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THE IMPACT OF EXCHANGE RATE FLUCTUATION ON TRADE BALANCE IN SHORT AND LONG RUN

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Abstract

This study shows the short and long-run impact of exchange rate on trade balance in Vietnam. Following a depreciation of real exchange rate, trade balance initially deteriorates. Trade balance will improve after four quarters and new equilibrium will be set after twelve quarters. Autoregressive distributed lag (ADRL) are used to explore long-run impact, showing trade balance improvement when real exchange rate depreciates. Corresponding error correction model (ECM) based on long-run cointegration equation indicates immediate deterioration of trade balance after a depreciation. Impulse response functions based ECM exhibit J-curve pattern of trade balance when there is a permanent depreciation.

Key word: exchange rate and trade balance, autoregressive distributed lag, J-curve

I. Introduction

Vietnam is a young open economy on the process of industrialization in which exports are considered to be motivation for developing. Although the export-driven industrialization of Vietnam has succeeded with impressive growth of exports at 20 percent on annual average during the past ten years, the average annual growth of imports is higher at 22 percent, leading to lasting trade-balance deficit. Before 2006, trade deficit is rather small, around 5,000 million USD. Current account deficit-to -GDP ratio, correspondingly, is below 5 percent. Trade deficit turns to be serious from 2007 at 14,120 million USD, and reaches peak in 2008 at 21,774 million USD, causing current account deficit-to-GDP ratio rises up to 10 percent.

There have been a lot of studies trying to explain the performance of Vietnam's trade balance. However, there is few study focusing on exploring the role of exchange rate to trade balance deficit. The purpose of this study is to measure the impact of exchange rate on trade balance of Vietnam in short- and long-run. The methodology used for estimating long-run impact is cointegration analysis based on autoregressive distributed lag (ADRL) approach of Pesaran, Shin and Smith (2001). Short-run impact is explored by corresponding error correction model (ECM) based on obtained long-run cointegration equation. The responsiveness of trade balance to exchange rate shock is examined by impulse response function.

II. Literature review

There are many studies on the impact of exchange rate on trade balance for developing countries which come to various conclusions. Upadhyaya and Dhakal (1997), applying the methodology proposed by Wickens and Breusch (1988), test the effectiveness of devaluation on the trade balance for 8 developing countries. The two researchers find that only in Mexican, the devaluation improves the trade balance in the long-run. Bahmani-Oskoose and Kanitpong (2001) when testing on disaggregated quarterly data by ARDL cointegration between Thailand and her main five trading partners for period 1973-1990, find evidence of the J-curve in bilateral trade with US and Japan only. Bahmani-Oskoose (2001) investigate the long-run response of Middle Eastern countries' trade balance to devaluation by applying the Engle-Ganger and Johansen-Juselius cointegration methodology and find a favorable long-run effect of a real depreciation on the trade balance for seven countries. Wilson (2001) examines the relationship between the real trade balance and the exchange rate for bilateral merchandise trade between Singapore, Korea and Malaysia with respect to US and Japan but finds no evidence of a J-curve effect except Korean trade with the United States. Tihomir Stučka (2004), using ARDL cointegration approach for Croatian finds long-run and short-run relationship between real exchange rate and trade balance and J-curve effect. Pavle Petrovíc and Mirjana Gligoríc (2010) by using Johansen's procedure, ARDL and corresponding ECM show that exchange rate depreciation in Serbia improves trade balance in the long-run while deteriorate trade balance in the short-run.

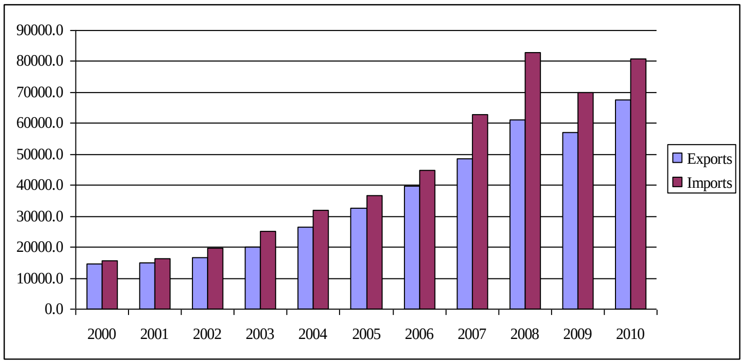
There are few quantitative studies on this relation in Vietnam. Lord (2002) uses cointegration equation and ECM model to explore the impact of real exchange rate on trade balance of Vietnam from 1990 – 2001. Obtained results indicate that the effect of Vietnam's real effective exchange rate on its international competitiveness and export demand are statistically significant in the global market and a number of regional markets. The long-run real exchange rate elasticity of demand for exports in the global market is equal to –1.8 in the short run and –2.0 in the long run. In the short run, the competitive price elasticity ranges from -0.1 in the ASEAN-5 market to –0.3 in the US market, while in the long run it ranges from –0.4 in the US market to –1.9 in the EU market. Another study by Phan Thanh Hoan and Nguyen Dang Hao (2007), using cointegration theory for quarterly data from 1995(1) to 2005(4), find that real exchange rate has impact on trade balance in the long run. One percent depreciation of real exchange rate causes trade balance to increase by 0.7 percent.

