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DOLLARISATION AND MACROECONOMIC PERFORMANCE: AN EMPIRICAL INVESTIGATION FROM VIETNAM

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Abstract

The paper examines the relationship between dollarisation and economic performance, focusing on the effects of dollarisation on macro variables for the Vietnamese economy. Using the Vector Error Correlation Model (VECM) model, the paper exhibits two key relationships: (1) the relation between the dollarisation of deposits and the monetary variables under the impact of ceiling policy of deposit interest rates, (2) the relation between the dollarisation of loans and economic growth and exports. The paper concludes by offering some recommendations for the control dollarisation in the economy.

Key Words

Dollarization; currency; international trade; macroeconomics.

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INTRODUCTION

Transition economies have attracted a considerable amount of foreign currency through various channels. These sources are essential resources in seeking to boost economic growth. However, these countries have thereby encountered a dollarised economy, which is the phenomenon of currency substitution. The attraction of dollarisation can reduce transaction costs and eliminate exchange rate risk (Dornbusch, 2001; Fischer, 1982; De Grauwe and Polan, 2000). Thereby promoting international trade and global economic integration (Baliño et al., 1999; Edwards, 2001; Gruben and McLeod, 2004); as well as controlling hyperinflation, and thereby mitigating against crises (Goldfajn et al., 2001; Beckerman and Cortés Douglas, 2002; Solimano, 2002; Pasara, 2020).

Nevertheless, dollarisation leads to difficulties concerning the foreign exchange market for the central bank's regulatory procedure of money supply (Yinusa, 2008). Vietnam has had a history of using the US dollar parallel with the Vietnamese currency since the 1960s. In South Vietnam, the US dollar was widely stored and used, and, by contrast, in North Vietnam, the government banned foreign currencies under Decree 102/CP dated July 6, 1963. After the country's reunification in 1975, the Vietnamese economy went through a long period of difficulties and failures in domestic currency and monetary policies.

The outcome was a loss in confidence in the Vietnam Dong, increased gold and foreign currency attractiveness, and complex control of dollarisation. The rate of foreign currency deposit out of M2 was officially announced in 1991 as 41.2% (without globalisation data), and from here, the issue of dollarisation became a concern of researchers Dodsworth (1996); Nguyen (2002); Hauskrecht and Nguyen (2004); Goujon (2006) and Watanabe (2006).

The paper investigates the effects of dollarisation on the real economy with the economic variables of growth, employment, and volatility. According to its supporters, dollarisation will positively affect change through two channels: firstly, dollarisation will result in lower interest rates, higher investment, and faster growth (Dornbusch, 2001). Secondly, by eliminating currency risk, a common currency encourages international trade; this, in turn, results in more rapid growth. In contrast, following a view that goes back at least to Meade (1951), countries with a hard peg – including dollarised countries – will have difficulties accommodating external shocks. This, in turn, will be translated into greater volatility and may even lead to lower economic growth (Parrado and Velasco, 2002, Broda, 2001).

At a general level, dollarisation has been presented to achieve credibility, growth, and prosperity. Following this view, countries that give up their currencies will be unable to engage in macroeconomic mismanagement, with the outcome that their public finances stay in balance and their external accounts move within reasonable bounds. Dollarisation-imposed

macroeconomic stability leads to lower interest rates, higher investment, and superior economic performance. Current arguments favoring dollarisation have gone beyond traditional discussions on optimal currency areas. Indeed, dollarisation proponents have recently argued that giving up the national currency is the right option for the vast majority – if not for all – of the emerging nations.

Most researches on dollarisation in Vietnam focused on analysing and evaluating the status of dollarisation with common theories, including (i) replacing assets with assets in foreign currencies and (ii) replacing currency positions in various economic sectors, households, businesses, and commercial banks. The question then becomes: How to limit this phenomenon to an acceptable level while exploiting the positive effects of dollarisation? In Vietnam's socio-economy, the reality of dollarisation has increased due to the complicated developments of the past years.

Therefore, a concern must be how this will impact the stability and economic growth in the integration process in the Vietnamese economy. Determining the relationship between dollarisation and macroeconomic indicators represents a necessary research direction aimed at optimizing the situation in the economy.

The remains of the paper are organised as follows. Section 2 presents a literature review of the phenomenon of dollarisation. Section 3 presents an analysis of how dollarisation affects economic performance. Section 4 presents the results of our investigation, and Section 5 provides some concluding remarks.

THEORETICAL AND LITERATURE REVIEW

Literature review

The issue of dollarisation has attracted many pieces of research on both the causes and impacts of foreign currency holdings and macroeconomic indicators and management policies. Edwards (2001), Edwards and Magendzo (2003) provide empirical evidence that dollarised economies have lower inflation rates, lower GDP growth rates, and more significant variation in output than economies using local currency. Nicolo et al. (2003) argue that dollarisation directs the financial system of developing countries in the condition of an inflationary economy. Reinhart et al. (2003) demonstrate that dollarisation can partly curb inflation and create currency imbalances in developing countries.

Ize and Yeyati (2003) argue that the only way to limit dollarisation is to discourage the use of the dollar and increase the attractiveness of the local currency. Neanidis and Savva (2009) used monthly data for 11 transitional economies in Central and Eastern Europe (Armenia, Bulgaria, the Czech Republic, Estonia, Georgia, Kyrgyz, Lativia, Poland, Romania, Russia and Ukraine) to reveal the influence of the interest rate differential between local and foreign currencies. Kamin and Ericsson (2003) for Argentina,

Clements and Schwartz (1993) for Bolivia; and Mueller (1994) for Lebanon, provide empirical evidence that the need to hold foreign currency will be higher when inflation is high and prolonged.

In addition, Menon (2007) states that for transition economies in Southeast Asia such as Cambodia, Laos and Vietnam, dollarisation is a "symptom" of macroeconomic instability, political instability, an underdeveloped monetary and financial system, and a lax legal system on foreign exchange management. Carranza et al. (2009), using data from 124 countries (including Vietnam), analyse empirically the exchange rate pass-through mechanism in economically affected economies and find that the higher the level of dollarisation, the greater the pass-through effect of exchange rate fluctuations on inflation.

However, the focus of this study is the transmission mechanism of the exchange rate in dollarized economies. Musoke (2017) used a GARCH model for Tanzania, concluded that an increase in dollarisation leads to an increase in exchange rate volatility. Brown et al. (2018) use the inflation index (CPI) in 71 regions of Russia and apply the OLS method to examine the relationship between the inflation index and financial dollarisation. Then, the results confirm that higher inflation leads to an increase in deposit dollarisation and a reduction in loan dollarisation. Bannister et al. (2018) analyse panel data following a GMM method on 77 developing countries from 1996 to 2015 to examine the relationship between dollarisation and financial development and determine that dollarisation impedes financial development, leading to slow economic growth in developing countries.

Recently, Tweneboah et al. (2019) examined the macro variables that determine the state of dollarisation in Ghana and, based on an ARDL model with a data set from January 2002 to March 2016, affirm that a low inflation rate and stable exchange rate lead to a reduction in the dollarisation. Edy-Ewoh and Binuyo (2019) provide empirical evidence with data series from 1972 to 2017 showing that dollarisation in Nigeria does not positively impact macroeconomic variables such as lending rates, inflation, unemployment, and GDP growth.

Hauskrecht and Nguyen (2004) use a qualitative analysis method to evaluate the status of the dollarisation in Vietnam based on the ratio of foreign currency deposits to total deposits. The study shows that there are two main drivers of dollarisation in Vietnam: firstly, the loss of credibility of monetary policy due to a very high and unstable inflation rate in the long run, which combined with exchange rate decline, leads to an increase the riskiness of nominal assets in VND; secondly, the level of savings in the form of local currency assets is low and relatively short term. However, this study only assessed the dollarisation of Vietnam from 1988 to 2003. In this period, the Vietnamese economy was standing on the threshold of the World Trade Organization (WTO) and still not yet profoundly integrated into the world economy and even without sources of foreign currency transfers into the country.

Goujon (2006) argues that the Vietnamese economy suffered from

dollarisation in 1991-1999 due to the necessity to control the exchange rate and money supply M2 to control inflation. Nevertheless, this study explains the relationship between inflation and exchange rate fluctuations and the M2 money supply in the economy suffering. It does not focus on the relationship between dollarisation and exchange rate instability. Also, this study shows that countries with a foreign exchange market ineffectively operate on a large scale. The tendency to suffer from dollarisation is higher. The research indicates the government makes an appreciation changes in Vietnam in implementing the Foreign Exchange Law in the period 1996-2005.

Nguyen (2002), using the method of integrated research and analysis, synthesizes the dollarisation picture in Vietnam in the period 1991-2001, pointing out the main influences such as international trade and financial integration, ineffective coordination between exchange rate policy and interest rate policy.

Most research in this area has been conducted before the WTO 2007 and the global financial crisis of 2008. Moreover, very few articles using econometric models determine the relationship between dollarisation and macroeconomic indicators. Thus, this paper finds out the impact of dollarisation on macro variables using econometric models. To date, most cross-country studies have been restricted to “independent currency unions” and have included very few observations on strictly dollarised countries. More comprehensively, this paper seeks to enlighten the impact of dollarisation on Vietnam’s economic performance.

