TESTING OF THE RICARDIAN EQUIVALENCE PROPOSITION
An Empirical Examination for Malaysia (1962-2006)

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This paper investigates the effects of debts and budgetary deficit on real variables using structural Vector Error Correction Model (VECM) method with long-run restrictions. We compare our estimates of the impulse responses with those based on levels Vector Auto-Regressive (VAR) with standard recursive order restrictions. The test is conducted on the Malaysian data covering the period of 1962-2006. The empirical results do not support the existence of "Ricardian Equivalence" hypothesis. The effects of budgetary deficit and government spending have a significant influence on private consumption and private investment.

Introduction

The ability of fiscal policy to influence the aggregate demand has been incessantly debated in macroeconomics. Some economists believe that continuous deficits are considered a stabilization package in an economy. Its implementation is said to be able to boost real variables such as consumption, investment and gross domestic product through multiplier effects. The tax system and debts are instruments used to finance the budgetary deficits. Deficits financed by debts and tax are current liabilities that will be brought forward to the future, hence to be burdened to the future generations, taking into consideration the intertemporal factor, as conveyed by Ricardo (1817) who introduced the "Ricardian Equivalence Theorem (RET)"

RET stipulates that the choice of financing government expenditures either through debts or tax do not have any impact on real economic variables such as consumption and investment. The basis of the theorem is due to public's perception on future tax liability that is equivalent to current debts. As such, any reduction in tax will cause individuals to increase their savings to the extent of the tax cuts, and allow them to compensate future tax increase. The theorem has been supported by Barro (1974) where the public's permanent income is directly related to future generation through the operation of intergenerational transfer, which does not consider the current tax cuts and increase in disposable income to be permanent. As a result, the public will save additional disposable income to finance their future tax increase. In other words, the public does not consider bond or government debts as net wealth.[1]

The idea of RET has been extraordinarily important within the academic debate over government policies. There are three reasons for this. Some economists have argued that RET does in fact describe the world. This small group has provided a useful reminder to the rest of the economists that the conventional view of government fiscal stimulus may not affect the economy scientifically. The inability of macroeconomists to perform true experiments makes macroeconomic knowledge including RET opens to debate. Although we believe that policymakers are best advised to rely on the conventional view of government policies, we admit that there is room for reasonable disagreement. The second and more significant reason that RET is important is that it offers a theoretical benchmark for much further analysis. RET claims that government's choice between debt and tax is finally irrelevant. Thus, it can be viewed as one natural starting point in the theoretical analysis to check the

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[1] As mentioned by Graham and Himarios (1996), an increase in aggregate demand due to tax reduction and issuing new bonds will depend on the degree of consumers' perception on government debt as net wealth, including household financial assets (book value holdings of government debt) and tax-exempt securities.

relevance of government financing on the economy. Last but not least, theoretical literature offers various reasons as to why government budget financing affects the real variables but does not prove that the proposition is not true to represent the actual economy. To reach such a judgment, one must assess the quantitative important of these theoretical deviations from the Ricardian benchmark.

Realizing the importance of the effect of debt neutrality on fiscal policy and future generation, the main purpose of this study is to examine the existence of RET in Malaysia using the Vector Error Correction Model (VECM). If RET is not taken into consideration, there is a possibility that the Malaysian perceive the government debts as real wealth that in reality is a burden to future generation.

Review of the Literature

The Malaysian government has played an active role in the economy since its independence, especially in promoting overall social and economic development process. In the 1970s, the government implemented the New Economic Policy in order to obtain sustainable economic growth and poverty eradication. This has been achieved through fiscal stimulus and government involvement in large commercial enterprises. In the 1980s, the government pursued an expansion countercyclical fiscal policy aimed at stimulating economic activities and sustaining growth to ride out the ef-

fects of global recession. The new direction in public policy also tried to promote the participation of private sector as the main driver of economic growth of the country in early 1990s. In late 1990s, as Malaysia experienced regional economic crisis, fiscal policy turned expansionary to support economic activities. All the countercyclical fiscal policy implemented largely through discretionary measures was effective in supporting economic recovery and sustaining domestic demand.

In the millennium period, fiscal policy has remained important with constant review subject to changing circumstances. The fiscal policy continues to support the expansion of private sectors activities. In conducting the policy, care was taken that fiscal measures would not unduly risk creating imbalances that might jeopardize the long term growth potential, price stability or gains from a robust balance of payments. The government has remained committed to the adherence of fiscal policy management (Malaysia 1970; 1980; 1990 and 2005).

In line with the importance of fiscal policy, particularly the relevance of RET, mixed results have been obtained through several empirical studies conducted to assess the RET. Among the studies, Ghatak and Ghatak (1996) have found that in India, for the period of 1950-1986, the RET was rejected as the country had been facing the setback of an imperfect credit market, liquidity constraints, differential borrowing rates and finite planning

horizon.[2] Domenech et al. (2000) also discover a similar empirical result for 17 OECD countries where private saving compensates only a small fraction of budget deficit, and they suggest that RET did not hold for the period under studied. Argimon et al. (1997), Bahmani-Oskooee (1999) and Ahmad and Miller (2002) support the existing crowding-in effect of private investment of public expenditures for different economic background. They reject the RET. Bagnai (2006) finds a stable long-run relationship between current account fiscal deficits and investments in 22 OECD countries.

Subsequently, Bassam and Hamid (2004) have examined the causality between the government's incomes and expenditures for the states of Jordan and Egypt. Using differential vector auto regressive analysis (VAR-D), they find that a unidirectional relationship exists between government revenues and expenditures. It means that the increase in tax will not impact on a decrease in budget deficits. To ensure sufficient domestic savings for private investment, the government had been advised to implement a plan to reduce budgetary deficit via privatization. On the contrary, Nelson and Singh (1994) find that the budget deficits exercised little impact of any statistical significance on economic growth in less developed countries during 1970s and 1980s. Wheeler (1999), who used the variance decomposition (VD) analysis and Impulse Response Function (IRF) derived from the VAR model, finds empirical evidence supporting the "Ricardian Equivalence" i.e., any increase in government debts cause a decline in wealth that consequently leads to the reduction of interest rates, outputs and price levels. Baharumshah et al. (2008) investigated the relevance of twin deficit hypothesis in five ASEAN countries by examining the causal relationship between current account deficit, budget deficit and investment. They establish that government expenditure crowds out private investment. They conclude that the empirical results on the impact of budget deficits on macroeconomic variables are still inconclusive. Little and in fact none can be concluded about empirical evidence of RET for the case of Malaysia.

The Theoretical Framework of RET

As an illustration on the functionality of RET, assume the indefinite future can be separated into two segments, which are the current and future as the first and second segments, respectively.[3] It is also assumed that:

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[2] Under the assumption of infinite planning horizon, the empirical result may invalidate the RET proposition.

