

An Analysis of Twin Deficit Hypothesis by Using the Mundell Fleming Model

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Abstract

In recent years, many researchers have conducted research to check the validity of twin deficit hypothesis, there are two main methods to check the twin deficit's validity, one of them is to check it through proper and all channels or links which are causing to shift one deficit's effect on the other end(e.g. budget deficit 's effect on current account balance is through exchange rate and interest rate.) while the other way is to check it through the both ends or without internal links like exchange rate and interest rate etc. The data for the paper was collected through the secondary sources. We have taken the data of United States, United Kingdom, Austria, India and Pakistan. Out of which India and Pakistan are developing and remaining are developed.

Data analyzed through the E-views software. For the regression analysis SPSS 21 was used to check out twin deficit hypothesis. We have checked the twin deficit hypothesis' validity in 16 countries' cross sectional data, some of the countries are categorized as most corrupt and some of them as least corrupt by HDI and WDI. Finally we can conclude that there is twin deficit in least corrupt countries while twin divergence in most corrupt countries.

Keywords: *Twin deficit hypothesis, HDI, Budget deficit*

Introduction

Twin deficit shows that fiscal deficit will ultimately result in trade deficit or there is a relation between trade and budget deficit. **Budget deficit = (S-I) + Trade deficit** Twin deficit hypothesis shows the relationship between budget deficit and trade deficit. Deficits to an economy is often considered bad but there is difference in opinion in economists about the advantages and disadvantages of deficits, like It's not a problem at all according to mankiw(2006) , he said if exports increase then trade deficit increase

,but if foreigners purchase assets in our country then our exports will be low and trade deficit would be worsen, so if trade deficit increase then let it increase, while krugman and Bernanke(2006) are follower of traditional twin deficit hypothesis which says trade deficit is bad. While some are in between both above described concepts like Roubini (1988) found that a portion of budget deficit(almost 22%) is compensated with capital inflow while rest effects trade deficit due to high exchange rate. There is a lot of work done in twin deficit hypothesis's validity. It was basically emerged from U.S economy in 1980's when the problem of twin identified and significantly researched , but with passage of time twin deficit was checked in different countries individually and also in groups to compare. Basically there are following 4 major findings or differences among the researchers in literature.

In **Keynesian** hypothesis theory or Mundle flaming theory (bi-directional), researchers like, frenklend and Razin(1986), Yi(1993)and Baxter(1995) found the causality between both. Chen (2006) also found positive relationship between twin deficits. Ahmed(1986-87) found that there is causality run in budget deficit to trade deficit. Roubini (1988) concluded that a lunit change in budget deficit affects current account 0.22-0.98. Lane (1998), Piersanti (2000) took 17 OECD countries' data separately and found relevant result. Piersanti incorporated expectations and proved it right. Salvatore (2006) proved it for G7 countries. Yoichi Matsubayashi (2005) proved it through separating private and public accounts. Ball(1990) found positive relation between deficits. MURTHY and PHILLIPS (1996) proved it true in long run for us through maximum likelihood method. AQEEL and NISHAT (2000) proved it for Pakistan. Sidiqi(journal of commerce vol 3) proved it with JJ method for Pakistan.

In **Recordian** view, researchers Found that there is no significant causality or reverse causality between both deficits and both are indifferent from each other and can't affect each other. Ferrero (2010) proved it for G7 countries and said that fiscal policy is least relevant to trade. Evans (1985-88) found that there is no significant relationship among both. Miller and Russek(1989); Dewold and Ulan (1990) also proved it. Bernardina Algieri (2012) proved it with Granger causality and today a moto (reduced form strict model used) In **reverse causality** view, researchers like Kayhan, Bayat ,Yüzbaş (2013) with bootstrap process-based Toda-Yamamoto causality and frequency domain analysis methods found that there is reverse causality between budget deficit and trade deficit which run from trade deficit to budget deficit and no significant relation from fiscal deficit to current account deficit. They found that budget deficit effects current account deficit positively in short and medium term. While in long run its not effective because in long run current account deficit effects budget deficit. Kalou ,Paleologou(2012)used multivariate vector correction and corrected structural breaks and proved it. Ramchandar (1998) tested 5 developing countries and except Malaysia all results were reverse causality's.Saeed and Khan (2012) proved it for Pakistan.(checked through Granger causality).(so policy implication not only fiscal deficit correction enough)(for small economies)

