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Twin Deficits in the Lao PDR: An Empirical Study

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Abstract

In this paper, we investigate the dynamic relation between the budget deficit and the current account deficit in the Lao PDR from 1980 to 2010. We apply an approach that uses cointegration and an autoregressive distributed lag (ARDL) combined with a Granger causality within a vector error correction framework (VECM). The results disclose that a long run relation exists between the two variables. There is long run bidirectional causality between the budget deficit and the current account deficit that supports the twin deficit hypothesis and confirms the strong Granger causality between the budget deficit and the current account deficit in the Lao PDR.

Key words: Government budget deficit; Current account deficit; ARDL bounds testing; Granger causality; the Lao PDR

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INTRODUCTION

The budget and current account balances are closely related. The issue that variations in fiscal policy can lead to predictable developments in an open economy's current account performance remains a controversial one. Therefore, the question on the causality between the government's budget deficit and the current account deficit is important to investigate. McKinnon (1980, 1990), Miller and Russek (1989) were the first to coin the phrase "twin deficits" to describe the relation between the budget and the current account deficits in the United States. More recently, developing economies have begun to experience the same relation (Edwards, 2001; Megarbane, 2002).

The traditional examinations of these two deficits are based on two theories. The first is the Twin Deficits Theory that postulates that the budget deficit has a strong effect on the current account deficit. Smyth and Hsing (1995) argue that budget deficits create trade deficits because a growing budget deficit generates increased interest rates. Higher interest rates then create increased currency exchange rates that in turn grow the trade deficit. The second is the Ricardian Equivalence Hypothesis. Barro (1989) states that no relation can exist between the two variables because the budget deficit has no effect on the real interest rate and the current account deficit.

Plenty of evidence exist that supports the relation between the budget and current account deficits but there is no agreement on what direction the relation takes. Most of the previous investigations focus only on OECD countries such as the United States. These investigations have produced a mixed bag of results. Some studies attempt to empirically analyze the deficit relations in less developed countries. Their findings can be more important and are more likely to add insights on possible adjustments to budgetary policy.

Laos has been in transition since 1986. In that year Laos began a shift from a central economy to more of a market economy. Consequently, with the exception of a period of negative growth following the Asian financial crisis of 1997, Laos has generally been achieving high rates of economic growth with low inflation. The average economic growth was about 7 percent during the period of 2000 to 2010. Since 2005, inflation has been below double digits and fell to 4.5 percent in 2007 (World Bank,

2012). Also, the exchange rate has grown to 9,670 kip per US$ in 2007 compared to 10,655 kip per US$ in 2005. Despite higher economic growth with lower inflation and a stable exchange rate, Laos faces serious macroeconomic problems that still need to be addressed. Primarily, Laos is suffering from chronic deficits at both the government and the international trade levels. Its deficit financing mainly comes from foreign sources. During the last three decades, the ratio of the budget deficit to GDP was over 5 percent, improving slightly after 2000. In fiscal year 2006-2007, the budget deficit to the GDP was 2.7 percent compared to 6.5 percent in fiscal year 1997-1998. The current account deficit has also followed the same pattern during the last three decades. Recently, in 2011, the current account deficit was at negative 1.8 to the GDP (World Bank, 2012).

Despite the importance of the relation between the two variables, no study has investigated the Lao PDR. Our objective in this paper is to explore the link between the Laos' 'twin deficits' and this link's implication on managing both. In order to examine this long-run link, we apply the ARDL approach combined with the Granger causality in a VECM framework.

There are two contributions of this paper. First, this study is a pioneering effort by investigating the link between the budget deficit and the current account deficit in the Lao PDR. Second, we use the ARDL approach to cointegration that Pesaran, Shin and Smith (2001) develop in their paper.

This paper is organized as follows: In Section 2, we discuss the literature and its findings. In Section 3, we provide the modeling, empirical strategy, and data collection. Section 4 provides our results and the conclusion is last.

1. REVIEW OF THE LITERATURE

There is plenty of support for the relation between the budget (BD) and current account (CAD) deficits yet there is no agreement as to which direction the relation takes. The literature mainly centers on a discussion primarily between two theories. However, these theories do not predict all possible outcomes for the relation. In fact, we find four testable hypotheses that can arise from the twin deficits theory.

