In: Small Economies and Global Economics ISBN: 978-1-60456-477-8
Editors: J. R. Pillarisetti, R. Lawrey, J. T. S. Yean et al.

Chapter 27

TWIN DEFICITS IN PACIFIC ISLAND COUNTRIES: A CASE OF VANUATU

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ABSTRACT

According to open economy macroeconomics, budget deficit leads to deterioration of current account balance. However, the findings of various studies investigating into the existence of a link between budget and current account deficits in different regions of the world covering both developing and developed countries were inconclusive. This chapter attempts to examine the presence of any connection between budget deficits and current account deficits in Vanuatu, a small, open island economy in the South Pacific. Based on the results of an empirical analysis of data covering a 23-year period (1983- 2005), this chapter provides strong evidence to support the twin deficit hypothesis in Vanuatu. Further, the paper identifies the consequences of budget deficits and indicates the required policy measures for correcting the imbalances for consideration by decision makers.

1. INTRODUCTION

Pacific island countries (PICs), ever since their independence in the mid 20th century have been receiving substantial foreign aid each year, which has proved to be supportive in several ways. First and foremost, annual aid inflows supplement domestic savings, besides providing budgetary support. Further, aid inflows being in terms of foreign exchange, serve as comfortable cushions against pressures of current account deficits on exchange rates, caused by trade gaps experienced by almost all PICs, which with a narrow range of exports are

highly dependent on imports of all categories including food, fuel and intermediate and capital goods.

Following the end of the Cold War in the late 1980s, which led to changes in the donors' priorities, there has been a marked decline in aid inflows specifically earmarked for budgetary support. The donors decided to link their assistance increasingly to implementation of structural reforms in PICs. With stagnant revenues and rigidities in public sector expenditures, the fiscal position in PICs deteriorated further. Budget deficits have now become an annual phenomenon. Being open economies, PICs began to experience larger external current account deficits as well, thus giving rise to the emergence of twin deficits.

It is still uncertain whether budget deficit causes current account deficit or vice-versa. Studies conducted in other regions, which examined the possible link between the twin deficits in both developing and developed countries could not reach any consensus. Vanuatu, which is taken up as a case study, has been struggling with twin deficits. The objective of this chapter is to examine the short-run temporal causality and long run relationship between external current account deficits and budget deficits in Vanuatu with a view to obtaining better appreciation of causal linkages for formulating appropriate macroeconomic policies.

This chapter is organized as follows. The second section gives a brief descriptive account of Vanuatu's economy, analyzing the recent trends in twin deficits experienced by Vanuatu during the last 25 years; the third section reviews in brief the vast amount of literature on the subject; the fourth section outlines the modeling strategy employed for the empirical study; the fifth section reports the results; and the sixth and final section presents the conclusions with policy implications.

2. VANUATU'S ECONOMY: TRENDS IN TWIN DEFICITS

Formerly known as the New Hebrides, Vanuatu is one of the youngest PICs. Table 1 presents a comparative picture of general key indicators of PICs. Vanuatu comprises an archipelago of about 85 islands located in the Southwest Pacific, approximately 2,300 kilometers off the coast of Australia. The island nation is prone to natural disasters, which include an average of four to seven cyclones annually affecting one part or other of the country and about 2000 earth tremors of varying intensity.

The economy of Vanuatu with a total population of 215,000 is dual in nature with subsistence agriculture dominating on all but the two islands of Efate, on which the capital Port Vila is situated and Santo, which has the major port located in Luganville. Vanuatu does not have any kind of direct taxation, individual income or corporate income tax. Consequently, the offshore financial centre (OFC) institutions, inherited from the colonial past continue to thrive in Port Vila, which has emerged as a pure tax haven attracting financial inflows from high tax friction states to zero tax friction [Jayaraman, 1998]. Along with a flourishing tourism industry, the urban-oriented Efate, on which all OFC institutions are located did a lot better than other outer islands. Mainly for this reason, there has been a steady rural-urban drift, with rise in squatter settlements in Port Vila. Further, Vanuatu suffers from serious inadequacies in human resource skills to man jobs, both in public services and the private sector, which has led to near permanent dependency on expatriate management and technical services in several areas [Jayaraman, 2004].

Table 1.Vanuatu among Pacific Islands: Selected Key Indicators

	Population ('000) 2005	Per Capita GDP (Current Prices) in US$ 2005	Dev Index Ranking 2004	Vulnerability Index Ranking 1997	Aid per capita in US$ 2005	Aid	
						% of GDP 1990	% of GDP 2002
The Pacific							
Cook Islands	19	2,651	62	NA	490.0	NA	28.0
Fiji	840	2,195	90	9	61.0	3.9	1.8
Fed States of Micronesia	114	2,211	NA	NA	923.0	NA	37.4
Kiribati	90	751	129	NA	191.0	22,5	18.6
Palau	20	6,482	NA	NA	1295.0	NA	NA
Papua New Guinea	5,600	714	139	31	40.0	12.8	7..2
Republic of Marshall Islands	58	2,559	NA	NA	991.0	NA	49.6
Samoa	181	1,672	75	20	186.0	42.6	14.5
Solomon Islands	471	550	129	11	132.0	21.7	11.0
Tonga	101	1,629	55	3	270.0	26.3	16.4
Tuvalu	11	345	118	NA	260.0	47.2	45.0
Vanuatu	215	1,493	119	1	154.0	33.0	11.7

Source: ADB [2004]; IMF [2004]; Jayaraman [2006]; UNESCAP [2004].

