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Abstract

This paper aims to empirically examine the *Twin Deficit Hypothesis* and *Feldstein-Horioka Hypothesis* in the case of Indonesia. The cointegration result shows that fiscal imbalances, investment and current account imbalances have a long run relationship. *Autoregressive Distributed Lag* (ARDL) and *Autoregressive Distributed Lag-Error Correction Model* (ARDL-ECM) approaches are applied to estimate the long run and short run relationships, respectively. The estimation results show that the fiscal imbalances have a positive impact on the current account imbalances in Indonesia. Meanwhile, investments have a negative impact on the current account. Those results indicate that *Twin Deficit Hypothesis* and *Feldstein-Horioka Hypothesis* hold in Indonesia.

Key Words: *Twin Deficit Hypothesis, Feldstein-Horioka Hypothesis,* ARDL, ECM.

JEL: F30, F33, F42.

1. Introduction

In the last three decades, current account imbalances and fiscal imbalances have increased globally (Faruqee, 2008). These phenomena have attracted the attention of researchers to analyze them. As described by the International Monetary Foundation (IMF), current account is a component of the balance of payments of a country. Current account covers the differences between total exports of goods, services, and transfers, and the total imports of the country with the exception of the capital and financial transactions and obligations. Current account imbalance occurs when a country's current account in surplus or deficit. Fiscal imbalance is defined as a phenomenon when government spending exceeds its income, which is known as the fiscal deficit, or the phenomenon when government spending is lower than the income, which is known as a fiscal surplus. Blanchard and Milesi - Ferretti (2009) states that along with the increase in current account imbalances and fiscal imbalances, the world economy becomes unstable; it is marked by the economic crises that hit the world and make world economic grow slower than usual. Carvalho (2012) examined the relationship between current account imbalances and fiscal imbalances in the U.S. economy in the period 1980-2010. The result of the research stated that the current account deficit significantly affects the economy of U.S. The results of these studies are evidence that the current account and government spending are important components in the macroeconomic.

In 1998, Indonesian economy experienced economic crisis which deteriorated its macroeconomic indicators. In that period, Indonesia experienced negative economic growth, significant depreciation of Rupiahs against US Dollars, high unemployment rate, high inflation rate, current account deficit and fiscal deficit (Radelet , 1999). Various efforts had been taken by the Indonesian government to get out from the crisis, one of which is the fiscal deficit policy. After the economic crisis that hit Indonesia in 1998, the Indonesian government has been implementing fiscal deficit policy as part of efforts to boost economic growth. It is interesting to study the pattern shown by the development of fiscal and current account imbalances in Indonesia during the 2000 first quarter to 2012 second quarter. Based on Figure 1, it appears that there is a positive relationship between budget imbalances with the current account imbalance.

Insert Figure 1 here.

Another interesting pattern is shown in Figure 2, which graphs the percentage of investment to Indonesia's GDP and the current account imbalances to Indonesia's GDP. In the figure, it appears a negative relationship between the levels of investment in the current account. This is consistent with research conducted by Firdmuc (2003). Firmuc (2003) tried to proof two popular hypotheses, namely *Twin Deficit Hypothesis* and *Feldstein-Horioka Hypothesis*. In the research, Firmuc (2003) made a model to figure out the relationship between fiscal imbalances, investment, and current account imbalances.

Insert Figure 2 here

Relationship between investment, fiscal imbalances and current account is important to study because these variables have an impact on a country's macroeconomic stability (Marinheiro, 2006 and Calvaho, 2012). Three variables also have impacts on other macroeconomic variables, namely the exchange rate and interest rate (Sadaqat, 2011). In addition, fiscal imbalances (surplus/deficit) and investment relatively can be managed by policymakers than other macroeconomic variables, such as exchange rates. The high contribution of trade (exports and imports) to the Indonesia's Gross Domestic Product reflects the importance of trade policy, one of which is the management of the current account.

This study generally aims to determine the relationship between investment and fiscal imbalances toward current account imbalances. This research is relevant to be applied in Indonesia because the Indonesian government has always implemented fiscal deficit policy after 1998 and Indonesia government also experienced current account deficit in several periods. This study uses quarterly data started from 2000 quarter 1 to 2012 quarter 2. This study is started in 2000 because the Indonesian government has always implemented a fiscal policy deficit and has experienced several periods of the current account deficit. In addition, the Indonesian economy began to experience improvements after the 1998 crisis and to avoid bias results in regression.

The rest of this paper is organized as follows. The second part contains the theoretical framework, literature review, and research methodology. The third section contains the results of the regression data and discussion. The last section contains conclusions and recommendations.

2. Theoretical Framework and Literature Review

2.1 *Twin Deficit Hypothesis*

Keynesian views that the relationship between current account imbalances and fiscal imbalances can be explained through the *Twin Deficit Hypothesis*. The hypothesis states that an increase in the country's fiscal deficit will increase the country's current account deficit. Keynesian views that the government budget is an important factor in the changes in economic variables, especially the foreign sector. Any increase in government spending will increase aggregate spending and raise the level of inflation and interest rates. An increase in interest rates could potentially lead to a crowding out effect on the domestic economy and capital inflows into the country. An increase in interest rates could potentially lead to an increase in foreign exchange reserves, but on the other hand, domestic demand for goods imports also increased and the demand for domestic goods abroad will decline. Implementation of expansionary fiscal policy by increasing the budget deficit could potentially push the inflation rate which causes an increase in the relative value of domestic goods and foreign goods will increase the current account deficit (Olanipekun, 2012).

