TWIN DEFICITS HYPOTHESIS IN SEACEN COUNTRIES: A PANEL DATA ANALYSIS OF RELATIONSHIPS BETWEEN PUBLIC BUDGET AND CURRENT ACCOUNT DEFICITS

LAU, Evan*
BAHARUMSHAH, Ahmad Zubaidi

Abstract
In this paper, the twin deficits hypothesis was examined using the panel data of nine SEACEN countries. Empirical results provide evidence to support the view that Asian budget deficit causes current account deficit directly as well as indirectly. From policy perspectives, the statistical analysis suggests that managing budget deficit offers scope for improvement in the current account deficit. However, this finding does not support the policy of manipulating the intermediate variables to reduce the twin deficits to a sustainable level since these variables appear to be endogenous in the system.

JEL classification: C23, C51, H60, H62, F32
Keywords: Twin Deficits, Vicious or Virtuous Circle, Panel Analysis, SEACEN Countries

1. Introduction

Most observers consider large and persistent current account deficits to be the cause of macroeconomic imbalances that have important implications on long-term economic progress. Numerous researchers have explored the possible long-run (positive) link between budget and current account deficits. The so-called 'twin deficits hypothesis' that emerged in the 1980s marked a period of strong appreciation of the dollar and an unusual shift in current account as well as fiscal deficits, not in favor of the US. This close connection between current and budget deficits is not unique to the US. Countries in Europe (e.g. Germany and Sweden) faced similar problems in the early part of the 1990s where the rise in budget deficits was accompanied by a real appreciation of their national currencies that adversely affected the current accounts (see Ibrahim and Kumah, 1996). Developing economies have also experienced the simultaneous upsurge of budget and current account deficits (Laney, 1984; Anoruo and Ramchander, 1998 and Khalid and Teo, 1999). In fact, writers like Laney (1984) noted that the unsustainable budget (debts) in the early 1980s had widened the current account deficits and went on to say that the relationship between these two variables is much stronger in the developing countries.[1]

* Dr Evan Lau, Faculty of Economics and Business, Universiti Malaysia Sarawak, Email: lphevan@feb.unimas.my and Ahmad Zubaidi Baharumshah is Professor of Economics, Department of Economics, Faculty of Economics and Management, Universiti Putra, Malaysia. E-mail: zubaidi@putra.upm.edu.my .
Acknowledged the financial supportfrom UNIMAS fundamental grant 03(72)/546/05(45). All remaining flaws arethe responsibility of the authors.
[1] For instance, Latin America countries (Mexico, Brazil, Venezuela and Argentina) went through an international debt crisis. The high debts obligation was due to the oil price shocks of the 1970s leading to inflationary import prices, which in turn led to serious balance of payments problems.

The emergence of the current account and budget deficits phenomenon in many of the countries has drawn increasing attention to the problem of twin deficits.

A review of the literature in the last two decades suggests the following: first, it highlights the importance of financial variables such as interest rate and exchange rate in the budget-current account deficit nexus. Most of the earlier studies have ignored the role of these two financial variables in bridging the link between the two deficits. Second, unlike the debt crises of the 1980s that was driven by a budget deficit, the 1994 Mexican and the 1997-98 East Asian crises were due to imbalances in the current account. Third, the body of evidence has not yielded a consensus on the causal relationship between the two deficits. In our view this is important, as it will determine the source of the problem and provide the right policy mix to address the issue of external imbalances in the developing countries. Motivated by the work of McCoskey and Kao (1999) and the emergence of the twin deficits phenomenon in many countries in the last decade, this paper first attempts to provide an in-depth analysis of the twin deficits for a panel of South East Asian Central Banks countries (SEACEN: Malaysia, Singapore, Thailand, Indonesia, South Korea, Myanmar, Nepal, Sri Lanka and the Philippines). The second objective of this paper is to trace the causality pattern through which fiscal budget affects current account deficit.

The plan of the paper is as follows. Section 2 describes the theoretical paradigms and the relevant literature in the research area. Section 3 briefly discussed the panel-based testing procedure and the data utilized. The empirical results are reported in Section 4. Finally, Section 5 contains concluding remarks and policy stance.

2. Theory and Previous Empirical Debate

The theoretical explanation for the twin deficits hypothesis is based on the well-known Mundell-Fleming framework. According to this model, an increase in budget deficit induces upward pressure on interest rates that in turn trigger capital inflows and appreciation of the exchange rate. Ultimately, the appreciation of the domestic currency will lead to an increase in current account deficit. Private saving remains the same as the public perceived the government bond issue to finance deficit as increasing their wealth. The response of domestic investment and current account deficit to a large extent depends on capital mobility. In the case when capital is highly mobile, domestic interest rate is unresponsive (inelastic) to fiscal shock. Hence, there no crowding-out effect on domestic investment as foreign capital will quickly offset the fall in domestic investment. Capital inflow in turn puts upward pressure on exchange rate through either a rising nominal exchange rate in the case of a fixed exchange rate regime or rising prices under a flexible exchange rate system. Therefore, the conventional Mundell-Fleming model predicts a positive relationship between the two deficits.

Beside the Mundell-Fleming framework, there is the Keynesian absorption theory that links the two deficits. According to the absorption theory, an increase in budget deficit would increase domestic absorption and hence imports, and the expansion of imports leads to the worsening of the current account deficit. Hence, like the Mundell-Fleming model, the Keynesian suggests that the causal relationship between the two variable runs from budget deficit to current account deficit and not the other way round.

