# MOTIVES FOR SAVINGS

# AND PORTFOLIO CHOICE:

# EVIDENCE FROM MICRO-DATA FOR JAPAN

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by

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The undersigned, appointed by the Dean of the Graduate School, have examined the dissertation entitled

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# MOTIVES FOR SAVINGS AND PORTFOLIO CHOICE:

# EVIDENCE FROM MICRO-DATA FOR JAPAN

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## ABSTRACT

This study investigates the effects of income risk and liquidity constraints on household portfolio choice and saving behavior using Japanese household-level data (POSFAL) from 1989 to 2003.  An integrated analysis for three aspects of saving and overall analysis for whole portfolio structure, introduced in this study, provide following results and implications for saving and portfolio behavior in Japan.

First, a factor entailing precautionary saving does not necessarily accompany a precautionary portfolio. Precautionary saving sensitively responds to income risk and liquidity constraints. But portfolio response takes some time for adjustment.  Second, a household with higher precautionary saving motives apparently holds a smaller share of risky assets, a larger share of liquid safe assets and has a lower saving rate.  This suggests that other sources of risk like unemployment and health risk affect savings and portfolio choice greatly.  Third, each financial market has a specific dominant factor and there is a trade-off relationship between portfolios by explanatory variables.

These results shed light on the explanation of the 1990's in Japan. Increasing income risk and expected liquidity constraints raise the saving rate, but the deteriorating income circumstances dominated and decreased the overall saving rate. Fundamental uncertainty like unemployment risk decrease the share of risky assets and increase the share of liquid assets.  Expanded liquid assets contribute to the low interest rates trend.

# Chapter 1.

# Introduction and Motivation

*Four Stylized Facts on the Japanese Economy*

From what is called "the lost 10 years," the Japanese economy presented

distinguishing stylized facts from other developed countries' economies in the 1990's. As

seen in Figure 1-1 (a) through (j), four stylized facts can be observed.  First, a long

economic recession accompanying deflation and high unemployment, which the Japanese

economy had never experienced.  The real Gross Domestic Product (GDP) growth rate

stagnated at 0~1% in the 1990's except for a temporary recovery in 1996. The economy

fell into deflation after 1995 in GDP deflator base and after 1999 in Consumer Price

Index (CPI) base.  The unemployment rate soared from 2% in 1991 to 5.2% in 2003.

Second, a decreasing trend in both short term and long term interest rates.  From 1999,

the Japanese economy experienced low interest rates, at approximately zero percent.

Third, an asset market bubble burst, leading to a long downturn in the asset market.

Stock and land prices have fallen to one-third of their peak values.[1]  Fourth, a declining

trend in the household saving rate and notable change in the household portfolio for

financial assets – a smaller share of risky assets is substituted by a larger share of liquid

safe assets.[2]

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[1] Stock price were restored temporarily in 1999 with a world wide Information Technology (IT) boom.

[2] Aggregate saving rate has remained relatively higher level during 1998-1999, when the economy is suffering from most serious recession

<Figure 1-1> Macro Economic Indicator in Japan During1985-2003

(a) GDP Growth Rate (%)
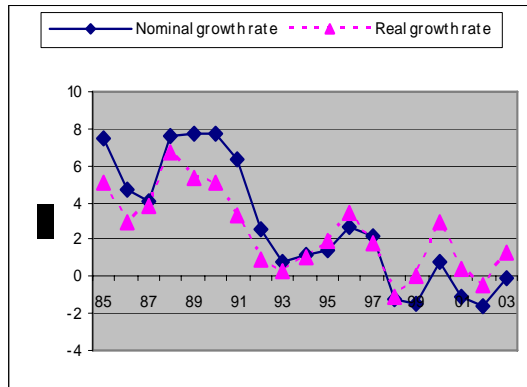
(b) Inflation Rate (%)
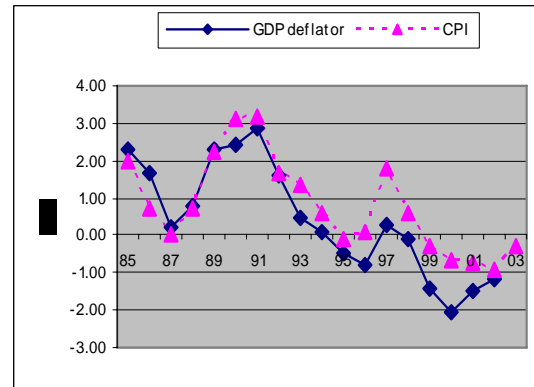




Source: Economic and Social Research Institute (ESRI), Japan

(c) Unemployment Rate (%)
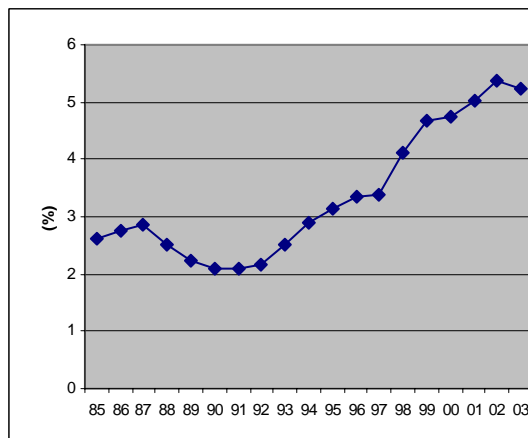
(d) Short-term Interest Rate (%)





