CHAPTER 2

Theory and Literature Review

2.1 Theory

In this chapter, some of the related theories concerning this study will be discussed in two ways as economic theory and econometric theory.

2.1.1 Economic Theory

Economic theories to be emphasized concerning the influence of exchange rate on trade balance are (1) elasticity approach; and (2) balance of payment approach. When studying about the exchange rate, there are two basic kinds of exchange rate which are nominal and real exchange rate.

Nominal exchange rate is the relative price of the currencies of two countries (MANKIW, 2013). This means that the country can trade at the rate at which the currency unit of one country to another

Real exchange rate is the relative price of the goods of two countries. That is, the real exchange rate shows the rate at which it can trade the goods of one country for the goods of another (MANKIW, 2013).

2.1.1.1 The Exchange Rate and the Trade Balance

The real exchange rate is the price of domestic goods relative to foreign goods. An appreciation of the exchange rate may tend to decrease trade balance or net exports which are export minus import. The nominal exchange rate is determined by the real exchange rate and the price levels in the two countries.

Suppose that the real exchange rate is low. It means domestic currency is depreciating. Therefore, the domestic goods are cheaper than foreign goods, and the domestic residents will want to buy fewer imported goods than domestic produce goods. On the other hand, foreigners will want to purchase many of domestic produce goods as

a result of both of these actions. The quantities of exports are greater than the quantity imports, so the trade balance of the country will be improved.

In contrast, if the real exchange rate is high, it means domestic currency is appreciating. Therefore the domestic goods are more expensive relative to the foreign goods, and the domestic residents will want to purchase many imported goods. On the other hand, foreigners will want to purchase few domestic goods. Therefore, the quantity of the country net exports will be low because of quantity exports less than the quantity of import, so the trade balance of the country will be reduced. The relationship of the exchange rate and trade balance can be illustrated by the graph as follow:

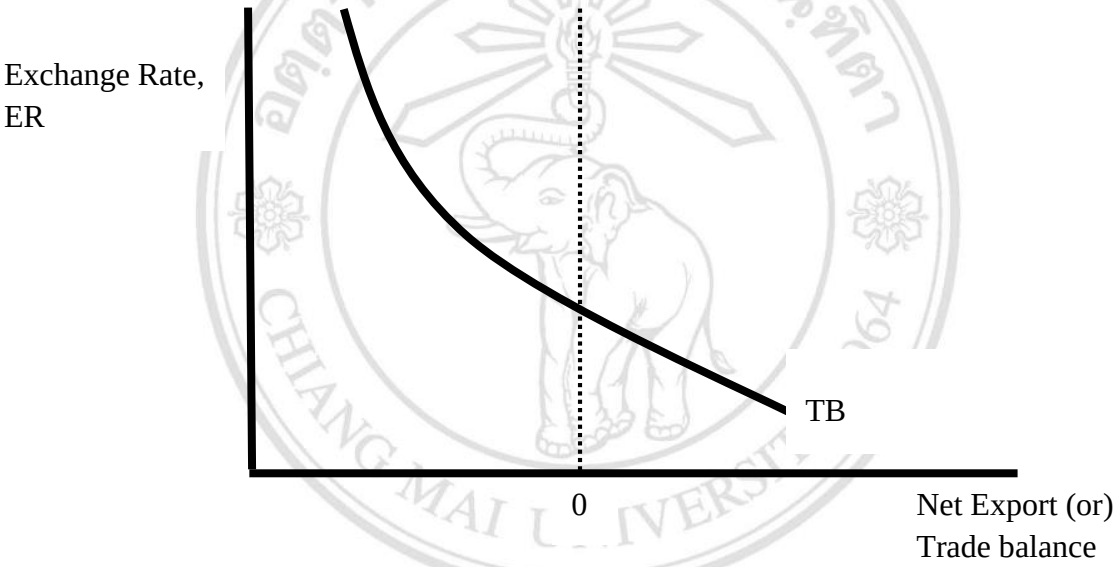

Figure 2.1 Net Exports and the Real Exchange Rate

Figure 2.1 illustrates the negative relationship between the trade balance and the real exchange rate. The lower the exchange rate, the domestic produce goods are less expensive relative to foreign imports, and therefore the greater are the country trade balance. In the figure, the horizontal axis measures negative values of net export because imports can be greater than exports Therefore net exports can be lower than zero. The exchange rate is related to the trade balance negatively.

