Chapter 9
FINANCIAL BEHAVIOUR : A COMPLETE SYSTEM APPROACH

9.1 Introduction

The present chapter is, in a way different compared to other chapters. Here the purpose of analysis is to explain the behaviour of the Indian economy, different sectors and different financial instruments on lines of recent development in the duality theory.

The traditional consumer theory begins with the utility analysis with the utility maximisation hypothesis. This was revised by Hicks in the indifference curve approach using the ordinal approach than the cardinal approach.

Analogous to utility maximisation hypothesis, in recent years the cost function approach has attained prominence in the consumer demand theory. This approach is based on the duality theory and yields minimum level of income necessary to attain a particular utility level.

This approach has been adopted in most of the recent studies relating to measurement of welfare changes, the distributional effects of inflation and in the social cost-benefit analysis.

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In the neo-classical theory of demand - following utility maximisation hypothesis - has induced many researchers in the world to quantify the consumer behaviour. In this postulation, the demand function satisfy automatically the theoretical restrictions; adding up, homogeneity, Slutsky symmetry and negativity. However, the structure of the preferences considered has been restricted so that independent determination of the prices and income elasticities was found to be not feasible. Accordingly, empirical analyst have relied on some specific forms of demand function rather than the utility function. In this, the demand functions are postulated spriori and theoretical restrictions are imposed to make the parameters confirm the theoretical requisites. This line of approach has also resulted in the testing of the validity of the postulates of the neoclassical theory. Moreover, the demand functions are seen to be flexible enough without possessing interdependency in the price and income elasticities. However, the utility interpretation to such demand functions could not be established, in consequence the quantification of consumer surplus and other aspects relating to consumer surplus could not be made empirically measurable.

With the emergence of the duality theory, the cost function approach, for measuring the consumer response to price and income changes has attained prominence. This approach has edge over the above two approaches, wherein
the theory allows to quantify the behaviour in a flexible framework, at the same time making the testing of restrictions feasible. In this approach, the demand functions are derived by postulating a particular cost function satisfying the theoretical requirement. In view of these advantages in the empirical work, and in view of the fact that in the financial analysis, the parameters such as wealth and income elasticities play a crucial role in planning and policy formulation, we intent to exploit empirically, this approach in this chapter.

This chapter is organised as follows: Section II deals with a brief review of the general utility theory and duality approach. Section III highlights the application of the utility theory in the financial sector and the related empirical works. Section IV analyse the application of the duality theory by considering a specific cost function to the Indian financial structure. This section also provides the details of data and empirical results. Finally, the conclusion is given in section V.

9.2 General Utility Theory and its application to financial sector

In the cardinal utility theory, it begins with the following general assumptions - like rationality, cardinal utility, constant marginal utility of money, diminishing marginal utility of money and total utility depends on quantity of number of commodities.
The equilibrium of the consumer depends on the utility from the commodity and their respective prices. The limitation of the theory was that the cardinal utility is extremely doubtful. It is difficult to measure utility change when marginal utility of money is constant. The diminishing marginal utility established from introspection and it is a psychological law which must be taken for granted.

In the case of indifference curve analysis, the basic assumptions like rationality, ordinal utility, diminishing marginal rate of substitution, consistency and transitivity of choice are important.

Here the consumer would like to maximise his satisfaction from number of commodities subject to price and income constraints. This can be expressed in the following way

$$U = \int (q_1, q_2, \ldots, q_n)$$

subject to $$\sum P_i q_i = q_1p_1 + q_2p_2 \ldots q_n p_n = \gamma$$

This can be written in the following way also

$$(q_1p_1 + q_2p_2 \ldots q_n p_n - \gamma) = 0$$

In the above hypothesis, the demand functions automatically satisfy the theoretical properties. The functional relationship can be expressed as given below

$$q_1 = f(p_1, p_2, \ldots, p_n, \gamma)$$

where $q_1$ = demand for Xth commodity

$P_i$ = price of ith commodity

$Y$ = income of the individual.

The derived demand function in equation (10.1.3)
satisfies the theoretical properties viz. adding up, homogeneity, slavesty condition and negativity conditions.

1) Adding up conditions

This condition indicates that the total expenditure on commodities is equal to total income of the consumer by assuming saving to be zero. If the consumer spends only on ith commodities then the equation would be as follows

$$x = P_i q_i = Y$$

2) Homogeneity condition

This property implies that proportionate change in income and prices should leave the quantity consumed unaffected, thereby absence of money illusion. This may be represented in the following equation.

$$\sum_{i=1}^{n} \frac{\partial q_i}{\partial P_i} p_i + \frac{\partial q_i}{\partial Y} y = 0$$

$$\forall j = 1, \ldots, n.$$  

In the elasticity form this condition

$$\sum_{j=1}^{n} \eta_{ij} + \eta_{i} = 1, \ldots, n.$$
This also implies that the sum of all elasticities for any good must vanish.

3) Symmetry

This property implies that the income compensated price effects should be symmetric. This can be stated in the following way:

\[
\frac{\partial \eta_i}{\partial p_j} + \rho_j \frac{\partial \eta_i}{\partial \gamma} = \frac{\partial \eta_j}{\partial p_i} + \rho_i \frac{\partial \eta_j}{\partial \gamma}
\]

In the elasticity form this implies

\[
(\eta_{ij} + \omega_i \eta_i) = (\eta_{ji} + \omega_j \eta_j)
\]

This condition can be verifies for its validity by considering the alustky equation after testing the aggregate condition.

In the case of demand models derived from utility maximisation hypothesis, all the above conditions are automatically satisfied.