Source: Econstats
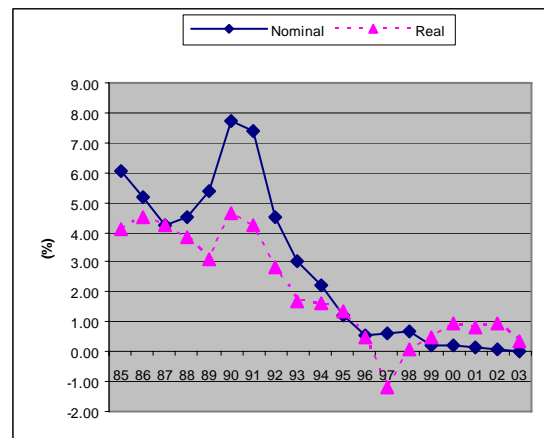
Source: Bank of Japan, 60-89 days money
market rate, weekly average over year

(e) Long-term Interest Rate (%)
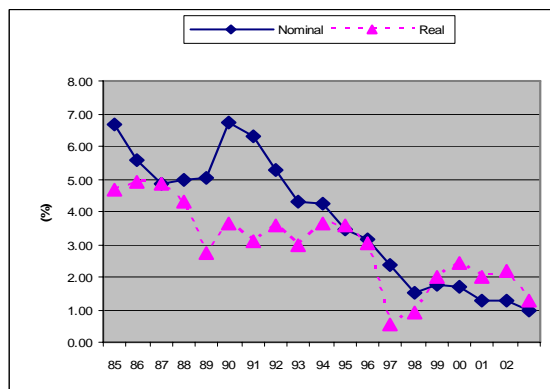
(f) Exchange Rate (yen/$)





Source: Bank of Japan, 10 year government bond
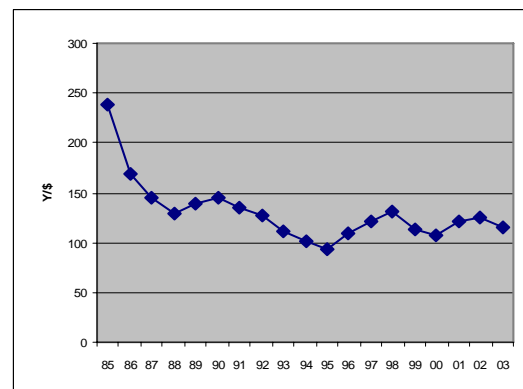
Source: Bank of Japan (BOJ)

2

(g) Stock Price Index(Nikkei 225, 1968=100)  (h) Urban Land Price Index (2000=100)
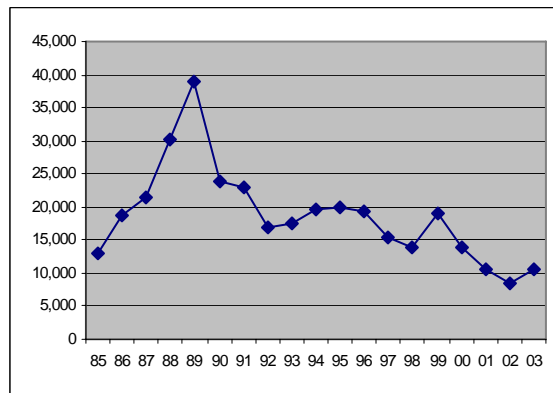


Source: Statistics Bureau, Japan
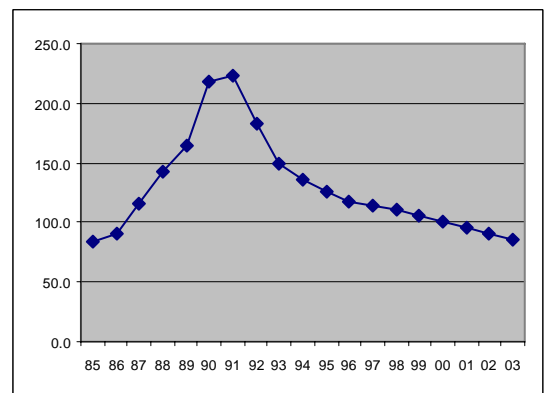


Source: Statistics Bureau, Japan
6 major cities, residential area

(i) Household Saving Rate
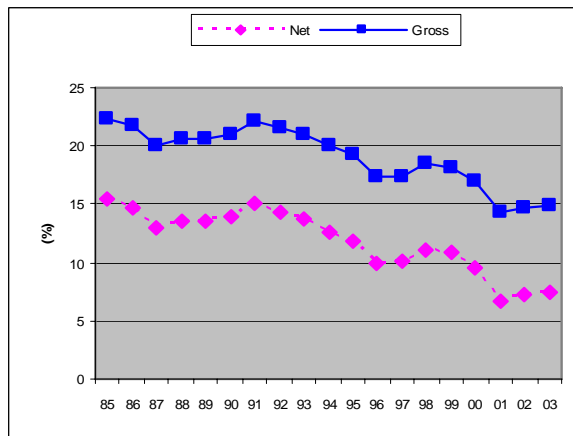


Source: ESRI, Japan

(j) Household's Portfolio Share over
Total Financial Assets
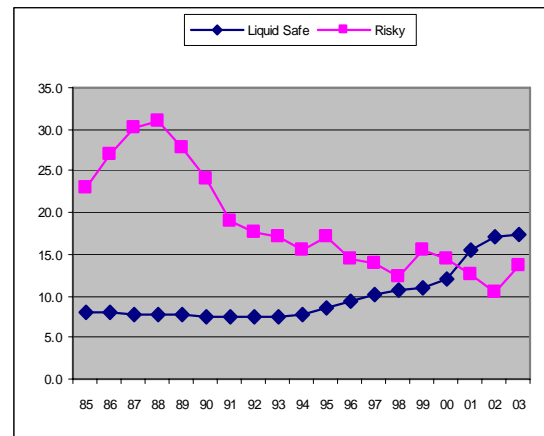


Source: BOJ, Flow of Funds Account
Liquid Safe Assets: Cash and Deposits at
Checkable accounts
Risky Assets: Bonds, Equities, Investment Trusts
and Foreign currency deposits

*Three Questions*

The fourth stylized fact initiates 3 questions: First, why does the Japanese household

saving rate begin a long decreasing trend in the 1990's differently from other times in the

Japanese economy?  Second, why does the share of risky assets of Japanese households

fall and the share of liquid safe assets rise in the 1990's differently from the international

standard trend of developed countries?  Third, what is the impact on Japanese economy

from the above unique change in saving and financial portfolio structure?  Household

saving behavior affects the business environment greatly through consumption

expenditure and it also dominates the effectiveness of a policy.  In addition, the structure

of household portfolios influences an economy broadly through a shock on the structure

of the financial market.

