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Causality tests of budget and current account deficits: Cross-country comparisons*

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Abstract. This study attempts to determine the causal relationship between budget and current account deficits as well as the direction of such causality. A selected sample of some developed and developing countries with annual time series data is used and cointegration techniques are applied to bring evidence regarding this important issue. Our results do not support any long-run relationship between the two deficits for developed countries while the data for developing countries do not reject such a relationship. However, our results suggest a causal relationship between the two deficits for most of the sample countries.

Key words: Twin deficits, cointegration, Granger causality, developed vs. developing countries

JEL classifications: E62

1. Introduction

The emergence of record current account and budget deficits in many countries, including the US during the 1980s, has drawn increasing attention to the issue of "twin deficits". The twin deficit hypothesis asserts that an increase in budget deficit will cause a similar increase in current account deficit. Conventional economists suspect that these two deficits are closely, and perhaps even causally, related. There are a number of channels through which budget deficit

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may influence current account deficit. In a Mundell-Fleming framework, it is argued that an increase in budget deficit would induce upward pressure on interest rates, causing capital inflows and appreciation of exchange rates. Hence, an increase in current account deficit. The Keynesian absorption theory suggests that an increase in budget deficit would induce domestic absorption and hence, import expansion, causing current account deficit. Feldstein-Horioka (1980) finds that savings and investment are highly correlated, causing budget deficit and current account deficit to move together. An alternative view is that the "twin deficits" are not related in the simple manner depicted by the conventional economists. The link from budget deficit to current account deficit can be weak or nonexistent. Therefore, there may not exist any predictable or systematic relationship between the two deficits given that there could be many other factors that might serve to make the "twin" relationship doubtful. One such factor concerns the stability of saving and investment over time. For instance, Sachs (1981), Obstfeld (1985), Leachman (1991), and Karunaratne (1992), found low correlation between saving and investment.

Another contrary view is provided by Barro (1989) known as the Ricardian Equivalence Hypothesis (REH). He states that shifts between taxes and budget deficits do not matter for the real interest rate, the quantity of investment, or the current account balance. In other words, theoretically, REH negates any link between the two deficits, though empirical evidence is mixed[1]. One important implication of the validity of REH is that the planning horizon for the regime and the private sector is the same (or infinite). Several empirical tests have been performed to test this assumption within a Ricardian framework[2]. Recently, Haug (1996) developed a model for consumption, which nests both Ricardian equivalence and non-Ricardian alternative. The assumption of infinite horizon for households is then tested using cointegration techniques and quarterly data from Canada. These results do not find any empirical support to reject the assumption of infinite horizon. Cardia (1997) used a similar approach, which nests Ricardian equivalence within a non-Ricardian alternative arising from finite horizon and/or distortionary taxes. The important contribution by Cardia (1997) is to look at the twin deficit hypothesis within a consumption model that nests both Ricardian and non-Ricardian equivalence. Using data from G-7 countries, he found low correlation between the two series for both the nested and non-tested hypotheses. These results, therefore, do not support or reject the REH.

The above discussion suggests that there are many contrary views regarding the link between the budget and current account deficits. Henceforth, the issue has become very important for researchers to find empirical evidence of a relationship between the two, if any. The methodology used to analyze the above issue varies from well-specified theoretical models to using simple one-to-one relationship between budget deficit and current account deficit. This paper does not develop any specific model such as Haug (1996) and Cardia (1997), rather uses an approach similar to Miller and Russek (1989) to identify a causal relationship between the two deficits that may exist. An impor-

[1] Empirical estimates by Evans (1989) using U.S. data do not find any support for high correlation between budget deficit and trade deficit under a Ricardian framework.

[2] Khalid (1996) tested the assumption of infinite horizon for a large sample of developing countries. The data was not able to reject the validity of the assumption of infinite horizon for a majority of sample countries even though Ricardian neutrality was rejected.

tant implication, if such a relationship exists, would be to suggest the policy makers to devise policies, which would include both the internal and the external accounting while dealing with structural stabilization.

