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Fiscal Sustainability: An Empirical Investigation in Sarawak

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ABSTRACT

This paper examines the fiscal sustainability condition for Sarawak during 1971 to 2004. We also split the sample period into the pre-crisis (1971-1996) to investigate the disparities between the two empirical samples. Empirical validation from the time series analysis finds that government revenue, government expenditure and Gross domestic Product (GDP) are cointegrated, which provides some support for the position that Sarawak's budget deficit is sustainable in the long run in both sampling periods. The results also found support for coefficient of expenditure being unity in both periods. This finding suggests that reducing the size of government spending may improve fiscal budget deficits without having to undergo changes in the overall strategy.

Keywords: Fiscal Sustainability, Revenue, Expenditure, GDP and Sarawak.

INTRODUCTION

Since the publication of Hamilton and Falvin's (1986) article, the behavior of fiscal deficit sustainability has been an important topic in economic frontline and policymaking. It is seen as a key indicator of a country's economic performance. According to this view, temporary fiscal deficit presents few problems, as the imbalances may be the result of dealing with a recession, natural disaster or some other form of short-term event. However, persistent fiscal deficit poses a problem that is likely to induce a policy response at both macro and microeconomic levels.

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If such a phenomenon occurs, then the fiscal imbalances would imply a need for larger and more painful adjustments for the economy (e.g: fiscal tightening in the form of expenditure restraints).

Being the largest state in Malaysia, Sarawak is blessed with the abundance of natural resources. Besides being one of the world largest exporters of tropical timber, Sarawak is also rich with petroleum resources. These resources do in a way or another help towards increasing the income and revenue of Sarawak's state government. Additionally, the sources of revenue for the development expenditure in Sarawak are both from state and federal government of Malaysia. The federal allocation for government development expenditure in Sarawak had reduced from 89 percent of total development expenditure in the First Malaysian Plan to 38 percent in the Fifth Malaysian Plan. Accordingly, the federal government had allocated a mere 2 to 3 percent for the first five Malaysian Plans' national development allocations in commerce and industry sectors in Sarawak. Moreover, education and training expenditure consist of 7 percent from national development allocation each for the first five Malaysian Plans.

Figures 1 and 2 show that Sarawak budget has been in deficit for a long period. The only exceptional was in 1980. Evidently, the expenditure in Sarawak has been rising faster than revenue, and as a result, the state government of Sarawak has had growing deficits since 1971 (Wee, 1995). The upward trend is particularly noticeable when the New Economic Policy (NEP) was introduced in 1970 and during the 1979 – 1983 periods (Mukul, 1989). Over the whole period, the budget deficit fluctuates around 5 percent of the GDP, which implies as to whether or not these deficits are 'too large'. However, since late 1980s and 1990s, the deficit in budget mounted to more than 10 percent of the GDP. Does the behavior of the deficit indicate boundless growth of government debt? The answer to this question will give rise as to whether Sarawak's budget deficit are sustainable over the long run or not. With this in regard, this paper tests the sustainability condition of fiscal position in Sarawak over the years of 1971 to 2004.

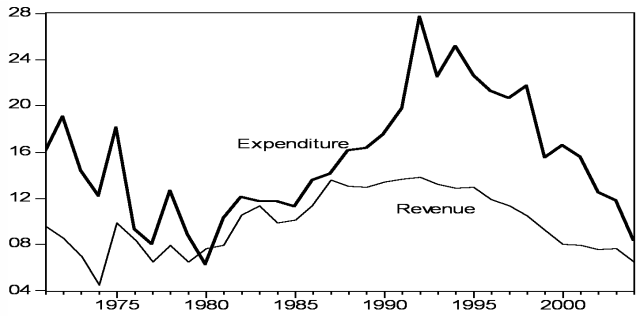

Figure 1 Sarawak's total expenditure and revenue as a proportion of GDP, 1971 – 2004