In **twin divergence** theory, researchers like Soyoung Kim(2007), Nouriel Roubini(2007-08)found that there is improvement in fiscal deficit while worsening the current account deficit or trade deficit, because empirical result showed that in usa from 1992-2000 Gdp improved from -ve 5% to 2.5% while current account worsen from -1% to - 4.5% **Budget deficit = (S-I)+ Trade deficit** 'If budget deficit increased then investment decrease or saving increase and trade deficit improves', was the logic given by Soyoung Kim, Nouriel Roubini(found for short run).Muller (2005)also find twin divergence between budget and trade deficit

→Problems in REH, CATH and TWIN Divergence is reduced form data, due to small economies, short run occurrence measured, respectively

→Structural breaks ignored and linear data taken in most of literature, either all countries taken in literature are developed or developing, or small and big but no work has been done on most corrupt nation and least corrupt nation's twin deficit simultaneously. We will find out the most and least corrupt nation's twin deficit and then analyze the accuracy of twin deficit hypothesis.

Literature Review

The budget deficit and the current deficit, or the addition of a deficit to a fiscal deficit, are discussed in the study of this table. 1. As discussed in Table 1, the basis of the deficit deficit is the subject of many studies. These studies have attempted to use this relationship in different ways for different countries and different groups. This is especially so because ancient studies paying attention on the economy of US. On other side similar studies were done on other countries as well. The trophies have been won in several studies, following the traditional feedback. These studies highlights that current account deficit can influence the budget deficit. Some studies yield results presented for RH, which show no contact or partial restriction between twin deficits.

On contrary, a few studies have associated savings gaps to the root causes of budget deficits and then expanded them, increasing the current volume balance. In this regard, these studies emphasize that they cannot be directly accepted by the traditional methodology. However, studies have attempted to validate the basic theory of the three deficits, most notably in nature. There are also experimental studies based on triplet deficits. In the currency crisis and Asian financial crisis, deficit and experience with different countries, the current Lai and Ting Current Department (2009) examined Cambodia's theory of deficit and confirmed Granger's reasons. Bonnie and Anaya (2016) and Basu and Dasso (2005) interviewed and their graduate examination confirmed that tobacco theory in India. China needs to keep interest rates low, especially in basic loans, which are very low among the market and cause severe troubles in the economy. The literature shows that the FDA's "influence in development" is an important source of surplus for China's current account. In fact, the World Development Security Report (1985) shows that a country can develop through FID and technology transfers. Such a strategy would have a significant impact on FERs that increased from 1999 to the US dollar from the end of 2013 to \$ 3.8 million by 1999. Since then, the surplus of the capital account has been reduced. Data from the Forex Exchange of State Administration (SAFE) shows that in 2015 China recorded a loss of \$ 142.4 billion in capital and financial accounts. There are two different views in the economic literature, which have shown the link between the deficit in budget and deficit in current account. The first hypothesis is taxed at the point of traditional cases, which states that the deficit current account is positively correlated with the budget deficit. This means that a deficit increase in the budget increases the deficit of current account and will affect the current budget surplus. An increase in the power deficit will stimulate household sentiment, as there will be an increase in household income, which will increase the current account deficit and growth. The theory of deficit has been taxed on M. Fleming Model (Fleming, 1962; Manorville, 1962), which emphasized that an increase in the budget deficit would result in higher intercession of interest rates and exchange rates. Increase in interest rates Attraction for foreign investors to invest in domestic investors. This increase is due to increased demand and currency appreciation, which in turn leads to increased trade and foreign exchange prices. However, the natural imports of foreign currency will increase and the current account deficit will

