Twin Deficits: An Alternative Framework from General Equilibrium Perspective with U.S. Results

Tuck Cheong Tang

Abstract
This study proposes an alternative theoretical framework for testing twin deficits hypothesis from the general equilibrium perspective (income-expenditure equilibrium) that takes both the behavioural variables - saving and investment into consideration. Empirically, the cointegration tests show U.S. fiscal balance, current account balance, real GDP and interest rates (short- and long-run) are co-moved over the periods 1970Q2 - 2011Q4. The real income and interest rates from the saving and investment channels, are important variables in explaining the U.S. current account deficit. The empirical results validate the twin deficits hypothesis in U.S. Some policy implications have been drawn – “fiscal cliff”. This study also suggests the profolio balance approach from the general equilibrium perspective for future twin deficits analysis.

Keywords: Budget deficit; Current account balance; General equilibrium perspective; U.S.
JEL code: F32
1. Introduction

The historical statistics from the OECD Economic Outlook show the U.S. is experiencing fiscal deficits or ‘government dis-savings’ between 1970 and 2011, except for the year of 1973, and 1998-2001. The U.S. current account balances are in surpluses for only the year of 1970, 1973-76, 1980-81, and 1991. It is widely believed that the U.S. trade deficit rose mainly because of the skyrocketing federal budget deficit (Darrat, 1988, p. 879). Hence, the unprecedented increase of deficits in both current (trade) account and fiscal balance in the U.S., especially during the 1980s has advocated the theoretical formulation of and empirical examination on the twin deficits hypothesis. According to this hypothesis, a larger fiscal deficit leads to an expanded current account deficit by its effect on national saving and consumption (Bartolini & Labiri, 2006, p. 6). Typically, the fiscal deficit will cause a similar increase in current account deficits\(^1\) - the loanable funds theory suggests that budget deficit would cause high interest rates as large of the U.S. budget deficits financed by the sale of bonds (Darrat, 1989, p. 363) causing capital inflows and appreciation of exchange rates hence widen the trade imbalances (deficits). According to (Bartolini & Labiri, 2006, p. 5), however, “Each dollar rise in the fiscal deficit is associated on average with a 30 cent decline in the current account” (from regression results of 18 OECD countries), and it indicates too weak to support the view that deficit reductions in the U.S can play a major role in correcting the nation’s current account imbalance with the rest of the world. Consistently, (Corsetti & Muller, 2006), from their results suggest that a fiscal retrenchment in the U.S. may have a limited impact on its current external deficit. Later, in the 1990s, Sweden and Germany also experienced similar situations where the rise in budget deficits had affected their current account accounts with real appreciation of their national currencies (Ibrahim & Kumah, 1996, p. 117). (Bernheim, 1989) has analyzed the economic [real] effects of budget deficits from the three schools of thought, namely Neoclassical, Keynesian, and Ricardian. The study recommends that the Neoclassical paradigm offers the most relevant insights for public policy. It advocates that budget deficits raise total lifetime consumption by shifting taxes to subsequent generations – assumes full employment (of economic resources), increased consumption necessarily implies decreased in savings, and raise interest rates to bring capital markets into balance. Thus, the persistent deficits do “crowd out” private capital accumulation (Bernheim, 1989, p. 55). (Vamvoukas, 1999) tested empirically the validity and rationale of the Keynesian proposition (conventional view) and the Ricardian equivalence

\(^1\) However, (Miller & Russek, 1989) find that “a $1 change in the fiscal deficit eventually leads to roughly a $1 change in the trade deficit”.

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hypothesis, and the results suggest that budget deficit has short- and long-run positive and significant causal effects on trade deficit.

(Data Source: OECD Economic Outlook)

**Figure 1. Scatter Plot for Current Account Balance ($\ln CAD$) and Budget Balance ($\ln BD$)**

Figure 1 shows the natural patterns between U.S. current account balance and budget balance over the periods 1970Q2 - 2011Q4. Few interesting features can be naturally abstracted from the patterns presented in the diagram. These values include some outliers. A simple regression line technically shows a weak positive correlation between budget balance and current account balance – increases in budget deficit will worsen the country’s current account deficit. But, this is poorly true for the observations as boxed in Figure 1. Most of the observations are randomly clustered on the north-east quadrant. In contrast, negative correlation between budget balance and current account balance is observed the observations pinned on the left quadrant that improvement in budget deficit may worsen the current account deficit. Virtually, the twin deficits are inclusive. Without taking the general equilibrium approach into account, any significance relationships between the two deficits variables are misleading - they are mirror images of each other. Any negative empirical results involved only the two deficits accounts are subjected to structural misspecification as more information are ‘captured’ by the “black hole” resulting no correlation.