The Mundell-Fleming framework provides one theoretical explanation for the relation. Their approach shows that when the BD increases, then it induces upward pressure on the interest rate. This pressure, in turn, triggers inflows of capital and a higher exchange rate that ultimately increases the CAD. A second explanation of the linkage is the Keynesian absorption theory. This theory finds that when the BD increases, then it induces absorption of domestic funds and hence import expansion, which causes the CAD to worsen by increasing.

Both of these frameworks only find an unidirectional relation for the BD to the CAD. Some studies, such as Hutchison and Pigott (1984), Bachman (1992), Leachman and Francis (2002), find that a growing budget deficit causes an increased external account deficit. But, Baharumshah and Lau (2007) find a unidirectional causality between the BD and the external deficit in Thailand (i.e., the BD positively influences the CAD), while Hakro (2009) makes a similar finding for Turkey and Pakistan.

The Ricardian Equivalence Hypothesis (hereafter REH) that that is based on Barro (1974) is the second hypothesis. This theory is based on the presumption that the two deficits are not related. Thus, the inter-temporal movement of the tax rate and the BD does not affect the real interest rate, the amount of investment, or the CAD. Therefore, this absence of any Granger causality between the two deficits supports the REH. Based on their empirical evidence, Evans and Hasan (1994), and Kaufmann, Scharler and Winckler (2002) conclude that no link exists between the two deficits. Their conclusion also supports the REH.

A third approach is that a unidirectional causality exists for the two deficits. This causality happens when the CAD deteriorates that then leads to slower growth. The slower growth leads to growth in the BD. When confronted with a financial crisis resulting from chronic and large CADs, a country might face a situation in which large injections of public funds are needed to help the troubled financial sectors, to improve the corporate governance system, and to lessen the impact of a recession. Studies such as Khalid and Teo (1999), Kim & Kim (2006) support this concept. With data from Egypt, Marinheiro (2008) study finds a reverse causality from the CAD to the BD that contradicts the twin deficits theory. According to the authors, the causality happens when the government uses their budgets affect the CAD. This type of external adjustment can be especially relevant to less developed countries (Khalid & Teo, 1999).

The fourth approach is the bi-directional causality between the BD and the CAD. This causation is called 'current account targeting' by Summers (1988). The author argues that the external adjustment can be accomplished through fiscal policy. The causation could be more relevant to less developed countries with large foreign debts. Alkswani and Al-Towaijari (1999) also find empirical evidence on the reverse causation in Saudi Arabia. They argue that less developed countries can use fiscal stimulus to lessen the negative financial impacts of large trade imbalances. The recessions brought about by very large CADs increase government spending but also reduce the revenues from taxes.

Although BD might cause CADs, significant feedback might create the causation to run in both directions. Feldstein and Horioka (1980) show a high correlation between savings and investments that causes the BD

and the CAD to move in the concert. Thus, Lau & Baharumshah (2006) also find that the BD and the CAD move together in nine Asian countries. Jayaraman and Choong (2007), Arize and Malindretos (2008) support this finding in Fiji and some African countries respectively.

This brief review of the findings shows that the evidence on the direction of the causality is mixed. This mix arises because of the different data sets, the alternative econometric methods, and the different country characteristics. Despite the fact that the relation between the BD and the CAD is important, its evaluation in order to address their imbalances is also important. However, the empirical research on this issue in the Lao PDR is scarce.

2. MODELING, EMPIRICAL STRATEGY AND DATA COLLECTION

The twin deficit hypothesis is mathematically built from national income identity. Conventionally, the following relation represents the twin deficit theory:

$$CAD = Sp + BD - I \quad (1)$$

where CAD stands for the current account deficit, the S^p represents the private savings gotten from Y– T – C, BD represents the country's budget deficit, and I is investment. This equation provides two observations. First, at least one cointegrating relation or long-term equilibrium could be possible among the variables CAD, Sp, BD, and I. And, there is one long-term relation observed between the CAD and the BD. Second, we observe that there is a positive relation between the CAD and the BD in which the BD acts to determine the CAD as the twin deficits theory predicts.

