A Causality Analysis of Foreign Direct Investment and Current Account Balance in Thailand

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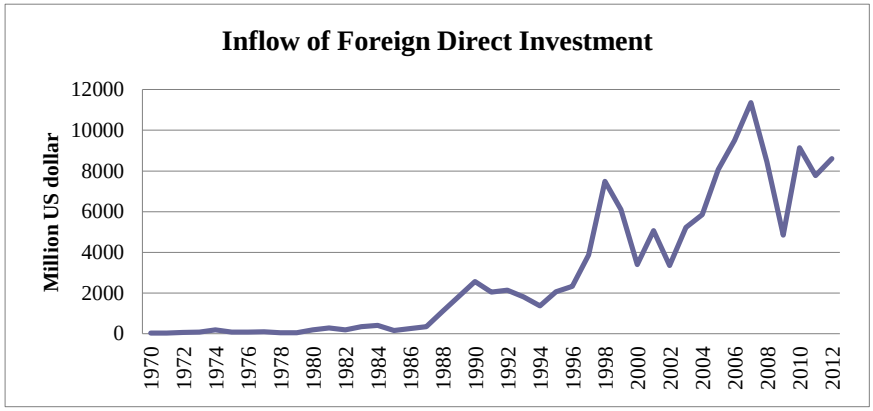
Abstract

Thailand is one of the most attractive countries for foreign direct investment (FDI) and the trend is increasing over time. FDI leads to an increase in import and export because of spillover effect, technology transfer and improvement in infrastructure. However, there are some considerations that FDI might be the cause of current account imbalance. Therefore, this paper investigates the causal relationship between current account and foreign direct investment through the Granger causality test. However, the result shows that there is no causal relationship between FDI and current account in Thailand. In addition, it is found unidirectional relationship between export and FDI.

Keywords: Foreign direct investment (FDI), Current Account, Import, Export, Granger Causality

Introduction

Over the decades, Thailand is one of the most attractive destinations for foreign direct investment (FDI) due to the formation of several free trade agreements, geography, relatively cheap production cost, market demand, friendly culture, and government support. The trend of inward FDI is still increasing, however, there was some significant drop in 1998 and 2008 because of Asian financial crisis and Global Financial Crisis respectively. From 1990 to 1996, FDI flow into Thailand substantially by large scale industries such as steel and petrochemical, and infrastructure projects. For the post-crisis, the growth of FDI had increased mainly due to the increase in Merger and Acquisition. In addition, since 1970, the electronics and machinery and transport equipment industry attracts large volume of FDI as Japanese companies considered Thailand as their production base, which contributed to the increase in both export and import of these industries in Thailand.



Source: UNCTAD

FDI creates technology and knowledge spillovers, improvement in infrastructure and quality of factor of production, which resulted in higher production efficiency. In addition, the effect of FDI will contribute to the economic growth and development in host countries. Particularly, it will boost up the import and export value, for instance, importing technological equipment and machinery will generate higher growth of export over time.

Even though, FDI has several advantages to host countries, there is a consideration on the current account. Calvo, Leiderman and Reinhart (1996) observed that developing countries normally had surge in international capital inflow, which have coincided with widening current account deficits. The sustainability of current account deficit might deteriorate the stable path of economy and reflect dangerous and unsustainable imbalance between national savings and investment and the accumulation debt (Maxwell, 2005).

For the current account in Thailand, it moved back and forth between surplus and deficit. However, during these recent years, the current account became deficit.

Year	2005	2006	2007	2008	2009	2010	2011	2012	2013
Current Account (Million Baht)	-302,493	84,553	539,704	67,381	755,336	312,944	276,920	-45,070	-73,875

Source: Bank of Thailand

Since there is no clear relationship between FDI and current account, this paper mainly focuses on discovering the causality relationship between these two variables as well as exports and imports.

Literature Review

Since the liberalization on FDI might promote the growth in term of knowledge and technology transfer, there is some cost of FDI associated with current account deficit, especially in developing countries. There are some literatures that related to this issue. In the case of India, Kaur, Yadav and Gautam (2012) explained in their paper that there is unidirectional causality from FDI to current account and they are co-integrated in the long run through using Vector Auto Regressive and the Granger causality. The results in their paper also showed that there is bidirectional causality from FDI to exports and imports, which support the earlier explanation. Furthermore, the magnitude of impact of FDI is more on import than that on exports.