The impact of exchange rate on trade balance can be seen as two different kinds of approaches. There are the elasticity approaches and the balance of payment approach explained as follows.

2.1.1.2 The Elasticity Approach

In the approach of elasticity, it emphasizes on the relative's price effects of depreciation on trade balance and it proposes that depreciation works best when the elasticities of demand are high. In this approach, the country's currency depreciation affects a country's trade balance through changes in the relative prices of goods and services internationally. When a country which trade balance faces deficit, it can be able to interchange its trade deficit by reducing its relative prices so that the country's exports may be high and imports may be low. The nation can reduce its relative prices by authorizing its exchange rate to depreciate in a free market or by devaluing its currency under fixed exchange rates system. The final result of currency depreciation may depend upon the price elasticity of demand for its exports.

2.1.1.1.2 The Balance of Payments (BOP) Approach

In the approach of the balance of payments, that explains what kinds of factors influence the supply and demand of a nation's currency. The balance of payments is a method of recording all the international monetary transactions of a country during a specific period of time (MANKIW, 2013). The recorded transactions are separated into three kinds of categories: the current account transactions, the capital account transactions, and the central bank transactions.

As stated earlier, a nation's price of currency depreciation or appreciation instantly affects the volume of a nation's imports and exports and, consequently, a fluctuation in the exchange rates can affect the balance of payment variances. A country's currency depreciation will improve the value of exports in domestic currency terms, and conversely, the imports will become more expensive. Its value will be decrease domestically. If the value of exports increases greater than the value of imports, the currency depreciation will be better than the current account.

2.1.2 Econometric Theory

Theoretical model was used to find out the impact of exchange rate on trade balance in Myanmar can be specified as a simple model:

GTB = f (GMER, GEX, GIM) (2.1)

Where:

GTB stands for growth rate of trade balance. MER stands for the growth rate of market exchange rate, GEX stands for growth rate of export, and GIM stands for the growth rate of import.

This model sets a hypothesis that TB is a function of market exchange rate, trade balance, export and import. In order to analyze and examine the degree of influence of exchange rate on trade balance, Augmented Dickey Fuller (ADF) unit root test, which is a set of methods of time series econometrics, was used to analysis the data or stationary or not. Switching Regression Estimation wass used in this study.

2.1.2.1 Test the Unit Root Test

To test a Unit root is believed to be the first step in a study. This step will be to test different economic variables that will be used in the equations to determine if they are stationary or non-stationary. The equation is to be Stationary [I (0) integrated of order 0;], or Non-stationary [I (d), d > 0; integrated of order d]. Most studies are popular for testing Unit root by Dickey-Fuller test (DF) and the Augmented Dickey-Fuller test (ADF). By the DF test method, these are H_0: $\rho = 1$ from the equation (2.2) below.

$$X_t = \rho X_{t-1} + \varepsilon_t \quad (2.2)$$

where, X_t is the independent variable of time series data at time t.

X_{t-1} is the independent variable of time series data at the time t-1 .

ε_t is random error.

ρ is the relative rate coefficient (Coefficienct Autocorrelation). .

If ρ = 1, we can write as follow:

$$X_t = \rho X_{t-1} + \varepsilon_t \; ; \varepsilon_t \sim \text{i i d } (0, \sigma^2 \varepsilon_t .) \quad (2.3)$$

where ε_t is a series of random variables, where the normal distribution is the same and is independent of each other, with the average value of zero and a constant variance , with the assumption of the test of Dickey-Fuller.

H_0: $\rho = 1$

H_a: $|\rho| < 1 \; ; -1 < \rho < 1$

The test, called a unit root. If $H_a : |\rho| < 1, \; X_t$ is a stationary. And if : $H_0 : \rho = 1 \; X_t$ is nonstationary. However, this test can be performed as

$$\Delta X_t = \theta X_{t-1} + \varepsilon_t \quad (2.4)$$

That is, $X_t = (1 + \theta) X_{t-1} + \varepsilon_t$, which is the equation (2.3) exerted by the

$\rho \; (1 + \theta)$:

