The Relationship between Foreign Direct Investment, Current Account and Economic Growth in Vietnam: A Framework for International Capital Flow Management

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***Abstract* - The relationship between foreign direct investment (FDI), current account, and economic growth is a subject that always attracts the attention of researchers with studies that focus on both developed and developing countries. Many studies have shown that FDI has a positive effect on the growth of countries. However, this capital also brings some risks. Therefore, this study evaluates the relationship between foreign direct investment, current account, and economic growth in Vietnam. Using the VECM method, the research results have shown that FDI and current accounts positively affect Vietnam's economic growth in both the short and long term. The novelty of this paper is that the authors have done the robustness test through the Bayesian stability test. Based on research results, we propose policy implications to minimize the negative effects of FDI inflows and make the most of this capital source for Vietnam's sustainable economic development.**

Keywords *- Bayes, Current Account, Economic Growth, Foreign Direct Investment*

1. Introduction

The relationship between foreign direct investment (FDI) and economic growth is a subject that always attracts the attention of researchers with studies that focus on both developed and developing countries. Theoretically, FDI inflows play an important role in host countries' economic development, especially developing countries. Specifically, FDI inflows affect employment, production, prices, income, import-export, and the host country's well-being, thereby affecting economic growth. However, domestic and foreign studies show inconsistency in empirical evidence regarding FDI in economic growth. The impact of FDI on economic growth can be positive [6], [9], [10], [12], [17], [19], negative or not significant [10], [21]. From the results of domestic and foreign studies, we found that to assess the impact of FDI on economic growth accurately can be either direct or indirect through another variable. Another variable that has been considered and has also been identified in previous studies is the current account. The empirical studies also show evidence of the relationship between FDI and current account [23], [24].

In practical terms, quantitative analysis and the development of a system of solutions for the State Bank of Vietnam (SBV) and the Ministry of Planning and Investment to minimize the negative effects of FDI inflows and to make the most of this capital source for the sustainable economic development of Vietnam is a matter of urgency for the period 2021-2025. Accordingly, the Vietnam Macroeconomic Assessment Report of the International Monetary Fund (IMF) in 2018 highlighted the paradox in the relationship between Vietnam's current account and economic growth in 2015-2017. Accordingly, the current account was continuously in surplus, but the Vietnamese economy grew strongly. This is theoretically contradictory. Specifically, in an open economy, the relationship between savings, investment, and the current account is expressed through the formula: S - I = CA (CA-Current Account). When the current account is in surplus, it corresponds to savings greater than investment and often leads to an economic slowdown. Thus, the nature of Vietnam's economy is different from the theory.

In fact, the explanation for the above phenomenon has had a number of studies and opinions of experts that is due to the operation of FDI enterprises in the recent period. Specifically: (i) The stronger and deeper participation of the FDI sector is the main driver that has changed the domestic production and import-export structure of Vietnam, changing Vietnam's trade structure and thereby, having a strong impact on the current account balance. Accordingly, the proportion of the FDI sector participating in exports is increasing compared to the domestic sector; (ii) The FDI sector uses retained earnings to reinvest, causing the "Savings" category from the business sector to increase dramatically in the past 3 years.

Besides, according to the General Statistics Office of Vietnam report, the GDP growth rate in 2018 and 2019 always reached over 7%, the highest level in the period from 2008 to 2019. Contributing to that result, not to mention the role of large foreign direct investment enterprises such as Samsung, Formosa, and a series of other enterprises. Considering the whole year 2017, Samsung and Formosa contributed a high proportion to the 9.4% percentage point increase of the industry and contributed to setting a record of import and export with a turnover of over US $ 400 billion. In 2020, the impact of the COVID-19 pandemic caused global FDI inflows to plummet as global blockades and economic slowdowns slow down existing projects and economic prospects. However, Vietnam's FDI disbursements decreased only slightly compared to 2019, and the trade balance was a record high

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of USD 19.1 billion. Despite the COVID-19 pandemic, new FDI inflows show a trend of shifting investment to Vietnam.

Besides the important contributors to the Vietnamese economy, there have been some signs of instability of this capital source. Specifically, (1) FDI started to show signs of decline in the first half of 2018; (2) The difference between "registered capital" and "disbursed capital" has been growing since 2016; (3) Moreover, the development history of many countries also shows that the dependence on FDI inflows too much, contains many risks that can cause macroeconomic instability when there is an unexpected decline in the size and quality of FDI.

Therefore, this study evaluates the relationship between foreign direct investment, current account, and economic growth in Vietnam. From there, we are proposing solutions to minimize the negative effects of FDI inflows and make the most of this capital source for Vietnam's sustainable economic development.