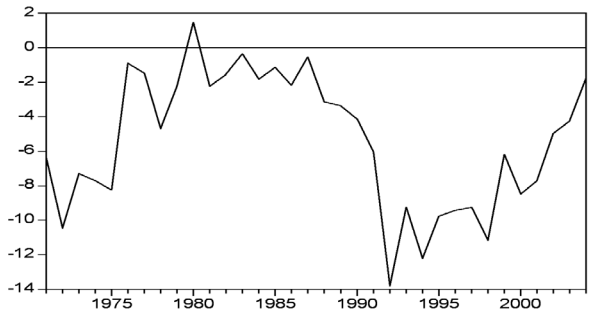

Figure 2 Sarawak's budget deficit as a proportion of GDP, 1971 – 2004

Basically, there are two approaches in the literature of fiscal sustainability. First, Hamilton and Flavin (1986), Trehan and Walsh (1988); Wilcox (1989); MacDonald (1992); and Uctum and Wickens (2000) tested the univariate stationarity of the debt or deficit for the whole trajectory path of the fiscal positions over time. Hamilton and Flarin (1986) showed that if deficits and government debt followed a stationarity process, then intertemporal budget balance is satisfied. They found stationarity of undiscounted US debt under the assumption of constant real interest rates. Besides, the results of Trehan and Walsh (1988, 1991) and Smith and Zin (1991), among others found support for the sustainability of U.S. and Canadian fiscal policies respectively. Second, Hakkio and Rush (1991) examined the bivariate long-run cointegration relationship between government revenue and expenditure (see also for example, studies like Tanner and Liu 1994; Payne 1997; Papadopoulos and Sidiropoulos 1999; Martin 2000). For example, Hakkio and Rush (1991), allowed for stochastic real interest rates and a growing economy, and had shown that in recent years, fiscal policy violates the intertemporal budget constraint within the US.

This study offers several policy perspectives. First, the empirical investigation sheds some light on the long run financial performances of the Sarawak government. This information is crucial for Sarawak in evaluating its financial performances and strategies. Being the largest state in Sarawak, the prudent planning for expenditure and revenue policy options is important to support the overall strategy towards development. Second, Sarawak recorded deficit in its budget for most of the sampling period. Hence the results add to the understanding of deficit sustainability in the literature. This is also the first study of its kind for Sarawak particularly evaluating the government financial performance. Third, the sampling period would be segregated into pre (1971 – 1996) and the full sampling period (1971 – 2004). The purpose is to examine the disparities in government fiscal conduct for these samples.

In line with previous studies such as Baghestani and McNown (1994), Ross and Payne (1998) and Koren and Stiassny (1998), GDP is included in the empirical investigation as a control variable. Within this context, understanding the relationship between government revenue and expenditure is an essential tool to reduce persistent budgetary problems as well as to maintain budgetary targets and balances. The remaining of the paper is organized as follows. The next section contains a brief description of the fiscal sustainability condition. The description of the data and empirical results are presented in Section III. And finally, Section IV concludes the paper and provides some policy lessons.

FISCAL SUSTAINABILITY CONDITION

Sustainability of fiscal conduct can be derived from the government's intertemporal budget constraint (GIBC). The budget constraint looks at the long-run relationship between government revenue and expenditure (that covers the total government spending on goods and services, transfer payments and interest on debts).

The model starts by defining the budget constraint faced by a government at period t

$$G_t + (1 + r_t)B_{t-1} = RR_t + B_t \tag{1}$$

where G_t is the value of government purchase of goods and services and transfer payments; RR_t is the government revenue; B_t is government debt; and r_t is the (one period) interest rate. At this point in the discussion it is worth noting that the variables in (1) can be nominal, real or "deflated" by population or real GDP[1].

The budget constraint expressed in (1) pertains to period t; there is similar constraint for periods t+1, t+2, t+3,…, and recursively solving the equation via forward substitutions leads to the following government intertemporal budget constraint

$$B_0 = \sum_{t=1}^{\infty} \delta_t [RR_t - G_T] + \lim_{n \to \infty} \delta_n B_n \tag{2}$$

In Equation (2) $\delta_t = \prod_{s=1}^{\infty} \beta_s$ where $\beta_s = 1/(1+i_s)$, and δ_t is the discount factor. The equation simply says that the current value of government debt B_0 is equal to the expected present value of all future primary surpluses $\sum_{t=1}^{\infty} \delta_t [RR_t - G_t]$,

[1] The interpretation of the interest rate in Equation (1) depends on how total government expenditures and revenues are measured. When the variables are nominal, r_t is the nominal interest rate; when the variables are real, r_t is the real interest rate; when the variables are real per real GDP, r_t is the real interest rate minus the rate of growth in real GDP; and when the variables are real per capita, r_t is the real interest rate minus the rate of population growth (Hakkio and Rush, 1991).

plus a limiting term representing the asymptotic expected present value of the government's debt. The crucial element in (2) is the last term $\lim_{n\to\infty} \delta_n B_n = 0$, where the limit is taken as $n \to \infty$. When the limit term is zero $\lim_{n\to\infty} \delta_n B_n = 0$ (transversality condition), this implies that in the long run we rule out a Ponzi scheme that is the government is not 'bubble' financing its expenditure by issuing new debts to finance the deficits. Therefore, a fiscal policy will be sustainable if the limiting term in Equation (2) is zero[2].