On the basis of the criteria[1] evolved by the United Nations' Committee on Development Planning, Vanuatu, along with 23 other small island and developing states (SIDS), has been designated since 1971 as the least developed country (LDC) among the developing countries [Encontre, 2004]. Although on the basis of threshold income level, Vanuatu was found eligible for graduation from LDC status in 1997, it was allowed to retain the LDC status on the grounds of perceived deterioration in the quality of life in Vanuatu following a major the earthquake of 2002, which inflicted severe damages to public and private properties in Port Vila.[2]

[1] The criteria currently in operation are: (i) economic vulnerability index (EVI); the Augmented Physical Quality of Life Index (APQLI); and an Economic Vulnerability Index (EVI). Present requirements are: a GDP per capita less than US $1,035; an APQLI score greater than 64; and an EVI score of less than 34. The earlier [2003] criteria did not include EVI, but included the following: threshold per capita GDP of US $765; an augmented physical quality of life index of 47; economic classification index of 26; and threshold population of 75 million. As of end 2006, there are 50 countries, which have been designated as LDCs [UN Office of the High Representative for the Least Developed Countries, 2006]. Twelve of them have also been designated as Small Island and developing states (SIDS). Although eight of them graduated, they were brought back to LDC status due to adverse developments subsequent to their graduation [Delaney, 2006].

[2] Much before the earthquake of 2002, Vanuatu's Prime Minister pleaded in his 1997 address to the UN General Assembly for retention of LDC status. The General Assembly in its resolution: 52/210 of 18 December 1997 withheld the recommendation to graduate Vanuatu [Encontre, 2004].

Vanuatu follows a fixed exchange rate regime [IMF 2006]. The country's currency *vatu*, is pegged to a transaction-weighted basket of currencies of major trading partners, namely Australia and New Zealand. As the latter have been targeting inflation as their monetary policy objective, Vanuatu's consumer price level has also remained low. There are no exchange controls, either in respect of current account or capital account transactions. Further, citizens and resident expatriates alike are free to keep their bank deposits in any currency of their choice. Thus, the economy of Vanuatu is the most open of all PICs.

Like all other PICs, Vanuatu depends for its foreign exchange earnings on a narrow range of commodities for exports and tourism. The island country's exports include beef, copra, coconut oil, cocoa, timber and *kava,* a traditional root crop, which is used as a beverage. Further, there are many other commonalities shared by Vanuatu with PICs, which include structural constraints to growth: communal land tenure system, which restricts the marketability of land as an economic commodity, thereby inhibiting land related investment activities; isolation from major markets; proneness to natural disasters of all kinds; and external economic shocks.

Despite substantial annual aid inflows, which amounted on an average to about 33 % of GDP during the last two decades, economic performance of Vanuatu has been observed to be weak, with continuing stagnation in per capita income since early 1990s [Jayaraman & Ward, 2006; Sugden & Tevi, 2004; Gay, 2004; UN ESCAP, 2004]. Annual average rate of growth of about 3% in GDP has not been sufficient enough as population has been growing at almost the same rate. While outer islands have been dependent on subsistence agriculture, the two urban areas depend on the government for jobs, as it has been a major employer in the formal sector. Wages and salaries have been accounting for around 50 to 55% of government's total annual expenditure.

In the first decade (1980-1989) of independence, Vanuatu had to face difficulties of all sorts. These included a rebellion on the outer islands and adjustments requiring streamlining of government functions and bureaucracies inherited from the combined Anglo-French condominium rule, besides the impact of annual occurrence of natural disasters of cyclones. As foreign grants, which in 1980 accounted for 80% of government expenditure fell to 21% in 1989, the government had to cut down the much needed operation and maintenance expenditure of existing assets including roads and ports for accommodating emerging development expenditures. The efforts to raise revenue through increase in user fees and charges as well as import duties proved inadequate, as the government continued its policy of no direct taxation on personal and corporate incomes. The annual overall budget position of surpluses of the earlier years became negative in later years of the first decade of the country's independence. The budget deficit in 1989 was 9% of GDP as against a budget surplus of 6% in 1984. For financing fiscal deficits, the government had to resort to domestic borrowing, including monetisation of the deficit by Reserve Bank of Vanuatu, when the latter was forced to pick up the unsold bonds [Jayaraman, 1995].

In the second decade (1990-1999) of independence, Vanuatu resorted to substantial external borrowing, although on concessional terms, from Asian Development Bank for undertaking development projects. Further, it resorted to a large-scale domestic borrowing for purchase of an aircraft for the government owned Air Vanuatu with a view to promoting tourism. Although budget deficit levels were reduced in the first half of the 1990s, by introduction of turnover taxes and streamlining of other indirect tax measures, political instability and frequent changes in governments had their own toll on public finances. In the

second half of the 1990s, mismanagement of pension funds by the state sponsored Vanuatu National Provident Fund (VNPF) and subsequent efforts to bail out VNPF came in the way of reducing the deficit to a sizeable extent. Fiscal consolidation efforts towards containing fiscal deficits were frequently offset by discretionary exemptions and unforeseen expenditures, which were often approved by supplementary budget appropriation bills in the parliament. As a result, in 1998, the budget deficit climbed to 6.7% of GDP. Measures to finance fiscal deficits led to a rise in public debt, which shot up to 33% of GDP in 1998 from 17% in 1988. In 1998, with loan assistance of $20 million from Asian Development Bank, the government began to implement a Comprehensive Reform Programme over a three-year period towards improving economic and financial management.

During 2000-2005, fiscal performance improved with the successful introduction of VAT [Browne, 2006]. Better expenditure control, improvements in budgeting and pruning of non-essential expenditures reduced budget deficits from the previous high levels. In fact, there was a small budget surplus in 2004 of about 1% of GDP. Total public debt, domestic and external, has been kept under the mandated level of 40% of GDP. However, fears were expressed that fiscal consolidation was being achieved through compression of spending on social services and physical infrastructure, such as roads and jetties in outer islands, which could hamper medium–term growth [Creane, 2006].