In the case of Pakistan, Siddiqui, Ahmad, and Asim (2013) indicate that FDI and current account have long run relationship and the causality relationship between them is unidirectional by using Vector Auto Regressive and Vector Error Correction model. In addition, they also suggested that the policy makers should take into account of FDI since it may cause to the deterioration of balance of payments in the long run.

Akbas and Senturk (2013) studied on G7 countries and concluded that there is unidirectional casual relationship from FDI to current account deficit and total credits.

In the case of Vietnam, Pham (2009) found the evidence that in the short run there are bi-directional relationship between FDI and exports and FDI and imports, whereas, in the long run there is only uni-directional causal relationship from FDI to imports and exports.

Samsu, Derus, and Ooi (2008) conclude that FDI and exports have long-term relationship and there is evidence of FDI causing exports in Malaysia. Seabra and Flach (2005) found that FDI causes profit remittance and emphasize significant adverse long−run effects of FDI attraction policies for the Brazilian economy.

From the previous literatures, mostly it indicated a uni-directional causal relationship from FDI to current account and there is long-term relationship between them as in India, Pakistan and in G7 countries. However, there is no evidence in Thailand case. Therefore, this paper has an attempt to examine the causal relationship between current account, its component and FDI in Thailand.

Data and Methodology

The data consist of net foreign direct investment (FDI), current account, export value, import value and gross domestic product (GDP), which are obtained from the Bank of Thailand (BOT). These data are taken quarterly from year 1997 to 2010. The variables used in this paper will be in term of percentage of GDP where FDI, CUR, IMP, EXP refers to FDI, current account, imports value and exports value as percentage to GDP respectively.

To examine the causality relationship between FDI and current account, the Granger causality test have been used under Vector Auto Regressive (VAR) framework. Firstly, it is needed to test the stationary properties by employing Augmented Dickey Fuller (ADF) Test and Phillips-Perron (PP) Test. Testing stationary properties through unit root test, the null hypotheses is as followed.

H_0 = The series are non-stationary or contain a unit root

H_a = otherwise

The regression model for unit root is given by

$$\Delta FDI_t = \alpha FDI_{t-1} + \beta_1 \Delta FDI_{t-2} + \cdots + \beta_p FDI_{t-p} \quad (1)$$

$$\Delta CUR_t = \alpha CUR_{t-1} + \beta_1 \Delta CUR_{t-2} + \cdots + \beta_p CUR_{t-p} \quad (2)$$

Where ΔFDI is the first difference of FDI and ΔCUR is the first difference of current account.

If the result shows that there is significantly different from zero on coefficients, it means that the null hypothesis is rejected. Furthermore, the lag order can be conducted through Akaike Information Criteria (AIC) and Schwarz Bayesian Information Criteria (SBIC) to find the optimal lag used in VAR model.

Secondly, it is needed to find cointegration properties in the variables through Johansen and Juselius methods. The significant result, implied long-run relationship between these variables, will be concluded from the trace statistics and maximum eigen values. In Johansen technique, the vector y_t which can be expressed as VAR with *l* lags:

$$y_t = A_1 y_{t-1} + A_2 y_{t-2} + \cdots + A_l y_{t-l} + \varepsilon_t \quad (3)$$

Where y_t is a vector (n x 1); A_i is the parameters matrix (n x n)

Next, identifying the causal relationship between FDI and current account through the Granger causality approach. Variable y is said to be Granger-caused by x if x helps in the prediction of y. The VAR model for FDI and CUR is given by

$$FDI_t = \lambda_0 + \sum_{i=1}^{l+r} \alpha_{1i} FDI_{t-i} + \sum_{i=1}^{l+r} \beta_{1i} CUR_{t-i} + e_{1t} \quad (4)$$

$$CUR_t = \lambda_0 + \sum_{i=1}^{l+r} \alpha_{2i} CUR_{t-i} + \sum_{i=1}^{l+r} \beta_{2i} FDI_{t-i} + e_{2t} \quad (5)$$

Where FDI is the FDI as percentage of GDP, CUR is current account as percentage of GDP, *l* is the optimal lag, *r* is the order of integration, λ is constant, α and β are coefficients of FDI and CUR and

e_1 and e_2 are the white noise error term. From equation 4, the null hypothesis is that CUR does not granger cause FDI. In equation 5, the null hypothesis is that the FDI does not granger cause CUR.

