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Vanguard Effect of Foreign Aid in Thailand

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Abstract

This study examines the relationship between foreign aid and investment in Thailand in two ways to see whether foreign aid contributes to Thai economy through encouraging investment in Thailand. The estimation results are summarized as follows. First, the relationship between foreign aid and investment adding to trade, savings, and growth from 1975 to 2020 is shown as positive relationships by using OLS but not by using VAR model. Second, positive relationship between the accumulated foreign aid and foreign direct investment from 1970 to 2020 is shown by using the VAR model, the Granger causality test, and the Impulse response test. Based on the estimation results, we infer that in Thailand foreign aid mainly arranged for social infrastructure since the 1980s guided investments to an extent since foreign aid and investment in Thailand has positive relationship under some restrictions.

JEL classification numbers: F35, O53.
Keywords: Foreign Aid, Vanguard, Foreign Direct Investment, Thailand.

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1 Introduction

Recently, there has been a wide prevalence in the efficient ways for low-income countries to become middle-income countries. One method is invested by private sectors including foreign companies. Empirical studies robustly estimate the positive relationship between the foreign direct investment (FDI) and GDP (Dollar and Kraay 2002, Ravallian 2001, Besley and Burgess2003), and the negative relationship between the GDP and poverty ratio (Borensztein et al. 1998, Hsiao and Hsiao 2006). In contrast, whether foreign aid contributes to economic growth is still under discussion. One of the purposes of foreign aid is strengthening the social infrastructures for companies to invest including FDI. The effect of foreign aid to FDI is called "vanguard effect" although this effect is also still under discussion. In this point, Thailand used foreign aid mainly for social infrastructures and invited foreign companies since the 1980s, which led to the economic growth shown in Figure 1.

This study examines the relationship between foreign aid and investment in two ways. The first way is estimating the relationship between the foreign aid and investment adding to trade, savings, and growth from 1975 to 2020, similar to previous literatures examining cross-country panel data analysis. The second way is estimating the relationship between accumulated foreign aid and FDI in Thailand from 1970 to 2020 by using the time series analysis: VAR model, Granger causality, and Impulse response as a more comprehensive way. Through these two ways, we infer whether foreign aid in Thailand has a vanguard effect on investment.

The remainder of this paper is structured as follows. Section 2 describes the literature review, including the relationship between foreign aid and economic growth and the vanguard of foreign aid in the Asian region. Next, Section 3 presents data, methodology OLS including the cointegration and VAR model, and estimation results of the first way followed by previous literatures. Section 4 shows data and methodology, i.e., the VAR model, granger causality, impulse response, and the estimation results in the comprehensive way. Finally, Section 5 provides a discussion with interpretation and summarizes as well as concludes the study.