*Two Hypotheses*

According to economic theory, two hypotheses are possible in finding the answer for

the above saving and portfolio questions in Japan.   One possible hypothesis is life cycle

theory, based upon the high and rapid aging society of Japan.[3]   Life cycle theory

(Modigliani and Brumberg, 1954; Horioka, 2006) predicts people save more in middle

age and dissave in old age after retirement.  Concerning portfolio choices of households,

some researchers emphasize the age effect.  Bodie et al (1992) argue that the young enjoy

holding more risky assets than the old since the young have flexibility in labor supply.

King and Leape (1987) assert share of risky assets are positively related with age through

learning effects over age.  Another possible hypothesis to explain saving and portfolio

choice is income risk and liquidity constraints.  As seen in Figure 1-1, the deteriorating

economy in Japan in the 1990's may augment uncertainty for the future and liquidity

constraints.  Unavoidable income risk induces households to raise precautionary saving

(Leland, 1968; Sandmo, 1970) and to avoid avoidable risk (a rate of return risk) −that is,

to reduce holding risky assets (Kimball, 1993).  Liquidity constraints also make

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[3] The elderly ratio (the percentage of persons over 65) in Japan has been increasing rapidly from 12.1%
(1990), 17.3% (2000) to 25% (2005 estimation)

households increase precautionary saving (Zeldes, 1989), and to hold safer and more liquid assets (Paxson, 1990).

*Distinctive Features and Some Contributions*

Between the two possible hypotheses above, the hypothesis using income risk and liquidity constraints is the focus in this paper because it can be used to analyze and offer good insight of individual's behavior in detail. However, an analysis based on life cycle theory can be examined to test the validity of the theory and to extend the understanding of an individual's behavior. Guiso et al (1996) presented the seminal empirical paper about effects on household portfolio choice of income risk and liquidity constraints using Italian micro data. Guiso et al's paper (1996) will be a benchmark in testing the effects of income risk and liquidity constraint for the Japanese case in this paper. This paper has the following distinctive features distinguishing itself from other previous studies by extending Guiso et al's model (1996):

(1) An integrated analysis for both saving and portfolio choice.
An individual's saving behavior is constituted from three aspects. That is, "Why people save," "How much people save," and "How people save". "Why people save" is a question about the motives for saving. "How much people save" is about the decision between saving and consumption over income. "How people save" is about portfolio choice among financial products. So far, however, most studies on saving and portfolio choice have been conducted for only one aspect. Some focus on "how much people save," while others focus on portfolio choice, and some focus on saving motives. This segmentation seems to arise from a limitation of data available. Fortunately, the data

used in this paper includes rich information on motives for saving, amount of saving, and a detailed composition of financial assets. And thus an integrated analysis will be explored in this paper.

(2) An overall analysis for portfolio structure as a whole

Most previous portfolio studies use a single criterion for the classification of financial assets, such as "risky" or "safe" assets. But along with risk, liquidity is another important criterion for choosing financial assets. So four-classifications comprising all type of financial assets are introduced in this paper; risky assets, liquid safe assets, fairly safe assets, and illiquid safe assets. This classification enables an analysis of the entire structure of the financial market with more depth and diversity.

(3) A unique measure of both income risk and liquidity constraints

Finding appropriate measures of income risk and liquidity constraints is the most critical issue for empirical studies (Guiso et al, 1996; Browning and Lusardi, 1996). "Income variance" is newly employed as a proxy for income risk in this paper, which is drawing from the relationship between current income direction and future income prospects. As for measure of liquidity constraint, some proxies are examined such as information about reasons for current consumption variation, consumption volatility spreading current to future, and borrowing status. The strong point of this measure lies in using each household's own detailed information reported in the data.[4]

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[4] Due to the limitation of available data, another source of data is sometimes used for the measure of income risk and liquidity constraints in some previous studies. Guiso et al(1996) use 1986 data to test of 1989 data. Nagagawa (1999) and Doi (2004) use macro data to test micro data.

*Structure of this paper and Conclusions*

The paper is constructed as follows: In Chapter 2, the theoretical and empirical related literatures are reviewed. Issues on income risk and the liquidity constraint, and empirical studies on the Japanese case are emphasized. Chapter 3 describes the data. Definitions of important variables, summary statistics, and selected data set for empirical tests are mentioned. Chapter 4 studies saving motives. First, life cycle theory in Japan is tested through the income-consumption profile procedure. Second, saving motives are investigated. Various aspects for saving motives are examined. In Chapter 5, portfolio choices of Japanese households are presented. First, characteristics and categorization of thirteen financial products in Japan are described. Second, the picture of portfolio in Japan is presented through analysis of the trend, participation and diversification. Third, portfolio distribution is examined through the age-portfolio profile and wealth-portfolio profile. In Chapter 6, the model and methodology for empirical tests, measure of income risk and liquidity constraints, and test results are reported. Chapter 7 summarizes and concludes.

Empirical test results using Japanese POSFAL data[5] suggest increasing income risk and expected liquidity constraints cause the saving rate to rise, but deteriorating income circumstances dominate to decrease the saving rate overall. Precautionary motives for saving, reflecting other fundamental uncertainty like unemployment risk, cause the share of risky assets to decrease and the share of liquid assets to increase. The expanded liquid assets seems to sustain low interest rates in the 1990's for Japan.