At the other end of the spectrum of the twin deficit debate is the Ricardian Equivalence Hypothesis (REH). The REH proposed by Barro (1974) suggests that the public anticipate future increase in taxes. Knowing that their future disposable income will be reduced because of the impending increase in taxes, households reduce their consumption spending and raise savings to smooth out the expected reduction in income. Thus, there is no effect on national savings, investment, and current account deficit following a budget deficit Turning to the empirics, the evidence so far does not provide a clear consensus on the debate. Researchers like Hutchison and Pigott (1984), Bachman (1992), Ibrahim and Kumah (1996), Vamvoukas (1999), Piersanti (2000) and Leachman and Francis (2002) found support for the conventional view that a worsening budget deficit stimulates an increase in current account deficit. In contrast, the empirical evidence in Miller and Russek (1989), Rahman and Mishra (1992), Evans and Hasan (1994), Wheeler (1999) and Kaufmann *et al.* (2002) offer support for REH.

Literature on the twin deficits issue has mainly centered on two major theoretical paradigms. However, as pointed out by Darrat (1988) and Abell (1990) these are not the two possible outcomes between the two deficits.[2] A high correlation between the two deficits is also consistent with two other competing hypotheses: namely (1) two variables are mutually dependent (see, Darrat, 1988; Kearney and Monadjemi, 1990; Normandin, 1999 and Hatemi and Shukur, 2002) and (2) the causality runs from current account deficit to budget deficit termed as 'current account targeting' (Summers, 1988; Biswas *et al.*, 1992; Anoruo and Ramchander, 1998; Khalid and Teo, 1999 and Alkswani, 2000). According to them, this will occur if the government of a country utilized their budget (fiscal) stance to target the current account balance. The discussion provided above suggests that the link between budget and current account deficits is indeed an empirical issue.

3. Methodology and Data

The nature of the twin deficits phenomenon allows for the adoption of the cointegration and nonstationarity data analysis. In this section, a brief discussion on the methodology – the panel unit root, panel cointegration and the Granger causality tests conducted in the environment of dynamic OLS (DOLS) panel VAR framework – are provided. The last sub-section provides the data description.

3.1 Data Description, Annually time series data beginning 1980 and ending 2001 for all the nine SEACEN countries were utilized in this paper. All data, which were not seasonally adjusted and expressed in nominal terms, were obtained from several issues of *SEACEN Financial Statistics* (SFS). The variables employed in the study are the current account deficit (CAD), the budget deficit (BD), the nominal exchange rate (EXC) denominated in US dollar and short term interest rate (IR). While conducting the panel-

[2] These authors went on to argue that in a bi-directional relationship, budget cut in isolation will not be effective to resolve a current account deficit dilemma. In fact, complementary options such as interest rate policy, exchange rate policy, trade policy with a budget cut are better options.

based procedure, we build upon a panel of four-dimensional variables with nine countries. In this sense, each of the variables, for instance CAD would have 198 observations (t=22, n=9) where t is the number of time series and n is the cross sectional units (countries). Both the CAD and BD are expressed as a ratio of the nominal gross domestic product (GDP). For most countries, the CAD and BD are expressed in domestic currency. For consistency in the panel, all the variables are expressed in US dollars.

3.2 Panel Unit Root Test. The first step in the estimation of dynamic panels is to test whether the variables at hand contain unit roots. To this end, we applied the mean group approach of t-bar test of Im *et al*. (1997, 2003, IPS). The IPS test allows for the heterogeneity of dynamics and error variances across groups in the panel, which has superior power performance than the competing tests of ADF (single equation unit root procedure) and that of Levin and Lin's (1993, LL) panel raw unit root test (see also Levin *et al.*, 2002). The IPS evaluates the null hypothesis as H_0: $b_i = 0$ for all i, against the alternative that all the series are stationary, H_1: $b_i < 0$ for all i. In short, the test statistics of t-bar are given as

$$\Gamma_{\bar{t}} = \frac{\sqrt{N}\{\bar{t}_{NT} - E(t_T \mid b_i = 0)}{\sqrt{Var(t_T \mid b_i = 0)}} \Rightarrow \text{N}(0,1) \qquad (1)$$

where $\bar{t}_{\text{NT}} = \frac{1}{N}\sum_{i=1}^{N} t_{iT}$ such that $\bar{t}_{\text{NT}}$ is the average augmented Dickey-Fuller (ADF) t-statistics for individual countries. The terms $E\ (t_T \mid b_i = 0)$ and $Var\ (t_T \mid b_i = 0)$ are the finite common mean and variance of the individual ADF statistics $t_{iT,}$ tabulated in IPS. The test statistics converge to the standard normal distribution as T (time periods dimension) and N (cross-sectional dimension of the panel) tend to infinity and N/T tends to zero under the null hypothesis of unit roots, $b_i = 0$, $i=1,2\ldots N$.

3.3 Panel Cointegration. If the relevant variables in the panel are nonstationary, the system can be tested for cointegration. Pedroni (1997, 1999) developed a number of statistics based on the residuals of the cointegrating regression. This system allows different individual effects across N or the cross-sectional interdependency. In particular, Pedroni's test is based on the null hypothesis of no cointegration versus the alternative hypothesis that suggests that the variables in the multi-country setting form a cointegrating relationship. Assuming a panel of N countries each with m regressors (X_m) and T time observations, generally the long run model may take the form

$$Y_{i,t} = a_i + f_i t + h_{1i}X_{1i,t} + h_{2i}X_{2i,t} + \ldots + h_{Mi}X_{Mi,t} + e_{i,t} \qquad (2)$$
$$\text{for } t=1,\ldots,T;\ i=1,\ldots,N;\ m=1,\ldots,M$$