[3] For the sake of simplicity, households and government are assumed exist in two time periods. Household spends his (her) exogenous income to attain utility by consuming goods in both periods, likewise government purchases goods and financed its spending by taxes and debts. See Heijdra and Van Der Ploeg (2002).

(1) there exists a perfect foresight between households and government, (2) household will exist as long as the government remains in existence, (3) utility is obtained from consumption in both time segments, (4) the supply of labor is exogenous, (5) household income is exogenous, as such the lifetime utility, V, is given as:

$$V = U(C_t) + \{1/1+\rho\}U(C_2);$$
$$\rho > 0 .... \quad (1)$$

where,

C_t = consumption during the period t (t=1,2),

$U(.)$ = the 'instantaneous' utility function, and

ρ = the pure rate of time preference.[4]

At the end of period 0 (in the past), household possesses financial assets in real term denoted as A_0, and household would also receive interest payments at the beginning of period 1 which is rA_0 where r is the real interest rate, and it is assumed to be fixed. The exogenous non-interest income payments are represented by Y_1 and Y_2, respectively. Therefore, the budget constraints for both period segments are:

$$A_1 = (1+r)A_0 + (1-t_1)Y_1 - C_1 ....(2)$$

$$A_2 = (1+r)A_1 + (1-t_2)Y_2 - C_2 = 0........(3)$$

where t_1 and t_2 are the tax rates on income for the two periods.[5] $A_2 = 0$ implies that it is not possible for household to depart with a positive financial asset ($A_2 > 0$), and it is not possible for household to depart with debt ($A_2 < 0$).[6] If the household may borrow or lend freely at interest rate r and A_1 may have a positive or negative value, a single lifetime budgetary constraint can be derived from both Equations (2) and (3).

$$A_2 = 1+r)[(1+r)A_1 + (1-t)Y_1 - C1] + (1-t_2)Y_2 - C_2 = 0$$

$$C_1 + (1+r)^{-1}C_2 = (1+r)A_0 + (1-t_1)Y_1 + (1-t_2)(1+r)^{-1}Y_2$$

$$C_1(1+r)^{-1}C_2 = (1+r)A_0 + H........ (4)$$

Equation 4 depicts the present value of lifetime consumption that must be equal to total wealth, and the right side of the equation represents total wealth, which is the sum of initial financial wealth inclusive of return on interest received, *(1+r) A_0* and human wealth, *H*.

$$H = (1-t_1)Y_1 + (1-t_2)(1+r)^{-1}Y_2 ......(5)$$

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[4] ρ represents the effect of impatience. The higher the level of impatience implies the greater discounted future utility.

[5] Equation (2) and (3) are under assumption that interest on income is untaxed.

[6] The model can be modified by introducing household with inheritance.

To illustrate RET, the government sector needs to be introduced as well as its budgetary constraints. The underlying assumptions involved are: (1) the government spends for its own consumption, G_1 and G_2, and finances its expenditures either through taxes or debts; (2) there is no seignorage in the model, which means financing through printing of money is impossible. As the household, the government also faces two segment periods and may borrow or lend at the interest rate r. The identity of the government's budget constraints can be specified as:

$$(D_1 \equiv) \, rB_0 + G_1 - t_1 Y_1 = B_1 - B_0 \, ...(6)$$

$$(D_2 \equiv) \, rB_1 + G_2 - t_2 Y_2 = B_2 - B_1 = -B_1$$
$$... \, (7)$$

where D_i and B_i are the budgetary deficit and government debt in period i (i=1,2), respectively, and B_2 will be zero because the government will not default on its debt and is assumed to remain capable of repaying the debt. As such, the single government budgetary constraint can be derived as:

$$(1+r)B_0 + G_1 + (1+r)^{-1}G2 =$$
$$t_1 Y_1 + (1+r)^{-1}t_2 Y_2 \, ...(8)$$

where the left hand side of (8) represents the present value of the government net liability and the right hand side of the equation depicts the present value of government net income.[7] As government bond is the sole financial asset in a "toy economy," household borrowing (lending) may only be negative (positive) in value of the government bond. So, equilibrium in the financial capital market is specified as:

$$A_i = B_i \qquad \forall_i = 0, 1, 2 \, ...(9)$$

As such, RET can be presented by replacing equation (9) in equation (4).

$$C_1 + (1+r)^{-1}C_2 = (1+r)A_0 + H =$$
$$(1+r)B_0 + H$$
$$= t_1 Y_1 + (1+r)^{-1}t_2 Y_2 - G_1 - (1+r)G_2 +$$
$$(1-t_1)Y_1 + (1+r)^{-1}(1-t_2)Y_2$$
$$= Y_1 - G_1 +$$
$$(1+r)^{-1}(Y_2 - G_2) = \Omega .... (10)$$

Equation (10) shows that the tax parameters have been dropped out of the household's budget constraints. Hence, only the present value of government spending (given as exogenous) is capable of influencing the level of household net wealth. Therefore, the choice of consumption C_1 and C_2 does not depend on the tax parameters t_1 and t_2. The above depicts RET where the approach of the government to financing its expenditure is found not to influence the level of real consumption.

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[7] For example tax revenue.

Data Description

The RET is investigated by examining the impact of government debt and budgetary deficit on the private consumption and private investment. In order to proceed with empirical analysis, this study employs the annually time series data from the year 1962 to 2006 and have been obtained from Annual International Financial Statistics and Annual Bulletin National Bank of Malaysia. All the series are originally expressed in its nominal terms and have been transformed to real terms using the consumer price index for the year 2000 as the base year. The notations are used in this paper: Real Gross Domestic Product (RGDP), Real Government Deficit (RGD), Real Private Consumption (RPCONS), Real Private Investment (RPINV), Real Government Debt (RDEBT) and Real Foreign/External Debt (RFEDEBT).

Before we indulge further into empirical evidence, we present the behavior of the selected variables throughout the sample period. The trends of RGD as well as RFDEBT were experiencing their ups and downs over certain period. We can see that the trends of these variables give an impact on the real sectors whereby the changes in RGD and RFDEBT give a multiplier effect on RPCONS and RPINV. From the behavior of the series, it indicates that RET may be rejected for the case of Malaysian data but yet to be proven empirically.