In regard to external accounts, Vanuatu's trade deficit has been generally high. Lack of a significant manufacturing base has been largely responsible for its dependence on imports of all consumer goods. Primary processing of local raw materials is confined to production of copra-based products, including oil and coconut cream and detergents. Since the country does not produce any staple except traditional root crops, wheat flour and rice dominate food imports, along with edible oils and beverages. All intermediate and capital goods, transport and machinery are imported.

In the 1980s, four major agriculture products, copra, cattle (beef), cocoa and *kava*, once referred to as "four Cs", were the exportable commodities, which were the mainstay of cash incomes in the rural sector to pay for children's education and medicines, kerosene and other consumer goods. Copra is marketed by the state owned Vanuatu Commodities Marketing Board, while exports of cocoa, coffee and kava are handled by the private sector. These products along with vegetables and fruits, mainly for domestic consumption, contribute 15% of the gross domestic product (GDP). In the 1980s, copra accounted for 35% of total exports, while shares of beef and cocoa were 6% and 4%. Annual cyclones, which uproot many of the agricultural crops, severely affect steady growth.

With the emergence of timber exports, exports of cocoa and coffee receded into the background. In recent years, timber accounted for 11% of total exports, copra 31% and beef 9%. Other exports include minerals and handicrafts. With most of the exports being primary agricultural exports competing with those of other island economies, they happen to form a small proportion of total world trade and hence Vanuatu is a price taker. Consequently, export earnings are subject to the effects of a high degree of variation in world prices. Since 1997, copra and cocoa prices have fallen considerably. On the other hand, prices of most manufactured goods and other strategic imports, including fuel have been on the rise. The resultant effects of high variability in terms of trade are reflected in high volatility in export earnings.

A study by Yari [2003] showed that volatility in export earnings had adverse effects on Vanuatu. The instability measure of exports earnings (average percentage deviation of export

earnings from the exponential trend level for 1998-2000) for Vanuatu was 21.5 %, which is higher than that of other PICs: that of Nauru (20 %), Papua New Guinea (18 %), Solomon Islands (17 %) and Fiji (14 %). Aside from the negative effects of the terms of trade, production levels of the commodity exports themselves have also been fluctuating. Frequent cyclones resulting in uprooting of crops have been the main reason for these variations in output. Damages to farm and hinterland roads linking marketing centres and harbours and jetties in remote islands as well as delays in the restoration of links adversely affect exports and rural incomes.

Tourism earnings, on the other hand, which were on the rise due to establishing of new air links in the 1990s, gave a big support to meet the import deficits. Nearly 60% of total foreign exchange earnings are contributed by tourism, while OFC institutions contribute about 12% of GDP.[3] However, since most of the tourists preferred the two urban centres, little of the tourism dollar trickled down to rural communities in other islands. In 1998 and the subsequent two years, Vanuatu suffered heavy loss in tourism earnings due to civil unrest in the country. A hefty rise in tourist arrivals in 2000 reversed the trend but with the 9/11-terror attack of 2001 in the USA, tourism had another setback. In addition, the consequent recessionary conditions in the industrialized countries have also had a negative influence on tourism earnings. Added to these unforeseen circumstances, annual cyclones and frequent tremors have taken their own toll on resort hotels and other tourist facilities.

Table 2. Vanuatu: Budget and Current Account Deficits: 1983-2005

Year	Budget Deficit (% of GDP	Current Deficit (% of GDP	Trade Deficit (% of GDP	M2 (% of GDP	Inflation (%)	Growth Rate (%)
1983-1990 (Ave)	2.3	17.3	35.4	92.8	6.4	1.3
1991-1995 (Ave)	3.5	8.0	26.1	107.9	3.5	6.7
1996-2000 (Ave)	4.1	8.3	19.8	106.1	2.5	1.6
2001	3.7	6.2	24.7	104.4	3.4	-2.7
2002	2.1	-11.2	24.7	107.0	2.2	-4.9
2003	1.8	10.4	23.4	102.5	3.1	2.9
2004	-1.2	12.2	26.1	107.0	1.4	3,5
2005	0.3	6.1	26.2	109.0	2.6	3.1

Source: Asian Development Bank [2006].

[3] The services sector of Vanuatu is marked by a significant presence of offshore financial centres. Absence of direct taxation of any kind in respect of incomes and profits earned by citizens of Vanuatu and residents and non-residents alike has made Vanuatu a pure tax haven, attracting funds from industrialized nations [Jayaraman, 1998]. However, its contribution to GDP has been observed to be on the decline, especially after the European Union and the USA, in the wake of the 2001 terror attack, successfully persuaded Vanuatu to streamline the legislation as well as tighten surveillance measures to control money laundering activities in recent years [Fossen, 2002].

Unlike other PICs, Vanuatu does not receive sizeable inward remittances from its citizens residing overseas. With no other service incomes, tourism earnings alone largely influence the current account balance of external accounts. Until the end of the 1990s, annual current account deficits have been around 2% of GDP, except in 1999 when it was about 5% of GDP. After some surpluses in 2001 and 2002, the current account deficit has been on the rise. Table 2 provides details of budget and external deficits during the period under study.

3. Linking Budget Deficit to Current Account Deficit: A Brief Literature Survey

A survey of studies on the linkages between current account deficits in the balance of payments and budget deficits begins with standard treatment of external current account deficits which is based on the national accounting identity [Daniel et al., 2006].