Equation (2) implies that all coefficients, and hence the cointegrating vector, vary across countries thus permitting full heterogeneity (h_i) and fixed effects (a_i). In addition, for some applications, we may also wish to include deterministic time trends which are specific to individual members of the panel and are captured by the term $f_i t$, although it will often be the case that we choose to omit these $f_i t$. Based on the cointegrating

residuals, $e_{i,t}$, Pedroni (1997, 1999) developed seven panel cointegration statistics for testing the null hypothesis of no cointegration.[3] Panel n-Statistic, Panel r-Statistics, Panel t-Statistic (non-parametric) and Panel t-Statistic (parametric) are commonly referred to as within-dimension or panel cointegration test. The remaining three test statistics, the Group r-Statistics, the Group Panel t-Statistic (non-parametric) and the Group t-Statistic (parametric) are based on pooling along what is commonly referred to as between-dimension or group mean panel statistics. Specifically, the within-dimension statistics are constructed by summing up both the numerator and the denominator terms over the N dimension separately, whereas the between-dimension statistics are constructed by first dividing the numerator by the denominator prior to summing up over the N dimension.

For the within-dimension statistics, the test for the null hypothesis of no cointegration is implemented as a residual based test of $H_0: g_I = 1$ for all i, versus the alternative hypothesis $H_1: g_I = g < 1$ for all i, so that it presumes a common value for $g_I = g$. In contrast, for the between-dimension statistics the null hypothesis of no cointegration is implemented as a residual based test of the null hypothesis $H_0: g_I = 1$ for all i, versus the alternative hypothesis $H_1: g_I < 1$ for all i. Here it does not presume a common value for $g_I = g$ under the alternative hypothesis which implies that the within dimension based statistics allow one to model an additional source of potential heterogeneity across individual members of the panel. Pedroni (1999) shows that under appropriate standardization based on the moments of vector of Brownian motion function, each of these statistics converges weakly to a standard normal distribution when both the T and N of the panel grow large. The standardized distributions for the above mentioned seven panel and group statistics can be expressed in the form of

$$\frac{e_{N,T} - m\sqrt{N}}{\sqrt{n}} \Rightarrow N(0,1) \qquad (3)$$

where e_{NT} is the respective panel/group cointegration statistic and m and n are the expected mean and variance of the corresponding statistics. They are computed by Monte Carlo stochastic simulations and tabulated in Pedroni (1999, Table 2).

4.3 Granger Causality (DOLS Panel VAR Estimator). Once the null hypothesis of no cointegration has been rejected, the coefficients of the long run relationships can be estimated using the Kao and Chiang (2000) dynamic ordinary least square (DOLS) method based on the Stock and Watson (1993) estimator for time series. Intuitively, the DOLS procedure involves running the following regression of

$$CAD_{i,t} = a_i + b_1 BD_{i,t} + b_2 IR_{i,t} + b_3 EXC_{i,t} + \sum_{j=-q}^{q} c^1{}_{ij} \Delta BD_{i,t+j} + \sum_{j=-q}^{q} c^2{}_{ij} \Delta IR_{i,t+j} + \sum_{j=-q}^{q} c^3{}_{ij} \Delta EXC_{i,t+j} + e_{it} \qquad (4)$$

[3] For detailed description of the mathematical formulae for the seven panel cointegration statistics, one could refer to Pedroni (1999, Table 1).

where $t = 1,...,T$ and $i = 1,...,N$. Equation (4) includes the leads and lags of $\Delta BD_{i,t}$, $\Delta IR_{i,t}$ and $\Delta EXC_{i,t}$ in the cointegrating regressions in order to produce asymptotically unbiased estimators and to avoid the problem of estimating nuisance parameters. However, our key interest in this study is to determine the causal relationship existing between the current account deficit and its determinants. In order to establish the causal linkages between CAD, BD, IR, EXC, we built the four-dimensional panel vector autoregressive (VAR) system upon the DOLS framework.

The empirical model is given by

$$\begin{pmatrix} CAD_{it} \\ BD_{it} \\ IR_{it} \\ EXC_{it} \end{pmatrix} = \begin{pmatrix} a_{1it} \\ a_{2it} \\ a_{3it} \\ a_{4it} \end{pmatrix} + \begin{pmatrix} 0 & b_{12}^{(1)} & b_{13}^{(1)} & b_{14}^{(1)} \\ b_{21}^{(1)} & 0 & b_{23}^{(1)} & b_{24}^{(1)} \\ b_{31}^{(1)} & b_{32}^{(1)} & 0 & b_{34}^{(1)} \\ b_{41}^{(1)} & b_{42}^{(1)} & b_{43}^{(1)} & 0 \end{pmatrix} \begin{pmatrix} CAD_{it} \\ BD_{it} \\ IR_{it} \\ EXC_{it} \end{pmatrix} + \begin{pmatrix} j_{11}^{(1)} & j_{12}^{(1)} & j_{13}^{(1)} & j_{14}^{(1)} \\ j_{21}^{(1)} & j_{22}^{(1)} & j_{23}^{(1)} & j_{24}^{(1)} \\ j_{31}^{(1)} & j_{32}^{(1)} & j_{33}^{(1)} & j_{34}^{(1)} \\ j_{41}^{(1)} & j_{42}^{(1)} & j_{43}^{(1)} & j_{44}^{(1)} \end{pmatrix} \begin{pmatrix} \Delta CAD_{it-1} \\ \Delta BD_{it-1} \\ \Delta IR_{it-1} \\ \Delta EXC_{it-1} \end{pmatrix} + \ldots$$