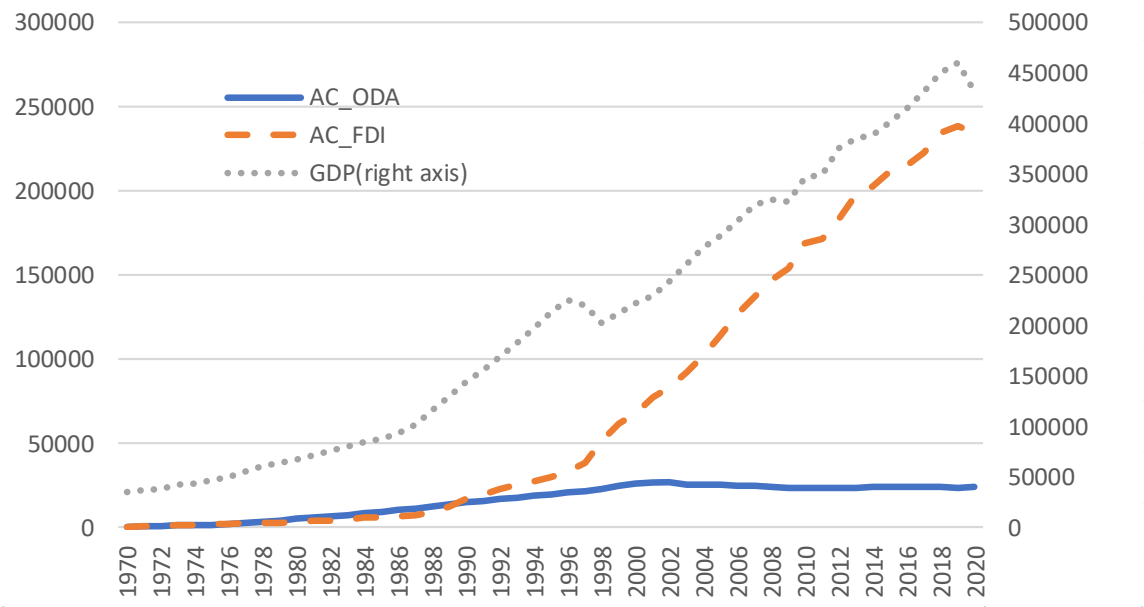

Figure 1: Foreign aid, foreign direct investment, and GDP

Source: World Development Indicators.
Note: AC_ODA indicates foreign aid accumulated since 1970, and AC_FDI indicates foreign direct investment accumulated since 1970, respectively.

2 Literature Review

The effect of foreign aid is still under discussion. We examine previous studies from the side of aid effectiveness and regional study.

First, from the macroeconomic point of view, the way of measuring effect is divided into four generations (Arndt et al., 2016; Nowak-Lehmann and Gross, 2021). The first generation examines the relationship between domestic savings to finance investment and foreign aid as a complement to savings (Hansen and Tarp 2000). The second generation is an aid-investment link using the Harrod-Domar model. Constant investment and productivity of capital determine economic growth. In this model, all savings and aid are used to finance investment. However, previous studies show that a substantial portion of the aid is consumed rather than invested (Hansen and Tarp, 2000; Nowak-Lehmann et al., 2012). The third generation is that the aggregate effect of aid directly impacts per capita income or economic growth using the Solow growth model. The results of the aid effectiveness are divided into positive and negative (Burnside and Dollar, 2000; Easterly et al., 2004). The fourth generation pursues the effectiveness of the different types of aid (Rajan and Subramanian, 2008).

Second, from the regional studies, Kimura and Todo (2010) examined foreign aid as a vanguard using the gravity model in the East Asia region and found positive results. Sakurai (2021) studied the relationship between aid and economic growth in Thailand using the third generation model and also found a positive relationship.

This study shows the vanguard effect of foreign aid in Thailand by estimating the relationship between foreign aid and investment, similar to Nowak-Lehmann and Gross (2021), including the second and third generations. Many studies, and not just in the case of Thailand, use the panel data, although foreign aid and investment from other countries are accelerated simultaneously.

3 Relationship between Investment and Foreign Aid

This section outlines the empirics of the vanguard effect in Thailand in two ways. The first part estimates the relationship between investment and foreign aid, adding to trade, savings, and growth from 1975 to 2020, similar to Nowak-Lehmann and Gross (2021). The next part shows the estimation of the relationship between FDI and foreign aid in Thailand from 1970 to 2020 using the time series analysis: VAR model, Granger causality, and Impulse response more comprehensively.

3.1 Data

This study uses six indicators: investment, foreign aid, domestic savings, trade as the total of export and import, and GDP. All variables are used from the World Development Indicators made by the World Bank. GDP is used from the constant prices in 2015, and all variables are converted into constant prices using the GDP deflator, and divided by GDP. Data description is shown in Table 1. Every variable is named as follows: INVY is the investment divided by GDP, ODAY is foreign aid divided by GDP, DOMSY means domestic savings divided by GDP, DEBTY is external debt divided by GDP, TRADEY means total of the export and import divided by GDP, and GROWTH is GDP growth rate. The value of ODAY is so small that interpretation of the result needs careful.