Among others, the constant elasticity models and the differential demand system\(^1\) are the most commonly used systems of this categories.\(^2\)

\(^1\) Rotterdam Demand System

Based on the postulates of such demand equations, the above conditions are requisite with the theory which are incorporated while estimating the parameters of the system. However, the robust econometric technique have to be used to estimate the parameters of the model. This procedure also provide an opportunity to empirically examine the validity of the postulates of the neoclassical theory cited above.

Apart from the above approaches, the cost minimisation criteria for deriving the demand functions and for testing the theoretical postulates thus gained prominence in recent years. The recent model usually called as almost ideal demand system belongs to this category.

By considering a specific class of preferences that permit exact aggregation over consumers, Deaton and Mullbauer1 have proposed AIDS, which has a functional form which is consistent with known household budget data, it is simple to estimate largely avoiding the need for non-linear estimation, and it can be used to test the restrictions of homogeneity and symmetry through linear restrictions. Further, it gives an arbitrary first order approximation to any demand system and satisfies the axioms of choice exactly. The specific class of preferences - known as PIGLOG class- are represented through a cost function C(U,P) which defines the maximum expenditure necessary to attain a specific utility level u, at given vector of prices P.

The specific cost function is defined as

$$\log (U, P) = a(p) + b(p) \quad 9.2.8$$

where \(a(p)\) and \(b(p)\) are functions of prices and are assumed to be linear homogeneous. The specific forms considered to derive AIDS from the cost function (9.2.8) are as under:

$$a(p) = \alpha_0 + \sum_k \alpha_k \log p_k + \frac{1}{2} \sum_{k,j} \gamma_{kj}^* \log p_k \log p_j \quad 9.2.9$$

$$b(p) = \beta_0 \prod_k \rho_k^{\beta_k} \quad 9.2.10$$

where \(\alpha, \beta, \gamma\) are parameters.

For the cost function (9.2.8) to be homogeneous in \(p\), requires that

$$\sum_k \alpha_k = 1. \quad 9.2.11$$

$$\sum_k \gamma_{kj}^* = \sum_k \beta_k = 0. \quad 9.2.12$$

For a utility maximizing consumer, total expenditure \(X\) is equal to \(C(U, P)\) and this equality can be inverted to give \(U\) as a function of \(P\) and \(X\) yielding the indirect utility functions. By using this result and considering the fact that

$$\frac{\partial}{\partial \log p_1} \log q_1 = w_1$$
AIDS is derived by substituting (9.2.9) and (9.2.10) in (9.2.8) as

$$W_i = \sum_j Y_{ij} \log p_j + \beta_i \log (X/IP) + \alpha_i$$  \hspace{1cm} 9.2.13

\[ i = 1, 2, 3, \ldots, n \text{ (number of commodities)} \]

Where \( X \) is income and \( P \) is price index defined by

$$\log P = \alpha_0 + \sum_k \log p_k + \frac{1}{\pi} \sum Y_{kj} \log p_k \log p_j$$  \hspace{1cm} 9.2.14

and parameters defined by

$$Y_{ij} = \frac{1}{2} (Y_{ij}^* + \text{Y}_{ij}^*) = \gamma_{ij}$$  \hspace{1cm} 9.2.15

The parameters of AIDS are \( \alpha_i \) (\( i = 1, 2, 3, \ldots, n \)) and \( \gamma_{ij} \) (\( i, j = 1, 2, \ldots, n \)).

We may note that the dependent variables of the demand variables of the demand functions in 9.2.13 are in budget share form and they are related with real income \((X/P)\) and nominal prices with a particular specification for \( P \) given in 9.2.14 and thus \( P \) acts as deflator, are seen correspond exactly to changes in utility levels.

Since the budget share add up to one, the system of equations in 9.2.13 satisfies automatically the adding up property which implies that

$$\sum_k \alpha_k = 1, \sum_k \beta_k = 0, \sum_k Y_{kj} = 0$$  \hspace{1cm} 9.2.16
For the system to be consistent with the utility theory the following additional restrictions must be hold for homogeneity and symmetry.

**Homogeneity**
\[ \frac{\partial}{\partial \lambda} \mathbf{V}_{ij} = 0 \]  
9.2.17

**Symmetry**
\[ \mathbf{V}_{ij} = \mathbf{V}_{ji} \]  
9.2.18

We may note that the negativity condition implying concavity of the cost function have no obvious parametric representation. However they can be verified by estimating a matrix \( C \) (given below) and examining for the negative semidefiniteness

\[
C_{ij} = \mathbf{V}_{ij} + \delta_{ij} \log \left( \frac{X(\mathbf{P})}{-W_i} \right) - \mathbf{w}_i \delta_{ij} - \mathbf{w}_j \mathbf{w}_i 
\]  
9.2.19

where \( \delta_{ij} = 1 \) for \( i = j \) and \( \delta_{ij} = 0 \) for \( i \neq j \)

The expressions for the income elasticities (\( \eta_i \)) and uncompensated cross price elasticities (\( \eta_{ij} \)) are given by

\[
\eta_i = 1 + \beta_i \mathbf{w}_i 
\]  
9.2.20

\[
\eta_{ij} = \frac{1}{\mathbf{w}_i} \left[ \mathbf{y}_{ij} - \beta_i \left( a_j + \sum_k a_{kj} \log p_k \right) \right] - \delta_{ij} 
\]  
9.2.21

**Methods of estimation**

The price formation in (9.2.14) makes the cost of budget share equation (9.2.13), a non-linear system and thus
following Deaton and Mullbauer (1980) the system of non-linear equations could be transformed into non-linear equations by approximating \( P \) with \( P^* \) an index due to Stone as \( P \sim p \)

\[
\log P^* = \sum_k \lambda_k \log P_k
\]

