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Structural breaks and the twin deficits hypothesis: Evidence from East Asian countries

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Abstract

In this paper, we examine the relevance of the twin deficits hypothesis (TDH) for selected East Asian countries. Empirical results reveal that the admission of regime shifts substantially influences the conclusion that TDH exists in four out of the seven countries that we have investigated. It seems that TDH are less likely to be evident in countries with highly developed financial systems (Singapore and Japan).

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1. Introduction

Imbalances of current account are of great analytical and empirical interest on the policy front[1]. Eichengreen (2006) has posited that a large and persistent US current account deficit (CAD) distorts international capital inflows, and eventually leads to global imbalances such as the ones the world is now experiencing. When the CAD persists, the probing question that emerges at the policy forefront is: What are the sources of these current account imbalances? Studies in the literature reveal several sources such as the "savings glut" phenomenon (Bernanke, 2005) while others have examined the sustainability of the CAD (Cashin and McDermott, 1998; Fountas and Wu, 1999). Some have also resorted to pointing up the causal relationship between the current account and the financial account (Wong and Carranza, 1999; Yan, 2007). The term "twin deficits" was used to describe the relation between the budget and current account deficits in the US during the 1980s. After Bagnai (2006) and others, we define twin deficits hypothesis (henceforth, TDH) as a long-run (positive) relationship between the current account and the fiscal balance, among other variables.

This paper explores the TDH by examining the causal relationship between the BD (balance deficit) and the CAD. We note that there is a theoretical case for such a relation in that an increase in the BD leads to an increase in domestic interest rates, to an inflow of foreign capital, and subsequently to the appreciation of the domestic currency, which then results in a CAD (Salvatore, 2006). Accordingly, these imbalances may impair economic activity, undermine wealth creation and reduce a nation's well being.

On the above note, we revisited the TDH issue using data from seven East Asian countries that comprised Singapore and Korea of the Newly Industrialized Countries (NICs), Malaysia, Thailand, Indonesia, and the Philippines of the Newly Industrialized Economies (NIEs), and Japan as an industrialized economy. This study contributes to the discussion of TDH in two aspects. First, we consider both investment and fiscal balance as the determinants of the current account in the long-run, while the majority of the empirical studies to date have concentrated on only one of these factors. Second, studies focusing on Asian economies (Anoruo and Ramchander, 1998; Kouassi *et al.*, 2004) have recognized the importance of structural shifts in the long-run relationship, but no formal statistical tests were conducted except for Baharumshah *et al.* (2006)[2]. As discussed in Bagnai (2006), and more recently, Daly and Siddiki (2008), the standard tests for cointegration appear to be weak with the occurrence of structural breaks in the data. The external balance as well as the budget deficit of the crisis-affected countries (Indonesia, Thailand, Malaysia, South Korea and the Philippines) was severely affected in the aftermath of the crisis. This is important with respect to whether the admission of structural breaks might substantially impact on the empirical support for Keynesian or the Ricardian Equivalence Hypothesis perspectives (REH)[3].

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[1] Policymakers have endeavored to incorporate new theoretical advances in open economy macroeconomics into their analyses to attain a better understanding of the dynamic behavior of current account movements. Thus, it is natural for the policy makers to treat the current account as an important macroeconomic indicator of policy decision and the measurement of the economic performance in any open economy (Salop and Spitaller, 1980).

[2] We note that Kim and Kim (2006) relied on the Zivot and Andrews (1992) unit root test to show a break in BD and exchange rate in 1997 for the case of Korea. The analysis also shows a break in CAD series in 1985.

[3] Previous literature on the subject has mainly been based on the two major theoretical models of Keynes and the REH, respectively. The Keynesian proposition suggests positive and unidirectional Granger causality runs

The paper is structured as follows: The next section presents the theoretical model, which accounts for the role of investment and the econometric strategy. Section 3 reports the empirical results while section 4 concludes.

2. The Twin Deficits Model and Econometric Strategy

2.1 The Model

We use the model which builds upon the national accounting identity. Following Fidrmuc (2003) and Bagnai (2006), the public sector may meet its financing needs through domestic and international financial markets. Considering the significant role of private investment in the national accounting identity, the long-run relationship between the CAD, BD and investment can be represented as:

$$CAD_t = \beta_1 + \beta_2 BD_t + \beta_3 INV_t + \varepsilon_t \quad (1)$$

where CAD and BD are as defined earlier, INV is the investment and βs are the parameters of the model. Equation 1 provides a useful framework for investigating the link between CAD, BD and INV. We expect that $\beta_2 > 0$ while $\beta_3 < 0$, that is, a BD and a high domestic investment are expected to worsen the current account. Thus, we expect a high correspondence between the CAD and the BD in the long-run. We also expect a high correlation between the CAD and the INV, especially in the developed countries. The coefficient of BD should, therefore, equal one if the country is perfectly integrated into the global economy. Without capital mobility, the deficits cannot be "twins" and we can expect the parameters of the model to be close to zero (Bagnai, 2006). Meanwhile, if the coefficient of INV in Equation 1 is equal to unity, then this suggests that the investment expenditures are totally financed from the world financial market.