Following the research, the dynamic relation between the BD and the CAD is investigated. The relation is specified as follows:

$$\text{Ln } BD_t = \alpha_1 + \alpha_2 \ln CAD_t + \mu_t \quad (2)$$

$$\text{Ln } CAD_t = \beta_1 + \beta_2 \ln BD_t + \mu_t \quad (3)$$

where the μ is an error term. We expect that α_2 and $\beta_2 > 0$. The BD is defined as the ratio of the government's budget deficit to the GDP. The CAD is defined as the ratio of the government's revenue to the GDP.

We examine the long-run link between BD and CAD by using an ARDL testing approach to cointegration. Pesaran and Pesaran (1997), Pesaran and Shin (1999), Pesaran *et al.* (2001) sequentially develop this approach and find this method to be more efficient than other techniques. There are several comparative advantages to the ARDL that make it more useful than others. First, the ARDL is flexible in relation to a small sample size such as ours. The method allows for the integration of the variables regardless of their order, and whether they are stationary at I(1) or I(0). Second, the ARDL determines a dynamic unrestricted error model (UECM) through a linear transformation. The UECM integrates the short-run dynamics with the long-run equilibrium without losing any information over time. The formula for the ARDL approach to cointegration is:

$$\Delta \ln BD_t = c_1 + \delta_1 \text{trend} + \pi_1 \ln BD_{t-1} + \pi_2 \ln CAD_{t-1} + \sum_{i=1}^{p} \theta_i \Delta \ln BD_{t-i} + \sum_{i=1}^{p} \phi_i \Delta \ln CAD_{t-i} + u_{1t} \quad (4)$$

$$\Delta \ln CAD_t = c_2 + \delta_2 \text{trend} + \pi_1 \ln CAD_{t-1} + \pi_2 \ln BD_{t-1} + \sum_{i=1}^{p} \theta_i \Delta \ln CAD_{t-i} + \sum_{i=1}^{p} \phi_i \Delta \ln BD_{t-i} + u_{2t} \quad (5)$$

Here, Δ is the logarithm for the first difference operator. The c_1 and c_2 are constants, δ_1 and δ_2 are coefficients on the trend term, and the π_1 and π_2 are the coefficients on the lagged level dependent and independent variables respectively. The $_i$ and Φ_i are the coefficients on the lagged dependent and independent variables respectively. The u_{1t} and u_{2t} are the error terms. And, the P signifies the maximum lag length, which is decided by the user.

There are two procedures for the ARDL. The first procedure uses a F-test to determine the joint significance of the lagged-level variables. The null hypothesis denotes the non-existence of a long-term relation as ($\ln BD_T$/ $\ln CAD_t$with (Ho:$\pi_1 = \pi_2 = 0$) versus (H_a: $\pi_1 \neq \pi_2 \neq 0$). Pesaran *et al.* (2001) find lower and upper critical bounds in the F-test. If the F-statistic is greater than the upper critical bound, then the lack of cointegration among the variables in the null hypothesis is rejected. If the F-statistic is less than the lower bound, then the null hypothesis is accepted.[1] The next step is to estimate the long-run and short-run equations by using the ECM. To ensure the convergence to the long-run equilibrium, the sign for the coefficient of the lagged error correction term (ECM_{t-1}) must be negative and statistically significant. Further, we conduct the diagnostic tests (Pesaran & Pesaran, 1997).

After the cointegration of the variables is established for the long-run relation, the long-run and the short-run causality can be examined. The Granger causality from the VECM framework is used to determine the direction of the causality between the variables. The VECM is developed as follows:

$$(1-L)\begin{bmatrix} \ln BD_t \\ \ln CAD_t \end{bmatrix} = \begin{bmatrix} \varphi_1 \\ \varphi_2 \end{bmatrix} + \sum_{i=1}^{p} (1-L)\begin{bmatrix} a_{11i} & a_{12i} \\ b_{21i} & b_{22i} \end{bmatrix} + \begin{bmatrix} \xi_1 \\ \xi_2 \end{bmatrix} \times \begin{bmatrix} \ln BD_{t-1} \\ \ln CAD_{t-1} \end{bmatrix} \times [ECM_{t-1}] + \begin{bmatrix} \mu_{1t} \\ \mu_{2t} \end{bmatrix} \quad (6)$$

where the difference operator is (1-L), and the ECM_{t-1} is generated from the long-term association. The significance of the coefficient for the ECM_{t-1} uses the t-test statistic to indicate the causality over the long run. To test the direction of the causality between the variables in the short run, we use the significance of the F statistic.