Writing the set of budget share in equation 9.2.13 for each time period \( t \) and by adding a stochastic error term \( V_t \) which is assumed to follow a multivariate normal distribution

\[
V_t = f(\mathbf{z}_t \theta) + V_t
\]

Where \( \mathbf{z}_t \) is the vector of explanatory variables and \( \theta \) is the vector of parameters. The following properties are assumed for the stochastic term \( V_t \)

\[
E(V_t) = 0
\]

\[
E(V_t, V_{t'}^2) = \Lambda \text{ for all } t
\]

\[
E(V_t, V_{t'}^2) = 0 \text{ for } t \neq t'
\]

In view of the adding up property, the contemporaneous covariance matrix \( \Lambda \) of \( V_t \) is singular and thus one equation has to be deleted while estimating the model; and the parameters of the deleted equation could be arrived subsequently.

9.3 Application of general utility theory in financial analysis

Very few studies have analysed the financial behaviour in general utility framework so far as we are aware, only two studies in this area seems to have attain prominence.
These studies have analysed the financial behaviour of a sector of the economy in both static and dynamic framework. We explain below the specification and the estimation of the models considered by Saito and Coural.

9.3.1 Saito's Model

Saito's model is basically a linear model, and utility specification is of want independent type, further the model belongs to the first category where all the restrictions are automatically satisfied. This model is similar to the familiar duality approach used in most of the studies related to consumer behaviour.

Saito in fact has considered the static and dynamic models and we shall discuss them in turn. The specification of the static model is given below.

\[ Hi = C_i q_l + B_i \left( W - \sum q_k k \right) \]

where \( W = \sum B_i = 1 \)

where \( Hi \) = value of end period holdings of ith assets, measured in terms of purchasing power of consumer goods (end period stock of flow of fund series/consumer price index).

\( q_l = 1/(1 + r_i) \); where \( r_i \) is the current rate of interest of ith financial asset,

\( W = \) end of period net worth of financial assets, measured in terms of purchasing power of consumer goods.

\( B_i C_i \) = are parameters.
The above system of equations or set of assets demand functions derived by maximizing the expected utility of the asset holdings. The specific utility function of the asset holdings corresponding to the above demand functions is assumed to be

$$U = -\exp \left( - \sum H_i P_i \right)$$  \hspace{1cm} \text{(9.3.2)}

where $P_i$ is the return per dollar invested in the $i$th asset in the next period. $P_i$ will be stochastic variable and increasing function of current interest rate $r_i$. Thus further assumes that

$$X_i = P_i/(1+r_i)$$  \hspace{1cm} \text{(9.3.3)}

by assuming that $X_i$ follows a gamma probability distribution

$$f(X_1, X_2, \ldots, X_n) = \prod_{i=1}^{n} f_i(X_i)$$  

$$= \prod_{i=1}^{n} \frac{1}{\Gamma(\alpha_i)\beta_i^\alpha_i} X_i^{\alpha_i-1} e^{-x_i/\beta_i} \text{ for } 0 < x_i < \infty$$

$$= 0 \text{ otherwise}$$

$$\alpha_i > 0, \beta_i > 0$$

In the equation (1) $m$ and $C_i$ are the parameters, $m$ is interpreted as the marginal asset budget share and $C_i$ is interpreted as the minimum amount of assets and liabilities to be maintained by the financial sector. Since

$$C_i = \frac{1}{\beta_i} \quad \text{and} \quad \beta_i = \alpha_i / \sum_{k=1}^{K} \alpha_k$$  \hspace{1cm} \text{(9.3.5)}

The parameters in the system also provide scope to examine whether an asset holding is risky or not.
For the purpose of investigation, the holding of each asset consists of two parts, portfolio and non-portfolio.

\[ H_i = M_i + G_i \]  \hspace{1cm} 9.3.6

where \( M_i \) = \( i \)th asset for the portfolio purpose

\( G_i = i \)th asset for the other purpose

We have stated earlier that

\[ H_i = C_i G_i + M_i \left( \omega - \sum_{k=1}^{n} E_k \gamma_k \right) \]

\[ C_i = 1/M_i \]

\[ M_i = \alpha_1 \left( \sum_{k=1}^{n} \alpha_k \right) \]

\[ G_i = \left( \frac{1}{C_i + M_i} \right) \]  \hspace{1cm} 9.3.7

By rearranging equation 9.3.6 we get \( M_i = H_i - G_i \), then instead of formula for \( G_i \) in the equation 9.3.7 we have

\[ G_i = C_i/G_i - 1/M_i \]  \hspace{1cm} 9.3.8

The \( G_i/G_i \) is linear function of income, then we have

\[ G_i = G_i^* + G^* \]  \hspace{1cm} 9.3.9

By substituting equation 9.3.9 into 9.3.7 we get

\[ H_i = M_i W + M_i Y + G_i + u_i \]  \hspace{1cm} 9.3.10

\[ M_i = \sum_{k=1}^{n} \left( \delta_{ik} - b_i \right) q_k c_k \]  \hspace{1cm} 9.3.11

\[ G_i = \sum_{k=1}^{n} \left( \delta_{ik} - b_i \right) q_k c_k \]  \hspace{1cm} 9.3.12

where \( M_i \) = end period net worth of financial assets

\( Y = \) per capita real personal income

Here multicollinearity becomes big problem in estimating equations 9.3.9 to 9.3.11, although in this system the
the number of parameters relevant to interest rates are significantly reduced compared to simple linear function of all interest rates. Thus technique of pooling the cross section and time series data are adopted.