Theoretically, the transmission channel in the Mundell-Fleming framework provides a direct link between the two deficits, whereby any changes in fiscal deficit will have a direct effect on current account deficit through changes in exchange rate[3]. Miller and Russek (1989) used a simple identity to analyze the linkage between the budget deficit and current account deficit. We follow the same approach and use the following identity in our empirical analysis:

$$-\mathrm{BD} = -\mathrm{CAD} + (I_p - S_p) \tag{1}$$

The above identity states that the government budget surplus is equal to the current account surplus plus the excess of investment over private savings. Suppose that the government fixes spending and cuts tax, thereby creating a deficit. Identity (1) indicates that, as a result, either the current account surplus must decline or the excess of investment over savings $(I_p - S_p)$ must decline, or both. It also indicates that macroeconomic equilibrium is achieved when private and public saving minus private investment equates the current account of balance of payment.

In line with identity (1), the existence of large and highly sophisticated capital markets in the developed countries can provide a substantial portion of funds to finance both public and private domestic needs and hence, the configuration of private investment and savings may absorb the effect of fiscal policy without transmitting it to the external balance. However, the developing countries lack deep domestic capital markets that necessitate huge external financing for their large fiscal deficits. In addition, many developing countries are debtors whose economic growth is largely dependent on foreign capital inflows and lending. Debts incurred by these nations imply that a large part of their income is spent on debt servicing and interest payments leading to a possible deterioration in the current account balance. Such continuous increase in national debt may eventually lead to a rise in budget deficit. At the same time, developing countries with inefficient system of taxation and huge public spending (due to large public sector enterprise or heavily subsidized domestic sector) will always need foreign lending to meet their fiscal deficits. In either case, some causal relationship may exist between the two deficits.

Empirical analyses on this important issue have failed to provide any consensus. Miller and Russek (1989), Dewald and Ulan (1990), Enders and lee (1990), Alse and Oskooee (1992), Rahman and Mishra (1992), Rosenswieg and Tallman (1993), and McNeils and Siddiqui (1994) show that there is no systematic association between the current account deficit and the budget deficit. Contrary to this, Laney (1986), Abel (1990), and Jeon and Lee (1991) found these variables to be cointegrated. Biswas, Tribedy, and Saunders (1992) found bi-directional casual relationship between actual budget deficits and net exports for US using annual data over the period 1950–88. It is important to note here that most of the above stated analyses are based on data from developed countries. Historical data from developing countries show that most

[3] See Miller and Russek (1989) and Karunaratne (1992) for more detailed discussion on such linkages.

of these countries incur huge budget and current account deficits. It will, therefore, be an important contribution to the existing literature to bring some evidence from developing countries on the 'twin deficit' issue. A comparison of these results with evidence from developed countries would make this exercise more interesting. Our main interest, in this paper, is to identify any long-run and causal relationship between the two deficits rather than developing a sophisticated macroeconomic model describing the relationship between the two. Therefore, our approach is different from other studies such as Dewald and Ulan (1990), Jayaraman (1994), Haug (1996) and Cardia (1997) who use more comprehensive models or Quintos (1995) and Wilcox (1989) who look at the sustainability of government deficits or Hakkio and Rush (1991) who analyze the magnitude of budget deficits.

This paper examines the validity of the twin deficit hypothesis using time series data for a selected sample of developed and developing countries with relatively high budget deficit and current account deficit. By having a mixed sample of countries, the analysis may help to formulate appropriate policies for some countries facing tremendous problems of budget and current account deficits. The analysis provides cross-country comparisons regarding the presence of any long-run relationship between the two deficits. Further, we examine the direction of causality if such a relationship exists. The analysis also allows the possibility of any structural break. We use econometric techniques such as unit root tests, cointegration, and causality tests to accomplish these objectives. The remainder of the paper is organized as follows. Section 2 describes the methodology adopted and the data used in our analysis. Section 3 details the empirical results. Finally, conclusions and policy implications are discussed in section 4.

2. Methodological structure & data

The paper aims to achieve two broad objectives. One is to determine any cointegrating (or long run) relationship between the two deficits and the other is to identify the causal relationship between the two and the direction of causality. The methodology to perform cointegration test between two or more series requires, first determining the order of integration of each variable in a model. We use Dickey-Fuller (DF) and Augmented Dickey-Fuller (ADF) and Phillips-Perron (1988) tests to identify the order of integration. Perron (1992) also studied the effects of allowing for structural breaks when testing for unit roots. He showed that a unit root test, which does not take account of any break(s) in the series, would have low power. If the break(s) in the series are known, then it is relatively simple to adjust the ADF test by including (composite) dummy variables[4] to ensure there are as many deterministic regressors as there are deterministic components in the data generating process. However, it is assumed here that most likely the date of the break will not be known *a priori*. In such a situation, it is necessary to test for the possibility of break using a recursive or rolling approach (Banerjee, Lumsdaine and Stock,

[4] Dummy variables that take on a value of $(0, 1)$ are added to allow for shifts in the intercept and dummies multiplied by a time trend to take into account any change in the slope of the deterministic trend.

