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The Interaction of Macroeconomic Variables on Capital Inflow in Emerging Market Countries in ASEAN: Panel Error Correction Model Approach

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Abstract

This study investigates the short and long-term determinants of capital inflows in emerging market countries in ASEAN using the Panel Error Correction Model. This study uses panel data with a time series from 2000 to 2017 and a cross-section of five countries (Indonesia, Malaysia, Philippines, Thailand, and Vietnam). This study has three important findings. First, conditions of exchange rate, foreign reserve, and lending rate disrupt the equilibrium of capital inflow in the short term. Second, current account conditions disrupt the equilibrium in the long term. Third, capital inflow will return to equilibrium in the long term. Therefore, it is highly recommended for emerging market countries in ASEAN to stabilize the variables that disrupt the equilibrium in the long and short term to stabilize their capital inflow.

Keywords: Capital inflow; Macroeconomic variables; Panel error correction model; Emerging market countries; ASEAN.

1. Introduction

International trade has greatly increased in the era of globalization, which has resulted in economic growth around the world (Forbes and Warnock, 2012). Every country involved in international trade continues to improve and increase its production sector to meet world market demand (Ostry *et al.*, 2012). One effort to achieve this goal is to integrate domestic financial markets with international financial markets to facilitate the mobilization of capital flows between countries. This condition will facilitate investment activities, especially for capital inflow in a country (Brana and Lahet, 2010; Tillmann, 2013).

Capital inflow benefits the economy of small open countries, especially by increasing investment funds, facilitating technology transfer and managerial capabilities, and encouraging the development of domestic financial markets. In addition, capital inflow is beneficial in development activities and it covers investment-saving gaps (Combes *et al.*, 2012). Although capital inflow aids country's economy, it involves risks that can impact the country's economic stability (Alberola *et al.*, 2015). These potential risks include an increase in a country's risk of reversing foreign capital inflow, inflating asset prices, increasingly complicated macroeconomic management, and increasing vulnerability of the domestic financial market.

The experiences from several crises show that foreign capital inflow creates problems, especially in emerging market countries. The Asian economic and financial crisis that occurred in the period 1997-1998 and the global financial crisis of2008 showed that foreign capital inflow significantly impacted the crises experienced by developing countries in the Asian region. As foreign investors respond to economic shocks more quickly, this condition gives rise to increased volatility of capital inflow causing the economy to become unstable and eventually increasing the impact of a crisis (Benigno *et al.*, 2015; Blundell-Wignall and Roulet, 2014).

The Association of Southeast Asian Nations (ASEAN) region is well-known for its growth potential among market participants who seek to diversify their exposure in emerging markets. Within ASEAN, middle-income markets with relatively higher growth and a sizable GDP generally offer attractive diversification benefits for emerging markets exposure. Among the middle-income ASEAN markets, the GDPs of Indonesia, Malaysia, Philippines, Thailand, and Vietnam were well over USD 100 billion in 2009 and have been growing steadily. Graph 1 shows the characteristics of these five emerging markets using GDP as indicator.