Table 1: Data description

	INVY	ODAY	DOMSY	DEBTY	TRADEY	GROWTH
obs	46	46	46	46	46	46
mean	0.312	0.000	0.286	0.382	0.862	0.052
std	0.084	0.000	0.045	0.156	0.342	0.041
min	0.218	0.000	0.205	0.125	0.370	-0.076
max	0.503	0.000	0.359	0.923	1.364	0.133

Notes: INVY: investment to GDP ratio. ODAY: foreign aid to GDP ratio.
DOMSY: domestic savings to GDP ratio. DEBTY: external debt to GDP ratio.
TRADEY: sum of export and import to GDP ratio. GROWTH: GDP growth ratio.

3.2 Methodology

We estimate the OLS equation shown in (1) by the following processes. If the error term is I(1), the equation (1) should be estimated as the first termThe estimation equation is shown as Equation (1). We first check the unit root tests of all variables to see whether the equation (1) can be estimated by using the level series or not. If all variables are I(1), the equation (1) should be estimated by using the first difference.

Next, we check the unit root test of the error term whether this relationship is cointegrated or not. If the error term of the level series is I(1) in the case of explanatory variables are I(1), we judge that this relationship is spurious regression.

$$INVY_t = \alpha + \beta_1 ODAY_t + \beta_2 DOMSY_t + \beta_3 DEBTY_t + \beta_4 TRADEY_t + \beta_5 GROWTH_t + \varepsilon_t \quad (1)$$

where
$INVY_t$: investment to GDP ratio in the year t
$ODAY_t$: foreign aid to GDP ratio in the year t
$DOMSY_t$: domestic savings to GDP ratio in the year t
$DEBTY_t$: external debt to GDP ratio in the year t
$TRADEY_t$: sum of export and import to GDP ratio in the year t
$GROWTH_t$: GDP growth ratio in the year t

Finally, we also use the vector autoregression (VAR) model or cointegrated VAR model to see the effect of the foreign aid. This model is used to determine the relatiosnhips among variables and tracing the responses of the shock. VAR model is shown as the equation (2). Variables are converted into the first difference if they are I(1) as a result of the unit root test.

$$\begin{bmatrix} D(INVY)_t \\ D(ODAY)_t \\ D(DOMSY)_t \\ D(DEBTY)_t \\ D(TRADEY)_t \\ D(GROWTH)_t \end{bmatrix} = \begin{bmatrix} \alpha_{1t} \\ \alpha_{2t} \\ \alpha_{3t} \\ \alpha_{4t} \\ \alpha_{5t} \\ \alpha_{6t} \end{bmatrix} + \begin{bmatrix} \beta_{11} & \beta_{12} & \beta_{13} & \beta_{14} & \beta_{15} & \beta_{16} \\ \beta_{21} & \beta_{22} & \beta_{23} & \beta_{24} & \beta_{25} & \beta_{26} \\ \beta_{31} & \beta_{32} & \beta_{33} & \beta_{34} & \beta_{35} & \beta_{36} \\ \beta_{41} & \beta_{42} & \beta_{43} & \beta_{44} & \beta_{45} & \beta_{46} \\ \beta_{51} & \beta_{52} & \beta_{53} & \beta_{54} & \beta_{55} & \beta_{56} \\ \beta_{61} & \beta_{62} & \beta_{63} & \beta_{64} & \beta_{65} & \beta_{66} \end{bmatrix} \begin{bmatrix} D(INVY)_{t-1} \\ D(ODAY)_{t-1} \\ D(DOMSY)_{t-1} \\ D(DEBTY)_{t-1} \\ D(TRADEY)_{t-1} \\ D(GROWTH)_{t-1} \end{bmatrix} + \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \\ \varepsilon_{3t} \\ \varepsilon_{4t} \\ \varepsilon_{5t} \\ \varepsilon_{6t} \end{bmatrix} \quad (2)$$

where
$INVY_t$: investment to GDP ratio in the year t
$ODAY_t$: foreign aid to GDP ratio in the year t
$DOMSY_t$: domestic savings to GDP ratio in the year t
$DEBTY_t$: external debt to GDP ratio in the year t
$TRADEY_t$: sum of export and import to GDP ratio in the year t
$GROWTH_t$: GDP growth ratio in the year t
D(--) indicates the first difference

3.3 Estimation Results

We first conduct the unit root test of these eight variables using the ADF and PP tests. As shown in Table 2, all variables except foreign aid have the unit root and I(1). Since most variables have a unit root, Equation (1) can be estimated by converting to the first difference or by the level series under cointegration.

