Ricardian Equivalence Hypothesis and Budgetary Deficits: The Case of Pakistan 1972-2008

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Abstract
During the last few decades, the Ricardian equivalence hypothesis (REH) has been an important theme of economic research both theoretical and applied. However, to test the validity and consistency of REH, there is very limited work has been done in the developing countries. Since the REH requires a number of assumptions that might not appear to be satisfied in developing countries, it seems that the REH should not hold. In this study an attempt has been made to empirically test the validity of Ricardian equivalence hypothesis for Pakistan using annual time series data for the period 1972 to 2008. The use of cointegration analysis invalidate the RE hypothesis in Pakistan. So Pakistan is a non Ricardian economy facing budget and current account deficits.

Keywords: Ricardian Equivalence Hypothesis; Budgetary Deficits; Case of Pakistan

1. Introduction
The government taxation policy has an important role to stabilizing the economy. This policy can be useful only if the fiscal decisions of the government are capable to affect household’s consumption and saving behavior meaningfully. The governments often float debts by issuing bonds of different maturities and coupon rates. Household sector considers bonds as net wealth. The Ricardian approach holds the view that households (with perfect foresight) do not take government debt as a net wealth. Thus for a given time path of government spending, the debt-for-tax replacement would have no effect on private consumption since the increased disposable income (due to tax reduction) is likely to be saved by the households. So the total national savings, interest rate and marginal propensity to consume (MPC) remain unaffected and therefore no rationale for crowding out effect.

If the Ricardian equivalence does not hold, then an increase in public borrowing (due to budget deficit) is likely to decrease national saving (both domestic and foreign). For a given amount of investment, this
decrease in national saving leads to an increase in the current account deficits (twin deficits). In this study an attempt has been made to empirically test the validity of Ricardian equivalence hypothesis for Pakistan using annual time series data for the period 1972 to 2008.

The rest part of the paper is organized as follows. Section 2 reviews the existing literature on Ricardian Equivalence hypothesis. Theoretical and analytical framework is presented in section 3. Section 4 gives data description and econometric methodology. Section 5 discusses the estimation results while section 6 is devoted to conclusion.

2. Literature Review

In this section, we have reviewed some existing empirical as well as theoretical literature on Ricardian Equivalence hypothesis. Bernheim (1987) evaluated the existing theory and evidence on Ricardian equivalence and argued that the long run neutrality is extremely weak. Kazmi (1991, 1992) tests Evans Model of intertemporal allocation of resources as affected by the perceptions of the consumers about debt accumulation. The results failed to confirm the Ricardian Equivalence hypothesis for Pakistan. Ghatak and Ghatak (1996) examined the validity of the Ricardian equivalence (RE) hypothesis for India by using the cointegration analysis and the rational expectations model. Both of them invalidate the RE hypothesis. Ricciuti (2001) reviewed the literature on Ricardian equivalence and interpreted as an overview to the short and long run theories. The Ricardian equivalence hypothesis is usually rejected when investigated in a life-cycle framework, and accepted when it is estimated through optimizing models. Marinheiro (2001) examined empirical evidence of Ricardian equivalence for Portuguese economy and found that there is only partial equivalence in the Portuguese economy which rejects the hypothesis Ricardian equivalence. Frish (2003) found that Ricardian equivalence operates in Israel through capital market and found that change in firm’s value bring a shift in public consumption through consumption. Giorgioni and Holden (2003) found mixed evidence on Ricardian Equivalence Proposition for ten developing countries including Burundi, El Salvador, Ethiopia, Honduras, India, Morocco, Nigeria, Pakistan, Sri Lanka and
Zimbabwe. Wroblowsky and Mac hacek (2003) suggested that Ricardian equivalence is likely invalid for Czech Republic due to the failure of private consumers in solving intertemporal optimization problem. Hatfield (2009) investigated the question of Ricardian equivalence in the context of local public finance. The result is significant if and only if sub national units use property taxes, however for other tax bases, a weaker result is shown. Castro and Fernández (2009) rejected the Ricardian proposition for Spanish economy, although some degree of substitution between public and private saving is detected. These results supported the countercyclical role of fiscal policy in the case of Spain. Wroblowsky (2009) examined empirically the evidence of a Meta analysis of Ricardian Equivalence proposition. His methodology is similar to that of Stanley58, however he included the latest empirical data to the sample and considered the changes in the meta-independent variables structure. The consequences of these studies are different from case to case. These results are much related to those achieved by Stanley. Based on the above cited review of the literature, it may be concluded that the empirical and theoretical literature on Ricardian equivalence proposition (REP) is inconclusive. The theoretical literature emphasizes several reasons for weakness of this hypothesis. If equivalence prevails there is no scope for effective stabilizing fiscal policies. The empirical evidence provided so far shows a mixed response, both in favor and against. Since the REP requires a number of assumptions that might not be satisfied in developing countries, like Pakistan, and therefore, the REP might not hold. The overall results were indefinite and so rationalize the need for a deeper econometric analysis.