$$+ \begin{pmatrix} j_{11}^{(q)} & j_{12}^{(q)} & j_{13}^{(q)} & j_{14}^{(q)} \\ j_{21}^{(q)} & j_{22}^{(q)} & j_{23}^{(q)} & j_{24}^{(q)} \\ j_{31}^{(q)} & j_{32}^{(q)} & j_{33}^{(q)} & j_{34}^{(q)} \\ j_{41}^{(q)} & j_{42}^{(q)} & j_{43}^{(q)} & j_{44}^{(q)} \end{pmatrix} \begin{pmatrix} \Delta CAD_{it-q} \\ \Delta BD_{it-q} \\ \Delta IR_{it-q} \\ \Delta EXC_{it-q} \end{pmatrix} + \begin{pmatrix} d_{11}^{(1)} & d_{12}^{(1)} & d_{13}^{(1)} & d_{14}^{(1)} \\ d_{21}^{(1)} & d_{22}^{(1)} & d_{23}^{(1)} & d_{24}^{(1)} \\ d_{31}^{(1)} & d_{32}^{(1)} & d_{33}^{(1)} & d_{34}^{(1)} \\ d_{41}^{(1)} & d_{42}^{(1)} & d_{43}^{(1)} & d_{44}^{(1)} \end{pmatrix} \begin{pmatrix} \Delta CAD_{it+1} \\ \Delta BD_{it+1} \\ \Delta IR_{it+1} \\ \Delta EXC_{it+1} \end{pmatrix} + \ldots$$

$$+ \begin{pmatrix} d_{11}^{(q)} & d_{12}^{(q)} & d_{13}^{(q)} & d_{14}^{(q)} \\ d_{21}^{(q)} & d_{22}^{(q)} & d_{23}^{(q)} & d_{24}^{(q)} \\ d_{31}^{(q)} & d_{32}^{(q)} & d_{33}^{(q)} & d_{34}^{(q)} \\ d_{41}^{(q)} & d_{42}^{(q)} & d_{43}^{(q)} & d_{44}^{(q)} \end{pmatrix} \begin{pmatrix} \Delta CAD_{it+q} \\ \Delta BD_{it+q} \\ \Delta IR_{it+q} \\ \Delta EXC_{it+q} \end{pmatrix} \qquad (5)$$

To test whether BD does not Granger cause movement in CAD, the null hypothesis H_0: $b_{12}^{(1)} = j_{12}^{(1)} = j_{12}^{(2)} = ... = j_{12}^{(q)} = d_{12}^{(1)} = d_{12}^{(2)} = ... = d_{12}^{(q)} = 0$ was tested against the alternative of Granger causality. The Wald test was employed to establish the long run causality between these variables, which followed c^2 distribution with p degree of freedom. Moreover, the twin deficits phenomenon is a long run behavioral relationship that requires methodologies for estimating long run equilibria. Thus, the application of the dynamic panel VAR Granger causality method is suitable for permitting the estimation of long run equilibrium states in establishing the direction of the causality.

4. Empirical Results

4.1 IPS Unit Root Test. To identify possible unit roots, the IPS test was performed on levels and then on first differences. The results summarized in Table 1 unanimously show that using panel data, we can reject the null hypothesis of nonstationarity at the 5 percent significance level when estimating the first differences. These results indicate that all the

series are stationary in the first difference or all the series are generated by an *I(1)* process when the individual country data are pooled together.

Table 1: IPS Panel Unit Root Test

Variables	IPS $\bar{t}$ statistics	
	Without trend	With trend
	Level	
CA	-0.668 (0.252)	-1.229 (0.110)
BD	-0.203 (0.419)	-0.281 (0.389)
IR	-0.685 (0.246)	-0.403 (0.344)
EXC	-0.161 (0.436)	-0.131 (0.447)
	First Difference	
ΔCA	-11.405 (0.000)	-10.653 (0.000)
ΔBD	-7.082 (0.000)	-6.037 (0.000)
ΔIR	-8.414 (0.000)	-6.588 (0.000)
ΔEXC	-5.007 (0.000)	-3.245 (0.001)

Notes: IPS indicates the Im *et al*. (1997, 2003) test. The critical values are taken from IPS (1997) Table 4. CA, BD, IR and EXC are defined in the main text. The estimates of the $\bar{t}$ statistics are based on the normal ADF statistics. The parenthesized values are the probability of rejection while Δ denotes the first difference operator.

4.2 Pedroni Test. On determination of the presence of unit root in the variables, we proceeded to the panel cointegration tests. From the cointegration results in Table 2, we found strong evidence to reject the null hypothesis of no cointegration for five out of the seven statistics provided by Pedroni (1999). Rejecting the null hypothesis of no cointegration between the *I(1)* series in the panel implies that the four variables do not drift apart in the long run steady state relationship. More importantly, the results indicate the benefits of using pooled panel data from which more variability can be exploited from the cross-sectional information. Despite the disparities in the individual countries, we found CAD, BD, IR and EXC are cointegrated in the multi-country setting.

Table 2: Pedroni (1999) Cointegration Test for Heterogeneous Panels

Test Statistics	
Panel cointegration statistics (within-dimension)	
Panel v-statistic	3.096
Panel ρ-statistic	-0.983
Panel pp-statistic	-3.596
Panel adf-statistic	-3.428
Group mean panel cointegration statistics (between-dimension)	
Group ρ-statistic	-0.284
Group pp-statistic	-4.396
Group adf-statistic	-4.762

Notes: (a) The number of lag truncations used in the calculation of the seven Pedroni statistics is 3. The 5 percent critical value is –1.645 since the residual based test is the one-tailed test. Hence, large negative values (left tail) imply the rejection of the null hypothesis of no cointegration. One

exception is the panel v-statistics which diverge to positive infinity (right tail) that requires a large positive value (larger than 1.645) to reject the null of no cointegration. The critical values for mean and variance of each statistic were obtained from Pedroni (1999, Table 2). All the estimations and the calculation of the panel cointegration statistics were carried out in in RATS 5.02 using the algorithm kindly provided by Pedroni. (b) *Panel v* is a non-parametric variance ratio statistic; *panel r* and the *panel pp* are analogous to the non-parametric Phillips-Perron ρ and t-statistics respectively; *panel adf* is the parametric statistic based on the Augmented Dickey-Fuller ADF statistic; *group r* and *group pp* are the non-parametric Phillips-Perron ρ and t-statistics while *group adf* is the standard parametric ADF statistic.