Table 2: Estimation results of the unit root test

Investment/GDP (INVY): I (1)				
	ADF		**PP**	
	Intercept	**Intercept & Trend**	**Intercept**	**Intercept & Trend**
Level	-2.227	-2.939	-1.588	-2.195
First Difference	-4.4866***	-4.412***	-3.619***	-3.579***
ODA/GDP (AIDY): I (0)				
	ADF		**PP**	
	Intercept	Intercept & Trend	Intercept	Intercept & Trend
Level	-3.537**	-4.416***	-3.607***	-4.597***
First Difference	-	-	-	-
Savings/GDP (DOMSY): I (1)				
	ADF		**PP**	
	Intercept	Intercept & Trend	Intercept	Intercept & Trend
Level	-2.212	-1.752	-1.951	-1.478
First Difference	-4.556***	-4.726***	-4.536***	-4.669***
Domestic Debt/GDP (DEBTY): I (1)				
	ADF		**PP**	
	Intercept	Intercept & Trend	Intercept	Intercept & Trend
Level	-2.412	-2.329	-2.211	-2.082
First Difference	-4.386***	-4.376***	-4.428***	-4.423***
Export+Import/GDP (Tready): I (1)				
	ADF		**PP**	
	Intercept	Intercept & Trend	Intercept	Intercept & Trend
Level	-1.347	-0.336	-1.347	-0.336
First Difference	-6.096***	-6.262***	-6.096***	-6.259***
GDP growth rate (GROWTH): I (1)				
	ADF		**PP**	
	Intercept	Intercept & Trend	Intercept	Intercept & Trend
Level	-2.782*	-3.753**	-2.782*	-3.829**
First Difference	-7.449***	-	-8.273***	-

Table 3: Estimation result of the OLS

Dependent variable: D(INVY)				
Estimated equation	①	②	③	④
D(ODAY)	34919255	27499013		
	(4634400)***	(16005006)*		
D(DOMSY)	-0.131	0.385	-0.360	0.260
	(0.132)	(0.316)	(0.239)	(0.315)
D(DEBTY)	-0.102	-0.147	-0.187	-0.182
	(0.035)***	(0.084)*	(0.091)**	(0.083)**
D(TRADEY)	0.025	0.010	0.065	0.024
	(0.030)	(0.079)	(0.086)	(0.080)
D(GROWTH)	0.040	-0.057	0.120	0.079
	(0.057)	(0.160)	(0.111)	(0.142)
C	-0.002	-0.001	0.000	-0.001
	(0.011)	(0.005)	(0.012)	(0.005)
AR(1)	0.519		0.449	
	(0.142)***		(0.292)	
MA(1)	1		0.443	
	(4.339.526)		(0.321)	
Adj. R^2	0.752	0.170	0.490	0.208
Durbin-Watson stat	1.740	0.841	1.912	0.905

Note: 1. D(--) indicates the first difference, and (-1) indicates the previous period.
2. Standard errors are shown in parentheses. *** is significant at 1%, and ** is significant at 5%.
3. ODAY: foreign aid to GDP ratio. DOMSY: domestic savings to GDP ratio.
DEBTY: external debt to GDP ratio. TRADEY: sum of export and import to GDP ratio.
GROWTH: GDP growth ratio.