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[5] Public Opinion Survey on Financial Assets and Liabilities conducted by Central Council for Financial Service Information during 1989-2003.

# Chapter 2.

# Related Literature Review

The theoretical and empirical issues over households' saving behavior and portfolio selection are reviewed. Depending on the difference of emphasizing point, a number of saving and portfolio theories can be roughly classified into two types and they are competing. One is a life cycle theory emphasizing on the effects of age over life time, the other is a theory of precautionary saving and portfolio focusing on effects of income risk and liquidity constraints. Issues on income risk and the liquidity constraints are focused in this paper.

## 2.1. Issues on Determinant of Saving

### 2.1.1. Review of General Theoretical and Empirical Issues

Largely there are two steams for issues on saving. One is whether consumption is smoothed over one's lifetime or not. The other is whether precautionary demand for saving exists under income risk or liquidity constraints, and if it exists, how it can be captured and how much the magnitude is.

Since permanent income hypothesis by Friedman (1957) and life cycle income hypothesis by Modigliani and Brumberg (1954) emerged in the 1950s, it has been much debated whether people smooth their consumption within their lifetime or across generations. However, it was difficult work to apply these life-cycle views to the empirical analysis until Robert Hall's seminal paper appeared in 1978. The difficulties

lay mainly in how to observe a household's wealth and how to model a household's

expectations. Hall (1978) introduced a new method in studying consumption by setting a

first order condition, which is called the "Euler equation approach." This shows that

representative consumers optimize their consumption and saving under intertemporal

budget constraints with fully rational and forward-looking vision. Therefore, after 1978,

consumption studies could be performed using only observations for consumption in two

periods, the interest rate, and demographics. But the problem still exists for incorporating

such rational behavior into an econometric method. Campbell and Mankiw (1989)

developed Hall's methodology assuming that two groups of economic agents existed in

the economy. They examined whether the permanent income hypothesis is valid. The

model they used is $\Delta C_t = \Delta C_{1t} + \Delta C_{2t} = \lambda \Delta Y_t + (1-\lambda)\varepsilon_t$. Here, $\Delta C_t$ is change in aggregate

consumption of group 1 and Group 2. $\lambda$ is a fraction of individuals who consume current

income and $\varepsilon_t$ is rational forecast error, an innovation in permanent income. Campbell

and Mankiw thus show that consumption is more sensitive to current income than the

permanent income using quarterly time series aggregate data from 1953 to 1986 in the

U.S. Carroll and Summers (1989) present similar results to Campbell and Mankiw's by

using both macro-level and micro-level data. Carroll and Summers assert that if the

Permanent Income Hypothesis is held, the expected rate of growth of income should be

closely related to rate of interest and should not be related to the growth of consumption.

First, Carroll and Summers use an OECD aggregate data set across countries and find

that rates of income growth and those of consumption growth move together almost

equally contrary to the prediction of permanent income theory. Second, they analyze

micro-level data in U.S. Consumer Expenditure Surveys (CES) of 1960-1961 and 1972-

1973. Carroll and Summers find that the paths of income and consumption are very similar by graphing income and consumption profiles against age group for different education and occupation groups. These results also deviate from the prediction of the consumption smoothing hypothesis. They refer to this as "consumption and income parallel." They conclude "consumption smoothing takes place over periods of several years not several decades" and they suggest more intensive studies should be done on liquidity constraint and short-run precautionary saving as a determinant of consumption behavior. This paper will apply the Carroll and Summers micro analysis to Japanese data and compare each result later. Attanasio and Browning (1995) assert that the rejection of permanent income hypothesis in the Campbell & Mankiw model is attributed to aggregation bias and insufficient consideration about the demographic factor affecting consumption. They argue that estimates using the structural model derived from aggregate time series data are likely to be very misleading since the model draws inference of micro-behavior from aggregate data. The model they use under assumption of restricted quadratic preference is $\Delta Ln(C_{t+1})=$ constant $+ \beta'Z_{j+1} + \gamma'\Delta[(Z_{t+1}$ $Ln(C_{t+1})] + \eta\Delta[ Ln(C_{t+1})]^2 + \sigma r_{t+1} + \varepsilon_{t+1}$. Here, Z is the vector of household characteristics and $r_{t+1}$ is the real interest rate. They use cross sectional data on 44,334 households between 1970 and 1986 from the Family Expenditure Survey in U.K and estimate the above model with generalized methods of moment (GMM). They present a high correlation between consumption and income would disappear when they control for the change in family composition such as number of family size and children.

The other stream of research is the effects on saving of income uncertainty and liquidity constraints. Leland (1968) demonstrates that precautionary saving is positive

with the uncertainty of future income if the utility function is additive and decreasing risk aversion in the period model. Sandmo (1970) distinguish two types of saving from two types of risk; income risk and capital risk. Accumulated saving from income risk plays a role as a buffer that guarantees to keep future consumption with in a minimum level. However, saving from capital risk has a different role: a dollar's worth of present saving does not guarantee a certain increase of future consumption due to the possibility of losing it. Sandmo (1970) present that "increased uncertainty about future income increases saving" (income effect) under decreasing risk aversion and increased capital risk decreases saving (substitution effect) under risk aversion. Total effects depend on the magnitude of these two effects. His intuitive interpretation is that higher riskiness makes the consumer save more to protect oneself against a low level of future consumption. Sandmo (1970) also specifies the different saving behavior between salary earners and self-employed persons or farmers, who have more variable income. He expects the self-employed group save more than the group with a relatively safer job. Zeldes (1989) also illustrate that a more risky income stream leads to lower consumption levels. And Zeldes (1989) have known that liquidity constraints can induce precautionary saving even by consumers with quadratic utility functions which present no inherent precautionary saving motive.

