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Structure of the household sector asset portfolio in India

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STRUCTURE OF THE HOUSEHOLD SECTOR ASSET PORTFOLIO IN INDIA

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MARCH 2005

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Foreword

In recent years there has been growing concern over the question of the impact of financial sector reforms on the structure of household savings. It is expected that the structure of domestic savings go through considerable change in an economy undergoing financial reforms. For taking policy measures to increase domestic savings, it is therefore important to understand such changes. An analysis of asset substitutability will help in finding out such changes. The analysis will also help in identifying the changes in the composition of saving, so that the policy measures are directed towards the most productive instruments.

In this context as a part of ICRIER's research on macroeconomics, the present paper tries to examine the substitution among financial assets of the household sector. In India various tax incentives are provided to various saving instruments to increase the domestic saving. To see the usefulness of these incentives it is necessary to know the structure of household saving and its changing patterns. This paper identifies the saving instruments, which are acted as substitutes for others over the period of 1970-71 to 2002-03.

Dr. Arvind Virmani
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March 2005

1. INTRODUCTION

There has been considerable research on the issue of what determines the allocation of households portfolio of assets. Many theoretical models analyse the impact of wealth, age, and tax rates on the portfolio selection. The neoclassical model of portfolio selection assumes that in a world of perfect information, perfect capital markets, no taxes or transaction costs, individuals choose their portfolio to maximise expected return. However in real world, the recognition of such factors as transaction costs, capital market imperfections and vagaries of tax systems makes it unlikely that asset proportions will be stable across wealth and age groups. The portfolio allocation of the household sector is also influenced by the risk return trade-off. In simple portfolio models it is assumed that investors allocate funds across assets with different risks and returns and try to maximise wealth by diversification of portfolios. The relative importance of different assets in the portfolio reflects investor's risk and return preference. Interest yield on an asset would be an important determinant of the demand for an asset, and the relative interest rates on different asset would determine the pattern of asset holding. An analysis of the structure of interest rates in India would shed some light into the household portfolio decisions and variation in interest would repeat the degree of substitution among assets.

Indian studies have focussed on savings behaviour of the household sector at the aggregate level while portfolio decisions of households received less attention. Paradoxically this has gone hand in hand with a number of tax incentives to influence the saving choices of households. Therefore an empirical analysis of the effect of interest rates on the portfolio allocation of households is an essential first step in evaluating the effect of tax incentives on the allocation of savings. Understanding household portfolio behaviour may help in understanding the changes in asset holding patterns that have taken place over the period of time due to partial financial sector reforms. Portfolio decisions also have implications for issues such as the adequacy of precautionary saving and degree of retirement preparedness.

In this study we approach the problem by estimating the properties of the household demand functions for the claims against financial intermediaries. The objective of the study is to estimate a simple model of household investment behaviour

and determine the degree of substitution among the financial assets. The study is based on the annual time series data for the period 1970-71 to 2002-03 and the assets are current, time and saving bank deposit, post office saving and time deposits, provident and pension fund, public provident fund and national saving certificates. The study is organised as follows. Section 2 reviews the literature on asset substitution. Section 3 describes the financial system in India. Section 4 outlines the trend in the household sector financial assets. Section 5 presents a model to explain the movements in the household sector's stocks of different financial assets. A brief description of variables is given in section 6. Results of the empirical analysis are reported in Section 7, followed by concluding remarks and policy implications in Section 8.

2. LITERATURE REVIEW

There are numerous aggregative studies of the household demand for financial assets including money. Lydall (1958) and Pesek (1963) found that wealth and not income had a significant effect on household's money balances. Lee (1964) exploring the effect of wealth and income on the holdings of various types of financial assets concluded that both income and wealth are important determinants of the amounts held. Uhler and Cragg (1971) considered the effect of non-human wealth, income, family size and age of the household head on holdings of financial assets. Using logarithmic regression to estimate the effects of the variables on total amounts of financial assets held at each level of diversification, they found that wealth, age and family size were significant where as the income variables are rarely significant.

In the above studies the yield on financial assets did not figure as an important variable. However it becomes an important variable while looking at the substitutability among assets, particularly money and other interest bearing financial assets. The issue of substitution was addressed in the context of the theoretical concept of money. Questions were raised whether the concept of money should be confined to currency plus demand deposits or should be extended to include other liquid assets. Those who argued that the definition should be broadened assume that the assets to be included are closer substitutes for currency and demand deposits than for other assets. In this context a number of studies were undertaken to identify the close substitutes for currency and demand

deposits. Lee (1966) has found evidence in favour of the substitutability between non-bank intermediary liabilities and money where as Feige(1964) found no such substitution among them.

Hamburger (1968) tried to analyse this issue by looking at the properties of the household demand functions for the claims against financial intermediaries. He investigated the household demand for different financial assets and used yields along with income and wealth as explanatory variables. The results for the study period 1952-1962 suggest the significant impact of wealth and interest rate and negligible impact of income on the demand for financial assets. He also found that time and saving deposits at commercial banks are close substitutes to savings accounts at other financial institutions and marketable funds. However the results do not provide any support for the suggestions for extending the definition of money to include assets other that currency and demand deposits.

Chase, Jr (1969) while estimating the household demand for savings deposits in USA for the period 1921-1965, found that the size of the saving deposits depends on the yield offered to savings depositors relative to market yield. Also he traces that the demand for money is negatively related to savings deposit yields.

The capital asset pricing model (CAPM) analyses the behaviour of household sector portfolio allocation on the basis of risk return trade-off, which implies that in equilibrium an investor will hold only a minimum variance portfolio. However it has been observed that individuals often hold portfolios of very different nature consisting of few assets. In general, households invest in a small number of safe assets such as bank accounts (savings and checking accounts) or tax deferred retirement accounts. Several studies have been undertaken to find out the reasons for the lack of diversification of portfolios. Deaton, (1981) observed that institutional restrictions such as minimum purchase requirements can make a particular asset less attractive to smaller borrowers. Feldstein (1976) pointed out that the portfolio structure is biased towards or against certain assets without necessarily leading to zero holdings. He concluded that differential tax treatment alters the relative price of assets making some more attractive than others and hence makes the portfolio biased towards certain assets. The issue of capital market imperfection in the form of borrowing and liquidity

constraints (Paxson, 1990) and incomplete information (King and Leape 1987) are also cited as reasons for non-diversification of portfolios.

An attempt was also made to extend these results by examining the impact of transaction costs on optimal portfolio decisions. Zabel (1973) while analysing portfolio decisions and transaction costs, observed that introduction of transaction costs changes the character of the individual's consumption and portfolio choices. He found that the number of assets in an optimal portfolio would be sensitive to the magnitude of fixed charges per transaction. He also concluded that the same features would be observed in the presence of proportional transaction costs. Goldsmith (1976) developed several models explaining some effects of transaction costs on portfolio selection. His analysis shows that greater transaction costs, reduces the number of securities held because it makes diversification more costly. Therefore he suggested that an investor would want to substitute less risky assets into his portfolio, thus reducing the necessity for greater diversification. Similarly Mayshar (1981) tried to examine the implications of introducing transaction costs to the Capital Asset Pricing Model (CAPM). He observed that in the presence of transaction costs, investors don't trade in all the assets.

Various studies on India (Raj, 1962; Chakravarty, 1973; Rao, 1980 and Mujumdar, 1980), have tried to explain the increase in aggregate savings in India. The increase has been attributed to redistribution of income in favour of non agricultural households, decline in agricultural prices and build up of institutional infrastructure such as branch expansion and bank nationalisation are the major determinants of growth of saving rate. The issue of substitutability between different assets has not got enough attention. Mujumdar (1980) examined the substitutability of various savings instrument such as currency and bank deposits (demand and time deposits) for the period 1951-52 to 1978-79 and its two sub periods such as 1963-64 to 1978-79 and 1968-69 to 1978-79 by using OLS method. The substitution effect of currency for bank deposits and of demand deposits for time deposits was brought out for all the periods. Subrahmanyam and Swami (1995) estimated a direct translog model for the period 1970-71 to 1988-89 for India's household sector to examine this issue which indicated the presence of significant substitutability between bank deposits and life insurance plus pension funds.

It has been argued that financial liberalisation and reforms in the form of deregulation, easy entry, and developments in information technology lead to major changes in the portfolio allocation of the households through asset substitution. Rybezynski (1986) observed that " As an economy passes through the bank oriented stage of financial development, increased competition from other financial firms and markets, rise in market interest rates etc., tend to shift funds away from bank deposits and into other financial instruments". Therefore the financial sector reforms in the recent decades have raised important issues concerning the substitution of assets.

In this context, Jha and Longjam (2004) observed that the financial sector reforms in India have important implications for the user cost of assets and resulted in substantial substitution among them. The past decade in India has seen radical changes in financial markets. Financial markets have experienced a policy-induced move towards international integration, liberalisation and product innovation. The most important effects are the growth in mutual funds, the increasing importance of private pension funds and so on. In the face of such changes in portfolio behaviour, it is important to study the portfolio composition of household than the simple consumption saving choice. Therefore the present study makes an attempt to analyse various factors responsible for the selection of household portfolios.

3. FINANCIAL SYSTEM IN INDIA

The gross domestic saving rate in India has increased significantly over the past decades having reached 24.2% in 2002-03. Various steps were undertaken in India to increase gross domestic saving. For example in the 70s steps were undertaken in the form of nationalisation of commercial banks, build up of new financial institution and rapid expansion of bank branches. The conventional wisdom is that this helped in the acceleration of household saving in financial assets. In this context the reforms in the financial system in India is discussed in the following sections.

3.1 Interest Controls and De-regulation

Unlike a free market economy, where government controls interest rates indirectly through fiscal and monetary policy instruments, in India the government

exercised a direct control over a large number of interest rates. The government either fixed the rates or indirectly controlled them via regulations or through fiscal and monetary policy instrument. For example, interest rates on deposits and advances of nationalised institutions were fixed by the government and interest rates on provident funds of non-government employees, deposit and advances of co-operative banks, corporate debentures were indirectly regulated by the government. An important feature of the interest rate policies in India was the pegging of nominal interest rates on both deposits and advances of nationalised financial institutions. The interest rates on private organised financial sector were also pegged through imposition of ceiling rate on deposits and advances. During the period of 1960-85 almost every interest rate in India was administered in the form of either fixed, ceiling or differential level by government, RBI or some other authority like Indian Banks Association.

Bhattacharya (1985) observes that as a result of the interest rate pegging, the demand for institutional credit tends to exceed the supply necessitating the credit rationing and other non-price control on the institutional credit. Bhole (1985) also argued that pegging of interest rate resulted in an inappropriate saving and investment behaviour, maldistribution of financial resources and weakening of the effectiveness of monetary policy. This problem was further complicated by the inflexibility of the organised market interest rates with respect to inflation rate. And growing inflation rate widens the gap between nominal and real interest rates.

In order to correct these anomalies, the RBI began deregulating the interest rates in 1985. Most of the debt market rates such as call rate, 182-day treasury bills rate, commercial paper and certificates of deposits rates were made flexible and market determined. However interest rates on different bank deposits remained unchanged during that period, with the only exception of an upward movement in the interest rate on term deposits within the framework of administered interest rates. In 1991 the Narasimham committee advised for further deregulation of interest rates in a phased manner. Major reforms took place in the post 1991 period with the Finance Ministry initiating a comprehensive program of financial liberalisation. According to the official claim, the market forces to a great extent now determine interest rates in the money and government securities market. In the banking system interest rate on deposits except bank

saving and non-resident deposits are determined freely by the banks. On the advances side, except for a part of export credit and small loans up to Rs. 2 lakh, banks are also free to decide their own lending rates based on commercial judgement and risk reward considerations. Not withstanding this deregulation in the money debt and banking sector, interest rates on small savings and provident funds have remained administered and steady with attractive tax incentives.

However it has been argued that despite the official claim, the interest rates in India have remained effectively administered with the floor for all rates determined by the interest rates on small savings (Bhalla, 2002). Therefore it is useful to analyse the structure of interest rates in India. The behaviour of selected nominal interest rates over the period of 1970-71 to 2002-03 is depicted in figures 1 to 3. The structure of interest rates is analysed across the three broad categories, *viz* (i) Short term deposit rates (up to three years including savings rates), (ii) long-term deposit rates (over 3 years) and (iii) rates on certificates and provident funds. It would be observed from figure 1 which depicts the short term nominal deposit rates that have increased during the study period, though there has been a declining trend since 1998-99. There is similar trend in the interest rates of the other two categories as shown in Figure 2 and Figure 3.