Next, we estimate Equation (1) in the first difference and level series in the case of cointegration. Since the error term of the equation (1) in the level series is estimated as I(1), the equation (1) in the level series is the spurious regression. In contrast, since the equation (1) in the first difference is effectively estimated as positive shown in Table 3, it is inferred that foreign aid is positive relationship with the investment. The estimation result with the AR and MA process is shown in the equation ① in Table 3 to adjust the Durbin-Watoson ratio, and without the process in the equation ② in Table 3. Equations ③ and ④ are estimated additionally without foreign aid since the coefficient of ODAY is so large that other explanatory variable may be affected. Rough estimation results are not changed even if reducing the foreign aid from an explanatory variable since most variables except for the DEBTY are ineffecient. From four equation it is inferred that foreign aid may affect to the investment although that the magnitude can be confirmed more carefully.

Finally, we estimate the VAR model to see the effect of the foreign aid to the investment. Table 4 shows the estimation result of the VAR model, and the ODA in the previous year to the investment this year is insignificantly estimated. In addition, the estimated result of the Granger causality test from the foreign aid to the investment illustrated in Table 5 is ineffective.

Table 4: Estimation result of the VAR model

	D(INVY)	**D(ODAY)**	**D(DOMSY)**	**D(DEBTY)**	**D(TRADEY)**	**D(GROWTH)**
D(INVY(-1))	0.301	0.000	0.020	0.915	-0.463	-0.556
	(0.150)*	(0.000)***	(0.085)	(0.288)***	(0.327)	(0.184)***
D(ODAY(-1))	1992227	0	13512906	18495959	-4213034	34033865
	(16000000)	(0.162)	(8747793)	(30000000)	(34000000)	(19000000)
D(DOMSY(-1))	0.701	0.000	0.265	-0.358	0.848	0.760
	(0.304)**	(0.000)	(0.171)	(0.581)	(0.660)	(0.371)**
D(DEBTY(-1))	-0.042	0.000	0.036	0.406	-0.063	-0.017
	(0.080)	(0.000)	(0.045)	(0.154)**	(0.175)	(0.098)
D(TRADEY(-1))	-0.010	0.000	-0.012	-0.110	-0.065	-0.053
	(0.076)	(0.000)	(0.043)	(0.146)	(0.165)	(0.093)
D(GROWTH(-1))	0.196	0.000	0.076	-0.748	0.783	-0.284
	(0.155)	(0.000)	(0.087)	(0.297)**	(0.337)**	(0.190)
C	-0.002	0.000	0.001	0.008	0.014	-0.005
	(0.005)	(0.000)	(0.003)	(0.009)	(0.010)	(0.006)
Adj. R-squared	0.305	0.169	0.088	0.304	0.111	0.152

Note: 1. D(--) indicates the first difference, and (-1) indicates the previous period.
2. Standard errors are shown in parentheses. *** is significant at 1%, and ** is significant at 5%.
3. ODAY: foreign aid to GDP ratio. DOMSY: domestic savings to GDP ratio.
DEBTY: external debt to GDP ratio. TRADEY: sum of export and import to GDP ratio.
GROWTH: GDP growth ratio.