increase (Lichtman & Francis, 2002; Salari, 2006). Finally, regulators agree with the Canadian approach to Hypothesis (RH). It has been said that, in a free economy setting, there is no relation between the budget and the current account deficit and therefore there is no. In other words, no difference in the state tax structure will have an effect on real interest rates, rewards or deductions (Barrow, 1989; and Naeem, 2008). The assumption here is that Modigliani and Indo are created in 1957 based on the life cycle models of the degenerative patterns. This shows that the current wheat yield is comparable to that of the mainland. Highlighting this question is important for a policy, and educational context. Policy makers should be aware that addressing external emergencies with the help of financial institutions will increase the external and external equities. Second, we primarily examined the effects of power consumption in multiple frameworks and found general relationships between these variables. The study relies on the RDD model to investigate the defect dissipation for small and long wrench china. Also if such a relationship exists, the direction of the arbitrator should be analyzed. We use examples, RDL-bound Examination One and the use of Granger for economic methods to attain these objectives. In the section "Theoretical Backgrounds and Literature Review" we explore the theoretical basis of such a deficit. According to "Macroeconomics of the Chinese Economy," China will provide a comprehensive analysis of the Chinese economy. Section "Data and experimental results" information and data and experimental results. Section "Results and Discussion" provides the experimental results and section "Results" provides the study results.

There is a lot of work done in twin deficit hypothesis's validity. It was basically emerged from U.S economy in 1980's when the problem of twin identified and significantly researched, but with passage of time twin deficit was checked in different countries individually and also in groups to compare. Basically there are following 4 major findings or differences among the researchers in literature.

Mundell's theory (bi-directional), researchers like, Frenkel and Razin (1986), Yi (1993) and Baxter (1995) found the causality between both. Chen (2006) also found positive relationship between twin deficits. Ahmed (1986-87) found that there is causality run in budget deficit to trade deficit. Roubini (1988) concluded that a 1 unit change in budget deficit affects current account 0.22-0.98. Lane (1998), Piersanti (2000) took 17 OECD countries' data separately and found relevant result. Piersanti incorporated expectations and proved it right. Salvatore (2006) proved it for G7 countries. Yoichi Matsubayashi (2005) proved it through separating private and public accounts. Ball (1990) found positive relation between deficits. MURTHY and PHILLIPS (1996) proved it true in long run for us through maximum likelihood method. AQEEL and NISHAT (2000) proved it for Pakistan. Sidiqi (journal of commerce vol 3) proved it with JJ method for Pakistan. These inconsistent results may be due to differences in sampling patterns and methodologies. D., Using Different Economic Technologies: 21 Developing Countries, since the 1960s, Khalid (1999) considered three components: real deficit, real need for real discounts (GDP) Get real business as a projected fixed income for real public consumption and as government expenditure. It was used to estimate the Johansen-Singer (1988) and the full information maximum feedback (FIML) parameter. The model allows us to estimate the finite and non-standard models when the constrained measures are used, meaning that they are petroleum estimates when the sample countries are examined for RE. RHE did not produce results for twelve children with the remaining five episodes resulting from RH. The response to retirement distributions in the last group of countries shows an alternate stability between alternative spending and government spending. Ghotak and Gatak (1996) studied India for various periods, such as private spending, government spending, income, taxes, private wealth, government bamboo, government deficit, government deficit, investment,

government spending and bonds in India. Review the linear equation since 1986. Twin deficit hypothesis shows the relationship between budget deficit and trade deficit. Deficits to an economy is often considered bad but there is difference in opinion in economists about the advantages and disadvantages of deficits, like It's not a problem at all according to mankiw(2006) , he said if exports increase then trade deficit increase ,but if foreigners purchase assets in our country then our exports will be low and trade deficit would be worsen, so if trade deficit increase then let it increase, while krugman and Bernanke(2006) are follower of traditional twin deficit hypothesis which says trade deficit is bad. While some are in between both above described concepts like Roubini (1988) found that a portion of budget deficit(almost 22%) is compensated with capital inflow while rest effects trade deficit due to high exchange rate.