III. Performance of trade balance and exchange rate in Vietnam in 2000-2010

3.1.The performance of trade balance

In terms of value, in period of 2000-2010, both exports and imports are increasingly year-by-year, except in 2009 due to the global crisis. In detail, the values of exports and imports increase from 14,483 million USD and 15,636.8 million USD respectively in 2000 to the peak of 61180.2 million USD and 82,953.8 million USD respectively in 2008. After a backward step in 2009, exports and imports take back normal speed to increase in 2010 at 67,430 million USD and 80,791 million USD respectively (Figure 1). Regardless the year of 2009, the average growth rates of exports and imports are 20.6 percent and 24.6 percent respectively, explaining for larger and larger trade deficit.

Figure 1 – Volume of exports and imports in 2000-2010



Source: General statistic office (GSO)

In terms of structure by product, as can be seen over structure of exports (table 1), it takes 10 years for the economy to adjust the shares of processed and refined goods in total exports from 45 percent to 55 percent. This slow change implies that it will cost more time for the economy to increase the value added contained in exporting products because of the time need to research, experiment, use techniques and technologies and applies them into production. As a result, improving the trade balance by adjusting the structure of export cannot achieve in a few days or months, even years.

Table 1 – Structure of exports by foreign trade standard in 2000-2010

	2000	2001	2002	2003	2004	2005	2006	2007	2008
Total exports	100	100	100	100	100	100	100	100	100
Raw or preliminary processed goods	55.8	53.3	49.6	46.6	47.4	49.6	48.3	44.6	44.2
Processed and refined goods	44.2	46.7	50.4	53.3	52.6	50.4	51.7	55.4	55.2
Other	0.04	0.00	0.01	0.02	0.01	0.02	0.02	0.04	0.58

Source: GSO

Meanwhile imports' structure indicates the weakness of domestic production, including export production. Table 2 shows that large proportion of importing products (about 90 percent) is accounted by production materials including machinery, equipment, tools, fuels and raw material which are necessary for production, including export production. Thus, it is obvious that exports production highly depends on imports. This indicates the lack of subsidiaries industries for exports in the economy.

Table 2 – Structure of imports in 2000-2010

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Production materials	***93.8***	***92.1***	***92.1***	***92.2***	***93.3***	***89.6***	***88.0***	***90.5***	***88.8***	***90.2***
- Machinery, equipment, tools,	30.6	30.5	29.8	31.6	28.8	25.3	24.6	28.6	28.0	29.3

accessories										
- Fuels and raw materials	63.2	61.6	62.3	60.6	64.5	64.4	63.4	61.9	60.9	60.9
Consumption products	***6.2***	***7.9***	***7.9***	***7.8***	***6.7***	***10.4***	***12.0***	***9.5.***	***11.2***	***9.8***
- Foods	1.9	3.0	2.5	2.4	2.4	3.0	2.8	2.5	2.7	n.a
- Medical supplies	2.2	2.0	1.8	1.6	1.4	1.4	1.3	1.2	1.1	n.a
- Other	4.1	5.0	4.3	4.0	3.8	6.6	8.3	5.8	7.2	n.a

Source: Author's calculation on GSO's data

3.2.The movement of exchange rate

In early 1999, the State Bank of Vietnam (SBV) issued two important Decisions, Decision 64/1999/QĐ/NHNN and 65/1999/QĐ/NHNN, in which SBV announces to move the exchange rate regime of Vietnam to a type of managed floating exchange rate system. Accordingly, daily trading exchange rate at commercial banks is determined by published interbank rate and fluctuation band applied for different periods. In addition, SBV gradually widens fluctuation band many times to intensify the flexibility of market exchange rate, from +0.1 percent in 1999 to +/-0.75 percent at the end of 2007, +/-3% in 2008 (Table 3).