4.3 Dynamic Panel VAR Granger Causality, Given the fact that all the series under investigation are cointegrated, Equation (5) was estimated using the DOLS method adopted from Kao and Chiang (2000). The main interest of the whole exercise is to establish the causal linkages among the four-dimensional systems provided in Equation (5). The empirical results portrayed in Table 3 suggest that the null hypothesis that budget deficit does not cause current account deficit is easily rejected at the 5 percent significance level. Moreover, the Wald test reveals bi-directional causal relations between the two variables. This suggests that internal deficit is not the prime cause of the external deficit and it is seen that the reverse causation running from external to internal deficits is much stronger in terms of significance. This tallies with the earlier works by Anoruo and Ramchander (1998) and Khalid and Teo (1999) based on the experiences of the developing countries. Indeed, Khalid and Teo (1999) noted that a high connection between the two deficits is more likely to occur in the developing rather than the developed economies. This finding appears to be at odds with the conventional view which emphasizes that the causal relationship runs from budget deficit to current account deficit and not vice versa.

Table 3: Dynamic Panel VAR Granger Causality Results

Dependent	ΔCAD	ΔBD	ΔIR	ΔEX
Variable	WALD (χ^2-statistics)			
CAD	-	17.344 (0.004)	5.404 (0.611)	14.488 (0.013)
BD	25.854 (0.000)	-	11.106 (0.134)	8.345 (0.138)
IR	5.903 (0.316)	26.063 (0.000)	-	6.035 (0.535)
EXC	3.462 (0.629)	7.566 (0.372)	26.796 (0.000)	-

Notes: Parenthesized values are the probability of rejection of Granger non-causality. Estimations are based on the pooled data for 1980-2001 and 9 countries (N=9, T=22) with three lead and three lags of first differenced explanatory variables.

The endogeneity of two deficit variables warrants an investigation into the indirect causality that may exist in the twin deficits phenomenon. This is important as it allows for the mapping of the role of the causing variables (interest and exchange rates) as well as the indirect causal relationship in the twin deficits hypothesis. Specifically, the causal chain that runs from budget deficits to interest rate, to capital flows, to exchange rate and finally to the current account deficit (BD→IR→EX→ CAD) (see Volcker, 1984; Abell,

1990). Table 3 reports that budget deficit Granger causes current account deficit by operating through the channel of exchange rate and interest rate. Earlier, the bi-directional causality existing among the two deficits was detected. As a matter of fact, these causal movements complete the whole story of the twin deficits debate.

4.4 Further Evidence. Despite the short life span of the annual observations, we also tested the interplay between current account balance and fiscal balance using the country-specific setting. We adopted the Toda and Yamamoto (1995) that allow for causal inference to be conducted in the level VARs that may contain integrated and (non-) cointegrated processes.[4] The results, shown in Table 4 support the findings of bi-directional causality in the panel VAR setting. Specifically, bi-directional causality (BD↔CAD) existed in six out of nine countries under investigation (see Table 4).

For the remaining countries, two support the conventional twin deficits hypothesis (BD→ CAD) while Myanmar follows Summer's proposition of current account targeting (BD← CAD). To ensure the robustness of the results, the causality test was re-run with d=2. The results are not presented here but the key point to emphasis is that they are quantitatively similar to those presented in Table 4. We re-estimated the four-dimensional panel VAR system using the DOLS framework by including the six bi-directional countries in the system while dropping the other three countries. The purpose is to show how robust our results are to the exclusion of the three countries (Myanmar, Singapore and South Korea) in the panel VAR system reported in Table 3. The results of the causality tests, which are available upon request, do not change the causal inference reported earlier in Table 3. These causal linkages among BD→IR→EX→ CAD are summarized in Figure 1.

To sum up, we found that statistical evidence supports the indirect relationship between the two deficits as suggested in Volcker (1984) and Abell (1990) but our empirical regularities differ in the following ways. First, we found that the causal relationship between budget and current account deficits works through two channels: one directly between budget deficit and current account deficit and the other through interest rate and exchange rate. Second, our results suggest that the continuous processes correspond to the conjecture of the 'vicious or virtuous circle' phenomena since a feedback relationship exists between the twin deficits.

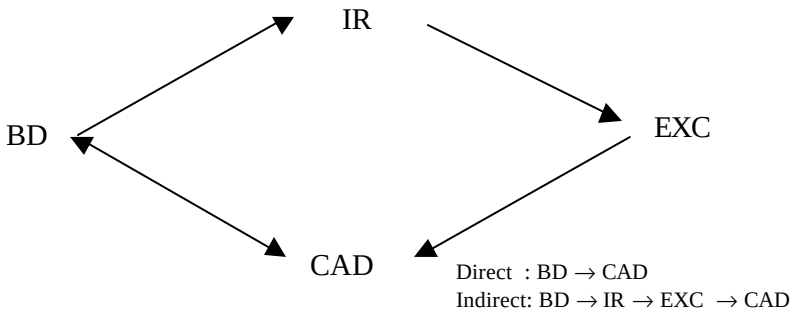
[4] It is proven that in the integrated and (non-) cointegrated system, the MWALD test for restrictions on the parameters of a VAR(k) has an asymptotic c^2 distribution when a VAR ($p= k + d_{max}$) is estimated, where d_{max} is the maximum order of integration suspected to occur in the system and k is the lag length selected for the estimation. Furthermore, this procedure imposes (non-) linear restrictions on the parameters of VARs models without pretest for unit root and cointegrating rank and the MWALD test statistics could be easily computed using the Seemingly Unrelated Regression (SUR) method technique.