2. Literature review

2.1. The influence of foreign direct investment on supply chain.

Companies have historically invested in overseas production facilities to gain access to locally bound natural resources, to be closer to their customers and markets, and to gain access to markets that they would otherwise be barred from due to high tariff and non-tariff protection. Investment motivated by these factors is referred to as “horizontal” FDI in the academic literature. Recently, multinational enterprises from developed countries have been investing abroad to take advantage of: (a) cross-border factor cost differences; and (b) a readily available and abundant pool of technology and skilled personnel. This latter type of foreign investment is known as “vertical” FDI in the literature [1], [20]. Multinational enterprises are increasingly motivated to establish overseas production facilities and cross-border sourcing for a variety of reasons, including (i) Reduced inventory costs through just-in-time delivery of parts and components; (ii) More efficient utilization of capacity and core capabilities; (iii) Access to specialized skills and resources that the company could not develop organically or acquire through mergers and acquisitions; (iv) Benefits from special tax privileges and economic investment incentives of the host country; (v) Benefits from special tariff treatments available between the host country and key trading partners

Most Multinational enterprises operating abroad introduce their business models in their work with local suppliers, which proved to be successful in their home countries. Furthermore, it is known that international producer and retailer companies entering new markets are trying to bring their established supplier relationships with them. Besides, imports of ready-for-consumption products keep decreasing, and most foreign companies prefer to invest in their production and open new production facilities abroad in order to make products affordable for a large number of local consumers.

When international retailers and processors enter a new country, they face the challenge to build up their procurement and distribution systems. In this context, it is observable that they are taking their business models known from their home countries into the newly entered markets. Thus, local supply chains will improve as FDI flows into the country [27].

2.2. The relationship between foreign direct investment and economic growth

Recently, Ref. [5] conducted a study on the impact of FDI on Romania's economic growth in the period 1990 - 2010. The author proposed a model for the relationship between FDI and economic growth in Romania, using a neoclassical model with a Cobb-Douglas production function, to analyze the effect of FDI on economic growth. Research results show that Romania's economy grows from the positive influence of fiscal policy and FDI.

Research by Ref. [17] uses the VAR model to evaluate the impact of foreign direct investment on economic growth in Vietnam. The results show that FDI inflows positively impact economic growth in Vietnam through export stimulation and human resource quality improvement.

Ref. [19] researched 43 provinces in the period 1997-2012. By the Granger causality test, the research results have shown that FDI has a causal relationship with the variable private investment, labor resources, tax revenues, infrastructure, trade openness, and technology deviation. Model estimation results by the GMM method show that FDI has an impact on economic growth.

However, some studies indicate that FDI does not have a significant effect on economic growth. Ref. [18] provides evidence that foreign capital can reduce economic growth by making excessive profits in a country, thereby distorting free trade as high taxes. Ref. [10] also concludes in their economic research on FDI and GDP growth. In particular, FDI does not have a statistically significant effect on growth. Besides, Ref. [21] argues that FDI creates a negative effect on domestic capital, and the impact of FDI on growth is negative.

2.3. The relationship between foreign direct investment (FDI) and current account

One variable considered in the relationship between FDI and economic growth that has also been pointed out in previous studies is the current account. The empirical studies also show evidence of a relationship between FDI and the current account. Capital flows can affect the current account, and FDI is a significant component of capital flows. In some developing countries, including Vietnam, a fact is that when FDI inflows continuously increase, there is also a deficit in the trade balance. The trade balance deficit is the main cause of the current account deficit in Vietnam. Several studies have shown that FDI inflows have a significant correlation with the current account.

Trade liberalization is expected to improve the current account and increase FDI. And if the relationship between FDI and exports exists, then FDI will increase with the level of exports in particular and the current account in general. Foreign direct investment can encourage exports and replace imported goods, leading to a better current account, especially between traditional manufacturing enterprises and joint venture enterprises [11]. Research by Ref. [25] demonstrates that FDI encourages export

activities in China. Ref. [7] also found similar results for member states of the European Union.

2.4. The relationship between economic growth and current account

The current account deficit started to be seen as an important indicator in the post-1990 period, especially in assessing developing countries' economies.

Ref. [13] conducted a study with a data set of 100 countries, in the period 1971-2007 through a Probit model with economic growth as the dependent variable, the study showed that the current account has a negative effect on economic growth and makes the economy grow negatively.

Ref. [14] took the survey in BRICS and MINT countries 1992-2013 and used the cointegration test method to analyze collected data. The study results show that the current account deficit has a significant effect on the countries of the two blocs' economic growth in the long term, but this is an important issue for MINT countries rather than the BRICS countries.

Ref. [8] has shown that the current account deficit is an investment greater than national savings, so appropriate policies are needed to reduce the world's deficit and dependence. Because of the lack of resources, the level of technology and technology is not equal, developing countries often rely on more developed countries to keep up with the demand for growth and globalization. Through the results of panel data analysis, Ref. [8] showed a long-term causal relationship from economic growth to current account deficit of countries in the "EGALEs" bloc (including Brazil, China, India, Indonesia, Mexico, Russia, and Turkey) during the period 1994 - 2014.