1992). The test statistics used here is the minimum ADF τ_τ-statistic computed over various sub-samples of the data.

The recursive minimum ADF τ_τ-statistic is computed using sub-samples $t = 1, \ldots, k$, for $k = k_0, \ldots, N$, where k_0 is a start-up value and N is the size of the full sample.[5] The model is estimated for each sub-sample and then the minimum value of $\tau_\tau(k/N)$ across all the sub-samples is chosen and compared to the critical values provided in Table 1 of Banerjee, Lumsdaine and Stock, (op. cit.) to test the null of a unit root.

Once the order of integration is determined, the next important task is to perform tests for cointegration between the two series to identify any long-run relationship. For a bi-variate system, Engle and Granger (1987) developed a two-step procedure, which is commonly used to identify a cointegrating relationship between the two series. However, the results obtained using Engle-Granger two-step procedure may be sensitive to the choice of independent variable. This problem can be overcome by using both variables as dependent variable, alternately. Another alternative test for cointegration is developed by Johansen and Juselius (1990). This test uses maximum likelihood method to determine the exact number of cointegrating vector in the system. We use these methods to test for cointegration between the budget deficit and the current account deficit in our sample countries. In order to maintain our earlier argument about the possibility of structural break in the series, we use recursive minimum test to the cointegrating relationship as well.

Causality test is used to test the causal relationship between the two series as well as to identify the direction of such causality. Sims test is used when the series have unit roots but not cointegrated. Engle and Granger (1987) have proposed to test Granger causality based on an error-correction model (ECM), if the series are cointegrated. Recent econometrics research such as Toda and Phillips (1993), Toda and Yamamoto (1995) and Rambaldi and Doran (1996) suggests some alternative procedures to test for Granger causality. This is discussed in more detail in the next section.

We examine the long-term relationship and any causality between budget deficit and current account deficit for five developed countries and five developing countries. The five developed countries are: United States, United Kingdom, France, Canada and Australia. The sample of developing countries consists of India, Indonesia, Pakistan, Egypt and Mexico. The sample countries are selected on the basis of their high BD/GDP and CA/GDP ratio[6]. A comparison of both developed and developing countries will help in determining the direction of causality between the two deficits. Data for the developed countries are based on an annual time series ranging from 1950 to 1994, while for developing countries it ranges from 1955 to 1993[7]. The variables are scaled relative to GNP, therefore, we use CAD to denote the ratio of current account deficit to GNP and BD to denote the ratio of budget deficit to GNP.

The data are mainly collected from the various issues of IMF International

[5] Here, we set $k_0 = 0.25N$ (one-quarter of the sample size).

[6] We plot BD/GDP and CAD/GDP for each country over varying periods (US: 1953–93; UK: 1952–93; France: 1967–93; Canada: 1950–94; Australia: 1960–92, India: 1952–93; Indonesia: 1966–93; Pakistan: 1959–93; Mexico: 1961–92; and Egypt: 1957–92). These plots show increasing trend in both deficits over the specified period. These plots are not included in the paper due to space constraint. However, these plots may be obtained from the first author upon request.

[7] Data range used for a specific country is stated in table 1 and table 2.

Financial Statistics (IFS)[8]. For some of the developing countries a complete time-series data on the above variables is not available and hence other sources such as Yearbook of International Trade Statistics and Government Finance Statistics Yearbook have been used to fill-in any data gaps[9]. The time series variables involved in this analysis are current account deficit, budget deficit, trade-weighted exchange rate and nominal GNP.[10] The IFS provides the measure of current account deficit denominated in US dollar, while the budget deficit and nominal GNP are measured in domestic currency denomination. In order to maintain consistency, we use the trade-weighted exchange rate to convert the current account deficit into one that is denominated in domestic currency[11].