The relationship between dollarisation and macroeconomic indicators

The relationship between deposit dollarisation and the macro indicators

High inflation increased the interest rate because inflation reduces the purchasing power of the local currency. Then, Vietnamese tend to switch to gold or foreign currencies, this has been confirmed in the researches of Calvo, and Végh Gramont (1992), Clements and Schwartz (1993), Mueller (1994), Kamin and Ericsson (2003), Bahmani-Oskoee and Domac (2003), Yeyati (2006) found out. In contrast, Kurasawa and Marty (2007), Payne (2009), and Kim et al. (2004) argue that the dollarization leads to lower inflation. The reason is that in these countries with a history of instability currencies, they rely on a strong foreign currency with low inflation to control their inflation

For deposit rate and exchange rate, Uncovered Interest Rate Parity (UIP) ($r - r^* = \Delta E$, r interest rate of the local currency, r^* interest rate of the foreign currency, E spot exchange rate, ΔE expected change in the exchange rate) only occurs when two currencies have the same credit rating. In the case of countries with weak currencies, the trade balance is often in deficit, leading to abnormal exchange rate fluctuations, especially after exchange rate shocks.

Thus, deposits dollarisation has a positive relationship with exchange rate fluctuations. This result has been proved by Girton and Roper (1981), Corrado (2008), Akçay et al. (1997), Bahmani-Oskoee, Domac (2003), Lay et al. (2012), Oomes (2003), Honohan (2007). In addition, Yeyati and Ize (2005) indicated a positive relationship between deposit dollarisation and exchange rate volatility in a stable environment when inflation is controlled at a low level for the developing countries.

Regarding the interest rate, Oomes (2003) demonstrated that the current exchange rate is stable, the expected interest rate of the domestic currency may decrease, making foreign currencies more attractive. Bofinger et al. (2001), Vetlov (2001), Civcir (2005), Yeyati (2006), Kessy (2011), Lay et al. (2012) provided the evidence on this relationship, the result that the deposit dollarisation has a positive relationship with foreign currency interest rates and negative with domestic currency interest rates.

For deposit dollarization and parallel market profit, Bahmani-Oskooee et al. (2002) presented the positive correlation between parallel market profit and depost dollarization in 27 developing countries. The result is similar to the studies from Reinhart and Rogoff (2004) and Bahmani-Oskooee and Tanku (2006).

The relationship between loan dollarisation and macroeconomic indicators

Regarding loan dollarisation and exchange rate, According to the law of interest rate parity, the foreign currency borrowers have to pay $r^*+\Delta E$ while local currency borrowers only cost r. Therefore, if the exchange rate fluctuates continuously, foreign currency borrowers will be at risk and vice versa. It can be said that the exchange rate is a factor that has a negative impact on the decision to borrow foreign currency. This is confirmed by the research result of Barajas and Morales (2003), Luca and Petrova (2008), Rosenberg and Tirpák (2008), Neanidis and Savva (2009), Steiner (2012). In addition, Basso et al. (2007) found that in the short run, loan dollarisation is more likely to cause exchange rate shocks than in the long run.

Loan dollarisation and interest rate, the countries with weak currencies had higher domestic interest rate (r) than the foreign currency interest rate (r^*). In this case, if the financial market is perfect, investors will borrow foreign currency, invest domestically to enjoy profits, thereby increasing loan dollarisation. Barajas and Morales (2003) show an important factor promoting the loans dollarisation is the difference in interest rates between domestic and foreign currencies. This is also the same finding of Basso et al. (2007, 2011), Rosenberg and Tirpak (2008), Brown and De Haas (2010).

Loan dollarisation and deposit dollarisation have the same direction because the commercial banks must balance to avoid currency deviations to ensure liquidity and making profits from foreign currency trading. The relationship between loan dollarisation and deposit dollarisation is found a lot in the studies: Yeyati and Ize (2005), Basso et al. (2007), Brown et al.

(2011), Luca and Petrova (2008), Neanidis and Savva (2009), Rosenberg and Tirpák (2008), Steiner (2012).

The connection between loan dollarisation and export, Dalgic's study (2018) provided evidence that most large firms with foreign currency revenues borrow in foreign currencies in emerging economies. Alp and Yalcin (2015) and Dalgic (2018) prove that foreign currency borrowing has a positive impact on the export growth of firms.

METHODOLOGY

VECM model

The paper chooses the Vector Error Correlation Model (VECM) because all the variables included are macroeconomic indicators with time-series data that are often correlated. Furthermore, VECM is useful in studying the relationships from the previous period that have affected the demand for foreign currency holding of individuals. Moreover, many previous studies use the VECM model to measure the relationship between dollarisation and macroeconomic variables. Studies on deposit dollarisation are from Vetlov (2001), Civcir (2005), Kessy (2011), Mengesha and Holmes (2015), Krupkina and Ponomarenko (2017), Fabris and Vujanović (2017). The studies on loan dollarisation are Arteta (2005), Luca and Petrova (2008), Rosenberg and Tirpák (2008), Neanidis and Savva (2009), Zettelmeyer et al. (2010). Besides, VAR/VECM models are applied to solve the exogenous and endogenous variables. This method is suitable for available data series from general to specific econometric models, simple in use, and high reliability.

The VECM (Vector Error Correlation Model) model proposed by Johansen and Juselius (1990) and Johansen (1995) is used in the case that the data series is non-stationary at the original order I(0), stops at the order difference I(1) and contains a cointegration relationship. In fact, VECM is a general form of VAR model, using Error Correlation Model (ECM) method. The overall regression equation for the time series Y_t and X_t has the following form (t is time):

$$Y_t = \beta_0 + \beta_1 X_t + u_t \quad (1)$$

and, thus,

$$u_t = Y_t - \beta_0 - \beta_1 X_t \quad (2)$$

If Y_t and X_t are time series that do not stop at the origin I(0) and stop at the first difference I(1), the remainder from (2) is also stationary. It contains r cointegration relationships, then the model VECM form:

$$\Delta Y_t = \alpha_0 + \alpha_1 \Delta X_t - \varphi u_{t-1} + \varepsilon_t \quad (3)$$

Here Δ is the first difference 1; α_1 is the short-run effect that measures the direct effect when a change in X_t will change Y_t; φ is the adjustment effect representing how much of the imbalance will be properly corrected; ε_t error; u_{t-1} is one-stage delay value of the error correction term (error correction term - ECT), $u_{t-1} = Y_{t-1} - \beta_0 - \beta_1 X_{t-1}$ (β_1 indicates the long-term effect of X_t *on* Y_t).

Methodology for deposit dollarisation

Data

Data for the study were collected monthly from January 2008 to December 2017 from reliable sources such as the State Bank of Vietnam (SBV), the International Monetary Fund (IMF), and the State Bank of Vietnam. The study selects this period because of the period (from 2008 to 2017) when Vietnam's economy is heavily affected after joining the WTO and the 2008 global financial crisis. Moreover, deposit dollarisation in Vietnam has decreased sharply since the State Bank applied the policy of ceiling deposit dollarisation. The selected variables are as follows:

- Deposit Dollarisation (DDI): the two general indicators that researchers used to measure the deposit dollarisation status in the economy are: the rate of deposits in foreign currencies in total deposits (DDI) and the rate of deposits in foreign currency in money supply (M2 DDI). The study uses the ratio of deposits in foreign currencies to total deposits (DDI). In the Vietnamese economy, the number of foreign currencies is statistically recorded in the form of deposits in the commercial banking system. Besides that, the foreign currency also exits considerably as the cash holding, but for which there have no accurate statistics for measuring M2 DDI.
- Inflation: is measured by the consumer price index, CPI. The higher the inflation rate, the more the devaluation of the domestic currency, and the more the tendency to change to holding foreign currencies.
- USD/VND exchange rate (ER): reflecting the increase or decrease in the value of VND against the USD, is a signaling tool to regulate the exchange rate policy and monetary policy of the SBV. The exchange rate used in the model is the official rate (from January 1, 2016, the central rate) announced by the SBV.
- Deposit interest rate VND (R_VND) and deposit interest rate USD (R_USD) are two crucial variables measuring the return when holding VND or USD, showing the attractiveness of that type of asset in the investment portfolio. These are two variables that directly affect the deposit dollarization status.
- Parallel market profit (PERF): is the percentage difference between the selling rate of USD/VND on the free market (ER_F) and the official bank (ER_C selling rate of commercial banks). Unofficial payments coexist with the authorized bank with higher regular exchange rates. Therefore, this is a factor affecting people's decisions to hold foreign currency:

$$PERT = \frac{ER_F - ER_C}{ER_C} \times 100\%$$

- Foreign Exchange Reserve (RES): reflects the government's ability to intervene to keep the foreign exchange market stable and are a measure of public confidence in macroeconomic stability and the value of the VND.
- The distance between the ceiling rate of the interest rate (DIF_CE): is the difference between the ceiling deposit of the interest rate of the domestic currency (R^{ce}_{VND}) and the ceiling deposit of the interest rate of the foreign currency (R^{ce}_{USD}). This variable reflects the limit of nominal profit of domestic currency against foreign currency. It simultaneously transmits a signal to regulate the monetary policy of the SBV in a certain period. R^{ce}_{VND} applied by the SBV from April 2011, thus, in the period from January, 2008 to March, 2011, the study uses the US dollar deposit interest rate with a term of less than 6 months by commercial banks as the ceiling deposit for foreign currency interest rates:

$$DIF\_CE = R^{ce}_{VND} - R^{ce}_{USD}$$

The variables of deposit dollarisation (DDI), foreign exchange reserves (RES_t), the exchange rate (ER_t), and inflation (CPI_t) are trend variables without standard division, for which the right deviation is very high. The study converts to the natural logarithmic base to reduce the right-*skew* and approximate a normal distribution.