To examine further on the causal relationship between FDI and exports, and FDI and IMP, the above method can be applied. The VAR frameworks are as followed.

$$FDI_t = \lambda_0 + \sum_{i=1}^{l+r} \alpha_{1i} FDI_{t-i} + \sum_{i=1}^{l+r} \beta_{1i} EXP_{t-i} + e_{1t} \quad (6)$$

$$EXP_t = \lambda_0 + \sum_{i=1}^{l+r} \alpha_{2i} EXP_{t-i} + \sum_{i=1}^{l+r} \beta_{2i} FDI_{t-i} + e_{2t} \quad (7)$$

Where EXP is the percentage of exports to GDP. The null hypothesis for equation 6 is that EXP does not granger cause FDI and for equation 7, the null hypothesis is vice versa

$$FDI_t = \lambda_0 + \sum_{i=1}^{l+r} \alpha_{1i} FDI_{t-i} + \sum_{i=1}^{l+r} \beta_{1i} IMP_{t-1} + e_{1t} \quad (8)$$

$$IMP_t = \lambda_0 + \sum_{i=1}^{l+r} \alpha_{2i} IMP_{t-i} + \sum_{i=1}^{l+r} \beta_{2i} FDI_{t-1} + e_{2t} \quad (9)$$

Where IMP is the percentage of imports to GDP. The null hypothesis for equation 8 is that IMP does not granger cause FDI and for equation 9 the null hypothesis is vice versa.

Lastly, to implement the analysis, the Impulse Response Function should be used in order to explain how the shocks coming from the error term related to FDI affect to current account, exports and imports through time.

Results

Testing the stationary properties

Through ADF and PP test, only current account contains stationary property at levels at 95 percent confidence level, whereas all of the variables are stationary at first differences at 99 percent level of confidence. Therefore, all variables at first differences are used in later process.

Investigate optimal lag

AIC and SBIC gives different optimal lag for current account and FDI. From AIC, it suggests 2 lags, while SBIC suggests 1 lag. However, 2 lags will be used in this model. 2 lags are also suggested for FDI and export and FDI and import.

Testing cointegration (l=2)

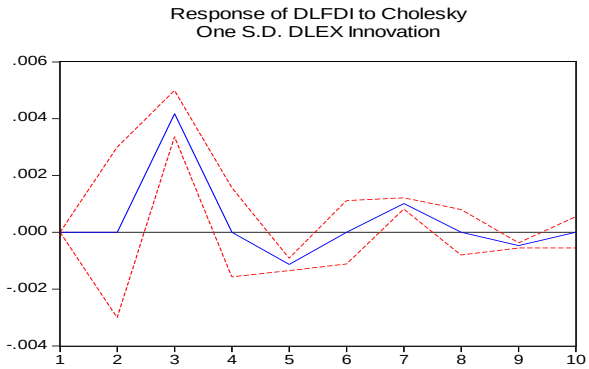
Since current account is stationary at level, there is no need to test cointegration. For FDI and imports, the test shows no significant relationship on cointegrating equation, meaning that there is no long run relationship between these variables. For FDI and exports, they are cointegrated since both trace statistic and maximum eigen values are higher than critical value at 95 confidence level. It means that there is long run relationship between these variables.

Granger No Causality Test for FDI and CUR, IMP and EXP

The result shows that there is no granger causal relationship between FDI and current account and between FDI and import. In contrast, there is a unidirectional relationship between export and FDI.

Impulse Response Function

Since there is no causal relationship between FDI and current account, and FDI and imports, it is no need to conduct impulse response function. As there is only one relationship between export and FDI, the effect of shock can be examined through impulse response function. The shock of export cause FDI to increase in period 3 because there is some lags for investors to adjust to invest in Thailand and it tend to move back to normal path around period 5.



This table illustrates the conclusion of result.

	Method	FDI and Current account	FDI and Imports	FDI and Exports
Stationary properties	Unit root: ADF and PP	Current account is stationary at level	Import is stationary at first difference	Export is stationary at first difference
Optimal lag	AIC and SBIC	2	2	2
Cointegration properties	Johansen – Juselius procedure	-	No long run relationship	Long run relationship between FDI and export
Causality relationship	Granger causality test	No causal relationship	No causal relationship	Unidirectional relationship from exports to FDI
Effect of shock	Impulse response function	-	-	Export shocks cause FDI to spike up in period 3 and turn to normal path in period 5

Result Justifications

From the results, there is no causal relationship between FDI and current account, which contrast to hypothesis that FDI should have effect to current account because traditionally FDI induce imports and exports, which are main component of current account. However, the data are collected at macro-level, there might be other variables such as real exchange rate or trade openness have significant impact on current account, therefore, the impact of FDI to current account is statistically insignificant. Furthermore, FDI might have indirect relationship with current account. For example, FDI might have influence on real exchange rate, which affect on international trade, and eventually have some impact on current account.