3. Empirical results

3.1. Unit root test results

We apply three types of unit root tests to the data from a sample of developed and developing countries. Table 1 reports the results for developed countries. Column 3 and 4 are DF/ADF and Recursive Minimum tests on data in levels, respectively. The last three columns in table 1 are results of ADF[12], Recursive minimum and Phillips-Perron tests on data in first difference. Our results indicate that both the budget deficit (BD) and current account deficit (CAD) are first difference stationary. The Recursive Minimum test for the possibility of structural break(s) in the unit root test does not alter the results. Similar tests are applied to the data from developing countries and the results are reported in table 2. These results also suggest that both BD and CAD series are first difference stationary. Having established the evidence that both series are I (1), determining the cointegration between the two series is imperative before tests are performed for causality. In view of our discussion in the previous section, such determination of cointegrating relationship will help us to decide whether causality should be tested using data in levels or in first difference. We discuss this in the next section.

3.2. Cointegration test results of CAD and BD

The presence of any cointegrating relationship between the budget deficits and current account deficits in our sample countries is determined using Engle and

[8] Items 80, 78ald, and 99a.c. in the IMF's International Financial Statistics provide data on budget deficit, current account deficit, and GNP, respectively. This data is also available in IFS CD-ROM released by the IMF on a monthly basis.

[9] Complete data on BD and CAD for Indonesia is not available in the IFS. Data from 1960–70 on BD and CAD is obtained from Government Finance Statistics Yearbook and Yearbook of International Trade Statistics, respectively. Similarly, data between 1960–1965 on BD for Mexico is also obtained from Government Finance Statistics Yearbook.

[10] Deficits are recorded in positive terms whilst surpluses are recorded in negative terms.

[11] This is consistent with Laney (1984) and Rosenswieg and Tallman (1993) to signify the real value of currency. This computed series for each country is available from the first author upon request.

[12] Due to fewer number of observations, we restrict to 3 lags only.

Table 1. Unit root tests: Developed countries

Country	Period	Levels		First Differences		
		DF/ADF Test	Recursive Minimum	ADF Test	Phillips-Perron Z-test	Recursive Minimum
Current Account Deficit (% of GNP)						
United States	1952–94	−2.76	−1.77	−5.40*	−5.38*	−4.72#
United Kingdom	1952–94	−2.79	−1.40	−5.79*	−7.55*	−4.18##
France	1967–94	−3.05	−3.42	−6.98*	−9.79*	−6.55#
Canada	1950–94	−2.54	−1.88	−9.14*	−8.01*	−5.75#
Australia	1960–94	−3.00	−3.05	−6.51*	−10.24*	−4.96#
Budget Deficit (% of GNP)						
United States	1952–94	−1.80	−1.18	−6.09*	−10.17*	−4.31##
United Kingdom	1952–94	−2.82	−1.07	−5.38*	−5.39*	−4.07##
France	1967–94	−2.48	−3.09	−7.49*	−9.09*	−6.23#
Canada	1950–94	−3.05	−2.10	−6.59*	−8.85*	−4.68#
Australia	1960–94	−2.38	−1.12	−3.79*	−7.58*	−4.15##

Notes: a) The recursive minimum ADF statistics is used to test for unit root allowing the possibility of structural break(s). Critical values are found in Banerjee, Lumsdaine and Stock (1992, Table 1). # and ## represent the significance level at 5% and 10% respectively.
b) * and *** represent MacKinnon (1990) critical values for rejection of null hypothesis of unit root at 1% and 5% significance level respectively.

Table 2. Unit root tests: Developing countries

Country	Period	Levels		First Differences		
		DF/ADF Test	Recursive Minimum	ADF Test	Phillips-Perron Z-test	Recursive Minimum
Current Account Deficit (% of GNP)						
India	1952–93	−2.27	−1.71	−3.13*	−7.91*	−8.46#
Indonesia	1961–93	−2.06	−2.66	−3.91*	−7.57*	−4.45##
Pakistan	1959–94	−2.59	−3.36	−4.78*	−7.73*	−4.17##
Mexico	1961–92	−1.71	−1.98	−4.88*	−6.30*	−4.10#
Egypt	1957–92	−2.83	−2.86	−4.26*	−6.63*	−6.21#
Budget Deficit (% of GNP)						
India	1952–93	−1.97	−1.13	−3.46*	−5.76*	−4.11##
Indonesia	1961–93	−2.54	−1.04	−4.93*	−12.81*	−4.58#
Pakistan	1959–94	−2.54	−3.43	−6.10*	−8.78*	−7.52#
Mexico	1961–92	−2.14	−1.60	−3.73*	−5.43*	−3.19
Egypt	1957–92	−2.98	−1.99	−4.36*	−6.10*	−4.92#

Notes: a) The recursive minimum ADF statistics is used to test for unit root allowing the possibility of structural break(s). Critical values are found in Banerjee, Lumsdaine and Stock (1992, Table 1). # and ## represent the significance level at 5% and 10% respectively.
b) * and *** represent MacKinnon (1990) critical values for rejection of null hypothesis of unit root at 1% and 5% significance level respectively.