The above static and dynamic specification of the model are estimated by adopting maximum likelihood procedure and the pooled time series of the cross section data has been used for empirical implementation. These results have highlighted that the luxury nature of wealth elasticities of equities is 1.069 and is the highest among all the assets. Further the elasticities for demand deposits, time deposits and life insurance and provident funds are seen to be of low order. In the case income elasticities, it was highest (-2.188) in the case of mortgage and instalment debt. The pension fund and life insurance elasticities were 0.821. A comparison of elasticities between demand and time deposit suggests that the former is more affected by income and latter by wealth. The savings, loans, shares\(^\dagger\) and bonds were least affected by level of income.

The time series results show that the diagonal entries of the matrix i.e. own interest rate's effect were negative. This implies that each of the eight assets are gross substitute to each other.

The results from the dynamic equations suggest that in general, the off-diagonal elements of the adjustment coefficient

\(^\dagger\) Ibid, p.15-16
matrix may be expected to be negative, implying that people will decrease a positive discrepancy between desired and actual level, levels of an asset by selling other assets.

In the conclusion Saito emphasises that "comparison of our estimates with earlier one has revealed that though they were on the whole consistent with one another, our estimates for the effect of individual factors on asset and liability have tended to be smaller than earlier findings. In fact it has been found that most of our estimates are consistent with those of earlier studies.1/

9.3.2 Conrad's Model2/

The duality approach in the theory of consumer behaviour has been adopted to the allocation of assets and liabilities of the Private non-Bank sector. A service flow of assets, physical capital and liabilities are assumed to be present in the argument of the direct utility function.

The portfolio approach of Markowitz3 and Tobin4/ are famous. In this theory, the trade off between expected revenue (mean) and corresponding risk (variance) is determined by utility maximisation under condition of uncertainty.

1/ Ibid, p.16
The consumer's behaviour is analysed in three ways. In the first case, the objective of the Household sector is to keep his portfolio diversified. The emphasis on the flow permits the utilisation of traditional consumer behaviour theory. The fixed relationship between stocks and service flow rendered by stocks which permits the utilisation of stock quantity as proxy to measure of the flow. Here it is based on the utility function, prices and wealth constraints.

The second method is to formulate the problems in terms of Lancaster's approach to consumer's demand theory by assuming that the consumer combine assets and liabilities to produce certain characteristics and service flows.

The third approach, presented by Conrad, here interest payments and profits from stocks as the argument of a utility function. The returns and interest payments as the quantification of the service flows and their evaluation in the preference system of Household depends on the different characteristics, peculiarities of the assets and liabilities. The prices are the interest rates for the alternative form of investing monetary wealth.

The assets are divided mainly into five broad heads. (1) currency and demand deposits, (2) time deposits, (3) saving deposits, (4) government bonds and (5) bearer bonds. The liabilities are (1) short term commercial bills, (2) long term commercial bills, (3) private bonds and (4) foreign liabilities.
The balance sheet of the Private non-bank sector is divided into two broad groups, financial assets and physical assets in one group and liabilities and net wealth in the second. There are five assets and four liabilities in this model.

Assets: \( A_1, \ldots, A_5 \)

Physical Assets: \( K \)

Liabilities: \( L_1, \ldots, L_4 \)

\[ W = \] Private Net Wealth

The following sign conventions are used.

\( A_i > 0 \quad \text{for} \quad i = 1, \ldots, n \quad \text{and} \quad k \geq 0 \)

\( L_j \leq 0 \quad \text{for} \quad j = 1, \ldots, m \quad \text{and} \quad w > 0 \)

Under the above sign conventions balance sheet identities can be written as

\[ \sum A_i + K + \sum_{j=1}^{m} L_j = W \]

where,

\( ZA_i = \) Expected service flows from currency and deposit

\( ZA_i = \) Expected interest revenue at the end of the period from the stock of the assets \( A_i \) at the beginning of the period.

\( ZL_j = \) Expected interest payments at the end of the period from the stock of liability \( L_j \) at the beginning of the period (\( j = 1, \ldots, m \)).

\( ZK = \) Expected profit at the end of the period from the physical capital \( K \) at the beginning of the period.
For each, the relationship is like this,

\[ ZA_i = \frac{\mu_i A_i}{K_i} \quad 9.3.1.2 \]
\[ ZL_j = \frac{L_j}{r_j} \quad 9.3.1.3 \]
\[ ZK = \frac{K}{r} \quad 9.3.1.4 \]

The purpose here for the consumer is to maximise utility
subject to budget constraint, which can be written in the
following way

Maxi \( U (ZA_1 \ldots ZA_n, ZK, ZL \ldots ZL_m, t) \)

subject to budget constraints

\[ \sum_{i=1}^{n} ZA_i \left( \frac{1}{X_{Ai}} \right) + ZK \left( \frac{1}{X_{K}} \right) + \sum_{j=1}^{m} ZL_j \left( \frac{1}{X_{jL}} \right) = W. \quad 9.3.1.5 \]

The above equation can be written in the following way,

\[ \sum_{i=1}^{n} ZA_i \left( \frac{1}{X_{Ai}} \right) \left( \frac{1}{W} \right) + ZK \left( \frac{1}{X_{K}} \right) \left( \frac{1}{W} \right) + \sum_{j=1}^{m} ZL_j \left( \frac{1}{X_{jL}} \right) \left( \frac{1}{W} \right) = 1. \quad 9.3.1.6 \]

Here the groupwise separability is assumed that ratio of any
two assets (liabilities) within the aggregates is independent
of interest rate outside the aggregate.