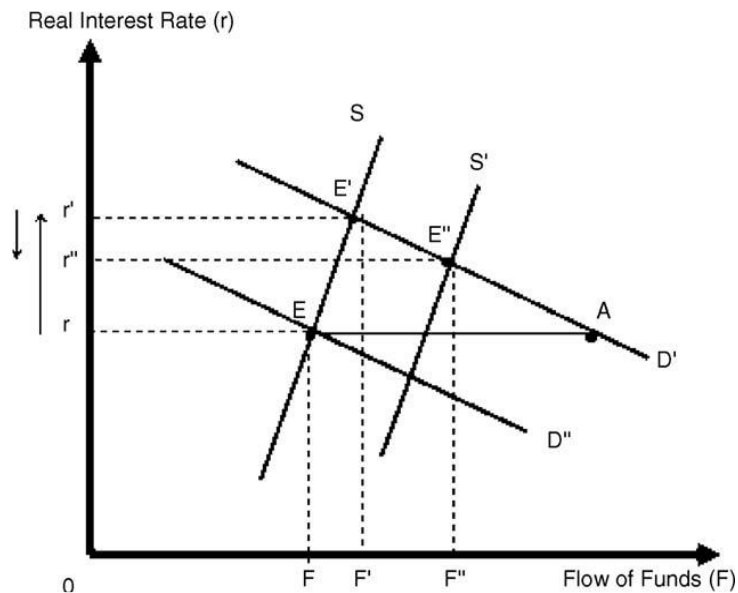
Analytical Framework:

Budget deficit causes trade deficit while interest rate and exchange rate are mediums or channels through which budget deficit's causality is being run on current account deficit.

Effect of Budget deficit:

We will see the short term effect of an exogenous increase in budget deficit on interest rate, exchange rate, and current account balance.

Figure.1



Initially economy is at point 'F' ,an increase in budget deficit will increase the investment or demand of loan able funds from('F-F') while (F''-F') is crowding out, Id flexible exchange rate then new interest rate will be r' , it is also plausible that if a decline in domestic savings then foreign savings will help them to recover budget deficit.

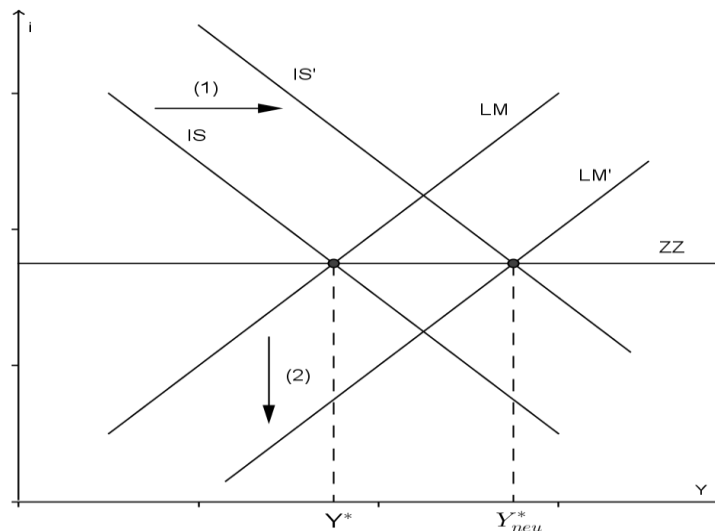
Mundell- Fleming Model:

Most of open economy macroeconomic models use Mundle (1962-63) and Fleming (1962)’s pioneering work in extending the Keynesian model by introducing external sector. In Mundle flaming model it is shown that effect of Budget deficit on current account depends on

- ❖ Interest rate
- ❖ Exchange rate

They proved that internal instability (budget deficit causes inflation which will cause interest rate to rise) causes external instability (Exchange rate pressure will effect on Net exports and current account), hence we know only one instability can be corrected at a time, rare examples are here in world where both internal and external instability both are controlled, while Mundle flaming model says that if we improve one instability then other one will be automatically vanished.

Figure.2



On IS-LM we were on output level “y*” then due to an increase in government expenditure, demand goods market will increase that will shift the IS-IS’ that will yield higher interest rate domestically which will cause capital inflow and exchange rate will increase and net export decrease but if central bank wants a fix exchange rate and interest rate (both internal and external stabilizers) then it will increase money supply and LM-LM’ shifts that shows purchase of that capital inflow and again interest rate and exchange rate be on its initial point but in the result we will get “ Y* new” . Ultimately we saw that an increase in government expenditure resulted in budget deficit which caused trade deficit. (L.M shifted rightward or I.S shifted back showed fixed exchange rate which was ultimate finding of Mundle flaming Model, but not discussed here because lack of relevancy .) Following variables are employed in this study. B.D= budget deficit, difference between revenues and expenditure of Government as a percentage of GDP of the concerned economy.