In general, there are four ‘popularized’ hypotheses on the causation between fiscal deficit and trade (current) account balance:- (1) budget deficits cause trade deficits (hence, the well-examined twin deficits hypothesis); (2) trade deficits cause budget deficits; (3) budget deficits
and current account deficits are causally independent; and (4) both accounts deficits are mutually causal. The theoretical view of the first hypothesis has been briefly explained in previous paragraph. The second causal relationship is from current account deficit to budget deficit that reflects the deterioration in current account leads to slower pace of economic growth and hence increased the budget deficits as illustrated by the Keynesian view on the increases of government spending. This hypothesis is often named as “long-run current account targeting”. The third causation between both balances is explained by the so-called Ricardian equivalence hypothesis, that no relationship between budget deficit and current account deficit. The central Ricardian observation is that deficits merely postpone taxes (Bernheim, 1989, p. 63). With an assumption of an increase in taxes (in future), future disposable income will drop and, it offsets the consumption (drops) that increases private savings to smooth out the expected drop in income, hence budget deficits have no real effects. This hypothesis is also supported by the other view that budget and current account deficits are themselves influenced by other factors, and the apparent association between the two variables is rather elusive (Darrat, 1988, pp. 880-881). The last hypothesis describes a bi-directional causality – the current account and budget deficits are mutually dependent ((Darrat, 1988) & (Abell, 1990)). Indeed, this statement is hypothesized from both the first and the second hypotheses. Also, this study is related to various strands of literature that focus on twin deficits hypothesis. With introduction of some advance (new) econometrics approaches many empirical studies have examined the “relationship” between budget balance and current (trade) account balance, in the view of twin deficits phenomenon. Among the well-applied methodology is the vector autoregressions (VARs) approach-based cointegration, causality, impulse response functions and variance decompositions analysis. However, their empirical findings are inclusive and vulnerable since their empirical settings are based on an ad hoc specification without a proper theoretical derivation that may artificially generate a positive relationship between both accounts’ deficits. This study looks at this concern and fills the gap from the general equilibrium perspective (income-expenditure approach).

Bringing together insights from these strands of literature, this study offers:—

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2 Assumed an economy is relatively open that will probably have domestic developments dictated by the foreign balance to a certain extent. Hence, the budget balance of a country will be affected due to the large inflows or through debt accumulations - a country will run into budget deficits (Reisen, 1998).

3 For example, Japan’s current account surplus is stable during the 1990s, despite the country’s sharply declining fiscal condition as the changes in private saving can offset changes in fiscal policy, leaving a country’s current account balance largely unaffected (Bartolini & Labiri, 2006, p. 2).
an alternative testing framework (structural equation) to validate the twin deficits hypothesis that derived from the general equilibrium perspective by the so-called income-expenditure approach. It does consider the role of goods and services market clearing condition that involves behavioural determinations of both private saving and domestic investment (see Section 2);

(2) an appropriate testing methodology that considers both cointegration and coefficients tests as suggested by the income-expenditure equilibrium, rather than of causality method; and

(3) Extra empirical evidence of twin deficits hypothesis for a well-studied nation, U.S., and enrich the existing literature. The empirical results show a positive finding of the twin deficits model derived from the income-expenditure equilibrium.

Next section is about the literature review for a few of selected empirical studies. Section 3 set up a simple theoretical framework for testing the twin deficits phenomenon that derived from the income-expenditure equilibrium (goods and services market) of general equilibrium perspective. Section 4 describes the data and documents the empirical results obtained. Section 5 concludes the study and suggestions for further research.