To ensure consistency of this system of maximisation
of utility, we have to impose a set of parameters restrictions.
If parameters in the denominators are same for all equations,
the parameters relation in adding up conditions are necessary
and sufficient condition for adding up property, that is,
sum of shares equal to unity. To ensure the fulfillment of
the integrability conditions, a set of parametric restrictions
of the demand functions have been derived for this purpose
following the demand equations in the share form are considered.
\[
\frac{A}{W} = \frac{\alpha_A + \beta_{AA} \ln \left( \frac{1}{A} | W \right) + \beta_{AK} \ln \left( \frac{1}{A_K} | W \right) + \beta_{AL} \ln \left( \frac{1}{A_L} | W \right) + \beta_{AE} \cdot t}{\alpha_W + \beta_{WA} \ln \left( \frac{1}{A} | W \right) + \beta_{WK} \ln \left( \frac{1}{A_K} | W \right) + \beta_{WL} \ln \left( \frac{1}{A_L} | W \right) + \beta_{WE} \cdot t}
\]

9.3.1.7.

\[
\frac{K}{W} = \frac{\alpha_K + \beta_{KA} \ln \left( \frac{1}{A} | W \right) + \beta_{KK} \ln \left( \frac{1}{A_K} | W \right) + \beta_{KL} \ln \left( \frac{1}{A_L} | W \right) + \beta_{KE} \cdot t}{\text{Denominator as 9.3.1.7.}}
\]

9.3.1.8.

\[
\frac{L}{W} = \frac{\alpha_L + \beta_{LA} \ln \left( \frac{1}{A} | W \right) + \beta_{LK} \ln \left( \frac{1}{A_K} | W \right) + \beta_{LL} \ln \left( \frac{1}{A_L} | W \right) + \beta_{LE} \cdot t}{\text{Denominator as 9.3.1.7.}}
\]

9.3.1.9.
Simplified notations are:

\[ X = A, k, L, t \]  \hspace{1cm} 9.3.1.10

\[ BWX = BAX + BkX + BLX \]

For the translog demand system symmetry of the parameters \( B_{ij} \) ensures this consistency.

\[ B_{kA} = B_{AK}, B_{kL} = B_{LK}, B_{LL} = B_{Lk} \]  \hspace{1cm} 9.3.1.11

**Regression Results**

The regressions results of the equation 7 to 9 are shown in the Table 3 and 5 (of the article). The elasticities of each equations are also calculated. The result indicates that the signs of the elasticities were economically reasonable. The own interest elasticities of assets are positive and negative in case of liabilities. The rate of return on capital has declined over time which makes the holdings of the financial assets more attractive. The assets and liabilities are independent to each other. Commercial Banks and Private Non-Banks do not borrow money to increase assets of interest rate on assets rises. This may be only in the case of the interest rates on liabilities are lower than for assets. The low rate of interest for liabilities does not stimulate investment in physical assets. In order to reduce the problem of multicollinearity the identical group of yields are not included.

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1/ Conrad, op.cit., 1980, p.183
The elasticities in case of the inflation rate is rather small and log elasticities are also not substantially high. Higher rate of inflation increases the share of liquid asset for transaction purpose. This also attracts household to purchase durable goods and residential constructions. The own price coefficients in the case of demand and time deposit implies that increase in the own rate of return will increase the demand for these deposits. The time deposits and bearer bonds are weak compliments but the latter seems to be independent to rate of interest rate. The preference for government bond increase significantly and decrease in the case of cash and saving deposits. In the case of liabilities diagonal entries showed expected signs which suggests that increase in own interest rate reduces the corresponding share, although except for long term commercial bills.

The conclusions from the Conrad's models are as follows

1) substitution relationship are empirically less significant than it is usually assumed,
2) physical assets and financial assets are weak substitute, although the substitution relationship has strengthened over time,
3) assets and liabilities are independent of one another and their decisions are also taken separately, and
4) relationship between currency, demand deposits and time deposit do not permit to conclude that Private Non-Bank can partially off set the effectiveness of monetary policy because of the nearness of money of these deposits.
The advantage of this model over earlier models is that it consists of a complete system of demand and supply under the condition of utility maximisation subject to total wealth constraints. This approach also tests the wealth and interest elasticities which are very useful policy instruments for financial planning and policy.

In the subsequent section some aspects of this model is used to examine the financial behaviour of the Indian economy, in line of different financial instruments and sectors.

9.4 The Behaviour of Indian Financial Structure:

The relationships considered for examining the financial structure resemble rather closely the derived demand functions from the AIDS cost function. However, the present relationships are only partial in nature and thus they fail to establish a link with the duality theory.

An attempt is made here to explain the general macro behaviour of Indian financial structure and then the behaviour of different sectors of the economy. Here the (real) total financial uses and (real) interest rates are considered as explanatory variables. The purpose here is to see whether the financial structure of the Indian economy is responsive to any key variables or not. The variables
which are considered here are (real) interest rates and (real) total financial use of the economy. The format of the equation is given below:

\[ W = \alpha + \beta \log \text{TFU}^* + \gamma' \log R^* \]

where,

- \( W \) = budget share of each instrument,
- \( \text{TFU}^* \) = (real) total financial uses of the economy
- \( R^* \) = (real) interest rate (corresponding real interest rate for each variable).