H_0: $\theta = 0$

H_a: $|\rho| < 1 \; ; -1 < \rho < 1$

If θ in the equation (2.4), the negative is thatρ. Equation (2.3) shall be less than 1, therefore it can be concluded that the rejection $H_0 : \theta = 0$, which is the accepted : $H_0 : \theta < 0$, means that the $\rho < 1$ and X_t are integration of order zero. That is, X_t looks stationary and if we are not able to. Reject: H_0: $\theta = 0$ it means that X_t is still nonstationary. If X_t is the random walk complex which will have a general bias (random walk with drift) we can write the model as follows:

$$\Delta X_t = \alpha + \theta X_{t-1} + \varepsilon_t \quad (2.5)$$

And if X_t is the random walk complex, which has a general bias (random walk with drift) and likely based on linear (linear time trend), we can write the model as follows:

$$\Delta X_t = \alpha + \beta_t + \theta X_{t-1} + \varepsilon_t \quad (2.6)$$

Where t = time, that will do a test $H_0 : \theta = 0$, with : $H_0 : \theta < 0$ summary. Dickey and Fuller regression equations were considered three different models to test whether there is a unit root.

Whether or not that three such equations are:

$$\Delta X_t = \theta X_{t-1} + \varepsilon_t \quad (2.7)$$

$$\Delta X_t = \alpha + \theta X_{t-1} + \varepsilon_t \quad (2.8)$$

$$\Delta X_t = \alpha + \beta_t + \theta X_{t-1} + \varepsilon_t \quad (2.9)$$

The parameters θ are interested in all the equation. That is, if $\theta = 0$; X_t is unit root by comparing statistics t (t-statistic), calculated with the appropriate values that are in the table of Dickey-Fuller or to the critical value of MacKinnon. However, the critical value will not change. If the equation (2.7), (2.8) (2.9), to be replaced by linear regression rate (autoregressive processes).

$$\Delta X_t = \theta X_{t-1} + \sum_{i=1}^{\rho} \emptyset_i \Delta X_{t-i} + \varepsilon_t \quad (2.10)$$

$$\Delta X_t = \alpha + \theta X_{t-1} + \sum_{i=1}^{\rho} \emptyset_i \Delta X_{t-i} + \varepsilon_t \quad (2.11)$$

$$\Delta X_t = \alpha + \beta_t + \theta X_{t-1} + \sum_{i=1}^{\rho} \emptyset_i \Delta X_{t-i} + \varepsilon_t \quad (2.12)$$

The number of lagged difference terms that will be imported is included in the equation; it must have enough. Positive values make the error terms are serially independent and take ADF (augmented Dickey-Fuller test) test statistic values for ADF test statistic with distribution. . Linear directed (the asymptotic distribution) is the same as the DF statistic, so that they can take up the critical values.

2.1.2.2 Switching Regression Model

Switching regression model is a model that consists of two scenarios, hypothetically. In both scenarios, as follows:

Scenario 1: $Y_{1i} = \beta_1 X_{1i} + u_{1i}, if\ \gamma' z_i \geq u_i$ (2.13)

Scenario 2: $Y_{2i} = \beta_2 X_{2i} + u_{1i}, if\ \gamma' z_i < u_i$ (2.14)

$u_i \sim (0, \sigma_i^2)$, $u_{1i} \sim (0, \sigma_{1i}^2)$) , $u_{2i} \sim (0, \sigma_{2i}^2)$

where, Y_{1i} is is a variable based on the time series data at the situation 1.

Y_{2i} is a variant based on the time series data at the situation 2

X_{1i} is the independent variable of time series data at the situation 1

X_{2i} is the independent variable of time series data at the situation 2

β_1 , β_2 , γ is the parameter value.

u_i , u_{1i} , and u_{2i} are the value of the variable error is random.

The assumption is that the u_i has a relationship with u_{1i} and u_{2i} ; this model is called the Switching regression models. Regression model with endogenous Switching is defined by switching to a group within the structure of the models.

From equation (2.13), if $\gamma' z_i \geq u_i$ and to select the equation (2.14), if $\gamma' z_i < u_i$, that is, to select the equation (2.14), If not $\gamma' z_i \geq u_i$, we see whether we will choose (2.13) and it will see that in this case is to decide whether to follow the equation (2.13) or equation (2.14). There have two choices or a decision that is two ways choose by containing a description explanatory variable). For decision, it already mentioned z_i is consistent; this style is called the Probit model. Define the Dummy variable which is the value of γ exerted, to perform a criterion function exerted thus:

$I_i = 1 \; if \; \gamma' z_i \geq u_i$,

$I_i = 0$ Otherwise

In the case of a clear example of discrimination, it can define what I_i will have a value of 1 or 0. So can use it as a maximum the Probit maximum likelihood to find γ by I_i is a variable (the Dependent variable) and γ can be estimated, in such a way that a Scale factor only. Let Var (u_i) = 1 also assumes hypothetical, that u_i , u_{1i} , and u_{2i} have a normal distribution three Variant (normal Trivariate distribution) by the mean vector is equal to zero, and Covariance matrix.