Figure 1: Short Term Nominal Rates

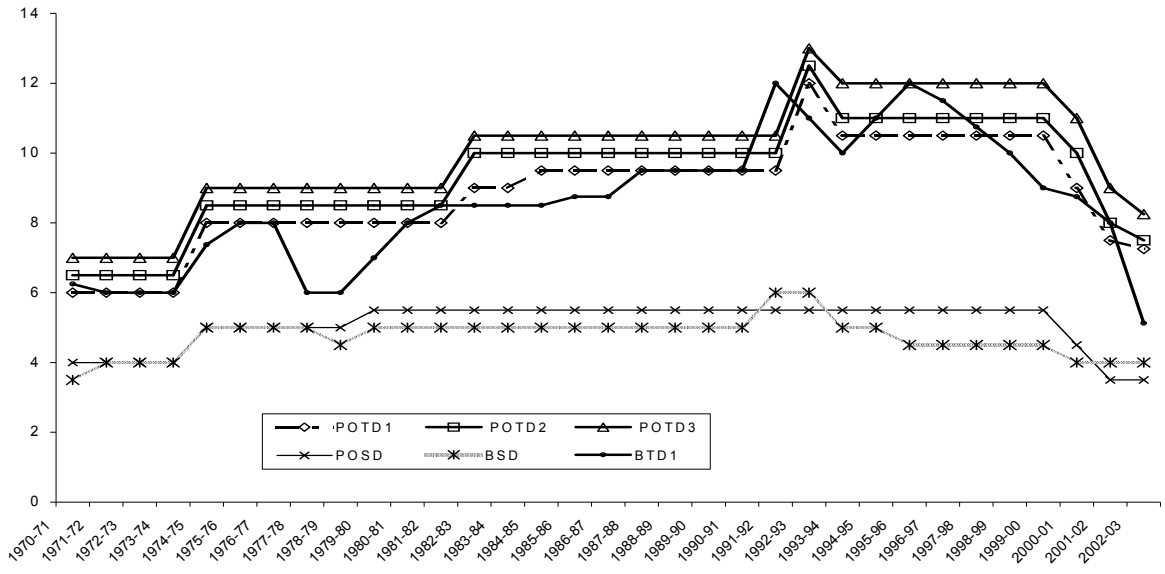


Figure 2: Long Term Nominal rates

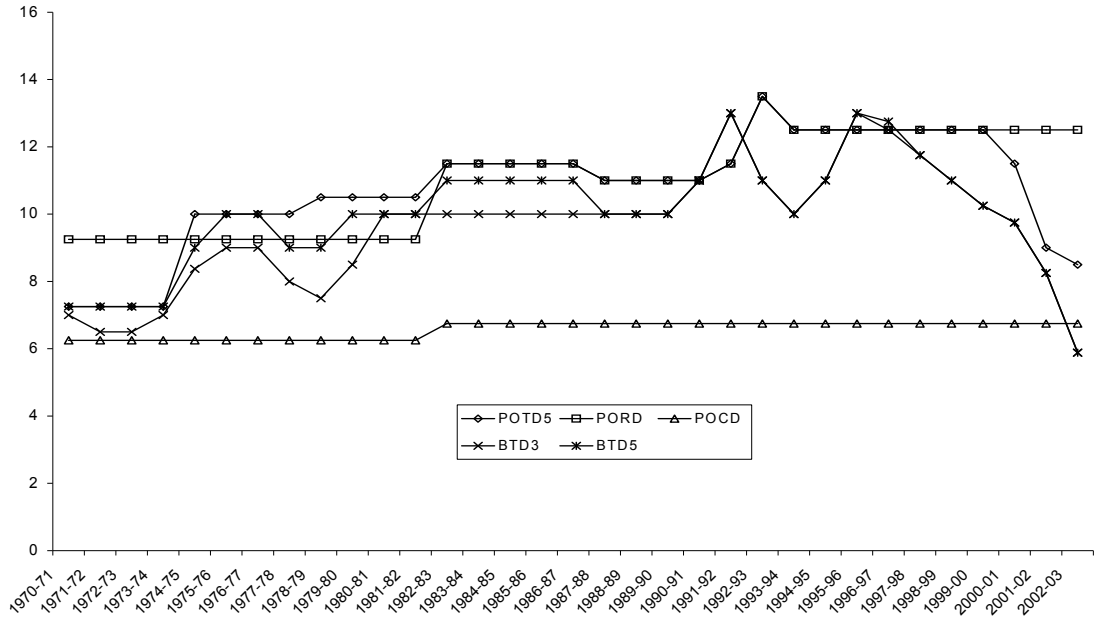
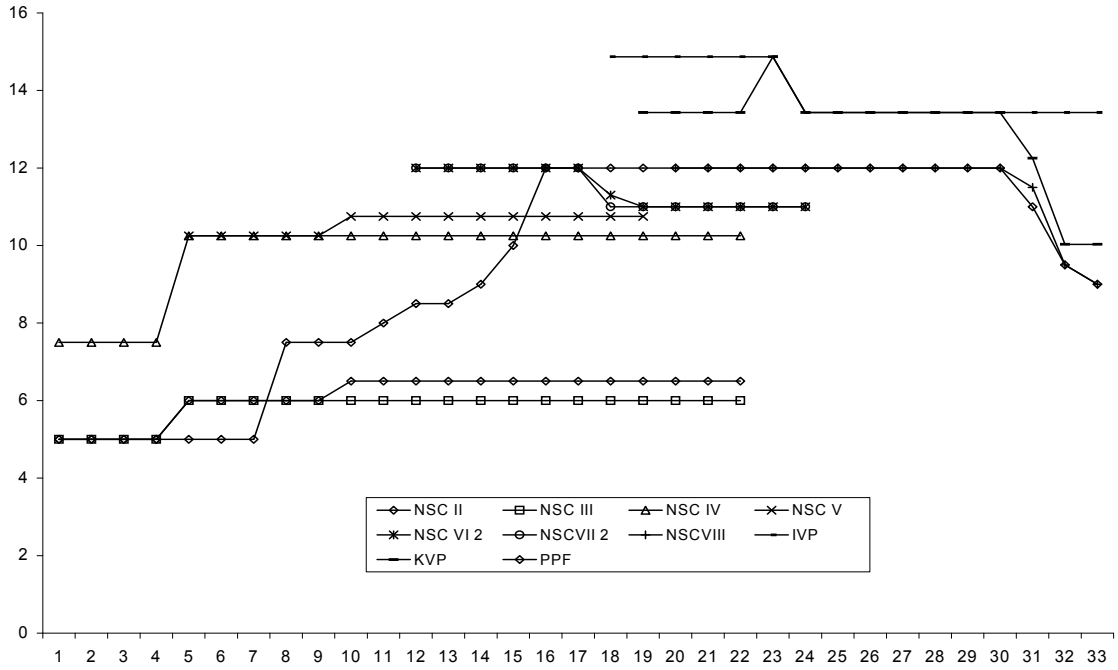


Figure 3: Nominal Rates on Certificates and PF



It is also observed that there has been little fluctuation in interest rates during this period. Therefore an increase in interest rates may have been the result of periodic intervention of the authorities. However, the underlying principles and considerations on which such changes in interest rates are based is not known. It is not known how the authorities from time to time have decided upon the extent, frequency and timing of these interventions. It has been stated by the authorities that the level of interest rates is based on considerations of risk, liquidity and maturity of the funds. However the interest rate differentials depicted in Table 1 does not seem to indicate the presence of these attributes in the determination of interest rates in India. For example interest rates on time deposits of the same maturity with the post offices and banks differ significantly with the difference fluctuating from year to year. The post office rates have mostly been higher than the bank deposit rates. During 1970-71 and 2002-03, the difference between them has varied between 0 to 2.4 and 0 to 2.6 percentage points in case of one to three year and five-year deposits respectively. The saving rates, both post office and bank, have been kept at much lower level, though 40% of the bank savings deposits are treated as time deposits by the RBI as per its scheme of dividing the savings deposits into demand and time liabilities. The other short term rates are also higher than the saving rates by around 2 percent points. Similarly interest rates on small savings have been higher than those on the government securities of comparable maturities. The other interesting feature is that even among the small saving media, with comparable maturity and tax rebates the level of interest rate differs. For example the interest rates differential on the 7-year NSCs is very high. The difference in interest rates on NSC IV and NSC II as well as on NSC III increased from 2.5 to 3.8 and 2.5 to 4.6 respectively. This suggests some arbitrariness in the discretionary control of the authorities on interest rates. If interest rates were fixed on the basis of risk, maturity etc, then the rate on small saving deposits like PPF and NSC would have been much lower as these deposits get higher tax benefits than the other deposits.

Table 1: Interest Rate Differentials in India

Year	BR-B1	B3-1	B5-3	B5-1	P5-1	P5-2	P5-3	P3-1	P3-B3	P5-B5	NSCIV-II	NSCIV-III
1970-71	-0.65	0.75	0.25	1	1.25	0.75	0.25	1	0.00	0.00	-1	0
1971-72	-0.40	0.5	0.75	1.25	1.25	0.75	0.25	1	0.50	0.00	-1	-0.5
1972-73	1.40	0.5	0.75	1.25	1.25	0.75	0.25	1	0.50	0.00	-1	-0.5
1973-74	1.40	1	0.25	1.25	1.25	0.75	0.25	1	0.00	0.00	-1	0
1974-75	0.03	1	0.625	1.625	2	1.5	1	1	0.63	1.00	0	0.375
1975-76	-0.60	1	1	2	2	1.5	1	1	0.00	0.00	-1	0
1976-77	-0.60	1	1	2	2	1.5	1	1	0.00	0.00	-1	0
1977-78	3.00	2	1	3	2	1.5	1	1	1.00	1.00	0	0
1978-79	3.00	1.5	1.5	3	2.5	2	1.5	1	1.50	1.50	0.5	0
1979-80	2.00	1.5	1.5	3	2.5	2	1.5	1	0.50	0.50	-0.5	0
1980-81	1.00	2	0	2	2.5	2	1.5	1	-1.00	0.50	-0.5	1.5
1981-82	0.50	1.5	0	1.5	2.5	2	1.5	1	-1.00	0.50	-0.5	1.5
1982-83	1.50	1.5	1	2.5	2.5	1.5	1	1.5	0.50	0.50	-1	0
1983-84	1.50	1.5	1	2.5	2.5	1.5	1	1.5	0.50	0.50	-1	0
1984-85	1.50	1.5	1	2.5	2	1.5	1	1	0.50	0.50	-0.5	0
1985-86	1.25	1.25	1	2.25	2	1.5	1	1	0.50	0.50	-0.5	0
1986-87	1.25	1.25	1	2.25	2	1.5	1	1	0.50	0.50	-0.5	0
1987-88	0.50	0.5	0	0.5	1.5	1	0.5	1	0.50	1.00	0	0.5
1988-89	0.50	0.5	0	0.5	1.5	1	0.5	1	0.50	1.00	0	0.5
1989-90	0.50	0.5	0	0.5	1.5	1	0.5	1	0.50	1.00	0	0.5
1990-91	0.50	1.5	0	1.5	1.5	1	0.5	1	-0.50	0.00	-1	0.5
1991-92	-2.00	1	0	1	2	1.5	1	1	-2.50	-1.50	-2.5	1
1992-93	1.00	0	0	0	1.5	1	0.5	1	2.00	2.50		
1993-94	2.00	0	0	0	2	1.5	0.5	1.5	2.00	2.50		
1994-95	1.00	0	0	0	2	1.5	0.5	1.5	1.00	1.50		
1995-96	0.00	1	0	1	2	1.5	0.5	1.5	-1.00	-0.50		
1996-97	0.50	1	0.25	1.25	2	1.5	0.5	1.5	-0.50	-0.25		
1997-98	1.25	1	0	1	2	1.5	0.5	1.5	0.25	0.75		
1998-99	2.00	1	0	1	2	1.5	0.5	1.5	1.00	1.50		
1999-00	3.00	1.25	0	1.25	2	1.5	0.5	1.5	1.75	2.25		
2000-01	3.25	1	0	1	2.5	1.5	0.5	2	1.25	1.75		
2001-02	-1.50	0.25	0	0.25	1.5	1	0	1.5	0.75	0.75		
2002-03	0.88	0.755	0	0.755	1.25	1	0.25	1	2.37	2.62		

Source: Report on Currency and Finances (Various Issues), Handbook Of Statistics on the Indian Economy, 2003-04.