3. Methodology and data

3.1. Methodology

3.1.1. Model

To study the causal relationship between FDI, current account, and economic growth in Vietnam, we used the Vector Error Correction Model (VECM) to correctly identify the results of the causal effect between these variables in the short term and the long term. The VECM is a popular model in analyzing time series data, helping researchers analyze and evaluate causal effects or pass-through effects, thereby determining reaction effects over time when there is a change from the influencing factors. This is consistent with the assessment in macroeconomics. The VECM model requires time series to be stationary, and depending on the properties of cointegration, the researcher chooses the appropriate model.

Based on a review of related studies such as [2], [3], [5], [8], [19], the research model proposed by the authors is as follows:

$$\Delta x_t = \pi x_{t-1} + \tau_1 \Delta x_{t-1} + \tau_2 \Delta x_{t-2} + \cdots + \tau_{k-1} \Delta x_{t-(k-1)} + u_t$$

Where x_t is the vector of the variables in the model, π is the square matrix of order nxn, τ_t is the square matrix of order nxn, u_t is the error vector, and k is the latency of the model. The variables in the model are presented in the following table.

Table 1. Summary of variables in the model.

ID	Variable name	Describe the variables	Formula
Main variable			
1	CA_t	Ratio of Current account to GDP in year t	$\frac{CA_t}{GDP_t}$
2	FDI_t	Ratio of Foreign Direct Investment to GDP in year t	$\frac{FDI_t}{GDP_t}$
3	$GDPPC_t$	GDP per capita growth rate in year t	
Control variables			
4	$REER_t$	Real effective exchange rate in year t	
5	K_t	Natural logarithm of a Capital stock in year t	lnK_t
6	L_t	Employment rate in year t	
7	r_t	Interest on deposits in year t	

3.1.2. Vector Error Correction Model

To perform VECM estimation, it is possible to briefly summarize the processing of variables in the time series model that this study will perform as follows:

Step 1: Stability test of time series of variables in the model by Unit Root Test.

Step 2: Select the model's optimal lag length based on a Vector Autoregressive Model (VAR) and criteria such as AIC (Akaike information criterion), HQ (Hannan-Quinn information criterion), SC (Schwarz information criterion), FPE (Final Prediction Error criterion).

Step 3: The Cointegrations test was performed based on the Johansen Cointegration test to determine the long-term relationship between the variables in the model. Short-term relationship determination is based on Vector Error Correction Model.

3.1.3. Testing Model stability

A problem with the estimation methods is the stability of the model. This is because the regression coefficients of the model variables are changed in value when the number of observations changes. Conclusions drawn from the estimation results may then be affected.

In this study, due to the objective limitation of sample data for estimating the VECM model, conclusions about short- and long-term relationships between variables may be affected. To overcome this shortcoming and reinforce the conclusions drawn more firmly, we use the Bayes method to test the model's stability. The data simulation was performed through the Metropolis-Hastings (MH) sampling algorithm.

In science, there are two schools of statistical inference: Bayesian and frequentist. These approaches differ in their philosophy of science and their understanding of the concept of probability. The frequentist inference is based on the current sample observations without regard to relevant information about known data. Conclusions in the frequentist inference are based on sample data. Meanwhile, the Bayesian inference, on the one hand, is still based on the collected sample data, on the other hand, combining additional experience and known data about the observed problem to deduce the current statistics [22].

The Bayes method is derived from the following conditional probabilities:

$$\mathrm{p(A|B)} = \frac{\mathrm{p(A,B)}}{\mathrm{p(B)}}$$

or

$$\mathrm{p(A,B)} = \mathrm{p(A|B)} \times \mathrm{p(B)}$$

Similarly, we also have

$$\mathrm{p(A,B)} = \mathrm{p(B|A)} \times \mathrm{p(A)}$$

So

$$\mathrm{p(A|B)} \times \mathrm{p(B)} = \mathrm{p(B|A)} \times \mathrm{p(A)}$$

or

$$\mathrm{p(A|B)} = \frac{\mathrm{p(B|A)p(A)}}{\mathrm{p(B)}}$$

where the prior $\mathrm{p(A)}$ is the probability that A is true before the data is considered, the posterior $\mathrm{p(A|B)}$ is the probability that A is true after the data is considered, the likelihood $\mathrm{p(B|A)}$ is the evidence about A provided by the data B, $\mathrm{p(B)}$ is the total probability of the data taking into account all possible hypotheses.

Therefore, the posterior distribution has two components: a likelihood function that includes information about the model parameters based on the observed data. A prior distribution includes previous information about the model parameters. By Bayesian law, a likelihood function and prior distribution are combined to create a posterior distribution. Therefore, in Bayes analysis, two important issues that need to be identified are the prior distribution and sampling algorithm.

In this study, we used the Bayes method to test the stability of the estimates in the VECM as follows:

Step 1: determine the co-integrated regression equation (demonstrating the long-term equilibrium relationship between the variables)

$$Y_t = \alpha + \sum_{t=1}^{m} \beta_t x_t + ECM_t$$

The ECM is measured with the residual from the above regression as follows:

$$ECM_t = Y_t - \alpha - \sum_{t=1}^{m} \beta_t x_t$$

where, Y_t is the dependent variable, x_t is the independent variable in the model, α, β_t are coefficients, m is the number of independent variables.