Table 4: MWALD Results

Null Hypothesis	Test Statistics		Conclusion
A: Indonesia (k=4 d=1)	MWALD	p-value	
BD do not Granger cause CAD	8.021	0.018	Reject Ho
CAD do not Granger cause BD	22.585	0.000	Reject Ho
B: Malaysia (k=3 d=1)			
BD do not Granger cause CAD	8.033	0.018	Reject Ho
CAD do not Granger cause BD	14.964	0.001	Reject Ho
C: Myanmar (k=5 d=1)			
BD do not Granger cause CAD	5.439	0.066	Do not Reject Ho
CAD do not Granger cause BD	10.454	0.005	Reject Ho
D: Nepal (k=5 d=1)			
BD do not Granger cause CAD	6.921	0.034	Reject Ho
CAD do not Granger cause BD	8.470	0.014	Reject Ho
E: Philippines (k=4 d=1)			
BD do not Granger cause CAD	7.268	0.026	Reject Ho
CAD do not Granger cause BD	9.268	0.010	Reject Ho
F: Singapore (k=3 d=1)			
BD do not Granger cause CAD	8.089	0.017	Reject Ho
CAD do not Granger cause BD	2.325	0.313	Do not Reject Ho
G: South Korea (k=5 d=1)			
BD do not Granger cause CAD	18.378	0.000	Reject Ho
CAD do not Granger cause BD	3.3184	0.190	Do not Reject Ho
H: Sri Lanka (k=5 d=1)			
BD do not Granger cause CAD	7.494	0.024	Reject Ho
CAD do not Granger cause BD	9.233	0.010	Reject Ho
I: Thailand (k=5 d=1)			
BD do not Granger cause CAD	13.447	0.001	Reject Ho
CAD do not Granger cause BD	15.650	0.000	Reject Ho

Note: k = optimum lag and d = maximal order of integration.

Figure 1: Direction of Causal Relationship



Note: BD → CAD implies one-way causality while BD ↔ CA indicates the bi-directional causality relationship.

5. Concluding Remarks

Most of the empirical investigation of the twin deficits hypothesis (TDH) had ignored the role of the two financial variables (interest rates and exchange rates) in bridging the link between the two deficits. This paper attempts to rectify this omission by incorporating these two variables and investigated their influence on the twin deficits nexus in the dynamic panel VAR setting. The results from the empirical model are summarized as follows. First, it finds that interest rates, exchange rates and budget deficit seem to play an important role in explaining the current account balance. Second, it finds a two-way causal relationship between budget and current account deficit and that there exist two channels in which budget deficit affects the current account: directly BD? CA and indirectly via $BD \rightarrow IR \rightarrow EX \rightarrow CA$. The bi-directional causal relationship between the two deficits is also detected in a bivariate framework for most of the SEACEN countries. Third, we showed that nominal exchange rate affects the current account of the Asian countries. These results are consistent with the conventional wisdom that the worsening of the current account in Asian countries prior to the crisis was due to the appreciation of the real exchange rates. The sharp depreciation of the Asian currencies vis-à-vis the dollar led to a large swing in the current account position of these sample countries.

From the policy perspective, the statistical analysis suggests that managing the budget deficit offers a scope for improvement in the current account deficits. However, the findings may not support the policy of manipulating the intermediate targets (interest rates and exchange rates) in bringing down the twin deficits to sustainable levels since these variables appear to be endogenous in the system. Also, export promotion may be another option that policymakers may pursue due to the "virtuous" circle impact from the export sector growth. This study also makes the case for increased government spending in response to dilemma associated with large current account deficit. This evidence maybe attributed to the fact that the governments of these countries are concerned with the deleterious economic consequences of trade imbalances on the domestic manufacturing industries (e.g. unemployment, fall in market share etc). Government aid as well as a fall in the tax revenues due to a decline in business in export sector, tends to support the causality from current account to budget deficits.

In addition, FDI is less likely than the other capital inflows, to stimulate private consumption and real appreciation problem. Frankel and Rose (1996) found that a high FDI to debt ratio is related to a low likelihood of a currency crisis for a panel of over 100 developing countries from 1977 through 1991. Why is this so? First, FDI is subjected less to sudden capital reversals and is governed by long-term profitability expectations. Second, FDI is likely to produce positive external spillovers. Third, in the absence of the financial sector and foreign exchange distortion, FDI can improve current account balance by accelerating growth and national savings (Fry, 1996). The intuition is straightforward: high rates of growth (for example 6-8%) may help to diminish the debt burden and the economy can easily grow itself out of the debt problem.

References

Abell, J. D. (1990) 'Twin Deficits during the 1980s: An Empirical Investigation,' *Journal of Macroeconomics*, vol. 12, pp. 81-96.

Alkswani, M. A. (2000) 'The Twin Deficits Phenomenon in Petroleum Economy: Evidence from Saudi Arabia, Presented at the Seventh Annual Conference', Economic Research Forum (ERF), 26-29 October, Amman, Jordan.

Anoruo, E. and Ramchander, S. (1998) 'Current Account and Fiscal Deficits: Evidence from Five Developing Economies of Asia,' *Journal of Asian Economics*, vol. 9, pp. 487-501.

Barro, R. J. (1974) 'Are Government Bonds Net Wealth?,' *Journal of Political Economy*, vol. 82, pp. 1095-1117.