Following financial instruments are analysed here,

1. currency and deposit (CD)
2. investment (INV)
3. loan and advances (LA)
4. provident fund (PF)
5. life fund (LF)
6. contractual savings (CS)
7. small savings (SS)

The share of each instrument can be derived by calculating the ratio of the each financial instrument's total financial
uses with the total financial use of the economy as a whole. J
The results are given below

\[ CD = f (\log TFU^e \cdot \log R_{a12} ) \]

\[ CD = 20.6675 + 0.3195 \ln TFU^e - 10.06 \ln R_{a12} \]

\[ (1.78)^a \quad (1.76)^a \]

\( \chi = 23.8 \quad R^2 = 0.245 \)

\[ INV = f (\log TFU^e \cdot \log R_{a1} ) \]

\[ INV = 25.35 + 4.969 \ln TFU^e + 10.69 \ln R_{a1} \]

\[ (1.09)^b \quad (1.382) \]

\( \chi = 22.49 \quad R^2 = 0.089 \)

\[ INV = f (\log TFU^e \cdot \log R_{a1} ) \]

\[ INV = -9.86 + 3.48 \ln TFU + 5.87 \ln R_{a1} \]

\[ (0.353) \quad (1.248) \]

\( R^2 = 0.0749 \)

\[ LA = f (\log TFU^e \cdot \log R_{ADV} ) \]

\[ LA = 37.77 + 7.94 \ln TFU + 25.06 \ln R_{ADV} \]

\[ (1.318) \quad (1.623) \]

\( \chi = 34.38 \quad R^2 = 0.0982 \)

\[ PF = f (\log TFU^e \cdot \log RPF ) \]

\[ PF = 23.055 - 1.94 \ln TFU^e - 0.499 \ln RPF \]

\[ (3.881)^a \quad (0.772) \]

\( \chi = 7.6 \quad R^2 = 0.385 \)

---

1/ The 1954-55 to 1980-81 period is considered here and the data are taken from Reserve Bank of India Bulletin.
\( C_8 = f (\log TFU^*, \log RPF^*) \)
\( = 30.71 - 2.51 \ln TFU^* - 0.926 \ln RPF^* \)
\( (3.981)^2 \quad (1.183) \)

\( R^2 = 0.4019 \)

\( SS = f (\log TFU^*, \log RSS^*) \)
\( = 24.32 - 2.53 \ln TFU^* - 0.696 \ln RSS^* \)
\( (3.94)^2 \quad (0.435) \)

\( R^2 = 0.940 \)

where

- \( TFU^* \): Total (real) financial use
- \( R_{12} \): (Real) time deposit rate
- \( R_{RB}^* \): (Real) yield on government securities
- \( R_{ADW}^* \): (real) state bank advance rate
- \( RPF^* \): (real) rate of interest on provident fund
- \( RSS^* \): (real) rate of interest on small savings
- \( Ri \): (real) rate of interest on variable dividend

The response of the budget shares of each financial instrument is found to be of some significance in the case of currency and deposit contractual savings and small savings. However, here interest cost as opportunity cost factor is found to be insignificant variable in affecting the budget shares of each financial instruments. The \( R^2 \) is poor in almost all cases.

In the alternative framework, an attempt is made to examine the relationship only with the real total financial use of the economy. The equational format is given below:

\[ W = f (\log TFU^*) \]

where, \( W \) = budget share of the financial instrument,
\( TFU^* \) = (real) total financial use of the economy.
In the entire financial structure of the Indian economy, currency and deposit, contractual savings and small savings are to some extent significant with total financial use of the economy. However, the budget share of the contractual savings and small savings showed declining trend but t values are significant in all cases.

The results also suggest that among the instruments which are responsive to changes in the (real) total financial uses, are mostly held by the Household sector. So now the next important part is to examine the lending pattern of the Household sectors. The equational format is same and the variables are (real) total financial uses of the Household sector, and (real interest rate). Here the sector's lending
pattern in terms of different financial instruments (their budget shares) is responsive to the variables stated above becomes the useful part of the analysis. The equation format is given below.

\[ v = f \left( \log \text{TUR}^*, \log \text{R}^* \right) \]

where \( v \) = budget share of each financial instrument with respect to total financial use of the Household sector

\( \text{TUR}^* \) = (real) total financial use of the Household sector

\( \text{R}^* \) = (real) interest rate (respective interest rate associated with the instrument).

The dependent variables are shares of currency and deposit (\( \text{CH}_\text{R} \)), cash in hand (\( \text{CH}_\text{R} \)), Demand Deposit (\( \text{DD}_\text{R} \)), Time deposit (\( \text{TD}_\text{R} \)), contractual savings (\( \text{CS}_\text{R} \)), small savings (\( \text{SS}_\text{R} \)) and Provident fund (\( \text{PF}_\text{R} \)). The results are given below.

\[ \text{CHH} = \hat{f} \left( \log \text{R}_{12}^*, \log \text{TUR}^* \right) \]

\[ \text{CHH} = -87.91 + 15.93 \text{ Ln R}_{12}^* + 19.01 \text{ Ln TUR}^* \]

\[ (2.27)^a \quad (5.51)^a \]

\[ R^2 = 0.6697 \]

\[ \text{DHH} = \hat{f} \left( \log \text{R}_{12}^*, \log \text{TUR}^* \right) \]

\[ DHH = 29.97 + 8.55 \text{ Ln R}_{12}^* - 3.05 \text{ TUR}^* \]

\[ (0.665) \quad (0.986) \]

\[ R^2 = 0.0926 \]

\[ \text{EDH} = \hat{f} \left( \log \text{R}_{12}^*, \log \text{TUR}^* \right) \]

\[ EDH = -93.93 + 20.06 \text{ Ln R}_{12}^* + 13.64 \text{ Ln TUR}^* \]

\[ (2.18)^a \quad (3.71)^a \]