Figure 1. **Trend of Selected Real Macroeconomic Variables**
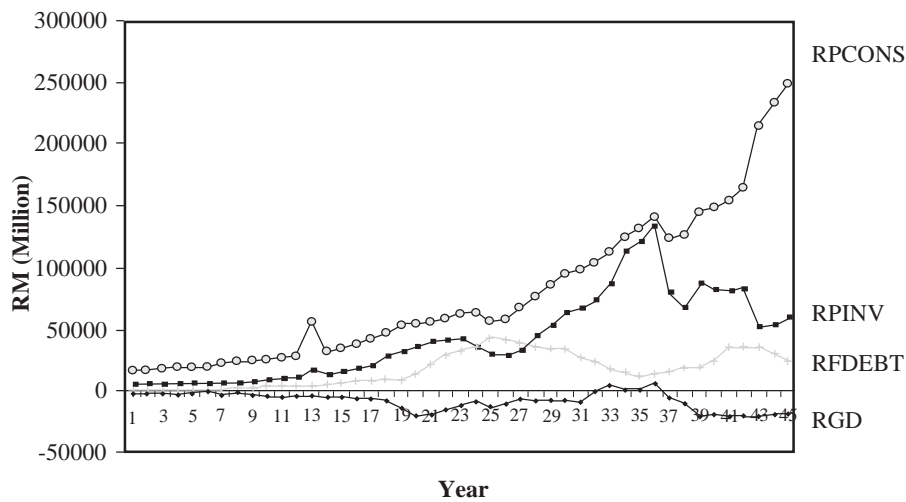
Econometric Methodology

For the purpose of examining the existence of the "Ricardian Equivalence Theorem," Vector Error Correction Model (VECM) is applied to analyze the effect of debts and government deficits on consumption and investment (macroeconomic real variables). Upon checking the cointegration between variables, VECM is more appropriate to evaluate the long run relationship between variables. Moreover, the median estimates from VECM are in general more accurate than Vector Autoregresive (VAR). The VAR falsely estimates if the variables are cointegrated. Although structural knowledge improves accuracy, not knowing the true structure and identifying and estimating it at each replication lead to an increased uncertainty.[8] Knowing the cointegration rank leads to more accurate inference. To apply VECM (Mitchell 2002), *firstly*, the stationarity of the time series involved is tested using the "Augmented Dickey-Fuller" and Phillip-Perron tests. The model considered for Y_t time series are:

◆ Random movement with intercept

$$Y_t = \beta_1 + \delta Y_{t-1} + \alpha_i \sum_{i=1}^{m} \Delta Y_{t-i} \ldots \ldots (11)$$

◆ Random movement with intercept and stochastic trend

$$Y_t = \beta_1 + \beta_2 t + \delta Y_{t-1} + \alpha_i \sum_{i=1}^{m} \Delta Y_{t-i} \ldots \ldots \ldots (12)$$

where Y_t = [$RPCONS_t$, $RPINV_t$, $RFDEBT_t$, RGD_t]'

Secondly, if each variable is integrated of order 1; $RPCONS_t$, $RPINV_t$, $RFDEBT_t$, RGD_t and $RGDPt \sim I(1)$, then the determination of optimal lag length is performed based on the "Likelihood Ratio" test or AIC and SBC criterion on the traditional Vector Auto Regressive (VAR).[9] *Thirdly*, Equation 15 is estimated and the rank of (r) for matrix π is determined. Given;

$$Y_t = A_1 Y_{t-1} + A_2 Y_{t-2} + \ldots + A_p Y_{t-p} + \varepsilon_t \ldots \ldots \ldots (13)$$

where Y_t = vector [$RPCONS_t$, $RPINV_t$, $RFDEBT_t$, RGD_t]' (n x 1) dimension and $\varepsilon_t \sim$ i.i.d with zero mean and matrix variance Σ_ε. By subtracting Y_{t-1} from both sides of the equation, as such;

$$Y_t - Y_{t-1} = A_1 Y_{t-1} - Y_{t-1} + A_2 Y_{t-2} \ldots + A_p Y_{t-p} + \varepsilon_t$$

[8] In the event of any structural breaks, CUSUM test will be performed in order to identify the breaks for considered period.

[9] According to Enders (2004), if the series are all I(1) and they are not cointegrated, so that the model should be VAR in first differences (VAR-D). It is important to note that by differencing the variables, there will be a loss of important and useful information regarding the long-run relationships. In other words, omitting the cointegration or linear relationship is an error specification in a VAR-D that provides no information about the long-run which of interest to economists (Patterson 2000).

$$\Delta Y_t = (A_1 - I)Y_{t-1} + A_2Y_{t-2}.....+$$
$$A_pY_{t-p} + \varepsilon_t$$

Subsequently, add $(A_1\text{-}I)Y_{t-1}$ on both sides of the equation and obtain;

$$\Delta Y_t = (A_1 - I)Y_{t-1} + A_2Y_{t-2}.....+$$
$$A_pY_{t-p} + \varepsilon_t$$

By continuing the same process, the following equation can be obtained;

$$\Delta Y_t = \sum_{i=1}^{p-1} \pi_i \Delta Y_{t-i} + \pi Y_{t-p} + \varepsilon_t ......(14)$$

Following Johansen (1991; 1995), cointegration test is performed. Estimation of the above equation can be considered by introducing the A_0 intercept that is:

$$\Delta Y_t = A_0 + \sum_{i=1}^{p-1} \pi_i \Delta Y_{t-i} + \pi Y_{t-p} +$$
$$\varepsilon_t.................................(15)$$

where Equation 15 represents rank matrix π, if $r(\pi)=0$, then null matrix π and Equation 15 will be the ordinary VAR model in the form of first difference. If $r(\pi)= n$, that is full rank, then the vector time series process is stationary (no cointegration) and for intermediate case i.e. if $r(\pi)= 1$, it is said that a cointegration vector exists and the term πX_{t-p} is the error correction factor. If $1< r(\pi)< n$, then there exists more than one cointegrating vector. Johansen defines matrices α and β as;[10]

$$\pi = \alpha\beta'$$

and the matrix π;
$\beta = (\beta_1, \beta_2, \beta_3, \dots\dots \beta_n)'$ that is cointegrating vector
$\alpha = (\alpha_1, \alpha_2, \alpha_3, \dots\dots \alpha_n)'$ that is speed adjustment parameter

The matrix π and characteristic roots λ can be obtained from the estimation, and the test on the number of characteristic roots is indifferent from zero can be performed by employing the following statistics;

$$\lambda_{trace}(r) = -T\sum_{i=r+1}^{p-1} \ln(1 - \lambda_i)$$

and

$$\lambda_{max}(r,r+1) = -T\ln(1 - \lambda_{r+1})$$

where, $\hat{\lambda}$ is the estimated of characteristic roots or eigen value obtained from the estimation of matrix π, and T is the number of usable observations. The vector error correction model (VECM) is derived from the VAR constrained model that can be specified as follows;

$$\Delta Y_t = \sum_{i=1}^{n} A_i \Delta Y_{t-i} + \sum_{i=1}^{r} \zeta_i \Theta_{t-1} +$$
$$\upsilon_t.................................(16)$$

[10] α and β are having (n x r) dimension where *n* and *r* are the number of equations respectively in VAR.

where ,

Y_t = a variable vector (n x 1),

A_i and ζ_i = the estimated parameters,

υ_i = the error term and,

Θ = the derived error correction from the maximum likelihood estimation of cointegration vector.