Table 3 – Fluctuation bands applied from 1999-2010

Time	2/1999	6/2002	1/2007	12/2007	3/2008	6/2008	11/2008	3/2009	11/2009
Bands	±0.1%	±0.25%	±0.5%	±0.75%	±1%	±2%	±3%	±5%	±3%

Source: SBV

However, the fluctuation of exchange rate on the market is much smaller than allowed bands (table 4). For the whole period, VND/USD exchange rate moves upward gradually, indicating the nominal depreciation of VND against USD in the long run. However, the slow and small depreciation of nominal VND/USD exchange rate expresses that it seems to have intervention of SBV into published interbank rate so that market exchange rate goes after intended route under the will of government. Thus, the flexibility of VND/USD rate is very little.

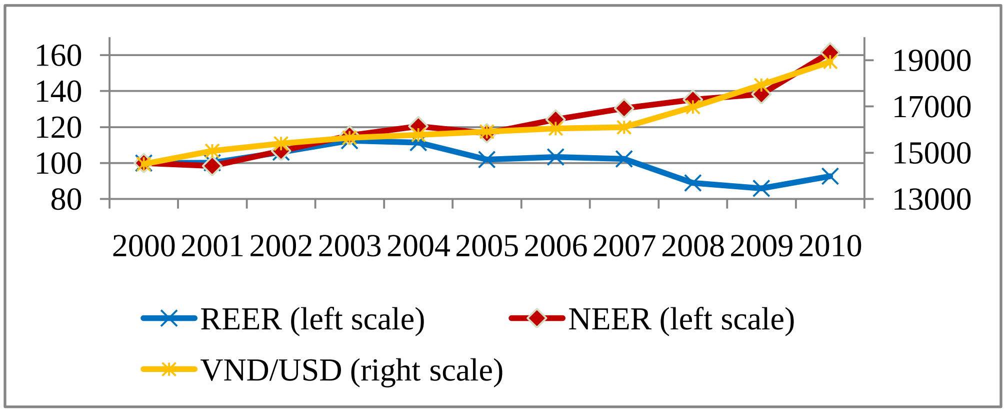
Table 4 – Nominal exchange rate (NER) between VND and USD in 2000-2010

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Published interbank rate*	15070	15368	15608	15737	15875	16054	16114	16977	17941	18930
Change (%)		1.98	1.56	0.84	0.86	1.13	0.37	5.36	5.68	5.51
Commercial bank rate**	15195	15406	15647	15778	15915	16051	16021	17486	18479	19495

Source: * SBV, end of period rate; ** Vietcombank Head office's offer rate, end of period rates.

In addition, according to two decisions in 1999, SBV announces exchange rate of VND is determined based on a basket of currencies of countries which are trading partners, loan partners of Vietnam. Correspondingly, exchange rate management of Vietnam will pursue goal to stabilize the value of VND against selected currency basket. However, according to our computation, real effective exchange rate (REER) of VND moves in different trend with nominal effective exchange rate (NEER), and also VND/USD exchange rate since 2003.

Figure 2 – REER, NEER and VND/USD rate in 2000-2010



Source: author's calculation on SBV's and IFS's data

Figure 2 shows that, the distance between REER and NEER, and VND/USD rate become further and further, indicating the movement of nominal exchange rate on the market is separated greatly from it real value and also implying SBV does not follow it announced target when managing exchange rate. Ulrich Camen (2006) and Nguyen Tran Phuc, Nguyen Duc Tho (2009) also have similar conclusion that VND has tended to use USD as a nominal anchor and the VND/USD rate was kept very stable compared with other bilateral nominal exchange rate.

Besides, REER is undervalued to the base year for most of the time in studied period and only turns into overvalued from 2007. As in theory, the trade balance of Vietnam must be improved as competitiveness of Vietnam's good increases. Meanwhile, the trade balance with major trading partners in reality deteriorates. This performance implies that trade balance not only determined by exchange rate but other macro-economic factors. The impact of other variables must be significant because their impacts on trade balance are so strong that overshadowing exchange rate's impact, causing trade balance to larger deficit.

IV. Estimating the impact of real exchange rate on trade balance in Vietnam in 2000-2010

4.1.Model specification

The study use model developed by Tihomir Stucka (2004) based on the standard "two-country" imperfect substitutes model as specified in Goldstein and Kahn (1985) and Rose and Yellen (1989).

$$TB = \beta_1 + \beta_2 REER + \beta_3 GDP + \beta_4 GDP^* + \varepsilon \quad (1)$$

In which TB represents trade balance, REER represents real effective exchange rate, GDP represents domestic output and GDP* represents foreign output. REER is chosen as representative for exchange rate because a country trades with multiple of partners, only REER can reflect country's currency value relative to the other currencies, as adjusted for the effect of inflation.