Model for deposit dollarization

The State Bank has applied the policy of ceiling interest rate since 2008 until now; divided into 2 phases: from January 2008 to March 2011 – using the ceiling of VND; from April 2011 to present – applied on both VND and USD. The purpose of the article is to find out the relationship between dollarization and macro variables in-ceiling deposit interest rate policy. Therefore, the study selects the data series starting from January 1/. 2008 to December 2017 and divided model (4) into 2 phases to assess the role of the operating mechanism with a ceiling of VND (from January 2008 to March 2011 – referred to as phases 1) compared with the working mechanism of ceilings on both VND and USD interest rates (from April 2011 to present - referred as phases 2).

The VECM model is used to determine the relationship between the deposit dollarization and macroeconomic variables:

$$Y_t = [DDI_t, RES_t, DIF\_CE_t, PERF_t, R\_USD_t, R\_VND_t, ER_t, CPI_t] \quad (4)$$

Methodology for loan dollarization

Data

The SBV and the IMF publish the official data on foreign currency loans by year (from 2015 to 2017, IFM statistics every six months). Therefore, the research period has been extended from 1992 to 2017. The data is collected from the SBV and the IMF to get a larger sample. In addition, in 1992 Vietnam officially opened the economy and entered the world economy. The selected variables are defined as follows:

- Loan dollarisation (LDI): is the rate of credit in foreign currency (FCL) in the total credit of commercial banks (TL)
- Deposit Dollarisation (DDI): is the rate of deposits in foreign currencies (FCD) in the total deposits of commercial banks (TD)
- Payable cost difference (IRD): is the difference in the cost of paying when borrowing VND versus borrowing USD. This ratio is calculated as follows:

$$IRD = LSCV_{vnd} - LSCV_{usd} - \Delta ER$$

$LSCV_{vnd}$ is a short-term lending rate of commercial banks

$LSCV_{usd}$: Short-term USD lending interest rate of commercial banks

ΔER : USD / VND exchange rate fluctuations of the SBV:

$$\Delta ER = \frac{ER_t - ER_{t-1}}{ER_{t-1}} \times 100$$

- GDP economic growth: GDP growth index (%)
- Export (EX): USD Export Price Indexes are calculated in U.S. dollar terms

The variables take a natural logarithm (except for the variable IRDt because this variable has a negative number period) to ensure stability.

Model for loan dollarisation

Previous studies using the VECM model find a relationship between loan volatility status and macroeconomic variables (Arteta, 2005; Luca and Petrova, 2008; Rosenberg and Tirpák, 2008; Neanidis and Savva, 2009; Zettelmeyer et al., 2010). Therefore, the model is applied to determine the relationship between the status of loan dollarization and macroeconomic variables:

$$Y_t = [LDI_t, GDP_t, DDI_t, EX_t, IRD_t] \qquad (5)$$

FINDINGS

In this part, we used the VECM estimation model (4) and (5) with the following sequence (model (4) estimation in two stages): (1) Checking the VECM estimation conditions, including (i) Testing the stationarity of the data series, (ii) Choosing the optimal delay based on the reduced VAR model estimation results, (iii) Testing the optimal lagged cointegration relationship by Johanson method, (iv) (1) Test to remove the variable; (2) Estimating the VECM model; (3) The residual test of VECM includes: (i) Normal distribution of residuals, (ii) Series correlation of residuals, (iii) Overall stability of the model to ensure reliable estimation results; (4) Analysis of VECM estimation results.

Deposit dollarization

Verify the VECM estimation conditions

Stationary test

We use Augmented Dickey Fuller (ADF for one unit root and Phillips - Person (PP)) method for a unit root to detect the stationarity in time series data. The results of the Table 1 test show that all variables do not stop at the original order I(0), but all stop at the first difference I(1) with the significance level of 1% and 5%.

Table 1: Results of detecting the stationarity and variance of DDI model data

Variable	t-statistic				Variable	t-statistic			
	Stage 1		Stage 2			Stage 1		Stage 2	
	ADF test	PP test	ADF test	PP test		ADF test	PP test	ADF test	PP test
$LDDI_t$	0.3511	-0.1413	-2.6336	-2.6336	$D(LDDI_t)$	-3.0673***	-3.2267***	-7.3921***	-7.3101***
$LRES_t$	0.1839	0.1347	-1.4244	-1.8232	$D(LRES_t)$	-5.6380***	-5.6356***	-5.3209***	-5.3354***
DIF_CE_t	-2.2400	-1.8110	-1.9979	-1.8970	$D(DIF\_CE_t)$	-3.4221**	-4.4884***	-6.4011***	-6.5780***
$PERF_t$	-1.5683	-1.4601	-3.4367*	-3.5252*	$D(PERF_t)$	-6.2268***	-7.1712***	-9.3335***	-9.3635***
R_USD_t	-0.7487	-0.4014	-1.9402	-1.9582	$D(R\_USD_t)$	-4.6209***	-4.5778***	-9.3220***	-9.3220***
R_VND_t	-0.4546	-0.0387	-0.7678	-1.0767	$D(R\_VND_t)$	-3.2798***	-3.2876***	-6.3666***	-6.4520***
LER_t	0.5685	1.2015	0.7874	0.6475	$D(LER_t)$	-6.6845***	-6.7349***	-7.4985***	-7.4844***
$LCPI_t$	0.2996	-1.2903	-0.6122	-1.1598	$D(LCPI_t)$	-3.0557**	-3.0063**	-6.7185***	-12.099***

*, **, *** denote rejection of null hypothesis at the 10%, 5% and 1% level of significance.
Source: Own survey.

Lag Determination

The optimal model lag is selected according to SC standards and based on a consideration of model stability.

Table 2: Lag Determination of DDI model

Lag	LogL	LR	FPE	AIC	SC	HQ
			Stage 1			
0	-30.37291	NA	1.10e-09	2.074211	2.422518	2.197006
1	240.1156	409.3880	1.69e-14	-9.087329	-5.952570*	-7.982179
2	346.0451	114.5184*	2.93e-15*	-11.35379*	-5.432579	-9.266286*
			Stage 2			
0	372.1353	NA	9.52e-15	-9.582507	-9.337167	-9.484457
1	1059.037	1211.116	7.30e-22*	-25.97466	-23.76659*	-25.09221*
2	1120.177	94.92775	8.30e-22	-25.89939	-21.72860	-24.23254

Source: Own survey.

Cointegration test

By Johansen's method, the selected research results are passed by both Trace and Maximum Eigenvalue tests: at least 3 cointegrating equations are shown in Table 3.

Table 3: Cointegration test results of DDI model

Stage 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.885037	324.3050	187.4701	0.0000
At most 1 *	0.848635	244.2686	150.5585	0.0000
At most 2 *	0.840989	174.4104	117.7082	0.0000
At most 3 *	0.604208	106.3754	88.80380	0.0015
At most 4 *	0.546829	72.08132	63.87610	0.0087
At most 5	0.397267	42.79638	42.91525	0.0514
At most 6	0.370121	24.06396	25.87211	0.0826
At most 7	0.171510	6.961560	12.51798	0.3486

Trace test indicates 5 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 *	0.885037	80.03645	56.70519	0.0001
At most 1 *	0.848635	69.85823	50.59985	0.0002
At most 2 *	0.840989	68.03498	44.49720	0.0000
At most 3	0.604208	34.29407	38.33101	0.1355
At most 4	0.546829	29.28494	32.11832	0.1068
At most 5	0.397267	18.73241	25.82321	0.3236
At most 6	0.370121	17.10240	19.38704	0.1041
At most 7	0.171510	6.961560	12.51798	0.3486

Max-eigenvalue test indicates 3 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Stage 2

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.770508	327.0224	187.4701	0.0000
At most 1 *	0.498580	212.2151	150.5585	0.0000
At most 2 *	0.478208	158.3709	117.7082	0.0000
At most 3 *	0.386365	107.6329	88.80380	0.0012
At most 4 *	0.295872	69.54120	63.87610	0.0155

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.770508	114.8073	56.70519	0.0000
At most 1 *	0.498580	53.84424	50.59985	0.0223
At most 2 *	0.478208	50.73797	44.49720	0.0093
At most 3	0.386365	38.09170	38.33101	0.0532
At most 4	0.295872	27.36199	32.11832	0.1707

At most 5	0.203023	42.17920	42.91525	0.0591
At most 6	0.178074	24.47874	25.87211	0.0738
At most 7	0.111059	9.182530	12.51798	0.1694

Trace test indicates 5 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

At most 5	0.203023	17.70046	25.82321	0.4005
At most 6	0.178074	15.29621	19.38704	0.1781
At most 7	0.111059	9.182530	12.51798	0.1694

Max-eigenvalue test indicates 3 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Source: Own survey.