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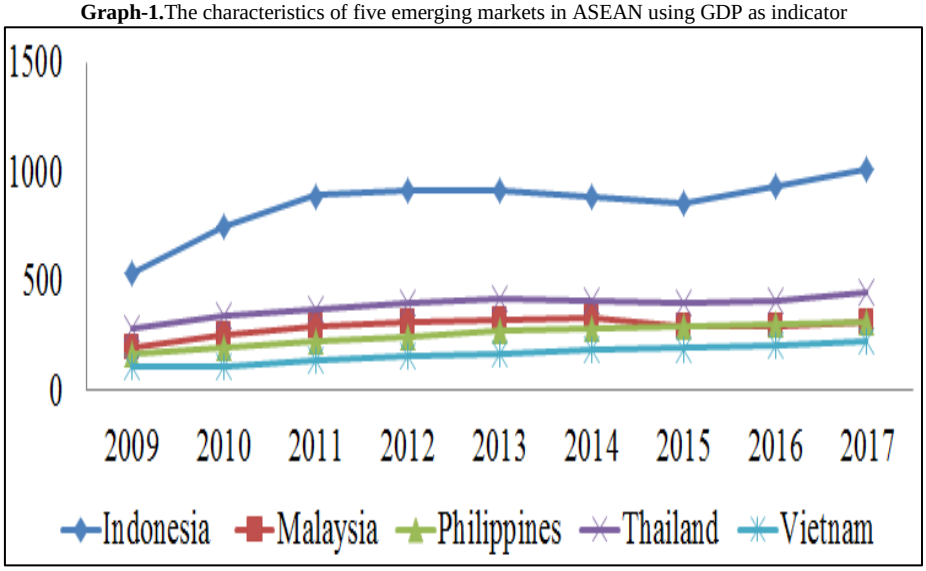
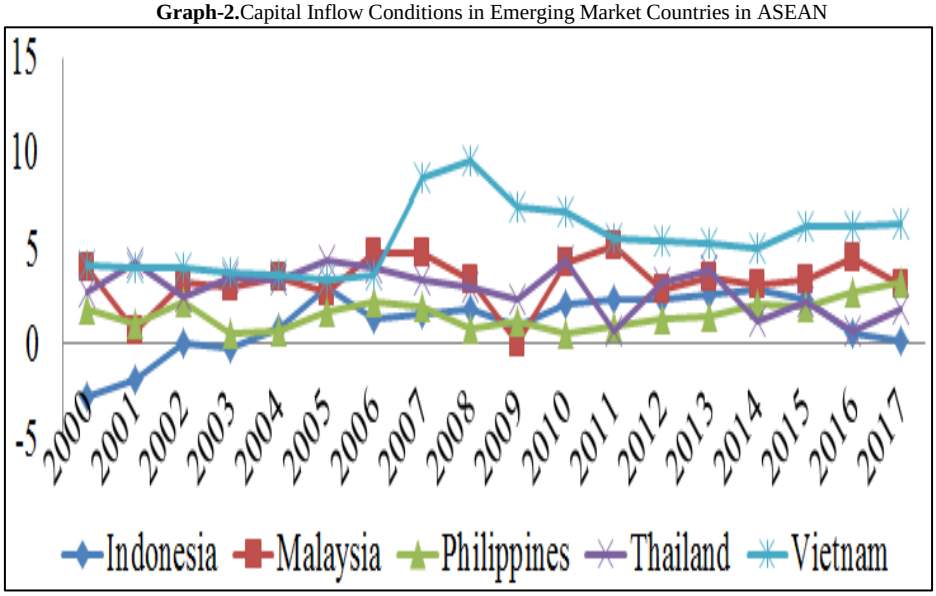
Graph-1. The characteristics of five emerging markets in ASEAN using GDP as indicator



Source: World Bank, 2018

When we relate the developing market countries in ASEAN to the capital inflow conditions summarized in Graph 2, this shows that there is a variable trend during the sample period.

Graph-2. Capital Inflow Conditions in Emerging Market Countries in ASEAN



Source: World Bank, 2018

Graph 2 indicates a negative trend in capital inflows at the beginning of the sample period in Malaysia, the Philippines, Thailand, and Vietnam. Whereas Indonesia showed a positive trend at first, which turned into a negative trend from 2003 onwards. The overall trend fluctuates as the inflow of capital from developing market countries in ASEAN differs every year. Based on this explanation, it is necessary to examine the determinants of these fluctuations in capital inflow in the short and long term to achieve stability.

