

## CHAPTER- III

### LITERATURE SURVEY

#### 3.1 Introduction

This Chapter throws light on empirical works done before on *twin deficit hypothesis*. Relevant models with interpretation of empirical findings are being presented in subsequent sections.

#### 3.2 Twin Deficit Hypothesis

In economic literature, two different theories exist in regard to the relation between trade deficit and budget deficit. One of them, the **Twin Deficit Hypothesis, (TDH)** which argues that budget deficit causes trade deficit and hence, the two deficits are twins. Therefore, this theory advocates for regulating budget deficit to achieve balance in the external sector

The **Ricardian Equivalence Hypothesis (REH)** is the other which contradicts the *twin deficits hypothesis* and claims that increase in government expenditure is absorbed by rise in private savings, causing no external sector deficit. In other words, according to (REH), if government runs a deficit by borrowing, the economic agents expect that government will raise future taxes to finance the budget deficit and so they increase their saving to meet the future tax burden. Similarly, a cut in taxes, though increases the disposable income of the individuals, will not lead to higher private consumption in anticipation of higher future tax rates. Thus savings will respond positively to the changes in budget deficit, leaving the trade deficits unaltered. It is, therefore, held that the two deficits are not systematically related to each other.

#### 3.3 Empirical Models and Findings

The relation between two deficits becomes an important topic of debate after the emergence of secular nature of simultaneous movement of the twins in the United States from the early 1980s. The debate has led to a large number of studies for US, but they have yielded conflicting conclusions. This is shown in the table below.

**Table 3.1**

**Findings on the Relationship Between Twin Deficits in the USA**

<b>Researcher/s</b>	<b>Sample countries</b>	<b>Findings</b>
Darrat (1988)	USA	Bi-directional-causality between-BD and TD
Bahmani-Oskooee (1989), & Latif- Zaman & Do Costa (1990)	USA	Uni-directional causality from BD to CAD
Enders and Lee (1990), Dewald and Ulan (1990)	USA	No causal link between the two deficits
Miller and Russek (1989), Abell (1990) and Bachman (1992)	USA	Uni-directional causality from BD to CAD.

The empirical studies on twin deficits in the context of **other countries** also produced a mixture of results. These results are also shown in the table below.

**Table 3.2**

**Findings On Twin Deficits**

<b>Researcher/s</b>	<b>Sample countries</b>	<b>Findings</b>
Khalid & Guan (1999)	10 countries	<i>Uni-directional causality</i> from BD to CAD in USA, France & Canada. <i>No causality</i> between BD and CAD, in UK & Australia. Weaker support for <i>bi-directional causality</i> too in Canada. <i>Two Way causality</i> for India. <i>Causality from CAD to BD</i> in Pakistan and Indonesia. <i>Unidirectional causality</i> from BD to CAD for Egypt and Mexico
Vamvoukas (1999)	Greece	<i>One way causality</i> from BD to TD
Kearney & Monadjemi (1990)	8 countries	<i>Causality from CAD to BD</i> in Germany, Australia and France.
Laney (1984)	58 countries	<i>Causality from BD to CAD</i> in developing countries. Amongst

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		the world's largest economies, Canada & Italy only demonstrate a statistically significant
Bernheim (1988)	6 countries	<i>Positive relationship between BD and CAD.</i> \$ 1.00 increase in the BD is associated with roughly a \$0.30 decline in the CA Surplus for USA, UK, CANADA and West Germany, but \$ 0 .85 decline in CA for Mexico. <i>No effect</i> on CA for Japan.
Islam (1998)	Brazil	<i>Bilateral causality</i> between Trade deficit and budget deficits.
Alkswani (2000)	Saudi Arabia	<i>Causality</i> from trade deficit to budget deficit.
Olga vyshnyak (2001)	Ukraine	BD <i>Granger causes</i> to CAD
Akbostanci and Tunc (2002)	Turkey	<i>Twin deficit hypothesis</i> holds and <i>Ricardian Equivalence Hypothesis</i> is not validated both in long run and short run as well.
Ali-salman-saleh ,Mahendhiran Nair & Tikiri Agalewatte (2005)	Sri Lanka	<i>Causality from budget deficit to Current account deficit.</i>

Since researchers have formulated and experimented different modeling patterns with different time horizon, test results are not unanimous in many cases. Such diversified and contradictory results might have arisen because of country wise economic policy divergence, nature of data and their definitions, model specification, constraint e.g. partial modeling instead of full modeling, variables identification problem and their best fit and the time span. This can be explained in detail in the next section.