2.2 Econometric Strategy

We start by investigating the integration properties of BD, CAD and INV for the countries under investigation. To accomplish this task, we use the well-known Zivot and Andrews (1992, ZA) method that endogenously searches for a break-point and tests for the presence of a unit root[4]. Put briefly, the ZA model specification includes a shift in the mean, a shift in trend and the regime shift. For this purpose, two dummies will be included in the latter case while one dummy each will be included in the estimation process. Additionally, we consider the Gregory and Hansen (1996, GH) tests to account for an endogenously determined break at some unknown point in time in the cointegrating relation. The procedure offers three

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from BD to CAD. In the REH paradigm, taken from the seminal work of Barro (1974), consumers foresee the 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 are no subsequent effects that are noticeable on the CAD as the BD increases in the absence of any Granger causality between the two deficits.

[4] The selection of the possible break-point, (T_B), is viewed as the outcome of an estimation procedure designed to fit $\{y_t\}$ that is fully determined by the data.

models based on the nature of the shift in the cointegrating vector (see Gregory and Hansen, 1996).

To test for the causal relationship between CAD, BD and INV, we use the procedure advocated by Toda and Yamamoto (1995, TY). To briefly demonstrate, we consider the following autoregressive model assuming $p = (k + d_{max}) = 3$, where k is the optimal lag, and d_{max} is the maximum order of integration that is suspected to occur in the system.

$$\begin{bmatrix} CAD_t \\ BD_t \\ INV_t \end{bmatrix} = \begin{bmatrix} \alpha_{1t} \\ \alpha_{2t} \\ \alpha_{3t} \end{bmatrix} + \begin{bmatrix} \beta_{11}^{(1)} & \beta_{12}^{(1)} & \beta_{13}^{(1)} \\ \beta_{21}^{(1)} & \beta_{22}^{(1)} & \beta_{23}^{(1)} \\ \beta_{31}^{(1)} & \beta_{32}^{(1)} & \beta_{33}^{(1)} \end{bmatrix} \begin{bmatrix} CAD_{t-1} \\ BD_{t-1} \\ INV_{t-1} \end{bmatrix} + \begin{bmatrix} \beta_{11}^{(2)} & \beta_{12}^{(2)} & \beta_{13}^{(2)} \\ \beta_{21}^{(2)} & \beta_{22}^{(2)} & \beta_{23}^{(2)} \\ \beta_{31}^{(2)} & \beta_{32}^{(2)} & \beta_{33}^{(2)} \end{bmatrix} \begin{bmatrix} CAD_{t-2} \\ BD_{t-2} \\ INV_{t-2} \end{bmatrix} +$$
$$\begin{bmatrix} \beta_{11}^{(3)} & \beta_{12}^{(3)} & \beta_{13}^{(3)} \\ \beta_{21}^{(3)} & \beta_{22}^{(3)} & \beta_{23}^{(3)} \\ \beta_{31}^{(3)} & \beta_{32}^{(3)} & \beta_{33}^{(3)} \end{bmatrix} \begin{bmatrix} CAD_{t-3} \\ BD_{t-3} \\ INV_{t-3} \end{bmatrix} + \begin{bmatrix} \varepsilon_{CAD} \\ \varepsilon_{BD} \\ \varepsilon_{INV} \end{bmatrix} \qquad (2)$$

For example, if k=2 and d_{max}=1, a causality from BD to CAD can be established by rejecting the null hypothesis that BD_1 and BD_{t-2} are jointly equal to zero in the first equation of the above system while BD_{t-3} is left unrestricted as a long-run correction mechanism. Similar analogous restrictions and testing procedures can be applied in testing the hypothesis that CAD does not Granger cause movement in BD by establishing a significance of the MWALD statistic for a group of lagged CAD variables in the second equation of the system. This procedure can be easily generalized for a larger number of lags in the VAR system.