The national accounting identity is:

$$Y = C_{pub} + C_{priv} + I_{priv} + I_{pub} + (X-M) \quad (1)$$

Where Y = national output
C_{pub} = Consumption by public sector
C_{priv} = Consumption by private sector
I_{priv} = private sector investment
I_{pub} = public sector investment
X = exports of goods and services
M = imports of goods and services

Manipulation of (1) would yield

$$X-M = Y- \{C_{pub} + C_{priv} + I_{priv} + I_{pub}\} \quad (2)$$

Since X-M is external current account balance, we write

$$CA = (S_{priv} + S_{pub}) - (I_{priv} + I_{pub}) \quad (2a)$$

Where
CA = external current account balance;
S_{priv} = private sector savings
S_{pub} = public sector saving

By manipulation of (2a), we obtain

$$CA = (S_{priv} - I_{priv}) + (S_{pub} - I_{pub}) \quad (3)$$

While (S_{priv} - I_{priv}) is the private savings and investment balance, (S_{pub} - I_{pub}) represents the fiscal balance. Assuming private savings/investment remained stable overtime, external current account balance would be equal to overall fiscal balance. Alternately, external current account deficit would be equal to budget deficit. This identity provides a basis for modelling the hypothesised long run relationship between current account deficits and budget deficits. However, we do not have any indication of the direction of linkages, both behavioural and temporal.

Under fixed exchange regime in the Johnson's [1972] monetary approach to balance of payments model with or without capital mobility, any excess domestic absorption, with private investment and savings gap being stable, excess government expenditure over its revenues would spill into excess demand for overseas goods and services, resulting in trade/current account deficit. Under freely floating regimes, with either partial or free capital mobility in the Mundell-Fleming open economy model, there is interaction between budget deficit and trade/current account deficit directly through domestic absorption and indirectly through monetary channels. As budget deficit rises, aggregate demand would increase and domestic interest rate would also rise; and if the domestic rate is higher than world interest rate there will be a capital inflow, resulting in the rise of real exchange rate; exports would fall; and trade balance/current account balance would deteriorate. Thus, our modelling strategy has to incorporate both real and monetary variables.

A review of past empirical studies on both developed and developing countries shows conflicting results. These studies used either trade deficits or current account (taking into account net earnings from services including tourism and transfers, official and private including remittances) deficits depending upon the country circumstances. Studies by Chen & Haug [1993], Evans [1988, 1993], Evans & Hasan [1994] on the US and Canadian economies concluded that there was an absence of linkage between budget and external deficits. Their conclusion indicated the possibility of existence of Ricardian Equivalence proposition on the ground that economic agents anticipate that budget deficits would be financed by increase in future tax rates; accordingly, they would adjust consumption towards maximising the inter-temporal welfare by increasing current savings rather than current consumption; and thus there would be no effect on domestic interest rates, total savings, investment, price level and income. Earlier study by Normandin [1994], however, showed that Ricardian equivalence proposition could be rejected for the Canadian economy but not for the US economy. Darrat [1988] in his study on the US economy noted the existence of bi-directional causality between two deficits.

Laney [1984] in his study of 58 countries observed the presence of causal linkage running from fiscal balance to external balance in the case of developing countries, which was absent in the case of developed countries. Similarly, Khalid & Guan [1999] noted the existence of a long run-cointegrating relationship between fiscal and trade deficits in selected developing countries while recognizing the absence of such relationship in developed countries.

Thus, we note the evidence collected by empirical studies is inconclusive. The results differed across countries. Further, they varied more significantly when the researchers employed different econometric techniques with different model specification for the same country data [Onafowara & Owoye, 2006]. Past studies utilised models with variables representing domestic absorption, which included industrial production index and variables to represent monetary influences, which included interest rate and real exchange rate.

4. MODELLING STRATEGY

While focusing our attention on Vanuatu, we observe the island nation like all other PICs, suffers from serious data deficiencies. Further, the time span of data series of Vanuatu, as an independent nation from 1980, is also limited. The national income data have been compiled only from 1983 onwards with technical assistance from Asian Development Bank. Hence, our study covering a 23-year period (1983-2005), uses the available data series. Since Vanuatu depends heavily upon tourism earnings for foreign exchange, besides earnings from traditional export crops, we take up current account deficits, rather than trade deficits. Our model, incorporating the real and monetary variables, therefore remains simple and is written as:

$$CAD = f(RGDP, BD, M2) \tag{1}$$

where

CAD = Current account deficit (% of GDP);
RGDP = real GDP (index number); and
BD = budget deficit (% of GDP);
M2 = broad money supply (% of GDP)

RGDP represents domestic absorption and *M2* as % of GDP captures monetary influences, which would include changes in interest rate and inflation and the consequent changes in real exchange rate,[4] affecting trade volume. The data series are drawn from a single source, namely Asian Development Bank [2006].

We employ bounds testing approach developed by Pesaran et al., [2001] to examine the existence of any relationship between current account deficit and budget deficit. This approach has assumed great importance because in recent years the stationary properties of the series and finite sample performance of this testing procedure have increasingly proven to be superior to that of co integration procedure by Johansen [1988, 1991], Johansen & Juselius [1990]. It is also well recognized that the traditional F-test for Granger non-causality is not valid when the variables are co integrated and the test statistic does not follow its own distribution; and in this case, error correction models (ECMs) may be used instead [Granger, 1988]. However, if the variables are not integrated of the same order or are not cointegrated, ECM cannot be applied. In addition, possibly severe pre-test biases in ECM may exist, especially for finite samples. To overcome these problems, an autoregressive distributed lag (ARDL) model proposed by Pesaran et al., [2001] might be applied.

Following Pesaran et al., [2001], we form the vector autoregression (VAR) of order p (VAR(p)) for the twin deficit model:

$$Z_t = \mu + \sum_{i=1}^{p} \beta_i Z_{t-i} + \varepsilon_t \tag{2}$$

[4] Real exchange rate (RER) is the ratio of price of non tradables to price of tradables and is denoted as p_n/p_t. However, for empirical application purposes, RER is the product of nominal exchange rate (NER) and the ratio of domestic price (p_d) and foreign price (p_f) levels. It is represented as: RER= NER (p_d/p_f). There is vast amount of literature on the subject [Williamson, 1994]. For derivation of RER in steps, see Jayaraman [1997].

where Z_t is the vector of both X_t and Y_t, where Y_t is the dependent variable (*CAD*) an X_t is the vector matrix represents a set of explanatory variables (*RGDP*, BD and M2 $\mu = [\mu_Y, \mu_X]'$, t is a time or trend variable, and β_i is a matrix of VAR parameters for lag According to Pesaran et al., [2001], the dependent variable must be I(1) variable, but th regressors, or explanatory variables can be either I(0) or I(1).