GDP and GDP* are chosen because they are the best choice for variables measuring countries' income.

All variables in model (1) are in logarithm form. According Khan and Hossain, 2010, the attractive feature of the log-linear model is that the slope coefficient measures the elasticity of the dependent variable with respect to the independent variable .

In this model, REER and TB are expected to be positive relation (β_2>0), indicating that depreciation of currency will improve trade balance, and the other way round in case of depreciation. GDP* and TB are expected to be positive related (β_2>0) under the rationale that when there is a rise in foreign income, demand for export will increase. The impact of GDP on TB is ambiguous because, an increase in domestic output raises imports but could also boost exports, and the net effect on the trade balance could either be an improvement or a worsening. It is well understood that the supply drives output growth, e.g. due to an increase in productivity, leads to an improvement of the trade balance (Caves, Frankel, and Jones, 2001).

*4.2.*Data description

4.2.1. Technical data description

In this study, we use quarterly data from 2000(1) to 2010(4) to estimate the impact of exchange rate on trade balance. The choice of this period relies on the availability of data. In detail, quarterly GDP data of Vietnam is not available before 2000. Besides, one year before 2000, SBV announces to change exchange rate regime of Vietnam to managed floating exchange rate and re-adjusts the nominal value of VND to bring it back to its real value relative to other currencies. Also, the trade balance of Vietnam is fairly balance in 2000.

Data for computing is taken from various reliable sources, mainly from International financial statistics (IFS). The specific sources for data are as follow:

- Data on average-period nominal exchange rate of VND against USD is taken from SBV. Data on average-period nominal exchange rate of other currencies against USD from 2000(1) to 2010(4) is obtained from IFS.
- Data on exports, imports of Vietnam with trading partners is taken from GSO.
- Data on WPI/PPI of trading partners and CPI of Vietnam from 2000(1) to 2010(4) is obtained from the IFS.
- Real GDP data for seventeen (17) trading partners from 2000(1) to 2010(4) is obtained from IFS in index form. Data on real GDP of Vietnam is obtained from Bloomberg in index form also.

The trade balance is defined as the ratio of exports to imports (X/M). The ratio has been widely used in many empirical investigation of trade balance – exchange rate relationship. It is preferable because it is not sensitive to the unit of measurement and can be interpreted as nominal or real trade balance (Bahmani-Oskooee, 1991). In addition, it neatly solves the problem of using log-form of a trade deficit.

Real effective exchange rate is computed as geometric weighted average of bilateral exchange rates between VND and major currencies (currency basket), adjusted by relative consumer price.

The weight of each currency in the basket is its trade share. Total trade share of countries in the basket account for 85% - 90% foreign trade of Vietnam each year.

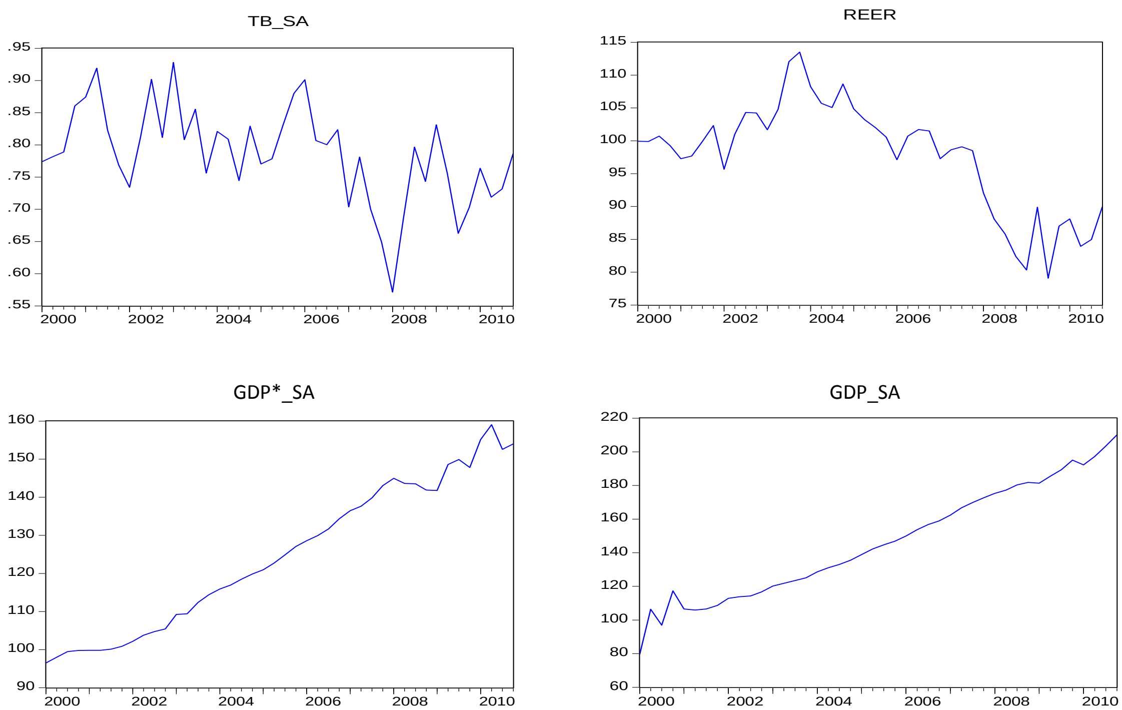
The foreign income variable is based on a weighted average of the indices of real GDP for seventeen trading partners using total trade shares as weights.