The real interest rates of the three categories are depicted in figures 4 to 6. In the short-term rates for the whole study period the saving deposits earned a negative rate of return except for the period 1976-77 and 1977-78. The other rates of interest are positive since mid 80s, but they were mostly around 2 to 4 percent per annum. It is observed that during periods of high inflation the real rate of return was lower than during the periods of low inflation. If inflation rate were accounted for, then the nominal rates would have been higher in 70s and 80s and the lower in the recent times. Interest rates on bank term deposits have been completely deregulated since October 1997, and the rates on term deposits have been declining since then along with all other interest rates though they are still higher than the bank deposit rates (**Appendix Table A 1**).

Figure 4: Real Short Term Interest Rates

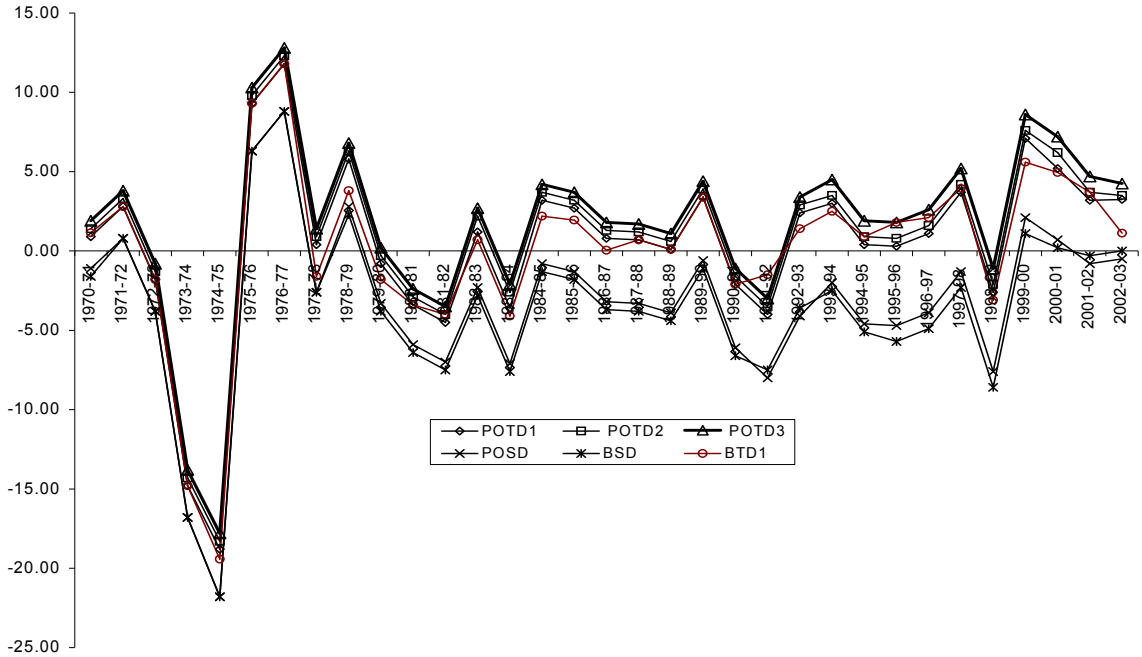


Figure 5: Real Long Term Rates

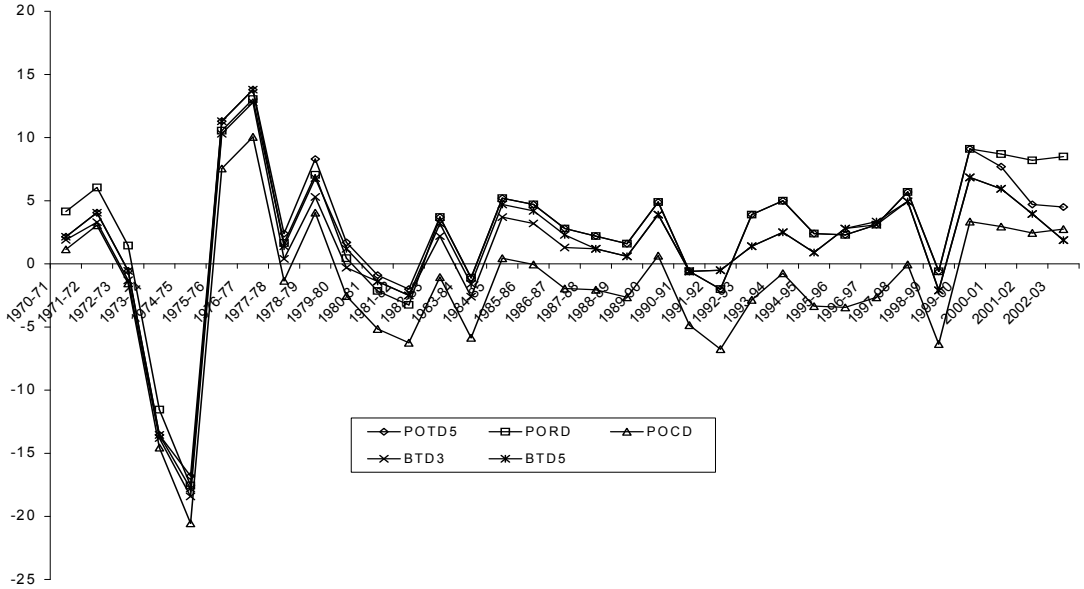
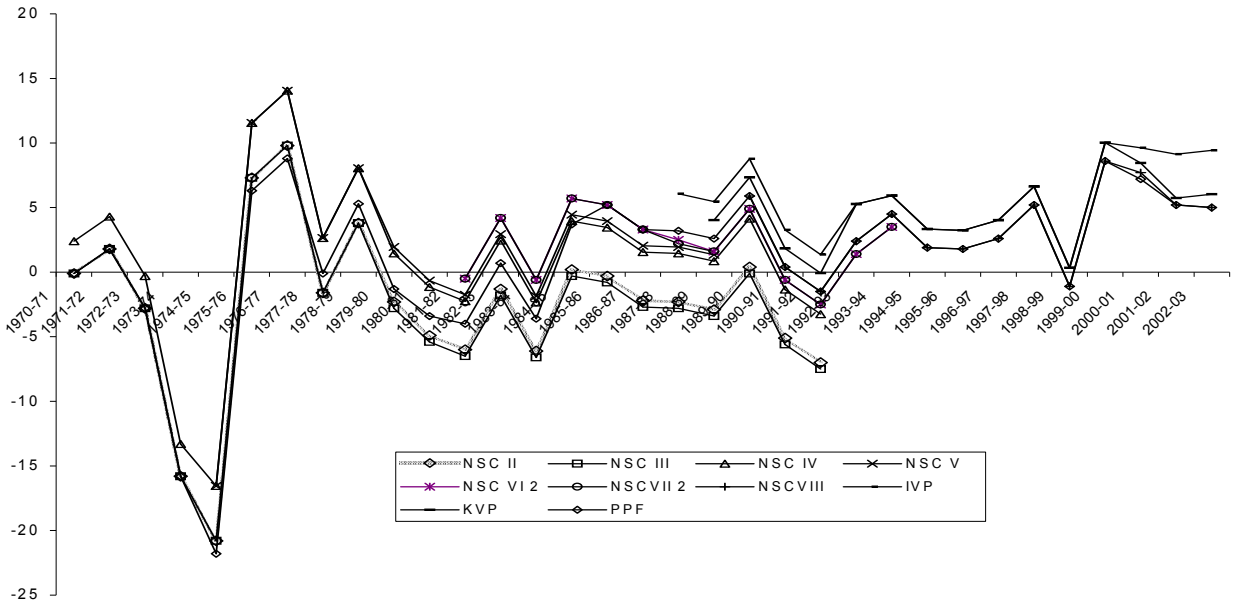


Figure 6: Real Rates of Certificates and PF



In order to find structural breaks in the structure of interest rates, one can look at the mean and coefficient of variation of the interest rates. The analysis indicates three different features in the structure of interest rates in the last three decades. There has been no fundamental change in the structure of some interest rates such as one year public provident funds, post office cumulative deposits and post office recurring deposits **(Fig A1 to A3)**. The variation has been gradually increasing in another set of rates like post office saving deposits, post office time deposits (1, 2, 3 and 5 year) and bank time (1, 3 and 5 year) and saving deposits as indicated in **Fig 7 to Fig 15** respectively. The interest rate on five year bank time deposits has also increased slowly and since 1990-91 it has been fluctuating. This implies that the five year bank time deposit is more flexible than the other interest rates. Besides the rate on post office recurring deposits in all these interest rate structures, there is a small break point in 1991-92. However the interest rate on bank saving deposit **(Fig 15)** shows a clear break in 1991-92 suggesting that the phase one of the bank savings interest rates ends in 1991-92**.** This indicates the impact of financial reforms on the structure of interest rates.