[1] If the calculated F-statistics falls between the lower and upper bounds, it is inclusive. The significance and negative lagged error-correction term has been used for the investigation of cointegration (Kremers , Ericsson and Doladol, 1992).

We use annual time series data that covers the period of 1980 to 2010 in which those data are available. All of the data were collected from the *World Development Indicators*.

3. RESULTS

We apply the ARDL to find the long-run link between the budget deficit and the current account deficit in the Lao PDR. To ensure that the variables are not stationary at I(2),we use the augmented Dickey-Fuller (ADF) (Dickey & Fuller, 1979 and 1981) and PP tests (Phillips & Perron, 1988). The unit root test shows that the RE and the GR are stationary in their different forms with the intercept and the trend. This finding implies that our variables have an order of integration that is I(1).

Table 1
Results of Unit Root Test

	ADF test				PP test			
	Level		Difference		Level		Difference	
	intercept	With trend	intercept	With trend	intercept	With trend	intercept	With trend
BD	-0.3954	-1.4213	-7.7495*	-7.4694*	-2.2453	-3.9790	-7.9869*	-8.9872*
	(0)	(0)	(2)	(2)	(0)	(0)	(2)	(2)
CAD	-1.7404	-4.7525**	-4.9798*	-5.1122*	-3.1407**	-5.6746*	-6.8428*	-8.0014*
	(0)	(0)	(0)	(0)	(0)	(0)	(2)	(2)

Note: * and ** show the significance at the 1% and 5% levels respectively. ( ) denotes the lag length for the ADF test or the bandwidth for PP test.

We select the optimal lag length by using the Schwarz Bayesian Criterion (SBC). The result indicates that one is the optimal lag order.[2] To account for a relatively small sample size, we produce new critical values (CVs) for the F-test computed by stochastic simulations with 20,000 replications. Table 2 reports the computed F-statistic for cointegration.

Table 2
Results of ARDL Cointegration Test

Variable	$lnBD_t$	$lnCAD_t$
F-statistics	5.04	7.4**
Cittical values	5% level	10% level
Lower bounds	5.5	4.3
Upper bounds	6.5	5.18
Diagnostic tests		
R^2	0.66	0.62
Adj-R^2	0.64	0.6
Durbin-Watson	1.5	2.03

Note: *, **, and *** show the significance at the 1%, 5%, and 10% levels respectively.

When the dependent variable is ln CAD_t, then the calculated F-statistic = 7.404 is higher than the upper critical bound at the 5% significance level. Further, when the dependent variable is ln BD_t, then the calculated F-statistic is 5.04 falls within the critical bound. Therefore, the alternative efficient test for establishing the cointegration is the significantly negative ECM_{t-1} (Kremers, *et al.* 1992). These results suggest that cointegration exists between the budget deficit and the current account deficit in Laos.

Table 3
Long-Term and Short-Term Analysis

	Dependent variable = $lnBD_t$			Dependent variable = $lnCAD_t$	
			Long-term results		
Variables	Coefficient	T-statistic	Variables	Coefficient	T-statistic
Constant	-3.923	-2.4324*	Constant	-0.2526	-0.1229
$lnCAD_t$	0.5001	2.3435*	$lnBD_t$	0.6702	3.0297*
			Short-term results		
$dlnCAD_t$	0.2819	1.834***	$dlnBD_t$	0.3995	2.003***
ECM_{t-1}	-0.5628	-3.895*	ECM_{t-1}	0.596	-3.56*

Note: *, **, and *** show the significance at the 1%, 5%, and 10% levels respectively.

