

ECONOMETRIC TEST OF RICARDIAN EQUIVALENCE HYPOTHESIS: RESULTS FOR NIGERIA

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Abstract

The paper examines the validity of the Ricardian Equivalence Hypothesis using Nigeria data from period 1980 – 2010. The data used in the model were stationary at level except wealth variable that is stationary at first difference. The estimated model shows that income and wealth have the theoretically expected positive value. The other variables were positive and significant contrary to the proposition that they be either zero or negative for the pure Ricardian Hypothesis to hold. The implication of the findings shows that Nigerians will respond positively to change in government policy such as a change in debt interest rate and fiscal deficit. It also means that Nigerians are not neutral to changes in government policy. Government can therefore use fiscal policy to change the aggregate demand of the citizens.

Keywords : Ricardian Equivalence Hypothesis, taxation, fiscal policy, aggregate demand

Introduction

The Ricardian Equivalence Hypothesis (REH) proposes that the substitution of a budget deficit for current taxes or an alternative temporal arrangement has an equal effect on aggregate demand. Therefore, the two are equivalent. A decrease in taxation by the government incurs a budget deficit with a future tax implication. According to the theorem, rational consumers recognise that these future taxes have a present value equal to the incurred debt. The consumers therefore see through the intertemporal veil, saving additional disposable income to pay the future taxes rather than raising their consumption an action equivalent to paying current taxes. The rise in private savings at any given time equal within the intertemporal framework exactly offsets the fall in public savings and therefore aggregate demand remains unchanged. The proposition has it that the private sector in anticipation of future tax obligations in view of current debt financed fiscal operations of the government. Government debt is not perceived as net wealth by rational and forward looking households. Put differently government budget deficit and debt are neutral with respect to aggregate demand and interest rate.

The Ricardian Equivalence hypothesis implies that debt financed fiscal policy would not raise aggregate demand, therefore having no short run

effects on employment and output within an economy. However, where policy is appropriately financed, consumers will perceive no future tax implications and experience a net wealth effect. An evaluation of the Ricardian Equivalence hypothesis is relevant in Nigeria because in recent years government debt or fiscal deficit have generated widespread public interest and political concern. Generally people believe that government deficit is one of the main causes of inflation, unemployment and economic recession. However, the effects of government deficit on the economy are not too obvious from some economic empirical studies in many countries.

There are two main dimensions of dealing with the Ricardian Equivalence hypothesis. The first is the Keynesian position, which posits that an increase in debt (deficit) due to tax cut raises disposable income and stimulates aggregate demand. Therefore, the debt causes higher interest rate and crowds out private investment. The second is the Ricardian Equivalence which posits that economic agents regard present day tax cuts as future tax burden because the economic agents are assumed to be rational and foresighted. The agents realise that present value of taxes depends on real government spending, not on the timing of taxes. Therefore an increase in debt cannot stimulate the aggregate demand as a result; the increase in debt has no real effects on the economy. In other words the increase in debt is neutral to the economy as such policy makers need not worry about deficit financing in the economy.

The Ricardian equivalence has several economic implications hence the need to evaluate its relevance with respect to the Nigerian economy. The Keynesian approach is based on the assumption that the economic agents decide their consumption on current income while the Ricardian Equivalence is based on the premise that when the agents are forward looking and are aware of government intertemporal budget constraint, they will anticipate that tax cuts today will result in higher taxes being imposed on their future generation. Hence the economic agents who take care of their descendants' utilities as well as their own will not increase their consumption based on increased current disposable income due to today's tax reduction. Using the assumption of free access to credit markets, economic agents decide their consumption based on permanent income which is not affected by the timing of taxes. Thus there is Ricardian equivalence between taxes and debt. A perfect Ricardian equivalence implies that reduction in government saving due to tax cuts is fully offset by higher private saving in the economy, so the aggregate demand is not affected.

Literature review

The Ricardian Equivalence hypothesis (REH) is based on the assumption that deficit correspond only to postponement of taxes within the economy. This assumption results the indifference between paying one naira for taxes in current period and paying one naira plus interest in the future period because the consumers are rational and have the right foresight. Given that the timing of taxes does not change the agent's permanent income or the lifetime budget constraint, a change in timing of taxes cannot alter the consumption decision of the economic agents.

The critics of the Ricardian Equivalence hypothesis claim that the assumption is only valid when the agent lives forever, which means that the assumption depends on the length of an agent's planning horizons. If the agent realise that the government will collect the postponed taxes after he dies, then his consumption decisions may change. Barro (1974) adopted the intergenerational altruism to extend the agents planning horizons. He stated that although the

parents realise that the postponed taxes will be collected after their death, they still will not increase their consumption simply due to their increased disposable income. This because parents take care of their children welfare, equally parents are aware that their children will pay higher taxes to compensate for the government deficits. This makes parents to save more instead of consuming more of their income. Parents therefore leave higher bequest to their children to help pay higher taxes in the future. Therefore each generational planning is extended to infinite horizon if each generation cares for its next generation's welfare and each generation leaves an altruistic bequest to its children thereby reinstating the existence of the Ricardian equivalence hypothesis.