Step 2: Using Bayes method to estimate equations in VECM as follows:

$$\Delta Y_t = c - \sum_{i=1}^{p} \beta_i \Delta Y_{t-i} + \sum_{j=1}^{m} \sum_{i=1}^{k} \gamma_{ji} \Delta x_{t-i} + \theta_t ECM_{t-i} + \varepsilon_t$$

where, ΔY_t is the first difference of the dependent variable; ΔY_{t-i} is the first difference of the dependent variable with t-i lags; Δx_{t-i} is the first difference of the independent variable with t-i lags; c, β_i, γ_{ji}, θ_t are the coefficients; ε_t is the error in the regression equation; p, k are the corresponding lags; m is the number of independent variables in the equation.

In this study, because the purpose of the Bayes analysis is to test the stability of the regression coefficients estimated by the VECM, the prior distribution of the coefficients β_i, γ_{ji}, θ_t will be determined according to the normal distributions. Specifically:

$$\beta_i \sim normal(\hat{\beta}, \widehat{\sigma_\beta}^2)$$
$$\gamma_{ji} \sim normal(\hat{\gamma}, \widehat{\sigma_\gamma}^2)$$
$$\theta_t \sim normal(\hat{\theta}, \widehat{\sigma_\theta}^2)$$

where, $\hat{\beta}$, $\hat{\gamma}$, $\hat{\theta}$ are the values of the regression coefficients obtained from the VECM,

$\widehat{\sigma_\beta}$, $\widehat{\sigma_\gamma}$, $\widehat{\sigma_\theta}$ are the standard deviations of the regression coefficients obtained from the VECM.

In this study, we used the Metropolis-Hastings sampling algorithm to create a 27500 MCMC (Markov Chain Monte Carlo), remove 2500 at the Burn-in stage, the MCMC sample size would be 25000.

3.2. Data

Due to data limitations, we collect and evaluate foreign direct investment, current account, and Vietnam's economic growth from 1998 to 2019. Data collected in Vietnam from the following sources: first, to calculate the variables in the model, we collected data by country of Vietnam provided by the Asian Development Bank (ADB) and the World Economic Outlook (WEO); Second, we collected additional data as well as collates from the General Statistics Office of Vietnam.

4. Empirical results

4.1. FDI flow and the participation in the global value chain of Vietnamese enterprises

Since the last two decades, the global economy has experienced a rapid transition from the traditional comparative advantage theory based on one country's endowments to the global-scale industrial organization or global value chains [16], [26]. Companies gradually began to relocate some of their activities offshore in order to reduce costs as a result of significant inventions in technology and transportation in the twentieth century. As a result of this product fragmentation, the international trade structure has changed, and developing countries are now part of global manufacturing networks.

By the middle of the first decade of this century, for example, manufacturing accounted for 85 percent of developing East Asia's total merchandise exports and

nearly three-quarters of ASEAN's exports. Vertical specialization, or trade-in components that are part of the same product, is becoming increasingly important in international merchandise trade. Component trade increased significantly in the first decade of the twenty-first century, rising from 24 percent of global manufacturing exports in 1992 to 54 percent in 2003 [15]. After joining the World Trade Organization, Viet Nam has been regarded as a very successful FDI recipient.

In order to pursue long-term economic growth, Viet Nam has attempted to achieve a prominent position on the Global value chains map, specifically by upgrading to upstream Global value chains. As a result of regional integration, particularly the Asean Economic Community (AEC) establishment, ASEAN countries, particularly Vietnam, have seen significant intra-regional investment... According to the ASEAN Investment Report 2013 – 2014, ASEAN companies invested approximately $21 billion in the region in 2013. It is also noted that intra-ASEAN investment accounts for 17% of total inflows into ASEAN member countries and is a major investment source in the majority of these countries.

The growing interest of corporations from ASEAN Member States in investing and sourcing regionally stems from the fact that investors can benefit from a dynamic and sizable market, access to a large pool of relatively low-cost skilled professional labor and labor, and low transaction costs for investing, sourcing, trading, and producing in ASEAN [4].

The correlation between foreign investment and trade is increasingly evident when about 70% of total exports come from foreign enterprises operating in Vietnam since 2010. In total import turnover, foreign investors also account for a large proportion, with about 58%.

The high import value indicates the limited extent of value-added in exports, the linkage, and the ability to exploit the domestic supply.

The indexes of FDI are all high but not enough to strengthen the link between FDI enterprises and domestic enterprises, increase technology transfer, promote innovation and increase the value-added proportion of exports. However, Vietnam can make better use of FDI inflows and promote linkages with domestic firms.