We can further develop a Vector Error Correction Model (VECM) as follows:

$$\Delta Z_t = \mu + \alpha t + \lambda Z_{t-1} + \sum_{i=1}^{p-1} \gamma_i Y_{t-i} + \sum_{i=0}^{p-1} \gamma_i X_{t-i} + \varepsilon_t \quad (3$$

where $\Delta = 1 - L$ and $\alpha = [\alpha_Y, \alpha_X]$. We partition the long-run multiplier matrix as follows

$$\lambda = \begin{bmatrix} \lambda_{YY} & \lambda_{YX} \\ \lambda_{XY} & \lambda_{XX} \end{bmatrix}.$$

The diagonal elements of the matrix are unrestricted, so the selected series can be eithe: I(0) or I(1). If $\lambda_{YY} = 0$, then Y is I(1). In contrast, if $\lambda_{YY} < 0$, then Y is I(0).

The VECM procedures described above are important in testing of at most, one cointegrating vector between dependent variable (Y_t) and a set of regressors (X_t). Further following the assumptions made (unrestricted intercepts and no trends) and restrictions imposed ($\lambda_{XY} = 0, \mu \neq 0$ and $\alpha = 0$) by Pesaran et al., [2001] in Case III, we re-formulate Equation (3) to derive the following Unrestricted Error Correction Model (UECM) tc examine the long run relationship between budget deficit and current account deficit.

$$\begin{aligned} \Delta CAD_t = {} & \beta_0 + \beta_1 CAD_{t-1} + \beta_2 RGDP_{t-1} + \beta_3 BD_{t-1} + \beta_4 M2_{t-1} + \sum_{i=1}^{p} \beta_5 \Delta CAD_{t-i} \\ & + \sum_{i=0}^{p} \beta_6 \Delta RGDP_{t-i} + \sum_{i=0}^{p} \beta_7 \Delta BD_{t-i} + \sum_{i=0}^{p} \beta_8 \Delta M2_{t-i} + u_t \end{aligned} \quad (4)$$

where u_t is the white noise error term; Δ is the first difference operator; and p is lag structure, which is determined by Akaike's information criterion.

There are two steps in testing the cointegration relationship between CAD and its explanatory variables. First, we estimate Equation (4) by ordinary least square (OLS) technique. Second, we examine the long run relationship by imposing the restriction that all estimated coefficients of lagged one level variables are equal to zero. That is, the null hypothesis is $\beta_1 = \beta_2 = \beta_3 = \beta_4 = 0$. In order to test the null hypothesis, following Pesaran, et al. [2001], we apply either standard Wald test or *F*-statistic, which has a non-standard distribution that depends on few factors such as sample size, the inclusion of intercept and trend variable in the estimation, and number of regressors. If the *F*-statistic

obtained from the restriction is less than lower bound critical value, we do not reject the null hypothesis of no long run relationship. In contrast, if the computed *F*-statistic is greater than upper bound critical value, then we reject the null hypothesis and conclude that there appears steady state long run equilibrium between the variables under study. However, if the *F*-statistic falls within lower and upper bound critical values, then the results are inconclusive and the stationarity properties of the series must be examined and investigated.

Narayan [2005] argues that the use of Pesaran et al., [2001] critical values for small sample study may produce misleading results because the critical values calculated are generally lower than those generated by Narayan who used similar GAUSS code used by Pesaran et al., [2001]. Narayan [2005] has generated a new set of critical values ranging from 30 to 80 observations. Since the sample size in our study is small (that is, 25 observations) and as the critical values provided by Pesaran et al., [2001] are calculated on the basis of large sample sizes of 500 and 1000 observations and 2000 and 40000 replications respectively, we propose to use the critical values provided by Narayan [2005].

Once the variables are found to be cointegrated, the next step is to use a parsimonious vector error-correction model to estimate the short-run dynamic causality relationship. Equation (3) can now be constructed into a vector error-correction model (VECM) in order to capture both short- and long-run impact of the vector. Defining Z_t as the vector of the potentially endogenous variables, we can model Z_t as an unrestricted vector autoregression (VAR) model with lag-length up to 3:[5]

$$Z_t = A_1 Z_{t-1} + A_2 Z_{t-2} + A_3 Z_{t-3} + U_t \quad \text{where } U_t \sim IN(0, \sigma) \tag{5}$$

where Z_t is (4 x 1) vector consists of *CAD, RGDP, BD* and *M2*. Each of the A_i is (4 x 4) matrix of parameters. The 4-VAR model as stated in Equation (5) will be used if there is no long run relationship to be found in the bounds testing approach. However, if there is a cointegration relationship, then the following vector error correction will be applied to examine the long- and short-run causality between variables.

$$\Delta Z_t = \Gamma_1 \Delta Z_{t-1} + \Gamma_2 \Delta Z_{t-2} + \Pi Z_{t-3} + U_t \tag{6}$$

where ΔZ_t= [*CAD, RGDP, BD* and *M2*]', $\Gamma_1 = -(I - A_1)$, $\Gamma_2 = -(I - A_1 - A_2)$ and $\Pi = -(I - A_1 - A_2 - A_3)$. Γ_i measures the short-run effect of the changes in Z_t. The (4 x 4) matrix of Π ($=\alpha\beta'$) contains both speed of adjustment to disequilibrium (α) and the long-run information (β) such that the term $\beta' Z_{t-3}$ embedded in Equation (6) represents the *(n-1)* cointegrating vector in the model.