3. Empirical Results

The quarterly data of CAD, BD and INV for the period from 1980:Q1 to 2006:Q4 are taken from the International Monetary Fund's *International Financial Statistics* (IFS). All variables are expressed as ratios of the GDP in order to account for their growth (size) in the economy. The period analyzed is of particular interest because there were significant changes in the Asian currencies vis-à-vis their major trading partners during that time. As expected, the results of the ZA tests (not reported) detect breaks in most of the series, mostly during the 1997 crisis[5].

Next, we applied the GH cointegration tests and the outcomes of the tests are summarized in Table I. Interestingly, we discovered that the statistics from Model C are significant (1% level) for Malaysia, Indonesia, Thailand, and the Philippines, thereby rejecting the null hypothesis and pointing in favor of cointegration between the three variables. Additionally, the countries of Japan (Panel B) and Korea (Panel C) support the existence of cointegration with a break in both C/T and C/S models. We found that the tests detected a structural break during the period 1996 – 98, and the significant values of the test statistics appear to coincide

[5] These results are available upon request from the authors.

with the Asian financial crisis.[6] Evidently, we failed to reject the null for Singapore and this means absence of TDH. To sum up, there is strong evidence of a unique long-run relationship with a break between CAD, BD and INV in six out of the seven countries under investigation.

Table I: Gregory and Hansen Results

Country	C	C/T	C/S
A: Indonesia	-8.354*	-11.985*	-3.984
	[1998:Q2]	[1998:Q2]	[1998:Q1]
B: Japan	-3.949	-5.730**	-7.187*
	[1999:Q1]	[1998:Q1]	[1998:Q1]
C: Korea	-4.069	-5.359**	-5.933*
	[1985:Q1]	[1997:Q3]	[1997:Q1]
D: Malaysia	-7.643*	-7.264*	-7.566*
	[1998:Q1]	[1997:Q2]	[1997:Q3]
E: the Philippines	-7.833*	-7.783*	-8.316*
	[1997:Q1]	[1998:Q2]	[1997:Q1]
F: Singapore	-1.905	-2.247	-1.971
	[1997:Q3]	[1999:Q1]	[1998:Q1]
G: Thailand	-6.237*	-7.726*	-6.691*
	[1996:Q1]	[1998:Q1]	[1996:Q2]
Critical Values			
1%	- 5.44	- 5.80	- 5.91
5%	- 4.92	- 5.29	- 5.50
10%	- 4.69	- 5.03	- 5.23

Notes: Critical values are obtained from Gregory and Hansen (1996, Table 1 pp.109) for m=2. Asterisks (**) and (*) denote values statistically significant at 1 percent and 5 percent level, respectively. Figures in [ ] refers to the breaking date. Estimation and calculation of the ADF test statistic were carried out in RATS 5.02.

We now estimate the long-run relationship as given in Equation (1) for all the countries in question. As shown in Table II, the estimates of the slope coefficients of the BD fall in the plausible range and carry the correct (positive) sign. For six countries, the coefficient of the budget deficit is below 0.25 (except for Indonesia where it is 0.45) and appears to support the medium-run open economy of Makin (2004)[7]. The magnitude of the coefficient of investment is higher than -0.35 except for Thailand (-0.137), Korea (-0.276) and Japan (-0.140). The results so far support the theoretical foundation laid out in Equation (1). These results along with the others are summarised in Table II.

[6] Authors Gruber and Kamin (2007) and others have noted that the large surpluses of the 1997–2003 period were closely associated with the ongoing effects of the financial crisis that started in 1997.

[7]In the classical open economy, the relationship between these two variables is one for one. The results from Bagnai (2006) also found that the average size of the coefficient for OECD countries' budget deficit is below 0.4 while in the recent study, Daly and Siddiki (2008) found that the coefficient ranged from 0.19 (Australia) to 1.59 (Ireland) in the collection of 23 OCED countries. Interestingly, the empirical results from Mohammadi (2004) reveal that a one percentage point increase in budget surplus/GDP ratio is associated with an improvement in the current account balance of a 0.2 percentage point in the sample industrialized countries and about a 0.3 percentage point in the sample of the developing countries.