3. Theoretical framework of REH

The Ricardian equivalence hypothesis, elaborated by Barro (1974), states that for a specified expenditure path, the substitution of debt for tax has no effect on aggregate demand and interest rates. The government’s inter-temporal budget constraint implies that a tax cut at present means a tax increase in the future for the households. As government borrowing only postpones present taxation to the future, the

58 Stanley (1998) gives a meta-analysis of 27 studies checking the Ricardian equivalence hypothesis. He finds strong evidence that this hypothesis is incorrect.
prospective taxpayers/consumers fully anticipate this phenomenon. In other words, they do not consider the current tax relief and the resulting increase in disposable income to be meaningful. Consequently, the consumption path is also unaffected and the increase in disposable income is entirely saved. According to the Ricardian equivalence hypothesis, the consumers respond to the tax cuts by saving the enhancements in disposable income rather than increasing consumption expenditure. This increase in private saving may be used in purchasing the newly issued government bonds thereby enabling the households to pay for the expected increased taxes in future. Therefore, if private savings increase by the same proportion as does the budget deficit, the net national savings remain unaffected and this in turn leaves the interest rate unaltered. In the same line of reasoning, the current budget deficits financed through borrowing (rather than taxation) will have no effect on current account balance since the resultant increase in private saving will be sufficient to avoid the need for external borrowing. When the agents are forward looking fully aware of the government’s inter-temporal budget constraint, they will anticipate that tax cuts today or government resorting to borrowing will result in higher taxes being imposed on their future generation. Hence the agents are not likely to increase their present consumption based on increased disposable income. With the assumption of free access to credit market, the agents are likely to decide their consumption on the basis of permanent income which is not affected by the timing of taxes (Barro, 1974). This behavioral phenomenon is called Ricardian equivalence between taxes and debt.

3.1 Analytical Framework

The consequences of RE theorem may be put another way; a decrease in the government's saving (CAD) leads to an offsetting increase in desired private saving, thus there is no change in desired national saving. According to Barro (1974, 1978), some theoretical assumptions are necessary for Ricardian equivalence to hold, given as under:

(a) No borrowing constraints are faced by consumers as capital markets are perfectly competitive.

59 Marinheiro, 2007
(b) The same planning period applies to both private and public sectors.

c) All taxes are in the nature of lump sum. Future income flows and future tax burdens are certain.

d) The individuals fully anticipate the future tax liabilities that are implicit in the debt/bonds issue.

e) Economic agents are rational, forward-looking and planning over infinite horizon.

If the RE hypothesis is invalidated on the basis of the non-fulfillment of the very assumptions, then increasing government deficit financed by issuing bonds as a substitute for extra taxation will tend to increase private consumption owing to the wealth effect. In other words, termination of the RE theorem may imply crowding out of private expenditures. All these assumptions are very strong and restrictive for developing countries. However, the empirical evidence and results in favour or against the RE hypothesis provided so far are mixed.