Positive relationship between the government fiscal imbalances and current account imbalances are described in the open economy model. In an open economy (Mankiw, 2006):

$$Y = C + I + G + (X - M) \tag{1}$$

$$S - (T - G) = I + (X - M) \tag{2}$$

Where Y is GDP, C is consumption, I is investment, G is government spending, X is exports of goods and services, and I is the import of goods and services of a country. In equation (2), S represents the private savings, while T represents government revenue in taxes.

The two equations can be substituted into the following:

$$(X - M) = (S - I) + (T - G) \quad (3)$$

$$S = I \quad (4)$$

Equation (4) assumes that savings and investment rates are stable. Thus, from equation (3) and (4) can be formulated into the following:

$$(X - M) = (T - G) \quad (5)$$

Equation (5) represents that current account imbalances possess a positive relationship with the government budget (fiscal) imbalances.

Keynesian Absorption Theory states that an increase in government budget deficits could potentially encourage domestic absorption. It could potentially lead to an increase in imports to meet domestic demand. This situation could potentially deteriorate the current account. When the increase in imports is significant and exceeds the increase in exports, the current account will be in deficit (Marashdeh and Saleh , 2011).

Relationship between fiscal deficit and current account deficit is also described by the Mundell – Flemming model. Based on research conducted by the Mundell - Flemming, an increase in the government's fiscal deficit could potentially encourage an increase in interest rates. It could potentially lead capital inflows and appreciation of the domestic exchange rate against foreign currencies. Appreciation of the domestic exchange rate against foreign currencies stimulate an increase of foreign imports and decrease domestic exports (Marashdeh and Saleh , 2011). This causes an increase in the current account deficit.

2.2 *Twin Deficit Hypothesis* and the Feldstein - Horioka

Feldstein and Horioka (1980) conducted a study to determine the relationship between the level of investment and private savings. The degree of correlation of the two variables can measure the level of capital mobility. If the national capital markets are integrated with international markets, domestic investment can be financed by foreign savings. This causes the weak correlation between the levels of investment savings.

Feldsten and Horioka (1980) conducted a cross - sectional analysis of the 16 OECD countries in the period 1960-1974. The model estimated is as follows:

$$\frac{I}{Y} = \alpha + \beta\left(\frac{S}{Y}\right) + u \qquad (6)$$

In the model, (I / Y) and (S / Y) represented the ratio of the level of investment to GDP and the ratio of the level of savings to gross domestic product. β was the coefficient of the saving rate and u is the error term. The coefficient savings rate variable would be high if there is no international capital mobility because domestic investment financed by domestic savings. If international capital mobility occurs, the coefficient of the level of savings would be low.

The β coefficient was 0.887 which means investments in OECD countries are financed by domestic savings. However, the integration of world financial markets, the interest rate differentials, and weak capital controls would lead weak correlation between savings and investment. This is what is known as *Feldsten - Horioka Puzzle*.

Firdmud (2003) conducted a study to explain the *Twin Deficit* and the *Feldstein-Horioka Puzzle* with the following models:

$$X_t - M_t = \beta_1 + \beta_2(T_t - G_t) - \beta_3 I_t \qquad (7)$$

In these models, XM represents the current account, T-G represents the government's fiscal imbalance, and I represents gross capital formation or investment levels. β_2 is positive and significant which indicates the validity of Twin *Deficit Hypothesis* and β_3 is negative, significant, and close to zero indicates the validity of *Feldstein - Horioka Hypothesis*. Actually, β_3 may be worth more than one if the investment rate is lower than the new production expenditure (Firdmuc, 2003).

2.3 Empirical Study

Feldstein-Horioka Hypothesis phenomenon or *Feldstein-Horioka Puzzle* and *Twin Deficit Hypothesis* began inviting curiosity of the researchers in the decade of the 2000s. Firdmuc (2003) analyzed the phenomenon of *Feldstein-Horioka Hypothesis* and *Twin Deficit Hypothesis* in countries belonging to the OECD in the period 1970-2001. The results of these studies indicated the occurrence of *Twin Deficit Hypothesis* and the *Feldstein-Horioka Hypothesis.* Marinheiro

(2006) examined the phenomenon *Feldstein-Horioka Puzzle* and *Twin Deficit Hypothesis* in Egypt in the period 1974-2004. The results of these studies indicated that the level of capital mobility is high in Egypt, it is indicated that Egypt is quite integrated with the international market. Therefore, the *Feldstein-Horioka Puzzle* is prevailing in the country. Meanwhile, *Twin Deficit Hypothesis* does not apply in the country. Aristovnik and Djuric (2009) examined the phenomenon in the countries that joined the European Union in the period 1995-2008. Their results indicated that there was a weak relationship between fiscal imbalances in the area. Investment in these countries were funded much by foreign sources, it indicated a high integration of the region with international markets. Baharumsah *et al* (2009) analyzed the phenomenon of *Feldstein-Horioka Puzzle* and *Twin Deficit Hypothesis* in Malaysia, Thailand, and the Philippines. The results of these studies state that *Twin Deficit Hypothesis* was occurred in the three countries.

3. Methodology

3.1 Research Model and Hypothesis

The model used in this study is an adaptation of a model used by Fidrmud (2003) and Halil Altintas and Sami Taban (2011). Variables used in this study are current account, fiscal imbalances (budget balance), and investment reflected by gross capital formation. All of the variables are divided by Indonesia's Gross Domestic Product. Two models are used to determine long-term and short-term effects of the model.