Variable elimination test

Variables rejection tests have no long-run impact

With three cointegration equations with long-run relationship coefficient matrix β, the study examines whether each variable has a long-run relationship according to the following model hypotheses:

$$\begin{cases} H_0^{LFCD}: & \beta_{11} = \beta_{12} = \beta_{13} = 0 \\ H_0^{LRES}: & \beta_{21} = \beta_{22} = \beta_{23} = 0 \\ H_0^{DIF\_CE}: & \beta_{31} = \beta_{32} = \beta_{33} = 0 \\ H_0^{PERF}: & \beta_{41} = \beta_{42} = \beta_{43} = 0 \\ H_0^{R\_USD}: & \beta_{51} = \beta_{52} = \beta_{53} = 0 \\ H_0^{R\_VND}: & \beta_{61} = \beta_{62} = \beta_{63} = 0 \\ H_0^{LER}: & \beta_{71} = \beta_{72} = \beta_{73} = 0 \\ H_0^{LCPI}: & \beta_{81} = \beta_{82} = \beta_{83} = 0 \end{cases}$$

The hypothesis H0 is rejected if the statistic $X^2_{statistic} > X^2_{critical}$ with the degree of freedom = 3 (number of cointegrating equations) or the p-value is < 5%. The testing results of each of the above hypotheses are summarized as follows.

Table 4: The results of the test of variable elimination have no long-run impact on DDI model

	LDDI	LRES	DIF_CE	PERF	R_USD	R_VND	LER	LCPI
Stage1								
Chi-square(3)	13.09***	13.14***	41.71***	37.13***	25.63***	37.06***	29.04***	18.66***
Probability	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Stage 2								
Chi-square(3)	68.33***	22.37***	18.09***	8.71**	15.62***	14.71***	13.67***	7.84**
Probability	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.04

*, **, *** denote rejection of null hypothesis at the 10%, 5% and 1% level of significance
$X^2_{critical}$ with degree freedom 3 at the 10%, 5% and 1%: 6.251, 7.815, 11.345
Source: Own survey.

The long-run variable rejection test results in Table 4 reveal that no variable was removed in the long-run relationship at the 5% significance level.

Variable elimination test has no short-run impact

Although no variables are removed in the long-run relationship, the findings cannot conclude that there is a short-run effect on the correction to the long-run equilibrium after each stroke. Therefore, determining which variable has no short-term impact or has a very weak effect on the long-run balance in each period is essential to assess the relationship between deposit dollarization status and the macro variables. The study can then compare the impact of the policy of two ceiling interest rates: how to change the position of deposit dollarization compared to the policy of one ceiling interest rate. From the short-term relationship coefficient matrix, α is obtained in the test of three cointegration equations, and the study examines the elimination of variables with no short-term effects established for each specific variable:

$$\begin{cases} H_0^{LFCD}: & \alpha_{11} = \alpha_{12} = \alpha_{13} = 0 \\ H_0^{LRES}: & \alpha_{21} = \alpha_{22} = \alpha_{23} = 0 \\ H_0^{DIF\_CE}: & \alpha_{31} = \alpha_{32} = \alpha_{33} = 0 \\ H_0^{PERF}: & \alpha_{41} = \alpha_{42} = \alpha_{43} = 0 \\ H_0^{R\_USD}: & \alpha_{51} = \alpha_{52} = \alpha_{53} = 0 \\ H_0^{R\_VND}: & \alpha_{61} = \alpha_{62} = \alpha_{63} = 0 \\ H_0^{LER}: & \alpha_{71} = \alpha_{72} = \alpha_{73} = 0 \\ H_0^{LCPI}: & \alpha_{81} = \alpha_{82} = \alpha_{83} = 0 \end{cases}$$

Similar to the long-run variable rejection test, the hypothesis H0 will be rejected if the statistic $X^2_{statistic} > X^2_{critical}$ with the degree of freedom = 3 or the p-value is < 5%. The inspection results are summarized as follows.

Table 5: The results of the test of variable elimination have no short-run impact on DDI model

	LDDI	LRES	DIF_CE	PERF	R_USD	R_VND	LER	LCPI
Satge 1								
Chi-square(3)	6.28*	9.63**	5.19	27.53***	10.84**	21.62***	19.94***	7.69*
Probability	0.09	0.021	0.15	0.00	0.01	0.00	0.00	0.05
Stage 2								
Chi-square(3)	12.23***	11.73***	25.25***	7.63*	74.16***	8.61**	8.53**	11.04**
Probability	0.00	0.00	0.00	0.05	0.00	0.03	0.03	0.01

*, **, *** denote rejection of null hypothesis at the 10%, 5%, and 1% level of significance
$X^2_{critical}$ with degree freedom 3 at the 10%, 5% and 1%: 6.251, 7.815, 11.345
Source: Own survey.

Looking at Table 5, it is clear that, in both periods, the variables are statistically significant at 10%, except for the variable DIF_CE in phase 1 ($X^2_{statistic} = 5.19 < X^2_{critical} = 6.251$). This result shows that, in the short-run, deposit rate ceiling gap in the phase 1 does not affect DDI; in other words, the deposit dollarization is affected by the policy of two ceiling interest rates (VND and USD) more substantial than the policy of one ceiling interest rate in VND.

VECM Estimation

Model (4) has met the conditions for VECM estimation, and the study has estimated and obtained the results of regression, pulse response function, and variance decomposition, precisely:

Regression Results

Table 6 and Table 7 shows only the regression results that are statistically significant in phase 1 and phase 2.

Table 6: Vector Error Correction Estimates of DDI model (Phase 1)

Vector Error Correction Estimates
Sample (adjusted): 2008M03 2011M03
Included observations: 37 after adjustments
Standard errors in ( ) and t-statistics in [ ]

Cointegrating Eq:	CointEq1	CointEq2	CointEq3
LDDI(-1)	1.000000	0.000000	0.000000
LRES(-1)	0.000000	1.000000	0.000000
DIF_CE(-1)	0.000000	0.000000	1.000000
PERF(-1)	0.031611***	-0.089233**	0.671988***
	(0.00916)	(0.01165)	(0.11433)
	[3.45040]	[-7.65844]	[5.87780]
R_USD(-1)	0.234022***	-0.268941**	3.273722***
	(0.03358)	(0.04271)	(0.41906)
	[6.96891]	[-6.29716]	[7.81214]
R_VND(-1)	-0.156490***	0.183494**	-2.344740***
	(0.01734)	(0.02206)	(0.21644)
	[-9.02248]	[8.31840]	[-10.8331]
LER(-1)	-9.173265***	4.380193*	
	(1.80960)	(2.30146)	
	[-5.06922]	[1.90323]	
LCPI(-1)	3.296831**		
	(1.49535)		
	[2.20472]		
@TREND(08M01)	0.040389***		0.368934***
	(0.01081)		(0.13495)
	[3.73474]		[2.73380]
C	71.35708	-42.09609	299.2841

Error Correction:	D(LDDI)	D(LRES)	D(DIF_CE)	D(PERF)	D(R_USD)	D(R_VND)	D(LER)	D(LCPI)
CointEq1		-0.177649*		24.73035***			0.114329***	
		(0.09394)		(5.49243)			(0.03565)	

		[-1.89111]		[4.50263]			[3.20687]	
CointEq2				29.11585***	-2.319055**		-0.051762*	-0.036239**
				(4.57528)	(0.98769)		(0.02970)	(0.01524)
				[6.36373]	[-2.34797]		[-1.74294]	[-2.37790]
CointEq3	-0.013339**		-0.550901**	1.036653**	-0.226107**		-0.012645***	
	(0.00586)		(0.25298)	(0.44735)	(0.09657)		(0.00290)	
	[-2.27596]		[-2.17761]	[2.31733]	[-2.34136]		[-4.35479]	
D(LDDI(-1))	0.395730*						0.255354**	
	(0.22907)						(0.11349)	
	[1.72756]						[2.25001]	
D(LRES(-1))							0.169126*	
							(0.08024)	
							[2.10763]	
D(DIF_CE(-1))		-0.013706*		0.838459*	0.249764**	0.480361***		
		(0.00754)		(0.44067)	(0.09513)	(0.16325)		
		[-1.81852]		[1.90268]	[2.62551]	[2.94243]		
D(PERF(-1))				0.281166*		-0.097608*	0.002184**	
				(0.15147)		(0.05611)	(0.00098)	
				[1.85630]		[-1.73951]	[2.22106]	
D(R_USD(-1))				2.113304**				
				(0.96247)				
				[2.19571]				
D(R_VND(-1))	-0.011327*			1.214964**			-0.012229***	
	(0.00673)			(0.51340)			(0.00333)	
	[-1.69401]			[2.36652]			[-3.66956]	
D(LER(-1))	0.716516**	-1.341521**			11.89107*			
	(0.39646)	(0.51756)			(6.53256)			
	[1.80728]	[-2.59199]			[1.82028]			
D(LCPI(-1))				154.5411***				0.481218***
				(49.6965)				(0.16553)
				[3.10970]				[2.90706]
C				-2.597500				0.005930
				(0.75132)				(0.00250)
				[-3.45725]				[2.36940]
R-squared	0.532933	0.376597	0.442661	0.767438	0.499118	0.755667	0.609222	0.674718
Adj. R-squared	0.327424	0.102299	0.197431	0.665111	0.278729	0.648160	0.437279	0.531593
Sum sq. resids	0.019280	0.032857	35.92181	112.3211	5.234356	15.41532	0.004732	0.001246
S.E. equation	0.027770	0.036253	1.198696	2.119633	0.457574	0.785247	0.013759	0.007060
F-statistic	2.593233	1.372950	1.805088	7.499832	2.264720	7.029032	3.543173	4.714209
Log likelihood	87.35243	77.48976	-51.95362	-73.04394	-16.32076	-36.30293	113.3377	138.0229
Akaike AIC	-4.073104	-3.539987	3.456952	4.596969	1.530852	2.610969	-5.477713	-6.812051
Schwarz SC	-3.550644	-3.017527	3.979412	5.119429	2.053312	3.133429	-4.955253	-6.289591
Mean dependent	0.000620	-0.021189	0.070270	-0.043987	-0.016216	0.136054	0.006880	0.009631