Table 3 shows the two variables' determinants for each other in the short and the long runs. The empirical evidence shows that both variables exist in the long and the short terms at the 1 percent and the 10 percent levels of significance respectively. Further, the estimate of the lagged ECM_{t-1} is statistically significant and has a negative sign at the 1% significance level. This significance shows the speed of adjustment from the short run to the long term. We find that the deviations in the short term to the long run are corrected by both the BD and the CAD by

[2] We also set the maximum lag order up to five due to the small sample size. The results are available upon request.

56.28 percent and 59.6 percent, respectively, in each year. The long-term elasticity of the BD, with respect to the CAD, is 0.5. This value indicates that for each 1 percent increase in the CAD, the BD rises by 0.56 percent. In contrast, the long-run elasticity of the CAD in relation to the BD is 0.67, with the corresponding rise.

The diagnostic tests show that the estimates are free from serial correlation, misspecification and heteroskedasticity in the short-run model. The stability of the ARDL parameters is examined by applying the CUSUM and CUSUMsq tests developed by Brown, Durbin and Evans (1975). Figures 1 and 2 in Appendix 1 show that the plot of the statistics from the CUSUM and CUSUMsq stays within the critical bounds, which indicates the stability of the equation.

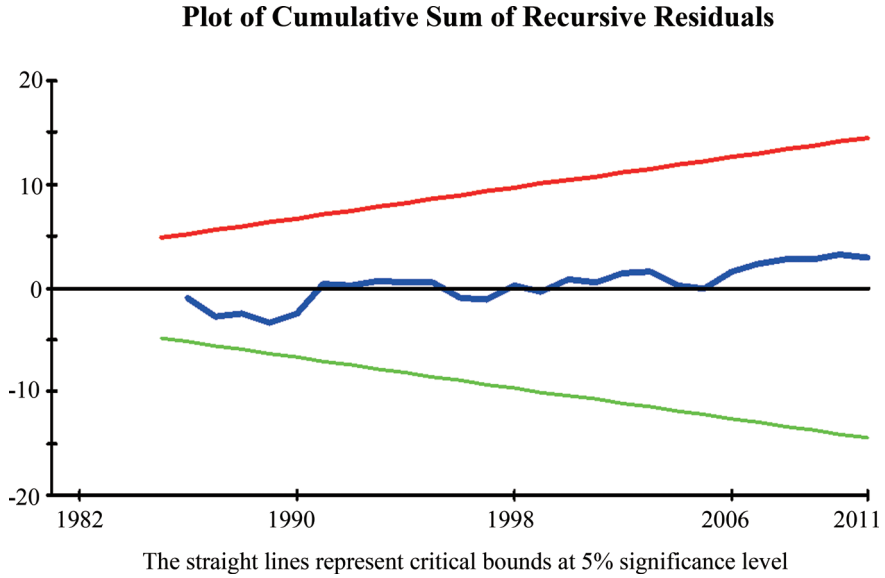

Figure 1
Plot of Cumulative Sum of Recursive Residuals (CUSUM)