In this regard, the critical issue is promoting the spread of FDI inflows, increasing the added value of exports, and making the most of the benefits that FTAs (Free trade agreements) bring, resulting from which Vietnamese businesses can integrate deeper into the global value chain. The strategy also considers policies, measures, and institutional reforms, as well as investment promotion, environmental concerns, and the effects of investment incentives.

Besides, Vietnam needs to shift its focus to attracting FDI with higher value, higher knowledge content, and greater contribution to growth, but still cannot ignore investment in the installation industry capital construction and investment in BPO (Business Processing Outsourcing).

4.2. Unit root test

The econometric studies show that most macroeconomic time series variables are non-stationary, using non-stationary variables leads to spurious regression. Unit root tests in this study are used to test whether time series variables are stationary. Table 2 shows the results of unit root tests for variables according to the Augmented Dickey-Fuller (ADF):

Table 2. Unit root tests for the variables used in the study

Variable	Levels		First Difference	
	ADF	P_value	ADF	P_value
CA_t	-2.154835	0.2268	-3.800383	0.0093
FDI_t	-2.675701	0.0934	-3.539079	0.0165
$GDPPC_t$	-3.427940	0.0204	-4.239499	0.0035
K_t	-2.676797	0.0932	-4.217901	0.0037
L_t	-0.855682	0.7836	-4.990346	0.0006
R_t	-2.147094	0.2295	-5.506149	0.0002
$REER_t$	0.321984	0.9743	-3.408123	0.0218

Source: Author's own computation

According to ADF, the results of the unit root test showed that some variables are not stationary at the levels. However, all variables are stationary at the first difference with a significance level of 5%.

4.3. The model's optimal lag length

Next, we perform the optimal latency selection for the VECM model. Optimal lag length results are presented in Table 3.

Table 3. Optimal lag length selection.

Lag	LogL	LR	FPE	AIC	SC	HQ
1	-112.8309	NA	13.02715*	11.07554*	11.52187*	11.18068*
2	-107.9336	7.123352	19.63596	11.44851	12.34118	11.65880

LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Source: Author's own computation

According to the results obtained, four criteria are suggesting the lag of 1, which are: (1) the final predictive error (FPE: Final pridiction error); (2) Akaike information criterition (AIC: Akaike information criterition); (3) Schwarz information criterion (SC: Schwarz information criterion), (4) the Hannan-Quinn information criterion (HQ: Hanan-Quinn information criterition). Therefore, lag 1 was chosen for estimating the VECM.

4.4. Long-term equilibrium analysis: cointegration test

To test whether there is a long-term equilibrium relationship between FDI, current account, and economic growth, it is necessary to perform cointegration tests on the variables. The Johansen cointegration test is conducted, and the corresponding results are shown in following Table 4.

Table 4. Cointegration test results.

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.607779	33.31457	29.79707	0.0189
At most 1	0.391229	12.72412	15.49471	0.1253
At most 2	0.078780	1.805229	3.841466	0.1791

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 p-values

Source: Author's own computation

According to the Table 4, the statistical p-values are less than 5% for the null hypothesis of no cointegration equation. When the null hypothesis exists at most 1 cointegration equations, the p-value is higher than 0.10, suggesting that the null hypothesis should not be rejected. In other words, there is one cointegration equation amongst FDI, CA, and GDPPC.

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4.5. VECM model analysis

After the cointegration test, a VECM model can be established to reflect the long-term equilibrium and short-term fluctuations amongst variables. The estimation results are shown in Table 5 below

Table 5. VECM estimation results.

Error Correction:	D(GDPPC)	D(FDI)	D(CA)
CointEq1	-0.849568	-0.866319	2.471962
	(0.17409)	(0.41289)	(1.18142)
	[-4.88013]	[-2.09818]	[2.09236]
D(GDPPC(-1))	0.304014	-0.396625	0.483446
	(0.16301)	(0.38662)	(1.10626)
	[1.86499]	[-1.02587]	[0.43701]
D(FDI(-1))	0.347198	0.215156	-0.879562
	(0.13632)	(0.32332)	(0.92514)
	[2.54687]	[0.66545]	[-0.95073]
D(CA(-1))	0.136806	0.072928	-0.190902
	(0.04769)	(0.11311)	(0.32364)
	[2.86865]	[0.64476]	[-0.58985]
C	0.168003	0.125752	-0.045065
	(0.11966)	(0.28380)	(0.81205)
	[1.40402]	[0.44310]	[-0.05550]
D(K)	0.344607	0.986169	-2.503851
	(0.11680)	(0.27703)	(0.79268)
	[2.95031]	[3.55980]	[-3.15873]
D(L)	-0.166200	-1.620473	2.552547
	(0.44349)	(1.05185)	(3.00971)
	[-0.37475]	[-1.54059]	[0.84810]
D(R)	-0.001576	0.430354	-0.957543