Model 1: Auto Regressive Distributed Lag (ARDL) to estimate the long-term relationship:

$$CA_t = \alpha_0 + \sum_{i=1}^{m} \alpha_{1i}\ CA_{t-i} + \sum_{i=0}^{m} \alpha_{2i} BB_{t-i} + \sum_{i=0}^{m} \alpha_{3i} I_{t-i} + e_t \quad (8)$$

Model 2: Auto Regressive Distributed Lag (ARDL) to estimate the short-term relationship:

$$\Delta CA_t = \beta_0 + \sum_{i=1}^{m} \beta_{1i}\ \Delta CA_{t-i} + \sum_{i=0}^{m} \beta_{2i} \Delta BB + \sum_{i=0}^{m} \beta_{3i} \Delta I_{t-i} + ECT_{t-1} +_{u_t} \quad (9)$$

CA is the ratio of the current account to Gross Domestic Product (GDP) of Indonesia. BB is the ratio of budget balance (surplus or deficit) government to Gross Domestic Product (GDP) of Indonesia. I is the ratio of the rate of investment to Gross Domestic Product (GDP). Subscribe t indicates time series data, the symbol i shows periods of time, whereas, e_t and u_t are residual of each model, and ECT (Error Correction Term) is the residual at the first lag of the model 1. Symbols α_{1i}, α_{2i}, α_{3i} show the long-run variable of coefficients CA, BB , and I on the model.

Symbols β_{1i}, β_{2i} , β_{3i} show short-run variable of coefficients CA , BB , and I on the model. Symbols α_0 and β_0 show constant coefficients in each model. Symbol ΔCA_{t-i} represents the change in the variable CA at time t-i, the symbol ΔBB_{t-i} represents the change in variable B at time t-i , and ΔI_{t-i} represents the change in the variable I at time t-i .

In the model, the expected coefficient for the variable B is positive ($\alpha_{2i} > 0 ; \beta_{2i} > 0$) and statistically significant, while the expected coefficient for the variable I is negative ($\alpha_{3i} < 0 ; \beta_{3i} < 0$) and statistically significant.

Based on the theoretical considerations and previous researches, the hypotheses of this study are as follows: (1) The government budget (fiscal) imbalances (surplus and deficit) and investment have a long-run relationship with the current account imbalances in Indonesia. (2) The government budget (fiscal) imbalances (surplus and deficit) and investment have a short-run relationship with the current account imbalances in Indonesia. (3) The government budget (fiscal) imbalances (surplus and deficit) have a positive and significant relationship to the current account imbalances in Indonesia. (4) Investments in Indonesia are more financed by domestic sources

3.2. Tools of Analysis

Tool of analysis used in this study is an econometric approach called Autoregressive Distributed Lag - Error Correction Model (ARDL - ECM) which is developed by Wickens and Breusch (1988) and Pesaran *et al* (2001). The researcher uses ARDL - ECM approach because the model is able to include a lot of variables, incorporating elements of time (lag) in the analysis of economic phenomena in short and long run, and be able to assess the consistency of empirical models with economic theory. In addition, the model is capable of finding solutions to the problem of time series variables which are not stationary, avoiding spurious regression in econometrics and overcoming bias results when there are dependent and independent variables in the model which are not stationary and has different of degree of integration.

To obtain an unbiased estimation of the results, there are some steps that have to be followed. The first phase, the researcher conducts the unit root test for each of the variables contained in the model. The approach taken for this test is the Augmented Dicky - Fuller (ADF) and Phillips - Perron (PP). The first step taken to do it is determining the maximum lag of the model. In this study, the researcher uses the approach of Schwartz (1959)[1] to determine the maximum lag, then; the researcher uses the minimum AIC values to test the unit roots of each variable. To get the unit root tests are consistent, the researcher also uses the approach of Stock (1994)[2] to determine the amount of lag in the unit root test.

The second phase, the researcher estimates the relationship between variables with ARDL bound testing approach. This is done by performing a regression equation namely Unrestricted Error Correction Model (UECM) model:

$$\Delta CA_t = \gamma_0 + \sum_{i=0}^{k} \gamma_{1i}\ \Delta CA_{t-i} + \sum_{i=0}^{k} \gamma_{2i} \Delta BB_{t-i} + \sum_{i=0}^{k} \gamma_{3i}\ \Delta I_{t-i} + \gamma_4\ CA_{t-1} + \gamma_5 BB_{t-1} + \gamma_6 I_{t-1} + e_t \quad (10)$$

Cointegration occurs when the null hypothesis of the test is rejected. As for testing the null hypothesis is $H_0 = \gamma_4 = \gamma_5 = \gamma_6 = 0$. The hypothesis is tested with Wald Test. We have to compare the value of the F-statistic of the Wald Test with *Pesaran* critical value. If the F -statistic is greater than the critical value of the *Pesaran's* upper limit, cointegration occurs. If the F -statistic is smaller than the critical value of the *Pesaran's* lower limit, cointegration does not occur. If the F -statistic is between the upper limit and lower limit of *Pesaran* Critical Value, then the result is inconclusive

The third phase, the researcher estimates the long-run relationships of the models by long-run ARDL approach. The model used is $CA_t = \alpha_0 + \sum_{i=1}^{m} \alpha_{1i}\ CA_{t-i} + \sum_{i=0}^{m} \alpha_{2i} BB_{t-i} + \sum_{i=0}^{m} \alpha_{3i} I_{t-i} + e_t$. The fourth stage is estimating the short-run relationships of the model by the short-run ARDL approach. The model used is as follows: $\Delta CA_t = \beta_0 + \sum_{i=1}^{m} \beta_{1i}\ \Delta CA_{t-i} + \sum_{i=0}^{m} \beta_{2i} \Delta BB_{t-i} + \sum_{i=0}^{m} \beta_3 \Delta I_{t-i} + ECT_{t-1} + {}_{u_t}$, where ECT is an error correction term which is the residual of the long–run estimation made in the previous stage. The *general to specific* process is also carried out to obtain a good estimation.