In addition, in these recent years, service sector such as tourism and remittance may contribute higher to current account. FDI might not contribute to service sector substantially and it might have no relationship with remittances because the remittances depend on companies' policy whether to transfer profit back to home countries or not. Therefore, higher contribution of service sector and remittances to current account might obscure the relationship between FDI and current account.

The results also reveal that there is a unidirectional relationship between exports and FDI meaning that exports have caused on FDI. The investors may observe good historical exports value and expect potential growth in the future, therefore, they invest in Thailand. In addition, Thailand provides a lot of incentives to foreign investors for long-term investment such as tax reduction, and board of investment promotions. Thailand also adopts export-led growth policy and support export-oriented industries. The construction of industrial park also creates potential growth in exported-oriented industries because of reduction in transaction cost, transportation cost, and economies of scales. Due to these factors, they provide potential growth in export industry, which will induce foreign investors to set up factories in Thailand.

Limitations and suggestions for further studies

This Vector Auto Regressive model have ignored other related variables such as real exchange rate or trade openness, therefore, it might not explain the relationship accurately. For further studies, it is needed to add these variables into the model in order to investigate this relationship more precise. In addition, not only VAR model is used, but also Vector Error Correction (VECM) model can be added to implement the result because using VECM, it is able to identify short run causal relationship. However, there also have some limitation on the availability of data. Given these data, the variables are not cointegrated so it cannot continue with VECM since this model is required that the variables have to be cointegrated.

There is a limitation on the availability of data as well. The data are obtained from year 1997 to 2010, which during these years, FDI flow to Thailand because of the collapse of many factories through M&A. It would be better, if the data are acquired before 1997 because in 1960s, Thailand

support import-substitution trade regime and in 1980s the government shift to export promoting regime and began to engage in massive campaign to attract foreign entrepreneur to Thailand so there is a number of foreigners invest in Thailand coinciding with Japan, who face the appreciation of Yen and move to Thailand as production base, which means that they had to imports machinery and equipment. If these years were included, the relationship between FDI and imports and exports might present some significant relationship.

Since the flow of FDI might boost investment, imports and exports respectively, identifying relationship between FDI and current account might not be revealed. The structural VAR can be employed in order to investigate relationship because the structural VAR will adjust and arrange the order of the variables.

Furthermore, separate the FDI, imports and exports into industry-level made it easier to find relationship between these variables because it will reduce the factors that will affect on them compared to macro-level that there are a number of factor has influences on variables. Panel causal analysis can be used to discover causal relationship of the variables in two dimensions, time-series and cross sectional variables. In this case, FDI, imports and exports are time-series whereas the data collected in each industry is cross sectional. In addition, panel data will eliminate the heterogeneity problem and non-time or non-industry error through fixed effect. However, this method might not reveal clear relationship between FDI and current account.

Conclusion

From the past until now, many foreign investors come to invest in Thailand remarkably due to favorable benefits such as free trade agreement, geography and relatively low factors of production. FDI also boost growth and improvement in technology and quality of factor of production. However, in developing country, expansion of capital account is coincided with widening current account balance. In addition, from literature reviews, in India, Pakistan, Vietnam, and Malaysia, there are strong evidence that FDI has caused on current account, imports and exports. Therefore, this paper aim to analyze the relationship of FDI and current account and supplement by investigating relationship between FDI and current account component, exports and imports in Thailand. FDI, current account, imports and exports data are obtained from the Bank of Thailand from 1997 to 2010 and VAR model and Granger Causality test are employed to uncover the relationship of these variables. However, the results show that there is no causal relationship between FDI and current account and FDI and imports because the model might neglect some relevant factors and current account has higher contribution of service sector and profit remittances. Another result shows that there is a unidirectional relationship between exports and FDI. The effect of exports causes FDI to spike up in third period and back to normal in later period. Since investors will observe historical export value before they are going to invest, FDI is caused by exports. In addition, government's supports in export-oriented industry such as building industrial part or tax reduction induce long-term

investors to invest. Lastly, there are some limitations on this paper that the model is ignored some variables and there are some problems on the availability of the data. For furthered studies, VECM, structural VAR and panel causal analysis can be used to discover relationship among FDI, current account and its component more accurate.