Table II: Cointegrating Regression Estimates

Country	Constant	BD	INV
A: Indonesia	0.112	0.451	-0.518
	(8.222)*	(2.741)*	(-6.570)*
B: Japan	0.016	0.096	-0.140
	(6.577)*	(2.254)**	(4.269)*
C: Korea	0.081	0.194	-0.276
	(16.856)*	(1.751)	(-14.651)*
D: Malaysia	0.109	0.062	-0.352
	(18.144)*	(4.129)*	(-18.374)*
E: the Philippines	0.250	0.221	-0.601
	(13.042)*	(5.222)*	(-11.300)*
F: Singapore	0.247	0.221	-0.589
	(12.511)*	(5.058)*	(-10.758)*
G: Thailand	0.016	0.091	-0.137
	(6.508)*	(2.127)**	(-4.190)*

Notes: The cointegrating regressions are estimated from the information obtained from Table I. Where break is present, we used the most general model of C/S or regime shift. In the case of Singapore, dummy variable was absence in the cointegrating regression. Asterisks (*) and (**) denote values statistically significant at 1 percent and 5 percent level, respectively. Figures in ( ) refer to the *t*-ratio of the corresponding coefficients.

Table III: Granger Non-causality Results

Dependent Variable	CAD	BD	INV
	MWALD (χ2-statistics)		
A: Indonesia (k=5 d=1)			
CAD	-	14.785**(0.005)	14.812*(0.011)
BD	3.646 (0.601)	-	1.679 (0.891)
INV	6.863 (0.231)	8.335 (0.138)	-
B: Japan (k=3 d=1)			
CAD	-	0.208 (0.976)	2.046 (0.562)
BD	0.391 (0.942)	-	0.874 (0.831)
INV	1.597 (0.659)	0.529 (0.912)	-
C: Korea (k=4 d=1)			
CAD	-	12.267*(0.015)	1.463 (0.833)
BD	1.965 (0.742)	-	20.881**(0.000)
INV	3.689 (0.449)	4.922 (0.295)	-
D: Malaysia (k=4 d=1)			
CAD	-	13.029*(0.011)	6.225 (0.182)
BD	12.338*(0.015)	-	15.620**(0.003)
INV	6.880 (0.142)	3.850 (0.426)	-
E: the Philippines (k=5 d=1)			
CAD	-	11.976*(0.035)	11.990*(0.034)
BD	7.148 (0.209)	-	11.574*(0.041)
INV	3.234 (0.663)	6.044 (0.301)	-
F: Singapore (k=3 d=1)			
CAD	-	1.166 (0.760)	8.255*(0.041)
BD	2.750 (0.431)	-	0.802 (0.848)
INV	5.138 (0.161)	5.353 (0.147)	-
G: Thailand (k=5 d=1)			
CAD	-	11.707*(0.039)	14.812*(0.011)
BD	3.204 (0.668)	-	2.589 (0.762)
INV	5.340 (0.375)	0.163 (0.921)	-

Notes: Figures in parentheses are the p-value. Asterisks (*) and (**) denote values statistically significant at 5 percent and 1 percent level, respectively. k = optimum lag and d = maximum order of integration.

Next, Table III reports the results of the TY procedure. We found that the BD Granger causes CAD for Indonesia, Korea, Malaysia, the Philippines and Thailand. Also, causality in the reverse direction (CAD Granger causes BD) was only pronounced in the case of Malaysia[8]. Such evidence is contrary to what was found in the research literature for the OECD countries. Nonetheless, Anoruo and Ramchander (1998), Kouassi *et al*. (2004) and Kim and Kim (2006) conclude that the CAD causes a BD in most of the developing economies of Asia while Katircioglu *et al*. (2008) have found similar evidence using a panel of Small Island Economies (SIEs). This result may be attributed to the fact that the government spending leads have deleterious effects on trade imbalances. These findings suggest that the TDH is in favor of four (Indonesia, Korea, the Phillipines and Thailand) out of the seven countries. Additionally, we discover that in all the countries, INV Ganger cause CAD, with Korea, Japan and Malaysia being the exception. With regard to Singapore and Japan, the data clearly rejects TDH for the sample period under investigation.

4. Concluding Remarks

Using the time series methods that have been designed to allow for a structural shift in the parameters of the model, we found support of TDH in four out of seven Asian countries: Indonesia, Korea, the Philippines and Thailand. The study also presented a feedback relation between the BD and CAD for Malaysia. For the perspective on Singapore and Japan, however, we discovered that current account deficits and budget deficits do not follow a joint path: the results clearly reject a direct relationship between budget and current account deficits. Unlike the other Asian countries, these two countries experienced a fiscal surplus for most of the sample period and a steady improvement of current account balances for the sample period under investigation.

Finally, our findings also indicate that investment plays an important role in determining the CAD. This implies that these countries (Singapore and Japan) may have relied on foreign capital as a source of financing their domestic investment. From a policy perspective, this finding appears to support the argument that government spending in the post-crisis era and the large fiscal stimulus introduced following the recent global recession will clearly affect most of the ASEAN countries' external imbalances.

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