	(0.07427)	(0.17614)	(0.50401)
	[-0.02122]	[2.44319]	[-1.89985]
D(REER)	-0.050132	0.061784	-0.148303
	(0.02655)	(0.06296)	(0.18015)
	[-1.88856]	[0.98135]	[-0.82324]
R-squared	0.827956	0.611899	0.569327
Adj. R-squared	0.722082	0.373068	0.304297

Source: Author's own computation

According to the results shown in Table 5, in the model with dependent variable D(GDPPC), the long-term equilibrium relationship between FDI, current account, and economic growth has a significant impact. The error correction term's coefficient is -0.849568 which means that when the economic growth is disturbed and deviated from equilibrium, it will be subject to a 0.849568 speed adjustment of another side to make it possible to return to an equilibrium level in the short term. Besides, the coefficient of the error correction term is statistically significant at 1%. Thus, there is an impact of FDI and current account on economic growth in the long term. On the other hand, the coefficient of FDI is 0.347198 which is positive and p-value 0.0243 is less than the significance level of 5%. Thus, in the short term, an increase in foreign direct investment will positively impact economic growth. The coefficient of CA is 0.136806 which is positive and p-value 0.0132 is less than the significance level of 5%. Thus, in the short term, an increase in the current account will positively impact economic growth.

In the model with dependent variable D(FDI), the long-term equilibrium relationship between FDI, current account, and economic growth has a significant impact. The error correction term's coefficient is -0.866319 which means that when FDI is disturbed and deviated from equilibrium, it will be subject to a 0.866319 speed adjustment of another side to make it possible to return to an equilibrium level in the short term. Besides, the coefficient of the error correction term is statistically significant at 10%. Thus, there is an impact of economic growth and current account on FDI in the long term. The results also show that only the impact of economic growth and current account on foreign direct investment in the long run and no short-term impact. However, deposit interest rates have a positive impact on foreign direct investment in the short term. In addition, the Real effective exchange rate will have no impact on foreign direct investment in the short term.

In the model with dependent variable D(CA), the long-term equilibrium relationship between FDI, current account, and economic growth has no significant impact. Research results show that both in the short and long term, economic growth and foreign direct investment have no impact on the current account.

4.6. Testing Model stability

Based on the results of analyzing the relationship between foreign direct investment, current account, and economic growth using the VECM method, we continue to test the estimates' stability using the Bayes method. Specifically, we perform a stability test with the dependent variable model of economic growth.

$$D(GDPPC) = C(1)*(GDPPC(-1) + 0.373756243396*FDI(-1) + 0.0933557343995*CA(-1) - 7.33111858421) + C(2)*D(GDPPC(-1)) + C(3)*D(FDI(-1)) + C(4)*D(CA(-1)) + C(5) + C(6)*D(K) + C(7)*D(L) + C(8)*D(R) + C(9)*D(REER)$$

The co-integration equation is replaced as follows:

$$ECM(-1) = GDPPC(-1) + 0.373756243396*FDI(-1) + 0.0933557343995*CA(-1) - 7.33111858421$$

Then, we have:

$$D(GDPPC) = C(1)*ECM(-1) + C(2)*D(GDPPC(-1)) + C(3)*D(FDI(-1)) + C(4)*D(CA(-1)) + C(5) + C(6)*D(K) + C(7)*D(L) + C(8)*D(R) + C(9)*D(REER)$$

We uses the prior distributions for the regression coefficients based on the VECM analysis results. Specifically:

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C(1) = {dgdppc:L.ecm} ~ normal(-0.849568,0.0303)
C(2) = {dgdppc:dlgdppc} ~ normal(0.304014,0.163011*0.163011)
C(3) = {dgdppc:dlfdi} ~ normal(0.347198,0.136323*0.136323)
C(4) = {dgdppc:dlca} ~ normal(0.136806,0.047690*0.047690)
C(6) = {dgdppc:dk} ~ normal(0.344607,0.116804*0.116804)
C(7) = {dgdppc:dl} ~ normal(-0.166200,0.443491*0.443491)
C(8) = {dgdppc:dr} ~ normal(-0.001576,0.074267*0.074267)
C(9) = {dgdppc:dreer} ~ normal(-0.050132,0.026545*0.026545)
C(5) = {dgdppc:_cons} ~ normal(0.168003,0.119659*0.119659)
{sigma2} ~ jeffreys
```

In this study, we used the Metropolis-Hastings sampling algorithm to create a 27500 MCMC (Markov Chain Monte Carlo), remove 2500 at the Burn-in stage, the MCMC sample size would be 25000. Model estimation results using the Bayes method are presented in the following table:

Table 6. Model estimation results using the Bayes method

	Mean	Std. Dev.	MCSE	Median	Equal-tailed [95% Cred. Interval]	
dgdppc						
ecm						
L1.	-.9143945	.1360492	.007775	-.9158054	-1.178158	-.6491982
dlgdppc	.3806627	.1043287	.010372	.3820116	.17109	.5889866
dlfdi	.3147984	.0813977	.008425	.3153127	.1560708	.4768719
dlca	.1391474	.028955	.001843	.1389066	.0812253	.195976
dk	.3652057	.073784	.003719	.3659731	.2211005	.5106111
dl	-.2538636	.2724944	.01178	-.2516994	-.773072	.2795132
dr	-.0094022	.0423294	.003324	-.0097831	-.0938558	.0729416
dreer	-.0481122	.0160496	.001914	-.0475331	-.0817194	-.0189882
_cons	.1945148	.0813885	.010482	.1921686	.0403702	.3622478
sigma2	.1891666	.0738208	.003507	.173794	.0929919	.374222

Source: Author's own computation

Bayes analysis results show that the average value of 25000 estimated regression coefficient C(1) of the the error correction term is -0.9143945, which has a negative value. Simultaneously, the 95% confidence interval of this regression coefficient is (-1.178158; -0.6491982) firmly affirms that the value of this regression coefficient is in the negative value domain. This result reinforces the estimation results obtained from the VECM method. Thus, there exist long-term effects of FDI and current account on economic growth. According to the results shown in Figure 1, the MCMC test results of the coefficient C(1) show that the MCMC chain is converging. Specifically, the Trace chart shows 25000 estimated values of the coefficient C(1). The Trace chart shows that the MCMC series has no trend, the estimates are thickly distributed into a horizontal line fluctuating around the mean of -0.9143945. Autocorrelation chart shows decreasing correlation to 0. The distribution chart of the coefficient C(1) has the normal distribution. The density function of the 1st-half, 2nd-half, and overall of the MCMC are nearly identical. Thus, the results of Bayes analysis for coefficient C (1) are reliable.

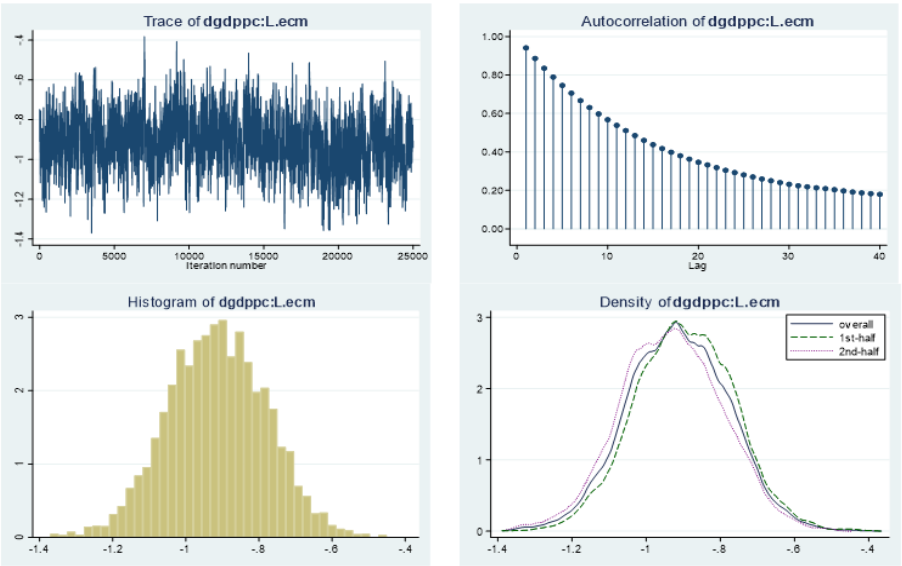

Figure 1. Test results of the convergence of the MCMC chain corresponding to the coefficient C(1)
Source: Author's own computation

Bayes analysis results show that the average value of 25000 estimated regression coefficient C(3) of FDI is 0.3147948, which has a positive value. Simultaneously, the 95% confidence interval of this regression coefficient is (0.1560708; 0.4768719) firmly affirms that the value of this regression coefficient is in the positive value domain. This result reinforces the estimation results obtained from the VECM method. Thus, in the short term, an increase in foreign direct investment will positively impact economic growth. According to the results shown in Figure 2, the MCMC test results of the coefficient C(3) show that the MCMC chain is converging