The empirical literature on the RE hypothesis is vast and ever expanding. Most studies usually estimate reduced-form consumption functions or Euler equations. A simple specification is proposed by Perelman and Pestieau (1993). The authors estimate the following consumption function:

\[ C_t = \alpha_0 + \alpha_1 (Y_t - TX_t) + \alpha_2 BDEF_t + \alpha_3 W_t + \alpha_4 GB_t + \varepsilon_t \]  

In the above relation, C stands for consumption, Y-TX for disposable income, BDEF for the fiscal budget deficit, W for private wealth and GB for government debt. Holding public expenditure unaltered, the sum of both coefficients of disposable income and budget deficit gives the effect of a tax-for-deficit substitution on current consumption. Hence, the Ricardian equivalence hypothesis is interpreted as implying \( \alpha_1 + \alpha_2 = 0 \) and \( \alpha_4 = 0 \), the pure Keynesian view implies that \( \alpha_2 = 0 \).

The policy implications of the Ricardian hypothesis are very important but unpleasant for the governments. The present tax cuts and the resultant deficit financed by floating new bonds/raising debt

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60 (Wroblowsky, 2003; Ghatak, 1996; Holden, 2003) They have discussed very briefly about Ricardian Equivalence theorem and test this theorem for different developing countries.

61Marinheiro (2008), if the results for the proxy of wealth are not reasonable, it would be possible to estimate the consumption function excluding wealth and debt from the list of independent variables.
may not increase private consumption as assumed/intended by the government. Thus, it may not be a useful fiscal instrument for stabilizing the economy.

4. Econometric Methodology and Data Description

In this study, we employed the unit root tests, Johansen co-integration technique and the Error Correction Model to attain our objectives. The main purpose of co-integration analysis is to verify the nature of long run relationship between a set of time series variables. However, it is essential to check each time-series for stationarity before starting the co-integration tests. In case the time-series at hand is non-stationary, then the regression analysis carried out in the usual manner may produce spurious results. So the unit root tests are conducted first to examine this property of the time-series.

4.1. Co integration Analysis

If the variables of interest share a common stochastic trend, they are said to co-integrated in the long run (Christensen, Nielsen 200). The concept of co-integration was firstly introduced by Granger (1981) and further formalized by Engel and Granger (1987) by introducing a very simple method to check the existence of long run relationship between the variables. Although the EG test is very simple and convenient to implement, but it does not intimate as to which of the variable should be used as regressor and why. It may lead to contradictory results, especially when there are more than two I(1) variables under consideration (Pesaran and Pesaran, 1997). Therefore Johansen (1988; 1991) and Johansen and Juselius (1992) tests are employed in multivariate analysis. We discuss the Johansen co-integration procedure briefly:

Let's assume that we have three variables $Y_t$, $X_t$ and $W_t$ which can all be endogenous. Each time series variable has links with its past values. The variables can written in the matrix notation as $Z_t = [Y_t, X_t, W_t]$, where the vector may be expressed as:

$$Z_t = \alpha_0 + \alpha_1 Z_{t-1} + \alpha_2 Z_{t-2} + \ldots + \alpha_k Z_{t-k} + \mu_t \quad (4.1)$$
Defining $\Delta = 1 - L$, where $L$ is the lag operator, the above can be formulated in a vector error correction model (VECM) as follows:

$$
\Delta Z_t = \Pi_1 \Delta Z_{t-1} + \Pi_2 \Delta Z_{t-2} + \ldots + \Pi_k \Delta Z_{t-k-1} + \alpha_k Z_{t-k} + \mu_t
$$

$$
= \alpha_0 + \sum_{i=1}^{k-1} \Pi_i \Delta Z_{t-i} + \alpha_k Z_{t-k} + \mu_t
$$

(4.2)

where $\Pi_i = -(1 - \alpha_1 - \alpha_2 - \ldots - \alpha_k)$, $i = 1, 2, \ldots, k - 1$

The $\Pi$ matrix is $3 \times 3$ due to the fact that we assume three variables in $Z_t$. The matrix contains the information regarding the long run relationships among the variables concerned. If the matrix has a full rank, all the elements in the vector $Z$ are stationary. On the other hand, a zero rank indicates the absence of any co-integration and the model reduces to VAR in the first difference. In case the rank is positive but less than full, there exists co-integration. To test whether there exists co-integration among the variables or otherwise, two methods (test statistics) are used that determine the rank of co-integration space, due to Johansen (1988) and Johansen and Juselius (1990). The procedures are based on the propositions about eigenvalues.

a. This method tests the null hypothesis that rank of the matrix $\Pi$ is ‘$r$’ against the alternative hypothesis that the rank is $r + 1$. Thus, according to the null hypothesis, there are ‘$r$’ co-integrating vectors. The test statistics is based on the characteristic root (Eigenvalues).

