

CHAPTER – II

SURVEY OF THE LITERATURE

2.1 Literature Synthesis

This chapter presents the theoretical aspects of twin deficits and some relevant empirical works on Twin Deficit Hypothesis. Relevant models with interpretation of empirical findings are being discussed in detail in subsequent sections.

2.2 Introduction

Twin Deficit Hypothesis tells about the causal relationship between government budget deficit and trade (external) deficit. More specifically, the hypothesis indicates that government deficit will force trade deficit to move either way depending upon the direction of its change.

How the budget deficit implicates the trade deficit is inherent to the interactions among different macroeconomic variables concerned depending upon the market scenario and policy measures taken by the country. Mainly, there are four types of possible transmission mechanism proposed so far regarding the relationship between budget deficit and trade deficit.

- i. Mundel Fleming perspective is the one. Any increase in budget deficit would cause an upswing of interest rate with a net result of capital inflow and current account deficit. However, it is determined with the situation of capital account convertibility, openness of the economy, and response of the

economic agents. In Nepal, this transmission channel would be less effective since capital account is highly regulated and the economy is not fully opened since lots of investment areas are still highly regulated and outflow of the capital is in total control.

- ii. Second one is the Keynesian absorption theory. This proposition tells that any increase in budget deficit would result in increase in trade deficit through high volume of import. This mechanism is called 'domestic absorption'. This is a second choice of the economy to accommodate rising aggregate demand created through the liberal government expenditure. In Nepal, this diffusion conduit would be more operative because of the prevalence of structural rigidity in production, open border with China and India, high level of marginal propensity to consume (MPC), high volume of consumption and capital expenditure of the government as well as of the public.
- iii. The third one is the combined effect. With a simple intuition from point (i) and (ii), combined effect would be observed through capital inflow and domestic absorption. However, it would be difficult to segregate the exact and accurate measurement of such joint effect.
- iv. The last one is opposing effect on trade deficit by the budget deficit. In contrast to other views, this view has been proposed as *Ricardian Equivalence Hypothesis (REH)*. This proposition conveys that any change in government tax does not affect real interest rates, volume of investments and current account deficit. It is entirely because of rational expectations of the taxpayers. They assume that present tax cut is a future burden and government would extract it ultimately in future so that they start saving at

present for meeting future burden. Such behavior would nullify the net effect so that twin deficit hypothesis would not appear.

By evaluating the aforesaid propositions, we can infer four possibilities of relationships, which are usually found in empirical investigations. Those are,

- i. budget deficit has positive relationship with and significant effect on trade deficit (Keynesian proposition).
- ii. even though not very well defined theoretically, there exists a possibility of emergence of fiscal deficit in response to trade deficit. [Reverse proposition of (i)].
- iii. by natural deduction from (i) and (ii), both of them might be mutually dependent or bi-directional relation may hold. (Feed-back effect)
- iv. by the same token, no relation may prevail between the trade and budget deficits. (*Ricardian Equivalence Hypothesis*).

2.3 Twin Deficits in Theory

Theoretical aspects of the relationship between budget deficit and external deficit, their configuration and twin deficit concept are being presented through two-dimensional geometrical displays and mathematical expressions in this section.

2.3.1 Budget Deficit

Existence of a government in the system underlies with a simple intuition of factors necessitating land (boundary), population, and sovereignty. It is the government that initially embarks upon floating activities in the country for maintaining security

and legal system. It also interferes in mobilizing the economic activities and in building socio-economic infrastructures. For that, it starts mobilizing resources from individual level (citizens) and institutional level (corporate houses, multinational companies, and other institutions) by imposing taxes, non-taxes, or mobilizing grants and borrowings in meeting expenditures. As any government tends to achieve fuller employment and income generation, it needs more and more wherewithals, thereby exceeding expenditure over generated resources (revenues). This leads to the emergence of budget deficit (BD_t).

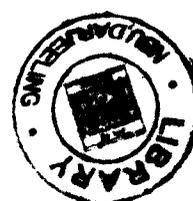
BD_t is derived mathematically by subtracting total tax (T_t) from total expenditures (G_t) such that, $BD_t = (T_t) - (G_t)$. If total tax and other resources exceed total government expenditures, budget surplus results in.

In Nepalese context, composition of government expenditure is a sum total of current and development (capital) expenses. Similarly, total resource is composed of direct and indirect taxes, non-tax revenues (administrative charges, royalties, dividends and fines etc) and grants. Decomposition of budget deficit is reflected in internal borrowing, foreign debt and seigniorage. This is how Nepalese fiscal system is guided by. Additionally, budget deficit can be financed by exhausting foreign exchange reserves; receipts from privatizing public enterprises and running government budget arrears. Out of these additional means, Nepal's budget deficit is occasionally financed by the 'privatization receipts' since she is on the move for privatization. However, unutilized, accumulated foreign exchange (currently it covers the more than nine month's imports cover in terms of goods and services) would be the other occasional source of financing if any severity crops up in the country. Nevertheless, possibility of forced government borrowing seems out of practice at least in the short future to come.