2. Literature Review - Selected Studies

From the literature survey, most of the studies directly examined the twin deficits hypothesis – budget deficit does cause current account deficit. (Darrat, 1988) considered U.S. quarterly data 1960-1984, and the results from the multivariate Granger-causality tests with additional variables of monetary base, real output, inflation, labour cost, exchange rate, short-term interest rate, long-term interest rates, and foreign real income support that budget deficit does Granger-cause current account deficit. The study also finds causality from current account to budget balance, hence the forth hypothesis is hold. The current account balance is also caused by exchange rate, monetary base, short-term interest rates, long-term interest rates, inflation, and foreign real income. All other variables significantly cause budget balance. Using the same empirical methodology, (Abell, 1990)’s study supports twin deficits hypothesis, but their relationship is indirectly connected through the transmission mechanisms of interest rates and exchange rates for the sample period 1979-1985. Other included variables are
money supply (M1), interest rates (Moody’s AAA rated bonds), real exchange rate, real disposable personal income, and consumer price index. (Ibrahim & Kumah, 1996) found that budget deficit does increase the interest rate differential, and do worsen the current account balance for Germany, Japan, Sweden and U.K for the period 1974-1992 (quarterly data). (Bartolini & Labiri, 2006) examined the fiscal and current account balances in OECD countries for the period 1990-2005, finds that most of the changes in fiscal and current account balances accord with the predictions of the twin deficit view. However, it is interesting finding from them that improving U.S. fiscal accounts from 1992 to 2000 were associated with a worsening U.S. current account. (Vamvoukas, 1999)’s study applied cointegration analysis, error-correction modelling and Granger trivariate causality, and supports twin deficits hypothesis in Greece. (Lau, Abu Mansor, & Puah, 2010) also find that causality runs from budget deficit to current account deficit for Malaysia, the Philippines (pre-crisis) and Thailand, which fits well with the Keynesian view.

Other group of studies such as (Lau, Abu Mansor, & Puah, 2010) find that the causality runs in the opposite direction that is from current account deficit to budget deficit, for the case of Indonesia, and South Korea. Also, other works such as (Kearney & Monadjemi, 1990), (Argimon & Roldan, 1994), and (Alkswani, 2000) have provided empirical support for the reverse causation. For example, (Alkswani, 2000) studied the twin deficits hypothesis by using Saudi Arabia’s data from 1970 to 1999, and the result suggests that trade deficit does Granger-cause budget deficit. However, some studies supports the view that both deficits are mutually dependent. (Darrat, 1988) find that both accounts deficits are mutually causal concluding the current account and budget deficits are mutually dependent. (Ibrahim & Kumah, 1996)’s study finds a bilateral causality between trade deficits and budget deficits for Brazil from 1973 through 1991. Also, (Lau, Abu Mansor, & Puah, 2010) reexamined the twin deficits argument in the Asian crisis-affected countries, and their empirical results suggest a bi-directional causality exists for the Philippines in the post-crisis era. It is interesting to note that, such hypothesis is vulnerable and their finding was artificially determined from the

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4. They investigated the effect of fiscal consolidation on the current account. They examined contemporaneous policy documents, including Budget Speeches, Budgets, and IMF and OECD reports, to identify changes in fiscal policy motivated primarily by the desire to reduce the budget deficit, and not by a response to the short-term economic outlook or the current account. Estimation results based on this measure of fiscal policy changes suggest that a 1 percent of GDP fiscal consolidation raises the current account balance-to-GDP ratio by about 0.6 percentage point, supporting the twin deficits hypothesis. This effect is substantially larger than that obtained using standard measures of the fiscal policy stance, such as the change in the cyclically adjusted primary balance.
Granger’s view of causation. Impressionistically, it is to say that the interpretation of two patterns (bi-direction causality) occurred simultaneously at the same time, is difficult. For example, given a fixed sample period, once a causal relation is empirical identified from X to Y (or Y to X), a feedback (reversed) causal relation is impossible. Economically, it reinforces the intuition that temporally based causality relationships may not reveal the true structural relationship that exists between the budget balance and the current account balance. The past studies fail to put an attention on this concern. Hence, the present study focuses on the first hypothesis – the twin deficits hypothesis.

Some studies also examine the co-moving between budget deficit and fiscal deficit with application of the cointegration approach. For example, (Miller & Russek, 1989)’s study shows no cointegration (long-run equilibrium relationship) between the both deficits. This negative finding, can be explained by a low power of the relevant statistical tests stemming from the shortness of the sample period. This “common factor”, however, can be handled with care by employing a longer sample period as well as the appropriateness of cointegration methods (including their critical values, see (Narayan, 2005)). Other reason of negative twin deficits hypothesis can be explained by the bias of bivariate framework for twin deficits hypothesis that ignores the influential of other relevant variables into trivariate or multivariate framework. (Daly & Siddiki, 2009) have find an empirical evidence of a long-run relationship between budget deficits, real interest rate and current account deficit in 13 out of 23 countries. Other study is (Ibrahim & Kumah, 1996). From the literature survey, most the studies fallen into this category, the model is intended to represent an ad hoc reduced form rather than a behavioural relationship(s) that derived systematically from the relevant theoretical theory.