2. Literature Review

Researchers and economists have studied the behavior of capital inflow in the short and long term. They uncovered many factors that determine the inflow of capital into a country ranging from domestic to international settings. Foreign exchange reserves, fiscal incentives, the current account position, an efficient capital market, good infrastructure, and efficient legal and judicial system, and law and order play a key role in attracting foreign capital inflow. Various studies have analyzed the determinants of capital inflow for specific countries. Pakistan is an example of a country that does not meet the before mentioned prerequisites. Currently, it faces twin deficits, political instability due to terrorism, and an inefficient legal system. These issues hamper the inflow of capital into the country (Jabbar and Awan, 2014). The case of Malaysia shows various reasons for capital inflows in the short run, i.e., real GDP, domestic Treasury bill rate, budget balance, current account balance, and US production. Empirical findings show that the pull factors, especially budget balance and current account are imperative in explaining the inflow of capital into Malaysia. Another interesting finding is the effect of the real factor as denoted by domestic and industrial country's outputs on capital inflows (Abdullah *et al.*, 2014). Meanwhile, the exchange rate and stock

market prices are important determinants of capital flows into Nigeria both in the short and long term (Ogbechie and Anetor, 2016).

There are various macroeconomic implications and policy responses regarding capital inflows. First, keeping public expenditure growth steady during episodes can help limit real currency appreciation and foster better growth outcomes in their aftermath. Second, resisting nominal exchange rate appreciation through sterilized intervention is likely to be ineffective when the influx of capital is persistent. Third, tightening capital controls has generally not been associated with better outcomes (Cardarelli *et al.*, 2010).

Capital inflow affects the financial structure of a country. Specifically, capitalinflow shocks have a significant and positive effect on real house prices, real credit available to the private sector, and real residential investment (Filipa *et al.*, 2014). Two studies found that capital flows to emerging market economies in the form of FDI and portfolio investment affect economies in various ways. Notably, the long-run regression estimate revealed that foreign direct investment negatively affects the exchange rate while portfolio investment has a positive impact on exchange rates. However, the magnitude of the impacts is minute, unlike the international oil price which has a strong negative effect on exchange rates. The short-run result was similar to the causality result, indicating that neither foreign direct investment nor foreign portfolio investment significant impacts exchange rates (Ahmed and Zlate, 2014). A study on the effects of capital flows on economic growth in Kenya showed that FDI and portfolio investments flows have a negative impact on the GDP growth rate although their impact is not statistically significant. However, other investment flows, which mainly represent corporate, financial institutions, general government borrowings and remittances from the Diaspora, do have a statistically significant positive impact on the GDP growth rate (Ochieng, 2017).

A study on the relation between capital flows and exchange rates found that public and private flows are associated with a real exchange rate appreciation. Among private flows, portfolio investment has the highest appreciation effect of almost seven times that of foreign direct investment or bank loans, while private transfers have the lowest effect (Combes *et al.*, 2011). Meanwhile, there is a relationship between foreign capital inflows and financial development. First, there is strong evidence that the relationship between private foreign capital inflows and growth is characterized by a nonlinear relationship based on financial development. Second, the positive benefits of the three types of capital inflows are only found in countries with financial market development beyond a threshold level (Baharumshah *et al.*, 2015). A study on capital inflows and domestic investment in Sub-Saharan Africa revealed that foreign direct investment positively impacts domestic investment but external debt has a negative impact on domestic invest¬ment in the long run (Adams *et al.*, 2016). Gross foreign direct inflows respond slowly to shocks while gross portfolio reacts on impact. Furthermore, the reaction of foreign direct investment to the shocks is not as high (Adaguna, 2016).

A study on capital flows and economic growth in Ghana found that capital flows have negative effects on economic growth in the short as well as long run. However, remittances exhibit positive insignificant elasticity in all the regressions. Moreover, the empirical results show that inflation negatively impacts growth, while the impact of trade, gross capital formation and population growth is mixed (Klobodu and Adams, 2016). Meanwhile, an empirical analysis of WAMZ experiencesshows that more than one form of capital inflow contributed positively to output growth in Nigeria. Moreover, ODA positively contributes more to output growth in Sierra Leone and Ghana, whereas FDI fosters more output growth in Nigeria and Gambia. Furthermore, remittances have the highest contribution in Liberia. Lastly, none of the inflows has positively impacted Guinea's economic growth (Orji *et al.*, 2014).