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[1] Formula developed by Schwartz to determine the maximum lag is $12.\frac{T}{100}^{\frac{1}{4}}$ where T is the number of observations in the model

[2] Formula developed by Stock to determine the lag in the unit root test is $\sqrt[3]{T}$ where T is the number of observations in the model

In the fifth stage, the researcher performs diagnostic tests, namely stability test, normality test, linearity test, heteroskedasticity test, and autocorrelation test. Stability and linearity tests are performed to determine whether there is an error in the specification of the model or not. Autocorrelation test is done to determine whether there is a relationship between the error terms of the model. Heteroscedasticity test is performed to determine whether the variance in the model is constant or not, and normality test is conducted to determine the normality of the model

CUSUM and *CUSUM - Squared* approach are performed to test the stability of the model. *Ramsey's Reset* approach is used to test the linearity of the model. *Durbin - Watson* approach and *LM Test* are conducted to test the autocorrelation in the model. *Breusch - Godfrey* approach is performed to see whether there is heteroscedasticity in the model. *Jarque - Berra* approach is used to test normality of the model. If the model passes the diagnostic tests, it means that the model does not bias in estimating.

4. Result and Analysis

The regression of the data in this study will follow the model and the methodology described in chapter 3. The first stage is unit root tests. The second stage is a cointegration test to determine whether there is long-run relationship in the model. The third stage is a long-run estimation of the model and the last stage is the estimation of the short-run model.

4.1 Unit Root Test

One of the main requirements to obtain an unbiased estimation results are stationery variables. A variable is said to be stationary if the mean, variance, and covariance of the data is fixed all the time. In this study, the researcher uses two approaches to do unit root test and to determine the degree of integration, namely the Augmented Dicky-Fuller (ADF) and Phillips - Perron (PP). Phillips - Perron approach incorporates the elements of structural changes in the test, while the ADF is not. Determination of the lag structure is an essential factor in the unit root test. In this study, two formulas developed by Schwart (1959) and Stock (1994) are used to determine the maximum lag. Based on the stationary tests with Augmented Dicky- Fuller (ADF) approach and Phillips - Perron (PP) approach, there are some variables that are not stationary at level or I (0).

In Table 1, it can be seen that the unit root test results by Augmented Dicky - Fuller (ADF) approach is relatively less consistent in determining the stationary and the degree of integration of each variables. However, the unit root test by the ADF approach indicates that the degree of integration of each variable is different. On the other hand, unit root test results by Phillips-Perron (PP) approach have consistent results with different approach of lag determination. Based on the PP approach, the two variables, namely, BB and CA have been stationary at the level or I (0), while I have been stationary at first degree or I (1).

Insert Table 1 here

Insert Table 2 here

4.2 Cointegration Test

Cointegration test is tested to determine whether there is cointegration relationship or long-run equilibrium in the model. In this study, the researcher uses the ARDL Bound Testing approach developed by Pesaran *et al*. (2001) to determine whether there is a cointegration relationship in the model. This approach is can be applied to the model which its variables have different degrees of integration. Based on the results of the unit root test, it is known that the variables in the model are stationary at different degrees. Therefore, the cointegration test which has been commonly used such as Engle-Granger (1987) approach, Johansen (1988) approach, and Johansen - Juselius (1990) approach, cannot be applied in this study.

The first step to implement the cointegration test is forming unrestricted error correction model (UECM) like equation 11 (Pesaran *et al*., 2001, and Altintas and Taban , 2011) :

$$\Delta CA_t = \gamma_0 + \sum_{i=0}^{k} \gamma_{1i}\ \Delta CA_{t-i} + \sum_{i=0}^{k} \gamma_{2i} \Delta BB_{t-i} + \sum_{i=0}^{k} \gamma_{3i}\ \Delta I_{t-i} + \gamma_4\ CA_{t-1} + \gamma_5 BB_{t-1} + \gamma_6 I_{t-1} + e_t \qquad (11)$$

The second step is determining the maximum lag and optimal lag used to perform the UECM regression models. Because of the data used in this study are quarterly data, the maximum lag used in the model is four. It draws on research conducted by Pesaran *et al* (2001). The next step is determining the optimal lag (m) by Akaike Info Criterion (AIC) approach, Scwartz Bayesian Criteria (SBC) approach, and the autocorrelation test. The optimal lag is the lag that has the smallest value of AIC and SBC and it does not contain autocorrelation. Optimal lag selection by AIC approach, SBC approach, and autocorrelation test are listed in Table 3.

Insert Table 3 here

Based on Table 3, there are no autocorrelation on all the models with one lag to four lags. Because of that, the optimal lag selection is based on the AIC and SBC approach. In the table, the optimal lag for this model is two. Once the optimal lag is found, the third step is regressing UECM with the lag. Based on the results of the UECM regression with lag two, variable ΔI_{t-i} and ΔCA_{t-i} are not significant. Therefore, to avoid over-parameterization, the researcher re-estimates the regression without variables ΔI_{t-i} and ΔCA_{t-i}. The next step is drawing conclusions related to the existence of cointegration relationships in the model. The researcher has to test the hypothesis of that relationship,$H_0 = \gamma_4 = \gamma_5 = \gamma_6 = 0$, by using Wald Test. The results of the F-statistic of Wald Test is then compared with the upper limit and lower limit Pesaran's critical value (Pesaran e*t al*,2001). The result of the Wald test indicates that H_0 rejected, this means that the independent variables affect the dependent variables. The next step is comparing the value of the F-statistic of the Wald test with an upper limit and lower limit Pesaran's Critical Value. The results are summarized in Table 4.