### 3.4 Several Important Studies:

**Olga Vyshnyak (2001)** himself found for Ukrainian data that past movements in government budget *Granger Cause* movement in current account deficit (CAD) showing *unidirectional relationship* for long run. For this verification, the researcher had run a bi-variate regression model as

$$CAB_t = c(1) + c(2)BB_{t-1} + u_t \quad (3.1)$$

The study involves *co-integration test* between model variables and *Granger Causality* between them. In verifying the *Granger Causality*, he had been studied with the following specification.

$$BB_t = \alpha + \sum_{j=1}^l \beta_j CAB_{t-j} + \sum_{j=1}^l \gamma_j BB_{t-j} + \mu_{1t} \quad (3.2)$$

$$CAB_t = \theta + \sum_{j=1}^l \delta_j BB_{t-j} + \sum_{j=1}^l \lambda_j CAB_{t-j} + \mu_{2t} \quad (3.3)$$

However, no *Error Correction Mechanism* (ECM) has been studied for examining the short-run relationship between BD and CAD. The data used in the study were just for eight years.

In Turkish case, as summarized by **Elif Akbostanci and Gul Ipec Tunk (2002)**, on their “**Turkish Twin Deficits: An Error Correction Model of the Trade Balance**”, *Ricardian Equivalence Hypothesis* (REH) is not validated both in the long-run and short-run. They had used Error Correction Model (ECM) by specifying following equations.

$$\Delta X_t = \sum_{i=1}^{k-1} \Gamma_i \Delta X_{t-i} + \Pi X_{t-k} + \mu + \varepsilon_t \quad (3.4)$$

$$\Pi = \alpha \beta' \quad (3.5)$$

where  $X_t$  is a (p x 1) vector of stochastic variables, which are I(1),  $\mu$  represents the intercept term, and the error term  $\varepsilon_t$  is assumed to be white noise. Since  $X_t$  is I(1), if a linear combination of these I(1) variables exists, then these variables are said to be *cointegrated*. If *cointegration* exists, an *Error Correction Representation* exists for these variables. In equation (3.5)  $\Pi = \alpha\beta'$  is the impact matrix where  $\alpha$  is the vector of adjustment coefficients and  $\beta$  is the vector of co-integrating relations and both are p x r matrices.

The variables in his model consist of the budget balance as a percentage of GDP, trade balance as a percentage of GDP, industrial production index, and narrow money as a percentage of GDP. The model includes an output term, and a monetary term, to account for different channels of interaction between the budget deficit and current account deficit. This model has supported *persistence of Twin Deficit Hypothesis* both for short run and long run with sample data of Turkey for 15 years (1987-2001) of the model variables.

Another empirical study was carried out by **Zengin (2002)** using ‘*Vector Autoregressive Model*’ (VAR). The evidence from the eight variables (budget deficit, trade deficit, seasonal adjusted internal and external revenue, trade weighted effective real exchange rate, average interest rates on securities, money supply M2, and GNP deflator). VAR system also supports the *Twin Deficit* notion that budget deficits influence trade balance.