Table 5: Estimation result of the Granger causality tests

Null Hypothesis	Obs	F-Statistic	Prob.
D(ODAY) does not Granger Cause D(INVY)	44	0.655	0.423
D(INVY) does not Granger Cause D(ODAY)	44	10.337	0.003
D(DOMSY) does not Granger Cause D(INVY)	44	6.710	0.013
D(INVY) does not Granger Cause D(DOMSY)	44	0.928	0.341
D(DEBTY) does not Granger Cause D(INVY)	44	1.203	0.279
D(INVY) does not Granger Cause D(DEBTY)	44	7.294	0.010
D(TRADEY) does not Granger Cause D(INVY)	44	0.275	0.603
D(INVY) does not Granger Cause D(TRADEY)	44	0.109	0.743
D(GROWTH) does not Granger Cause D(INVY)	44	4.127	0.049
D(INVY) does not Granger Cause D(GROWTH)	44	5.754	0.021
D(DOMSY) does not Granger Cause D(ODAY)	44	0.187	0.668
D(ODAY) does not Granger Cause D(DOMSY)	44	6.129	0.018
D(DEBTY) does not Granger Cause D(ODAY)	44	0.001	0.976
D(ODAY) does not Granger Cause D(DEBTY)	44	0.009	0.927
D(TRADEY) does not Granger Cause D(ODAY)	44	0.759	0.389
Null Hypothesis	**Obs**	**F-Statistic**	**Prob.**
D(ODAY) does not Granger Cause D(TRADEY)	44	1.012	0.320
D(GROWTH) does not Granger Cause D(ODAY)	44	0.555	0.460
D(ODAY) does not Granger Cause D(GROWTH)	44	0.386	0.538
D(DEBTY) does not Granger Cause D(DOMSY)	44	0.199	0.658
D(DOMSY) does not Granger Cause D(DEBTY)	44	0.248	0.621
D(TRADEY) does not Granger Cause D(DOMSY)	44	0.000	0.982
D(DOMSY) does not Granger Cause D(TRADEY)	44	2.079	0.157
D(GROWTH) does not Granger Cause D(DOMSY)	44	4.266	0.045
D(DOMSY) does not Granger Cause D(GROWTH)	44	0.987	0.326
D(TRADEY) does not Granger Cause D(DEBTY)	44	0.133	0.717
D(DEBTY) does not Granger Cause D(TRADEY)	44	0.908	0.346
D(GROWTH) does not Granger Cause D(DEBTY)	44	3.869	0.056
D(DEBTY) does not Granger Cause D(GROWTH)	44	0.195	0.661
D(GROWTH) does not Granger Cause D(TRADEY)	44	7.983	0.007
D(TRADEY) does not Granger Cause D(GROWTH)	44	0.131	0.720

Note: 1. D(--) indicates the first difference.
2. Standard errors are shown in parentheses. *** is significant at 1%, and ** is significant at 5%.
3. ODAY: foreign aid to GDP ratio. DOMSY: domestic savings to GDP ratio.
DEBTY: external debt to GDP ratio. TRADEY: sum of export and import to GDP ratio.
GROWTH: GDP growth ratio.

3.4 Summary of Estimation Results

In this section, we examine the relationship between foreign aid and investment in Thailand by using the equation shown in previous literatures. Result shows that the relationship between foreign aid and investment is seen by using the OLS but not in the VAR model. Hence the effect of the foreign aid to the investment is still under discussion since the relationship is not necessarily robust.

4 Relationship between FDI and Foreign Aid

This section outlines the empirics of the vanguard effect in Thailand from the perspective of the relationship between FDI and foreign aid in Thailand from 1970 to 2020 using the time series analysis: VAR model, Granger causality, and Impulse response in a more comprehensive way.

4.1 Data

In this section, foreign aid and foreign direct investment are used as endogenous variables. These variables are from the World Development Indicators made by the World Bank. Foreign aid is used as Official Development Aid (ODA) since both are facilitated as stock, compiled from 1970. In addition, showing the increasing rate, both are converted to the natural log. Later, conversion of the log of the accumulated ODA is presented as ln(AC_ODA). Similarly, the conversion of the log of the accumulated FDI is presented as ln(AC_FDI). The data description is shown in Table 6, and the overview of the two variables is shown in Figure 2.

Table 6: Data description

	ln(AC_ODA)	ln(AC_FDI)
mean	9.296	10.022
std	1.122	1.948
min	5.897	5.350
max	10.200	12.384

Note: 1. ln(AC_ODA) indicates natural logarithm of total foreign aid since 1970.
2. ln(AC_FDI) indicates natural logarithem of total foreign direct investment since 1970.