$$\Sigma = \begin{pmatrix} \sigma_1^2 & \sigma_{12} & \sigma_{1u} \\ \sigma_{12} & \sigma_2^2 & \sigma_{2u} \\ \sigma_{1u} & \sigma_{2u} & 1 \end{pmatrix} \quad (2.15)$$

Function is supposed to be the likelihood function for the the probit model this can be written as follows:

$$L(\beta_1 , \beta_2, \sigma_{1u} , \sigma_{2u}) = \pi \left[\int_{-\infty}^{\gamma' z_i} g\ (Y_i\ \beta'_1 X_{1i}, u_i) \right) du_i \ ]^{Ii} \left[\int_{\gamma' z_i}^{-\infty} g\ (Y_i\ \beta'_1 X_{1i}, u_i) \right) du_i \ ]^{Ii} \quad (2.16)$$

By g and f, a function of two variables is normal density functions of the normal distribution with two variables $(u_{1i},\ u_i)$, and $(u_{2i},\ u_i)$, respectively, and will see that σ_{12} does not appear In the equation (2.16). Therefore σ_{12} value cannot be estimated only σ_{1u} and σ_{2u}.

The function equation (2.13) can be found by using the regression method, switching to 2 steps (Two-Stage Switching Regression Method) to adjust the value of tolerance, have an average of zero. Unable to find expected value of u_{1i} and u_{2i} in equation (2.13) and (2.14) , which for the value of u_{1i} is shown as follows:

$$E(u_{1i} | u_i\ z_i \leq \gamma' z_i) = E(\sigma_{1u}\ u_i | u_i\ z_i \leq \gamma' z_i)$$

$$= -\sigma_{1u}\ \frac{\emptyset\ (\gamma' z_i)}{\phi\ (\gamma' z_i)} \quad (2.17)$$

$$E(u_{2i} | u_i\ z_i \leq \gamma' z_i) = E(\sigma_{2u}\ u_i | u_i\ z_i \leq \gamma' z_i)$$

$$= -\sigma_{2u}\ \frac{\emptyset\ (\gamma' z_i)}{\phi\ (\gamma' z_i)} \quad (2.18)$$

where the conditional distribution of u_{1i} , u_{2i} is normally, with the average equal to $\sigma_{1u}\ u_i$, $\sigma_{2u}\ u_i$ and the variance is equal to the $\sigma_1^2 - \sigma_{1u}^2$, $\sigma_2^2 - \sigma_{2u}^2$ by a u_i is defined, and the variance of u_i is equal to 1.Using the method of least squares to estimate the parameters of the equation (2.13) and (2.14). The value of these parameters is bias and not consistent. Proposed method of estimating the parameters of an equation (2.13) and (2.14), by adding the new variable W_{1i} and W_{2i} into equation

(2.13) and (2.14), to eliminate the problem, which ways will have a new equation as follows:

$$Y_{1i} = \beta'_1 X_{1i} - \sigma_{1u} W_{1i} \ + \ \varepsilon_{1i} \ \text{For } I_i = 1 \tag{2.19}$$

$$TB_{2i} = \beta'_2 RXR_{2i} - \sigma_{2u} W_{2i} \ + \ \varepsilon_{2i} \ \text{For } I_i = 0 \tag{2.20}$$

where ε_{1i}, ε_{2i} is the new tolerance value that is the average conditional (Conditional Means) is zero.

$$\varepsilon_{1i} = u_{1i} + \sigma_{1u} W_{1i}$$

$$\varepsilon_{2i} = u_{2i} + \sigma_{2u} W_{2i}$$

This can be estimated from the value β_1 and β_2 of the equation (2.13) and (2.14). By first finding the value γ from the maximum focus on the way the probit maximum likelihood. By observingI_i, which from the value γ^, it can calculate the value $\gamma' Z_i$ did that in the end, we can calculate W_{1i} and W_{2i}. The second step is to estimate the equation (2.19) and (2.20), by using Ordinary Least Squares method, this will give you an estimate of β_1 , β_2 , σ_{1u} and σ_{2u} and for finding the value of σ_1^2 and σ_2^2. Then, consider the variance of ε_{1i} and ε_{2i} from the equation (2.19) and (2.20) variance of it looks (Heteroscedastic) which, by principle, we should estimate the equation (2.19) and (2.20). The most common are less significant (Generalized Least Square, GLS) or the least squares method is a retard weight (weighted least squares) instead of the ordinary least squares method (OLS) and in the Var (ε_{1i}) and Var (ε_{2i}) is shown as follows:

$$E(u_{1i} \mid I_i = 1) = -\sigma_{1u} W_{1i}$$

$$E(u_{1i}^2 \mid I_i = 1) = \sigma_1^2 - \sigma_{1u} (\gamma' Zi) W_{1i}$$

$$E(u_{2i} \mid I_i = 0) = -\sigma_{2u} W_{2i} \tag{2.21}$$

$$E(u_{2i}^2 \mid I_i = 1) = \sigma_2^2 - \sigma_{2u} (\gamma' Zi) W_{2i}$$

$$E(u_{1i} \mid I_i = 1) = E(u_{2i} \mid I_i = 0)$$

$$Var(u_{1i} \mid I_i = 1) = \sigma_1^2 - \sigma_{1u}^2 W_{1i} \ (\gamma' Zi \ + \ W_{1i}) \tag{2.22}$$

$$Var(u_{1i} \mid I_i = 0) = \sigma_2^2 + \sigma_{2u}^2 W_{2i} \ (\gamma' Zi + W_{2i}) \quad (2.23)$$

How to find the value σ_1^2 and σ_2^2 . This is the dirty lang from have the value β_1 and β_2Then, we calculate the rest Residuals, as follows:

$$u\hat{}_{1i} = Y_i - \beta\hat{}_1 X_{1i} \text{ for } I_i = 1 \quad (2.24)$$

$$u\hat{}_{2i} = Y_i - \beta\hat{}_2 X_{2i} \text{ for } I_i = 0 \quad (2.25)$$

That from the equation (2.22) and (2.23) we can estimate the value σ_1^2 and σ_2^2 from

$$\sigma_1\hat{}^2 = \frac{1}{N_1}\sum_{i=1}^{N_1}[\, u_{1i}\hat{}^2 + \sigma_{1u}\hat{}^2 \ (\gamma' Zi) \ W\hat{}_{1i} \quad (2.26)$$

$$\sigma_2\hat{}^2 = \frac{1}{N_2}\sum_{i=1}^{N_2}[\, u_{2i}\hat{}^2 + \sigma_{2u}\hat{}^2 \ (\gamma' Zi) \ W\hat{}_{2i} \quad (2.27)$$

when N_1 = the number of observations in case $I_i = 1$.

N_2= the number of observations in case Ii = 0.

In spite that according to theory and definitions, it can be seen from the formula in equation (2.26) and (2.27), a value of $\sigma_1\hat{}^2$ and $\sigma_2\hat{}^2$, there is always a positive value (then the variance will need to be the value is always positive). However, there is a choice of 2 to a value of about $\sigma_1\hat{}^2$ and $\sigma_2\hat{}^2$, by that method in this two ways, were up $\sigma_1\hat{}^2$ and $\sigma_2\hat{}^2$ is positive , that is completed for estimating the value of various parameters by means of two-stage switching regression models with Switching variable and to manage its constant variance of the value bias ε_{1i} and ε_{2i}in the equation (2.19) and (2.20). The estimated parameter values to calculate the variance value in the equation (2.22) and (2.23) and use the method of least squares.

2.2 Literature Review

There are many empirical and descriptive studies on the impact of exchange rate on trade balance of the developing countries which found out various kinds of conclusions. **PHAM THI TUYET TRINH (2012)** examined the long and short run impact of Exchange Rate and Trade Balance in Vietnam: empirical examination on the impact of exchange rate on trade balance in short run and long run in Vietnam. The quarterly data of trade balance, real effective exchange rate, domestic output and

foreign output (from 2000 to 2004) are used in this empirical study. The purpose of this study is to measure the short run and long run impact of exchange rate on trade balance. In this empirical study, the Autoregressive distributed lag (ADRL) model is analyzed to look into long run impact and error correction model (ECM) model based on long-run co-integration equation find out the short run impact respectively. The study confirmed that currency depreciation has significant effect on trade balance of Vietnam.