The above model is not an appropriate equation for testing the sustainability of fiscal deficit. Following the literature, we assumed that the interest rate is stationary around a mean r or expressed as the real interest rate. In order to transform the equation into some testable implication and after further manipulation, (2) may also be written as

$$RG_t - RR_t = \sum_{s=0}^{\infty} \frac{\Delta RR_{t+s} - \Delta RG_{t+s} + r\Delta B_{t-1+s}}{(1+r)^{s-1}} + \lim_{s\to\infty} \frac{B_{t+s}}{(1+r)^{s+1}} \tag{3}$$

where RG_t represent the total government spending on goods and services, transfer payments and interest on debts or $RG_t = G_t + rB_{t-1}$. Hakkio and Rush (1991), assume that the RR_t and $G_t + (1 + \mathrm{r})B_{t-1}$ are both nonstationary variables of $RR_t = \alpha_1 + RR_{t-1} + \varepsilon_{1t}$ and $RG_t = \alpha_2 + RG_{t-1} + \varepsilon_{2t}$. Consequently, expression (3) can be conveniently rewritten as

$$RG_t = \alpha + RR_t + \lim_{s\to\infty} \frac{B_{t+s}}{(1+r)^{s+1}} + \varepsilon_t \tag{4}$$

where $\alpha = \frac{1+r}{r}(\alpha_1 - \alpha_2)$ and $\varepsilon_t \sum_{s=0}^{\infty} \frac{(\varepsilon_{1t} - \varepsilon_{2t})}{(1+r)^{s-1}}$. Equation (4) forms the basis for testing the hypothesis of sustainable fiscal deficit. If the transversality condition for the budget constraint holds and the limit term in (4) is zero, we obtain

$$RR_t = a + bRG_t + \mu_t \tag{5}$$

along with the null hypothesis of $b = 1$ and μ_t is a stationary process (see Trehan and Walsh, 1988; Quintos, 1995 and Kalyoncu, 2005). Equation (5) has been widely used as the basis to assess the sustainability of government's intertemporal budget constraint in the literature[3]. In line with the existing literature, we examined four

[2] This is equivalent to saying that the deficit is sustainable if and only if the stock of debt held by the public is expected to grow no faster than the mean real rate of interest which is viewed as a proxy for the growth rate of the economy.

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possible scenarios for the sustainability conditions and they are as follows (see, Quintos, 1995 and Martin, 2000):

- The deficit is 'strongly' sustainable if and only if the *I(1)* processes of *RR* and *RG* are cointegrated with cointegrating vector [1,-1] or with $b = 1$. It means that the government's budget constraint intertemporally holds and at the same time, the undiscounted debt process B_t is *I(1)*.
- The deficit is only 'weakly' sustainable if *RR* and *RG* are cointegrated with $0 < b < 1$[4].
- The deficit is unsustainable if $b \leq 0$. An unsustainable deficit is one that implies that B_t is exploding at the rate equal to or in excess of the growth rate in the economy, such that the limiting term in GIBC of Equation (2) is violated.
- The condition of $b > 1$ is not consistent with a deficit. It implies that government revenue is growing at a faster rate than government expenditure (see also Martin, 2000).

DATA DESCRIPTION AND EMPIRICAL RESULTS

Data Description

Annual observations (1971 – 2004) of the total government revenues and government expenditures (inclusive of the transfer payments and interest on the debt) and gross domestic product (GDP) are extracted from Department of Statistics, Sarawak. All these nominal variables (GDP, government revenue and government expenditure) were converted into logarithm format before the estimation process. All the variables used in the analysis are expressed in domestic currency of Ringgit Malaysia.