Browning and Lusardi (1996) survey the previous literature and demonstrate a relationship clearly among life-cycle type of saving, precautionary type of saving, and saving under a liquidity constraint. They assert that life-cycle saving and precautionary saving can be integrated in "a standard consumption model" which allows for households to keep the marginal utility of consumption constant over time with rational expectations.

So "smoothing of consumption" is basically the same principle for both the short-run

(business cycle) and the long-run (life-cycle) allocation. Browning and Lusardi clarify

that the intrinsic difference between life-cycle and precautionary saving originates from

the consumer's utility function assumed in a model. If quadratic utility function is

employed, which implies a perfect certainty situation, then the precautionary saving is

excluded.[6] For precautionary saving, non-quadratic preferences should be included.[7] In

other words, precautionary saving entails uncertainty. They present another model to

capture liquidity constraint since this "standard consumption model" assumes perfect

capital markets, and they point out the two difficulties which the researcher faces with

empirical studies: one is distinguishing precautionary saving from the effects of a

liquidity constraint, the other is measuring exogenous risks. They discuss the good

measure of individual uncertainty which is necessary for capturing precautionary saving

and illustrate their survey results as below.

| Authors (Data set) | Dependent Variables | Measure of Risk | Main Finding |
|---|---|---|---|
| Skinner('88, JME) (CES) | Saving rate | Occupation dummies | No evidence of precautionary motive |
| Guiso et al ('92, JME) (Italy, SHIW) | Wealth and consumption relative permanent income | Subjective earnings variance | Precautionary motive explains 2% of wealth accumulation |
| Carroll('94, QJE) (CES &PSID) | Consumption | Income Variance, equivalent precautionary premium | All measures of risk negatively related to consumption |
| Guiso et al ('96, AER) (Italy, SHIW) | Share of risky assets in the portfolio | Subjective earnings variance and health risk | Risk decreases the demand for risky assets |
| Carroll et al (95a, NBER) (PSID) | Log wealth | Income variance, equivalent precautionary premium | Precautionary motive explains about 40% of wealth accumulation |

Note: Partly quoted from Browning et al, '96, pp1836

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[6] They refer to the model with this assumption as "Certainty equivalence model (CEQ model)"

[7] They refer to the model with this assumption as "Standard Additive Model"

They suggest testing the significance of the non-quadratic model from the exact quadratic model since it is hard to find the characteristics of uncertainty which should be retained− that is, observable, significantly variable and exogenous.  Carroll and Kimball (2001) also discuss the issues on liquidity constraints and precautionary saving. Their main findings through theoretical analysis are that liquidity constraints intensify the precautionary motive, concavity in the consumption function induces this effect, and an additional liquidity constraint or uncertainty beyond the first one having a final effect by dominating the first effect coming from the former constraint.

**2.1.2. Review of Empirical Issues Concerning Japan**

Hayashi et al (1987) investigate the cause of a higher saving rate in Japanese households than those in the U.S.[8], and effects on savings and the housing purchase decision from different tax policies on interest payment[9] by the life-cycle simulation model.  They present simulation results showing that the difference in the income growth rate rather than that in the down payment system[10] for acquiring a house leads to a greater amount of the saving rate gap between these two countries and Japan's strong bequest motive under the given income growth rate is another factor to explain the saving rate gap between these two countries. Tax reforms which introduce deductibility of mortgage interest payments or exemption of interest income has a small impact on the

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[8] In 1988, the household net saving rate is 13.5% in Japan while it is 7.3% in the U.S(Source: OECD Economic Outlook 1978 database)

[9] Hayashi et al refer to this as "Most of the interest income of households are tax-exempt and interest payments of households are not tax deductible in Japan, while the opposite is true in the U.S"(1987, p1)

[10] A stylized fact Hayashi et al observed is that first, down payment ratio for the first-time buyer is 25% in the U.S and 35% in Japan in 1980s, second Japanese household is induced to save more early in the life cycle (20s or 30s) to fund a higher down payment requirement (1987, pp 9-13)

aggregate saving rate. Their findings suggest that the life-cycle theory is inappropriate for explaining the large gap in the saving rate between Japan and U.S.. Horioka and Watanabe (1997) explore the Japanese saving behavior uniquely by focusing on the saving motive. The data they use is the "Survey on the Financial Asset Choice of Households," conducted by Japanese Government in 1994 with 3,924 observations. The data specifies 12 saving motives and includes information on current wealth (financial assets), target wealth, and planned realization year. They estimate the contribution of each motive from the twelve motives to the overall household net savings[11]. They present two findings consistent with the prediction of the life-cycle model: First, age is the most powerful factor dominating saving motives. Second, retirement (62.5%) and precautionary motives (illness and peace of mind), all of which supports the life cycle model, are determinant motives. Their analysis is applied in this paper. Nakagawa (1999) suggests that a higher income risk causes the saving rate to increase in the 1990's in Japan as a precautionary saving motive and the evidence of life cycle hypothesis, which is indicative of a lower saving rate for the elderly[12], is not found in either the saving rate, or the wealth level of the elderly. He estimates the saving rate using the Probit model from 1998 POSHSC data[13] and shows that low income and elderly households tend to have a higher saving rate. He presents these two groups as exposed to

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[11] Net saving they defined here is gross saving minus dissaving. Gross saving = Saving in the form of the accumulation of financial asset + Saving in the form of loan repayment. Dissaving = Dissaving in the form of the decumulation of financial asset + Dissaving in the form of newly incurred debt + Dissaving in the form of the depreciation on owner-occupied housing

[12] Elderly is defined as those who are age 60 or over unless stated otherwise.