However, Feldstein (1988) criticised the existence of such an intra – family transfer between family members. He stated that there may not exist significant intergenerational transfer and the motive of bequest may be altruistic and may be non – altruistic. He stated further that in a population where there exist a large proportion of families that are childless they have little concern for taxes levied on future generation. This population often changes their consumption decisions when the government swaps debts for tax at any time. Similarly the population with children realise that the childless population consumption decision increase the next generation's taxes, they will offset the economic effects caused by the decisions of the childless population families by leaving more bequests to their children (Barro 1989). However, if the offset is incomplete then the Ricardian equivalence hypothesis will be violated. Seater (1993) argued that there is not enough evidence to reject the Ricardian hypothesis due to the existence of childless families. This is because it is difficult to estimate the magnitude of the impact of childless families' decisions to Ricardian equivalence, it is also not certain the number of childless families compared to the population with children, there is no evidence to measure how great the offset by the families with children is within the total population. He stated that it is difficult to conclude whether the existence of childless families is a critical variable and a possible source to reject the existence of Ricardian Equivalence theorem.

Seater (1993) also found a consistent result with altruism, the motive of bequest is altruistic. He stated that altruism is an important proposition of Ricardian Equivalence because parents are altruistic in the infinite

horizon; they therefore leave enough bequests to their children to help pay higher taxes in the future.

Another proposition underlying the Ricardian Equivalence is that economic agents are assumed to access capital market without any constrain to borrow. This assists the economic agents to make their economic decisions upon their permanent income, hence their economic and consumption decision will not be affected much in response to external shocks that leads to changes in government policies and current income of the citizens.

The capital market accessibility has been criticised, empirical evidence shows that most macroeconomic evidence indicate households are liquidity constrained. Cox and Campbell (1990) stated that a large proportion of consumers are liquidity constrained which affect the consumption behaviour of most economic agents.

Methodology and theoretical framework

For the purpose of this work, time series data from 1980 – 2010 were used, this was a period characterized by structural adjustment and economic transformation, it was a period of changes in economic policies, the leadership of the country also experienced changes from military regime that is characterized by dictatorship to civilian administration that has a democratic structure. A study of this period will help in evaluating the response of Nigerians to changes in policy focus of the government. Official publications of the Central Bank of Nigeria were used as the main source of data. These data were subjected to statistical analysis and inferential discussions.

In econometric analysis estimation results are sensitive to misspecification, omitted variable and endogeneity problem. Measurement of debts and deficits can be challenging, this is because some empirical works use total stock of government debt while others use total deficit. This may lead to bias estimates of some coefficients as it disregards possible correlations between federal, states and local government level of debts. In this study the total federal debt will be used for the empirical analysis because it represents the total debts outstanding in the country.

In model building it may not be possible to capture all the variable as different models used have variation in goals and that determine what should be included and what should not. This may lead to misspecified or omitted variables. The process of determining endogenous and exogenous variable is of interest in any analysis. Deficits can be an endogenous variable if it is affected by the economy’s situation or by unexpected need for high government expenditure (Kim 2003).

Due to reasons identified above tests based on the specification of structural consumption functions are certainly the most popular devices in testing Ricardian Equivalence. Feldstein (1982) tested for the Ricardian Equivalence and used the following equation:

$$C_t = \beta_0 + \beta_1 Y_t + \beta_2 W_t + \beta_3 SS_t + \beta_4 G_t + \beta_5 TX_t + \beta_6 TR_t + \beta_7 D_t + e_t \dots\dots\dots (1)$$

Where C is total consumer expenditure, Y is current income, W is the market value of privately owned wealth, G is total government purchases, Tx is total tax revenue, TR is government transfers, D is total government debts and e is the residual.

One of the testable hypotheses of the Ricardian Equivalence is that increased private savings will match government borrowing or increase in debt. In other words the extra wealth in the form of bonds held by households will be transformed into savings. The operational hypothesis here will be that there should be a positive relationship between government borrowing and private savings. Finding a positive relationship will provide evidence in favour of the Ricardian Equivalence. If on the other hand there is evidence to show a negative relationship it will mean a rejection of the Ricardian Equivalence Drekos, (2001).

The empirical literature on the Ricardian equivalence hypothesis is vast as such most studies focus their attention on the reaction of private consumption to government financing decisions. Such studies often estimate the reduced form consumption function. In this study emphasis will be on two reduced form consumption functions. The Bernheim (1987) type estimated function is preferred due to data availability and management simplicity in relation to Nigeria as a developing country with a growing population and an evolving fiscal operation.

$$C_t = \beta_0 + \beta_1 Y_t + \beta_2 (TX_t - G - rGB_{t-1}) + \beta_3 G_t + \beta_4 GB_t + \beta_5 W_t + X_t \omega + \epsilon_t \dots (2)$$

Where C represent real consumption per capita, TX is tax revenue, G is public consumption, GDT is

government debt, W is private wealth, X is a vector of other exogenous variables, r is the interest rate and $TX_t - G_t - r_tGDT_{t-1}$ is the government budget, equation (2) can be rewritten as:

$$C_t = \beta_0 + \beta_1 Y_t - \beta_2 BDE + \beta_3 G_t + \beta_4 GB_t + \beta_5 W_t + X_t \omega + \epsilon_t \dots (3)$$

Where BDE_t represent the government budget deficit. The importance of this specification over others is that it requires less information relative to the public accounts. It requires the value of the budget deficit and other key variables as explanatory variables. The implications are that under the pure Keynesian proposition $\beta_2 = -\beta_1$ while the Ricardian Equivalence Hypothesis which implies that $\beta_2 = 0$. Where β_2 measures the effect on current consumption a one naira tax for debt swap. Testing the restriction would allow for accepting or rejecting the Ricardian Equivalence Hypothesis.