S.T.I.R= short term interest rate which is usually 12 months treasury bill interest rate which is considered risk free interest rate.

N.E.R= Nominal effective exchange rate , which is defined as the ratio of an index of a currency’s period average exchange rate to a weighted geometric average of exchange rates for currencies of selected countries.

CA= current account balance, difference between exports and imports as a percentage of GDP of concerned economy.

G= Growth of GNP of required country.

GR= Growth of GNP of rest of World.

Debt= debt is central government’s debt as a percentage of GDP

Fdi= Fdi is foreign direct investment, net inflows as a percentage of GDP

Dummy= 1 for corrupt nation 0 for otherwise

We have taken the variables described above and followed the procedure described by “MUNDLE FLAMING” and illustrated above. We have taken the data of United States, United Kingdom, Austria, India and Pakistan. Out of which India and Pakistan are developing and remaining are developed. We have used use the regression lines in empirical analysis which will explain the relationship between twin deficits regression lines and their empirical results are given.

Empirical analysis:

In empirical analysis, first we have checked the simple correlation between current account and budget balances then in next step we have run a regression through which we have shown the impact or causality between both balances.

Relationship between budget balance and current account balance

descriptive analysis

Table “1” shows the simple correlation between the 16countries’ current account balances and budget balances.

Table.1

Country	Correlation	Country	Correlation
U.s	-0.97201	Denmark	-0.70138
U.K	-0.25133	Argentina	0
Austria	0.356998	Australia	-0.80163
Pakistan	0.022395	Brazil	-0.49683
India	0.641269	Canada	0.947066
Venzvila	0.644647	Finland	0.669892
South Africa	-0.67068	France	0.462704
Bangladesh	-0.80606	Germany	0.48932

Data given in table “1” is the correlation between average value of current account balance and budget balance over a decade (2001-2013). Theory says that there is positive relationship between current

account balances and budget balances, while in the table given above we can see that theory is failed in case of U.s, U.K, South Africa, Bangladesh, Denmark, Argentina, Australia, and Brazil. While it seems true in case of Pakistan, Austria, India, venezuela, Canada, Finland, France and Germany (remember that logic or reasoning to defend the former countries' -ve sign is not easy or true as data is not of short term rather it is average of more than a decade, so it depicts the long run trend or correlation between current account balances and budget balances.).Therefore, we can say that we observe two extreme cases in the table "1". First of them is pro-twin deficit e.g. Canada showing that budget deficit is hugely positively related with current account balance (0.947066), this is in favor of twin deficit hypothesis. While second is Anti-twin deficit e.g. U.s showing that budget deficit is not causing current account deficit instead of it both balances have a strong negative relation with each other(-0.97201).So we can't check or determine the twin deficit hypothesis' validity through simple correlation and this is the first reason that we will have to move to the regression analysis.

Observations: 4(only corrupt countries)

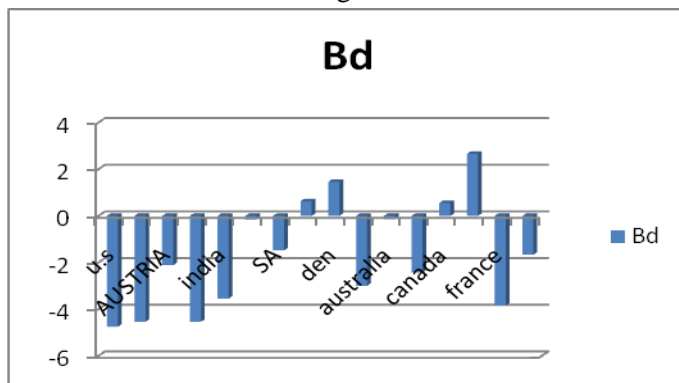
Variable: Bd, Ca

Mean:-2.2341,-2.24343

Median:-2.51006,-2.78984

Graph.1

Figure.3



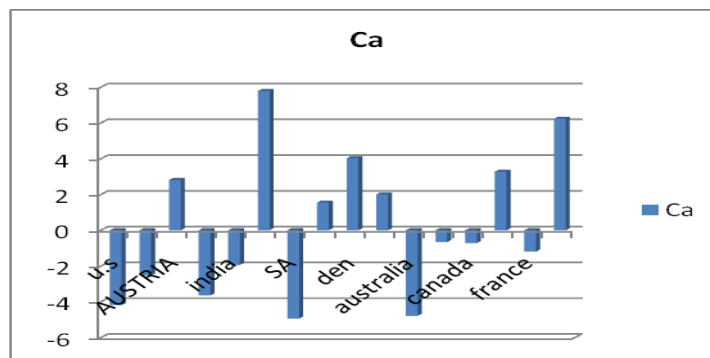
Observations: 16(all countries)