218467

17

02 DEC 2003



2.3.2 Trade Deficit

Trade deficit is a net result of import (domestic absorption) exceeding over export i.e. $(M-X)$. If any country's production pattern is not responsive to contemporary market behavior or policy shocks or is in structural rigidity with poor human resource, capital deficiency and obsolete technology, then it had to depend more on import with suppressed export. In such a situation, trade deficit becomes really a problem to the nation. Furthermore, if country needs more capital-intensive goods, it is quite natural that it even augments more import, thereby, incurring higher trade deficit. Simultaneously, if efficiency parameters and morale values were in question in the nation, the nation would even further run more and more trade deficit for the cost of simple basic consumption to luxury. Internal disorder again fuels the fire. Nepal holds almost all properties discussed above and is running very high trade and current account deficits for almost the entire period under study (1964 - 2004).

2.4 Behavior of Twin Deficits & Their Impacts

Straight effects of the twin deficits are reflected in real sector and monetary sector through interest rates or exchange rates etc. So, familiarization with the behavior of the twins and their transmission mechanism is indispensable before embarking upon our research study.

2.4.1 Floating Exchange Rate and Full Capital Mobility

Under this regime, an increase in government expenditures elevates interest rate within the home economy. As the interest rate goes up, chance of inflow of foreign capital rises if the economy is open. Due to the capital inflow, investment activity

would prosper and if the economy is not responsive to the newly availed opportunity, the importing behavior would rise at least mainly for the capital expenditure. As a consequence, import would escalate and export may not increase compared to import and the resultant effect would be the current account or the trade deficit. This is explained through a graphical presentation below:

Figure – 2.1

IS-LM Model Under Floating Exchange Rate & Full Capital Mobility

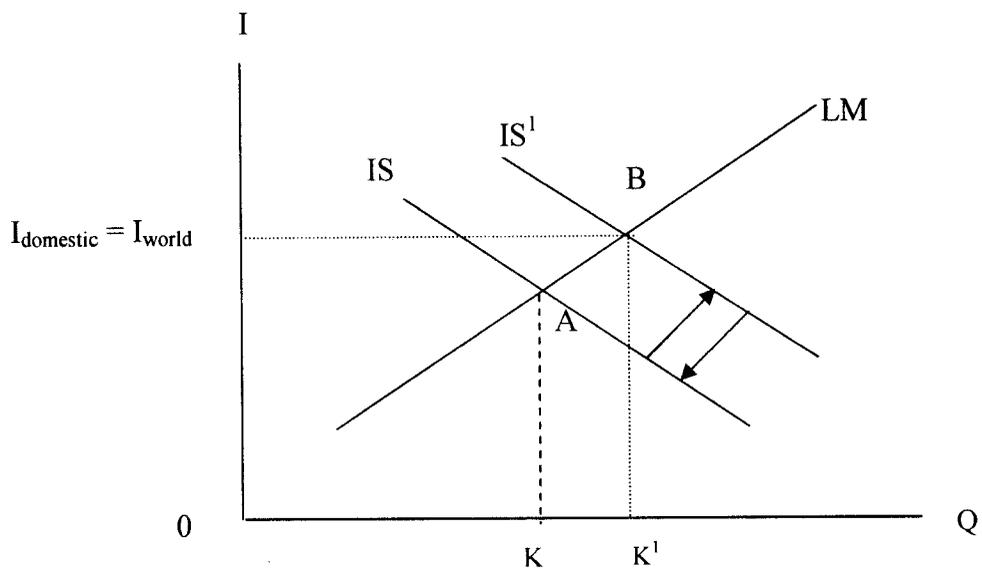


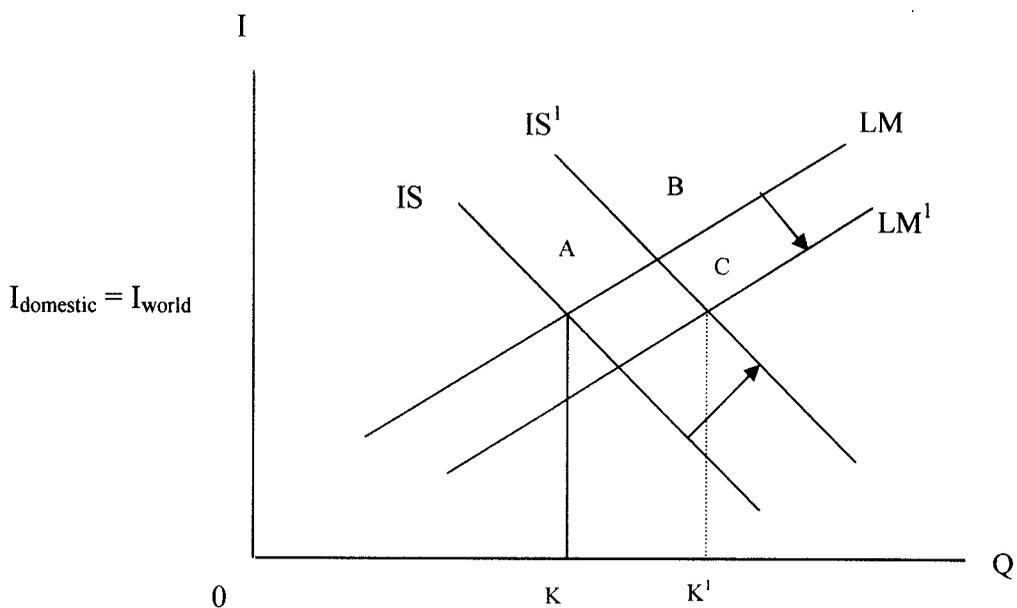
Figure - 2.1 represents the same message as discussed above. As the government expenditure expands by augmenting the fiscal deficit, IS curve shifts towards right to IS¹. However, since the international capital mobility is free to enter into the country and it comes to reap the higher rate of domestic interest, as a consequence exchange rate appreciates, thereby, rise in import and fall in export leading to current account deficit. This scenario provokes IS curve to shift back to initial position (at IS) so that domestic interest rate and international interest rate tend to be equal leading to no increment in aggregate demand with appreciated domestic currency resulting in current account or trade deficit.

2.4.2 Fixed Exchange Rate and Full Capital Mobility

In the fixed exchange rate regime with full capital mobility, escalation in government spending, which shifts the IS curve towards right to IS^1 , causes domestic interest rate to rise and capital inflow ascends. When flow of foreign currency rises in such regime, economic agents incline to exchange (buy) foreign currency in order to reap exchange rate arbitrage leading to rise in money supply which forces to shift the LM curve towards right-hand-side at LM^1 .

Figure – 2.2

IS-LM Model Under Fixed Exchange Rate & Full Capital Mobility



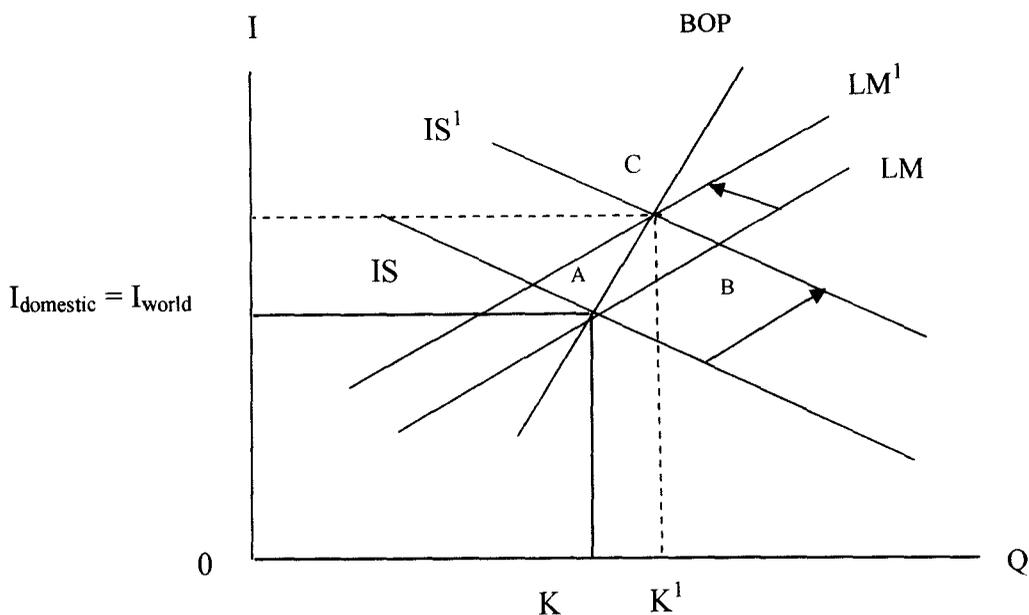
Rise in aggregate demand caused by excess money supply and government spending would augment imports resulting in high trade deficits in the long run. However the global and domestic interest rates will be at par in equilibrium with deficit in the current account.

2.4.3 Fixed Exchange Rate and Limited Capital Mobility

Perfect capital mobility is always not a subject of regular custom in the real world situation. For this purpose, let us cite an example of limited capital mobility with fixed exchange rate regime and try to dig out its consequences in the economy.