**Mamdouh Alkswani (2000)** in his paper on “**The Twin Deficits Phenomenon in Petroleum Economy: Evidence from Saudi Arabia**” holds that Saudi Arabian database does not support *causality* running from budget deficit to trade deficit. He used two steps ECM where first stage regressions were run on

$$BD_t = \alpha_0 + \alpha_1 TD_t + \varepsilon_t \text{ and} \quad (3.6)$$

$$TD_t = \beta_0 + \beta_1 BD_t + u_t \quad (3.7)$$

The second steps to estimate the ECM representation were,

$$\Delta BD_t = \alpha_0 + \sum \alpha_{1t} \Delta TD_{t-j} + \sum \alpha_{2t} \Delta BD_{t-j} + \lambda e_{t-1} \quad (3.8)$$

$$\Delta TD_t = \beta_0 + \sum \beta_{1t} \Delta TD_{t-j} + \sum \beta_{2t} \Delta BD_{t-j} + \delta \mu_{t-1} \quad (3.9)$$

And, for *Granger Causality* verification, following specifications were studied

$$X_t = \sum_{i=1}^m a_i X_{t-i} + \sum_{j=1}^n b_j Y_{t-j} + u_t \quad (3.10)$$

And

$$Y_t = \sum_{i=1}^r c_i Y_{t-i} + \sum_{j=1}^s d_j X_{t-j} + v_t \quad (3.11)$$

where  $X_t$  and  $Y_t$  were replaced by  $BD_t$  and  $TD_t$  respectively. Saudi Arabian data for 30 Years (1970- 1999) were used in the study.

**Stilianos Fountas and Christopher Tsukis (2000)**, on their cross-country study on ‘**Twin Deficits, Real Interest Rate and International Capital Mobility**’, conclude that the TDH is upheld only in the cases of Germany and the UK and only in the short run. The opposite hypothesis of current account targeting carries some weight in case of Canada in the short run. In case of Netherlands, there are some evidences consistent with current account targeting according to the sign of cointegrating vector. A result not supported by the long run exogeneity tests.

**Abdul Nasser Hatimi J and Ghaji Shukur (1999)** have tested *twin deficit hypothesis* in “**Multivariate – Based Causality Tests of Twin Deficits in the US**”. This paper possesses alternate method for testing the causality direction between US twin deficits involving Rao’s Multivariate F test combined with ‘*Bootstrap Simulation Technique*’. For this, they have identified the VAR model as

$$Y_t = \eta + A_1 Y_{t-1} + \dots + A_p Y_{t-p} + \varepsilon_t \quad (3.12)$$

where,  $\varepsilon_{jt} = (\varepsilon_{1t}, \dots, \varepsilon_{kt})$  is a zero mean independent white noise process with non singular covariance matrix  $\sum \varepsilon$  and, for  $J = 1, \dots, k$ ,  $E / \varepsilon_{jt} / 2^{+t} < \infty$  for some  $t > 0$

Using quarterly US data from 1975 Q1 to 1998Q2 from The International Financial Statistics (IFS) with *Multivariate Rao's F test* and *Bootstrap Test* applying VAR (2), they found very interesting result that twin deficits do not *Granger Cause* each other for sample period. While identifying structural break and using sub- period's data separately, first sub- period time supported BD *Granger causing* CAD while second sub- period supports CAD *Granger causing* BD. However, the '*Lucas Critique*' might have been in effect owing to internal policy shifts and international economic shocks.

**Michel Normandin (1999)** in "**Budget Deficit persistence and the Twin Deficit Hypothesis**", used '*Blanchard's Overlapping Generation Model*', and held "*..... The relevant Canadian consumer's horizon and the persistence of the Canadian budget deficit produce responses that are statistically positive. In contrast, the relevant U.S. consumer's horizon and the dynamic behavior of the U.S. budget deficit yield responses that are statistically insignificant.*"

**G. Karras and F. Song (1994)** in "**Government Spending and the Current Account: Some International Evidence**" have shown through their empirical research with a neoclassical frame work that *transitory (permanent) changes in Government spending reduce (leave unaffected) the trade balances*. It means that transitory change in Government spending motivates the *utility maximizing consumers* to consume out of their permanent income which remains almost unaffected by government spending. Changes of this nature, therefore, create a desire for smoothing consumption, which is accommodated by the current accounts. Permanent changes, on the other hand, create no such smoothing motivating and hence, leave no impact on current accounts.