.

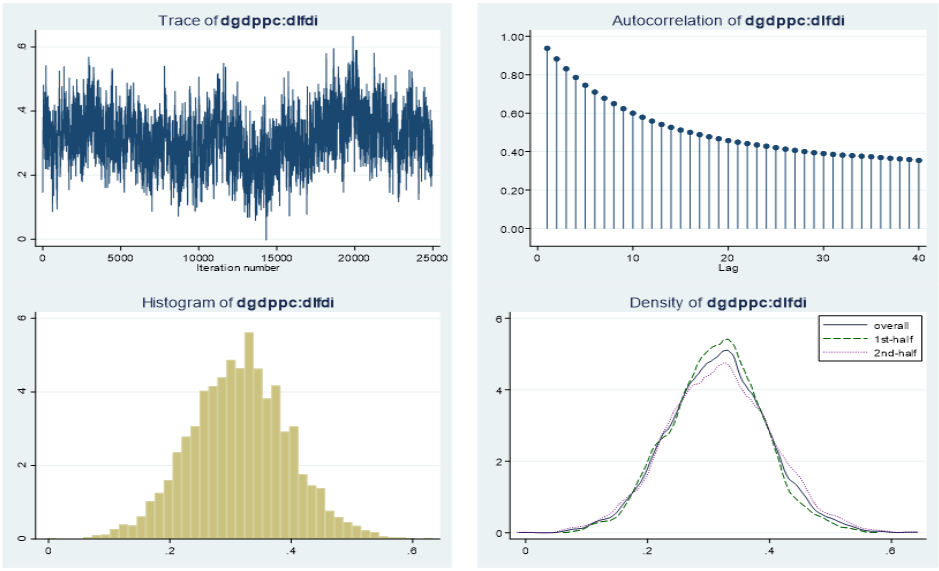

Figure 2. Test results of the convergence of the MCMC chain corresponding to the coefficient C(3)
Source: Author's own computation

Bayes analysis results show that the average value of 25000 estimated regression coefficient C(4) of CA is 0.1391474, which has a positive value. Simultaneously, the 95% confidence interval of this regression coefficient is (0.0812253; 0.195976) firmly affirms that the value of this regression coefficient is in the positive value domain. This result reinforces the estimation results obtained from the VECM method. Thus, in the short term, an increase in current account will positively impact economic growth. According to the results shown in Figure 3, the MCMC test results of the coefficient C(4) show that the MCMC chain is converging.

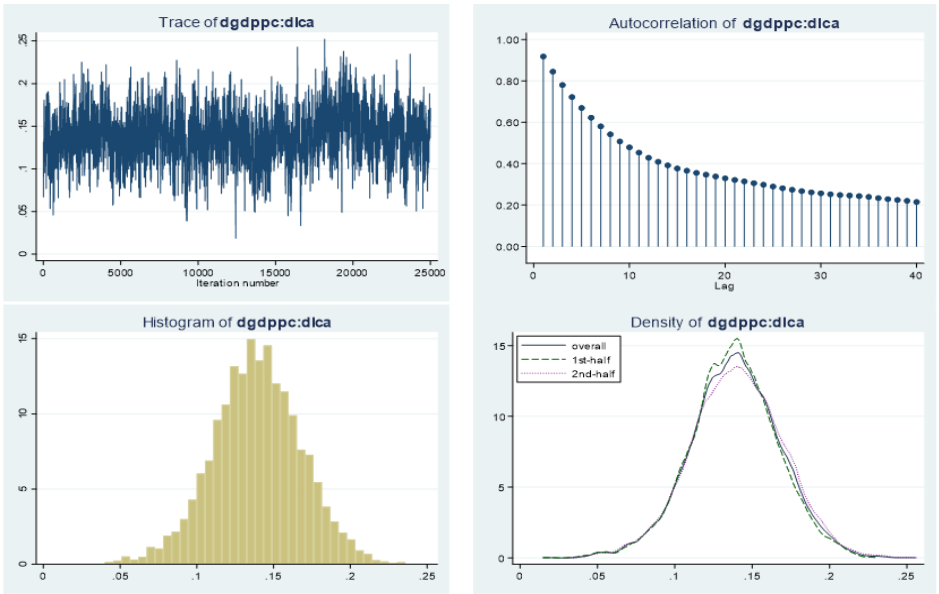

Figure 3. Test results of the convergence of the MCMC chain corresponding to the coefficient C(4)
Source: Author's own computation

5. Policy implications

Using the VECM method, research results show that foreign direct investment impacts economic growth in the short and long term. This paper's novelty is that the authors have done the robustness test through the Bayesian stability test. And, the results of the robustness test also showed that foreign direct investment has an impact on economic growth in the short and long term. Therefore:

The State Bank of Vietnam needs to continue operating monetary policy in macro stability to maintain FDI inflows. The period before 2019, with the stability of macro factors helped Vietnam to attract FDI very well, after this period, although the world economy was greatly affected by the Covid-19 pandemic. However, by maintaining the macro factors' stability, Vietnam still attracts better FDI than other countries in the same region (ASEAN). To achieve macro stability, monetary policy management needs to pay attention to changing the interest rate management mechanism, managing capital flows effectively, and using a combination of non-traditional monetary policies with fiscal policy.

Effectively manage FDI inflows according to IMF policy framework recommendations. Accordingly, the IMF recommends a policy framework in managing foreign capital flows from many countries. This framework provides policy proposals for foreign capital flows in specific cases in each country according to three major criteria: (i) value for money - whether that currency is being determined low price or not; (ii) foreign exchange reserves - the country's foreign exchange reserves are sufficient according to the criteria of the IMF or not and (iii) the economic situation - whether the economy is growing hot or not. For example, when the economy grows hot and foreign reserves are sufficient. At the same time, the currency is being properly priced, and it is recommended that it is not necessary to buy more foreign currency to increase foreign exchange reserves should let the local currency appreciate to control the hot rise of the economy.

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