Figure – 2.3

IS-LM Model Under Floating Exchange Rate & Limited Capital Mobility



Let us assume that the economy is in initial equilibrium at point A. When the government spending escalates augmenting fiscal deficit, IS curve shifts to right at IS^1 . In this course, let us draw a BOP line steeper than LM curve implying limited capital mobility. The intersection of IS^1 occurs in the LM curve at point B below the BOP line. At point B, CAD/TD occurs. Since the exchange rate is fixed, the monetary authority loses its foreign exchange reserves in protecting exchange rate so that devaluation

pressure crops up. Domestic money supply falls as the demand increased for foreign exchanges by the domestic residents. As a consequence, domestic money supply falls after some time because of high amount of foreign exchange hoarding by the residents. Due to the decrease in money supply, LM curve shifts to LM¹ and new equilibrium point is restored at C, where BOP also remains in equilibrium. At this point, domestic interest is higher so that AD increases following trade balance deterioration leading to current account deficit

2.5 How Budget Deficit (BD) and Trade Deficit (TD) are Twin Deficits: Exposition

By terminology, so-called twin deficits are not new to us since they represent budget deficit and trade deficit. Fiscal deficit had affected external deficit to move positively during 1980s and early 1990s in USA and then political economists had shown deep concern on its effects and given its name as *'inseparable twins'*. Martin Feldstein had popularized this terminology first time (1985) in USA. Onwards, they have secured popular place as *'twin deficits'* in economics literature. There was a hypothesis that budget deficit (BD) was the cause of trade deficit (TD) since its secular type of positive relationship observed empirically too in USA at that time. This proposition has been widely tested with cross-country data. In Nepal's case also fiscal deficit and trade deficit are moving in the same direction with negative balances for almost all periods incorporated under study.

Let us consider a macroeconomic system and find how these are twins. As such,

$$Y = C + I + G + (X - M) \dots\dots\dots (2.1)$$

$$Y = C + S + T \dots\dots\dots (2.2)$$

$$C + I + G + (X - M) = C + S + T \text{ (By substituting equation 1 on 2)..... (2.3)}$$

$$(I - S) + (G - T) - (M - X) = 0 \text{ (S stands for Saving)..... (2.4)}$$

$$(I - S) + (G - T) = (M - X) \text{ (By manipulation)(Symbol of twin behavior)... (2.5)}$$

$$(I - S) = (M - X) + (T - G) \text{ (2.6)}$$

The three terms in the parentheses represent three different deficits such as,

(i) $(I - S)$ implies Domestic Savings Deficit

(ii) $(G - T)$ implies Budget (Fiscal) Deficit

(iii) $(M - X)$ implies External Trade Deficit

If the sign changes in the all concerned deficits, the drama turns to a situation of "hell to heaven" i.e. all deficits to surpluses. However, excess surpluses are also subjects of other debates because of their demerits. Basically, (i) the Keynesian and Tobin problem of surpluses, aggregate demand and private sector balance sheets; (ii) the *Greenspan problem* i.e. what should we do with excess surplus when the publicly held national debt is paid off?; (iii) the *Minsky problem* about implications of repaying the publicly held national debt for financial markets; and (iv) the open market operations (OMO) problem i.e. implications of repaying government debt for the conduct of monetary policy are four⁴ major concerns that describe the problems of excess government surpluses.

The equation (2.5), if doesn't turn to the form of the equation (2.6), budget deficit and trade deficit always behave as twins implying budget deficit being the source of financing of trade deficit where investment and saving are not responsive to

4 See: Thomas I. Palley, The Case Against Budget Surpluses: Why Government Debt is Good and Moderate Budget Deficits are Needed in a Growing Economy, (Public Policy, AFL-CIO, Washington DC), Paper presented at the meetings of the Canadian Economics Association, McGill University, Montreal, Quebec, May 31-June 3, 2001. (tpalley@aficio.org)

policy shocks or where investment and saving have fairly negligible role in the economy owing to high level of consumption.

2.6 Empirical Models and Findings

Many scholars have attempted to evaluate the hypotheses on all possible grounds. TDH had especially been made more popular and gone through series of empirical investigations after the emergence of secular nature of simultaneous movement of the twins in the United States from the early 1980s. In economic literature, many researches focused on the inter-link between twin deficits. Mrs. Olga Vyshnyak of National University, Kyiv-Mohyla Academy, Ukraine mentioned several research findings from literature review in her research paper, “*Twin Deficit Hypothesis: The Case of Ukraine.*” These findings are being presented through the Table 2.1.