S.D. dependent	0.033862	0.038263	1.338036	3.662772	0.538781	1.323835	0.018341	0.010316

Determinant resid covariance (dof adj.)	1.38E-16
Determinant resid covariance	5.99E-18
Log likelihood	313.6281
Akaike information criterion	-10.30422
Schwarz criterion	-4.949007

Value [ ] is t-statistical; (***),(**), (*) statistical significance level 1%, 5% and 10%
Source: Own survey.

Table 7: Vector Error Correction Estimates of DDI model (Phase 2)

Vector Error Correction Estimates
Sample (adjusted): 2011M07 2017M12
Included observations: 78 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1	CointEq2	CointEq3
LDDI(-1)	1.000000	0.000000	0.000000
LRES(-1)	0.000000	1.000000	0.000000
DIF_CE(-1)	0.000000	0.000000	1.000000
PERF(-1)		0.160766***	-0.302652***
		(0.02896)	(0.08425)
		[5.55116]	[-3.59237]
R_USD(-1)	0.148998***		0.762172***
	(0.01773)		(0.25674)
	[8.40328]		[2.96864]
R_VND(-1)	-0.007682*		-0.863359***
	(0.00443)		(0.06421)
	[-1.73238]		[-13.4456]
LER(-1)	-5.576675***		
	(1.37062)		
	[-4.06872]		
LCPI(-1)		-9.013048***	17.08450**
		(2.44878)	(7.12364)
		[-3.68064]	[2.39828]
@TREND(11M04)	0.021382***		
	(0.00308)		
	[6.95351]		
C	56.09303	83.74925	-102.1323

Error Correction:	D(LDDI)	D(LRES)	D(DIF_CE)	D(PERF)	D(R_USD)	D(R_VND)	D(LER)	D(LCPI)
CointEq1	-0.230712***		5.193282***	4.094139*	-3.738149***	1.936894*	-0.013169*	
	(0.07866)		(1.03380)	(2.42166)	(0.31305)	(1.01701)	(0.00775)	

	[-2.93292]		[5.02351]	[1.69064]	[-11.9412]	[1.90450]	[-1.69820]	
CointEq2		-0.307505***			0.812886***		0.012740***	-0.014659**
		(0.07223)			(0.15096)		(0.00374)	(0.00631)
		[-4.25740]			[5.38493]		[3.40712]	[-2.32262]
CointEq3		-0.082100***			0.405961***		0.004417***	-0.009608***
		(0.02648)			(0.05533)		(0.00137)	(0.00231)
		[-3.10095]			[7.33660]		[3.22246]	[-4.15277]
D(LDDI(-1))					3.284083***	3.902471**		
					(0.57472)	(1.86712)		
					[5.71424]	[2.09010]		
D(LDDI(-2))			-3.613014**		1.964383***			
			(1.72592)		(0.52263)			
			[-2.09338]		[3.75863]			
D(LRES(-1))	-0.194637**	0.322399**						0.039660***
	(0.07418)	(0.14126)						(0.01234)
	[-2.62373]	[2.28238]						[3.21303]
D(LRES(-2))	-0.133764*		-1.908130*	4.041740*		-2.351661**		
	(0.07485)		(0.98368)	(2.30426)		(0.96771)		
	[-1.78710]		[-1.93978]	[1.75403]		[-2.43013]		
D(DIF_CE(-1))					-0.183708**			0.007051*
					(0.08752)			(0.00366)
					[-2.09908]			[1.92679]
D(DIF_CE(-2))								0.006613**
								(0.00328)
								[2.01759]
D(PERF(-1))	0.010207**	0.015068*			-0.043134**			
	(0.00463)	(0.00882)			(0.01843)			
	[2.20367]	[1.70844]			[-2.34000]			
D(PERF(-2))					-0.032818*			
					(0.01820)			
					[-1.80369]			
D(R_USD(-2))			-0.684504**	-2.091646**		-0.686095**		
			(0.34177)	(0.80060)		(0.33623)		
			[-2.00279]	[-2.61259]		[-2.04058]		
D(R_VND(-1))					0.226740***			
					(0.08110)			
					[2.79574]			
D(LER(-1))					-37.85836***			
					(5.81301)			
					[-6.51270]			
D(LER(-2))					-22.96778***			

					(6.11833)			
					[-3.75393]			
D(LCPI(-2))					-4.903740*			-0.357499***
					(2.60436)			(0.10889)
					[-1.88290]			[-3.28311]
C			-0.187825**	-0.479907**	0.113634***		0.001586***	0.003542***
			(0.07981)	(0.18696)	(0.02417)		(0.00060)	(0.00101)
			[-2.35334]	[-2.56691]	[4.70180]		[2.64879]	[3.50561]
R-squared	0.477786	0.540782	0.557150	0.434953	0.771341	0.482058	0.312866	0.530941
Adj. R-squared	0.306716	0.390349	0.412078	0.249852	0.696436	0.312387	0.087771	0.377284
Sum sq. resids	0.027210	0.098657	4.699606	25.78793	0.430934	4.548243	0.000264	0.000753
S.E. equation	0.021660	0.041243	0.284654	0.666798	0.086197	0.280032	0.002135	0.003604
F-statistic	2.792923	3.594830	3.840515	2.349808	10.29753	2.841136	1.389926	3.455358
Log likelihood	199.7967	149.5626	-1.117232	-67.51192	92.06467	0.159538	380.5151	339.6834
Akaike AIC	-4.610172	-3.322118	0.541467	2.243895	-1.847812	0.508730	-9.243977	-8.197009
Schwarz SC	-4.005887	-2.717834	1.145752	2.848180	-1.243528	1.113014	-8.639693	-7.592725
Mean dependent	-0.008472	0.015263	-0.070513	0.011014	-0.038462	-0.118256	0.001082	0.003544
S.D. dependent	0.026013	0.052821	0.371242	0.769876	0.156447	0.337704	0.002236	0.004567

Determinant resid covariance (dof adj.)	1.19E-22
Determinant resid covariance	1.11E-23
Log likelihood	1175.873
Akaike information criterion	-25.35571
Schwarz criterion	-19.70565

Value [ ] is t-statistical; (***),(**), (*) statistical significance level 1%, 5% and 10%
Source: Own survey.

Results of decomposition of variance

The details of the decomposition of variance result are presented in Table 8.

Table 8: Decomposition of variance of DDI

Period	S.E.	LDDI	LRES	DIF_CE	PERF	R_USD	R_VND	LER	LCPI
					Stage 1				
1	0.027770	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
6	0.125164	76.24983	0.977780	0.814130	8.265729	0.895367	1.903191	0.495861	10.39811
12	0.194637	57.70258	4.680728	0.397342	16.58884	3.265310	4.381352	0.339740	12.64411
18	0.236380	55.86788	5.136346	0.374577	17.33024	3.501780	4.763238	0.277985	12.74795
24	0.273699	54.76843	5.331833	0.347594	17.81935	3.621221	4.940965	0.256544	12.91406
					Stage 2				
1	0.021660	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
6	0.052690	64.03969	13.03996	6.742469	4.791721	1.580599	3.805531	4.944178	1.055848
12	0.076284	58.08687	8.468995	12.01313	7.053852	0.833253	8.377084	3.550828	1.615985
18	0.098187	54.48493	7.178807	18.11458	5.079157	0.505543	10.15376	2.623592	1.859640