4.2.2. Econometric characteristics of the data

**** Seasonality:***

Although we do not test seasonal characteristic of time series of variables, it's usually that trade balance and output are strongly impacted by seasonal factor. In literature, all previous study on the exchange rate–trade balance relationship, series of trade balance and output is always seasonally adjusted. Besides, on our estimation, we find that the result using seasonally adjusted series is more significant than the result using series without seasonal adjustment. Using Census X12 to seasonally adjust the TB, GDP, GDP* series, we have series for estimation as follow.

Figure 3 – Seasonally adjusted series: TB, REER, GDP,GDP*



Source: author's calculation

**** Stationarity***

It is necessary to examine the stationary requirement of the four variables as the stationarity characteristic is very important to estimate techniques. Here, the study employs the Augmented Dickey-Fuller (ADF) test and the Phillips-Perron (PP) test. Table 5 reports the test results for the four series, both in levels and in first-differences.

Table 5 – ADF and PP tests results for non-stationarity of variables

Variables	ADF test statistic	Critical values at 1%	PP test statistic	Critical value at 1%

TB	-3.4324	-3.5924	-3.3860	-3.5924
REER	-1.3254	-3.5924	-1.2121	-3.5924
GDP	0.2430	-3.6104	-2.2450	-3.5924
GDP*	-0.0666	-2.6240	-0.6596	-3.5924
DTB	-8.4671	-3.5966	-10.9696	-3.5966
DREER	-8.5292	-3.5966	-8.5129	-3.5966
DGDP	-5.3708	-3.6104	-64.6827	-3.5966
DGDP*	-2.8089	-3.6055	-6.8161	-3.5966

Note: All variables are in natural logarithms, D is the first difference operator

Source: Author's calculations

Both tests consistently suggest that the trade balance, real exchange rate, domestic output and foreign output are non-stationary in levels (as ADF test statistics and PP test statistics are higher than critical value respectively), but stationary in first-differences (as ADF test statistics and PP test statistics are lower than critical value respectively). This result clears the way for the cointegration analysis below.

**** Correlation matrix***

The correlation matrix between variables in table 4.2 below shows that GDP and GDP* are highly correlated to each other (correlation coefficient is 0.98) due to their trend characteristics. Therefore, we have to eliminate one of them out of the model for the purpose of precluding multi-collinearity. We choose to keep GDP because of its importance to trade balance although its correlation coefficient with TB is lower than GDP*'s correlation coefficient with TB.

Table 6 – Correlation matrix

	TB	REER	GDP	GDP*
TB	1.000	0.407	-0.479	-0.525
REER	0.407	1.000	-0.676	-0.659
GDP	-0.479	-0.676	1.000	**0.980**
GDP*	-0.525	-0.659	**0.980**	1.000

Source: author's calculation

4.3.Methodology

Pesaran, Shin, and Smith (2001) have developed a bounds testing procedure which incorporates the long-run trade balance equation (4.2) into an ECM. This enables simultaneous evaluation of long- and short-run coefficients, which represents one of the main advantages of this approach.

Let $X_t = (TB_t, REER_t, GDP_{t,}) = (TB_t, x'_t)$.