Variable: Bd

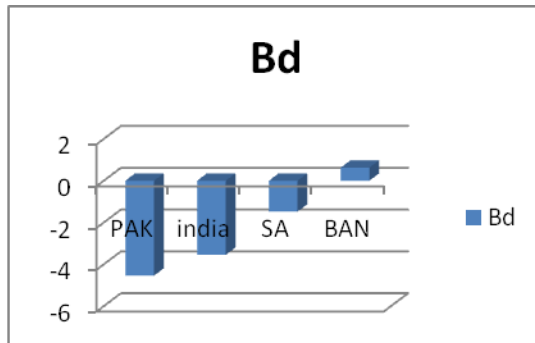
Mean value: -2.3069

Median: -2.42903

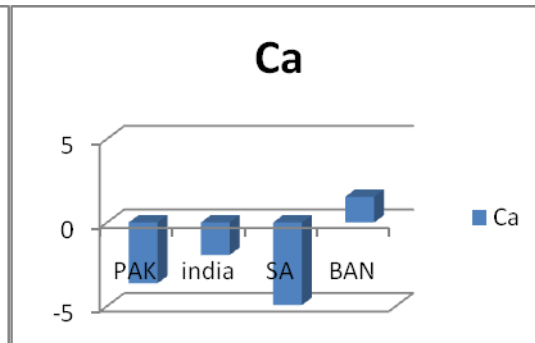
Graph.2



Graph.3



Graph.4



In graph.1 variable Bd has shown in 16 countries. It is mean value of given countries in past decade (2001-2013), and in graph.2 same practice has done with variable Ca. We could look that the trend or behavior of both variables was different checked in graph.3 for most corrupt nations. But for the perfect and comprehensive results to confirm the behavior and connection of both variables, and consequently it is also the major reasons that we have moved to regression analysis.

Regression analysis evidence:

Theory presented in literature review suggests or says about the validity of twin deficit hypothesis, which is basically a positive relationship between budget balances and trade balances, which can't be determined through simple correlation so keeping in view the muddle flaming model and the methodology we are following, our suggested regression line is

$$Ca_t = b_0 + b_1BD_t + b_2G_t + b_3GR_t + b_4Ct-1 + \mu \quad (1)$$

Here Ca is current account balance, BD is budget balance, G is annual growth rate of GNP, GR is growth of rest of world. While bi are co-efficient of the regression. This regression is best to check th validity of twin deficit hypothesis in panel data, But due to our data specification and constraints we will remove the lagged dependent variable from independent side, because in cross sectional data lagged dependent variable can't be found easily. Now if we try to regress this regression line for our data we will have a near singular matrix because our data is cross sectional and variable GRt is a constant term for every observation, so we will have to drop this variable as well so we will drop it. But now the strength of model is significantly decreased because two relevant variables are dropped so we will have to incorporate two relevant variables to maintain the strength of the model. So we will introduce a new regression line as

$$Ca = b_0 + b_1BD + \mu \quad (2)$$

We have 4 options in given data set and regression line framework (to check the 4 functional forms linear-linear, linear-log, log-linear, log-log) but we can't check it due to insufficient observations so we will only check the linear-linear. We checked all four possibilities through Ramsey test but only linear function is giving sensible indicator .So we will estimate this linear regression line only. In table 2 regression results are given:

Table.2

Dependent Variable: CA
 Method: Least Squares
 Date: 12/26/13 Time: 00:54
 Sample(adjusted): 18 33
 Included observations: 16 after adjusting endpoints
 White Heteroskedasticity-Consistent Standard Errors & Covariance