Table 3. Tests of cointegration between the BD and the CAD (developed and developing countries)

Country	Engle-Granger Test			Johansen-Juselius (Trace Test)	
	ADF[a]	ADF[b]	Recursive Minimum	$r = 0$	$r \leq 1$
Developed:					
United States	−3.07	−2.97	−3.99	15.11	1.45
United Kingdom	−2.78	−1.98	−1.73	17.49	5.70
France	−2.85	−1.93	−2.10	19.02	2.40
Canada	−2.48	−2.68	−3.94	12.05	4.36
Australia	−2.45	−3.38	−1.37	19.05	3.10
Developing:					
India	−1.98	−2.39	−4.25**	9.96	4.10
Indonesia	−3.47***	−3.56***	−5.64*	17.78*	4.5**
Pakistan	−5.20*	−4.24*	−4.98*	20.49*	9.78*
Egypt	−4.30*	−3.11***	−5.35*	19.62**	4.9**
Mexico	−1.25	−3.53***	−4.33**	25.68*	9.9**

Note: 1) a and b refers to ADF test statistic on the residuals obtained from the following co-integrating regressions

(a): OLS estimation of : $\mathrm{CAD}_t = \alpha_1 + \alpha_2 \mathrm{BD}_t + \mu_t$

(b): OLS estimation of : $\mathrm{BD}_t = \beta_1 + \beta_2 \mathrm{CAD}_t + \eta_t$

2) JJ tests have a constant in the cointegrating vector.

3) *, **, and *** indicates that the null hypothesis of no cointegration is rejected at 1%, 5%, and 10% significance level respectively.

Granger (EG) two-step method and Johansen and Juselius (JJ) maximum likelihood method. The EG method requires that the standard tests of unit root hypothesis be applied to the residuals of the cointegrating equation. Since the selection of dependent variable in this case is 'ad hoc', we perform co-integration test on both of the following equations:

$$\mathrm{CAD}_t = \alpha_1 + \alpha_2 \mathrm{BD}_t + \mu_t \tag{2}$$

$$\text{Or} \quad \mathrm{BD}_t = \beta_1 + \beta_2 \mathrm{CAD}_t + \eta_t \tag{3}$$

The results are reported in columns 2 and 3 of table 3. In using ADF test on the residuals, the number of lagged terms are added until the LM statistics indicate no autocorrelation problem. To be consistent with earlier analysis, we also apply the recursive minimum ADF test on these residuals. The recursive minimum ADF test results are reported in column 4 of table 3. As an alternate, we use JJ maximum likelihood method to detect any cointegrating relationship between the two series and report the results in the last two columns of the above table.

The above results reject the null hypothesis of no cointegration between BD and CAD in all developing countries except India where data does not support any cointegrating relationship between the two variables. On the contrary, these results do not support any cointegration between BD and

CAD in the entire sample of developed countries[13]. The evidence thus shows rather strongly that the twin deficits are $C(1,1)$ in the four out of the five developing countries. This is contrary to the five developed countries where none exhibits cointegration between CAD and BD. The results seem to agree with the *a priori* conjecture that the linkage between the fiscal balance and the external balance is much tighter for developing countries than for developed countries. These results are consistent with Evans (1988) who found that current account is largely independent of budget deficits in five major industrialized countries (Canada, France, Germany, UK, and the US). These results are also consistent with Karunaratne (1992) who found weak evidence of cointegration between the two deficits using data from Australia.

These results are not surprising given the lack of sophisticated domestic capital markets and low savings in most of these developing countries, which necessitates foreign financing for the largest proportion of their fiscal deficits. Private sources of funds in normal times in these developed countries could provide financing for both public and domestic needs, and at the same time the country might even be a net lender abroad. In addition, most developing countries are debt-ridden and future servicing of debts and interest payments may lead to an impending deterioration of current account balance.