\[ R^2 = 0.4204 \]
\[
\begin{align*}
\text{TbR} & = f (\log \text{R}_{12}, \log \text{TUR}^e) & 9.4.11 \\
\text{TbM} & = -26.81 - 10.99 \ln \text{R}_{12} + 8.64 \ln \text{TUR}^e & (0.914) & (1.799)^a \\
\text{R}^2 & = 0.3271 \\
\text{Csh} & = f (\log \text{RPF}^e, \log \text{TUR}^e) & 9.4.12 \\
\text{Csh} & = 37.88 - 1.030 \ln \text{RPF} - 4.13 \ln \text{TUR}^e & (0.684) & (3.28)^a \\
\text{R}^2 & = 0.3099 \\
\text{Pfe} & = f (\log \text{RPF}^e, \log \text{TUR}^e) & 9.4.13 \\
\text{Pfe} & = 33.36 - 0.3523 \ln \text{RPF} - 3.45 \ln \text{TUR}^e & (0.292) & (3.53)^a \\
\text{R}^2 & = 0.3466 \\
\text{Shh} & = f (\log \text{RSS}^e, \log \text{TUR}^e) & 9.4.14 \\
\text{Shh} & = 43.49 + 3.857 \ln \text{RSS} - 5.5 \ln \text{TUR}^e & (0.885) & (2.916)^a \\
\text{R}^2 & = 0.3579 \\
\end{align*}
\]

where \(*\) real flows

The behaviour of the Household sector is similar to that of the financial instruments in the economy. Here except for currency and deposit the interest variable is found to be insignificant. Here also, the influence of the interest rates on the components of the currency and deposit showed opposite sign than expected. Total financial use (real) is found to be significant in all cases except cash in hand. However the beta with contractual savings and small savings showed negative sign which suggests the declining share of these instruments. \(\text{R}^2\) is relatively high in the case of above instruments.
After analysing the Household's behaviour the next aspect of analysis is to examine the sectoral behaviour. Here the share of each sector with reference to total financial uses is calculated for the period 1954-55 to 1980-81. The purpose here is to know that whether the sector's share to total financial uses is responsive to total financial uses (real) and time variable $t$ or not. The equational format is given below.

$$W = \frac{f}{(\log TFU^0 t)}$$

where $W = \text{budget share of each sector in total financial uses}$

$TFU^0 = \text{total financial uses (real) of the economy}$

$t = \text{time}$

The results are given below:

<table>
<thead>
<tr>
<th>Sector</th>
<th>Log $TFU^0$</th>
<th>Time</th>
<th>$R^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Banking</td>
<td>$0.48$</td>
<td>$-0.18$</td>
<td>$0.372$</td>
</tr>
<tr>
<td></td>
<td>(1.4)</td>
<td>(0.38)</td>
<td></td>
</tr>
<tr>
<td>Other Financial Institutions</td>
<td>$-0.46$</td>
<td>$0.73$</td>
<td>$0.426$</td>
</tr>
<tr>
<td></td>
<td>(-3.66) a</td>
<td>(1.1) a</td>
<td></td>
</tr>
<tr>
<td>Government</td>
<td>$3.49$</td>
<td>$-0.29$</td>
<td>$0.0991$</td>
</tr>
<tr>
<td></td>
<td>(1.18)</td>
<td>(-0.84)</td>
<td></td>
</tr>
<tr>
<td>Private Corporate</td>
<td>$-2.25$</td>
<td>$0.265$</td>
<td>$0.2146$</td>
</tr>
<tr>
<td></td>
<td>(-1.21)</td>
<td>(1.78)</td>
<td></td>
</tr>
<tr>
<td>Rest of World</td>
<td>$0.32$</td>
<td>$-0.49$</td>
<td>$0.197$</td>
</tr>
<tr>
<td></td>
<td>(0.0299)</td>
<td>(-0.603)</td>
<td></td>
</tr>
<tr>
<td>Household</td>
<td>$0.82$</td>
<td>$-0.32$</td>
<td>$0.157$</td>
</tr>
<tr>
<td></td>
<td>(0.0793)</td>
<td>(-0.663)</td>
<td></td>
</tr>
</tbody>
</table>

Figures in the brackets are $t$ values
* real flows

The sector's behaviour showed different situation. Here except for other Financial Institutions, none of the
sector's share is responsive to either total financial uses (real) and time variable. $r^2$ is poor in almost all cases. This suggests that the proportion of the sector's financial use may more or less constant over the time period.

The other useful aspect of analysis is to see whether the lending pattern of the sectors shows any change after bank nationalisation or even prior to that. To examine this we have used the dummy variable technique. The period is divided into two phases.

I. Period prior to 1966-67 and after that
II. Period prior to 1969-70 and after that

I. Period prior to 1966-67 and after that

The share of each sector is analysed with the help of total financial use and the dummy variable

Here $D = 0$ for the period prior to 1966-67 and

$D = 1$ for the period from 1966-67 onwards

The equational format is given below

$$w = \alpha + \beta_1TU + \beta_2D + \beta_3DTU$$

where

$\beta_1$ = coefficient for total uses

$\beta_2$ = coefficient of the dummy variable or

$\beta_3$ = coefficient of the total financial uses when $D = 1$

$W_0$ = share of Other Financial Institutions sector

$WH$ = share of Rest of World Sector

$WH$ = share of Household sector
The results suggest that the behaviour of Other Financial Institution, Rest of World and Household sectors showed some changes after 1966-67 period. The results are given below:

\[ W_o = f(\alpha + \beta_1TU + \beta_2D + \beta_3DTU) \]

\[ \begin{align*}
W_o &= 38.206 - 3.894\, TU - 30.68\, D - 4.06\, DTU \\
& \quad (2.59)^a \quad (2.30)^a \quad (2.46)^a \\
R^2 &= 0.3282
\end{align*} \]