3. **The Theoretical Framework**

This study extends the theoretical framework from (Corsetti & Muller, 2006) by considering the behavioural relations of income-expenditure equilibrium. Accordingly, a simple accounting suggests that shocks to the government budget move the current account in the same direction. According to (Corsetti & Muller, 2006, p. 614), a general equilibrium model illustrates that: current account deficit = 0.5*[(Investment – Investment\textsubscript{ROW}) - (Private Saving – Private Saving\textsubscript{ROW}) + (Budget Deficit – Budget Deficit\textsubscript{ROW})]. Following the income-expenditure approach, (Tang & Lau, 2011) examined U.S. twin deficits hypothesis by including two new variables, namely planned private saving (S\textsubscript{p}) and planned domestic
investment (I) from \( \text{CAB}_t = \text{BD}_t + \text{Sp}_t - \text{I}_t \). A relationship characterises an open economy that, however, the behavioural content of \( \text{Sp}_t (. \) and \( \text{I}_t (.) \) has been ignored in their analysis.\(^5\) This study fills this gap. Other things being equal, a precise focus on this relation yields two theoretical observations. The first is there are possible for at least one cointegrating relation or long run equilibrium among the variables \( \text{CAB}, \text{Sp}, \text{BD}, \) and \( \text{I} \). More precisely, one of the long run relation identified by standard economic theory is \( \text{CAB} \) and \( \text{BD} \) relation. The second observation is a positive impact of \( \text{BD} \) on \( \text{CAB} \) (i.e. twin deficits hypothesis), in which other theoretically justified variables (private saving and investment\(^6\)) do play a role in validating this relationship as noted early in (Cavallo, 2005).

In equilibrium markets must clear. In the goods and services market this means that planned expenditure \( (E) \) equals planned output \( (Y) \) per period:

\[
E_t = Y_t
\]

(1)

Given that \( E_t = C_t + I_t + G_t + X_t - M_t \), and \( Y_t = C_t + S^p_t + T_t \), the income-expenditure equilibrium condition can be rewritten as equation (2):

\[
I_t + G_t + X_t = S^p_t + T_t + M_t
\]

(2)

where \( C \) is domestic consumption of goods and services, \( I \) is domestic investment, \( G \) is domestic government expenditure; \( X \) is exports of goods and services, \( M \) is imports of goods and services, \( S^p \) is private sector saving, and \( T \) represents the total tax revenue accruing to the domestic government.

The public saving \( (S^g_t) \) is \( T_t - G_t \) and that the sum of public and private saving represents national saving \( (S^n_t) \) it follows that the trade balance is equal to planned net national saving \( (S^n_t - I_t): \)

\[
X_t - M_t = S^n_t - I_t
\]

(3)

This condition implies that for goods market equilibrium net imports \( (M_t - X_t) \) must provide the resources to cover the excess of investment spending \( (I) \) that is not provided from domestic sources (i.e., national saving, \( S^n \)). Alternatively, any domestic spending or exports

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\(^5\) For simplicity, (Baharumshah, Ismail, & Lau, 2009) assumed \( S=I \) or \( S-I=0 \) for their reduced form twin deficits equation, \( \text{CAD} = b_1 + b_2 \text{BD} + b_3 \text{INV} \) (where \( \text{INV} \) is investment). Conversely, the twin deficits hypothesis is hold if the estimated coefficient of \( \text{BD} \) is statistically different from zero at conservative levels i.e. 10\%, 5\%, or 1\%.

\(^6\) Also, (Baharumshah, Ismail, & Lau, 2009)’s study documented that investment has a noticeable impact on current account deficit from the causality results of five ASEAN countries.
that cannot be provided for from domestic resources requires the importation of the requisite resources from abroad.