3.3. Results of causality test

Next, we test for the possibility of a causal relationship between BD and CAD as well as the direction of such causality, if any. As our earlier results show that the two series are not cointegrated for all developed countries but cointegrated for four out of five developing countries. This implies that we can not apply the same method to the entire sample of developed and developing countries to test for Granger non-causality (or causality). The issue of testing Granger causality in such a scenario has been subject of considerable recent research. Engle and Granger (1987), Sims, Stock and Watson (1990), Toda and Phillips (1993), Toda and Yamamoto (1995), and Rambaldi and Doran (1996) have proposed methods that can be used to test the Granger causality. If it is known that the system is I(1) but not cointegrated, then Sims, Stock and Watson (1990) and Toda and Phillips (1993) suggest that the causality tests in difference VAR's are valid. In this case, "causality tests in difference VAR's are likely to have higher power in finite samples (Toda and Phillips, 1993; p. 1377). This method requires that the variables in the equation to test Granger causality should be used in first difference. The presence or absence of causal relationship and the direction of causality can be traced by regressing alternative specification with one having ΔBD as the dependent variable and the other with ΔCAD as the dependent variable. We use this method for our sample of five developed and one developing country where data does not support the cointegration between the two variables.

If the system is cointegrated then testing the Granger causality within an error-correction model (ECM) is most commonly used procedure. However, due to limited number of observations, using VECM in this analysis may have a low power of the test. Toda and Yamamoto (1995) propose a simple and

[13] These results are consistent with Laney (1986), table 1.

interesting procedure that require the determination of the true lag length of the model and impose restrictions on the parameters of VAR models without pretests for a unit root and a cointegrating rank[14]. However, they argue that this procedure is more suitable when underlying economic model can not determine the cointegrating relationship with certainty or it is not of interest.

Toda and Phillips (1993; p. 1375), however, suggest that if the system has one cointegrating vector, usual *F*-test may be valid to test Granger causality. Since our system is bi-variate, there exist only one cointegrating vector. Therefore, we use *F*-test for our sample of four developing countries and test Granger causality in levels.

Another important point in testing Granger causality is that the order of lag (k) must be determined. This is commonly done by setting arbitrary lags or by applying an order estimation criterion such as Akaike's. However, in this exercise, the numbers of lags are added until the residuals from the regression are non-autocorrelated. This is achieved by observing the LM statistics (which follow a χ^2-distribution) for first and up to fourth order autocorrelation in the residuals.

The results of causality tests are summarized in Table 4. Scenario A reports the results for the sample countries where BD and CAD are not cointegrated, while scenario B reports the results for the sample of countries where the two series are cointegrated. For the sample of developed countries, the test supports the view that rising BD has indeed caused the surge in the CAD in the US, France and Canada, while the CAD and BD are independent for UK and Australia. There is also some weak support for bi-directional causality in case of Canada.

Among developing countries, the results for India indicate two-way causality, though weak in both cases (at 10% significance level). The results for Indonesia and Pakistan show that the direction of causality runs predominantly from CAD to BD. This off-course is no surprise given the huge indebtedness of Pakistan. These results, however indicate that high budget deficits are source of current account deficits in case of Egypt and Mexico. This is somewhat surprising, given the high level of debt in case of Mexico.

Considering these results, it seems apparently clear that the BD and CAD in developed countries are either independent or run unidirectionally from BD to CAD. On the contrary, developing countries have mixed results with evidence of CAD to cause BD in Indonesia and Pakistan while BD causing CAD in Egypt and Mexico. India, however, register some weak correspondence between the two series with the causality running in both directions. Since we use annual time series data with limited number of observations, the above results should, however, be used with some caution as unit root and cointegration tests may have low power. A generalization of the above results may require relatively large sample[15].

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[14] Rambaldi and Doran (1996) also proposed MWALD test for granger non-causality in a cointegrated system.

[15] These findings are based on a very small sample. In order to test the robustness of our results, we replicate the analysis using quarterly data over the same period for developed countries. This increases the number of observations by four times. The results are no different than the findings based on annual data for the same sample of developed countries. This justifies that our analysis does not suffer with low power of the test. These results are available from the first author upon request.