Based on the cointegration test with ARDL-Bound Testing approach, it can be concluded that the variables in the model has cointegration relations at the ten percent level of significance because of the value of F-statistic exceeds the upper limit and lower limit Pesaran Critical Value.

Insert Table 4 here

4.3 Estimating Long Run ARDL Model

After doing ARDL Bound Testing, it can be concluded that there is a cointegration relationship in the model. Therefore, the researcher can estimate the long-run relationships and short-run relationship of the model.

Estimating the long-run relationships of the model is done by regression to the following equation (Altintas and Taban, 2011):

$$CA_t = \alpha_0 + \sum_{i=1}^{m} \alpha_{1i} CA_{t-i} + \sum_{i=0}^{m} \alpha_{2i} BB_{t-i} + \sum_{i=0}^{m} \alpha_{3i} I_{t-i} + e_t \quad (12)$$

To obtain the optimal results, there are two commonly used approaches. The first approach is the selection of the most optimal ARDL models by looking at the value of AIC and SBC of each ARDL models. Based on research conducted by Shrestha and Chowdhury (2005), with this approach the researcher should do as much $(p+1)^k$, where p is a maximum lag number and k is the number of independent variables in the model. The second approach is *general to specific method*, developed by Krolzig and Hendry (2001). In this approach, the regression starts with a maximum lag then the researcher has to reduce variables which are not significant in the model one by one. Before reducing certain variables in the model, the researcher has to apply redundant test coefficient to determine whether the variable can be reduced. In this study, the researcher applies the second approach, *the general to specific method*, to get the optimal long-run ARDL model. The optimal long-run ARDL model is listed in Table 5.

Insert Table 5 here

After obtaining the estimation result of long-run ARDL Model, the researcher conducts the diagnostic tests to determine whether the model is biased or not. The results of the diagnostic tests in this model can be seen in Table 6. The diagnostic tests are performed to determine whether there is a deviation classical assumption. In this study, the researcher conducts linearity test or specification test of the model with Ramsey's RESET test. The result of Ramsey's RESET test indicates that the model does not experience misspecification. The stability test is tested by CUSUM test approach. Based on CUSUM test result, it can be seen that the parameters in the model is stable. The other diagnostic tests results indicate that the long-run ARDL model do not indicate any symptoms of autocorrelation and heteroscedasticity. However, the residuals of this model are not normally distributed or deviate from the classical assumptions. Even so, a deviation from this assumption can be ignored. As long as the non-multicolinearity assumption, non-autocorrelation, and homoskedastisitas met the classical assumption, the estimation remains BLUE, Best Linear Unbiased Estimator, (Gujarati and Porter, 2009). Additionally, Greene (2003) also states that the distribution of t and F at the residuals which did not meet the assumptions of normality has values close to t and F distributions in residual that meet the assumptions of normality. To avoid type 1 errors[3], Greene suggests to keep using the standard distribution of t and F, even though the residual deviates from the normal assumption. The value of R-squared of the model is 0.618; this means that 61.8 percent of the independent variables in the model can explain the dependent variable models.

Insert Table 6 here.

Based on the diagnostic tests listed in Table 6, it can be seen that the long-run ARDL model is not biased in estimating, therefore, the estimation of the model, as listed in Table 5, can be interpreted. In the long-run ARDL model, variable BB and I significantly affect the variables CA; signs on the coefficients are consistent with the theory. One percent increase in the fiscal deficit (BB) potentially increases the current account deficit by 0.845 percent. On the other hand, a one percent increase in investment could potentially reduce the current account by 0.25 percent. There are consistent with the theory. The negative sign of the coefficient of investment variable (-0.25) indicates that investment in Indonesia is mostly financed from domestic savings, not the international one.

4.4 Estimating Short-Run ARDL Model

To determine the short-run relationship between the variables in the model, the researcher applies the ARDL-Error Correction Model approach. The model used is as follows (Altintas and Taban, 2011):

$$\Delta CA_t = \beta_0 + \sum_{i=1}^{m} \beta_{1i}\ \Delta CA_{t-i} + \sum_{i=0}^{m} \beta_{2i} \Delta BB_{t-i} + \sum_{i=0}^{m} \Delta I_{t-i} + ECT_{t-1} +_{u_t} \quad (13)$$

Error Correction Term (ECT) is used to determine the speed of adjustment in the model. ECT_{t-1} is obtained from the first lag of the residual of long-run ARDL model. The estimation result the ECM approach is valid if the residual of long-run ARDL model has been stationary in the level (I(0)) and the coefficient of ECT is negative and in the range of zero to one. Based on the unit root test, the residual of the long-run model of ARDL - ECM or the ECT has been stationary at level. This means that the ECT of this model is valid. Table 7 and Table 8 summarize the stationary test results of ECT with ADF - Test approach and Phillips-Perron (PP).

Insert Table 7 here.

[3]Type 1 error occurs when researchers reject the true null hypothesis. Type 1 error lead researchers to conclude wrong conclusion, for example, researchers concluded that there is a relationship in the model, but actually, they are not.

Insert Table 8 here

The general to specific approach is used to obtain the optimal short-run ARDL model. The optimal ARDL model is listed in Table 9.

Insert Table 9 here

Furthermore, the researcher conducts diagnostic tests to determine whether the model is biased or not. The results of the diagnostic tests in this model can be seen in Table 10. The diagnostic tests are performed to determine whether there are deviation classical assumptions. The linearity or model specification test is performed with Ramsey's RESET test approach. The result of Ramsey's RESET indicates that the model does not experience misspecification the stability test is done by CUSUM test approach. Based on the CUSUM test result, it can be seen that the parameters in the model are stable. The other diagnostic tests results indicate that the short-run ARDL model does not indicate any symptoms of autocorrelation and heteroscedasticity, and the residuals from this model are fairly normal distribution.