Olga Vyshnyak (2000) in her own research study found for Ukrainian data that past movements in government budget Granger-caused movement in current account deficit (CAD) meaning a *unidirectional causality from budget deficit to current account deficit in the long-run.*

For this verification, she had run a bi-variate regression model as -

$$CAB_t = c(1) + c(2)BB_t + u_t$$

Table – 2.1⁵

Relationship Between Twin Deficits

Authors/s	Sample Countries	Results/Findings
Darrat (1988)	USA	Bi-directional causality between TD & BD.
Bahmani-Oskooee (1989)	USA	Unidirectional causality from BD to CAD.
Latif-Zaman & DaCosta (1990)	USA	Unidirectional causality from BD to CAD.
Enders & Lee (1990)	USA	Positive innovation in government debt is associated with an increase in consumption spending and in the CAD.
Zietz & Pemberton (1990)	USA	BD was transmitted to the TD primarily through the impact on imports.
Bachman (1992)	USA	Unidirectional causality from BD to CAD.
Mohammadi & Skaggs (1996)	USA	Maximum effect of an innovation in the budget surplus (BS) on the TD is relatively modest. So, shocks in the BS are not the major factors in determining the behavior of TD.
Laney (1984)	58 countries	Causality from BD to CAD in developing countries. Amongst world's largest economies, Canada & Italy only demonstrate a statistically significant positive relationship between BD and CAD.
Bernheim (1988)	6 countries	\$ 1.00 increase in the BD is associated with roughly a \$ 0.30 decline in CA surplus for USA, UK, Canada, and West Germany but \$ 0.85 decline in CA for Mexico. No effect on CA for Japan.
Kearney & Monadjemi (1990)	8 countries	Causality from CAD to BD in USA. No causality in Australia and France.
Vamvoukas (1997)	Greece	One-way causality from BD to TD.
Khalid & Guan (1999)	10 countries	Unidirectional causality from BD to CAD in USA, France and Canada. No causality between BD & CAD in UK and Australia. Weaker support for bidirectional causality too in Canada. Two-way causality for India. Causality from CAD to BD in Pakistan and Indonesia. Unidirectional causality from BD to CAD for Egypt and Mexico.

She attempted verification of *co-integration test*⁶ between model variables and *Granger causality* between them. In verifying the *Ganger causality*, he had run the following specifications:

⁵ Source: Ms Olga Vyshnyak, Twin Deficit Hypothesis: The Case of Ukraine, National University 'Kyiv-Mohyla Academy', Department of Economics, Ukraine, 2001

$$BB_t = \alpha + \sum_{j=1}^l \beta_j CAB_{t-1} + \sum_{j=1}^l \gamma_j BB_{t-1} + u_{1t}$$

$$CAB_t = \theta + \sum_{j=1}^l \delta_j BB_{t-1} + \sum_{j=1}^l \lambda_j CAB_{t-1} + u_{2t}$$

However, she did not run Error Correction Mechanism (ECM) for the short run relationship between BD and CAB. The data used in the study were just for 8 years, since Ukraine was running through a political transition period.

Elif Akbostanci and Gul Ipec Tunk (2002) have found on their “*Turkish Twin Deficits: An Error Correction Model of the Trade Balance*” that the Recardian Equivalence Hypothesis (REH) is not validated both in the long run and in the short run as well. In arriving at this result, they had used ECM by specifying following equation.

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

where, $\Pi = \alpha\beta'$ and,

$$\alpha = \begin{bmatrix} \theta_0 \\ \theta_1 \\ \theta_2 \\ \theta_3 \end{bmatrix} \begin{matrix} bbal \\ trbal \\ mon \\ ipi \end{matrix} \quad \beta_1 = \begin{bmatrix} bbal & trbal & mon & ipi \\ \theta_4 & \theta_5 & \theta_6 & \theta_7 \end{bmatrix}$$

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.

6 The two time series are co-integrated, if the residuals from the regression results of the model are stationary. (Gujarati, 1995, Pages 726-727)

Ahmet Zengin worked on “*The Twin Deficits (The Turkish Case)*”, using Vector Autoregressive (VAR) Model. The evidence from the eight - variable (budget deficit, trade deficit, seasonal adjusted external revenue, seasonal adjusted internal revenue, trade weighted effective real exchange rate, average interest rates on securities, money supply-M2, and GNP deflator) *VAR system* also supported the *Twin Deficit* notion that budget deficits led to the emergence of trade deficit.

In arriving at this conclusion, he used the following model with forecasting matrix and variance decomposition.

$$xX = c + a(L)X_{t-1} + U_t$$

where,

$\Sigma = uu'$, with Σ to be the covariance matrix of VAR residuals

C = vector of constant terms ($C_1, C_2, C_3, C_4, C_5, C_6, C_7, C_8$),

X_t = the vector of the model variables ($BD, TD, DG, IG, TE, HF, M_2, EN$)

u_t = a vector of random disturbances

$a(L)$ = the matrix of polynomial in the lag operator L .