Figure 7: Variation of Mean and CV of POSD

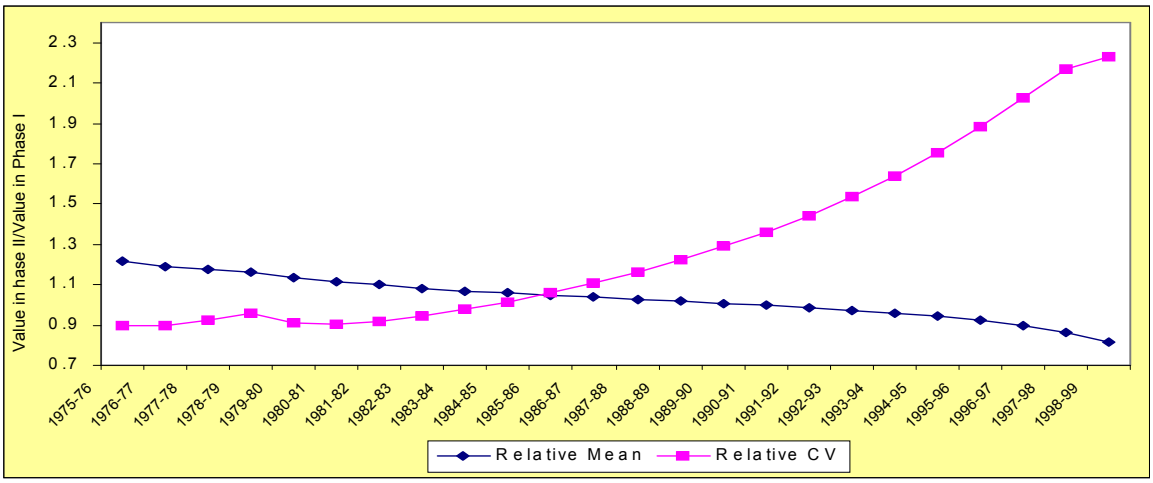


Figure 8: Variation of Mean and POTD1

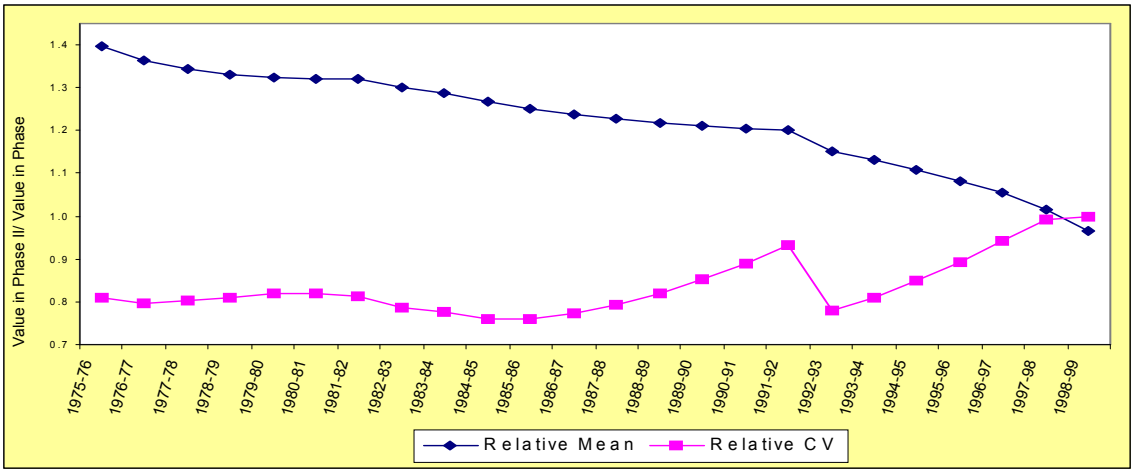


Figure 9: Variation of Mean and CV of POTD2

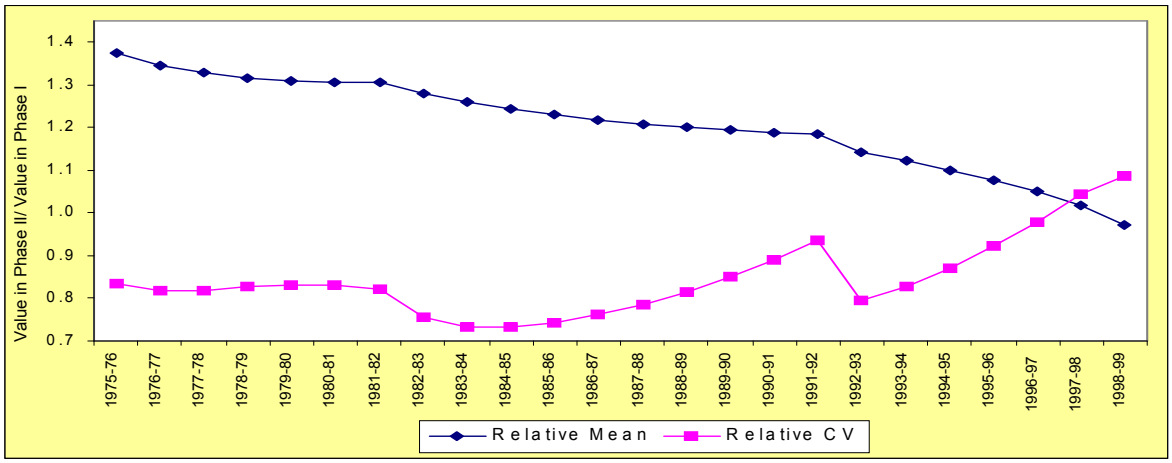


Figure 10: Variation of Mean and CV of POTD3

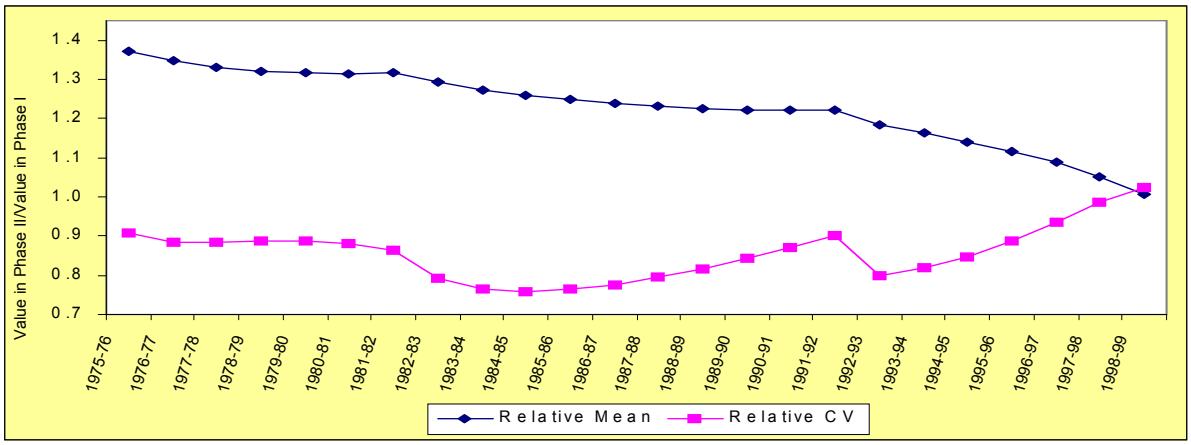


Figure 11: Variation of Mean and CV of POTD5

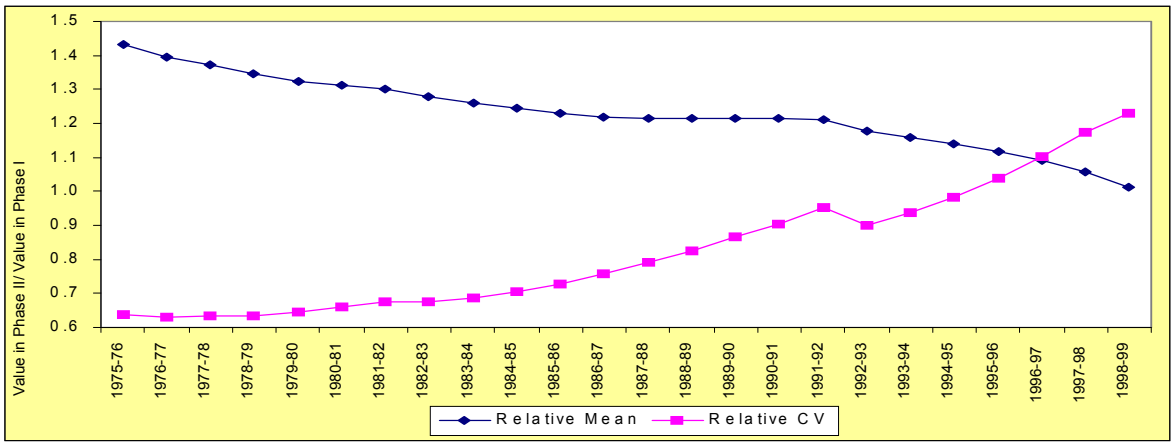


Figure 12: Variation in Mean and CV of BTD1

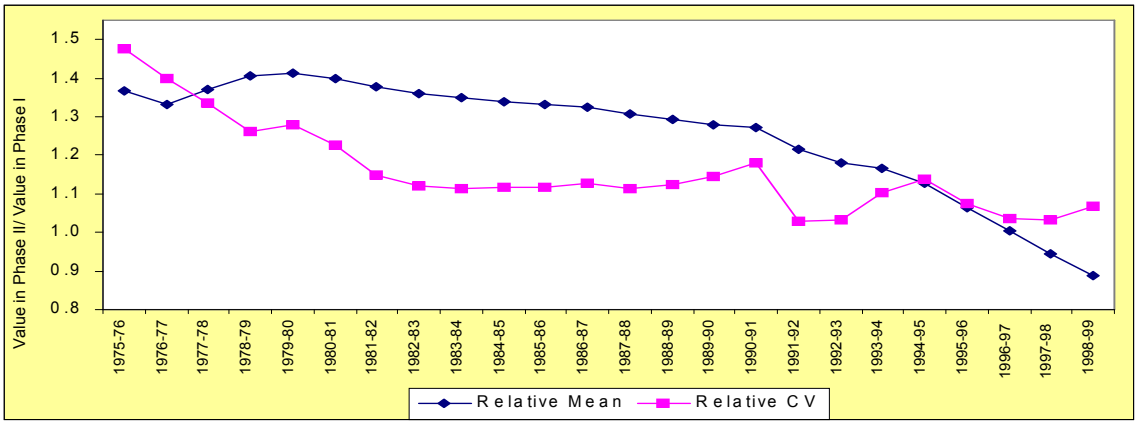


Figure 13: Variation in Mean and CV of BTD3

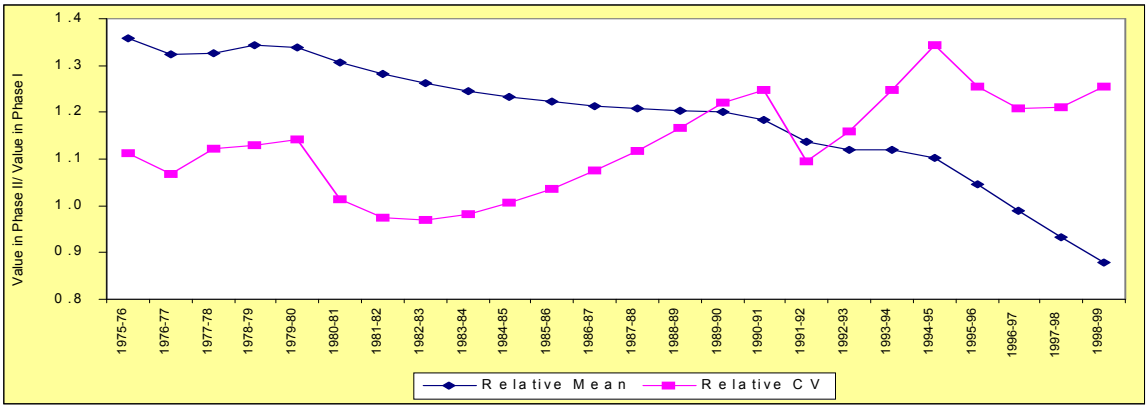


Figure 14: Variation in Mean and CV of BTD5

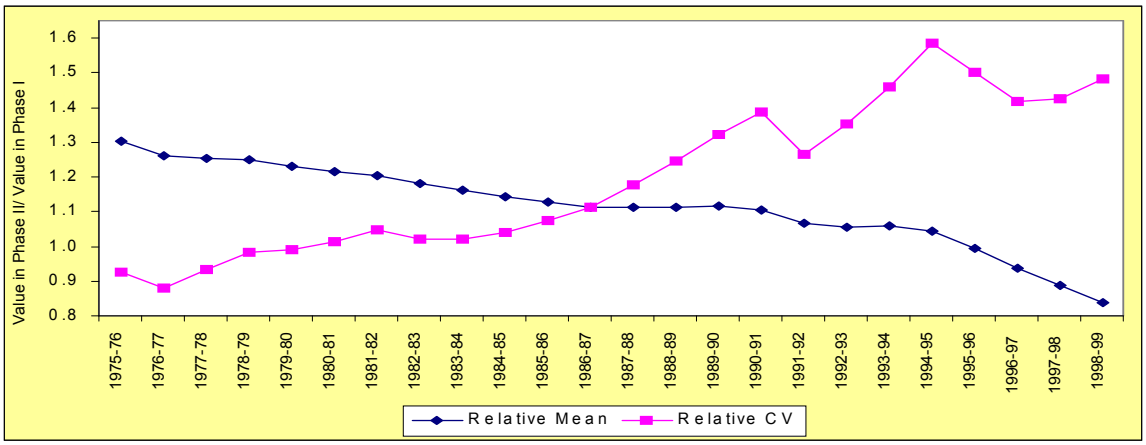
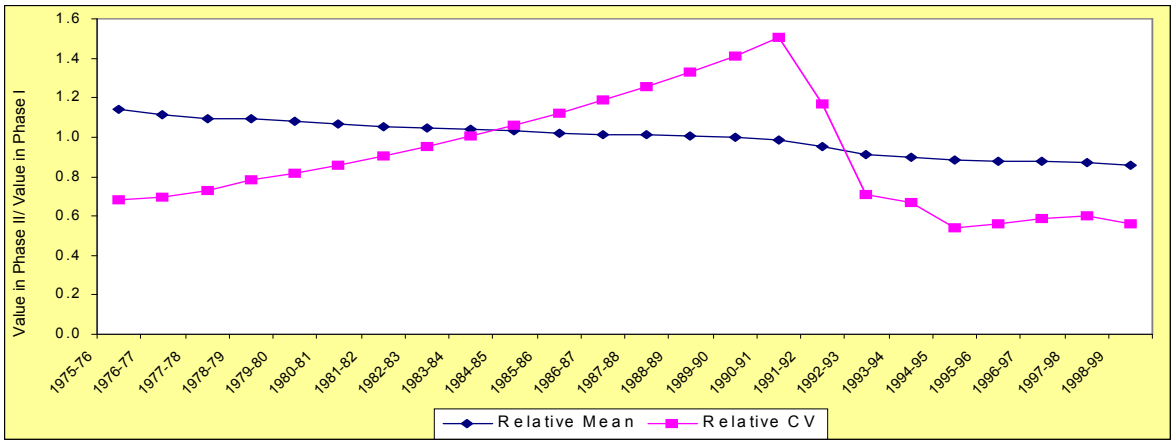


Figure 15: Variation of Mean and CV of BSD



3.2 Tax Incentives

Tax rules are an important determinant of household portfolio structure. They are often cited as the significant influence on a wide range of household portfolio choices, including whether to hold stocks or bonds, how much to invest in owner occupied housing and how to accumulate assets for retirement. There is substantial variation in the tax treatment of different portfolio assets and hence in the associated incentives for household portfolio structure. Therefore the tax system may have some important effects on the preference of the households that takes advantage of opportunities for tax deferred saving and portfolio accumulation. Also recognising the tax incentives for holding particular assets can be important for interpreting empirical results on how non-tax variables are correlated with portfolio structure. While taxation may affect portfolio choice, relatively few empirical studies have established a clear link between taxation and investment behaviour. This is due to the difficulty in calculating the marginal tax rates for different households. Households face different tax incentives due to their economic circumstances, such as their family structures, incomes and tax deductions. Though it is difficult to isolate a pure taxation effect on household portfolios given the differences in marginal tax rates, the impact of taxation can however be seen by analysing the tax deferred saving instruments.