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Appendix

Testing the stationary properties

Results of ADF and PP tests for Unit root at levels

Variable	P-value (ADF)	P-value (PP)
CUR	0.0074**	0.0078**
FDI	0.1662	0.0030**
EXP	0.0640*	0.0131**
IMP	0.6268	0.1995

**significant at 95 percent
*Significant at 90 percent

Results of ADF and PP tests for Unit root at first differences

Variable	P-value (ADF)	P-value (PP)
CUR	0.0000	0.0000
FDI	0.0000	0.0000
EXP	0.0000	0.0000
IMP	0.0000	0.0000

All variables are significant at 95 percent

Investigate optimal lag

Endogenous variables: DCUR DFDI

Lag	LogL	LR	FPE	AIC	SBIC	HQ
0	221.6784	NA	5.23e-07	-8.787136	-8.710656	-8.758012
1	233.3760	21.99150	3.85e-07	-9.095041	-8.865598*	-9.007668
2	240.2516	12.37609*	3.43e-07*	-9.210065*	-8.827660	-9.064443*
3	243.6732	5.885167	3.52e-07	-9.186929	-8.651563	-8.983059
4	246.6984	4.961350	3.68e-07	-9.147938	-8.459610	-8.885818
5	247.6664	1.509964	4.18e-07	-9.026655	-8.185365	-8.706287

Endogenous variables: DFDI DEXP

Lag	LogL	LR	FPE	AIC	SBIC	HQ
0	224.3891	NA	4.70e-07	-8.895564	-8.819083	-8.866440
1	233.7803	17.65546	3.79e-07	-9.111212	-8.881769	-9.023839
2	248.0725	25.72595*	2.51e-07*	-9.522900*	-9.140495*	-9.377278*
3	250.0741	3.442723	2.73e-07	-9.442963	-8.907597	-9.239093
4	251.3328	2.064234	3.06e-07	-9.333310	-8.644982	-9.071191
5	252.9888	2.583441	3.38e-07	-9.239553	-8.398262	-8.919184

Endogenous variables: DLIMP
DLFDI

Lag	LogL	LR	FPE	AIC	SBIC	HQ
0	216.9251	NA	6.33e-07	-8.597004	-8.520523	-8.567879
1	225.8937	16.86096	5.19e-07	-8.795747	-8.566305*	-8.708374
2	232.2753	11.48690*	4.72e-07*	-8.891012*	-8.508607	-8.745390*
3	235.4644	5.485295	4.89e-07	-8.858577	-8.323210	-8.654706
4	236.7337	2.081580	5.48e-07	-8.749347	-8.061019	-8.487228
5	237.7887	1.645883	6.21e-07	-8.631549	-7.790259	-8.311181

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SBIC: Schwarz information
criterion
HQ: Hannan-Quinn information criterion

Testing cointegration (l=2)

Series: FDI IMP
Lags interval (in first differences): 2 to 2

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.280489	20.15665	15.49471	0.0092
At most 1	0.049845	2.709917	3.841466	0.0997

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.280489	17.44673	14.26460	0.0152
At most 1	0.049845	2.709917	3.841466	0.0997

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Series: LFDI LEXP
Lags interval (in first differences): 2 to 2

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.270673	25.70177	15.49471	0.0010
At most 1 *	0.155749	8.973187	3.841466	0.0027

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.270673	16.72858	14.26460	0.0200
At most 1 *	0.155749	8.973187	3.841466	0.0027

Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Granger No Causality Test for FDI and CUR, IMP and EXP

Pairwise Granger Causality Tests
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
DFDI does not Granger Cause DCUR	53	0.68084	0.5110
DCUR does not Granger Cause DFDI		2.23765	0.1177

Null Hypothesis:	Obs	F-Statistic	Prob.
DIMP does not Granger Cause DFDI	53	0.15009	0.8610
DFDI does not Granger Cause DIMP		0.79224	0.4587

Null Hypothesis:	Obs	F-Statistic	Prob.
DLEXP does not Granger Cause DLFDI	53	4.25374	0.0199
DLFDI does not Granger Cause DLEXP		0.85328	0.4324