[13] It is abbreviation of Public Opinion Survey on Household Savings and Consumption (POSHSC) by the Central Council for Savings Information in Japan. The name of the survey is changed to Opinion Survey on Household Financial Assets and Liabilities (POSFAL) beginning in 2001.

the higher income risk during throughout the 1990's[14] from the Consumer's Behavior

Survey by the Economic Planning Agency.   Ogawa (2006) exhibits results unfavorable

to the life-cycle hypothesis.  He demonstrates that a rapidly declining saving rate in the

Japanese household during the 1990's is mainly attributed to the increase of liquidity-

constrained households.  Japan's large aging population is only a partial explanation for

the falling saving rate induced from the life cycle theory.  He constructs a model

consisting of two types of households; "life cycle type" following a smooth path of

consumption over a life time, and "liquidity constrained type" consuming current income

entirely.  He shows the proportion of the liquidity constrained ($\gamma$) has a negative

relationship with the aggregate saving rate and $\gamma$ has a significantly positive relationship

with unemployment.  He uses time series data from the 2004 National Account by

Cabinet Office and presents a simulation result that the household saving rate would have

increased by four percentage points in 2001 without the increase of liquidity constrained

motives in the 1990's. Horioka (2006) strongly supports the applicability of the life-cycle

hypothesis of saving in Japan.  He points out the life-cycle hypothesis predicts that "the

retired elderly" dissave, rather than "all elderly" dissave.  He asserts, however, that most

studies analyze the saving behavior of "all elderly," with only the distinction of elderly

living in extended families from elderly living in nuclear families[15] and that most studies

provide ambiguous or conflicting results for the life cycle theory.  He uses direct data

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[14] Nakagawa (1999) indicates that the risk perceived by low-income individuals (middle aged and elderly) is employment anxiety over possible job loss from restructuring and bankruptcy of the firm, but the risk perceived by young households is their pessimistic view about future pension benefits.

[15] Hayashi, Ando, and Ferris (1988) apply this analysis for the 1984 National Survey of Family Income and Expenditure (NSFIE) in Japan and find that the majority of elderly (as a head of household) living either in extended families or in nuclear families still save, and only the oldest elderly (those aged 80 or over) and the single elderly dissave.

which includes the saving rate of "retired elderly" households available from the 1995

Family Income and Expenditure Survey in Japan.  These data provide strong evidence for

the life-cycle theory in that the saving rate of retired elderly during the 1995-2002 period

is negative and high in absolute magnitude (from -4.0 to -20.4%).  Kitamura et al (2003)

conduct a descriptive investigation of saving behavior using NSFIE data during 1979,

1984, 1988 and 1994.  Their main finding shows inconsistent results for the life-cycle

hypothesis. They present that; (a) different income class more than the age profile as a

stronger factor in explaining variations in saving than age profile within the same income

class; (b) as income and wealth increases, richer households save at higher rates over the

age profile and richer elderly still save with significantly positive rates; (c) saving

behavior of younger households is more stable than that of elderly households.  Murata

(2003) examines the existence of precautionary saving using the 1996 Japanese Panel

Survey of Consumers (JPSC)[16] with 784 observations of young and middle aged women.

He measures uncertainty by subjective ways depending on the respondent's answer for

income prospects and future public pensions.  The results he suggests are mixed: public

pension uncertainty can explain one-third of financial wealth accumulation which

supports precautionary savings, however there is no evidence of a relationship between

household savings and uncertainty over labor earnings.

From above empirical studies, different results are primarily coming from sampling

problems (size, characteristics of sample) and measurement problems (definition of

dependent variables, measure of key explanatory variables like uncertainty and

borrowing constraints)

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[16] This survey is conducted by the Institute for Research on Household Economics (IRHE) from 1993. In 1993, JSPC covered 1,500 single and married women aged 24-34.

## 2.2. Issues on Portfolio Choice of Households

### 2.2.1. Review of Theoretical Issues

There are two theoretical issues on portfolio choice of households; risk and liquidity constraint effect and age effect. Dreze and Modigliani (1972) first studied about the effect of earning risk on consumption and portfolio choice. Their findings show that income risk, which is perfectly uninsurable, affects both the level of wealth (savings) and composition of the portfolio[17]. These results imply that the magnitude of wealth and its optimal portfolio may be chosen simultaneously. Kimball (1993) built a general framework to study the interaction between background risk and other undesirable risks. He demonstrates that if a utility function exhibits decreasing absolute risk aversion (DARA), then an increase in income risk (unavoidable risk) makes a household avoid rates of return risk (avoidable risk), hoping to reduce overall risk exposure even if both risks are statistically dependent. He calls this desire "temperance." Paxon (1990) examines how borrowing ceilings in the individual loan market affect the portfolio choice of consumers. She distinguishes two types of borrowing ceilings and their reverse effects; (a) exogenous borrowing ceilings, which are not affected by the individual's portfolio choice, and (2) endogenous borrowing ceilings, which exist due to interest rate ceiling. Maximum borrowing is affected by the magnitude of illiquid asset holdings since these serve as collateral. Paxon (1990) shows that exogenous borrowing ceilings cause consumers to hold a larger share of wealth in a liquid form and endogenous borrowing ceilings lead to less liquid portfolios.