Based on the results of diagnostic tests listed in Table 10, it can be seen that the short-run ARDL Model (ARDL - ECM) is not biased in the estimating, therefore the estimation of the model, as listed in Table 9, can be interpreted. In the short term ARDL models, the coefficient of error correction term (ECT) is -0.859. This indicates that the speed of adjustment to the current account balance is the 85.9 percent per quarter. ECT coefficient is negative and in the range of zero to one, and has been stationary at level. Those indicate that this model is valid. Changes in the two previous periods of BB significantly influences the change of CA, the signs of the coefficients are consistent with the theory, that is, a one percent change in the fiscal deficit (DBB) potentially increases the change in the current account deficit (DCA) by 0.15 percent . On the other hand, a changes in current account (DCA) of the previous period and the change of variables I (DI) are not significantly affected the changes in variables CA (DCA), but the sign on the coefficients are consistent with the theory. The *R squared* value is 0.28. It means that 28 percent of the independent variables in the model can explain the dependent variable of the models. Although the *R-squared* value is relatively low, however, the result is still valid because it does not deviate the classical assumption, such as linearity test, autocorrelation , and heteroscedasticity (Gujarati and Porter, 2009).

Insert Table 10 here

4.5 Regression Results Analysis

Based on the estimation result of long-run and short-run ARDL models, the coefficient of the independent variables in both models are consistent with the theory of *Twin Deficit Hypothesis and the Feldstein - Horioka Hypothesis*. The fiscal imbalances have positive impact toward current account imbalances. There are three transmission mechanisms to explain that result. First transmission, any increase in government spending can increase aggregate spending and raise the level of inflation and interest rates. The increase of interest rates could potentially lead to a crowding out effect on the domestic economy and capital inflows into the country. The increase of interest rates could potentially lead to an increase in foreign exchange reserves, but on the other hand, domestic demand for imported goods will also potentially increase and demand for domestic goods abroad will potentially decline. Implementation of expansionary fiscal policy by increasing the budget deficit could potentially push the inflation rate causing an increase in the relative value of domestic goods to foreign goods and potentially lead the current account deficit (Olanipekun , 2012).

The second transmission refers to the Keynesian Absorption Theory; increasing government budget deficits could potentially encourage domestic absorption so that could potentially lead to an increase in imports to meet domestic demand. This could potentially cause the current account deteriorates. When the increase in imports is significant and exceeds the increase in exports, the current account will be in deficit (Marashdeh and Saleh , 2011).

The third transmission is described by the Mundell - Flemming. Based on research conducted by the Mundell - Flemming, increasing fiscal deficit can encourage an increase in interest rates that could potentially lead to capital inflows and appreciation of the domestic exchange rate against foreign currencies. Appreciation of the domestic exchange rate against the foreign one potentially stimulates an increase of foreign imports and potentially reduces domestic exports. This could potentially lead to an increase in the current account deficit (Marashdeh and Saleh , 2011). The result shows that there is a negative relationship between investment and current account. It can be explained that an increased level of domestic investment, *ceteris paribus*, has the potential to reduce the level of domestic savings (Blanchard, 2009).

Based on the results of the regressions, it can be concluded that the investment in Indonesia in the period comes from domestic savings. This proves the validity of *Feldstein-Horioka*

Hypothesis in Indonesia, in other words the *Feldstein-Horioka Puzzle* is not applicable in Indonesia during the period of observation.

5. Conclusions

This study aims to analyze whether *the Twin Deficit Hypothesis and the Feldstein-Horioka Hypothesis* occur in Indonesia in the short-run and long-run. The variables used in this study are the current account in Indonesia, fiscal imbalances (government budget's surplus or deficit) in Indonesia, as well as investment in Indonesia for the period. Because of some variables have a different degree of integration, the researcher applies ARDL *Bound Testing* approach to determine the cointegration relationships in the model. As a result, there is a cointegration relationship in the model.

Autoregressive Distributed Lag (ARDL) is used to determine the long-run relationships in the model and *Autoregressive Distributed Lag-Error Correction Model* (ARDL - ECM) is used to determine the short-run relationships in the model. The empirical results of this study indicate a significant long-run relationship between the variables in the model as well as the sign of the variables in the model are consistent with the theory. Positive sign on the coefficient BB (Fiscal Imbalance) indicates that *the Twin Deficit Hypothesis* occurs in. The coefficient of investment is less than one and close to zero indicates that *Feldsten - Horioka Hypothesis* in force in Indonesia, in other words the *Feldstein-Horioka Puzzle* is not applicable in Indonesia in the period of observation. The results indicate that more investments in Indonesia are funded by domestic savings. In the short run, a change in BB (fiscal imbalance) two previous periods affects on the changes in CA (current account) positively and significantly. In the short run, the changes of I (investment) does not significantly affect on the change in CA, but the sign of the coefficient (DI) is consistent with the theory.

Twin Deficit Hypothesis and the Feldstein-Horioka Hypothesis are sensitive to the period of the study. Researchers carried out in different periods can have different results. Inferences related to this study need to be careful. Model specification error can lead to errors in drawing conclusions.

Based on the results, the Indonesian government can undertake management of the government budget, through the budget policy, as one of the measures to manage the current account in Indonesia. If the government implements a balanced budget policy or a budget surplus budget policy, it could potentially result in the current account in Indonesia become balanced or surplus. In addition, the Indonesian government can implement policies to attract foreign investors, because the results of the study concluded that investment in Indonesia financed by domestic saving in big portion.