where forecasting matrix is formulated in the vein of following modality,

Forecasting Matrix

$$\begin{bmatrix} BD_t \\ TD_t \\ DG_t \\ IG_t \\ TE_t \\ HF_t \\ M_{2t} \\ EN_t \end{bmatrix} = \begin{bmatrix} C_1 \\ C_2 \\ C_3 \\ C_4 \\ C_5 \\ C_6 \\ C_7 \\ C_8 \end{bmatrix} + \begin{bmatrix} 0 & 0 & 0 & 0 & a_{15}(L) & a_{16}(L) & 0 & 0 \\ a_{21}(L) & a_{22}(L) & 0 & 0 & 0 & a_{26}(L) & 0 & 0 \\ 0 & 0 & a_{33}(L) & 0 & a_{35}(L) & a_{36}(L) & 0 & 0 \\ 0 & 0 & a_{43}(L) & 0 & 0 & 0 & a_{47}(L) & a_{48}(L) \\ 0 & 0 & 0 & a_{54}(L) & a_{55}(L) & a_{56}(L) & a_{57}(L) & 0 \\ 0 & a_{62}(L) & a_{63}(L) & 0 & 0 & a_{66}(L) & 0 & 0 \\ 0 & 0 & 0 & a_{74}(L) & a_{75}(L) & 0 & a_{77}(L) & a_{78}(L) \\ 0 & 0 & 0 & a_{84}(L) & a_{85}(L) & 0 & 0 & a_{88}(L) \end{bmatrix} \begin{bmatrix} BD_{t-1} \\ TD_{t-1} \\ DG_{t-1} \\ IG_{t-1} \\ TE_{t-1} \\ HF_{t-1} \\ M_{2t-1} \\ EN_{t-1} \end{bmatrix} + \begin{bmatrix} e_{1t} \\ e_{2t} \\ e_{3t} \\ e_{4t} \\ e_{5t} \\ e_{6t} \\ e_{7t} \\ e_{8t} \end{bmatrix}$$

Mamdouh Alkswani (2000) studied “*On the Twin Deficits Phenomenon in Petroleum Economy: Evidence from Saudi Arabia*”. Saudi Arabian database did not support long run equilibrium relationship between the deficits. Rather the direction of causality from trade to budget deficit persisted in petroleum economy’s case.

To arrive at this conclusion, he used two-step ECM as follows. First step OLS regressions were run as,

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

$$TD_t = \beta_0 + \beta_1 BD_t + \mu_t$$

The second step to estimate the ECM representation was,

$$\Delta BD_t = \alpha_0 + \sum_{i=1} \alpha_{1i} \Delta TD_{t-i} + \sum_{j=1} \alpha_{2j} \Delta BD_{t-j} + \lambda e_{t-1}$$

$$\Delta TD_t = \beta_0 + \sum_{i=1} \beta_{1i} \Delta BD_{t-i} + \sum_{j=1} \beta_{2j} \Delta TD_{t-j} + \delta \mu_{t-1}$$

Again, for Granger causality verification, he did use the following specifications.

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

and,

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

where, X_t and Y_t are represented BD_t and TD_t respectively. Saudi Arabian data for 30 years (1970-1999) were incorporated in the study.

Stilianos Fountas and Christopher Tsukis (2000) did the cross country study on *'Twin Deficits, Real Interest Rate and International Capital Mobility'* and concluded that the TDH was upheld only in the cases of Germany and the UK and that was also in the short run. The opposite hypothesis of *'current account targeting'* carried some weight in case of Canada in the short run. In case of the Netherlands, there was some evidence consistent with current account targeting as shown by the sign of co-integrating vector. However, the result was not supported by the long-run exogeneity tests.

Abdulnasser Hatimi-J and Ghaji Shukur tested twin deficit hypothesis in *"Multivariate – Based Causality Tests of Twin Deficits in the US"*. They used alternative method for testing the direction of causality between US twin deficits with Rao's *'Multivariate F-test'* combined with *Bootstrap Simulation Technique*. For this purpose, they identified the VAR model as,

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

where,

$\varepsilon_t = (\varepsilon_{1t}, \dots, \varepsilon_{kt})$ is a *Zero Mean Independent White Noise Process* with *Nonsingular Covariance Matrix* $\Sigma \varepsilon$, and for $j = 1, \dots, k$, $E |\varepsilon_{jt}|^{2+\tau} < \infty$ for some $\tau > 0$.

Using quarterly US data from 1975Q1 - 1998Q2 from IFS with multivariate Rao's F test and *Bootstrap Test applying VAR (2)*⁷, they found very interesting result that twin deficits did not Granger cause each other for the whole sample period. While identifying structural break and using sub-periods data separately, first sub-period data

⁷ For detail, vide Abdulnasser Hatimi-J and Ghaji Shukur, *Multivariate – Based Causality Tests of Twin Deficits in the US*, International School, Jonkoping University, Sweden, JEL classification, C32, H62.

supported *BD Granger causing Current Account Deficit (CAD)* while second sub-period data supported *CAD Granger causing BD*. So, they inferred that the '*Lucas Critique*' might have been in effect owing to internal policy shifts and international economic shocks.

Michel Normandin (1999) summarizes in his most technical research paper on '*Budget Deficit Persistence and the Twin Deficit Hypothesis*,' by using Blanchard's *Overlapping Generation Model*, and held that "..... the relevant Canadian consumer's horizon (which can be long) and the persistence of the Canadian budget deficit produces responses that are statistically positive. In contrast, the relevant U.S. consumer's horizon (which can be long) and the dynamic behavior of the U.S budget deficit yield responses that are statistically insignificant."