Using data for Australia, Italy, Sweden the UK and the US, they find that the current effects of permanent changes in government spending in all five countries are *statistically not different from zero*, as predicted by the theory. The effects of the transitory changes in government spending, however, are found to be consistent with the model only for the UK and the USA. The Australian, Italian and Swedish current accounts are not statistically related to transitory changes in Government spendings. They also show that adopting a text book Keynesian Model or a model with liquidity constraints cannot resolve these puzzling findings.

**Daniel L. Thornton (2003)** in '**Do Government Deficits matter?**' first explores the relations of deficits to private saving, interest rates, trade deficit, output and inflation. Then he further considers the *Keynesian Hypothesis* and *Ricardian Equivalence* as well. He uses the data for 16

OECD countries over the period 1975-86. His data are of pooled time series / cross section by nature. He introduces first the general equation as

$$DV_{it} = \alpha_{it} + \beta_{it} DEF_{it} + \varepsilon_{it} \quad (3.13)$$

where  $I = 1, \dots, k$ , and  $t = 1, \dots, T$ ,  $DV_{it}$  and  $DEF_{it}$  denote the  $t^{\text{th}}$  observation for the  $i^{\text{th}}$  country of the dependent variable and the deficit measure respectively.  $\alpha$  and  $\beta$  denote fixed parameters and  $\varepsilon_{it}$  denote a random variable.

Equation (3.13) is impossible for testing because the numbers of the parameters exceed the numbers of observations. This problem had been circumvented by obtaining time series and  $\alpha_{it} = \alpha_t$  and  $\beta_{it} = \beta_t$  for all  $t$  for time series and  $\alpha_{it} = \alpha_i$  and  $\beta_{it} = \beta_i$ , for all  $I$  for cross sectional data. Thus these specifications are,

$$DV_{it} = \alpha_i + \beta_i DEF_{it} + \varepsilon_{it} \quad \text{and} \quad (3.14)$$

$$DV_{it} = \alpha_t + \beta_t DEF_{it} + \varepsilon_{it} \quad (3.15)$$

A pooled time series / Cross section representation can be obtained by imposing the restrictions  $\alpha_{it} = \alpha$  and  $\beta_{it} = \beta$  for all  $i$  and  $t$  to obtain equation (3.16) i.e.

$$DV_{it} = \alpha + \beta DEF_{it} + \varepsilon_{it} \quad (3.16)$$

This is just equivalent to imposing the restrictions  $\alpha_{it} = \alpha$  and  $\beta_{it} = \beta$  for all  $I$  on the time series model or  $\alpha_{it} = \alpha$  and  $\beta_{it} = \beta$  for all  $t$  on the cross sectional model.

Equations (3.14) - (3.16) are estimated with annual observations on the Government deficits, nominal interest rate, the Trade deficits, the price level (1980 = 100), the inflation rate, real output growth and private saving of the 16 OECD countries ( $k = 16$  and  $T = 12$ ). The equations are estimated both at levels and first differences.

Estimates of equation for both the levels and first differences data suggested that increase in deficit spending are associated with decrease in personal saving. It means that following decrease in the public savings also decline and so does the private saving. The result is not consistent with the *Ricardian view* that public and private savings are substitutes. Thus the research paper suggests the prevalence of *twin deficit hypothesis*.

**Amelie Clement (2002)** enquires into *REH and TDH* in '*Twin Deficits: A Cyclical Phenomenon?*' In explaining REH, in a two-period economy, consumers are assumed to maximize their utility function

$$U(C_1) + \beta U(C_2) \quad (3.17)$$

which is subject to an intertemporal budget constraint as follows

$$C_1 + (1/1+r) C_2 = (Y_1 - T_1) + (1/1+r) (Y_2 - T_2) + (1+r) \beta^P_1 \quad (3.18)$$

Here  $r$  is the interest rate,  $\beta$  is a subjective discount factor and  $\beta^P_1$  is the individual holding of financial assets at the end of period  $T = 0$ .