Subsequently, out-sample estimation from impulse response function (IRF) and variance decomposition (VD) will be performed as well as the diagnostic test on error of the VECM model, namely are the LM autocorrelation test, ARCH heteroskedasticity test and CUSUM analysis.

Empirical Result

Unit Root Analysis

Based on the ADF and PP test results, the stationarity of time series

Table 1. **Unit Root Test Results**

Malaysia	ADF (t-statistic)		Phillips Pheron (z-statistic)	
	Wiyhout Trend	**Trend**	**Without Trend**	**Trend**
A1. Level				
RGDP	2.7440(1)	-0.9375(1)	-2.2501(1)	-0.6844(1)
RGD	-1.7690(1)	-1.5768(1)	-1.6328(1)	-2.0127(1)
RPCONS	1.3387(1)	-1.8291(1)	2.9840(1)	-1.4665(1)
RPINV	-1.1304(1)	-2.9497(1)	-0.9049(1)	-2.9497(1)
RDEBT	0.2221(1)	-2.7808(1)	0.1824(1)	-2.7808(1)
RFDEBT	-1.4598(1)	-2.4467(1)	-1.2055(1)	-2.0612(1)
A2. First difference				
DRGDP	-3.8337*(1)	-8.2583*(1)	-6.7692*(1)	-8.4304*(1)
DRGD	-3.7888*(1)	-5.2719*(1)	-5.3027*(1)	-5.2713*(1)
DRPCONS	-5.2865*(1)	-7.8442*(1)	-7.5421*(1)	-8.4939*(1)
DRPINV	-4.7562*(1)	-5.2634*(1)	-5.2772*(1)	-5.1891*(1)
DRDEBT	-0.6989(1)	-0.8600(1)	-1.3976(5)	-1.5590(1)
DRFDEBT	-2.4880(1)	-3.0724*(5)	-3.4367**(1)	-3.5853**(5)

Notes: The numbers in parentheses represent optimal lag length. RGDP is real GDP, RGD is real government deficit, RPCONS is real private concumption, RPINV is real private investment, RDEBT is real government debt and RFDEBT is real foreign debt.

* and ** indicate 5 percent and 1 percent sigificance level, repectively. 1 percent and 5 percent critical value of ô-statistic is -4.38 and -3.60 respectively as developed by MacKinnon.

can be verified. To perform cointegration test, the series under studied must be stationary of the same order before the VECM is applied. As shown in Table 1, all the series are non-stationary in their level at one percent and five percent levels of significance. In other words, the results fail to reject the null hypothesis, which is $\delta = 0$ (The series suffer from unit root problem).

Table 1 also shows that the calculated ADF for each first-differenced series. Since the calculated values are larger than their critical values in all cases, this suggests that the null hypothesis that each first-differenced series has one unit root can be rejected at five percent level of significance; an exception is RDEBT. This implies that all the time series are stationary at I(1) except for RDEBT. This result allows the cointegration analysis to be carried out as suggested by Johansen and Juselius (1990).[11] Similarly, based on the PP test, the result is consistent with the ADF test that the first-difference stationarity is found in all the series except for RDEBT

Johansen Cointegration Analysis

In order to perform the VECM, the determination of the optimal lag length should be resolved and is followed by determining the rank of cointegration vector. In Table 2, the VAR model for the order of $p = 1,2$ and 3 has been estimated. Based on the relative minimum value of AIC, the optimal lag length is 2. The results are mixed according to SBC. Notwithstanding the above, for the purpose of further analysis, the lag length of 2 is chosen.

Table 3 presents the result of Johansen-Juselius's (1990) procedure to test the existence of cointegration between dependent and explanatory variables. Both statistics λ-trace and λ-max are found to be significant at least at five percent level of significance, under the null hypothesis of no co-integrating vector. The same statistics discover that null hypothesis that examines the existence of at least one cointegrating vector fails to be rejected. It indicates the existence of one cointegrating vector or three stochastic trends (n-r) for the period of study.

Vector Error Correction Model (VECM)

A VECM is formulated to reintroduce the information loss in the differencing process, thereby allowing for the long-run equilibrium as well as short-run dynamics. For the purpose of the study, the model is estimated in the form of first difference with one cointegrating vector and a lag length of two. From Table 3, it is found that both error correction terms in every VAR equation system is strongly significant at one percent significance level. The statistical significance of the coefficients associated

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[11] In order to proceed with VECM, the series must be integrated at the same order.

Table 2. **VAR(p) Model - Determination of The Optimal Lag Length**

VAR (p) Model	AIC	SBC
VAR(1)		
RPCONS	20.37	20.62
RPINV	21.55	21.80
RFDEBT	18.76	19.02
RGD	19.39	19.64
VAR(2)		
RPCONS	20.13	20.56
RPINV	21.22	21.65
RFDEBT	18.72	19.14
RGD	19.43	19.85
VAR(3)		
RPCONS	20.31	20.91
RPINV	21.33	21.92
RFDEBT	18.90	19.50
RGD	19.49	20.09

Table 3. **Johansen-Juselius Maximum Likelihood Test for Cointegrating Vector**

Null hypothesis	Time Period 1962-2003 (no of Lag =2)			
	λ- max	Critical Value 0.05	λ- trace	Critical Value 0.05
$r = 0$	52.48*	47.21	37.89**	27.07
$r \leq 1$	29.69	29.68	10.84	20.97
$r \leq 2$	15.41	15.41	3.15	14.07
$r \leq 3$	3.76	3.76	0.60	3.76

Note: λ-max and λ-trace are the likelihood ratio statistics based on trace and eigen values from the stochastic matrix. The critical value of 0.05 is based on Osterward-Lenum (1992).

* (**) indicates the rejection of null hypothesis at 5 percent (1%) significance level.

with error correction term (ECT) provides evidence of an error correction mechanism that drives the variables back to their long run relationship. Based on the causality test, there exists a significant unidirectional causation:

From RFDEBT $\rightarrow$ RPCONS

From RGD $\rightarrow$ RPCONS

From RFDEBT $\rightarrow$ RPINV

From RGD $\rightarrow$ RPINV

From the estimation, it has been discovered that RFDEBT and RGD have an impact on macroeconomic dependent variables, i.e., RPCONS and RPINV, which also show the rejection of the 'Ricardian Equivalence' in the case of Malaysia. This is expected since from our earlier discussion on the importance of fiscal policy, where from the independence until now, Malaysian government relies heavily on fiscal stimulus to affect the economic activities.