Equation (3) can be arranged in terms of a relation between various balances that have received prominent attention in open economy macroeconomics discussion. These balances provide potentially useful insights into possible adjustment processes that may affect net exports \((X_t - M_t)\) or current account balance.\(^7\)

\[
(X_t - M_t) = (S^p_t - I_t) + (T_t - G_t)
\]

The trade position \((X_t - M_t)\) is equivalent to the sum of net private saving \((S^p_t - I_t)\) and the government’s budget surplus \((T_t - G_t)\). This formulation draws attention to the potential relationship between fiscal policy and the trade balances. Rewriting the terms \(-(X_t - M_t)\) for current account deficit \((CAD_t)\) and \(-(T_t - G_t)\) captures budget deficit \((BD_t)\).

\[
CAD_t = (S^p_t - I_t) + BD_t
\]

A budget deficit \((BD_t)\) may be offset by an increase in private saving or fall in domestic investment \((I_t)\) or exports \((X_t)\). The latter adjustment response does cause the trade balance to fall as emphasised by the twin deficit hypothesis. The twin deficit hypothesis maintains that the external balance is dominated by the government budget, that trade deficits reflect predominantly budget deficits, and conversely. This would not be the case in a Ricardian world where government spending is a perfect substitute for private spending and taxes are lump sum. A budget deficit (public dis-saving), elicits a corresponding flow of net private saving without affecting the trade balance. However, if savers (households) are not Ricardian and the substitutability between private and public spending is less than perfect, a budget deficit is associated with insufficient private saving. This must be reflected in a negative trade balance as a result of the net imports that are required to realise the excess government expenditure. This logic applies *ipso facto* to explain adjustment to changes in the budget.

The response of domestic investment and the trade balance to budget deficits depends on the degree of capital mobility and the exchange rate regime. Given fixed exchange rates and a

\(^7\) The current account balance is usually referred to as the trade balance (net exports) that is, the difference between the value of exports and imports for a given period. However, the current account balance includes net services and net transfers - these particular sub-accounts is usually minimized and not considered due to the fact they normally represent a small fraction of the total (Ventosa-santaulària, Gómez-zaldívar, & Pérez, 2013, p. 1319).
high degree of capital mobility, the domestic interest rate responds to a fiscal stimulus. The tightening of domestic credit conditions is moderated as foreign funds flow in, maintaining a higher level of domestic investment and a negative trade balance. Capital inflows put upward pressure on the real exchange rate, either through a nominal exchange rate appreciation or a rising domestic price level. Either way, the appreciation of the real exchange rate, as a result of a budget deficit, further contributes to the adverse trade balance (Miller & Russek, 1989, pp. 97-98).

Given $BD_t$, the requirements for equilibrium in the goods market suggest that current account balance ($CAD_t$) can be explained by a set of behavioural variables that determine private saving, and domestic investment. Identify the relevant behavioural relationships that underlie the determination of private saving and domestic investment variables.

$$CAD_t = [(S_p^t(y_t^{(+)}), r_t^{(+)}))] - I_t^{(-)}] + BD_t$$  \hspace{1cm} (6)

Conventionally, economic theory states that the private saving ($S_p^t$) is positively explained by the households’ disposable income ($y_t$), and interest rate ($r_t$), while the interest rate variable has negative effect on domestic investment ($I_t$). Given $\frac{\partial CAD}{\partial t} = \frac{\partial BD}{\partial t} > 0$, it is to say that the $\frac{\partial CAD}{\partial y} = \frac{\partial S_p}{\partial y} > 0$ and $\frac{\partial CAD}{\partial r} = \frac{\partial S_p}{\partial r} = -\frac{\partial I}{\partial r} > 0$. Both $y$ and $r$ variables are expected to have a positive impact on a country’s current account balance by either households’ saving behaviour or investors’ decision to invest. In other words, the dynamic evolution of the net imports that a country spends abroad and the amount that it takes domestically (net private saving) should be balanced, that is, there should be (at least) one long-run relationship (cointegration) between the CAD, $y$, $r$ and BD, and both $y$ and $r$ should be positive.

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8 It partially supports (Bartolini & Labiri, 2006, p. 6)’s study that the twin deficits hypothesis that a larger fiscal deficit leads to an expanded current account deficit by its effect on national saving and consumption.

9 In this context, three cointegrating relations are potentially suggested by theory. The first is from the income-expenditure equilibrium about the current account determination, $CAD = f(y, r, BD)$. The second relation is from the Keynesian theory on the interest rate determination, $r = f(BD)$, and lastly, $BD = f(y)$ from the Wagner’s law. In view of the objective of the present study, this is rather interesting to focus on the first cointegrating relation suggesting that new knowledge.