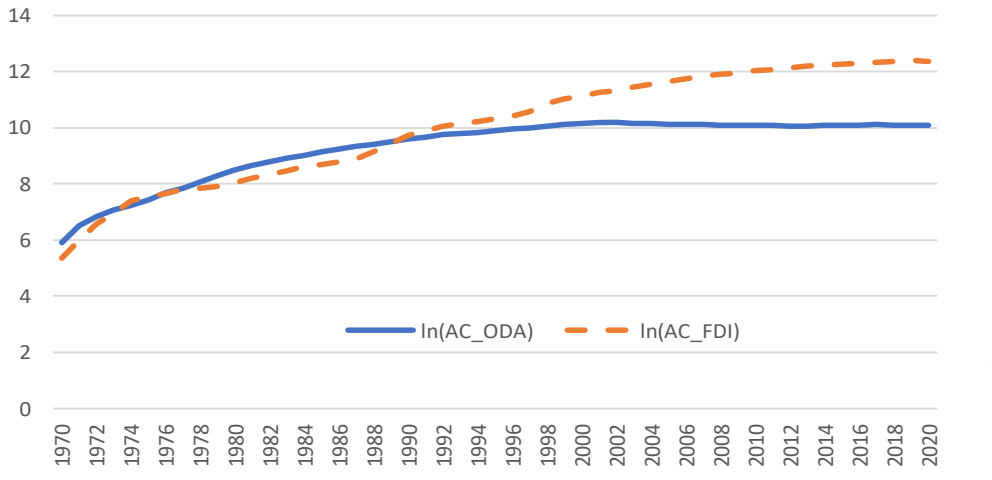

Figure 2: Overview of variables

Note: 1. ln(AC_ODA) indicates natural logarithm of total foreign aid since 1970.
2. ln(AC_FDI) indicates natural logarithem of total foreign direct investment since 1970.

4.2 Methodology

We conduct an estimation using the VAR model to determine the relationships among the variables of interest and facilities the tracing of the dynamic responses from an exogenous shock.

Before making the VAR model, a unit root test for stationarity is examined. Next, the following VAR model shown in the equation is conducted as shown in Equation (3).

$$\begin{bmatrix} D(\ln(AC\_ODA_t)) \\ D(\ln((AC\_FDI_t)) \end{bmatrix} = \begin{bmatrix} \alpha_{1t} \\ \alpha_{2t} \end{bmatrix} + \begin{bmatrix} \beta_{11} & \beta_{12} \\ \beta_{21} & \beta_{22} \end{bmatrix} \begin{bmatrix} D(\ln(AC\_ODA_{t-1})) \\ D(\ln(AC\_FDI_{t-1})) \end{bmatrix} + \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{bmatrix} \quad (3)$$

4.3 Estimation Results

The augmented Dickey-Fuller (ADF) and Phillips Perron (PP) tests are used to check whether these statistics have unit roots. Results of the unit root test, shown in Table 7, indicate that the ln(AC_ODA) is I(0) since it is rejected in the level series where ln(AC_FDI) is I(1) since it is rejected in the first difference. Thus we conduct the VAR model by using the first difference, which denotes D(ln(AC_ODA)) and D(ln(AC_FDI)), respectively.

We use the unrestricted VAR model in the previous and present periods, as shown in Equation (3). The result is shown in Table 8. D(--) denotes the first difference, and (-1) shows the previous period. Both variables of the previous and present periods are significant at 1%, and the previous FDI and present ODA is significant at 5%.

Table 7: Estimation results of unit root tests

Natural Log of Accumulated Official Development Assistance (ln(AC_ODA)): I(0)				
	ADF		**PP**	
	intercept	intercept&trend	intercept	intercept&trend
level	-6.018***	-3.921**	-15.668***	-6.689***
first difference	-	-	-	-
Natural Log of Accumulated Foreign Direct Investment (ln(AC_FDI)): I(1)				
	ADF		**PP**	
	intercept	intercept&trend	intercept	intercept&trend
level	-1.849	-0.939	-4.240***	-3.116
first difference	-4.313***	-4.508***		-4.549***

Note: *** and ** indicate the significance level at 1% and 5%, respectively.