Accordingly, we can re-state the Equation (6) as follows:

[5] The maximum lag length up to 3 is suggested as the frequency of the data is annual and there are only 25 observations in the study.

$$\begin{bmatrix} \Delta CAD_t \\ \Delta RGDP_t \\ \Delta BD_t \\ \Delta M2_t \end{bmatrix} = \Gamma_1 \begin{bmatrix} \Delta CAD_{t-1} \\ \Delta RGDP_{t-1} \\ \Delta BD_{t-1} \\ \Delta M2_{t-1} \end{bmatrix} + \Gamma_2 \begin{bmatrix} \Delta CAD_{t-2} \\ \Delta RGDP_{t-2} \\ \Delta BD_{t-2} \\ \Delta M2_{t-2} \end{bmatrix} + \begin{bmatrix} \alpha_{11} & \alpha_{12} & \alpha_{13} \\ \alpha_{21} & \alpha_{22} & \alpha_{23} \\ \alpha_{31} & \alpha_{32} & \alpha_{33} \\ \alpha_{41} & \alpha_{42} & \alpha_{43} \end{bmatrix} \times$$

$$\begin{bmatrix} \beta_{11} & \beta_{21} & \beta_{31} & \beta_{41} \\ \beta_{12} & \beta_{22} & \beta_{32} & \beta_{42} \\ \beta_{13} & \beta_{23} & \beta_{33} & \beta_{43} \end{bmatrix}' \times \begin{bmatrix} CAD_{t-3} \\ RGDP_{t-3} \\ BD_{t-3} \\ M2_{t-3} \end{bmatrix} \quad (7$$

There are two steps involved in the estimation of error-correction model (ECM). First, w identify the unique long-run relationship based on theory that represents the economi relationship underlying the long run model among *CAD, RGDP, BD* and *M2*.

Secondly, we estimate the short-run model within the VECM to find out the short ru causal relationship. The short run model is of interest since we can study the behaviour c each variable in the estimated system in response to the residual from the cointegratin equation (error-correction term - ECT). The ECT measures the speed of adjustment of eac variable in response to a deviation from the steady state equilibrium relationship. Since th objective of the study is to examine the causality relationship between budget deficit an current account deficit, the two equations are derived from Equation (7) as follows:

$$\Delta CAD_t = \beta_1 ECT_{t-1} + \sum_{j=1}^{k} \pi_j \Delta CAD_{t-j} + \sum_{j=1}^{k} \tau_j \Delta BD_{t-j} + \sum_{j=1}^{k} \lambda_j \Delta Y_{t-j} + u_{1t} \quad (8$$

$$\Delta BD_t = \beta_2 ECT_{t-1} + \sum_{j=1}^{k} \phi_j \Delta CAD_{t-j} + \sum_{j=1}^{k} \delta_j \Delta BD_{t-j} + \sum_{j=1}^{k} \eta_j \Delta Y_{t-j} + u_{2t} \quad (9$$

where ECT_{t-1} is the one-period lagged error correction term. Y_t is the vector comprising *RGDP* and *M2*, and u_{1t} and u_{2t} are white noise error terms. In these two equations, budget deficit and current account deficit are cointegrated when at least one of the coefficients β_1 or β_2 is not zero. In that case, two series will display long-run relationship. If $\beta_1 \neq 0$ and $\beta_2 = 0$, we conclude that budget deficit Granger causes current account deficit in the long run. On the other hand, if $\beta_2 \neq 0$ and $\beta_1 = 0$, current account deficit will Granger cause budget deficit. If both β_1 and β_2 are nonzero, the conclusion then is that there exists a feedback relationship between budget deficit and current account deficit in the long-run.

The short-run relationships between budget deficit and current account deficit are signified by the coefficients τ_j's and ϕ's. If τ_j's are not all zero, movements in budget deficit will cause current account deficit in the short-run. If ϕ_i's are not all zero, movements in current account deficit will cause budget deficit in the short-run. The short-run as well as

long-run dynamic causality relationships between budget deficit and current account deficit can be assessed by forming hypotheses and testing them on the estimated coefficients in the equations (8) and (9). In general, six possible testable hypotheses concerning the short-run and long-run influence of budget deficit on current account deficit ($BD_t \rightarrow CAD_t$) and current account deficit on budget deficit ($CAD_t \rightarrow BD_t$) can be formulated. These are summarized in Table 3.

Table 3. Six Possible Testable Hypotheses between Budget Deficit (BD) and Current Account Deficit (CAD)

Granger Causality Test	Testable Hypotheses	Description
$H^{ST}_{BD \rightarrow CAD}$ *(No ST linkage)*	$\tau_j = 0 \quad (j = 1,...,k)$	BD does not Granger Cause CAD in the short-term
$H^{LT}_{BD \rightarrow CAD}$ *(No LT linkage)*	$\beta_1 = 0$	BD does not Granger Cause CAD in the long-term
$H^{NO}_{BD \rightarrow CAD}$ *(No ST or LT linkages)*	$\beta_1 = 0$ *and* $\tau_j = 0 \quad (j = 1,...,k)$	BD does not Granger Cause CAD in the short- and long-term
$H^{ST}_{CAD \rightarrow BD}$ *(No ST linkage)*	$\phi_i = 0 \quad (i = 1,...,k)$	CAD does not Granger Cause BD in the short-term
$H^{LT}_{CAD \rightarrow BD}$ *(No LT linkage)*	$\beta_2 = 0$	CAD does not Granger Cause BD in the long-term
$H^{NO}_{CAD \rightarrow BD}$ *(No ST or LT linkages)*	$\beta_2 = 0$ *and* $\phi_i = 0 \quad (i = 1,...,k)$	CAD does not Granger Cause BD in the short- and long-term

These individual hypotheses can be tested using standard *F*-tests on the estimated coefficients of the error-correction model. The six hypotheses are used to examine the lead-lag and feedback relationships between budget deficit and current account deficit as well as other variables.