Impulse Response Function (IRF)

The source of changes in real consumption and investment variables can be viewed through the Impulse Response Function, whereby the IRF is derived from the moving average process (MA) of VAR model, and it depicts the short-term dynamic effect among the variables. Through IRFs, the relation between a unit of standard error of an innovation and a specific variable in the system of equation can be analyzed. Since the study is practicing the generalized impulse response, not the impulse response for structural model, the nonfactorized IRF with one standard deviation shock is good enough to map out the reaction between variables.

In view that the model is estimated in the form of first difference, the estimates of IRFs depict the effect of an innovation on changes in private consumption and private sector investment. Figure 2 shows the effect of an innovation that has caused an uncontrollable change in private consumption and private sector investment for an extended period of time. The changing effect attributed to one unit of standard error in innovation of RFDEBT and RGD has given a negative impact on the changes in RPCONS and RPINV. It has taken approximately nine years to stabilize RPCONS and RPINV. In light of our findings, Tan (2003) also brings the same conclusion that the government deficit has a negative impact on private investment in Malaysia by adopting a correlation method in order to identify the impact of government deficit on real variables. The empirical evidence from this study is also in line with the work of Haque and Montiel (1989) in checking the relevance of Ricardian Equivalence in 16 developing countries including Malaysia. Using the dynamic consumption model of finite horizon, we reject the RET hypothesis. However, our results are in contrast with Baharumshah et al. (2008) and Bagnai
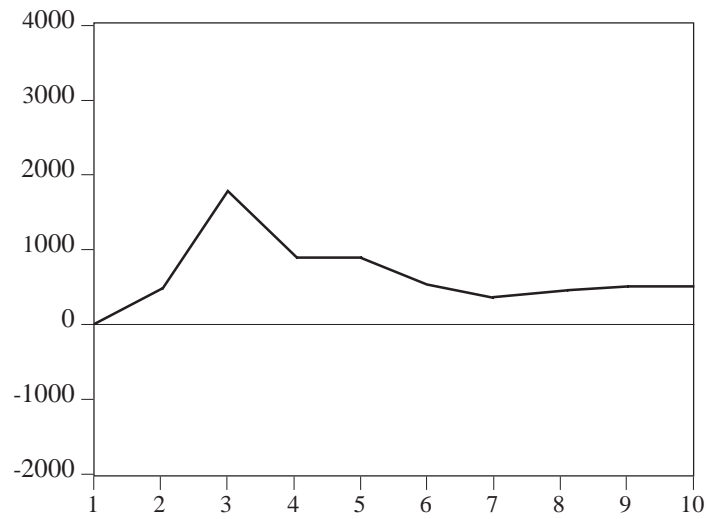
(2006) as both of these studies agree that budget deficit crowds out private investment as they incorporate the current account deficit into their model of VECM.

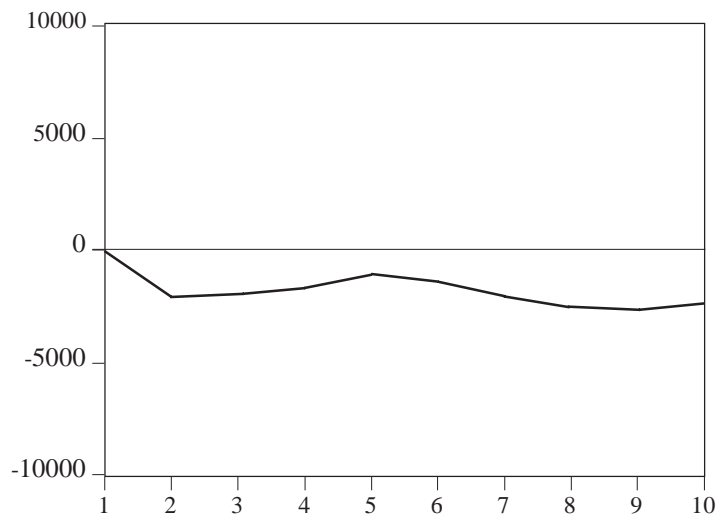Figure 2. **Response to Nonfactorized One Standard Deviation Innovations**