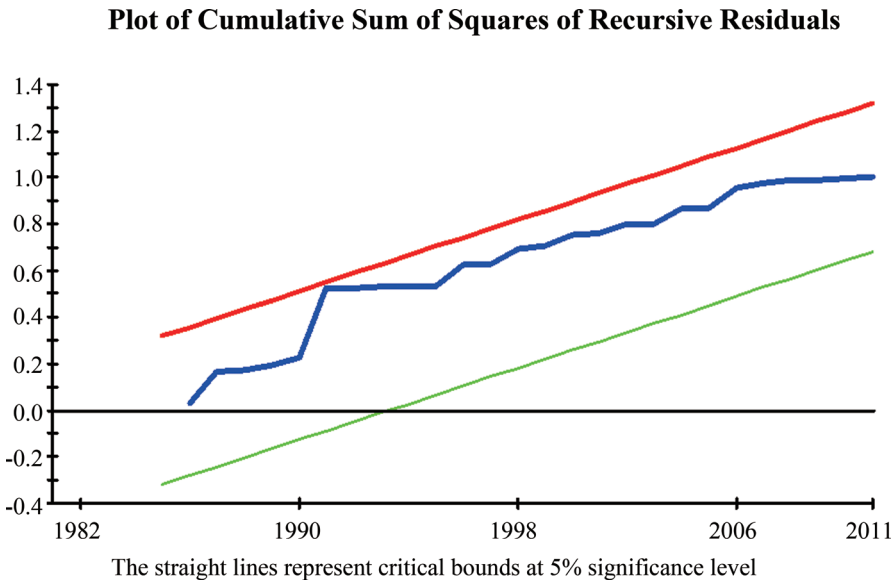

Figure 2
Plot of Cumulative Sum of Squares of Recursive Residuals (CUSUMSQ)

Table 4
VECM Granger Causality Analysis

Dependent variables	Short term		Long term	Joint causality	
	$InBD_t$	$InCAD_t$	ECT_{t-1}		
$InBD_t$	-	0.0362 [0.8506]	-0.6861* [0.0046]	-	6.7251* [0.0044]
$InCAD_t$	1.4763 [0.2353]	-	-0.7676* [0.0024]	6.3283* [0.0058]	-

Note: *, **, and *** show the significance at the 1%, 5%, and 10% levels respectively.

Table 4 reports the Granger causality results. These results disclose that the estimates of the ECM_{t-1} are statistically significant with negative signs at the 1% significance level. This finding implies that the bidirectional causality exists between the BD and the CAD in the long run. The joint causality confirms the strong causality between the BD and the CAD in the Lao PDR. This support indicates that our study is consistent with many earlier studies that argue there is significant feedback caused by the causality between the two variables in both directions; such as, Summers (1988), Alkswani and Al-Towaijari (1999), Feldstein and Horioka (1980), Darrat (1988), Normandin (1999).

CONCLUSION

In this study, we examine the causality between the government's budget deficit and current account deficit through an ARDL approach and a Granger causality in a VECM framework. We find that a long-run relation exists between the government's budget deficit and current account deficit in the case of Lao PDR. The results of this study suggest a bi-directional causality between the two deficits. This is not a surprising result for a small economy such as the Lao PDR.

On the one hand, governments can have large budget deficits by heavily borrowing in international markets. Furthermore, even the deficits financed by excessive money creation are more likely to affect the current account deficit. Excessive monetary expansion in an economy with a fixed exchange rate causes disequilibrium in the money market and in turn leads to an increase in the import demand and a larger current account deficit, all things being equal. Therefore, we expect to observe the causality running from budget deficits to the current account deficits. On the other hand, higher export prices (or export volumes) generated by the increase in world demand do not only raise the export earnings and improve the current account deficit but also reduce the budget deficit. Also, an increase in export prices raises the domestic income for expansionary or counter cyclical fiscal policies. In both cases, the improvement in the current account deficit could be reflected in an improvement in the budget deficit that suggests the causal relation of the current account deficits to budget deficits (reverse causation).

The finding of this paper illustrates that the decision to curb the problem of current account deficits cannot be achieved by simply relying on fiscal cuts or via versa. Policy measures focusing on monetary and productivity enhancement might have to be complemented with both a prudent budget policy and a trade policy. We realize the need for more empirical work in this area to understand the twin deficit phenomenon in the Lao PDR.

APPENDIX I

Table A
Diagnostic Tests

	LM Version		F Version	
	Statistics	P- Value	Statistics	P- Value
A:Serial Correlation	$\chi2$ (1)=0.2345	0.628	F(1, 26)=0.2048	0.655
B:Functional Form	$\chi2$ (1)= 1.3182	0.251	F(1, 26)= 1.1949	0.284
C:Normality	$\chi2$ (2)= 6.5770	0.037	N/A	
D:Heteroscedasticity	$\chi2$ (1)= 1.5389	0.215	F(1, 28)= 1.5139	0.229

A:Lagrange multiplier test of residual serial correlation
B:Ramsey's RESET test using the square of the fitted values
C:Based on a test of skewness and kurtosis of residuals
D:Based on the regression of squared residuals on squared fitted values

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