In India fiscal concessions on saving are given on some selective financial instruments to mobilise household saving for financing public sector plan outlay. The fiscal concessions are also given for savings in social securities like provident and

pension funds. Therefore the effective rate of return on financial savings after taking into consideration fiscal concessions differs from the nominal rate of return and vary widely among different types of financial instruments. And most importantly the effective rate of return on the same financial saving varies between persons depending on the marginal tax rate of the taxpayer. For example the income tax provision in India ensures two kind of tax benefits to small savings such as tax rebate under U/S 88 and tax exemption on interest income on these savings under U/S 80L. There are certain other debt instruments such as government dated securities, treasury bills and bank deposits which also enjoy the tax benefits given under Section 80L. However the benefits of Section 88 have been an exclusive privilege of provident fund, NSS and NSCs among the government debt instruments. Hence the benefit from small saving schemes and provident fund is higher than that of the dated securities and treasury bills. Therefore tax benefit for some instruments makes them more sought after savings instruments than others without any such benefit.

3.3 Asset Risk Factors

Indian household portfolios consists of financial assets such as currency, deposits, net claims on government, shares and debentures, insurance and provident fund. All the financial assets expect currency holdings earn a rate of return. Bank saving deposits, small saving instruments, which are described as claims on government, provident fund and insurance savings carry a fixed rate of return. These instruments have also got several tax saving features. Among the above assets, the small savings instruments are free from default or credit risk, being backed by a government guarantee.

All these assets are susceptible to interest rate risk, inflation and liquidity risk. Since these instruments are long term in nature and interest rates on them are administered, the risk arises due to downward change in interest rate while the investor still holds the investment. These instruments also suffer from inflation risk since the rates are fixed and not indexed to inflation. However this risk is common to all types of investment. More importantly small savings are less liquid compared to dated securities or bank deposits. Therefore they form a part of the non-marketable debt of the government, as there are hardly any secondary market activities for these instruments.

These characteristics are also shared by the insurance and provident fund. Nonetheless these instruments carry the best possible combination of safety and post tax return and cater to the needs of the salaried class, who have used them as a tax saving force. In this regard there is a limit to the liquidity provided by the bank deposits by way of safety, convenience and interest earnings. The additional benefit of small savings and provident fund due to the tax benefits makes them more attractive and it is expected that the portfolio will be biased towards these assets. Hence it is viewed that changes in the interest rate determination mechanism and differential fiscal concession on saving assets would lead to possible change in the preference structure of the savers for financial assets and there will be substitution between them.

4. Structure of Financial Assets

Over the last few decades, the allocation of household financial asset among financial market structures has changed markedly, most notably after the financial system restructuring began in mid 80s. **Table 2** reports portfolio shares for different financial assets calculated using aggregate data for the period 1970-71 to 2002-03 and illustrates the changing pattern in financial assets. It shows the importance of bank deposits in household portfolios. In 1970-71 the largest proportion of households financial assets at 77.5 percent was in the form of bank deposits with different classes of it and that remained still at large at 76 percent in 2002-03. However the composition of bank deposits has changed with a reduction in the importance of bank current deposits and saving deposits and an increase in the importance of bank time deposits. The share of bank time deposits increased from nearly 40 percent in 1970-71 to 50 percent in 2002-03 and remains the most important financial asset in household sector.

Table 2: Share of Household Financial Assets in Total Assets

Year	*BCD*	*BSD*	*BTD*	*TBD*	*POTD*	*POSD*	*TD(PO)*	*TC*	*PPF*	*TSS*	SPF
1970-71	16.9	20.9	39.7	77.5	0.8	10.8	12.9	1.0	0.1	13.9	8.6
1971-72	16.6	19.8	39.7	76.1	2.1	9.8	13.3	1.8	0.1	15.1	8.8
1972-73	15.9	19.9	40.5	76.3	3.8	8.5	13.6	2.0	0.1	15.7	8.0
1973-74	14.7	20.1	40.6	75.4	5.3	8.2	15.0	2.1	0.1	17.2	7.4
1974-75	13.8	20.3	42.3	76.4	6.2	6.9	14.4	2.1	0.1	16.7	7.0
1975-76	13.9	19.4	43.9	77.2	6.2	6.5	14.0	2.0	0.1	16.1	6.7
1976-77	13.1	20.2	45.1	78.4	6.3	5.6	13.2	2.0	0.2	15.4	6.2
1977-78	13.7	21.4	44.7	79.9	6.2	5.1	12.5	1.9	0.2	14.5	5.6
1978-79	13.0	22.2	44.8	80.0	6.2	4.7	12.2	2.3	0.2	14.7	5.3
1979-80	12.4	22.9	44.6	79.9	6.5	4.4	12.2	2.5	0.3	15.1	5.1
1980-81	12.5	24.0	43.8	80.3	6.5	2.4	12.1	2.6	0.4	15.0	4.6
1981-82	13.0	23.6	44.1	80.7	6.6	3.6	11.5	3.1	0.4	15.1	4.2
1982-83	12.1	23.9	44.9	80.8	6.3	3.3	10.8	3.9	0.4	15.1	4.1
1983-84	12.3	24.4	43.7	80.4	5.9	3.0	10.2	5.1	0.5	15.9	3.7
1984-85	12.3	23.8	43.9	80.0	5.6	2.6	9.6	6.6	0.5	16.7	3.4
1985-86	12.2	22.4	45.0	79.6	5.5	2.4	9.1	7.7	0.5	17.3	3.1
1986-87	11.2	22.5	45.8	79.5	4.3	2.2	7.7	9.0	0.5	17.3	3.2
1987-88	11.4	21.9	46.8	80.0	3.3	2.1	6.6	9.6	0.6	16.8	3.2
1988-89	10.8	22.0	45.3	78.1	2.6	2.0	6.3	11.3	0.7	18.4	3.5
1989-90	11.6	21.7	43.5	76.9	1.7	1.8	6.5	12.3	0.9	19.7	3.4
1990-91	11.6	21.4	43.5	76.4	1.1	1.6	6.5	12.7	1.1	20.2	3.4
1991-92	13.8	20.4	43.0	77.2	0.9	1.5	6.6	11.6	1.2	19.5	3.3
1992-93	12.9	18.6	47.1	78.7	0.7	1.3	6.0	10.7	1.4	18.1	3.2
1993-94	12.7	19.0	47.0	78.7	0.7	1.2	5.7	10.5	1.7	18.0	3.3
1994-95	11.9	17.5	49.2	78.6	0.7	1.1	5.6	10.9	1.8	18.3	3.1
1995-96	11.6	19.1	47.0	77.7	0.6	1.1	5.5	11.4	2.2	19.1	3.2
1996-97	11.4	18.7	48.2	78.2	0.5	1.0	5.0	11.4	2.3	18.7	3.1
1997-98	10.4	18.6	49.0	78.0	0.5	1.0	5.0	11.3	2.5	18.7	3.2
1998-99	10.1	18.5	48.8	77.4	0.5	0.9	5.2	11.6	2.6	19.4	3.2
1999-00	9.9	18.7	48.5	77.1	0.5	0.7	5.7	11.5	2.3	19.4	3.5
2000-01	9.3	18.7	48.4	76.5	0.6	0.7	6.5	11.1	2.6	20.2	3.4
2001-02	8.6	18.6	49.5	76.7	0.7	0.7	7.2	10.2	2.8	20.2	3.1
2002-03	8.3	19.0	48.7	76.0	0.9	0.7	8.3	9.7	2.9	21.0	3.0

Notations: Bank Current Deposits (BCD), Bank Time Deposits (BTD), Bank Saving Deposits (BSD), Post Office Saving Deposits (POSD), Post Office Time Deposits (POTD), Public Provident Fund (PPF), State Provident Fund (SPF), Total Bank Deposits (TBD), Total Certificates (TC), Total Small Savings Assets (TSS), Total Post Office Deposits (TD(PO))

From **Table 2**, the declining importance of post office deposits can also be noticed. The share of post office deposits in total financial assets, which include post office time, saving, recurring, cumulative and monthly income schemes has gone down from around 13 percent in 1970-71 to 8.3 percent in 2002-03. The share of post office

saving and time deposits has also declined over the time. The share of post office saving and time deposits is less than 1 percent in total deposits at present. However not withstanding the decline in post office deposits the share of small savings has gone up during the study period. The rise has been significant, as its share has reached at 21 percent in 2002-03 from 13.9 percent in 1970-71. This significant increase in small saving could be attributed to the rise in the share of certificates and public provident fund, which also constitute the small savings of the household sector. The increase in the share of certificates and public provident funds is again attributed to the relatively high interest rates and tax incentives offered on them.

As shown in **Table 2**, the share of total certificates in the total financial assets increased immensely from merely a 1 percent in the beginning of the study period to 9.7 percent in 2002-03. It reached at a level of 12.7 percent in 1990-91 and had continued to remain at a level higher than 11 percent till 2000-01 and has fallen back since then. The share of public provident fund in total financial assets is at 2.9 percent in 2002-03 against its share at 0.1 percent in 1970-71. The importance of state provident fund has been declining over the years and constitutes 3 percent of the total financial assets in 2002-03.

In order to analyse the inter asset substitutability, the share of various bank deposits in total bank deposits and share of various small saving instruments in total small savings is reported in **Table 3. Table 3** shows that the importance of traditionally the most important assets of small savings i.e the savings and time deposits of post offices have declined tremendously over the time period. The post office saving deposits in 2002-03 account for only 4.4 percent of total small saving deposits whereas in 1970-71 holdings in post office savings deposits was at 77.3 percent. Similarly the post office time deposits whose claim was low at 6 percent in 1970-71 and increased there after to account for nearly 50 percent of total small saving deposits in 1980-81 declined again to merely 4.4 percent in 2002-03. This decline of savings in traditional deposits can be attributed to the spread of bank branches, decline in real interests on them and the introduction of new saving instruments such as Kisan Vikas Patras, post office monthly income schemes etc. From the table it can be seen that Kisan Vikas Patras account for 32.2 percent of the total small savings which is the highest among all the assets in 2002-03. That is followed by the post office monthly income deposits at 23 percent in 2002-03.

The public provident fund also constitutes a larger part of small savings at 14 percent now which had a share of less than 1 percent in 1970-71. The above analysis indicates that there has been inter asset substitution in the household sector portfolio. However the exactness of substitution as well as the degree of substitution can be found out only through empirical analysis:

Table 3: Share of Various Bank Deposits in Total Bank Deposits and Small Saving Instruments in Total Small Saving Assets