Response of RGD to RPCONS

Response of RPCONS to RGD
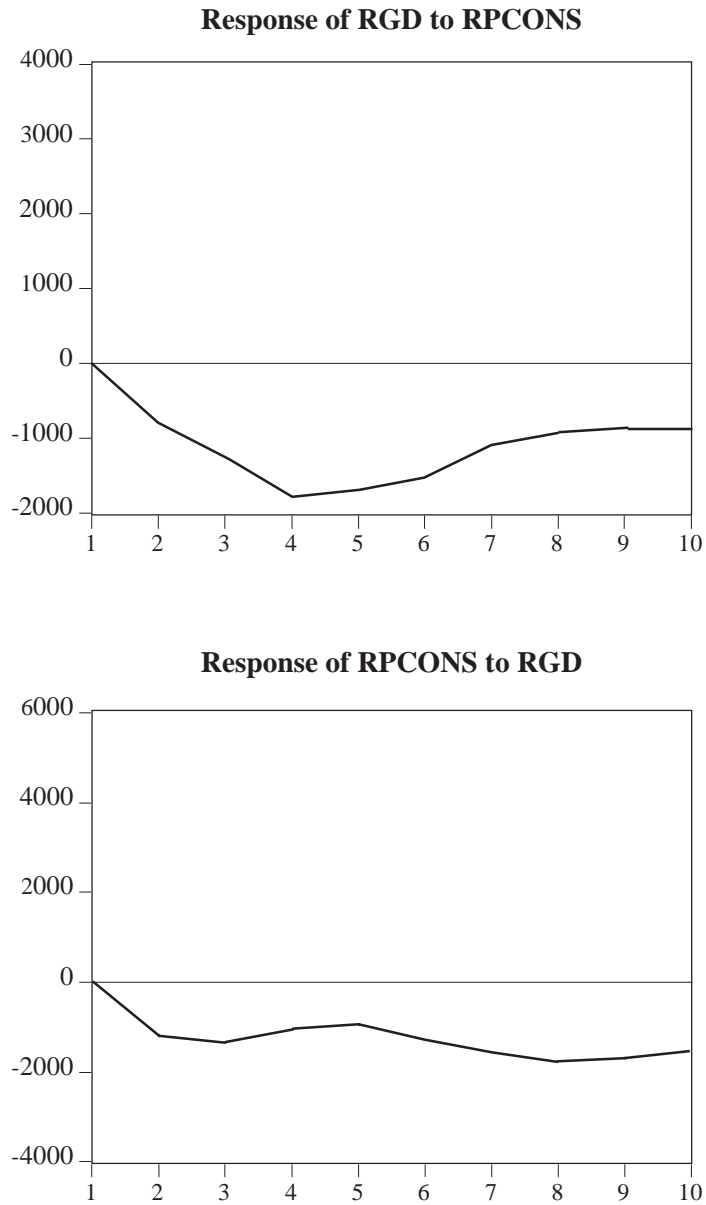
Continued from Figure 2
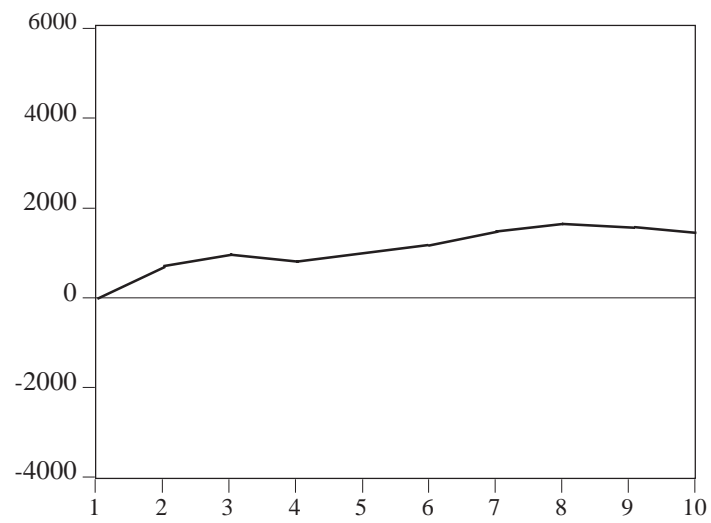
Response of RGD to RPINV
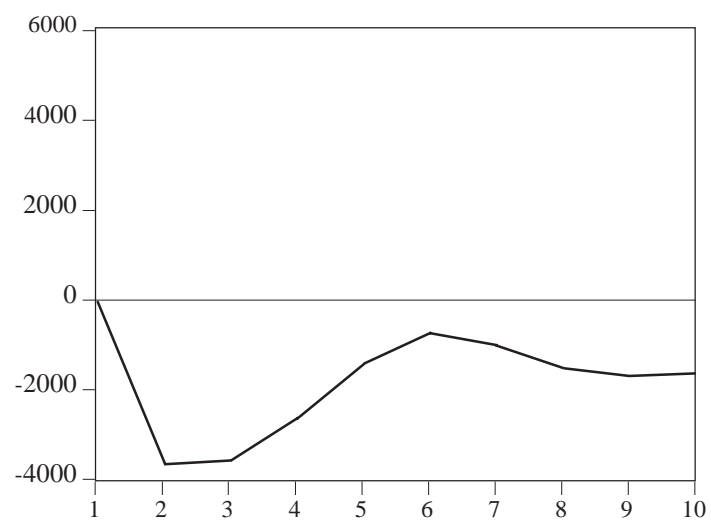

Response of RPINV to RGD

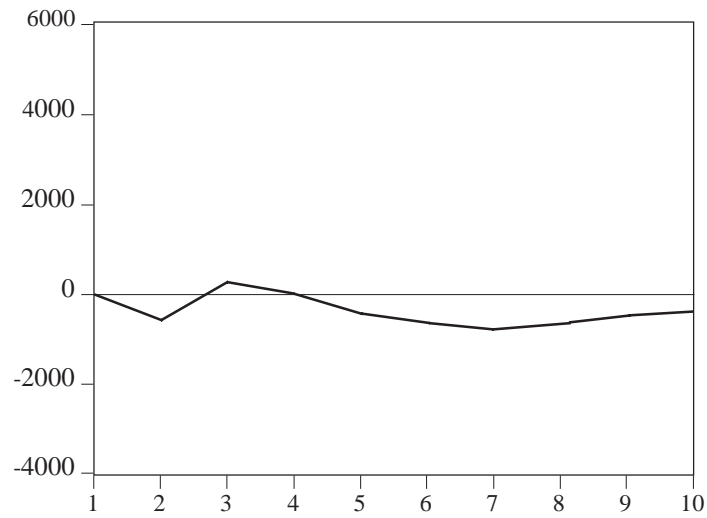*Continued from Figure 2*

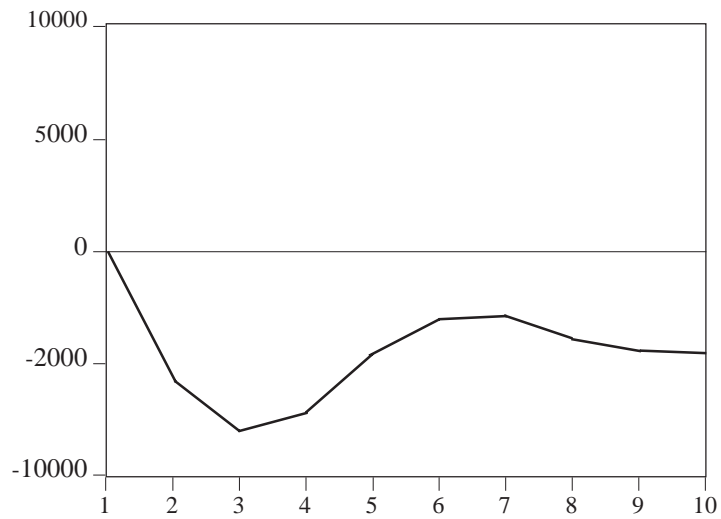### Response of RFDEBT to RPCONS

Response of RPCONS to RFDEBT

Continued from Figure 2

Response of RFDEBTS to RPINV

Response of RPINV to RFDEBT

Variance Decompositions (VDs)

The dynamic simulations are used to provide insights into the economic significant of the variables of the VECM. These simulations are used to calculate the VDs that show the percentage of forecast error variance for each variable that may be attributed to its own shocks and fluctuations in the other variables in the system, as well as IRFs. As illustrated in Table 6, the Granger causality chain implied by the analysis of VD proposes that about 72 percent of the forecast error variance of RPCONS is explained by its own shocks, and it reduces to 45 percent within a 10-year period. Besides being explained by its own variable, it is also explained by RFDEBT followed by RGD and RPINV. The same is also applicable to RPINV within the period of 10 years; the forecast error variance is 58 percent, followed by RFDEBT (31%), RGD (5%) and RPCONS (6%), where the last two variables represent only a small percentage of total varia-

tion. Hence, RPCONS is also more endogenous compared to RPINV characteristically.