Unit Root Tests

Standard unit root tests were performed for that RR, RG and GDP, first on levels and then first differences. Overall, we found is a realization of an *I (1)* stochastic process from the ADF (Said and Dickey, 1984) and KPSS (Kwiatkowski *et al*., 1992) testing procedures. The results are not reported here to conserve space but are made available upon request. The findings that all the variables have

[4] Hakkio and Rush (1991) demonstrate that $0 < b < 1$ is a sufficient criterion for the deficit to be sustainable. However, the condition of $b < 1$ implies that the government expenditure will always be larger than revenue. In this limit, the undiscounted stock of debts will reach infinity and make the value of debt unbounded which provides incentives for government to default on its debt. Therefore, this outcome is a less desirable scenario (see also Quintos, 1995 and Martin, 2000).

the same order of integration allow us to proceed with the Johansen multivariate cointegration analysis.

Multivariate Cointegration Test

Given the common integrational properties of all the series under investigation, the next step was to test for the presence of cointegration for the three-dimensional vector [RR, RG and GDP] for Sarawak. The Johansen procedure employs two likelihood ratio (LR) test statistics to determine the number of cointegrating vectors: the trace test and the maximal eigenvalue (λ-max) test. As this procedure has become a standard practice in empirical work, detailed explanation of the tests is not presented here. Interested readers may refer to Johansen (1988) and its extension in Johansen and Juselius (1990) for a complete discussion on the procedure. Results of the cointegration procedure are presented in Table 1. The null hypothesis of no cointegrating vector ($r = 0$) in favor of at least one cointegrating vector is rejected at 5 percent significance level in the full sampling period (see Panel A). We noted that both the trace and the maximum eigenvalue tests led to the same conclusion – the presence of one cointegrating vector. Interestingly, in Panel B (pre-crisis period) the results also indicate the existence of long run relationship for Sarawak. Rejecting the null hypothesis of no cointegration between the I (1) variables appearing in Equation (5) implies that the two variables do not drift apart in the long-run.

Table 1 Cointegration test results for sample period from 1971 to 2004

Panel A: 1971 – 2004 (Full sample)

Null	Alternative	k = 2 r = 1			
		λmax		Trace	
		Unadjusted	95percent C.V.	Unadjusted	95percent C.V.
r = 0	r = 1	27.0428*	20.9700	40.1196*	29.6800
r<= 1	r = 2	10.4024	14.0700	13.0768	15.4100
r<=2	r = 3	2.6743	3.7600	2.6743	3.7600

Panel B: 1971 – 1996 (Pre-crisis)

Null	Alternative	k = 2 r = 1			
		λmax		Trace	
		Unadjusted	95percent C.V.	Unadjusted	95percent C.V.
r = 0	r = 1	50.7719**	20.9700	59.4417**	29.6800
r<= 1	r = 2	8.6430	14.0700	8.6697	15.4100
r<=2	r = 3	0.0266	3.7600	0.0266	3.7600

Notes: Asterisks (*) denote statistically significant at 5 percent level. The k is the lag length and r is the cointegrating vector(s). Chosen r: number of cointegrating vectors that are significant under both tests.

Estimation of Long Run Equilibria

The Johansen procedure may be used to extract the long-run parameters of the model. However, a more robust method proposed by Stock and Watson (1993) that also corrects for possible simultaneity bias among the regressors is considered in this paper[5]. The method involves estimation of the long-run equilibrium relationship using the dynamic OLS (DOLS) method. In this study, we relied on the technique devised by Stock and Watson (1993) that allows for the (dynamic) estimation of cointegrating vectors for systems involving deterministic components. According to Equation 5, we test whether the cointegration coefficient b = 1 (strong form of sustainability condition) is insignificantly different from 1.

The results of the DOLS appear in Table 2 and the findings may be summarized as follows:

- In the full sample period, we observe that the estimated b is 0.928, which is close to unity. The null hypothesis of $b = 1$ is not rejected at conventional significance levels ($\chi^2 = 2.904$). As such, the empirical results suggest that exports (RR) and imports (RG) are cointegrated with the cointegrating coefficient near to 1, implying that the fiscal stance was on the sustainable path where it satisfied the strong form of sustainability condition (see Panel A, Table 2). Apart from that, we also tested for the stability of the estimated results by using the CUSUM squares test. If the plot of the CUSUM squares sample path moves outside the critical region (at the 5 percent significant level), the null hypothesis of stability overtime of the intercept and slope parameters is rejected (assuming the model is correctly specified). The plots of the CUSUM squares (CUSUMSQ) in Figure 3 reveal the null hypothesis of parameter stability cannot be rejected at the 5 percent level of significance, implying that the estimated results obtained earlier are indeed stable over time.
- We also observed the same pattern of results in the pre-crisis period where the coefficient of b is 0.903 and the restriction on the coefficient of $b = 1$, yields $\chi^2 = 2.961$, which implies that the budget deficit in Sarawak was indeed sustainable prior to the Asian financial crisis in 1997. Figure 4 plots the graphical path of the CUSUMSQ test for the period prior to the 1997 financial crisis. The visual illustration detected the instability of the estimated results presented in Panel B, Table 2 in the early 1980s to early 1990s consisting about a decade. This is an interesting observation as the deficit in budget for Sarawak drop sharply in that decade (see Figure 2).