Year	BCD	BSD	BTD	KVP	POMIS	NSC	PORD	POTD	POSD	PPF	IVP	NSST	POCD	NSAC	SSC
1970-71	21.8	27.0	51.2	0.0	0.0	7.2	0.1	6.0	77.3	0.4	0.0	0.0	9.0	0.0	0.0
1971-72	21.8	26.1	52.1	0.0	0.0	11.7	0.5	14.1	64.9	0.5	0.0	0.0	8.3	0.0	0.0
1972-73	20.8	26.1	53.1	0.0	0.0	12.9	1.1	24.1	54.1	0.5	0.0	0.0	7.2	0.0	0.0
1973-74	19.5	26.6	53.8	0.0	0.0	12.3	1.8	31.0	48.0	0.6	0.0	0.0	6.3	0.0	0.0
1974-75	18.0	26.5	55.4	0.0	0.0	12.7	2.6	37.0	41.1	0.6	0.0	0.0	5.9	0.0	0.0
1975-76	18.1	25.1	56.9	0.0	0.0	12.4	2.9	38.6	40.3	0.7	0.0	0.0	4.9	0.0	0.0
1976-77	16.8	25.8	57.5	0.0	0.0	12.9	3.5	41.2	36.6	1.1	0.0	0.0	4.6	0.0	0.0
1977-78	17.1	26.8	56.0	0.0	0.0	13.1	3.9	42.6	34.7	1.3	0.0	0.0	4.3	0.0	0.0
1978-79	16.2	27.7	56.0	0.0	0.0	15.5	4.3	42.5	32.2	1.4	0.0	0.0	4.1	0.1	0.0
1979-80	15.5	28.7	55.9	0.0	0.0	16.8	4.5	43.2	29.1	2.1	0.0	0.0	4.1	0.0	0.0
1980-81	15.5	29.9	54.6	0.0	0.0	17.1	4.6	43.4	16.2	2.4	0.0	0.0	4.1	0.0	0.0
1981-82	16.1	29.3	54.6	0.0	0.0	20.7	4.5	43.9	24.1	2.7	0.0	0.0	4.1	0.0	0.0
1982-83	15.0	29.6	55.5	0.0	0.0	25.6	4.7	42.0	21.8	2.9	0.0	0.0	4.0	0.0	0.1
1983-84	15.3	30.4	54.3	0.0	0.0	32.1	4.7	37.5	18.7	3.3	0.0	0.0	3.5	0.0	0.1
1984-85	15.4	29.8	54.9	0.0	0.0	39.4	4.8	33.9	15.8	3.1	0.0	0.0	3.0	0.0	0.1
1985-86	15.4	28.1	56.5	0.0	0.0	44.2	4.7	31.9	13.7	2.8	0.0	0.0	2.5	0.0	0.1
1986-87	14.1	28.3	57.6	3.3	0.0	48.9	4.9	25.1	12.6	3.0	0.0	0.0	2.2	0.0	0.1
1987-88	14.2	27.4	58.4	6.3	0.0	50.7	5.3	19.5	12.4	3.5	0.0	0.0	1.9	0.0	0.1
1988-89	13.8	28.2	58.0	10.2	0.0	45.6	5.3	14.4	10.9	4.0	5.6	2.3	1.4	0.0	0.1
1989-90	15.2	28.2	56.6	14.2	0.0	32.6	5.1	8.7	9.1	4.6	12.2	5.7	0.9	0.0	0.1
1990-91	15.1	28.0	56.9	17.9	4.4	28.5	5.0	5.6	7.9	5.3	16.4	8.7	0.5	0.0	0.0
1991-92	17.9	26.4	55.7	21.1	4.7	23.1	5.2	4.8	7.7	6.3	15.7	11.3	0.3	0.0	0.0
1992-93	16.4	23.7	59.9	25.2	5.1	19.1	5.5	4.1	7.4	7.8	14.8	10.8	0.2	0.0	0.0
1993-94	16.2	24.1	59.8	31.3	6.5	15.3	5.8	4.0	6.8	9.5	11.8	8.9	0.0	0.0	0.0
1994-95	15.1	22.3	62.6	37.5	7.8	13.0	5.8	3.8	6.0	10.0	8.7	7.2	0.0	0.0	0.0
1995-96	14.9	24.6	60.5	39.1	8.5	14.2	6.3	3.3	5.6	11.3	6.1	4.5	0.0	0.0	0.0
1996-97	14.5	23.9	61.6	38.7	8.4	15.5	6.4	2.9	5.3	12.5	6.7	3.6	0.0	0.0	0.0
1997-98	13.4	23.9	62.8	38.3	9.7	15.4	6.5	2.7	5.4	13.2	6.8	2.5	0.0	0.0	0.0
1998-99	13.0	23.9	63.0	38.4	11.7	14.8	6.4	2.5	4.5	13.2	7.1	1.9	0.0	0.0	0.0
1999-00	12.8	24.3	62.8	38.6	14.5	15.0	6.9	2.6	3.9	11.7	5.8	1.5	0.0	0.0	0.0
2000-01	12.2	24.5	63.3	36.9	17.0	14.6	7.5	2.8	3.5	12.7	4.0	1.5	0.0	0.0	0.0
2001-02	11.2	24.3	64.6	34.7	19.4	13.6	8.0	3.5	3.4	14.0	2.7	1.3	0.0	0.0	0.0
2002-03	10.9	25.0	64.1	32.2	23.0	12.6	8.0	4.4	4.4	14.0	1.7	1.1	0.0	0.0	0.0

Source: Different Issues of RBI Bulletin and Basic Statistical Returns

5. MODEL

Studies on the demand for financial assets suggest that, the household sector demand for non-money financial assets, in real terms may be expressed as a functions of asset yields/returns, r; real aggregate household income, Y; and W, the real non-human wealth of the household sectors. If S_i^* denote the real value of asset i desired by the household sector, given the current value of the variables noted above, then the function will be

$$S_i^* = a_i + \sum_j a_{ij} r_{ij} + a_{iy} Y + a_{iw} W \quad (1)$$

Assuming that the financial assets are not complementary products, we would expect a_{iw}, a_{iy} and a_{ii} to be positive and a_{ij} (for $j \neq i$) to be negative. This implies that as increase in wealth, income, yield on asset i or a decrease in the yield on some other asset would increase the households stock of asset i. As data on wealth is not available we drop this variable and use personal disposable income. Equation (1) therefore reduces to,

$$S_i^* = a_i + \sum_j a_{ij} r_{ij} + a_{iy} Y_{pdi} \quad (2)$$

The desired stocks variable S_i^* is not directly observable. Therefore a standard stock adjustment procedure is assumed. Actual stocks move towards the desired stock holdings and the rate of adjustment can be found by incorporating the flexible accelerator model of investment. It implies that the larger the gap between the existing capital stock and the desired capital stock, the more rapid will be the firm's investment. A fraction such as α of the gap between actual and desired saving stock is closed in each period. So if stocks of assets in the last period was S_{it-1} , the gap between actual and desired will be $(S_{it}^* - S_{it-1})$. Hence a fraction of this gap is added to last periods assets so that the actual stock at the end of the current period will be

$S_{it} = S_{it-1} + \alpha(S_{it}^* - S_{it-1})$ ……(3)

$\Rightarrow S_{it} = S_{it-1} + \alpha S_{it}^* - \alpha S_{it-1}$

Substituting equation (1) in the above equation yields

$\Rightarrow S_{it} = \alpha(a_i + \sum a_{ij} r_{ij} + a_{iy} Y_{pdi}) + (1- \alpha) S_{it-1}$ .....(4)

$\Rightarrow S_{it} = \beta_i + \sum \beta_{ij} r_{ij} + \beta_{iy} Y_{pdi} + \beta_i S_{it-1}$ .....(5)

The variable S_{it} is the real value of the household stock of asset i at the end of the t^{th} period. The constant α measures the fraction of adjustment the household sector makes towards equating its actual and desired asset balances during any time period. The larger is α the faster would be the adjustment. If α equals one, then the model implies that $S_{it}^{*} = S_{it}$ and adjustment is fully completed during the period of observation.

In the empirical analysis of the savings, it was found that growth of national wealth is an important factor in determining the growth of household saving. This implies that as the total wealth of the nation grows, one would expect that the earning of the household will increase and hence savings. And the change in total wealth might be caused by a change in population, prices or in per capita income. At the same time changes in total holdings of savings may be influenced by the same factors. Therefore the relevant variable will be a per capita real wealth. However since wealth is not easily quantified real per capita permanent income introduced by Milton Friedman can be used as a proxy for direct measure of wealth. Friedman used weighted average of current and past levels of real income to measure permanent real income and used the same as proxy for expected real income. Since the measure of permanent income involves the use of weights, which can be arbitrary, we have used the real personal disposable income as a proxy for household wealth.

6. Data

The household sector's demand for real financial assets is determined by the real interest rate and income. For each of the years 1970-71 to 2002-03, an estimate of total deposits held by households was estimated by adding holdings of households in current, saving and time deposits at commercial banks, provident and pension fund and total small saving deposits of the household sector, which includes postal deposits, certificate deposits and public provident fund. Household claims against life insurance, shares and debentures, units, trade debt could not be included due to the unavailability of data.

There is a multiplicity of instruments having similar names but different terms (maturity) and yields. Complete details are not available for all those with different levels of sub-aggregation. For example the commercial bank time deposits consist of three kind of deposits such as 1 year, 3 year and 5 year deposits with different interest yields. And also in case of national saving certificates, there were many different kinds. Some of them were discontinued in between and new ones are introduced subsequently with different interest rates. We have ignored the differences in the yield and maturity period to get the aggregate deposits. However we have taken care of using an appropriate interest rate for these aggregates.

The approach used here is to construct a weighted interest series on the claims. The weights are calculated by using the share of an asset, for example 1 year bank time deposit in total bank time deposits and interest rates on the specific asset. For example if in year t, the return on 1 year time deposit, X1 is r1 and total bank time deposits is X then the weight will be (w1=X1/X) and the weighted interest for year t+1 will be w1*r2 i.e., the interest rate on the current year's claim is multiplied with the weight of previous year. In this way the interest rate for 3 year and 5 year bank time deposits are calculated and average of the three weighted interest rates is used as composite interest rate for the aggregate claim. Similar approach was undertaken to calculate the interest rate on post office time deposits and national saving certificates. The interest rates on bank saving deposits and post office saving deposits[2], provident and pension fund, and public provident fund are used in its published form. The structure of interest rates is reported in **Appendix Table A 1**.

As the bank current deposits do not earn any interest rate, a change in its share is influenced by the change in prices. Therefore change in the consumer price index for industrial workers is used as a measure of inflation in this study. All the data are collected from various issues of RBI, such as Report on Currency and Finance, RBI Handbook of Statistics on Indian Economy, Basic Statistical Returns and Budget Documents. As the purpose here is to see the substitution among the above-mentioned assets, given the yield on a particular asset, one would expect a lower demand for them if higher yields are observed on any other assets. This choice of assets is not based on a supposition that these variables are better substitutes among themselves than the other assets available.

But among the yield and deposit series available for all the years in question, these assets have the advantages of representing an investment opportunity with a wide market for them and differential specifications. The empirical analysis is undertaken by using the above mentioned variables.

The data used are annual in nature and comprise of interest bearing saving instruments of the household sector such as bank deposits, small saving instruments, provident funds and personal disposable income, interest rates and inflation. In the category of bank deposits we have taken the data on time, saving and current deposits and in case of small savings the analysis focuses on post office time deposits, post office savings deposits, national savings certificates (NSC) and public provident fund. The other instruments of small savings were either not available for the whole period as many of them like Kisan Vikas Patra were introduced in late 80s or some of them were abandoned in the mean time. The savings on shares and debentures is not estimated due to unavailability of the return on it for the household sector and also its share is very low at 2.12 percent in 2002-03 of the gross financial saving. The interest rate data comprises of bank time deposit rate (3 to 5 Years), bank saving deposit rate, post office time deposit rate, post office saving deposit rate, Public Provident Fund (PPF) rate and NSC rate. We would like to mention that the provident fund rate and the public provident fund rate have almost remained same except for the first and last few years of the study period. Therefore we have considered the Public Provident rate and assumed it as the return on both the PF and PPF. All the variables are used in their real terms.

7. ESTIMATES AND ANALYSIS

The present study uses Ordinary Least Squares (OLS) to estimate equation (5) above for examining the substitution effect among the assets. The study is based on the period from 1970-71 through 2002-03. The Basic framework of the model is based on the works of Hamburger (1968) and Brainard and Tobin (1969). However before subjecting the model to empirical test it is useful to discuss a number of problems concerning the estimation techniques and the definition of variables. Estimation of the parameters will be complicated if the variables included in equation 5 are highly correlated with time i.e non-stationary in nature, which results in spurious relations. Therefore before estimating equation (5) we checked for their stationarity and it was found that except inflation and interest rates, all the variables are found to be non stationary as shown in **Appendix Table A 2**. But the log differences of the assets and personal disposable income are found to be integrated of order zero as in the same **Table A 2**. Therefore the empirical relations of equation (3) are estimated in log differences. The other problem, which arises in the estimation process, is due to the high level of correlation among the explanatory variables and particularly among the interest rates as indicated in correlation matrix **Table A 3**. Therefore to reduce the problem of multi-collinearity we have not used all the interest rates at the same time as explanatory variables. So the standard specification of the model is given as:

$$D\log S_{it} = \beta_0 + \beta_1 DR_{it} + \beta_2 DR_{jt} + \beta_3 D\log S_{it-1} + \beta_4 D\log Y_t + \varepsilon_t \quad (6)$$

Where,

Si = real deposits, i = 1 to n;

Y = real personal disposable income (PDI);

R = real rate of interest, where Ri and Rj represent own rate and the cross interest rate respectively.

All the variables (except interest rates) are in natural logarithms.

A direct OLS estimation of the above equation for different financial assets for the full sample period is carried out and the results are reported in Table 4. The estimation results as shown in the table 4 indicate that the households treat the assets as poor substitutes for each other. The impact of changes in the own interest rate is also insignificant in case of bank deposits, post office deposits and certificates. However in case of ppf and pf the own interest rate is positive and significant though very small. It also shows that the impact of change in income is significant and positive for bank deposits and (public) provident funds and insignificant for all others. The low R^2 value of the regression equations indicate that the model does not fit well.