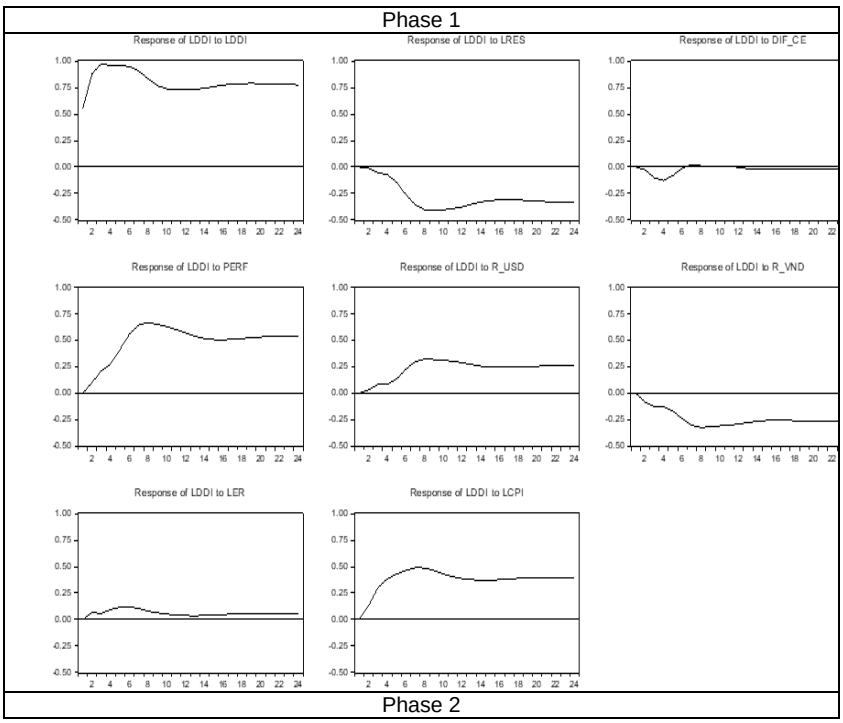
24	0.118687	51.15597	6.100142	22.88908	3.850554	0.378118	11.52954	2.033982	2.062618

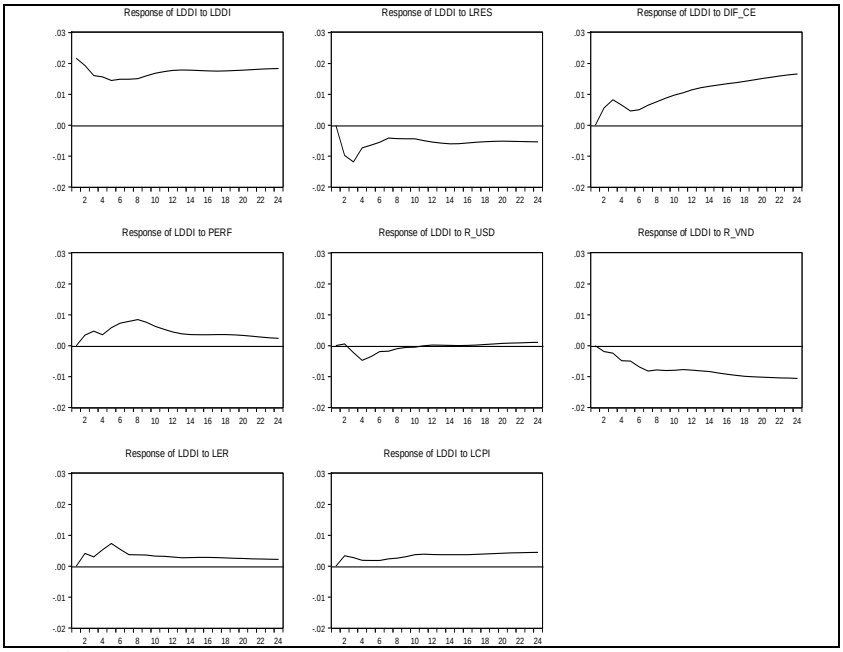
Source: Own survey.

Impulse response function results

Impulse response function results of deposits dollarization before shock 1% of variables as Figure 1.

Figure 1: Response of deposits dollarization before shock 1% of variables





Source: Own survey.

VECM residue test

The VECM's residual verification was tested. The Portmanteau and LM test results show that the residue of the VECM has no auto-correlation. The White test indicates that there is no variance of variance and that the characteristic solutions are in a single circle indicating that the model is stable (details in Table 9).

Table 9: VECM residual tests of DDI model

Stage 1					
VEC Residual Portmanteau Tests for Autocorrelations					
Lags	Q-Stat	Prob.	Adj Q-Stat	Prob.	df
1	45.50295	NA*	46.76692	NA*	NA*
2	98.22657	0.7160	102.5033	0.6049	107
3	146.6941	0.9108	155.2474	0.8004	171
4	209.1341	0.8866	225.2559	0.6646	235
5	248.9899	0.9840	271.3392	0.8730	299
6	303.7962	0.9894	336.7532	0.8349	363
7	365.8395	0.9853	413.2732	0.6744	427
8	429.9724	0.9779	495.0980	0.4397	491
9	478.9580	0.9912	559.8289	0.4347	555
10	524.2777	0.9976	621.9337	0.4593	619
11	572.5260	0.9992	690.5947	0.4119	683
12	619.3715	0.9998	759.9260	0.3633	747
*The test is valid only for lags larger than the VAR lag order. df is degrees of freedom for (approximate)					

Stage 2					
VEC Residual Portmanteau Tests for Autocorrelations					
Lags	Q-Stat	Prob.	Adj Q-Stat	Prob.	df
1	19.86510	NA*	20.12309	NA*	NA*
2	50.40402	NA*	51.46567	NA*	NA*
3	119.5224	0.1922	123.3487	0.1334	107
4	195.0457	0.1004	202.9544	0.0478	171
5	242.4517	0.3554	253.6074	0.1929	235
6	303.4849	0.4169	319.7267	0.1960	299
7	368.4705	0.4103	391.1194	0.1486	363
8	428.7255	0.4674	458.2606	0.1429	427
9	485.2073	0.5652	522.1096	0.1602	491
10	555.8367	0.4820	603.1256	0.0771	555
11	597.3383	0.7271	651.4410	0.1774	619
12	661.2548	0.7179	726.9787	0.1184	683
*The test is valid only for lags larger than the VAR lag order. df is degrees of freedom for (approximate) chi-					

chi-square distribution

VEC Residual Serial Correlation LM Tests

Lags	LM-Stat	Prob
1	59.16094	0.6479
2	61.53095	0.5643
3	47.40582	0.9402
4	76.04845	0.1440
5	42.66743	0.9816
6	60.68048	0.5946
7	91.10607	0.0146
8	83.32281	0.0528
9	58.36486	0.6751
10	68.59161	0.3245
11	51.65381	0.8666
12	60.24077	0.6102

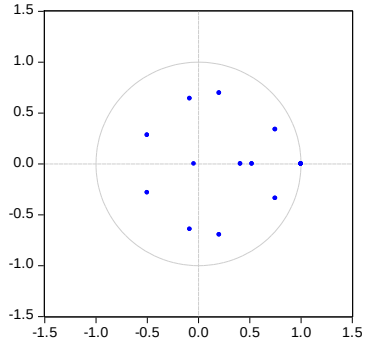
Probs from chi-square with 64 df.

VEC Residual Heteroskedasticity Tests: No Cross Terms (only levels and squares)

Joint test:

Chi-sq	df	Prob.
814.0000	792	0.2862

Inverse Roots of AR Characteristic Polynomial



square distribution

VEC Residual Serial Correlation LM Tests

Lags	LM-Stat	Prob
1	65.92945	0.4099
2	82.36621	0.0609
3	80.76247	0.0768
4	73.93012	0.1856
5	44.42497	0.9704
6	64.90730	0.4448
7	65.89190	0.4112
8	59.12782	0.6490
9	62.53141	0.5286
10	79.25844	0.0947
11	39.69445	0.9927
12	69.72775	0.2910

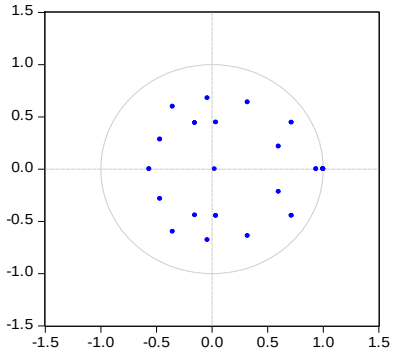
Probs from chi-square with 64 df.

VEC Residual Heteroskedasticity Tests: No Cross Terms (only levels and squares)

Joint test:

Chi-sq	df	Prob.
1344.175	1368	0.6720

Inverse Roots of AR Characteristic Polynomial



Source: Own survey.

VECM estimation's discussion

Factors affecting the status of deposit dollarization in phase 1 and phase 2 are determined through the estimation results of the VECM model, pulse response function, and variance decomposition of the model. The study determined the following outcomes.

First - for foreign exchange reserves (RES)

In both phases, the foreign exchange reserves play a considerable role in reducing the status of dollarization deposits. In Phase 2, the impact of RES on DDI is more clearly revealed through the estimated coefficients (Table 6 and Table 7), which are statistically significant at the 5% level. At the same time, the reaction of DDI after the shock of 1% RES in Figure 1 (Phase 1, column number two, row number one) shows that phase 1 takes 9 months for foreign exchange reserve to fully affect while Phase 2 takes only 3

months (Phase 2, column number two, row number one). This indicates that the larger the foreign exchange reserves, the faster and stronger the ability to intervene to stabilize the foreign exchange market, creating public confidence in the VND value and macroeconomic stability.