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[17] A utility function with a positive third derivative (convex marginal utility) is necessary for precautionary saving (Leland 1968, Sandmo 1970, Miller 1974)

The other issue on portfolio choice is the age effect over a lifetime. Samuelson (1969) shows that if the elasticity of marginal utility $-U'(W)/WU''(W)-$ is equal to wealth[18], then there is no age effect on lifetime portfolio selection in the dynamic portfolio model. It means that "chance to recoup" through repeated investments for youth with a long horizon is not relevant to reduce risk, and therefore the share of stockholdings should be constant over the life cycle. King and Leape (1987) show that share of risky assets are positively related with age through learning effects over age and liquidity constraints in young age. Bodie et al (1992) show that labor and portfolio choice are intimately related given labor supply flexibility. They present that share of risky assets decline with age since the young have higher labor flexibility and may take greater investment risks than the old. Gollier (2002) shows that utility functions under uncertainty are the key factor deciding the effect of time horizon on optimal portfolio choice. He confirms that a myopic portfolio, behaving as if there is no time left before retirement, is optimal only under a constant relative risk aversion (CRRA) preference. So Gollier believes if the absolute risk tolerance is convex and subhomogeneous, a riskier portfolio is optimal for the long time horizon. Ameriks et al (2004) clarify that the normative framework for which optimal portfolio shares would be constant over the life cycle is based on following assumptions: (a) Agent's preference is the CRRA type; (b) Asset returns are independently and identically distributed over time; (c) There is no human capital and all assets are tradable; and (d) Markets are perfect. Therefore, if one of these assumptions is

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[18] It is called "iso-elastic" utility (Samuelson, 1969) and a synonym with CRRA (Constant Relative Risk Aversion), and utility (Ameriks and Zeldes, 2004). A relative risk aversion index is the inverse of the elasticity of intertemporal substitution.

to be relaxed, then optimal portfolio shares will vary over age brackets.[19]

## 2.2.2. Review of Empirical Issues

As we can see from the preceding theoretical issues on portfolio choice of households,

both risk effect and age effect rely largely on the utility function employed in the model.

This conclusion requires the empirical test about the validity of model prediction.  Guiso,

Jappelli, and Terlizzese (1996) support theoretical propositions for risk effect in an Italian

1989 cross-sectional SHIW (Survey of Household Income and Wealth).  They present

that the income risk and expected liquidity constraint induce households to choose

precautionary portfolio allocations; if income risk is perfectly uninsurable and borrowing

constraints exist, then households reduce the share of risky assets in their portfolio.

Therefore, measure of income risk and liquidity constraint is the critical issue in their

model.  They used subjective opinions of respondents for real income growth and denied

or rejected borrowing information to measure income risk and liquidity constraints.

Bertaut and Starr-McCluer(2002) examine determinants of portfolio choice using pooled

data from U.S. SCF (Survey of Consumer Finances) for 5 years (1983, 1989, 1992, 1995

and 1998).  Their main finding is that age, wealth, income risk and information costs

have a significant effect on a household's portfolio selection. Concerning the age effect,

the ratio of older holding a risky asset is significantly less than the ratio of younger and

the share of risky assets is ambiguous between older and younger. Higher wealth

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[19] Ameriks and Zeldes (2004) also discuss the validity of "Professional Advice" on portfolio selection over age brackets.  Financial planners uniformly recommend that the young should take a riskier investment position based on the so called time diversification effect, in which fluctuation in security returns tend to cancel out over time, making their average returns superior to low-risk securities. They (2004) point out that this assertion is grounded in misunderstanding about the diversification of risk over time.

(financial or total assets) leads to both higher ownership and a higher share of risky asset. Self-employed and retired households who are thought to face a higher income risk have a relatively larger share of safe assets. And college-educated households who are thought to face lower income risk and have more information on financial assets (especially on stock investment) have a relatively higher share of risky assets. Ameriks and Zeldes (2004) show that portfolio decisions can be mostly explained by an age-related pattern[20]: Participation for risky asset and an unconditional share of risky assets have a hump-shaped pattern with age (peaking in the late forties and fifties), whereas conditional share of risky asset is flat with age. J.Banks and S.Tanner (2002)[21] find similar results to Ameriks and Zeldes' (2004) for age effect. The distinctive features of their findings lie in the emphasis on information cost and the effect of tax policy. The fact that conditional share of risky asset is constant with age is considered as importance evidence of effects of transaction or information cost. They observe a household's choice for tax-favored assets are more sensitive to marginal tax rates in comparison to similar tax exempted assets. This strong tax effect on portfolio selection is consistent with the findings of Eymmann and Borsch-Supan (2002) using German data.

### 2.2.3. Review of Empirical Issues Concerning Japan

Empirical studies for Japanese portfolio structure are scarce. Nakagawa and Shimizu (2000) investigate the determinants of Japanese portfolio choice and the cause of a

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[20] Ameriks and Zeldes (2004) used pooled and panel data in the U.S. Pooled cross-sectional data is from SCF (Survey of Consumer Finances) for 1983, 1989, 1992, 1995 and 1998. Panel data is from TIAA-CREF (Teachers Insurance and Annuity Association-College Retirement Equities Fund) during 1987-1999

[21] Banks and S.Tanner (2002) used pooled cross-sectional data in U.K from FES (Family Expenditure Survey) during 1978-1996.

Japanese low share of risky assets compared to that of other developed countries'

households using two types of data[22]. Their estimation results for determinant factor

reveal that: (a) age is not a significant factor; (b) the households thought to be less

anxious about current and future income tend to hold more risky assets[23]; and (c) there is

no significant change in portfolio selection between the "bubble" era (1991) and the

"post-bubble" era (1998).  As for the Japanese trend for lower risky assets, Nakagawa

and Shimizu (2000) demonstrate the following reasons: (a) the deteriorating return on

stock and precautionary saving due to an increase in income uncertainty in the 1990's; (b)

an inferior environment for stock investment due to lack of information, high transaction

cost (commission fee) and an unfavorable tax system compared to deposits and savings;

and (c) the Japanese mindset after the Second World War which believes "Saving is

virtuous, but stocks are not."   Iwaisako (2003) analyze portfolio choice from age-related

pattern and tenure of housing-related pattern using cross-sectional data from Nikkei

Radar in 1987, 1990, 1993, 1996 and 1999.  He presents the following estimation results.