Therefore following Nakagawa and Shimizu (1999), as well as due to the fact that the interest variables are stationary in levels, another variant of the model is also estimated. In this model, the level of interest rate is used as an independent variable instead in the first difference form as used in equation (6). So the new regression equation is fitted as

$$D\log S_{it} = \beta_0 + \beta_1 R_{it} + \beta_2 R_{jt} + \beta_3 D\log S_{it-1} + \beta_4 D\log Y_t + \varepsilon_t \quad (7)$$

7.1 Bank Deposits

The estimation results of equation (7) are reported in Table 5. The results indicate that this model performs better than the equation (6). The empirical estimate of the bank current deposit shows that inflation has a significant negative impact on it and income is not a determinant of bank current savings. The estimated demand function for savings in the form of bank time deposits does not show good statistical fit as indicated by low-adjusted R^2 of 0.28. The results also indicate that change in personal disposable income has no impact on the change in saving where as its own real interest rate has a significant positive but lower impact with a responsiveness of 0.019. There is also no significant adjustment in the demand of bank time deposits to the desired level as indicated by the lagged dependent variable. Coming to the most important substitution effect of other savings for bank time deposit we found that only real public provident fund(PPF) rate has the substitution effect which is brought out by the negative and significant coefficient of

–0.01. The demand function for the bank saving deposits also depicts the same kind of results with intercept turning out to be significant The substitution effect is only brought out by PPF rate with a significant and negative coefficient of –0.01. Its more responsive to personal disposable income followed by its own lagged variable with elasticity of 0.48 and 0.20 respectively. The responsiveness to its own rate is rather low at 0.02 but of correct sign and significant. It also shows a good statistical fit with R^2 at 0.67.

7.2 Post Office Deposits

The results obtained for post office saving deposit show that except for its own interest rate it is not affected by any other interest rates. The responsiveness to its own interest is very low at 0.03 but has a positive and significant impact. It has a good statistical fit with adjusted R^2 of 0.51. However though significant, coefficients of the lagged dependent variable as well as the personal disposable income are negative in sign. This implies that post office saving instruments are treated as inferior ones as investment in it decreases as income increases. But unlike the demand function of post office saving deposits, in case post office time deposit the substitution effect is indicated by the negative and significant impact of the PPF rate at –0.04. It is also responsive to its own rate, which is of correct sign and significant but is not responsive to income. However the trend coefficient turns out to be significant in this case. The lagged dependent variable is also significant and has got larger impact with a coefficient of 0.74. The demand function for post office time deposit has a good statistical fit with high-adjusted R^2 of 0.79.

7.3 Certificates & Provident Fund

The substitution effect of public provident fund for national savings certificate is shown in the negative and significant coefficient of PPF rate. NSC is also significantly affected by its own rate with a degree responsiveness of 0.063. There is also significant adjustment to the desired level, which is shown by the positive and significant elasticity of the lagged dependent variable. However personal disposable income has a negative and insignificant impact on it. In case of provident fund, the impact of its own interest rate is very small at 0.007 though significant. However neither the income nor the lagged

dependent variable significantly affects the holding of provident fund. The regression analysis for the public provident fund does not give satisfactory results with the negative and significant impact of its own interest rate. The responsiveness of public provident fund to income is however very high and significant at 1.69. It does not have a good statistical fit, as the R^2 is very low at 0.20. But the above results vindicate the arguments going on in the present day academic discussions that savings are getting substituted for the provident fund as that provides major tax benefits along with offering high interest rates.

7.4 Impact of Wages on Provident Fund

In India investment in provident fund is done by the salaried class and it is compulsory in nature. There fore it is important to examine the impact of wages on the investment in provident fund. The results of the demand function for provident fund reported in Table 6 shows that wage has a very high positive and significant impact on it with a responsiveness of 0.73 where as its own interest rate has a lower though significant impact on it. The demand function also shows a good statistical fit as indicated by the adjusted R^2 of 0.65.

The same analysis was also carried out for the public provident fund. The results are reported in the same **Table 6**. The results from this analysis are also not satisfactory as in case of the results of public provident fund in **Table 5**. The impact of wages is not significant as well as its own interest rate.

7.5: Model Performance

For further analysis, the comparative statistical properties of the model represented in equation 6 are illustrated in table 6. It shows the impact of the independent variables separately as well as the estimated value of the dependent variable. The actual value of the dependent variable is also presented for comparing it with the estimated value. The mean and variance of provident fund for both of its estimated and actual value for the whole period indicates that the mean remains same where as the variance of the estimated value is lower than that of the actual value. Similar results are also obtained for public provident fund. However to examine the impact of the liberalisation on the

portfolio behaviour, the statistical properties for both the pre liberalisation and post liberalisation period are also analysed in the same table 6. As indicated from the table it can be seen that there is little or no change in the statistical properties of the variables.

The accuracy with which the model generates the forecasts constitutes its real strength. Since in case of (public) provident fund both the models provide satisfactory results, the root mean square error (RMSE) criterion has been invoked to decide on the relative merits of each model. The RMSE for any model is defined as

$$RMSE = \left[\frac{1}{N} \sum_{j=1}^{N} e(t)^2 \right]^{\frac{1}{2}}$$

Where e (t) is the forecast error at time t for the concerned model and N is the total number of periods over which the forecasts are being compared.

An estimation of equation 6 for results in RMSE of 0.058 and 0.086 for provident fund and public provident fund respectively. Similarly the estimation of equation 7 provides RMSE of 0.047 and 0.1 for provident and public provident fund respectively. This shows that in case of provident fund the equation seven which estimates the regression by taking the interest rate into account out performs the model 6 which uses change in interest rate as independent variable. However in case of public provident fund equation 6 out performs the equation 7. But the results indicate that the models fit better to the provident fund data than to the public provident fund.

Table 4: Substitutability of the Assets with change in Interest Rates

Deposit →	DLOG (BCD)	DLOG (BTD)	DLOG (BSD)	DLOG (POTD)	DLOG (POSD)	DLOG (NSC)	DLOG (PPF)	DLOG (PF)
Intercept	0.07*** (1.81)	0.07* (2.63)	0.02 (1.03)	-0.1 (1.7)	0.003 (0.99)	0.005 (0.13)	0.21* (3.73)	0.004 (0.23)
ΔBTDR		0.001 (0.034)						
ΔBSDR			0.009 (0.62)					
ΔPOTDR				0.03 (1.4)				
ΔPOSDR					-0.013 (0.42)			
ΔNSCR						-0.02 (0.84)		
ΔPPFR		0.003 (0.31)	-0.006 (0.45)	-0.03 (1.33)	0.03 (0.90)	0.02 (0.98)	0.007* (2.91)	0.003** (2.02)
Inflation	-0.01** (2.03)							
DLog(BTD) $_{-1}$		-0.17 (0.88)						
DLog(BSD) $_{-1}$			0.29*** (1.82)					
DLog(POTD) $_{-1}$				0.76* (8.92)				
DLog(POSD) $_{-1}$					-0.65* (4.58)			
DLog(NSC) $_{-1}$						0.55* (4.76)		
DLog (PPF) $_{-1}$							0.10 (0.63)	
DLog (PF) $_{-1}$								-0.21 (1.17)
DL(PDI)	0.70 (1.62)	0.74** (2.02)	0.76** (2.39)	0.47 (0.76)	-0.33 (0.58)	0.52 (0.79)	1.08** (2.10)	1.12* (3.20)
Trend				0.004*** (1.74)			-0.004** (2.35)	
R^2	0.27	0.16	0.31	0.73	0.48	0.44	0.39	0.37
DW	2.30	1.71	1.96	1.9	2.22	1.36	1.78	1.66

Note: *, **, *** **represent the level of significance at 1%,5% and 10% respectively.**

Notations: Bank Current Deposits (BCD), Bank Time Deposits (BTD), Bank Saving Deposits (BSD), Post Office Saving Deposits (POSD), Post Office Time Deposits (POTD), Public Provident Fund (PPF), National Saving Certificates (NSC) and Real Personal Disposable Income (PDI). All the respective real interest rates are noted as BTDR, BSDR, POTDR, POSDR, PPFR and NSCR.

Table 5: Substitutability of the Assets

Deposit →	DLOG (BCD)	DLOG (BTD)	DLOG (BSD)	DLOG (POTD)	DLOG (POSD)	DLOG (NSC)	DLOG (PPF)	DLOG (PF)
Intercept	0.07*** (1.81)	0.056** (2.39)	0.13* (5.21)	-0.23* (2.92)	0.15* (2.80)	0.012 (0.45)	0.12** (2.64)	0.02 (1.23)
BTDR		0.018* (2.50)						
BSDR			0.02* (5.42)					
POTDR				0.047* (2.97)				
POSDR					0.028* (2.79)			
NSCR						0.063* (4.69)		
PPFR		-0.01*** (1.88)	-0.01* (3.99)	-0.04* (2.59)	-0.007 (0.82)	-0.05* (3.97)	-0.004 (1.10)	0.007* (4.42)
Inflation	-0.01** (2.03)							
DLog(BTD) $_{-1}$		0.01 (0.002)						
DLog(BSD) $_{-1}$			0.20*** (1.88)					
DLog(POTD) $_{-1}$				0.74* (9.74)				
DLog(POSD) $_{-1}$					-0.45* (3.5)			
DLog(NSC) $_{-1}$						0.45* (5.16)		
DLog (PPF) $_{-1}$							0.03 (0.13)	
DLog (PF) $_{-1}$								-0.05 (0.39)
DL(PDI)	0.70 (1.62)	0.43 (1.09)	0.48*** (1.91)	0.27 (0.45)	-1.45** (2.33)	-0.30 (0.60)	1.69** (2.15)	0.42 (1.26)
Trend				0.01* (2.74)				
R^2	0.27	0.28	0.67	0.79	0.51	0.72	0.20	0.58
DW	2.30	2.04	2.45	2.36	2.62	1.79	2.03	1.77

Note: *, **, * represent the level of significance at 1%,5% and 10% respectively.**

Table 6: Impact of wages on Provident Fund

Deposits	Dlog(PF)	DLog (PPF)
Intercept	-0.01 (-0.45)	0.28* (3.34)
PPFR	0.007* (4.82)	0.006 (1.55)
$DLog(PF)_{-1}$	-0.04 (-0.28)	
$DLog(PPF)_{-1}$		0.2 (1.03)
DLog(Wages)	0.73* (2.57)	-0.5 (-0.71)
AR(1)	0.37*** (1.76)	
Trend		-0.005** (-2.09)
R^2	0.65	0.20
DW	1.75	2.05

Note: $^{*, **, ***}$ **represent the level of significance at 1%,5% and 10% respectively.**

Source: Data on Wages (Compensation to Employees) collected from National Accounts Statistics (various Studies)