A pooled mean group analysis for developing countries of the impact of foreign capital inflows on economic grow indicates that inflows including net external debt and net official development assistance have a significantly negative impact on the economic growth of developing countries, while net foreign direct investment and net remittances have a positive and significant impact on economic growth in the long-run. The negative sign of error correction term shows the convergence of the variables towards equilibrium in the long-run (Rehman and Ahmad, 2016). Meanwhile, there is no co integrating relationship among FDI inflows, investments of foreign portfolio, and the development of financial sectors but there is a one-way causality from the development of financial sectors to FDI inflows in the short run (Bayar and Gavriletea, 2018). Moreover, fast-growing developing countries increase their holdings of safe assets, which creates net capital outflows despite inflows of foreign direct investment (Schroth, 2016). A study on banking crises investigated whether capital inflows bonanzas increase the probability of banking crises and whether this occurs through a lending boom mechanism. Results indicate that bonanzas more than triple the odds of a crisis, raising its probability to 14% from an unconditional probability of 4% (Julian, 2014). Lastly, international capital flow influences the effectiveness of Chinese monetary policy. Notably, the offset coefficient of short term international capital flows has a more violent fluctuation than that of the long term international capital flows (Meng *et al.*, 2018).

3. Methodology

3.1. Data Description

This study analyzes the conditions of capital inflow in five developing market countries in ASEAN, i.e., Indonesia, Malaysia, the Philippines, Thailand, and Vietnam. Annual data is taken from the World Bank with a sample period of18 years from 2000 to 2017. The collected data includes capital inflow, current account, exchange rates, economic growth, foreign reserves, inflation and loan interest rates. Table 1 provides an overview of the data and data source used in this study.

Table-1. Description and Data Source

Variable	Description
Capital Inflow	Foreign direct investment and portfolio inflows are used as a proxy for capital inflow in a country; data in percentage of GDP
Current Account	The sum of net exports of goods and services, net primary income, and net secondary income; data in percentage of GDP
Exchange Rate	Calculated as an annual average based on monthly averages (local currency units relative to the U.S. dollar);data in current local currency
Economic Growth	Annual percentage of GDP growth rate at market prices based on constant local currency as a proxy for economic growth; data in percentage
Foreign Reserve	The sum of foreign assets held by monetary authorities and money deposit banks minus their foreign liabilities; data in current local currency.
Inflation	The consumer price index reflects the annual percentage change in cost for the average consumer; data in percentage
Lending Rate	The bank rate that usually meets the short-term and medium-term financing needs of the private sector; data in percentage

3.2. Model Specification

This study uses the econometric Panel Error Correction Model to find out the equilibrium in the short and long term. The Panel ECM approach involves several steps. First, the data stationary test using the ADF test and the Phillips-Peron test to uncover any significant changes in the data; Second, the long-term relationship test, which is the base model that is not stationary at the level because the data comprises a panel. Thus, the selected long-term equation is the best model among the Common Effect Model (CEM), Fixed Effect Model (FEM), or Random Effect Model (REM). To select the best model we carried out a chow test to choose between CEM and FEM and a Hausman test to choose between REM and FEM. Third, if all variables pass the unit root test, then the co integration test can determine the possibility of a long-term relationship. In this study, we test the co integration of variables using the ADF test and the PP test to see the stationary residue (u) of the basic model at level. Fourth is a short-term equation, residual (u) in the basic model, which is also used as one of the variables in short-term equations. Short-term equations use variables similar to long-term equations, but they have been placed in the same order; the selected short-term equation model is the best model among the CEM, FEM, or REM. To select the best model, we used a chow test to choose between CEM and FEM and the Hausman test to choose between REM and FEM. Based on this explanation, the ECM model can for the long-term equation is as follows:

$$CI_{it} = \alpha_0 + \beta_1 CA_{it} + \beta_2 \log(ER)_{it} + \beta_3 EG_{it} + \beta_4 \log(FR)_{it} + \beta_5 INF_{it} + \beta_6 LR_{it} + U_{it} \quad (1)$$