10 (Darrat, 1989) finds that budget deficits have not caused significant changes in the long-term interest rate, but a reverse causality. Again, the empirical results from (Darrat, 1990) show structural federal deficits and the corporate bond rate are not cointegrated. The present study does not examine the causal relationship between budget deficit and interest rates, but to illustrate the role of interest rates on current account balance from the both saving and investment relations.
The structural relation (6) offers an alternative framework for twin deficits hypothesis. A reduced form of equation (6) can be written as bellow.

\[ \ln\text{CAD}_t = \beta_1 \ln y_t + \beta_2 r_t + \beta_3 \ln\text{BD}_t + e_t \]  

(7)

\( e \) is residual. Cointegration test (Engle & Granger, 1987) is applied to a set of variables - \( \ln\text{CAD}, \ln y, r, \) and \( \ln\text{BD} \). Once a cointegrating relation (at least one) is found among the non-stationary variables the parameters of the right-hand side variables in equations (7) can be estimated by OLS estimator. Hence, a cointegrating relation exits among \( \ln\text{CAD}, \ln y, r, \) and \( \ln\text{BD} \) is only a necessary condition and not a sufficient condition for twin deficits hypothesis (e.g. BD causes CAD) is hold. It needs to satisfy the (statistically) significance of real GDP \( (\ln y) \) and/or interest rate \( r \) – the determinators of net private saving behaviour \( (I \) and \( S^p) \) from the income-expenditure equilibrium.

\[ \ln\text{CAD}_t = \beta_1 \ln y_t + \beta_2 r_t + \beta_3 \text{Dummy} \_\text{BD}_t + e_t \]

(8)

In addition, the actualised budget deficits can be converted into a zero-one dummy \( (\text{Dummy} \_\text{BD}) \) that considers value of one for the periods with budget deficits, a value of zero otherwise for the budget balance variable \( (\ln\text{BD}) \).

4. Data and Empirical Results

This section provides a brief review on data information (variables) then reports the results of cointegration tests and regression estimations. The analytical framework (e.g. structural equation (6)) suggests four macroeconomic variables, namely current account balance \( (\ln\text{CAD}) \), budget balance \( (\ln\text{BD}) \), real GDP \( (\ln y) \) and real interest rates (i.e. short- and long-term \( r_s \) and \( r_l \)).\(^{11}\) All of the variables are in real terms – the nominal data were deflated by GDP deflator, except for real interest rates which is the difference between nominal interest rates and inflation rate (percentage per annum of GDP deflator). The U.S. data are obtained from the OECD Economic Outlook over the period 1970Q2 - 2011Q4.

Table 1 reports the KPSS stationarity test results that the null hypothesis of stationary has been rejected at least at 10\% level of significance, suggesting the level data are non-stationary. The next step is to examine the cointegratedness between current account balance, budget balance, real GDP and real interest rates.

\(^{11}\) The long-term interest rate is the long-term government bond yields (10-year), while the short-term interest rate is the 3-month or 90-day rate and yield (certificates of deposit).
Table 1. KPSS Stationarity Tests (Kwiatkowski, Phillips, Schmidt, & Shin, 1992)

<table>
<thead>
<tr>
<th>Variable:</th>
<th>LM-statistics</th>
<th>$H_0: X$ is trend stationary</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\ln CAD_t$</td>
<td>0.183**</td>
<td></td>
</tr>
<tr>
<td>$\ln BD_t$</td>
<td>0.166**</td>
<td></td>
</tr>
<tr>
<td>$\ln y_t$</td>
<td>0.122*</td>
<td></td>
</tr>
<tr>
<td>$r_l$</td>
<td>0.252***</td>
<td></td>
</tr>
<tr>
<td>$rs_t$</td>
<td>0.197**</td>
<td></td>
</tr>
</tbody>
</table>

Critical values: 0.216 (1%), 0.146 (5%), 0.119 (10%).

Notes: The KPSS equations include constant and trend. ***, ** and * denote significance level at 1%, 5% and 10%, respectively.