Then an ARDL representation of equation (4.2) reads as follow:

$$\Delta TB_t = \alpha_0 + \alpha_1 t + \alpha_2 \Delta x_t + \sum_{i=1}^{p} \beta_i \Delta TB_{t-i} + \sum_{i=1}^{p} \gamma_i \, \Delta REER_{t-i} + \sum_{i=1}^{p} \delta_i \, \Delta GDP_{t-i} + \lambda_1 TB_{t-1} + \lambda_2 REER_{t-1} + \lambda_3 GDP_{t-1} + \varepsilon_t \qquad (2)$$

Note: Δ denotes the first difference, t is trend, p is optimal lag length

For estimating the long-run relation, this approach includes two stages.

- The first stage is testing for the existence of a long-run equilibrium relationship (cointegration) between observed variables, in particular the cointegrating vector (λ_1, λ_2, λ_3) with following hypothesis:

- H_0: there is no cointegration: $\lambda_1 = \lambda_2 = \lambda_3 = 0$
- H_1: there is the presence of cointegration: $\lambda_1 \neq 0, \lambda_2 \neq 0, \lambda_3 \neq 0$.

The relevant statistic to test is the Wald-test in form of the F-test. The F-test has a non-standard distribution which depends on: (i) whether variables included in the model are I(0) or I(1); (ii) the number of regressors; and (iii) whether the model contains an intercept and/or trend. With small sample size in this study (44 observations) the critical values used are as reported by Narayan (2004) which based on small sample size[1]. Conclusive decision to

- Reject H_0 if the calculated statistic is above the upper limit of the band, accept H_1, the long-run equilibrium relationship between TB, REER, GDP exists
- Accept H_0 if the calculated statistic is below the lower limit of the band, reject H_1, there is no long-run equilibrium relation.
- The rest is inconclusive area.

When cointegration has been found, the next step is to estimate the cointegration vector by using equation (2).

4.4.Estimation results

In order to carry out the testing above, we follow the procedure of Pavle Petrović and Mirjana Gligorić (2010). We estimate, by ordinary least square (OLS), model (2), with and without liner trend, and with and without Δx_t. In this first step, number of lags is the same across variables and we vary it from 1 to 5. i.e. p = 1, 2, …5. For optimal lag length selection, we based on either Akaike Information Criterion (AIC) or Schwarz Bayesian Criterion (SBC), which are reported in table 4.5.

Table 7 - Statistic of selecting lag order (SBC and AIC) and F-Statisctics for testing the existence of a levels trade balance equation

	α_1=0			α_1≠0		
α_2=0						
p	SBC	AIC	F-stat	SBC	AIC	F-stat
1	**-1.85138***	**-2.14099***	**4.92524[a]**	**-1.77602***	**-2.107***	**5.00530[b]**
2	-1.69882	-2.11676	4.25440	-1.61233	-2.07207	4.17402
3	-1.42164	-1.97052	2.08337	-1.40218	-1.99329	2.81096
4	-1.19037	-1.87286	0.55056	-1.333825	-2.05896	2.62945
5	-0.96096	-1.77975	0.78288	-1.040767	-1.90265	2.03023
α_2≠0						

[1] Pesaran, Shin and Smith (2001) generates critical values based on 500 and 1000 observations and 20,000 and 40,000 replications, which suitable for large sample size

1	**-1.70241***	-2.07477	**4.81654[a]**	**-1.63034***	-2.04407	**4.931628[b]**
2	-1.60409	**-2.10562***	**4.92452[a]**	-1.52414	**-2.06747***	**4.889786[b]**
3	-1.30474	-1.93807	2.27650	-1.26064	-1.9362	2.66190
4	-1.12416	-1.89196	0.65777	-1.21769	-2.02815	2.12386
5	-0.88520	-1.79018	0.88685	-0.96359	-1.91166	1.99633

Note: * indicate minimum values of SBC and AIC; a and b denote significance level at 5% and 10% respectively.
Source: Author's calculation

For the specification α_1=0 and α_2=0, both SBC and AIC values show the optimal number of lag is one (p=1). The correspondent F value is 4.925243 higher than the upper 5% bound at 4.203 implying that the hypothesis H_0 can be reject, i.e. the cointegration between TB, REER and GDP exists.

The same result is also obtained for the specification $\alpha_1\neq0$ and α_2=0. Both SBC and AIC choose 1 lag and the corresponding F (5.0053) is higher than the upper 10% bound (4.347). This outcome also reject hypothesis H_0 and accept H_1, showing that the cointegrationg between TB, REER and GDP do exists.

For the specifications α_1=0, $\alpha_2\neq0$ and $\alpha_1\neq0$, $\alpha_1\neq0$ the results are not different. In both case, SBC and AIC optimal lag length are 1 and 2 respectively. The corresponding F value is higher than respective upper bound, hence showing the presence of cointegration.