Where,

α = intercept
β = coefficient of the respective variable
i = countries (Indonesia, Malaysia, Philippines, Thailand, and Vietnam)
t = years (2000-2017)
CI = Capital Inflow
CA = Current Account
ER = Exchange Rate
EG = Economic Growth
FR = Foreign Reserve
INF = Inflation
LR = Lending Rate
U = Residual

The co integration equation from the basic model in equation (1):

$$U_{it} = CI_{it}\ \alpha_0 - \beta_1 CA_{it} - \beta_2 \log(ER)_{it} - \beta_3 EG_{it} - \beta_4 \log(FR)_{it} - \beta_5 INF_{it} - \beta_6 LR_{it} \quad (2)$$

The ECM equation for the short-term equation:

$$\Delta CI_{it} = \alpha_0 + \beta_1 \Delta CA_{it} + \beta_2 \Delta\log(ER)_{it} + \beta_3 \Delta EG_{it} + \beta_4 \Delta\log(FR)_{it} + \beta_5 \Delta INF_{it} + \beta_6 \Delta LR_{it} + U_{it-1} \quad (3)$$

Where,

Δ = change (first difference)
U_{it-1} = the one period lagged value of the residual

4. Empirical Results

4.1. Unit Root Test

The first analysis comprises the Augmented Dickey-Fuller (ADF) test and the Phillips-Peron test for unit root tests in determining the stationary of variables by looking at the value of t-statistics and the p-values in Table 2.

Table-2. Unit Root Test

Variable	Test	Level		First Difference		
		t-statistics	p-value	t-statistics	p-value	Decision
CI	ADF	27.7629	0.0020	-	-	I (0)
	PP	37.4144	0.0000	-	-	I (0)
CA	ADF	7.07497	0.7183	42.9355	0.0000	I (1)
	PP	6.01325	0.8141	62.3421	0.0000	I (1)
log(ER)	ADF	2.08028	0.9957	26.3438	0.0033	I (1)
	PP	3.14999	0.9777	43.2868	0.0000	I (1)
EG	ADF	37.1618	0.0001	-	-	I (0)
	PP	39.5652	0.0000	-	-	I (0)
log(FR)	ADF	1.80826	0.9976	22.8327	0.0114	I (1)
	PP	1.93394	0.9968	35.3011	0.0001	I (1)
INF	ADF	33.1032	0.0003	-	-	I (0)
	PP	34.4322	0.0002	-	-	I (0)
LR	ADF	11.4023	0.3270	38.2377	0.0000	I (1)
	PP	12.1733	0.2736	55.8105	0.0000	I (1)

Source: Authors' Calculations

Based on the results of the calculations in Table 2, on average all variables are stationary at the first difference I (1).

4.2. Long Term Equation

4.2.1. Panel Data Estimation for Long term Equations

Fluctuating movements in capital inflow in emerging market countries in ASEAN cannot be separated from the macroeconomic variables that influence it. After looking at the capital inflow conditions and the determining factors, the following equations will present the data processing with panel estimation. The long-term equation consists of CEM, FEM, and, REM, whereas the best panel models will be selected to be used for long-term equations. The equations for the whole model are summarized below.

The following equation summarizes the panel data estimation for CEM for the long term:

$$CI_{it} = 18.883 - 0.025CA_{it} + 0.987\log(ER)_{it} + 0.245EG_{it} + 0.619\log(FR)_{it}$$
$$(0.0006)\quad (0.4967)\quad (0.0000)\quad (0.0052)\quad (0.0033)$$
$$- 0.352INF_{it} - 0.652LR_{it}$$
$$(0.0000)\quad (0.0000) \qquad (4)$$

The following equation summarizes the panel data estimation for FEM for the long term:

$$CI_{it} = 16.715 - 0.028CA_{it} + 0.929\log(ER)_{it} + 0.277EG_{it} + 0.528\log(FR)_{it}$$
$$(0.0596)\quad (0.4733)\quad (0.0053)\quad (0.0222)\quad (0.1299)$$
$$- 0.469INF_{it} - 0.763LR_{it}$$
$$(0.0000)\quad (0.0000) \qquad (5)$$