Secondly - for operating interest rate ceiling gap (DIF_CE)

Phase 1, DIF_CE either did not impact or had only a very weak impact on DDI, so that the estimated coefficient was not statistically significant (Table 6), while in phase 2, this variable significantly reduced DDI (Table 7). This indicates that the two-ceiling policy of deposit rate VND and USD effectively limits the status of dollarization deposit and is more significant than the policy of a one-ceiling deposit rate VND.

The effect of the double ceiling interest rate policy on deposit guarantee status is clearly seen through the results of the cumulative reaction of DDI due to the shock of DIF_CE which has opposite manifestations in two phases in Figure 1 (Phase 1 and Phase 2, column number three, row number one). Phase 1, the interest rate ceiling only applies to VND to prevent the deposit interest rates of commercial banks in the context of tight monetary policy to prevent inflation and exchange rate fluctuation, while R_VND is always in a close position. This shock of DIF_CE depends on the change of R_USD. When R_USD increases, DIF_CE decreases, and DDI increases as people tend to switch to hold foreign currencies. Inference in the opposite direction can be explained as in Figure 1 (Phase 1, column number three, row number one).

The reaction of the DDI has the opposite effect in the period when the SBV applies two ceilings R_{VND}^{ce} and R_{USD}^{ce}, especially R_{USD}^{ce} = 0%, so DIF_CE is completely dependent on R_{VND}^{ce}. In theory, for R_{VND}^{ce}, a downward trend should stimulate investment and promote growth On the other hand, R_{VND}^{ce} will increase only in the case of economic instability. In this case, it becomes necessary to use a tighter monetary policy to control inflation.

Thus, DIF_CE increases when the economy is unstable or inflation increases, leading to the tendency to switch to holding foreign currencies to avoid inflation, preserve the value of assets, and increase the dollarization of deposits in the economy (Figure 1, Phase 2, column number three, row number one). In recent years, especially from the beginning of 2016 up to the present, the macroeconomy has been stable, the exchange rate has been less volatile, and inflation has been low, R_{USD}^{ce}=0%, R_{VND}^{ce} deep decrease, as compared to the beginning of the ceiling deposit rate policy, since when the dollarization of deposits has dropped to a very low level.

The cumulative reaction of DDI due to the DIF_CE shock in Figure 1 also shows that DIF_CE has a positive effect with DDI during the period of stable exchange rate and low inflation, ie DIF_CE > ΔER + CPI (phase 2).

Otherwise, DDI has mixed reactions. It indicates that in the R^{ce}_{USD}=0%, R^{ce}_{VND}>ΔER + CPI, DDI will drop.

Besides, the decomposition of variance results in Table 8 clarifies the ceiling interest rate policy's role in the status of dollarization of deposits. Before April of 2011, the gap of ceiling deposit rate does not explain the evolution of the dollarization deposit, but after April of 2011, the gap of ceiling interest rate is one of the vital determinants (after values of DDI in the past) to the evolution of deposit dollarization.

Thirdly - for parallel market returns (PERF)

The results in Table 7 show that parallel market profits impact the status of deposit dollarization. The impulse response function of DDI due to the PERF shock in Figure 1 shows that, in both phases, DDI increases after the PERF shock, reaching the highest level in the 8th month, then decreasing gradually to reach equilibrium in different levels.

This result correctly reflects that the high rate of training is due to the existence of an informal foreign currency market. Because of the convenience, simple transactions, no cumbersome procedures, and the ability to fully respond, when there is a demand for foreign currencies, individuals and businesses still have a preference for trading on this market. Therefore, they are willing to accept transactions at a higher rate than commercial banks, making the rate on unofficial payment centers always higher than official payment centers. Therefore, when this difference increases, the psychology is that the holding of foreign currencies is expected to be more profitable from this market.

The role of parallel market profit in explaining the evolution of deposit dollarization status also differs between the two phases. Table 8 shows that in the first stage (except for past values of DDI), the PERF fluctuation is the leading determinant of DDI's evolution; but in stage 2, the PERF's role is significantly reduced in explaining the DDI's volatility. This shows the holding of foreign currency due to the expectation of gaining profits from unofficial financial markets, although remaining, has been much reduced, indicating that the exchange rate difference between the two markets has gradually narrowed, denoting an initial success in the SBV's exchange rate management mechanism, especially the flexible central rate each day, as it closely follows the market rate.

Fourthly - for foreign currency deposit rate (R_USD)

In theory, the interest rate of a foreign currency indicates the return earned from holding that currency, so that R_USD should have a positive impact on DDI. Figure 1 (Phase 1 and 2, column number two, row number one) shows that a 1% shock of R_USD causes the DDI to increase, following two distinctly different reactions. Before April 2011, the DDI increased rapidly, reaching the highest level of 1.42% after 8 months.

After the SBV applied the policy R_{USD}^{ce}, the very weak DDI increased 0.06% in the second month, then decreased to 0.47% in the 4th month, and gradually increased before reaching a new balance after 11 months. The results of the variance decomposition in table 8 provide clear evidence of the difference in the impact of R_USD on the evolution of DDI in the two periods. When the SBV started to apply the ceiling interest rate for USD, the R_USD only explained about 1% of DDI movements after 12 months.

Fifthly - for domestic currency deposit rate (R_VND)

The cumulative response of DDI in Figure 1 shows that aftershock increases of 1% R_VND, in general, in both phases, DDI has the lowest decrease of about 0.1% after 7 months before reaching a new equilibrium. However, the decisive role of DDI evolution in the stage after April 2011 has increased significantly compared to the previous stage through the decomposition of variance in Table 8.

Sixthly - for the exchange rate (ER) and inflation (CPI)

Similar to previous studies such as Vegh and Sahay (1995), Basso et al. (2007), Kamin and Ericsson (2003), Clements and Schwartz (1993), Mueller (1994), Catão and Terrones (2016), the model provides additional evidence of the positive effects of exchange rates and inflation on deposit dollarization status based on impulse response function results (Figure 1). In addition, the results of the decomposition of variance in Table 8 reveal the decisive role changes in deposit dollarization status situation of inflation and exchange rate. This result once again confirms the problem: in order to restore confidence in VND and to limit the status deposits in foreign currencies, the exchange rate must be kept stable and inflation controlled at a low level.

Loan dollarization

Verify the VECM estimation conditions

The study conducted a stationary test, determining delay and cointegration testing of the time series data of model (5). The results are summarized in Table 10.

Table 10: Results of VECM estimation conditions of LDI model

<table>
<tr><th>Item</th><th>Details</th></tr>
<tr><td>I</td><td>Results of detecting the stationarity and variance of LDI model data
<table>
<tr><th rowspan="2">Variable</th><th colspan="2">Statistical value t</th><th>Variable</th><th colspan="2">Statistical value t</th></tr>
<tr><th>ADF test</th><th>PP test</th><th></th><th>ADF test</th><th>PP test</th></tr>
</table></td></tr>
</table>

$LLDI_t$	0.848273	0.536896	$D(LLDI_t)$	-3.495372**	-3.436475**
$LGDP_t$	-2.524268	-2.218291	$D(LGDP_t)$	-4.464323***	-4.518549***
$LDDI_t$	0.927885	0.927885	$D(LDDI_t)$	-4.601406**	-4.601499***
IRD_t	-1.177460	-2.113680**	$D(IRD_t)$	-3.832400***	-7.392106***
LEX_t	-1.764633	-1.807598	$D(LEX_t)$	-4.141977***	-4.173269***

II

Lag Determination

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-72.68135	NA	0.000446	6.473446	6.718873	6.538558
1	52.48667	187.7520*	1.12e-07	-1.873889	-0.401322*	-1.483217
2	86.46901	36.81419	7.22e-08*	-2.622417*	0.077290	-1.906184*

III

Cointegration test results

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.950140	127.6620	69.81889	0.0000
At most 1 *	0.665829	55.69685	47.85613	0.0077
At most 2	0.583993	29.39041	29.79707	0.0556
At most 3	0.291750	8.341160	15.49471	0.4297
At most 4	0.002587	0.062173	3.841466	0.8031

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 *	0.950140	71.96510	33.87687	0.0000
At most 1	0.665829	26.30644	27.58434	0.0721
At most 2	0.583993	21.04925	21.13162	0.0513
At most 3	0.291750	8.278987	14.26460	0.3510
At most 4	0.002587	0.062173	3.841466	0.8031

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

Source: Own survey.

VECM estimations

The estimation results of the cointegration equation in Table 11 show that loan dollarization status, in the long run, is inversely related to economic growth, the same relationship with deposit dollarization and payable cost difference at the 1% significance level; export and loan dollarization have no long-term relationship.

Considering the short-term relationship from Table 11 shows that the status of loan dollarization affects export value but has no impact or has only a very weak effect on economic growth (the estimated coefficient is not statistically significant).