Table 4. Results of Unit Root Tests (Sample Period: 1985-2005)

Variables	ADF Test		Ng and Perron Test, MZa		KPSS Test	
	Level (Constant with Trend)	First Difference (Constant without Trend)	Level (Constant with Trend)	First Difference (Constant without Trend)	Level (Constant with Trend)	First Difference (Constant without Trend)
CAD	-3.156(0)	-6.711*(0)	-9.852(0)	-9.118*(0)	0.133*(2)	0.194 (6)
RGDP	-3.714*(3)	-3.630*(0)	-93.904(3)	-10.081*(0)	0.096(3)	0.115 (1)
BD	-3.215(0)	-6.547*(0)	-10.127(0)	-9.353*(0)	0.092(2)	0.086 (3)
M2	-3.537(0)	-5.975* (0)	-8.258(0)	-9.441*(0)	0.171*(3)	0.306 (10)

Note: The ADF critical value at 5% level is –2.9640 and –3.5629 for constant without trend and constant with trend regressions, respectively. These critical values are based on Mckinnon. The optimal lag is selected on the basis of Akaike Information Criterion (AIC). The Ng & Perron critical value is based on Ng & Perron (2001) critical value and the optimal lag is selected based on Spectral GLS-detrended AR based on SIC. The null hypothesis of the test is: a series has a unit root. The KPSS critical value is based on

KPSS (1992, Table 1) and the optimal lag is selected based on Newey-West using Bartlett kernel. The null hypothesis of the KPSS test is: a series is stationary. The asterisk * denotes the rejection of the null hypothesis at the 5% level of significance. The figures in brackets denote number of lags. CAD = current account deficit; RGDP = real GDP; BD =budget deficit; M2 = broad money supply.

5. EMPIRICAL RESULTS

Before proceeding with the cointegration analysis, we conducted unit root tests in regard to time series of the variables employed in the study, although the bounds testing procedure does not require the same order of integration. In Table 4, we report the results of three types of unit root tests: (i) the Augmented Dickey-Fuller (ADF), (ii) the modified non-parametric Phillips-Perron unit root test by Ng & Perron (2001), known as MZa test; and (iii) the KPSS test, which relies on the null hypothesis that the series under study is an I(0) stationary process. Based on the results reported in Table 4, we found that CAD, RGDP, BD and M2 are integrated at different order, either I(0) or I(1) process, depending on the use of the unit root tests. Obviously, under such conditions of mixed integrated order conditions of variables, the use of cointegration procedures such as Johansen [1988, 1991] and Johansen & Juselius [1990] are not appropriate.

The results of the unrestricted error correction model (UECM) adopted under bounds testing procedure are shown in Table 5. The empirical finding in Table 5 provides strong evidence in favour of cointegration between *BD* and *CAD* in Vanuatu. The calculated *F*-statistic of *CAD* equation (23.16) is statistically significant at 1% level. Hence, the null hypothesis of no cointegration relationship is rejected. On the other hand, the calculated *F*-statistic in the equations of *ED*, *BD* and *EXP* is respectively smaller than the respective lower bound value (either using both Pesaran, et al., [2001] or Narayan's [2005] critical values), thus leading us to conclude that there is only one cointegration equation. Our finding is in line with the findings of Enders & Lee [1990], Alse & Bahmani-Oskoee [1992], Biswas et al.,

[1992], Tanner & Liu [1994], Khalid [1996], Khalid & Guan [1999] and Kouassi et al., [2004].

The estimated equation for current account deficit as dependent variable is shown as follows:

$$CAD = -5.186 + 0.004RGDP^{*} + 5.978BD^{**} + 4.373M2^{**} \quad (10)$$
$$(-6.55) \quad (3.96) \qquad (6.05) \qquad (6.68)$$

Note: * and ** indicate significance at 5% and 1% levels. Figures in parentheses are calculated "*t*" values.

The results indicate that real GDP, budget deficit and money supply have a significant positive impact on the current account deficit. Of the three explanatory variables, it is found that in terms of the magnitudes of the coefficients, budget deficit has the maximum influence on current account deficit (5.978), followed by money supply (4.373) and real GDP (0.004). Our findings are in accordance with theoretical expectations that domestic absorption, budget deficit and money supply are positively associated with CAD.

Table 5. Bound Test for Cointegration Analysis

Dependent Variable		**Computed F-statistic**		
CAD		26.13***		
RGDP		2.89		
BD		1.95		
M2		1.23		
Critical Value	**Pesaran et al. (2001)[a]**		**Narayan (2005)[b]**	
	Lower bound value	Upper bound value	Lower bound value	Upper bound value
1 per cent	3.41	4.68	4.54	6.37
5 per cent	2.62	3.79	3.13	4.44
10 per cent	2.26	3.35	2.58	3.86

[a] Critical values are obtained from Pesaran, et al. (2001), Table CI(iii) Case III: Unrestricted intercept and no trend, p. 300.

[b] Critical values are obtained from Narayan (2005), Table case III: unrestricted intercept and no trend, p. 1988.

*** indicates significance at 1% level.

Table 6. Diagnostic Tests for Equation (10)

Diagnostic Test	**Null Hypothesis**	**Equation (10)**
Jarque-Bera test	H_0: Normality of error term	$\chi^2 = 0.8728$ [0.6463]
Breusch-Godfrey Serial Correlation LM Test	H_0: No autocorrelation	F(1) = 1.4226 [0.4442]
ARCH Test	H_0: Homoskedasticity	F(1) = 0.0003 [0.9854]
Ramsey RESET Test	H_0: The model is correctly specified	F(2) = 0.0088 [0.9403]

Note: Figures in square brackets are probability values of the test statistics. Figures in parentheses are the lag lengths used for the appropriate diagnostic tests.