The following equation summarizes the panel data estimation for REM for the long-term:

$$CI_{it} = 18.883 - 0.025CA_{it} + 0.987\log(ER)_{it} + 0.245EG_{it} + 0.619\log(FR)_{it}$$
$$(0.0008)\quad (0.5027)\quad (0.0000)\quad (0.0059)\quad (0.0037)$$
$$- 0.352INF_{it} - 0.652LR_{it}$$
$$(0.0000)\quad (0.0000) \qquad (6)$$

4.2.2. Chow Test

The Chow Test is used to select between CEM or FEM. Table 3 summarizes the results of the Chow Test to determine which model to select.

Table-3. Chow Test

F Statistic	Prob.
17.046594	0.0000

Source: Authors' Calculations

Based on the Chow Test results in Table 3, the probability significance is 0.0000. As the probability value is smaller than $\alpha = 0.05$, and the F statistic value is greater than the F table value of 2.21, thus, FEM is better to use. However, but this result must proceed to the HausmanTest.

4.2.3. Hausman Test

The Hausman test is used to select between REM or FEM, which can be determined from the summarized results of the test in Table 4 below.

Table-4. Hausman Test

Chi-Sq Statistic	Prob.
11.110061	0.0850

Source: Authors' Calculations

Based on the Hausman test results in Table 4, the probability significance is 0.0850. As the probability value is greater than α = 0.05, and Chi-Sq statistics is smaller than the Chi-Sq table of112.022, thus we select REM to interpret the long term situation.

4.2.4. The Best Model Representation for Long-term Equations

The best model for long-term equations is REM. The panel data estimation for REM in Equation (6) shows that exchange rate, economic growth, and foreign reserve have a positive and significant effect on the capital inflow in emerging market countries in ASEAN, which is consistent with the literature (Yesin, 2016). In addition, inflation and lending rate have a negative and significant effect on the capital inflow in emerging market countries in ASEAN, which is also consistent with the literature (Antras and Caballero, 2009). Whereas, the current account has a negative effect although not significant. Based on these findings, the current account disrupts the equilibrium of the capital inflow in the long term. From equation (6) we can interpret that capital inflow will increase by 0.987 if the exchange rate increases by one percent; capital inflow will increase by 0.245 if economic growth increases by one percent; capital inflow will increase by 0.619 if foreign reserve increases by one percent; capital inflow will decrease by 0.352 if inflation increases by one percent; and lastly, capital inflow will decrease by 0.652 if lending rate increases by one percent.

4.3. Co integration Test

Co integration tests aim to find an equilibrium in the long term between current account, exchange rate, economic growth, foreign reserve, inflation, and lending rate to capital inflow in emerging market countries in ASEAN. Co integration tests are carried out by checking the stationary of the residuals on long-term equations using the Augmented Dickey-Fuller (ADF) test and the Phillips-Peron test as summarized in Table 5.

Table-5. Co integration Test

Variable	Test	Level		First Difference		
		t-statistics	p-value	t-statistics	p-value	Decision
U	ADF	22.6614	0.0121	-	-	I(0)
	PP	28.9058	0.0013	-	-	I(0)

Source: Authors' Calculations.

Based on the results of calculations in Table 5, we can conclude that the residuals of long-term equations are stationary on level I(0).This means that the current account, exchange rate, economic growth, foreign reserve, inflation, and lending rate that affect capital inflow can reach an equilibrium in the long term. Therefore, although capital inflow cannot reach an equilibrium in the short term, this can be achieved in the long term. However, there is one disturbing variable namely the current account.

4.4. ECM Equation

4.4.1. Panel Data Estimation for Short-term Equations

The ECM test can show equilibrium in the short term using panel data. The short-term equation consists of CEM, FEM, and REM, where the best panel model will be used for short-term equations. This section summarizes the equations for the whole model.