RGD is also endogenous as its explanatory power is jointly explained by the variable itself, which is 46 percent, followed by RPINV (26%), RFDEBT (16%) and RPCONS (12%). Distinctively, RFDEBT is relatively exogenous as the greater contribution comes from its forecast error variation (76%), for over 10 years. Only 15 percent is explained by RGD, followed by RPINV (8%) and RPCONS (1%). Therefore, RFDEBT is the most exogenous compared to other variables that determine RPCONS and RPINV.[12] The result of these findings is in accordance with the VECM model which analyzes the effect within sample while VD analyzes the out-sample effect. Other researchers such as Bagnai (2006) and Baharumshah et al. (2008) do not perform variance decomposition to support their VECM results.

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[12] The RFDEBT is relatively the leading variable; being the most exogenous of all.

Table 5. **Variance Decomposition – RPCONS, RPINV, RFDEBT and RGD**

Standard Error	Period	RPCONS	RPINV	RFDEBT	RGD
'Variance Decomposition': RPCONS					
1	5241.956	100.0000	0.000000	0.000000	0.000000
2	6326.613	72.66816	1.349355	23.27589	2.706594
3	7112.044	58.62724	1.100032	35.38157	4.891151
4	7650.265	51.36036	4.621761	38.34318	5.674702
5	7960.323	49.19494	7.405742	37.08916	6.310154
6	8245.363	48.96929	8.646138	34.66942	7.715156
7	8565.327	48.84029	9.128608	32.36172	9.669386
'Variance Decomposition': RPINV					
1	8643.412	12.73539	87.26461	0.000000	0.000000
2	12455.10	6.161361	77.47150	14.34838	2.018758
3	15894.81	4.554618	65.14312	27.95504	2.347227
4	17940.34	5.948807	57.45235	34.12403	2.474812
5	18914.85	6.473004	55.95505	35.13084	2.441111
6	19604.75	6.386717	56.73623	34.25352	2.623538
7	20412.94	6.038406	58.09634	32.72643	3.138826
'Variance Decomposition': RFDEBT					
1	2911.531	9.009495	0.761374	90.22913	0.000000
2	5147.967	4.896439	5.261387	88.65375	1.188429
3	7940.281	2.492035	3.848009	87.68912	5.970836
4	10611.54	2.016689	4.537877	83.54719	9.898247
5	13000.95	1.741063	5.940171	79.81536	12.50341
6	15209.04	1.533312	7.069102	77.57801	13.81958
7	17146.33	1.318334	7.871379	76.55337	14.25692

Diagnostic

For diagnostic testing, three tests have been employed, which are the LM test to determine the existence of serial correlation among residuals, the ARCH test on VECM residuals, and the CUSUM test. The results are presented in Table 6. Based on the first two tests, it has been found that the null hypothesis cannot be rejected at five percent level. It means that the estimated VECM model is independent from serial correlation and the ARCH effect. Meanwhile, CUSUM test has found that both equations ΔRPCONS and ΔRPINV in the VECM model do not experience any structural break during the period under consideration. From Figure 3, the CUSUM value for both variables is between the two confidence intervals at five percent significance level.

Table 6. **LM and ARCH Diagnostic Tests on VECM (Lag 2) Residuals**

	F-Statistic	**T*R^2**
A. LM test-serial correlation Breusch-Godfrey		
RPCONS	0.810265	2.288178
	(0.455656)	(0.318514)
RPINV	1.445948	3.903654
	(0.253843)	(0.142014)
B. ARCH test		
RPCONS	0.037291	0.080986
	(0.963435)	(0.960316)
RPINV	0.441926	0.937469
	(0.646437)	(0.625794)

Note: The numbers in parentheses represent probability at 5 percent significance level.

Figure 3. **CUSUM Test at 5 percent Significance Level**
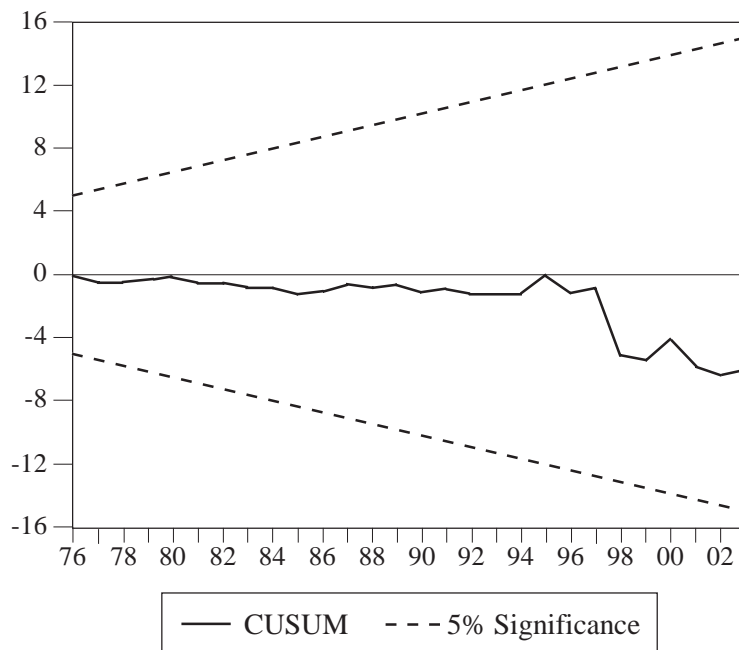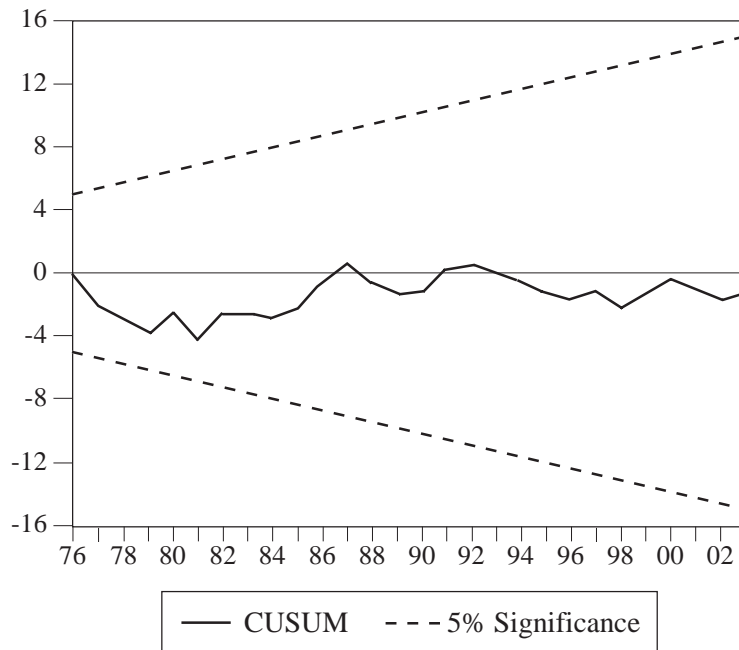
Conclusion

The Federal Government of Malaysia has played a key role in the economy by venturing beyond its traditional functions and look on a more direct and active role in the country's overall social and economic development process. The Federal Government's participation in the economy is to pursue an expansionary fiscal policy aimed at stimulating economic activities, sustaining growth and promoting the private sector as the main engine of growth for the economy. Therefore, we foresee that government financing through debt and tax has an influence on real sectors.