The Government, for its part, has also to respect its budget constraint as,

$$G_1 + (1/1+r) G_2 = T_1 + (1/1+r) T_2 + (1+r) \beta^G_1$$

This means that present value of government expenditures should be equal to the present value of its revenues, i.e., taxes, added to the discounted value of its financial assets at the end of the previous period.

Consumers are assumed to be the perfectly informed and forward looking so that they can see 'through' the government budget deficit constraint by understanding the relation between spending and taxation. Consequently, they integrate it to their own budget constraint

$$C_1 + (1/1+r) C_2 = (Y_1 - G_1) + (1/1+r) (Y_2 - G_2) + (1+r) (\beta^P_1 + \beta^G_1) \quad (3.19)$$

where  $(\beta^P_1 + \beta^G_1) = \beta_1$  is the stock of foreign assets of the whole economy.

REH has a very strong assumption that taxes have no effect on budget constraint of consumers. In the long-run, present value of taxes remains the same and no effect on current account through consumption channel exists. Again variation in government spending allowing taxes unchanged with zero CAB in small economy does not affect CAB. In this new fiscal policy shift, government's saving will decrease because it issues debt or sell assets matching the spending in order to esteem the following budget constraint,

$$(\beta^G_2 - \beta^G_1) = r \beta^G_1 + T_1 - G_1 \quad (3.20)$$

Private sector adjusts their consumption and saving to match expected tax rise in the future to meet the newly issued debt.

He again tries to verify the TDH in the framework of the stated model. In conclusion, this study shows that neither REH nor TDH were able to explain correctly the strong assumption on which they rely on, given that they are not likely to hold often.

In '**Ricardian Equivalence: An Empirical Application to the Portuguese Economy**', **Carlous Fonseca Marinheiro (2003)** has gone through various models scrutinized before. These include the '*Reduced Form Consumption Functions*' of Kormendi (1983), Modigliani and Sterling (1986), Bernheim (1987 a), Pereleman and Pestieau (1993), Cardia (1997), Leachman (1996) and '*Euler Equation Approach*' on a *Generalized Permanent Income Hypothesis etc.* The author

had run *ADF* test to check the order of integration of the data series as following, Suppose that the  $X_t$  is generated by the following process as

$X_t = \delta + \Phi_1 X_{t-1} + \varepsilon_t$  where,  $\varepsilon_t$  is a white noise. If  $X_t$  is a stationary process, it has a constant average  $E(X_t) = E(X_{t-1}) = \mu$ , therefore,  $\mu = \delta + \Phi_1 \mu$  and  $\mu = \delta / 1 - \Phi_1$ .

In order to have finite average, one should have  $\Phi_1 \neq 1$ , with  $\Phi_1 = 1 + \alpha$ , we obtain :

$$\Delta X_t = \delta + \alpha X_{t-1} + \varepsilon_t.$$

When  $\alpha = 0$ , the variable is a random walk, and therefore is not stationary. Stationarity implies a negative value for  $\alpha$ . In order to fulfill this requirement one adds lagged difference of the series until the residuals of the regression are white noise. This is the *ADF* test. The null of the non-stationary is tested by

$$\Delta X_t = \delta + \alpha X_{t-1} + \sum \Delta X_{t-1} + \varepsilon_t$$

When the model was tested for the Portuguese economy, the Komerandi (1983) specification of Ricardian Predictions are rejected. The standard Keynesian view that public expenditures have negative influence on consumption' is accepted.

**Andrew B Abel and Ben S Bernanke (2003)** have analyzed in 'Macro Economics' into relationship between the US government budget deficit and Current account deficit for the period 1960- 1998. This found that the twin deficit relation has gone in opposite direction barring the period of whole 1980s and first half of the 1990s. However, has shown strong support in favor of '*twin deficit hypothesis*'.