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.572581	1.140711	1.378598	0.1897
BD	0.819851	0.237010	3.459149	0.0038
R-squared	0.653538	Mean dependent var		0.193521
Adjusted R-squared	0.178791	S.D. dependent var		3.921046
S.E. of regression	3.553275	Akaike info criterion		5.490085
Sum squared resid	176.7607	Schwarz criterion		5.586659
Log likelihood	-41.92068	F-statistic		4.265744
Durbin-Watson stat	2.318070	Prob(F-statistic)		0.057919

Table.3

Dependent Variable: CA
 Method: Least Squares
 Date: 12/26/13 Time: 00:53
 Sample(adjusted): 18 33
 Included observations: 16 after adjusting endpoints
 White Heteroskedasticity-Consistent Standard Errors & Covariance

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.122553	1.303963	1.627771	0.1276
BD	0.745431	0.264072	2.822834	0.0144
DUMMY	-2.700612	1.518434	-1.778551	0.0987
R-squared	0.696488	Mean dependent var		0.193521
Adjusted R-squared	0.222871	S.D. dependent var		3.921046
S.E. of regression	3.456594	Akaike info criterion		5.485805
Sum squared resid	155.3246	Schwarz criterion		5.630666
Log likelihood	-40.88644	F-statistic		3.150910
Durbin-Watson stat	1.971218	Prob(F-statistic)		0.076603

We can see in table “2” that all coefficients have signs according to theory and BD coefficient also has positive sign which represents the validity of twin deficit hypothesis. Coefficient of BD is statistically significant at both 5% and 10 % level of significance. The coefficient of BD shows that due to one unit increase in budget deficit there is 0.81 units increase in the average value of current account balance, which validates and confirms the results of Frenkel and Razin(1986), Yi(1993) and Baxter(1995) Chen (2006) Ahmed(1986-87) Roubini (1988) Lane(1998) , Piersanti (2000) Salvatore (2006), Yoichi Matsubayashi (2005) Ball(1990) MURTHY and PHILLIPS(1996) AQEEL and NISHAT(2000). Now we

will return again to the results of table “2”. The coefficient of multiple determinations (R²) is 0.65 which is showing that explanatory variables are explaining the explained variable 24 % in given 16 countries’ data which is if not a good enough value then it’s also not a bad value of R². This value will be considered quite good. After correcting heteroscedasticity error terms decreased and coefficients are more significant because value of probability decreased after correction of heteroscedasticity. D-W statistics indicates that there is no autocorrelation among the data observations (2.31).over all model is significant, significance of model can be seen through F-stat value. Therefore we can conclude that the relationship between both deficits empirically exists. So we are now sure about the Mundle Fleming model’s validity and twin deficit hypothesis. It is credit worthy to note that estimating equation “2” with a dummy variable incorporated named dummy which will take value 1 if nation is corrupt and 0 otherwise then we will re-estimate equation “2” as

$$Ca = b_0 + b_1BD + b_2dummy + \mu \quad (2)$$

We can see in table “3” that dummy’s value shows that in most corrupt countries like Bangladesh, India, Pakistan, and South Africa’s current account deficits are highly or severely inverse dependent on budget deficit than that of least corrupt nations. After introducing dummy we can see that in least corrupt countries current account balances are positively related to each other while in most corrupt countries, these are negatively related with each other. R² is increased after introducing dummy in the model. Twin divergence in most corrupt countries can be seen.

Conclusion and policy implication:

We have checked the twin deficit hypothesis’ validity in 16 countries’ cross sectional data, some of the countries are categorized as most corrupt and some of them as least corrupt by HDI and WDI. We took cross sectional data and found that there is a positive relation between current account balance and budget balance, and then we incorporated a dummy variable and found that in most corrupt nations there is negative relationship between both balances and in least corrupt nations there is a positive relationship between current account balance and budget balance. So finally we can conclude that there is twin deficit in least corrupt countries while twin divergence in most corrupt countries.

So we can say that in a least corrupt country only a single policy (fiscal policy) can stabilize the economy and reduce both of deficits while in a most corrupt country both fiscal and trade policy will be used to stabilize the economy because in later case if only fiscal policy will be implemented to reduce budget deficit then it will reduce budget deficit but will increase the trade deficit.

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