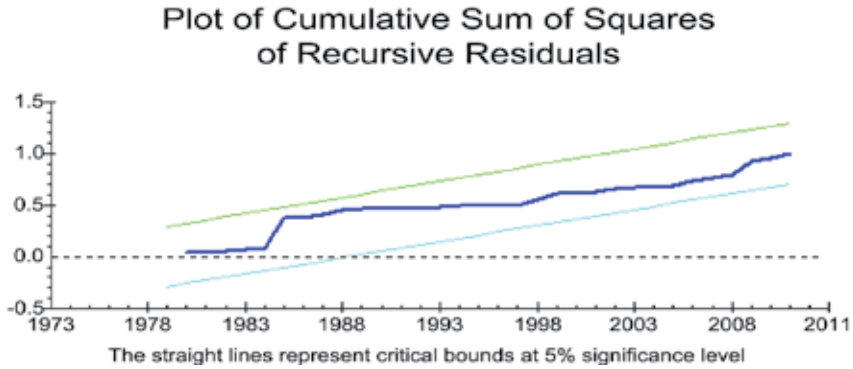


Figure A.4 CusumSQ (IPIDX-FDI-RER)