[5] They offer a parametric approach for estimating long-run equilibria in systems that involve variables integrated of different orders but still cointegrated. The possibility of simultaneity bias and small-sample bias among the regressors is dealt with by the inclusion of lagged and lead values of the first difference in the regressors.

Table 2 Dynamic OLS estimation (DOLS)

	Panel A: 1971 – 2004 (Full sample)	**Panel B: 1971 – 1996 (Pre-crisis)**
Coefficient of b	0.928	0.903
t-statistics	22.023 (0.000)	16.179 (0.000)
H_0: b = 1	2.904 (0.088)	2.961 (0.085)

Notes: Estimation of DOLS is based on both the sampling periods with three lags and three leads of first differenced explanatory variables. Parenthesized values are the probability of rejection (p-value).

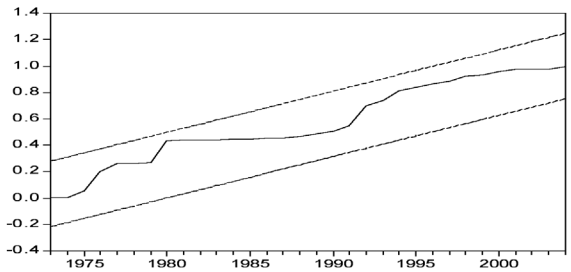

Figure 3 CUSUM squares test result from 1971 to 2004

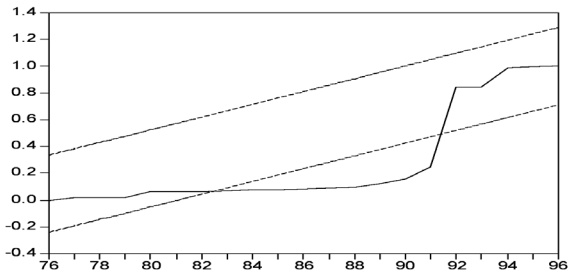

Figure 4 CUSUM squares test result from 1971 to 1996

CONCLUSIONS AND POLICY IMPLICATIONS

The main contribution of this paper is to trace the position of the government financial performance of Sarawak in the period that includes the 1997 financial crisis. Based on the simple econometric analysis, we lead to the following conclusions. First, we found significant long run cointegration relationship for Sarawak. The results hold for both sampling periods. Second, we found support for the strong form of sustainability condition in the both samples, suggesting that Sarawak is on the sustainable path in governing their financial performance. The results suggest that for every ringgit spends by government, the revenue generated

is around 0.938 (0.90) cents for full sample (pre-crisis). However, using the CUSUMSQ experiment, we found that the evidence for the pre-crisis period is not stable. This is due to the decade of deficit in the budget of Sarawak. There is a danger that the budget deficit could explode if the government's revenue performance is not improved or if a large portion of government expenditure is going towards unproductive investment. Whilst the gap between government expenditure and government revenue has not exploded (as indicated by the results), we caution that Sarawak should adopt a more ambitious fiscal framework to rebalance its financial structure. This would include reallocation of its spending to the development expenditures which will increase the productive capacity and the state GDP as whole. With the introduction of the idea of balance regional development (Sarawak Corridor of Renewable Energy or SCORE), of the states in Malaysia under the 9th Malaysian Plan and the Budget 2008, Sarawak is not to be left out from the national agenda of development planning[6]. Towards this end, monitoring, maintaining and sustaining stable fiscal position are important for the macroeconomic stability towards long run economic growth in Sarawak.

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[6] It is one of the five regional development corridors being developed throughout the country. SCORE is a major initiative undertaken to develop the Central Region and transform Sarawak into a developed State by the year 2020.

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