As cointegration has been found, the next step is to estimate the cointegration vector. The model (2) is re-estimated using the optimal number of lags for each variable. SBC and AIC are also used for lags' length selection, while the specification α_1=0 and α_2=0 of model (4.4) is estimated. Both information criteria have suggested the optimal model specification to be ARDL (2,3,0), i.e. one lag in ΔTB, two lags in ΔREER, zero lag in ΔGDP. Because the estimated coefficient of intercept is not statistically significant with low t-statistic value, we reject intercept out of model. Thus, the obtained ARDL model does not have intercept (Table 8). All diagnostic tests of the estimation regression suggest that it is a well-behaved model with no autocorrelation, homoskedasticity, normality of residuals and parameters stability.

Table 8 – Estimated ARDL(2,3,0) model

Variables	Coefficients	t-Statistics
TB_{t-1}	-0.5	-2.69
$REER_{t-1}$	0.10	1.87
GDP_{t-1}	-0.12	-2.16
ΔTB_{t-1}	-0.10	-1.6
$\Delta REER_{t-1}$	-0.75	-2.13
$\Delta REER_{t-2}$	-0.79	-2.19

Note: R^2=0.4l; Adj. R^2=0.35; Sum sq. resides=0.21, S.E. equation=0.09; Log likelihood=49.81, AIC=-2.13, SBC=-1.88, Mean dependent=0.00, Durbin-Watson Stat=1.87.
Source: Author's calculation

We continue to estimate other specification of model (2), including $\alpha_1\neq0$ and α_2=0, α_1=0 and $\alpha_2\neq0$, $\alpha_1\neq0$ and $\alpha_1\neq0$. We find that (i) there is no difference between Δx_t=0 and $\Delta x_t\neq0$ as the coefficient of Δx_t is not statistically significant; (ii) the coefficient of trend is not significant. Therefore, all specification of model (2) comes to unique result of ARDL (2,3,0) as specified in table 8.

The estimated ARDL (2,3,0) model in table 8 gives the following cointegration coefficients (with t-ratios in the brackets): λ_1=-0.5 (-2.69), λ_2=0.1 (1.87), λ_3=-0.12 (-2.16). The long-run trade balance equation is then obtained by renormalizing the obtained cointegration vector, by dividing it with λ_1 (-0.5), hence we finally get:

TB = 0.2REER – 0.24GDP

The obtained cointegration equation of ARDL (2,3,0) model shows positive impact of real exchange rate and negative impact of domestic output on trade balance. As expectation, long-run real depreciation of the currency leads to improvement in the trade balance; and vice versa, long-run real appreciation of the currency leads to deterioration in trade balance. The estimated elasticity is 0.2, shows that a one percent real depreciation/appreciate causes 0.2 percent improvement/ deterioration in trade balance. For the studied period, as real exchange rate of VND appreciates considerably against currency basket, the trade balance of Vietnam tremendously deteriorates as a result. In the other hands, the impact of domestic output on trade balance is consistently negative showing an increase in domestic output will deteriorate trade balance in the long run and vice versa. This result tells the role of domestic output to trade balance deficit as domestic output's growth rate rises relatively high to trading partners' outputs during the decade.

We proceed the procedure of Engle and Granger (1987) to obtain the short-run dynamic of trade balance. Then ECM model based on long-run equation is:

$$\Delta TB_t = \alpha_0 + \sum_{i=1}^{2} \beta_i \Delta TB_{t-i} + \sum_{i=1}^{2} \gamma_i \, \Delta REER_{t-i} + \sum_{i=1}^{2} \delta_i \, \Delta GDP_{t-i} + \phi EC_{t-1} + \varepsilon_t \quad (3)$$

Note: EC represents the error correction term.

Estimating equation (3) by OLS, we obtain the result reported in table 9, showing that while REER has significant negative short-run impact on trade balance, GDP have no impact on trade balance. The immediate impact of 1 percent depreciation of REER is to worsen the trade balance in two lags at 0.79 percent and 0.83 percent respectively. The obtained regressions also satisfied diagnostic tests, including no autocorrelation, homoskedasticy, normality of the residuals and parameters stability. The coefficient of the error correction term is negative and has absolute values smaller than one confirming the stability in the long-term cointegration equation.