To test how many of the numbers of the characteristics roots are significantly zero this test uses the following statistics:

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

(4.3)

The test statistic is based on the maximum eigenvalue (maximum eigenvalue statistic)

b. The second method is based on a likelihood ratio test about the trace of the matrix (trace statistic). This statistic is considers whether the trace is increased by adding more eigenvalues beyond the
rth eigenvalue. The null hypothesis in this case is that the number of cointegrating vectors is less than or equal to r. This statistic is calculated by:

\[ \lambda_{\text{trace}} (r) = -T \sum_{i=r+1}^{n} \ln (1 - \lambda_{r+1}) \]  

(4.4)

The usual procedure is to work downwards and stop at the value of r which is associated with a test statistic that exceeds the displayed critical value. Another important aspect is to select the appropriate model regarding the deterministic components in the multivariate system. It means that whether an intercept and/or a trend should enter either the short run and long run model, or both models.

4.2. Granger Causality Test

If a pair of series is cointegrated then there must be Granger-causality in at least one direction, which reflects the direction of influence between series. Theoretically, if the current or lagged terms of a time-series variable, say \( X_t \), determine another time-series variable, say \( Y_t \), then there exists a Granger-causality relationship between \( X_t \) and \( Y_t \), in which \( Y_t \) is Granger caused by \( X_t \).

4.3. The Short Run Analysis

The short run dynamics are examined using the Error Correction Model (ECM). It explains changes in the dependent variable in term of changes in the explanatory variables as well as deviations from the long run relationship between the variables and its determinants. The model follows from general to specific approach in econometric modeling which best fits the given data set. The co-integration of any two variables implies that there is some adjustment process which prevents the error term to enter in the long run relationship. However, if the variables are co-integrated over time, then an Error Correction Model (ECM) is appropriate. According to Engle and Granger (1987), the co-integrated variables have an ECM representation, which has the advantage of incorporating both the short-run and long run relationship between the variables in the same regression.

4.4. Data and Variables

Availability of adequate and reliable data is very important for consequential analysis. The validity of results depends on sufficient and consistent data. We have done our utmost effort for the collection of reliable and consistent data set for our research. We have used annual data set of Pakistan for the period 1972-2008. This data set is retrieved from different data sources. Most of the data is collected from Federal Bureau of Statistic, Annual Reports of the State Bank, Pakistan Economic Survey and Yearbook of International Financial Statistic (IFS) published by the IMF. The main variables used were the private Consumption, Disposable income, Government Debt and Budget Deficit.

5. Results and interpretation

As discussed in the previous section we have adopted a three-step procedure in testing the three hypotheses under consideration. First we apply the Augmented Dickey Fuller (ADF) unit root test to check the stationarity and order of integration of different economic variables used in this study. Next we resort to the Johansen’s Maximum Likelihood procedure to test for the long run co-integration among the variables. Finally, the Error Correction Model is employed to see the causality between the crucial variables. In the following lines, we discuss the findings and analyze the relevant results.

5.1 Unit root tests

At the outset, we test for the stationarity of all the time series variables involved with all the three hypotheses of this study. To tests for the validity of Ricardian equivalence, all variables are expressed in real per capita terms. Likewise, we have used the variables in level and also in term of their ratios to GDP for testing of the Twin Deficit Hypothesis and the F-H puzzle. We use the ADF model to check for the stationarity and the order of integration. The results are projected in Table 5.1 below.
Table 5.1: The ADF Test

\[ \Delta y_t = \mu + \delta y_{t-1} + \sum_{i=1}^{k} \beta_i \Delta y_{t-i} + \varepsilon_t \]