Biswas, B., Tribedy, G. and Saunders, P. (1992) 'Further Analysis of the Twin Deficits,' *Contemporary Policy Issues*, vol. 10, pp. 104-108.

Darrat, A. F. (1988) 'Have Large Budget Deficits Caused Rising Trade Deficits?,' *Southern Economic Journal*, vol. 54, pp. 879-886.

Evans P. and Hasan I. (1994) 'Are Consumers Ricardian? Evidence for Canada,' *Quarterly Review of Economics and Finance*, vol. 34, pp. 25-40.

Frankel, J. and Rose, A. K. (1996) 'Currency Crash in Emerging Markets: Empirical Indicators', National Bureau of Economic Research (NBER), Working Paper No. 5437.

Fry, M. (1996) 'How Foreign Direct Investment in Pacific Asia Improves the Current Account,' *Journal of Asian Economics*, vol. 7, pp. 459-486.

Ibrahim, S. B. and Kumah, F. Y. (1996) 'Comovements in Budget Deficits, Money, Interest Rate, Exchange Rate and the Current Account Balance: Some Empirical Evidence,' *Applied Economics*, vol. 28, pp. 117-130.

Im, K. S., Pesaran, M. H. and Shin, Y. (1997) 'Testing for Unit Roots in Heterogeneous Panels Working Paper,' University of Cambridge.

Im, K. S., Pesaran, M. H. and Shin, Y. (2003) 'Testing for Unit Roots in Heterogeneous Panels,' *Journal of Econometrics*, vol. 115, pp. 53-74.

Kao, C. and Chiang, M.H. (2000) 'On the Estimation and Inference of a Cointegrated Regression in Panel Data,' in B. Baltagi, T. B. Fomby and R. C. Hill (Ed) *Advances in Econometrics: Nonstationary Panels, Cointegration in Panels and Dynamics Panels*, vol: 15, pp. 179-222.

Kaufmann, S., Scharler, J. and Winckler, G. (2002) 'The Austrian Current Account Deficit: Driven by Twin Deficits or by Intertemporal Expenditure Allocation?,' *Empirical Economics*, 27, pp. 529-542.Kearney, C. and Monadjemi, M. (1990) 'Fiscal Policy and Current Account Performance: International Evidence of Twin Deficits,' *Journal of Macroeconomics*, vol. 12, pp. 197-219.

Khalid, A.M. and Teo, W. G. (1999) 'Causality Tests of Budget and Current Account Deficits: Cross-Country Comparisons,' *Empirical Economics*, vol. 24, pp. 389-402.

Laney, L. (1984) 'The Strong Dollar, the Current Account and Federal Deficits: Cause and Effect,' Federal Reserve Bank of Dallas, *Economic Review*, January, pp. 1-14.

Leachman, L. L. and Francis, B. (2002) 'Twin Deficits: Apparition or Reality?,' *Applied Economics*, vol. 34, pp. 1121-1132.

Levin, A. and Lin, C. F. (1993) 'Unit Root Tests in Panel Data: New Results,' University of California at San Diego (UCSD) Discussion Paper No. 56.

Levin, A., Lin, C. F. and Chu, C. S. J. (2002) 'Unit Root Tests in Panel Data: Asymptotic and Finite Sample Properties,' *Journal of Econometrics*, vol. 108, pp. 1-24.

McCoskey, S. and Kao, C. (1999) 'Comparing Panel Data Cointegration Tests with an Application of the Twin Deficits Problem,' Working Paper, Center for Policy Research, Syracuse University, New York.

Miller, S. M. and Russek, F. S. (1989) 'Are the Twin Deficits Really Related?,' *Contemporary Policy Issues*, vol. 7, pp. 91-115.

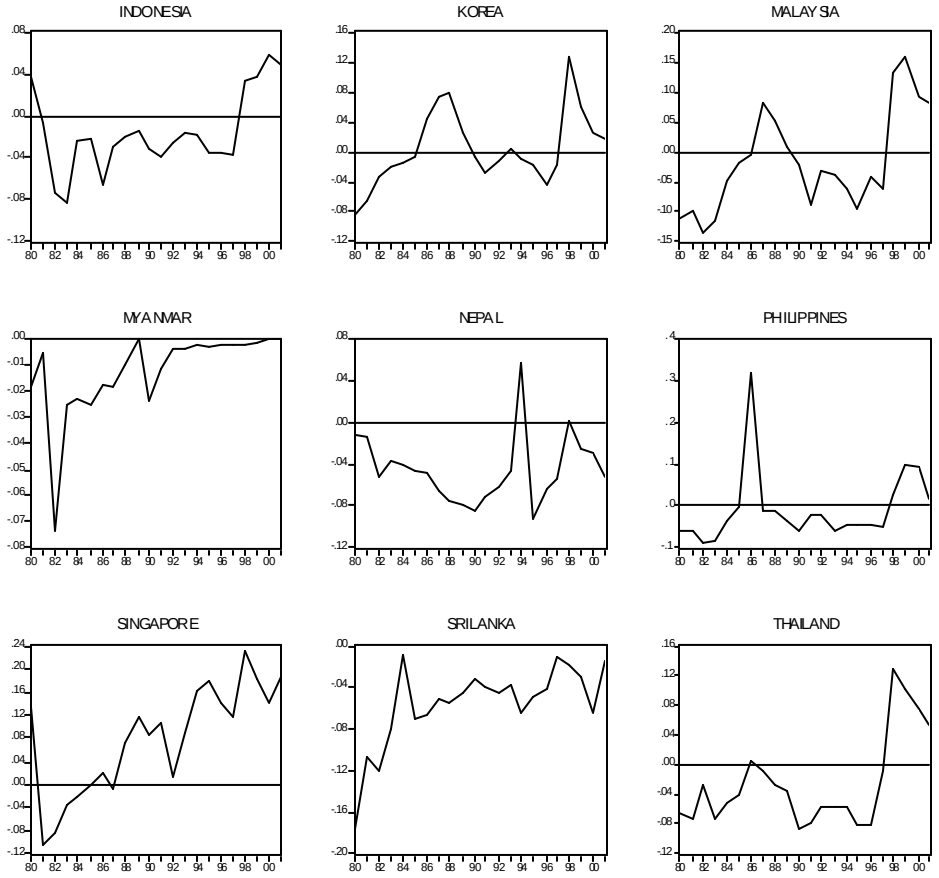
Normandin, M. (1999) 'Budget Deficit Persistence and the Twin Deficits Hypothesis,' *Journal of International Economics*, vol. 49, pp. 171-193.