Table 9 – ECM for trade balance based on ARDL (2,3,0)

Variables	Coefficient	t-statistics
EC_{t-1}	-0.4514	-2.8460
ΔTB_{t-1}	-0.1353	-1.5164
$\Delta REER_{t-1}$	-0.7986	-2.4781
$\Delta REER_{t-2}$	-0.8392	-2.5057

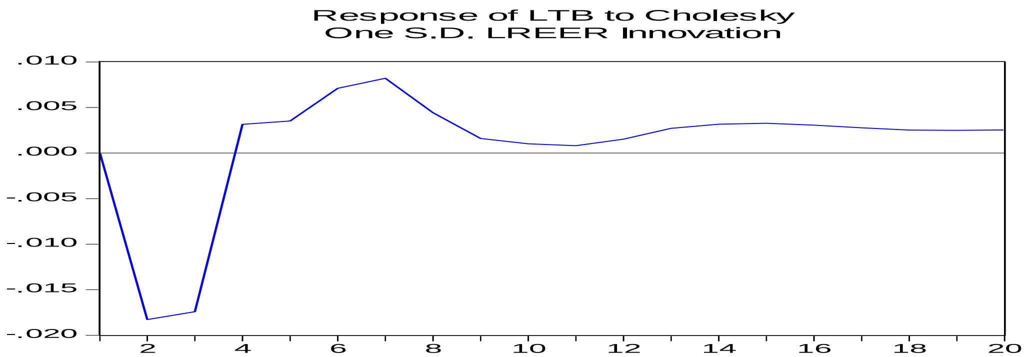
Note: EC=TB-0.2REER+0.24GDP; R^2=0.40; Adj. R^2=0.35; Sum sq. resides=0.21; S.E. equation=0.07; Log likelihood=49.56; AIC=-2.22; SBC=-2.05.

Source: Author's calculation

4.5.2. Impulse response

The impulse response function based on obtained ECM allows us to examine the evolution of the trade balance over time subsequent to a real depreciation of the currency. The results reported in figure 4 shows that after a permanent depreciation, the trade balance deteriorates in two quarters. 4 quarters after the shock the trade balance will improve. And 12 quarters after depreciation, the new equilibrium is established in line with new market conditions. Thus impulse response outcome implies the existence of J-curve effect in the relationship between real exchange rate and trade balance of Vietnam.

Figure 4 – Evolution of trade balance following real depreciation.



Source: Author's calculation

V. Conclusion and policy recommendation

Firstly, real exchange rate does have positive impact on trade balance in the long-run, indicating that, a depreciation can lead to improvement of trade balance improve and an appreciation can lead to deterioration of trade balance. Because real exchange rate has appreciated significantly since 2005, it is one of the reasons causing tremendous deficit of trade balance. However, the impact of real exchange rate is very limited (the elasticity coefficient is 0.2) which can be partly explained by (i) the dependence of export production on imported materials due to the lack of subsidiaries industries and (ii) composition of exports which is accounted mainly by low value-added products, real exchange rate appreciation is not the main determinant of trade balance deficit. Currently, depreciating real exchange rate to improve trade balance cannot take much effect. Nonetheless, as real exchange rate of Vietnam has appreciated by 10 percents to 2005 (and also 2000) and trade balance deficit is very serious, real exchange rate should be adjusted to equilibrium and improve the trade balance.

Secondly, there exists impact of real exchange rate on trade balance in Vietnam in short-run. Following a depreciation real exchange rate immediately causes significant negative impact on trade balance. However, the negative impact of real exchange rate on trade balance does not last long. Trade balance will be improved in the fifth quarter after depreciation and new equilibrium, which is higher than old equilibrium, will be set after twelve quarters.

Thirdly, the movements of real exchange rate and nominal exchange rate are towards different direction since 2003, indicating nominal exchange rate on the market is managed without connection with its real value. Because real exchange rate affects trade balance in both short- and long-run, if real exchange rate is kept out of concerning, policy makers will not know how far competitiveness of local producers may go. Therefore, exchange rate management should take into account real exchange rate for the benefit of trade balance.

In addition, the estimation results also indicate impact of exchange rate is less significant than the impact of domestic output on trade balance. Thereby, domestic output has role on demand side of imports and supply side of exports.

Besides, the estimation result can account for about 40 percent of trade balance performance. That means real exchange rate and domestic income can explain for 43 percent of trade balance. Thus, there must be other factors considerably determined trade balance of Vietnam which cannot be found in this study.

Finally, although the study do confirm exchange rate depreciation can improve trade balance, it is recommended that exchange rate policy manipulation should not be overused and it cannot do the work alone, out of the macroeconomic context and without supporting macroeconomic policies because the exchange rate as a policy instrument can have more effects in addition to the impact on trade competitiveness.

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