The empirical results of Johansen’s multivariate cointegration tests are presented Table 2.12 The low $p$-values of the trace statistics (last column in first panel) suggest the rejection of the null hypothesis of at most one cointegrating equation.13 Two cointegrating equations exist among current account balance, budget balance, real GDP and real long-run interest rate (rl) at 10% significance level. Meanwhile, by considering the short run interest rate (rs), the trace test indicates one cointegrating equation (e.g. $\ln CAD - \beta_1 \ln y - \beta_2 rs - \beta_3 \ln BD$), at 10% significance level. Overall, the empirical support of the existence of a cointegrating relation among the variables partially supports the twin deficits hypothesis in U.S., as postulated by the structural equation (6) that derived from the income-expenditure equilibrium approach.

Table 2. Unrestricted Cointegration Rank Test

<table>
<thead>
<tr>
<th>Hypothesized No. of CE(s)</th>
<th>Eigenvalue</th>
<th>Trace Statistic</th>
<th>0.10 Critical Value</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>0.170893</td>
<td>56.12652</td>
<td>37.03536</td>
<td>0.0006</td>
</tr>
<tr>
<td>At most 1</td>
<td>0.115711</td>
<td>25.76682</td>
<td>21.77716</td>
<td>0.0322</td>
</tr>
<tr>
<td>At most 2</td>
<td>0.035209</td>
<td>5.84544</td>
<td>10.47457</td>
<td>0.4551</td>
</tr>
<tr>
<td>At most 3</td>
<td>0.000239</td>
<td>0.03873</td>
<td>2.97616</td>
<td>0.8720</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hypothesized No. of CE(s)</th>
<th>Eigenvalue</th>
<th>Trace Statistic</th>
<th>0.10 Critical Value</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>0.159507</td>
<td>47.01144</td>
<td>37.03536</td>
<td>0.0089</td>
</tr>
<tr>
<td>At most 1</td>
<td>0.085057</td>
<td>18.86133</td>
<td>21.77716</td>
<td>0.2070</td>
</tr>
<tr>
<td>At most 2</td>
<td>0.027144</td>
<td>4.46053</td>
<td>10.47457</td>
<td>0.6443</td>
</tr>
<tr>
<td>At most 3</td>
<td>1.45E-05</td>
<td>0.00235</td>
<td>2.97616</td>
<td>0.9687</td>
</tr>
</tbody>
</table>

12 We also run the similar analysis for equation (8), and find no cointegration between $\ln CAD$, $\ln y$, and rl (or rs). The dummy variable, Dummy_BD is exogenously considered in the VAR system. The null hypothesis of none cointegrating relation is not rejected at 10% level of significance (trace test) with a $p$-value of 0.80 (0.89) for rl (rs) as interest rate.

13 We consider only the trace test since “… if[the trace test] shows more robustness to both skewness and excess kurtosis in innovations that the maximal eigenvalue test (Cheung & Lai, 1993, p. 326).
Notes: Trend assumption is no deterministic trend with lags interval (in first differences) of 1 to 4 * denotes rejection of the hypothesis at the 0.1 level **MacKinnon-Haug-Michelis (1999)’s p-values.

Table 3 reports the OLS estimates of the data-driven regressions (7) and (8) with a consideration of both the long (rl)-and the short-term (rs) interest rates with estimated OLS regressions (1)-(4). The results (of significance) are varying from specification to specification - only the data-driven regressions (1) and (3) have statistically significant budget balance, lnBD that a one percent of budget deficit raises the current account deficit by about 0.9 percentage point, supporting the twin deficits hypothesis as from the approach used by (Bartolini & Labiri, 2006). From the estimated regression (1), long run interest rate (rl) is positively significance but real GDP (lny) has no explanatory power for U.S. current account balance. Once the short run interest rate (rs) is taken into account, it is insignificance but the real GDP turns to meaningful interpretation – a one percent increases in real income, 0.098 percent increases in U.S. current account balance as explained by the saving channel. The dummy variables for budget deficit (Dummy_BD) are statistically insignificance (regressions (2) and (4)) from 10 percent level. By controlling [given] the budget deficits,¹⁴ both real GDP (y) and short-run interest rate (rs) are statistically significance and in positive sign (regressions (2) and (4)) supporting the theoretical view of twin deficits hypothesis from the income-expenditure approach via. both the saving and investment channels.

With combined positive results from both cointegration tests and estimated regressions, twin deficits hypothesis – budget deficit causes current account deficit in U.S., is empirically supported, from the general equilibrium approach. This positive finding supports previous studies by (Darrat, 1988) and others.