Pedroni, P. (1997) 'Panel Cointegration, Asymptotic and Finite Sample Properties of Pooled Time Series Tests with an Application to the PPP Hypothesis: New Results,' Indiana University Working Paper in Economics.

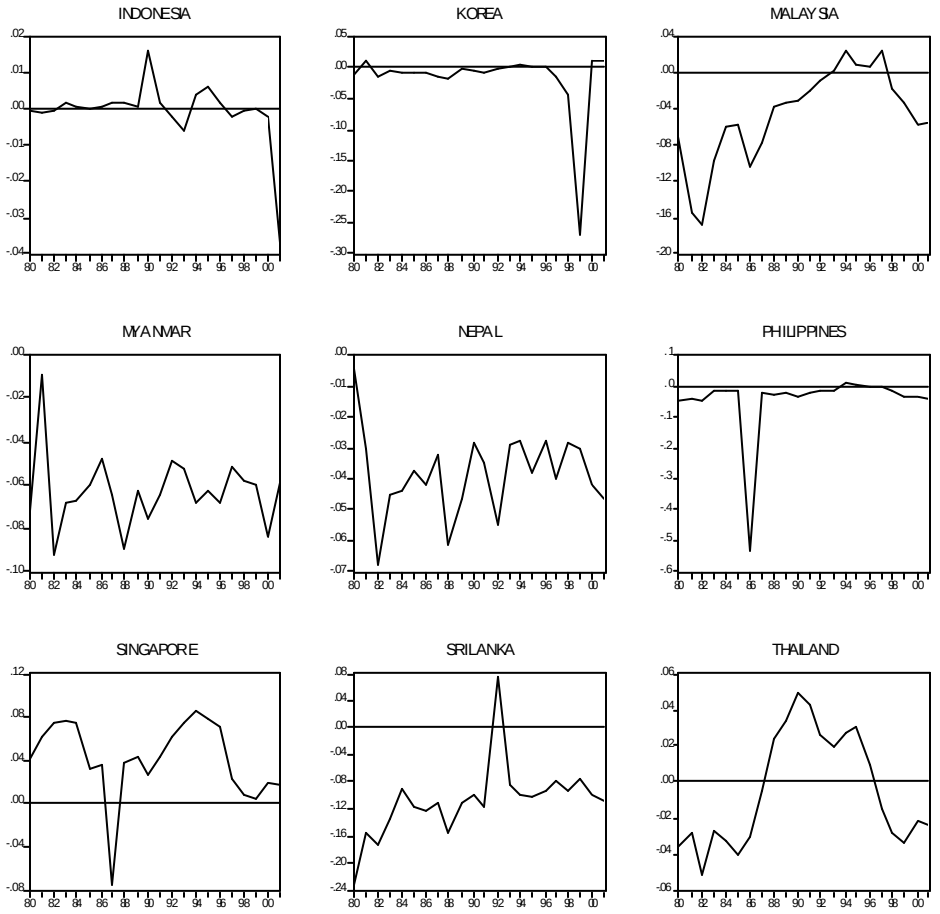
Pedroni, P. (1999) 'Critical Values for Cointegration Tests in Heterogeneous Panels with Multiple Regressors,' *Oxford Bulletin of Economics and Statistics*, vol. 61, pp. 653-670.
Piersanti, G. (2000) 'Current Account Dynamics and Expected Future Budget Deficits: Some International Evidence,' *Journal of International Money and Finance*, vol. 19, pp. 255-171.
Rahman, M. and Mishra, B. (1992) 'Cointegration of US Budget and Current Account Deficits: Twin or Strangers?,' *Journal of Economics and Finance*, 16, pp. 119-127.
Stock, J. H. and Watson, M. W. (1993) 'A Simple Estimator of Cointegrating Vectors in Higher Order Integrated Systems,' *Econometrica*, 61, pp. 783-820.
Summers, L. H. (1988) 'Tax Policy and International Competitiveness,' in J. Frenkel, (Ed) *International Aspects of Fiscal Policies* Chicago: Chicago UP, pp. 349-375.
Toda, H. Y. and Yamamoto, T. (1995) 'Statistical Inference in Vector Autoregressive with Possibly Integrated Processes,' *Journal of Econometric*, 66, pp. 225-250.
Vamvoukas, G. A. (1999) 'The Twin Deficits Phenomenon: Evidence from Greece,' *Applied Economics*, 31, pp. 1093-1100.
Volcker, P. A. (1984) 'Facing Up to the Twin Deficits,' *Challenge* March/April, pp. 4-9.

Annex.

CURRENT ACCOUNT PER GDP (CAGDP) FOR SEACEN COUNTRIES (1980-2001)



BUDGET POSITION PER GDP FOR SEACEN COUNTRIES (1980-2001)



Journal published by the Euro-American Association of Economic Development. http://www.usc.es/economet/eaa.htm