G. Karras and F. Song (1994) also carried out a highly mathematical research on "*Government Spending and the Current Account: Some International Evidence*." They presented their empirical results on neoclassical framework i.e. transitory (permanent) changes in government spending reduced (left unaffected) the trade balances. It means, transitory change in government spending motivated the utility maximizing consumers to consume out of permanent income, which remained almost unaffected by government spending. Changes of this nature, therefore, created a desire to smooth consumption, which was accommodated by corresponding changes in the current account. Permanent change on the other hand, created no such smoothing motivation and hence had no impact on current account. Using data for Australia, Italy, Sweden, the UK and the US, they found that the current effects of permanent changes in government spending in all five countries were statistically not different from zero, as

predicted by the theory. The effects of transitory changes in government spending however were found to be consistent with the model only for the UK and the USA. The Australian, Italian and Swedish current accounts were not statistically related to transitory changes in government spending. They held that adoption of a textbook Keynesian model or a model with liquidity constraints could not resolve these puzzling findings.

Daniel L. Thornton⁸ (2003) offered a very innovating research paper, “*Do Government Deficits Matter?*” He first explored the relations of deficits to private saving, interest rates, trade deficit, output, and inflation. Then he further elaborated Keynesian Hypothesis and Ricardian Equivalence as well. He used the data for 16 OECD countries over the period 1975-86. His data were of pooled time series/cross section representation. He introduced first the general equation as,

$$DV_{it} = \alpha_{it} + \beta_{it}DEF_{it} + \varepsilon_{it}, \quad i = 1, \dots, K, \text{ and } t = 1, \dots, T, \dots \text{ (a)}$$

where,

DV_{it} = t^{th} observation of the i^{th} country of Dependent Variable

DEF_{it} = t^{th} observation of the i^{th} country of the deficit measure

α_{it} , β_{it} = fixed parameters and

ε_{it} = the disturbances

But the equation (a) could not be estimated as the numbers of parameters exceeded the numbers of observations. This problem had been circumvented by obtaining time series/cross section representations of equation imposing the restrictions as:

⁸ The author is Assistant Vice President at the Federal Reserve Bank of Saint Louis, USA.

$\alpha_{it} = \alpha_t$ and $\beta_{it} = \beta_i$ for all t for time series, and

$\alpha_{it} = \alpha_i$ and $\beta_{it} = \beta_i$ for all i for cross sectional data.

Thus, the following specifications were ensured,

$$DV_{it} = \alpha_t + \beta_i DEF_{it} + \varepsilon_{it}, \dots\dots\dots (b)$$

$$DV_{it} = \alpha_i + \beta_i DEF_{it} + \varepsilon_{it}, \dots\dots\dots (c)$$

A pooled time series/cross section representation could be obtained by imposing the restrictions $\alpha_{it} = \alpha$ and $\beta_{it} = \beta$ for all i and t to obtain equation (d),

$$DV_{it} = \alpha + \beta DEF_{it} + \varepsilon_{it}, \dots\dots\dots (d)$$

This was just equivalent to imposing the restrictions $\alpha_i = \alpha$ and $\beta_i = \beta$ for all i on the time series model or $\alpha_t = \alpha$ and $\beta_t = \beta$ for all t on the cross sectional model.

Equations (b) to (d) were estimated with annual observations on the government deficits, nominal interest rate, the trade deficit, 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 were estimated both at levels and first differences.

Estimates of equations for both the levels and first differences data suggested that increase in deficit spending was associated with decrease in personal saving. It means that, as the public savings decreased, so did the private savings. This result was not consistent with the Ricardian view that public and private savings were substitutes. Thus, this research paper suggested the prospect of prevalence of *Twin Deficit Hypothesis (TDH)*.

Amelie Clement deliberated on REH and TDH in “*Twin Deficits: A Cyclical Phenomenon?*” In explaining REH, in a two-period economy, the researchers held that the consumers tried to maximize their utility function,

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

which was subject to an inter-temporal budget constraint as follows,

$$C_1 + \frac{1}{1+r}C_2 = (Y_1 - T_1) + \frac{1}{1+r}(Y_2 - T_2) + (1+r)\beta_1^P$$

where,

r = interest rate

β = a subjective discount factor and

β_1^P = individual holding of financial assets at the end of period $T = 0$.

The government, for its part, had also to satisfy its budget constraint as,

$$G_1 + \frac{1}{1+r}G_2 = T_1 + \frac{1}{1+r}T_2 + (1+r)\beta_1^G$$

which means that the 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.