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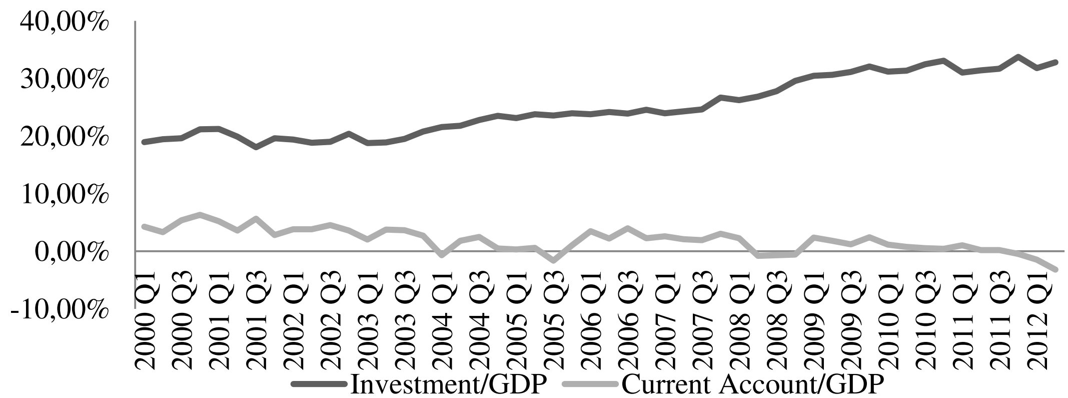
Figure 1
Percentage Fiscal and Current Account Imbalances to Gross Domestic Product,
2000 Quarter 1-2012 Quarter 2

Sources: compiled from International Financial Statistics (2012)

Figure 2
Percentage of Investment and Current Account to Indonesian's GDP,
2000 Quarter 1-2012 Quarter 2



Sources: compiled from International Financial Statistics (2012)

Table 1
Unit-Roots Test with ADF Approach

Variable	*Maximum Lag-Length set by Schwart*	*Level*	*First Difference*	Conclusion
CA	10	-4.016646** *(0,Trend and Intercept)*		I(0)
BB	10	-2.777114 (7,*intercept*)	-4.505583*** *(6, None)*	I(1)
I	10	-4.455006*** *(4, Trend and Intercept)*		I(0)
Variable	*Lag-Length set by* $\sqrt[3]{T}$	*Level*	*First Difference*	Conclusion
CA	3	-2.561756 *(3, Trend and Intercept)*	-4.127033*** *(3, None)*	I(1)
BB	3	-3.452732** *(3, Intercept)*		I(0)
I	3	-2.655491 *(3, Trend and Intercept)*	-2.001519** *(3, None)*	I(1)
Variable	*Lag-Length set by* $\sqrt[3]{T}$	*Level*	*First Difference*	Conclusion
CA	4	-2.419123 *(4, Trend and Intercept)*	-3.388585*** *(4, None)*	I(1)
BB	4	-2.113563 *(4, Intercept)*	-4.33644*** *(4, None)*	I(1)
I	4	-4.455006*** *(4, Trend and Intercept)*		I(0)

Description:
Null hypothesis (H0): the variable is non-stationary, or contains a unit root.
Rejection of the null hypothesis in the ADF test is based on the MacKinnon critical values.
Figures contained in the brackets indicate the optimal lag structure based on AIC Criterion and methods
A *, **, and *** indicate rejection of the null hypothesis (H0 is rejected) at a significance level of 10%, 5%, and 1%
T is the number of observations, in this study T = 50

Table 2
Unit-Roots Roots Test by Phillips-Perron (PP) Approach

Variable	*Maximum Lag-Length set by Schwert*	*Level*	*First Difference*	Conclusion
CA	10	-4.026794** *(Trend and Intercept)*		I(0)
BB	10	-10.51455*** (*Intercept*)		I(0)
I	10	-2.513058 *(Trend and Intercept)*	-8.296382*** (*Intercept*)	I(1)
Variable	*Maximum Lag-Length set by* $\sqrt[3]{T}$	*Level*	*First Difference*	Conclusion
CA	3	-4.01643** *(Trend and Intercept)*		I(0)
BB	3	-10.69487*** (Intercept)		I(0)
I	3	-2.405089 *(Trend and Intercept)*	-8.446732*** (*Intercept*)	I(1)
Variable	*Maximum Lag-Length set by* $\sqrt[3]{T}$	*Level*	*First Difference*	Conclusion
CA	4	-4.036254*** *(Trend and Intercept)*		I(0)
BB	4	-10.34002*** (*Intercept*)		I(0)
I	4	-2.508366 *(Trend and Intercept)*	-8.298228*** (*Intercept*)	I(1)

Note:
Null Hypothesis (H_0): the variable is non-*stationery*, (contain *unit root).*
Figures in parentheses indicate the method.