Table 11: Vector Error Correction Estimates of LDI model

Vector Error Correction Estimates
Sample (adjusted): 1992 2017
Included observations: 26 after adjustments
Standard errors in ( ) and t-statistics in [ ]

Cointegrating Eq:	CointEq1
LLDI(-1)	1.000000
LGDP(-1)	1.658370***
	(0.14700)
	[11.2817]
LDDI(-1)	-1.030840***
	(0.11159)
	[-9.23796]
LEX(-1)	-0.076727
	(0.04475)
	[-1.71443]
IRD(-1)	-0.013747***
	(0.00416)
	[-3.30706]
C	-2.070719

Error Correction:	D(LLDI)	D(LGDP)	D(LDDI)	D(LEX)	D(IRD)
CointEq1	0.094474	-0.272626**	0.087534	0.181678**	-10.21177**
	(0.09764)	(0.10743)	(0.09266)	(0.08316)	(3.91625)
	[0.96758]	[-2.53762]	[0.94465]	[2.18475]	[-2.60753]
D(LLDI(-1))	0.414154**	0.353578	-0.166709	0.288957*	6.932820
	(0.19712)	(0.21690)	(0.18708)	(0.16789)	(7.90649)
	[2.10098]	[1.63017]	[-0.89113]	[1.72115]	[0.87685]
D(LGDP(-1))	0.186365	0.125015	-0.118600	0.094007	-2.794130
	(0.17049)	(0.18759)	(0.16180)	(0.14520)	(6.83823)
	[1.09311]	[0.66642]	[-0.73300]	[0.64742]	[-0.40860]
D(LDDI(-1))	0.108857	-0.233210	0.135593	-0.266499	-18.39190
	(0.28284)	(0.31121)	(0.26843)	(0.24089)	(11.3446)
	[0.38486]	[-0.74935]	[0.50514]	[-1.10630]	[-1.62120]
D(LEX(-1))	-0.730150**	0.109063	0.002875	-0.375976	8.716294
	(0.27277)	(0.30013)	(0.25886)	(0.23231)	(10.9404)
	[-2.67683]	[0.36339]	[0.01111]	[-1.61843]	[0.79671]
D(IRD(-1))	0.002022	0.001045	0.005575	0.002188	-0.588921***
	(0.00458)	(0.00504)	(0.00435)	(0.00390)	(0.18383)
	[0.44120]	[0.20728]	[1.28165]	[0.56063]	[-3.20364]
C	0.100023	-0.019800	-0.058350	0.247128	-3.752492
	(0.06004)	(0.06607)	(0.05698)	(0.05114)	(2.40827)
	[1.66586]	[-0.29971]	[-1.02401]	[4.83265]	[-1.55817]

R-squared	0.440023	0.471687	0.160587	0.556604	0.432083
Adj. R-squared	0.242384	0.285224	-0.135676	0.400111	0.231641
Sum sq. resids	0.208403	0.252307	0.187697	0.151165	335.2657
S.E. equation	0.110720	0.121826	0.105076	0.094298	4.440891
F-statistic	2.226396	2.529652	0.542043	3.556737	2.155655
Log likelihood	22.90152	20.60744	24.15726	26.75472	-65.69696
Akaike AIC	-1.325127	-1.133953	-1.429772	-1.646226	6.058080
Schwarz SC	-0.981528	-0.790354	-1.086173	-1.302627	6.401679
Mean dependent	-0.056987	-0.007102	-0.058404	0.180516	-1.207187
S.D. dependent	0.127204	0.144097	0.098600	0.121749	5.066267

Determinant resid covariance (dof adj.)	2.92E-08
Determinant resid covariance	5.20E-09
Log likelihood	58.62058
Akaike information criterion	-1.551715
Schwarz criterion	0.411708

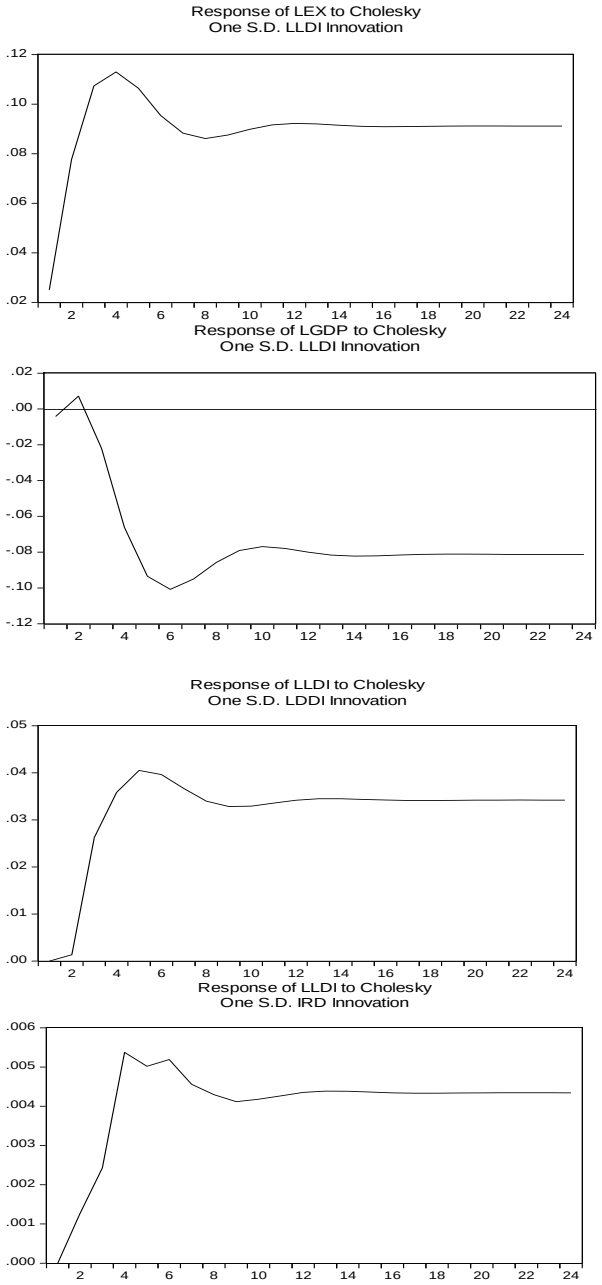
Value [ ] is t-statistical; (***),(**), (*) statistical significance level 1%, 5% and 10%
Source: Own survey.

The cumulative response of economic growth and export value due to the 1% LDI shock in Figure 2 shows that EX increases, whereas GDP decreases. This indicates that foreign currency credit has a negative impact on economic growth because the businesses face difficulties when they borrow capital in foreign currency with exchange rate risk. With the contract's maturity, companies must buy foreign currencies at a high price on the free market to repay the banks. This can quickly occur, and the rate increases more than decreases. These risks affect the results of business activities, thereby affecting economic growth.

Besides, although there are no official data, many businesses likely borrow foreign currency not to import goods or invest in production but to speculate or invest in real estate creating speculative "fever" in the market and bringing instability to the economy.

Despite facing many risks, many businesses still choose to borrow foreign currencies because there are no transaction costs. More importantly, the cost of lending VND is higher than borrowing USD. On the other hand, commercial banks also find ways to "release" the foreign currency capital they have mobilized to avoid risks in forex trading. Estimating the long-term relationship (Table 11) and the increased cumulative response of loan dollarization under the shock of the difference of payables and the shock of dollarization deposit (Figure 2) reveal a positive relationship between these variables.

Figure 2: Response of variables of LDI model due to 1% shock



Source: Own survey.

CONCLUSION

The study has used the VECM model to confirm: (1) The relationship between the deposit dollarized and the monetary variables under the interest rate ceiling policy, and (2) the relationship between dollarization loans with economic growth and exports.

For the relationship between the deposit dollarized and monetary

variables with the ceiling interest rate policy, the USD deposit rate changed from 3% to 0%. The dollarization of deposits decreases when the macroeconomic economy is stable. This finding suggests that the State Bank of Vietnam needs to pay more attention to maintaining the U.S dollars deposit rate to limit dollarization.

Additionally, the model finds empirical evidence that official and unofficial foreign currency market returns are vital factors influencing dollarization. This issue is consistent with observed reality. In particular, when the exchange rate difference between the official and the unofficial market is large, people tend to transfer their assets to a foreign currency.

The paper also finds that the exchange rate and inflation positively correlate with the deposit dollarization rate. Thus, this finding recommends that Vietnam seek to stabilize the macroeconomic environment, control the exchange rate stable and control the inflation rate at a low level, thereby limiting dollarization in the economy.

The paper provides empirical evidence that loans dollarization positively affects exports in the short term, and the interest payment for borrowing USD is more preferable to borrowing VND. However, loan dollarization in the long term has not brought any benefits for the economy, and the paper has concluded that there is a negative correlation with economic growth. This finding affirms the correct policy of the government to control dollarization. Moreover, the State bank of Vietnam should promote the ability of commercial banks to lend foreign currency to businesses when the enterprises need in the export and import activities. This finding shows that the State Bank of Vietnam wants to limit the loan dollarisation. They need to have supportive policies for businesses borrowing VND to export at a lower interest rate than borrowing foreign currency.

The paper still has some limitations which can be improved in further researches. Firstly, there are no accurate statistics for measuring M2 DDI (the deposit dollarization index). The article used the ratio of deposits in foreign currencies to total deposits (DDI) to measure the foreign exchange rate is not yet thoroughly assessing the degree of foreign exchange in the economy. Because in Vietnam, besides the statistical amount of foreign currencies in the commercial banking system, there is a vast amount of foreign currency in cash that people are storing. Secondly, the article has not assessed why Vietnamese people still prefer to keep and deposit foreign currency at commercial banks while the profit is none.

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