Assuming that the consumers were perfectly informed, forward looking and, therefore, could see “through” the government budget constraint by understanding the relation between spending and taxation ultimately, they integrated it to their own budget constraint given below,

$$C_1 + \frac{1}{1+r}C_2 = (Y_1 - G_1) + \frac{1}{1+r}(Y_2 - G_2) + (1+r)(\beta_1^P + \beta_1^G)$$

where,

$\beta_1^P + \beta_1^G = \beta_1$ is the stock of foreign assets of the whole economy.

REH has very strong assumption that taxes have no effect on budget constraint of consumers. In the long-run, present value of taxes remained the same and, therefore, there was no effect on current account through consumption channel.

Again variation in government spending, allowing taxes remaining unchanged with zero CAB in small economy did not affect CAB. In this new fiscal policy shift, government savings would decrease because it issued debt or sold assets matching the spending in order to satisfy the following budget constraint,

$$\beta_2^G - \beta_1^G = r\beta_1^G + T_1 - G_1$$

Given this behavior of government, private sector adjusted its consumption and saving to match expected tax rise in future to meet the newly issued debt.

Clement again tried to verify the TDH through testing of both hypotheses for US data of 1980s and 1990s. The main issue in this study was to examine if government deficit affected the CAD. This study showed that neither REH nor TDH were able to explain correctly the effects of fiscal behavior.

Carlous Fonseca Marinheiro's (2001) study on "*Ricardian Equivalence: An Empirical Application to the Portuguese Economy*" had many attention-grabbing outcomes on REH (alternatively TDH). For this, he had gone through various models⁹ like Reduced Form and Structural Consumption Functions of Kormendi's (1983), Modigliani and Sterling (1986), Bernheim (1987a), Pereleman and Pestieau(1993), Cardia (1997), Leachman (1996) and Euler equation approach on a *Generalized*

⁹ Though the elaborations of the scrutinized models were at good length in the paper, however mentioning all the details here is beyond the scope of this research paper. Kindly vide Carlos Fonseca Marinheiro, Ricardian Equivalence: An Empirical Application to the Portuguese Economy, Faculty of Economics of the University of Coimbra and Katholieke Universiteit Leuven, Portugal, March 2001 for detail study.

Permanent Income Model, Excess Sensitivity and Permanent Income Hypothesis, and a '*Permanent Income Hypothesis*' with a consolidated government sector.

The author had run ADF test to check the order of integration of the data series as following,

Let X_t be generated by the process

$$X_t = \delta + \phi_1 X_{t-1} + \varepsilon_t$$

where, $\varepsilon_t \sim iid N(0, \alpha_t^2)$

If X_t were a stationary process, then X_t would have a constant average

$$E(X_t) = E(X_{t-1})$$

Consequently,

$$E(X_t) = \delta + \phi_1 E(X_{t-1})$$

$$or \quad \mu = \delta + \phi_1 \mu$$

$$or \quad \mu = \frac{\delta}{1 - \phi}$$

In order to have finite average, one should have $\phi \neq 1$. With $\phi = 1 + \alpha$ we obtain: $\Delta X_t = \delta + \alpha X_{t-1} + \varepsilon_t$.

When $\alpha = 0$, the variable defines a random walk process, and therefore, it is not stationary. Stationary implies a negative value for α . The test to be valid requires that the error term be white noise. 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 non-stationarity is tested by $\alpha = 0$ in the following equation:

$$\Delta X_t = \delta + \alpha X_{t-1} + \sum_{j=1}^k \Delta X_{t-j} + \varepsilon_t$$

When empirical application to the Portuguese economy was done, the Komerandi (1983) specification, which was in line with Ricardian predictions, was rejected. The standard Keynesian view that public expenditures have negative influence on consumption was accepted.

Andrew B Abel and Ben S Bernanke (2003) analyzed in their book, 'Macroeconomics'¹⁰, the relationship between the US government budget deficit and current account deficit for the period 1960-1998. They found that the twin deficit relation had gone in opposite direction barring the period of whole 1980s and first half of the 1990s.

The authors also mentioned some evidences on this issue from other countries in the same book referring the paper¹¹, '*Investigating U.S. Government and Trade Deficits*'. They reported mixed observations for other countries. For example, 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 percentage of GDP), without experiencing severe current account problems.

Finally the authors concluded, if an increase in the government budget deficit was not offset by an equal increase in private saving, the result must be a decline in domestic investment and rise in the current account deficit.

10 Andrew B Abel (The Wharton School of the University of Pennsylvania) and Ben S Bernanke (Woodrow Wilson School of Public and International Affairs, Princeton University) have written very excellent book i.e. *Macroeconomics*, Pearson Education Inc., 2001 (First Indian Reprint, 2003).

11 Ellis Tallman and Jeffery Rosenweig, *Investigating U.S. Government and Trade Deficits*, Federal Reserve Bank of Atlanta, *Economic Review*, May/June 1991, pp. 1-11

2.7 Chapter Summary

This Chapter presents a survey of some relevant literatures and books regarding the *Twin Deficit Hypothesis (TDH)*. Researchers used different 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.

However, 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.