Table 8: Estimation results of the VAR model

	D(ln(AC_ODA)	D(ln(AC_FDI))
D(ln(AC_ODA)(-1))	0.522	-0.045
	(0.100)***	(0.060)
D(ln(AC_FDI)(-1))	0.260	0.709
	(0.115)**	(0.069)***
C	0.033	0.019
	(0.014)***	(0.008)**
Adj. R-squared	0.669	0.797

Note: 1. D(--) indicates the first difference, and (-1) indicates the previous period.
2. Standard errors are shown in parentheses. *** is significant at 1%, and ** is significant at 5%.
3. ln(AC_ODA) indicates natural logarithm of total foreign aid since 1970, and ln(AC_FDI) indicates natural logarithem of total foreign direct investment since 1970.

Next, we conduct the Granger causality test, as shown in Table 9, which indicates that the relationship between ODA and FDI is significant at 5%. Then we focus on the impulse response test shown in Figure 4. The result of the impulse response test of the ODA shows that FDI is increased after several years of ODA increase.

Table 9: Estimation results of the Granger causality tests

Null Hypothesis	Obs	F-Statistic
D(In(AC_ODA)) does not Granger Cause D(In(AC_FDI))	49	5.099**
D(In(AC_FDI)) does not Granger Cause D(In(AC_ODA))	49	0.555

Note: 1. D(--) indicates the first difference. ** indicates significance at 5%.
2. ln(AC_ODA) indicates natural logarithm of total foreign aid since 1970, and ln(AC_FDI) indicates natural logarithem of total foreign direct investment since 1970.

Finally, we conduct the impulse response test. Result shows that response of foreign aid is negative at the first several years although change to the positive after seven years in the lower bound. Finally the response shows stable after 13 years. One reasons of taking time for response is considered foreign aid are social infrastructure.

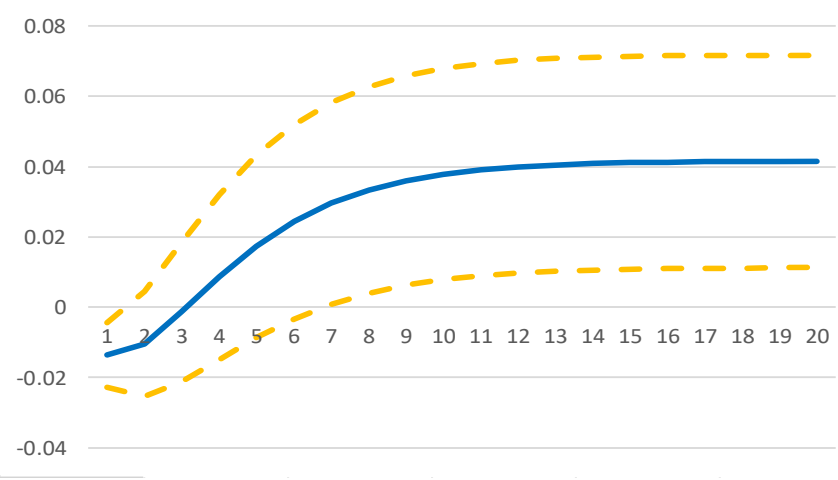

Figure 3: Impulse response test of the foreign aid to the investment

4.4 Summary of Estimation Results

This section examines the relationship between foreign aid and FDI using the VAR model, Granger causality test, and the impulse response directly. The estimation result shows positively effective. In addition, result of Impulse response test shows that it takes time to show the positive response.

5 Conclusion

This study examines the vanguard effect of foreign aid in Thailand in two ways by using the time series analysis. First, the relationship between foreign aid and investment adding to trade, savings, and growth from 1975 to 2020 is inferred as positive relationship but not robust. Second, the relationship between accumulated foreign aid and foreign direct investment from 1970 to 2020 is shown positively by using the VAR model, the Granger causality test, and the Impulse response test. Based on the estimation results, we infer that foreign aid in Thailand may guide the investment including FDI to an extent as a country data. In this regard, foreign aid from the 1980s to Thailand for encouraging investment is successful to an extent although further research is desirable due to some unrobust results.

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