<table>
<thead>
<tr>
<th>Variable</th>
<th>Levels ADF T-test</th>
<th>First Difference ADF T-test</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Level values</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>External Debt</td>
<td>-1.73027</td>
<td>-7.703914*</td>
<td>I(1)</td>
</tr>
<tr>
<td>Budget deficit</td>
<td>-2.70288</td>
<td>-5.81575*</td>
<td>I(1)</td>
</tr>
<tr>
<td>Consumption</td>
<td>-1.55237</td>
<td>-4.97451*</td>
<td>I(1)</td>
</tr>
<tr>
<td>Disposable Income</td>
<td>-0.358871</td>
<td>-2.86985***</td>
<td>I(1)</td>
</tr>
</tbody>
</table>

Note: the Mackinnon critical values of significance at the 1%, 5% and 10% are -3.69987, -2.97626 and -2.62742 respectively. The superscripts *, **, *** show significance at 1%, 5% and 10% respectively.

It is evident from the test that the series have become stationary by taking the first difference, which implies the presence of unit roots in the original data. In other words, all the variables are non-stationary at level and stationary at first difference or they are integrated of same order I(1). This validates our propositions that the variables concerned are indeed co-integrated and a long run relationship holds among them. With this information at hand, we proceed further to examine the nature of long run and short run relationships among the variable.

5.2 The Ricardian Equivalence Hypothesis

As discussed earlier, the validity of Ricardian Equivalence hypothesis has rarely been tested in case of Pakistan. Therefore, further research is required to explore this hypothesis which has important implications in the area of public finance. After determining the stationarity properties and order of integration, the next step is to examine the long run relationships among the variables concerned. The multivariate co-integration method due to Johansen (1988) and Johansen & Juselius (1990) has been
followed. We follow the specification proposed by Perelman and Pestieau (1993)\textsuperscript{63} given by equation (3.1) and reproduced below with slight modification. In particular, we have incorporated external debt as an argument and excluded wealth from the analysis\textsuperscript{64}.

\[ C_t = \alpha_0 + \alpha_1(Y_t - TX_t) + \alpha_2BDEF_t + \alpha_3GB_t + \epsilon_t \]

\[ C_t = 46.4936 - 0.0463(Y_t - TX_t) + 0.0009BDEF_t + 1.0904GB_t \]

In the above specification, the aggregate private consumption depends on disposable income of the households, the fiscal (budget deficit and the outstanding public debt.

The results of co-integration are shown in Table 5.2.

Table 5.2 Johansen’s Maximum Likelihood Test for Consumption function

<table>
<thead>
<tr>
<th>$A - Trace$</th>
<th>$A - Max$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\text{Eigen-value}$ &amp; $\text{H}_0$ &amp; $\text{H}_1$ &amp; $\text{Trace}$ &amp; $\text{5% Critical Value}$ &amp; $\text{H}_0$ &amp; $\text{H}_1$ &amp; $\text{Max}$ &amp; $\text{5% Critical Value}$</td>
<td></td>
</tr>
<tr>
<td>0.61393 &amp; $r \leq 0$ &amp; $r &gt; 0$ &amp; 62.9806 &amp; 54.0790 &amp; $r \leq 0$ &amp; $r &gt; 0$ &amp; 32.3590 &amp; 28.5880</td>
<td></td>
</tr>
<tr>
<td>0.43404 &amp; $r \leq 1$ &amp; $r &gt; 1$ &amp; 30.6215 &amp; 35.1927 &amp; $r \leq 1$ &amp; $r &gt; 1$ &amp; 19.3538 &amp; 22.2996</td>
<td></td>
</tr>
<tr>
<td>0.16885 &amp; $r \leq 2$ &amp; $r &gt; 2$ &amp; 11.2676 &amp; 11.2676 &amp; $r \leq 2$ &amp; $r &gt; 2$ &amp; 6.2882 &amp; 15.8921</td>
<td></td>
</tr>
<tr>
<td>0.13623 &amp; $r \leq 3$ &amp; $r &gt; 3$ &amp; 4.9793 &amp; 4.9793 &amp; $r \leq 3$ &amp; $r &gt; 3$ &amp; 4.9793 &amp; 9.16454</td>
<td></td>
</tr>
</tbody>
</table>

Note: A single lag length is used in the VAR. Critical values for trace and maximum likelihood tests are due to Osterwald-Lenum (1992). The model was estimated by assuming only an intercept and no trend in the equation.