Using Malaysia time series data for the period of 1962 to 2006, we observe that the 'Ricardian Equivalence' hypothesis does not materialize significantly. The effects of budgetary deficit and government spending financed through debts have significant influence on private consumption and private sector investment. Not surprisingly, the result may be due to the fact that Malaysia is characterized by an inefficient capital or credit market and a tax system that cause distortion in allocation. If the RET hypothesis is truly rejected, the implication is that debts will be considered wealth that increases real variables; furthermore, current generation tend to be more self-centered by not contemplating on the hereditary aspect for future generations (Barro 1974). In other words, the emerging perception is that, current tax liability and debts are to be burdens for future generations as increasing population will reduce the per capita liability accordingly. Our findings support the Keynesian view of expansionary budget policy.

References

Abu Al-Foul, B., and H. Baghestani. 2004. The causal relation between government revenue and spending: evidence from Egypt and Jordan. *Journal of Economics and Finance* 28 (2) (Summer): 260-269.

Ahmad, H., and S.M. Miller. 2000. Crowding-out and crowding-in effect of the components of government expenditure. *Contemporary Economic Policy* 18: 124-133.

Argimon, I., J.M.P. Gonzales, and J.M. Roldan. 1997. Evidence of public spending crowding-out from a panel of OECD countries. *Applied Economics* 29: 1001-1010.

Bagnai, A. 2006. Structural breaks and twin deficits hypothesis. *International Economics and Economics Policy* 3: 137-155.

Baharumshah, A. Z., E. F. Lau, and F. Stilianos. 2003. On the sustainability of current account deficits: evidence from four Asean countries. *Journal of Asian Economics* 14: 465-487.

BaharumShah, A. Z., T. Ismail, and E. Lau. 2008. Twin deficits hypothesis and capital mobility: The ASEAN perspective. *Proceedings of The MFA Conference 2008*: 539-553.

Bahmani-Oskooee, M. 1999. Do federal budget deficits crowd out or crowd in private investment. *Journal of Policy Modelling* 21 (5): 633-640.

Barro, R. J. 1974. Are government bonds net wealth?. *Journal of Political Economy*. (November): 1095-1117.

Bassam, A. F., and B. Hamid. 2004. The causal relation between government revenue and spending: Evidence from Egypt and Jordan. *Journal of Economics and Finance* 28 (2): 260-269.

Bassetto, M., and N. Kocherlakota. 2004. On the irrelevance of government debt when taxes are distortionary. *Journal of Monetary Economics* 51: 299-304.

Cadsby, C. B., and M. Frank. 1991. Experimental tests of Ricardian Equivalence. *Economic Inquiry* 29 (October): 645-664.

Croushore, D. D. 1989. The effect of government deficits on consumption and interest rates: A two equation approach. *Journal of Business and Economics* 28 (Spring): 85-106.

Domenech, R., D. Taguas, and J. Varela. 2000. The effects of budget deficit on national saving in the OECD. *Economics Letters* 69: 377-383.

Enders, W. 1995. *Applied Econometric Time Series*. New York, NY: John Wiley and Sons Inc.

Ganelli, G. 2004. The new open economy macroeconomics of government debt. *Journal of International Economics* XX (xxx-xx): 1-18.

Ghatak, A., and S. Ghatak. 1996. Budgetary deficits and Ricardian Equivalence: the case of India, 1950-1986. *Journal of Public Economics* 60: 267-282.

Graham, F. C., and D. Himarios. 1996. Consumption, wealth, and finite horizons: Tests of Ricardian Equivalence. *Economic Inquiry* 34 (3): 527-544.

Haque, N. U., and P. Montiel. 1989. Consumption in developing countries: Test for liquidity constraint and Finite Horizons. *The Review of Economics and Statistics* 71 (3): 408-416.

Heijdra, B. J., and V. D. P. Frederick. 2002. *The Foundation of Modern Macroeconomics*. New York, NY: Oxford University Press Inc.

Issler, J. V. and L. R. Lima. 2000. Public debt sustainability and endogenous seigniorage in Brazil: time-series evidence from 1947-1992. *Journal of Development Economics* 62: 131-147.

Jin, J. C. 2004. Can openness be an engine of sustained high growth rates and inflation? Evidence from Japan and Korea. *International Review of Economics and Finance* XX (xxx-xxx): 1-14.

Johansen, S., and K. Juselius. 1990. Maximum likelihood estimation and inference on cointegration with application to the demand for money. *Oxford Bulletin of Economics and Statistics* 52 (2): 169-210.

Johansen, S. 1991. Estimation and hypothesis testing of cointegration vectors in Gaussian vector autoregressive models. *Econometrica* 59: 1551-1680.

Johansen, S. 1995. *Likelihood-Based Inference in Cointegrated Vector Autoregressive Models*. New York: Oxford University Press.

Malaysia. Economic Report. Ministry of Finance (Various publication).

Matsubayashi, Y. 2004. Are U.S. current account deficits unsustainable? Testing for private and government intertemporal budget constraints. *Japan and the World Economy* XXX (xxx-xxx): 1-15.

Mitchell, J. 2002. The importance of long run structure for impulse response analysis in VAR models. *NIESR*. http://www.niesr.ac.uk.

Nelson, M. A., and R. D. Singh. 1994. The deficit-growth connection: Some recent evidence from developing countries. *Economic Development and Cultural Change* 43: 167-191.

Panades, J. 2001. Tax evasion and Ricardian Equivalence. *European Journal of Political Economy* 17: 799-815.

Patterson, K. 2000. *An Introduction to Applied Econometrics: A Time Series Approach*. Palgrave.

Ricardo, D. 1817. *On the Principles of Political Economy and Taxation* (3rd ed.). London: John Murray, 1821.

Stanley, T. D. 1998. New wine in old bottles: A meta- analysis of Ricardian Equivalence. *Southern Economic Journal* 64: 713-727.

Tamat, S., and M. N. Abu Hassan Shaari. 2001. The effectiveness of fixed exchange rate policy as a deterrent of external factor in BSKL. *Jurnal Pengurusan* 20: 47-67.

Tan, E. C. 2003. Fiscal deficits and macroeconomic performance in Malaysia. *Thammasat Review*: 187-214.