Equation prior to 1966-67

\[ W_o = \alpha + \beta_1TU \cdot \]

\[ \begin{align*}
W_o &= 38.206 - 3.894\, TU \\
R^2 &= 0.3282
\end{align*} \]

Equation since 1966-67

\[ W_o = 7.526 - 8.260\, TU \]

In the case of Rest of World sector, the results are as follows:

\[ W_R = f(\alpha + \beta_1TU + \beta_2D + \beta_3DTU) \]

\[ \begin{align*}
W_R &= -97.30 + 15.65\, TU + 200.78\, D - 27.608\, DTU \\
& \quad (2.28)^a \quad (3.27)^a \quad (3.35)^a \\
R^2 &= 0.4369
\end{align*} \]

Equation prior to 1966-67

\[ W_R = -97.39 + 15.84\, TU \]

Equation since 1966-67

\[ W_R = 103.39 - 11.96\, TU \]

In the case of Household's share (WH) the behaviour is as follows:

\[ WH = f(\alpha + \beta_1TU + \beta_2D + \beta_3DTU) \]

\[ \begin{align*}
WH &= 141.28 - 14.13\, TU - 121.53\, D + 16.2988\, DTU \\
& \quad (2.63)^a \quad (2.93)^a \quad (2.52)^a \\
R^2 &= 0.288
\end{align*} \]
Equation prior to 1966-67
\[ WH = 141.28 - 14.13 \text{ TV} \]

Equation since 1966-67
\[ WH = -19.75 + 2.1672 \text{ TV} \]

where

\( Wo \) = share of Other Financial Institutions in total financial uses

\( WR \) = share of Rest of World in total financial uses

\( WH \) = share of Household in total financial uses

(Figures in the brackets show t values, a shows that it is significant at 5% level of significance).

The above results indicate that above three sectors showed some changes after 1966-67. The beta coefficient with total financial uses showed negative sign and it increased in the case of Other Financial Institutions's share after 1966-67 period. The importance of Rest of World sector also declined after 1966-67 period whereas in the case of Household sector the beta showed positive sign than negative in prior to 1966-67 period.

II. Period prior to 1969-70 and after that

As discussed earlier, the important aspect is to know whether the behaviour of important sector show any change after 1969-70 or not. The equation format is same as used earlier.

\[ W = f ( \alpha + \beta_1 TV + \beta_2 D + \beta_3 DTU ) \]

Here the budget share of Rest of World (\( WR \)) and Household (\( WH \)) showed significant change, with respect to changes in the total financial use and the dummy variable.
The equation format is given below:

\[ W = f ( \alpha + \beta_1 TU + \beta_2 D + \beta_3 DTU ) \]

\[ WR = -101.39 + 16.23 TU + 129.88 D - 19.22 DTU \]

\[ R^2 = 0.5725 \]

Equation prior to 1969-70 period:

\[ WR = -101.3971 + 16.23 TU \]

Equation since 1969-70 period:

\[ WR = 20.4909 - 2.994 TU \]

In the case of the Household sector the result is given below:

\[ WH = f ( \alpha + \beta_1 TU + \beta_2 D + \beta_3 DTU ) \]

\[ WH = 151.6626 - 15.64 TU - 97.23 D + 13.66 DTU \]

Equation prior to 1969-70:

\[ WH = 151.66 - 15.64 TU \]

Equation since 1969-70 period:

\[ WH = 54.43 - 1.89 TU \]

The behaviour after 1969-70 suggests that the beta value showed negative sign after 1969-70 in the case of Household and Rest of World sector. This shows that the relative importance of Rest of World's sector declines after 1969-70, whereas the value of negative beta has declined after 1969-70 in the case of the Household sector, which shows increasing importance of that sector in the Indian economy since 1969-70.
9.5 Summary and Conclusion

The financial analysis as discussed in section IV explains the role of different financial instruments in the economy. The results suggest that currency and deposit, contractual savings and small savings are responsive to changes in the total financial uses (real) of the economy. However the interest rate is not found to be significant in all cases. In the case of contractual savings and small savings the beta value with total financial uses (real) showed negative sign which suggests that with the increase in the (real) financial use of the economy the share of these instruments declines. The beta value of total financial use (real) in the case of currency and deposit showed positive sign and t value is significant at 5% level. The behaviour of Household sector shows similar results.

In the case of sectoral behaviour the results are insignificant in all cases except for other Financial Institutions. This explains the fact that the proportions of the sectors flow has more or less remained constant over a time period. The role of Rest of World has declined after 1969-70 and the trend in the case of Household showed marginal improvement. The above results conclude following things:

a) The opportunity cost criterion seems to be not responsive to budget shares of financial instruments and sectors of the economy.
b) In order to mobilise resources the policy-makers have to rely on Household sector and especially on currency and deposit.

c) The contractual savings and small savings showed negative betas but it showed significant response with total financial use (real) of the economy.

d) Changes in the total financial use (real) of the economy does not alter the sectoral shares in the total financial uses.

e) The dependency on the Rest of World sector showed declining trend after 1969-70.

f) Wealth elasticity is highest in the case of Banking sector in the sectoral behaviour.

Thus above results suggests that the financial structure of the Indian economy showed relatively stable behaviour and even key instruments and sectors are found to be non-responsive to time or interest rates. However for mobilising the resources proper emphasis should be made on the Household sector and especially on currency and deposit, contractual savings and small savings. Monetary policy should be designed in such a way that in the financial structure opportunity cost variable does not become an insignificant variable.