The following equation summarizes the panel data estimation for CEM for the long term:

$$\Delta CI_{it} = -0.126 - 0.087\ \Delta CA_{it} + 1.655\ \Delta \log(ER)_{it} + 0.271\ \Delta EG_{it}$$
$$(0.4460) \quad (0.0623) \quad (0.4235) \quad (0.0000)$$
$$+ 1.052\ \Delta \log(FR)_{it} - 0.095\ \Delta INF_{it} - 0.158\ \Delta LR_{it} - 0.354\ U_{it-1} \quad (7)$$
$$(0.2093) \quad (0.0584) \quad (0.2293) \quad (0.0010)$$

The following equation summarizes the panel data estimation for FEM for the long term:

$$CI_{it} = -0.150 - 0.088\ \Delta CA_{it} + 2.423\ \Delta \log(ER)_{it} + 0.265\ \Delta EG_{it}$$
$$(0.4130) \quad (0.1010) \quad (0.4327) \quad (0.0007)$$
$$+ 0.778\ \Delta \log(FR)_{it} - 0.203\ \Delta INF_{it} - 0.318\ \Delta LR_{it} - 0.385\ U_{it-1} \quad (8)$$
$$(0.4349) \quad (0.0162) \quad (0.0562) \quad (0.0008)$$

The following equation summarizes the panel data estimation for REM for the long term:

$$CI_{it} = -0.126 - 0.087\ \Delta CA_{it} + 1.655\ \Delta \log(ER)_{it} + 0.271\ \Delta EG_{it}$$
$$(0.4614) \quad (0.0720) \quad (0.4393) \quad (0.0000)$$
$$+ 1.052\ \Delta \log(FR)_{it} - 0.203\ \Delta INF_{it} - 0.318\ \Delta LR_{it} - 0.385\ U_{it-1} \quad (9)$$
$$(0.2248) \quad (0.0672) \quad (0.2452) \quad (0.0014)$$

4.4.2. Chow Test

The results of the Chow Test to select the CEM or FEM are summarized in Table 6 below.

Table-6. Chow Test

F Statistic	Prob.
0.4985	0.9387

Source: Authors' Calculations

Based on the Chow Test results in Table 6, the probability significance is 0.9387, where the probability value is greater than $\alpha = 0.05$ and the value of F statistic is smaller than the value of F table of 2.21. Thus, it is better to use CEM for interpretation because there is no need to proceed to the Hausman test.

4.4.3. The Best Model Representation for Short-term Equations

This section discusses the short-term relationship between current account, exchange rate, economic growth, foreign reserve, inflation, and lending rate to capital inflow in emerging market countries in ASEAN. The best model for short-term equations is CEM; based on panel data estimations for CEM in Equation (7), the error term lag significantly affects changes in capital inflow. This means that there is an imbalance in short-term relationships. Changes in the exchange rate, foreign reserve, and lending rate have no significant effect on changes in capital inflow, which is consistent with the literature (Ifeakachukwu and Ditimi, 2017; Yesin, 2016). Thus, the imbalances that cause changes in the equilibrium of capital inflow are an insignificant variable. However, in the short term, current account and inflation changes have a significant influence on the capital inflow at alpha 10 percent level while changes in economic growth also have a significant influence on capital inflow at an alpha rate of 1 percent.

5. Conclusion

This research and the co integration tests found that capital inflow is stable in the long term despite some changes and disequilibrium in the short term. This finding is a serious concern for policymakers and governments of emerging market countries in ASEAN who must manage capital inflow to achieve an equilibrium of capital inflow. Furthermore, the government must make proactive policies to stabilize the problem of disequilibrium because it has created long-term and short term problems in the capital inflow. This study has several limitations. First, the data was collected for a limited timeframe (18 years). Second, if the research would be based on more data it would provide more accurate results as it studies the effect of independent variables on a dependent variable but also analyzes if there is a long-term equilibrium.

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