In this study the modified specification by Feldstein (1982), is used to test and estimate

Ricardian Equivalence Hypothesis for the Nigerian consumption function as follows:

$$TCONS = \beta_0 + \beta_1 GDP + \beta_2 WEA + \beta_3 GDEBT + \beta_4 TAX + \beta_5 PRIVC + \epsilon_t \dots (4)$$

$TCONS$ is consumption, GDP is the total income, WEA is the wealth, $GDEBT$ is government debt, TAX is the total tax revenue, $PRIVC$ is the private consumption. First there is a simultaneity problem as the regressors are correlated with regressand. Therefore two stage least square (2SLS) estimation technique was used to so as to obtain consistent estimate. Based on the theoretical convectional Keynesian setting government bonds would be perceived as net wealth therefore government spending should increase private consumption hence $\beta_3 > 0$ would be greater than zero $\beta_4 > 0$ a higher percentage of tax financing lowers consumption, β_1 and β_2 should be positive.

The formal test procedure was adopted beginning with the unit root test for all the variables in the model. The test result shows some kind of uniformity of absence of unit root in the variables except for the wealth which shows the presence of unit root meaning that it is stationary only at first difference.

Unit root test

Table 1: Unit root testing

Variables	ADF	LAG LENGTH
TCONS	-2.663717***	0
GDP	-5.631736*	0
WEA	-2.967767**	1
GDEBT	-2.622989***	0
TAX	- 3.19367*	0
PRIVC	-3.737853*	0

- *Indicates statistical significance at 1%
- **Indicates statistical significance at 5%
- ***Indicates statistical significance at 10%

The unit root test shows that consumption is statistically significant at 10%, the income variable is statistically significant at 1% level, wealth is statistically significant at 5% level, government debt is statistically significant at 10%, the tax variable is significant at 1%, private consumption is statistically significant at 1%.

Results and discussion

In this paper the macroeconomic model of the study of the Ricardian Equivalence Hypothesis estimate of equation 4 is presented in table 2 below

Table 2

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-223677.9	75.32501	-2.969504	0.0065
GDP	0.955780	0.370589	2.579085	0.0162
WAE	0.423593	0.329196	1.286749	0.2100
GOVDEBT	0.284813	0.088473	3.219223	0.0035
TAX	0.014263	0.045398	0.314169	0.7560
PRIVCONS	0.987272	0.012478	79.12358	0.0000
R-squared	0.898827	Mean dependent var	22.33911.	
Adjusted R-squared	0.878593	S.D. dependent var	27.99853.	
S.E. of regression	10.50271	Akaike info criterion	26.13381	
Sum squared resid	2.769011	Schwarz criterion	26.41136	
Log likelihood	-399.0741	Hannan-Quinn criter.	26.22428	
F-statistic	42.59018	Durbin-Watson stat	1.917366	
Prob(F-statistic)	0.000000			

$$TCONS = - 223677.9 + 0.955760GDP + 0.423599WEA + 0.284813GOVDEBT + 0.014263TAX + 0.987272PRIVCONS$$

The structural estimate shows that income and wealth have the expected positive sign and are statistically significant supporting the Ricardian Equivalence Hypothesis in Nigeria. Other variables such as government debt, tax and private consumption failed the test. The overall model shows that R² is 89%, this shows that 89% of the variables explain the consumption model. The Durbin Watson statistics of the estimated model was 1.917366 this shows the absence of autocorrelation.

The model shows that a tax cut by the government at any given time within the period of study will be responded to through a change in aggregate demand of the citizens by affecting the consumption time path. Government can use tax and domestic debt as instrument of economic development. This could be in the form of tax increase to increase government revenue for development or tax reduction that will help stimulate economic activities. Fiscal policy is a potent instrument as a government economic tool for moderating the performance of the economy.

Conclusion

The other variables were positive and significant contrary to the proposition that they be either zero or negative for the pure Ricardian Hypothesis to hold. The implication of the findings shows that Nigerians will respond positively to change in government policy such as a change in debt interest rate and fiscal deficit. It also means that Nigerians are not neutral to changes in government policy. Government can therefore use fiscal policy to change the aggregate demand of the citizens. The mix nature of the regression result for Nigeria may be as a result of a number of reasons some of which include household liquidity limitation, poor credit rationing give the underdeveloped nature of the money and capital markets, the low level of participation in the market, the high profile of unofficial trading activities

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