Table 3. Estimated Cointegrating Relation - OLS

<table>
<thead>
<tr>
<th>Explanatory variable</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ln(y)</td>
<td>0.060</td>
<td>0.837***</td>
<td>0.098*</td>
<td>0.825***</td>
</tr>
<tr>
<td></td>
<td>(0.265)</td>
<td>(0.000)</td>
<td>(0.084)</td>
<td>(0.000)</td>
</tr>
<tr>
<td>rl</td>
<td>3.699**</td>
<td>2.773</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.008)</td>
<td>(0.191)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>rs</td>
<td></td>
<td></td>
<td>2.111</td>
<td>8.464***</td>
</tr>
</tbody>
</table>

¹⁴ The dummy variable is statistically insignificant but it does not interpret no twin deficits. As illustrated by the income-expenditure approach (Section 3), either income (y) or interest rate (r) play a crucial role in validating the twin deficits hypothesis.
Our empirical results provide an interesting policy implication concerning the current popular shorthand term - “fiscal cliff” that the U.S. government announced at the end of 2012 on a simultaneous increase in tax rates and decrease of government spending through sequestration that would have occurred January 2013 through a series of previously enacted laws, in the purpose of reducing the country’s budget deficits. Increase in tax rates (temporally or permanently) will reduce the households’ disposible income that results a decrease in private saving depending on the marginal rate of saving. Based on the structural equation (6), it may worsen the U.S. current account balance, while the cut of government spending directly improves the budget account balance, hence the net effect of “fiscal cliff” on the country’s twin deficit hypothesis is theoretically ambiguous. The data-driven regressions (1) and (3) suggest that the country’s current account balance is directly responsive to budget balance with high elasticity values of 0.85 and 0.89, but the effect of real income is either insignificance or small, hence cutting government spending can improve the country’s current account deficit. However, based on the data-driven regressions (2) and (4) with a given budget deficit (Dumy_BD), U.S. current account balance is found to be more responsive to real income with an estimated elasticity of about 0.8, and it tells that an increase in tax rates that will reduce the households’ disposable income, worsens the current account deficit (i.e. decreases the current account balance).

5. Summary and Conclusion
This study uses time-series data 1970-2011 on U.S. to re-examine the twin deficits hypothesis. The empirical results show that the budget balance, current account balance, real income and interest rate are cointegrated, while the income and/or interest rate have significantly positive impacts on U.S. current account balance. According to the structural equation derived from the income-expenditure approach from the general equilibrium perspective, these findings support twin deficits hypothesis. The proposed empirical

\[
\begin{align*}
\lnBD_t & \quad 0.886^{***} \quad (0.000) \\
(0.139) & \quad 0.847^{***} \quad (0.000) \\
\text{Dummy}\_\text{BD}_t & \quad 0.070 \quad (0.648) \\
0.148 & \quad (0.307) \\
\end{align*}
\]

Notes: The dependent variable is \( \ln \)CAD. The value reported in (.) is \( p \)-value from the \( t \)-statistic. \( ** \), \( * \) and \( \dagger \) denote significance level at 1%, 5% and 10%, respectively. Constant term is not included as suggested by equation (6).
framework in this study does not aim to replace the existing (causality) approaches, but to introduce an alternative way in testing the twin deficits hypothesis.

There are two limitations that need to be acknowledged and addressed regarding this study. The first limitation concerns the income-expenditure Limitations – in goods and services market. One of the potential and necessary extension for further study is to explore the role of money (finance) for the twin deficits hypothesis in a more proper framework in a “monetised” economy. It can be actualized by the considering the implicit view of portfolio balance approach from the general equilibrium perspective that includes both bond and money markets. If the budget deficits accumulated by the country are financed by the issuance of bonds. The second limitation is about the case of U.S this study applied that the country is naturally in twin deficits. Hence, the empirical conclusion on the support of income-expenditure equilibrium for twin deficits hypothesis reported in this study may subject to further investigation. More robust conclusion can be generated by including other sample countries – among the two candidate countries are Japan and China that their negative fiscal balances with a substantial current account surplus. The Japan’s budget deficits expanded substantially in 1990s, while current account surplus in 1980s. A surge of China’s current account surplus recorded after 2004, but the country records prolong negative fiscal balances in late 1980s (except for 2007) with USD193.2 billion in 2013 marking a 50 percent increase from previous year. Other possible extension is to consider a group of countries such as between developed and developing nations that can be examined by either individual data or panel data approach. In this context, it calls for further study.
References