The same authors also mentioned some evidences on this issue from other countries in the same book referring the paper on investigating U.S. Government and Trade deficits '. The results for the other countries have observed mixed. For example, revealing the twin deficits idea, Germany's budget deficit and current account deficit both increased in the early 1990s following the reunification of Germany. During mid 1980s, however, Canada and Italy both ran government budget deficits that were considerably larger than those in the United States (as % of GDP), without experiencing severe current account problems. Finally the renowned authors conclude for sure that if an increase in the government budget deficit is not offset by an equal increase in private saving, the result must be a decline in domestic investment, rise in the current account deficit or both.

**Walter Enders and Bong- Soo Lee (1990)** in '**Current Account and Budget Deficits: Twins or Distant Cousins?**' develop a two country microtheoretic model consistent with the *Ricardian Equivalence Hypothesis (REH)*. An '*Unconstrained Vector Autoregression*' (UVAR) shows some patterns in the recent US data which appear to be inconsistent with the *REH*. Rigorous testing of

the model, however, does not allow them to reject the *independence* of the record federal government budget and current account deficits.

**Anjum Aqueel and Mohammed Nishat (2000)** in ‘**The Twin Deficits Phenomenon: Evidence from Pakistan**’ use annual data, and the study is based on *Cointegration Analysis*, *ECM* strategy and ‘*Granger Trivariate Causality Tests*’. The empirical results indicate that the Budget deficit has positive and significant long-run effect on the trade deficit in Pakistan. However, the short-run causal effect is negative between budget deficit and current account balances. Furthermore, except for interest rate, other policy variables like economic growth, exchange rate and money supply affect current account deficit directly.

**Ali Salman Saleh, Mahendhiran Nair and Tikiri Agalewatte, (2005)** in “**The Twin Deficits Problem in Sri-Lanka: An Econometric Analysis**”, argued that prolonged fiscal expansions contributed to current account imbalances. In case of Srilanka during the period 1970 to 2003 in this study, the *Auto Regressive Distributed Lag (ARDL)* model and ‘*bound tests*’ for *cointegration* have been used to asses the long-run dynamics between *twin deficits* in Srilanka. The empirical analysis of this paper supported the *Keynesian View* that there was a long-run relationship between current account imbalances and budget deficit. The empirical results also showed that the direction of causality runs from the budget deficit to current account deficit. Thus any policy measures to reduce the budget deficit in Srilanka could well assist in reducing the current account imbalances.

**Suparna Basu and Debabrata Datta (2005)** undertook an econometric study to examine the impact of the fiscal deficit on India’s external accounts since mid 1980s and form an absence of *cointegration* between these two deficits. Further, an absence of cointegration between the saving rate and the fiscal deficit –GDP ratio also negated the *REH in Indian circumstances*. These findings suggested that the ratios of trade deficit, fiscal deficit and net savings had randomly maintained the national income identity and that a high fiscal deficit had been sustained by a simultaneous as well as an independent increase in the saving ratios.

**Shankar Prasad Acharya and Arjun Kumar Baral (2006)** in their paper ‘**Twin Deficit Hypothesis: An Empirical Investigation on Nepalese Time Series, 1964-2000**’, found that Trade Deficit and Budget Deficit were stationary at first differences. These were *cointegrated* and there was *unidirectional causality* from budget deficit to trade deficit in the economy of Nepal.

### **3.5 Chapter Summary**

This Chapter presents a survey of some relevant literatures regarding the *Twin Deficit Hypothesis (TDH)*. Researchers used different methodologies, models and estimated the models with different time horizons. Accordingly, test results were not unanimous and on the contrary, the

findings varied widely. Such diversified and contradictory results might be due to country-wise economic policy divergence, nature of data and their definitions (possibility of lacking uniform practices of aggregation in countries), model specification constraints (e.g. partial modeling instead of full modeling ), variable identification problem and the time span. All The empirical studies mentioned in this chapter had gone through some battery of tests, which ranged from *sequential order of stationary testing to causality verification* under time series econometric framework.

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