Table 7. Summary of Temporal Causality Results based on Parsimonious Vector Error-correction Model (PVECM)

Dependent Variable	F-statistic				*ECT* (t-statistics)
	ΔCAD	ΔRGDP	ΔBD	ΔM2	
ΔCAD	-	5.26*	24.96***	10.51**	-0.0723** (-3.23)
ΔRGDP	1.24	-	1.23	1.50	-0.9777 (-0.14)
ΔBD	15.91***	3.58*	-	4.89**	-0.0082 (-0.49)
ΔM2	0.13	0.10	0.51	-	-0.0213 (-0.26)

*, ** and *** indicate significance at 10%, 5% and 1% levels, respectively. Figures in parentheses are calculated t-statistics.

Various diagnostic tests – tests of normality, autocorrelation, heteroskedasticity in the error term and misspecification error – were conducted to examine the validity and reliability of the long-run regression models. The results of the tests are summarized in Table 6. We do not reject the null hypotheses of no autocorrelation, the error terms being normally distributed and homoskedastic. The RESET test indicates that the model is correctly specified.

Next, we perform Granger-causality tests on the basis of a parsimonious vector error correction model (PVECM). The Granger causality results are reported in Table 7. For the equation with *CAD* as dependent variable, the coefficient on the error correction term is negative and significant at 5% level. A significant error correction term (ECT) is an indicative of long-run causality running from *RGDP*, *BD* and *M2* to *CAD*. However, none of the error correction terms in the remaining equations is found significant, indicating absence of evidence of any long-run causality running respectively from the relevant variables to *RGDP*, *BD* or *M2*. Thus, we have only one long run causality link connecting real GDP, budget deficit and money supply to current account deficit, which confirms the result of only one cointegration equation obtained from the bound testing approach. In the short-run, however, we observe the existence of a bi-directional causality between *CAD* and *BD*.

6. CONCLUSION

This chapter examined whether there was any long-term relationship between external current account and budget deficits in Vanuatu by conducting an empirical investigation of the data covering a 23-year period (1983-2005). Cointegration analysis of four variables, namely budget deficit, external current account deficit, domestic absorption and money supply was undertaken by adopting the bounds testing procedure in an ARDL framework. The empirical findings confirmed the twin deficit hypothesis in Vanuatu. However, the long run linkage runs only in one direction, which is from budget deficit to external current account deficit. In addition to the presence of a positive relationship in the long run between the two, the results show that domestic absorption and money supply positively affect external current account deficits. Among the three variables, budget deficit has the maximum

impact on external current account deficit. Besides confirming the presence of only long-run unidirectional causality running from budget deficit to current account deficit, the Granger causality tests also revealed the existence in the short-run of a bi-directional causality between current account deficits and budget deficits.

The results point to the direction in which Vanuatu should now move both in the short- and long runs. The policy implications are clear. In the short-run, supply elasticities of Vanuatu's exports, being mostly agricultural products, are likely to be very low and hence exports cannot be increased in the short run. Hence, the only remedy seems to be fiscal adjustment, which is needed for facilitating external adjustment for reducing domestic absorption. Fiscal adjustment would support adjustment in external current account in yet another way. This is through its favourable impact on real exchange rate. Reduction in government spending will tend to depreciate the real exchange rate by reducing the demand for non-tradables, thereby increasing the relative profitability of the tradable sector [Daniel et al., 2006]. Since Vanuatu's exports, being agricultural products are supply inelastic in the short run, it is more likely that fall in real exchange rate would benefit tourism earnings rather than commodity exports. However, Daniel et al., [2006] sound a warning against any reliance on devaluation of the currency, as a remedy to correct the external imbalance without correcting the fiscal disequilibria, since the outcome of any devaluation would be inflation. It would be an undesirable outcome resulting in rise in real exchange rate, hurting exports.

As part of medium term measures over the three to five year period, Vanuatu has to vigorously pursue fiscal consolidation [Jayaraman, 2006]. The measures of fiscal consolidation, which aim at reducing public sector deficits and accumulation of public debt, include the following: raising taxes; reduction in public expenditures, public employment, subsidies and transfers, consumption of goods and services and discretionary exemptions from taxes and fees and charges; and improving the performance of state owned enterprises in term of higher dividends. Fiscal consolidation would contribute to fostering fiscal discipline. The latter would in turn lead to greater fiscal flexibility, which is capability to run budget surpluses in good years and deficits in not so good years, as countercylical expenditures. In the absence of a firm commitment to foster fiscal discipline, there is always the danger that fiscal consolidation objectives are likely to be sacrificed in the immediate after-impact of a major economic shock such as fall in terms of trade or rise in oil price. Policymakers will do well to keep in mind that fiscal flexibility cannot be achieved without fiscal discipline.

In the light of the findings of a recent study on aid effectiveness in Vanuatu [Jayaraman & Ward, 2006], that exports positively contributed to growth, resources saved by fiscal consolidation efforts should be redirected into productive investments. These will include productive investments such as roads for connecting farms and hinterland to market centres and jetties in remote isolated islands for speedy movement of exportable agricultural products, thereby improving the country's trade balance.

Finally, Vanuatu's policy makers are aware that freer trade in goods and services envisaged under the Pacific Island Countries Trade Agreement (PICTA) which would usher in a free trade among PICs by 2010, would require phased reduction in/removal of trade taxes. In these circumstances, indirect taxation can no longer be relied upon in the future as the mainstay of revenue as was in the past. Any delay in introducing direct taxation would only lead to larger fiscal imbalances.

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