Table 4. Tests of Granger causality

Country	Unidirectional BD → CAD	Reverse CAD → BD	Bi-directional BD ↔ CAD
Scenario A: BD & CAD are Non-cointegrated:			
United States	8.7419*	1.9411	–
United Kingdom	1.1972	1.6175	–
France	5.7428*	1.4479	–
Canada	3.3136*	2.8676**	(Feedback)
Australia	1.6996	0.7316	–
India	2.3558**	2.8239**	(Feedback)
Scenario A: BD & CAD are Cointegrated:			
Indonesia	0.62	5.82*	–
Pakistan	0.73	3.70*	–
Egypt	4.76*	0.95	–
Mexico	4.81*	1.79	–

Notes:
a) The equations are of the following forms:

$$Y_t = \alpha_0 + \sum_{i=1}^{k} \alpha_i X_{t-i} + \sum_{j=1}^{k} \beta_j Y_{t-j} + u_{1t} \quad \text{(unidirectional causality)}$$

$$\text{and} \quad X_t = \gamma_0 + \sum_{i=1}^{k} \gamma_i Y_{t-i} + \sum_{j=1}^{k} \delta_j X_{t-j} + u_{2t} \quad \text{(reverse causality)}$$

where x and y are first-differenced BD and CAD in Scenario A and level BD and CAD in Scenario B respectively.
b) BD → CAD stands for "BD causes CAD" and vice versa.
c) The F-statistics reported are for the joint significance of $\beta_j s$ and $\delta_j s$. The asterisks * and ** represent statistical significance at the 5% and 10% levels respectively.

4. Conclusion and policy implications

The paper has empirically examined the twin deficit argument that rising fiscal deficit has been the primary cause of the recent surge in the current account deficit in many countries. Using a sample of five developed and five developing countries, the paper has performed some econometric tests to analyze a long run equilibrium relationship between the two deficits. Our empirical results show that such secular relationship exists in four out of five developing countries, while no developed country exhibits such a relationship. While the United States experienced surging budget deficit and current account deficit in the 1980s (which set off the interest in this "twin deficit" problem), nevertheless, cointegration results show that the two deficits are not related in the long run. The results seem to suggest that a high correspondence between the two deficits in the long run is more likely to occur in the developing countries than the developed ones. These findings may be justified in view of inefficient revenue collection system, which results into high fiscal deficits and the lack of deep and sophisticated domestic capital market to finance the fiscal deficit using domestic resources in developing countries. Therefore, these countries have to rely more on external financing leading to an inevitable soar in exter-

nal balance. In addition, future servicing of debts may aggravate the deteriorating current account deficit.

Results on the Granger test of causality support the existence of a causal relationship between the current account deficit and the budget deficit. The results on the direction of causality are mixed for developing countries with evidence supporting that the current account deficits cause budget deficits for Indonesia and Pakistan while the reverse is true for Egypt and Mexico. The data does not support any causal relationship for UK and Australia and some week evidence of bi-directional causality for Canada and India. Perhaps, the former result is possible when deteriorating current account deficit lead to slower growth of national income and hence, increased budget deficit. Also, economies that are relatively more open (where trade plays a relatively more important role) will probably more likely to have its domestic developments dictated by the foreign balance to a certain extent.

Many economists have argued that the way to reduce chronic current account deficits is to raise national saving by reducing the budget deficit and increasing the rate of private saving. However, the unidirectional causal relation running from the current account deficit to budget deficit or, even possibly the bi-directional relationship between these two deficits suggests that one simply cannot just rely on curtailing federal budget deficit in an attempt to trim down current account deficit. Thus, one cannot treat the federal budget as a fully controlled policy variable. Although discretionary fiscal policy has important macroeconomic implications, one cannot ignore the budgetary implications of exogenous changes in foreign trade variables.

We believe that a real solution to the problem of fiscal deficits and current account imbalances lies with a coherent package consisting of both fiscal and monetary policies. Policy measures focusing on productivity improvement, exchange rate and monetary stance will complement the budget-cut policy. It must be iterated again that the problem of ''twin deficits'' is truly an empirical one, and the number of countries selected here certainly cannot lead one to a generalization of results. However, the results obtained in this exercise do satisfy the *a priori* conjecture that it is more likely for the developing countries to show high correspondence between the two deficits. One major limitation of this research is the non-availability of more frequent data. This exercise may be replicated later if such data is available. This will help to improve the power of our tests. Possible extension to this research could consider using a model that includes other variables such as private saving and investment, exchange rate and interest rate to depict the twin deficit relationship. Given sufficient data availability, one may also analyze the correlation between savings and investment.

Although, we have used a relatively simple approach to analyze the issue of twin deficits as compared to more sophisticated models developed and analyzed by other researchers, the findings of this paper are consistent with earlier research. Moreover, the paper has brought evidence from a sample of developing countries on the twin deficit relationship as well as the direction of causality. These are interesting features of this paper.

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