A *, **, and *** indicate rejection of the null hypothesis (H0 rejected) at the significance level of 10%, 5%, and 1%
T is the total observation, in this study T = 50

Table 3
Lag Length, AIC, SBC, and Autocorrelation Test

Lag Length	AIC	SBC	Breusch-Godfrey Autocorrelation Test
1	-5.51034	-5.15949	1.379243(0.5018)
2	-5.53195	-5.05957	1.746832(0.4175)
3	-5.37235	-4.77605	2.203566(0.3323)
4	-5.25845	-4.53579	0.94491 (0.6235)

Description: The numbers in parentheses indicate the probability

Table 4
Cointegration test with ARDL Bound Testing Approach

k	*F-statistic*	*Critical Value (unrestricted intercept and no trend)*		
		Level of Significance	*Bottom Critical Value*	*Top Critical Value*
2	4.655279	5%	3.79	4.85
		10%	3.17	4.14
Diagnostic Test:				
BG Heteroskedastisity Test	6.05635 (0.4169)			
LM Test	0.118765 (0.9423)			
Ramsey RESET	0.000512 (0.9821)			
Jarque-Berra	2.575969 (0.275826)			

Table 5
Estimation results of Long Run ARDL Model

Variable	Coefficient	Std. Error	t-Statistic
C	0.0373	0.0149	2.5088
CA(-1)	0.5411	0.1286	4.2081***
BB(-2)	0.1453	0.0860	1.6892*
BB(-3)	-0.1065	0.0766	-1.3906
I	-0.1170	0.0507	-2.306778**
Long Run Coefficient [4]			
C	0.081384		5.46715***
BB	0.084587		2.60748***
I	-0.25487		-5.027012***

* Significant at level 10%

** significant at level the 5%

*** significant at level the 1%

Table 6
Diagnostic Test of Long Run ARDL Model

Ramsey RESET Test			
F-statistic	0.3313	Probability	0.5680
Likelihood ratio	0.3782	Probability	0.5385
LM Test			
F-statistic	0.2327	Probability	0.7934
Obs*R-squared	0.5406	Probability	0.7631
Breusch-Pagan-Godfrey)			
F-statistic	1.1386	Probability	0.3515
Obs*R-squared	4.5981	Probability	0.3311
Normality Test			
Jarque-Bera	2.5428	Probability	0.2804
R-squared	0.6188		

[4] Long-term coefficients obtained by dividing the respective coefficient of the independent variable in ARDL model with one dependent variable minus coefficient. Formula is as follows : $\beta = \frac{(\gamma_0+\gamma_1)}{1-\alpha_1}$ (Richard Harris, 2005)

Adjusted R-squared	0.5825
Akaike info criterion	-5.7569
Schwarz criterion	-5.5600

Description:

Ho for the linearity test is a linear model

Ho for the test is no autocorrelation in the model

Ho for heteroskedasticity test is no heteroskedasticity in the model

Ho to test normality is model has normal distribution

Lag in autocorrelation test is two
Based on a 5% critical value, the model passes the linearity test, autocorrelation, and heteroskedasticity test (H0 not rejected)

Table 7
Unit Root Test Result of ECT with ADF-Test

Variable	*Maximum Lag-Length set by Schwart*	*Level*	*First Difference*	Conclusion
ECT	10	-6.707699*** *(9,None)*		I(0)
Variable	*Lag-Length set by* $\sqrt[3]{T}$	*Level*	*First Difference*	Conclusion
ECT	3	-6.560277*** *(3, None)*		I(0)
Variable	*Lag-Length set by* $\sqrt[3]{T}$	*Level*	*First Difference*	Conclusion
ECT	4	-6.707699*** *(4, None)*		I(0)

Description:
The null hypothesis (H0) is non-stationary variable, or the variable contains a unit root.
Rejection of the null hypothesis in the ADF test is based on the MacKinnon critical values.
Figures contained in the brackets indicate the optimal lag structure based on AIC Criterion and methods
A *, **, and *** indicate rejection of the null hypothesis (H0 is rejected) at a significance level of 10%, 5%, and 1%
T is the number of observations, in this study T = 50

Table 8
The Unit Root Test Result on ECT with Phillips-Perron (PP) Approach

Variable	*Maximum Lag-Length set by Schwert*	*Level*	*First Difference*	Conclusion
ECT	10	-6.707699*** *(None)*		I(0)
Variable	*Maximum Lag-Length set by* $\sqrt[3]{T}$	*Level*	*First Difference*	Conclusion
ECT	3	-6.707860*** *(None)*		I(0)
Variable	*Maximum Lag-Length set by* $\sqrt[3]{T}$	*Level*	*First Difference*	Conclusion
ECT	4	-6.711188*** *(None)*		I(0)

Description:
The null hypothesis (H0) is the non-stationary variable, or the variable contains a unit root.
A *, **, and *** indicate rejection of the null hypothesis (H0 is rejected) at a significance level of 10%, 5%, and 1%
T is the number of observations, in this study N = 50

Table 9
Short Run ARDL-ECM Model Estimation Results

Variable	Coefficient	Std. Error	t-Statistic
C	-8.93E-05	0.002165	-0.041258
DCA(-1)	0.394443	0.263293	1.498114
DBB(-2)	0.157979	0.066995	2.358069**
DI	-0.31537	0.2258	-1.396655
ECT(-1)	-0.85915	0.310213	-2.76955***

Note:
***,**,and* significant at 1%, 5%, and 10% levels

Table 10
Diagnostic Test Result of ARDL-ECM Model

Linearity Model Test (Ramsey RESET Test)			
F-statistic	1.547617	Probability	0.2207
Likelihood ratio	1.746193	Probability	0.1864
Autocorrelations Test (LM Test)			
F-statistic	0.666867	Probability	0.5191
Obs*R-squared	1.521102	Probability	0.4674
Heteroskedasticity Test (Breusch-Pagan-Godfrey)			
F-statistic	0.642348	Probability	0.6354
Obs*R-squared	2.71273	Probability	0.607
Normality test			
Jarque-Bera	1.75788	Probability	0.415223
R-squared	0.285231		
Adjusted R-squared	0.215498		
Akaike info criterion	-5.69964		
Schwarz Criterion	-5.50087		