Table 7: Contributions to PF and PPF

	Contributions to PF					Contributions to PPF					
Year	*Interest*	*Income*	*lagged*	*Estimated DLPF*	*Actual DLPF*	*Interest*	*Income*	*lagged*	*Trend*	*Estimated DLPPF*	*Actual DLPPF*
1971-72	0.00	0.03		0.03	0.07	0.21	0.03		-0.01	0.23	0.35
1972-73	-0.01	0.03	-0.01	0.01	0.03	0.18	0.03	0.04	-0.01	0.23	0.31
1973-74	-0.03	0.02	-0.01	-0.01	-0.12	0.14	0.02	0.03	-0.02	0.18	0.19
1974-75	-0.01	-0.10	0.03	-0.08	-0.14	0.18	-0.09	0.02	-0.02	0.08	-0.04
1975-76	0.08	0.09	0.03	0.20	0.22	0.39	0.08	0.00	-0.02	0.45	0.35
1976-77	-0.01	0.12	-0.05	0.06	0.15	0.19	0.11	0.04	-0.03	0.31	0.53
1977-78	0.00	0.08	-0.03	0.05	0.02	0.21	0.08	0.05	-0.03	0.30	0.24
1978-79	0.02	0.05	0.00	0.07	0.10	0.25	0.05	0.02	-0.04	0.29	0.25
1979-80	-0.05	0.00	-0.02	-0.07	0.03	0.09	0.00	0.02	-0.04	0.08	0.54
1980-81	0.00	0.12	-0.01	0.11	-0.03	0.21	0.11	0.05	-0.04	0.33	0.18
1981-82	0.03	0.03	0.01	0.06	-0.04	0.28	0.03	0.02	-0.05	0.27	0.16
1982-83	0.02	0.03	0.01	0.05	0.05	0.24	0.02	0.02	-0.05	0.23	0.18
1983-84	0.00	0.07	-0.01	0.06	-0.04	0.20	0.07	0.02	-0.06	0.23	0.22
1984-85	0.01	0.05	0.01	0.07	0.03	0.22	0.05	0.02	-0.06	0.24	0.11
1985-86	0.02	0.04	-0.01	0.05	0.04	0.24	0.04	0.01	-0.06	0.23	0.06
1986-87	0.00	0.03	-0.01	0.02	0.09	0.20	0.03	0.01	-0.07	0.17	0.11
1987-88	0.00	0.05	-0.02	0.03	0.08	0.19	0.05	0.01	-0.07	0.18	0.23
1988-89	0.01	0.09	-0.02	0.08	0.07	0.21	0.09	0.02	-0.08	0.25	0.21
1989-90	0.00	0.09	-0.01	0.08	0.10	0.21	0.09	0.02	-0.08	0.24	0.31
1990-91	0.00	0.06	-0.02	0.03	0.04	0.19	0.06	0.03	-0.08	0.19	0.22
1991-92	-0.01	0.01	-0.01	-0.01	0.01	0.19	0.01	0.02	-0.09	0.13	0.17
1992-93	0.01	0.06	0.00	0.08	0.06	0.24	0.06	0.02	-0.09	0.22	0.21
1993-94	0.01	0.08	-0.01	0.08	0.07	0.22	0.08	0.02	-0.10	0.23	0.25
1994-95	-0.01	0.08	-0.01	0.05	0.04	0.18	0.07	0.02	-0.10	0.18	0.17
1995-96	0.02	0.03	-0.01	0.04	0.04	0.24	0.03	0.02	-0.10	0.19	0.16
1996-97	0.01	0.09	-0.01	0.10	0.03	0.23	0.09	0.02	-0.11	0.23	0.14
1997-98	0.00	0.04	-0.01	0.04	0.13	0.21	0.04	0.01	-0.11	0.15	0.17
1998-99	0.00	0.03	-0.03	0.01	0.03	0.20	0.03	0.02	-0.12	0.13	0.07
1999-00	0.01	0.07	-0.01	0.08	0.22	0.23	0.07	0.01	-0.12	0.19	0.02
2000-01	-0.01	0.08	-0.05	0.02	0.09	0.18	0.07	0.00	-0.12	0.13	0.24
2001-02	0.01	0.06	-0.02	0.05	0.05	0.22	0.06	0.02	-0.13	0.18	0.22
2002-03	0.00	0.03	-0.01	0.02	0.06	0.21	0.03	0.02	-0.13	0.13	0.13
Average(1970-2002)	**0.00**	**0.05**	**-0.01**	**0.05**	**0.05**	**0.21**	**0.05**	**0.02**	**-0.07**	**0.21**	**0.21**
Variance(1970-2002)	**0.0004**	**0.0016**	**0.0003**	**0.0025**	**0.0055**	**0.0023**	**0.0015**	**0.0002**	**0.0014**	**0.0057**	**0.0147**
Average (1992-2002)	**0.01**	**0.06**	**-0.01**	**0.05**	**0.07**	**0.21**	**0.06**	**0.02**	**-0.11**	**0.18**	**0.16**
Variance(1992-2002)	**0.0001**	**0.0005**	**0.0002**	**0.0008**	**0.0030**	**0.0005**	**0.0004**	**0.0000**	**0.0002**	**0.0015**	**0.0049**
Average (1971-1991)	**0.00**	**0.05**	**-0.01**	**0.04**	**0.04**	**0.21**	**0.05**	**0.02**	**-0.05**	**0.23**	**0.23**
Variance(1971-1991)	**0.0006**	**0.0022**	**0.0003**	**0.0035**	**0.0065**	**0.0033**	**0.0020**	**0.0002**	**0.0006**	**0.0070**	**0.0186**
RMSE(Eq.6) =	**0.058**					**RMSE1 =**	**0.086**				
RMSE(Eq.7) =	**0.047**					**RMSE2 =**	**0.1**				

8. CONCLUDING REMARKS

Indian economy has undergone major financial reforms since 1991 and there have been considerable changes in the financial sector and interest rate structure of the economy. With the changes it was expected that the composition of the house hold sector financial saving will change through substitution of assets. This paper tried to find out such kind of substitution among the financial assets available to the household sector. An important feature, which emerges from the analysis, is that provident fund acts as a substitute for other saving assets. The provident fund offers higher return as well as tax concessions. And in some sense there is the element of compulsion as in the organised sector the employees have to invest in the provident fund. But the substitution elasticity of provident fund in all the cases is very small. This implies that despite the official claim, the interest rates are still controlled and there is hardly any variation in them. And therefore the change in interest is not fully able to capture the substitutability effect. The study also found income and own interest rates as the important determinants of saving.

In the recent budget of 2005-06 there are some important changes in the income tax rules, which might further affect the structure of household saving. However it will take some time to realise its impact and hence analyse. Therefore the present study does not try to analyse the possible impact of the budget announcements regarding tax. However, it may be mentioned that this is not an 'all-inclusive' study and the issue needs to be further investigated and analysed. In particular, the tax aspect of the savings needs to be incorporated and hence analysed.

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Table A 1: Structure of Interest Rates

Year	BTD	BSD	PF	NSC	POTD	POSD	PPF
1970-71	7	3.5	4	5.7	7.2	4	5
1971-72	6.5	4	4	5.7	7.2	4	5
1972-73	6.5	4	4	5.9	7.1	4	5
1973-74	7	4	4	5.9	7.2	4	5
1974-75	9	5	5	7.6	9.7	5	5
1975-76	9	5	5	7.6	9.7	5	5
1976-77	9	5	5	7.9	9.7	5	5
1977-78	8	5	7.5	8.1	9.8	5	7.5
1978-79	7.5	4.5	7.5	8.6	10.3	5	7.5
1979-80	8.5	5	7.5	9.5	10.4	5.5	7.5
1980-81	10	5	8	9.8	10.4	5.5	8
1981-82	10	5	8.5	10	10.4	5.5	8.5
1982-83	10	5	8.5	10.7	11.4	5.5	8.5
1983-84	10	5	9	11	11.4	5.5	9
1984-85	10	5	10	11.3	11.4	5.5	10
1985-86	10	5	12	11.5	11.5	5.5	12
1986-87	10	5	12	11.7	11.5	5.5	12
1987-88	10	5	12	11.1	11	5.5	12
1988-89	10	5	12	10.9	10.9	5.5	12
1989-90	10	5	12	11	10.9	5.5	12
1990-91	11	5	12	11	10.9	5.5	12
1991-92	13	6	12	11.2	11.2	5.5	12
1992-93	11	6	12	11.3	13.2	5.5	12
1993-94	10	5	12	11.5	12	5.5	12
1994-95	11	5	12	9.4	11.9	5.5	12
1995-96	13	4.5	12	12	11.9	5.5	12
1996-97	13	4.5	12	12	12.1	5.55.5	12
1997-98	12	4.5	12	12	12.1	5.5	12
1998-99	11.5	4.5	12	12	12	5.5	12
1999-00	10.5	4.5	12	12	11.9	5.5	12
2000-01	10	4	11	11.5	10.8	4.5	11
2001-02	8.5	4	9.5	9.5	8.4	3.5	9.5
2002-03	6.25	4	9.5	9	7.9	3.5	9

Source: Hand Book of Statistics on Indian Economy and Report on Currency and Finances (Various Issues)

Table A 2: Unit root test results for variables (1970-2002)

Variables	On Levels		On log Difference	
	ADF	**PP**	**ADF**	**PP**
BCD	-2.00	-2.18	-3.27***	-6.78*
BSD	0.21	0.83	-3.79**	-3.80**
BTD	2.52	3.14	4.27**	5.09*
POTD	-2.33	-1.91	-2.78	-3.3***
POSD	-2.71	-2.25	5.9*	5.34*
PF	0.54	0.97	-4.75*	-4.89*
PPF	2.20	1.41	4.98*	4.62*
NSC	-1.751	-1.784	-2.607	-4.609*
BSDR	-4.697*	-3.88**		
BTDR	-4.496*	-3.745**		
POTDR	-4.536*	-3.772**		
POSDR	-4.603*	-3.862**		
NSCR	-4.435*	-3.74**		
PPFR	-4.307*	-3.738**		
INFLATION	-4.75*	-4.05**		
PDI	0.087	0.892	-4.867*	-5.489*

Note:
The unit root test regressions include the intercept and trend.
***, ** and *** indicates that unit root is rejected at 1%, 5% and 10% respectively.**

Table A 3: Correlation of Interest Rates

Interest Rates	POSDR	BSDR	POTDR	BTDR	NSCR	PPFR
POSDR	1	0.99	0.98	0.97	0.97	0.93
BSDR	0.99	1	0.97	0.96	0.96	0.92
POTDR	0.98	0.97	1	0.99	0.99	0.96
BTDR	0.97	0.96	0.99	1	0.98	0.96
NSCR	0.97	0.96	0.99	0.98	1	0.98
PPFR	0.93	0.92	0.96	0.96	0.98	1

Figure A1: Variation in Mean and CV of POCD

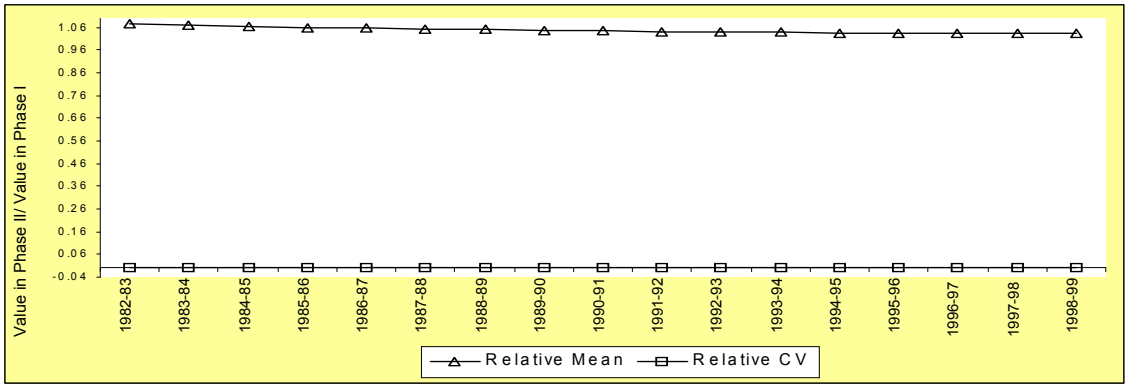

Figure A2: Variation in of Mean and CV of PORD

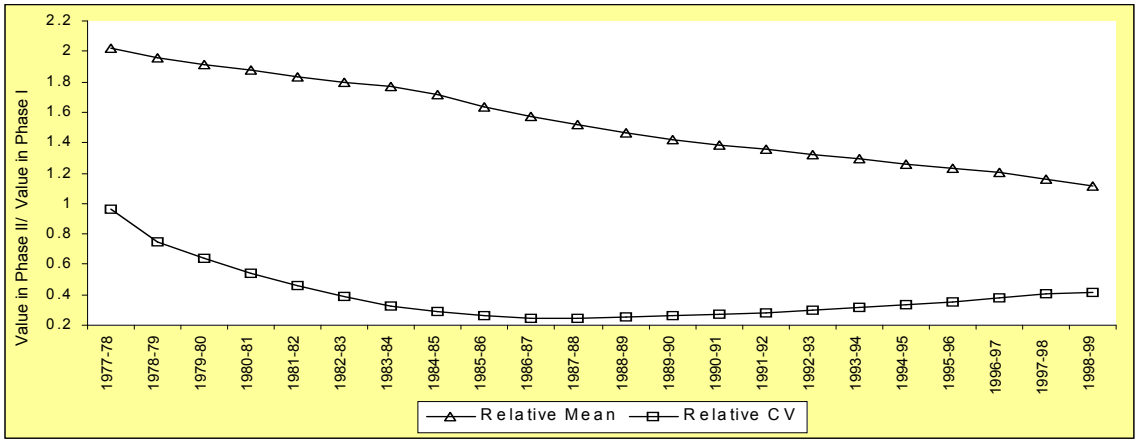

Figure A3: Variation in Mean and CV of PPF