Ng Yuen-Ling (2006) analyzed the relationship between Real Exchange Rate and Trade Balance in Malaysia: this empirical study attempted to identify the relationship between real exchange rate and trade balance of the country. In this study, the Unit Roots, Engle-Granger test, Co-integration techniques, and Vector Error Correction Model are used. The annual data of real exchange rate, trade balance, domestic GDP and foreign (United State) GDP are analyzed in the study from 1995 to 2006. There are three main results found in this empirical study: there is the long run relationship existing between the trade balance and exchange rate, the real exchange rate is essential variable for trade balance, and the devaluation of the country currency can significantly improve the trade balance in the long run in Malaysia.

Dr. Keshab R.Bhattarai and Mark K. Armah (2005) investigated the effect of Exchange Rate on Trade Balance in Ghana: evidence from co-integration analysis. In this empirical study, it estimates the trade balance as a function of the real exchange rate, the domestic incomes, and the foreign incomes. In this study, the annual time series data from 1970 to 2000 are used to analyze the effects of exchange rate on the trade balance in Ghana. To analyze a stable relationship between trade balance and the real exchange rate in the long run, the VER- Error correction models are used to confirm. The result found out in this study is the Ghana's trade balance will not improve in the short run but in the long run the devaluation of currency can improve the trade balance of Ghana.

Muhammad Shahbaz, Abdul Jalil and Faridul Islam (2006) explored the relationship between the Real Exchange Rate and the Trade Balance: the evidence from Pakistan. This empirical study analyzes the relationship between the exchange rate and the trade balance. The quarterly data of exchange rate and trade balance from July 1980 to June 2006 are used in this empirical study. The Auto Regressive Distributed Lag

(ARDL) approach to co-integration model is used to examine the relationship of the variables. The three major findings of this research paper are (1) long run relationship between the real exchange rate and the trade balance for all periods used, (2) the currency depreciation leads to deterioration in the trade balance, and (3) the shock of the real exchange rate causes the deterioration response of the trade balance in Ghana. In the following tables, the major facts of the studies are summarized clearly.

Table 2.1 Summary table of the Literature

Author	Title	Variables used in the study	Econometrics Method	Findings
IRINA TOCHITSKAYA	The Effect of Exchange Rate Changes on Belarus's Trade Balance	nominal exports, nominal imports, real domestic incomes, real foreign incomes, a REER	Unit Root Tests, ADF, ARDL, VAR	a real effective depreciation can improve the trade balance in the short run.
Dr. Keshab R.Bhattarai, Mark K. Armah	The Effects of Exchange Rate on the Trade Balance in Ghana: Evidence from Cointegration Analysis	Real Export, Real Import, RER, Real GDP, Foreign price, Domestic price, nominal	Cointegration, Engle-Granger, Error-Correction Model(ECM), Vector Autoregressive Model (VAR)	For improved balance of trade in Ghana, coordination between the exchange rate and demand management policies
MUHAMMAD SHAHBAZ, ABDUL JALIL, FARIDUL ISLAM	Real Exchange Rate Changes and the Trade Balance: The Evidence from Pakistan	Trade balance, ratio of real exports to real imports, real exchange rate	VAR model (Cointegration & Causality)	a long-run relationship between the series exists, and coefficient of elasticity is negative and statistically significant, which does not support for the J-relation.

Table 2.1 Summary table of the Literature (Continuous)

Author	Title	Variables used in the study	Econometrics Method	Findings
Ng Yuen-Lin	Real Exchange Rate and Trade Balance Relationship: An Empirical Study on Malaysia	Trade Balance, Real Exchange, Gross Domestic Product	Co-integration, Engle-Granger, Vector Error Co-integration Model	There is long rung relationship between Trade Balance and Exchange Rate. Marshall—Lerner condition exists because
Pavle Petrović, Mirjana Gligorić	Exchange Rate and Trade Balance: J-curve Effect	trade balance, real exchange rate, GDP	Johansen's Cointegration Analysis, ARDL, ECM, VAR	In the long run, A RER depreciation has a significant Positive impact on the TB in Serbia and short run movements and indicate the existence of the J-curve
PHAM THI TUYET TRINH	The Impact of Exchange Rate Fluctuation on Trade Balance in Short and Long Run: Vietnam	trade balance, real effective exchange rate, domestic output, foreign output	Autoregressive distributed lag (ADRL), Eerror correction model (ECM)	In the long-run, RER have positive impact on TB. Depreciation may lead to improvement of TB improve and an appre-ciation can lead to deterioration of TB. In short-run , there exists impact of RER on trade balance.