Looking at the empirical results, both the test statistics (trace and the maximum eigen-values) show that a single co-integrating vector exists at the 5\% significance level. The long run results are obtained by imposing additional restrictions. Table 5.3 reports the results with two restrictions; due to different schools of thoughts regarding the consumption function (Ricardian and Keynesians):

\textsuperscript{63} We have excluded the proxy variable of wealth that is not stationary at level as well at 1\textsuperscript{st} and 2\textsuperscript{nd} difference when we applied ADF unit root test.

\textsuperscript{64} For detail, see Kazmi, 1992&1991.
Table 5.3 Vector with Restrictions on the Coefficients of Consumption function

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Y-TX</th>
<th>BDEF</th>
<th>GB</th>
<th>Restrictions</th>
<th>LR test</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic Model</td>
<td>-0.0463</td>
<td>0.0009</td>
<td>1.0904</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recardian Restrictions</td>
<td>0.0007</td>
<td>-0.0007</td>
<td>0.0000</td>
<td>BDEF=(Y-TX), GB=0</td>
<td>10.7140 (0.0047)</td>
<td>Rejected</td>
</tr>
<tr>
<td>Keynesian Restrictions</td>
<td>-0.0194</td>
<td>0.0000</td>
<td>0.1758</td>
<td>BDEF=0</td>
<td>0.1137 (0.7358)</td>
<td>Not rejected</td>
</tr>
</tbody>
</table>

Note: test results are shown in the last column, with p-value in parenthesis. BDEF is the Government budget deficit; Y-TX is disposable income; and, GB is government debt.

With regards to the findings shown above, the LR test rejects the Ricardian Equivalence restrictions: the hypothesis that BDEF=-(Y-TX), GB=0. In contrast, the restriction imposed due to Keynesian hypothesis (that budget deficit financed through borrowing has no significant impact on consumption behavior or (BDEF=0), is not rejected by the LR test in case of Pakistan’s economy. This restriction presents the very high p-value.

Keeping in view these results, the validity of Ricardian Equivalence hypothesis cannot be favored in case of Pakistan. This implies that an increase in the deficit is not fully accommodated by an increase in private saving for a certain expenditure path. As a result, an increase in budget deficit is likely to motivate the need for external financing, which in turn leads to the twin deficit phenomenon. The above results confirm the conclusions reached to by Kazmi (1991, 1992) in which case the Ricardian Equivalence hypothesis was rejected for Pakistan’s economy. Our results are also in line with those obtained by Ghatak and Ghatak (1994) for India. The rationale is straight forward. Since both India and Pakistan are developing countries and have more or less similar structures, characteristics and behaviors of the economic agents.
6. CONCLUSIONS

The objective of this paper was to examine the validity of REH for Pakistan. The estimated empirical results showed no evidence in favor of the Ricardian equivalence hypothesis in Pakistan. However, this result should be taken with caution. The usual practice in vogue is that the governments resort to all the three sources of financing the budget deficits simultaneously, namely, taxation, internal and external borrowing as well as bank borrowing. In very rare cases, the governments have relied only on borrowing, that is to say, no increase in taxation. Further, the disposable incomes of the common masses are already at the subsistence level. The majority of the common masses don’t see any relief in the budgets presented by the governments, year after year, and therefore least interested in statistical juggleries. Therefore, it is very difficult to bring evidence in favor of the highly sophisticated Ricardian equivalence hypothesis in countries like Pakistan. Consequently, our results suggest that budget deficits have no impact on private consumption. People generally follow a particular path/pattern of expenditure and therefore the substitution of debt for taxes has little impact on the household’s consumption level. This means that fiscal policy might be playing an effective role to stabilize the economy to some extent, which in turn leads to the validity of twin deficit hypothesis. The imposition of Keynesian restriction on consumption level is not rejected while imposition of the RE restriction is rejected for Pakistan.
References