First, age-related pattern except participation is insignificant.  The distinctive Japanese

feature is that participation in equity does not decrease even after retirement age.  Second,

home ownership has a significantly positive effect on participation and share of equity.

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[22] The first type of data Nakagawa and Shimizu (2000) used is cross-sectional data from POSHSC(Public
Opinion Survey on Household Savings and Consumption) in 1991 and 1998 and the second type is a time-
series aggregate data from FSS (Family Savings Survey) during 1960~1998.

[23] The household including in this group is defined  the households who have high income,  less family,
White-collar worker or manager, own home, and live in a big city by estimation.

# Chapter 3.

# Data Description

## 3.1. Characteristics of Data

For the empirical analysis of portfolio choice and saving behavior, POSFAL data (Public Opinion Survey on Financial Assets and Liabilities) conducted by the Central Council for Financial Services Information[24] in Japan for 15 years (1989-2003) is used. The POSFAL is designed by a stratified two-stage random-sampling method throughout the whole country by region (9 categories) and city size (6 categories). The survey is conducted every year for the household with at least two members. The total sample size is 63,001 observations.[25] This survey contains detailed information on financial assets and liabilities, income, saving, consumption expenditure, target saving, saving rate, saving motive, expectation on next year's income and consumption, anxiety concerning the future, and demographics. Demographic information includes homeownership, number of household members, head of household age, head of household occupation, employment status of household members, and resident area. The timing of the survey is always the second half of June every year. Stock variables such as financial assets and liabilities are reported at the date of filling out the survey (probably 6/20~6/30) while flow variables like income and savings refer to amounts from the previous year. Though the survey data does not contain information about tangible asset and detailed

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[24] Bank of Japan (BOJ) plays a substantial role in the activities of CCFSI including the survey work.

[25] The total number of households surveyed is 6,000 but the response rate is approximately 70% every year.

consumption, it is superior to the other Japanese household survey[26] as well as the data

another researcher used[27] for analyzing portfolio choice and saving behavior in the sense

that POSFAL: (a) has a relatively large sample throughout all regions, age brackets, and

occupations for long periods; and  (b) provides all information together about saving

motive, flow of saving, saving stocks, and detailed structure of financial assets and debts.

## 3.2.  Definition of Important Variables

The definition of variables frequently used in this paper is as follows.

(1) Income, Saving, Saving Rate, Consumption

| Variables | Description |
|---|---|
| Income (DI) | The household amounts as an annual take-home pay after taxes in the past year comprising of money earned from work (labor income), pensions, property rentals, interest and so forth.  DI is observable during 1990-2003. In the 1989 data, income information is divided into 13 categories. |
| Saving (Sav) | The amount a household has saved in the past year from take-home pay after taxes in terms of accumulation of financial assets. It excludes savings for business and temporary deposits in accounts from the direct deposit of salary or for the automatic payment of utility bills, and investment for real assets such as land, housing. Saving is observable during 1991-2003. |

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[26] The major household survey by Japanese government includes the FIES (Family Income and
Expenditure Survey, monthly), the NSFIE (National Survey Family Income and Expenditure, every 5
years), and the FSS (Family Saving Survey, until 2000) Though these surveys are very reliable and include
detailed information on income and consumption, they does not provide qualitative information like saving
motive and lack sufficient information on financial products. For details, see Kitamura et al (2003, p151)

[27] The data Iwaisako (2003) used has the good feature of real estate assets. But it has various limitations: a
small sample size with 2,000 observations at most and regionally limited to the Tokyo area.  The data
Murata (2003) used has strong points in the sense that it is a panel data, but it has serious weak points: too
few observations with 784, and is restricted to only young and middle aged women.

| | |
|---|---|
| Saving rate | Expressed in terms of the amount a household has saved in the past year from take-home pay after taxes. This survey provides information on saving rate directly and it is observable for the entire period. |
| Consumption (CEXP) | Annual income (DI) + Savings withdrawn + New borrowing + Proceeds from sales of land and/or housing – Annual saving (SAV) – Annual loan repayment – Purchase of land and/or housing. Consumption information is available during 1991-2003. |

(2) Financial Assets

This survey provides abundant information on a household's portfolio using 13 types of financial products. The outstanding amounts of total financial assets correspond to the saving balance. Note: it does not include "Cash" in hand and foreign currency-denominated financial products are also included in each corresponding yen denominated products.   This information is available for whole periods (1989-2003) except "Non-life insurance". There is no observation on "Non-life insurance" for 1996 and 1997 among whole periods.

| Variables | Definition |
|---|---|
| Deposits and savings (BD) | All deposit and savings in financial institutions. It excludes postal savings and includes foreign currency deposits. |
| Time and savings deposits (BTD) | Deposits and savings for a fixed term (subcategory of BD). So the gap of BD and BTD is the checkable (demand) deposits. |
| Postal savings(PS) | All household savings in Japan's postal system. |
| Postal time savings(PTS) | Postal savings for a fixed term such as fixed-amount savings and installment savings (subcategory of PS). So the gap of PS and PTS is the checkable (demand) deposits in Japan's postal system. |
| Money trusts and/or loan trusts (MLT) | Includes newly introduced products named "*Big,*" "*Hit,*" and "*Super-Hit*" |

| | |
|---|---|
| Life insurance and/or postal life insurance(LI) | Total of paid-in premiums. Excludes benefits already granted, non-savings type and annuity type products |
| Non-life insurance(NLI) | Total of paid-in premiums. Excludes benefits already granted, non-savings type and annuity type products. Unavailable for 1996 and 1997 |
| Personal annuity insurance(AI) | Total of paid-in premiums. Excludes benefits already granted, and premiums paid for public pensions (welfare pension, national pension, and public servants' mutual aid) |
| Bonds (BOND) | Amounts in market value, or par value if market value is unknown. Include foreign currency-denominated bonds |
| Stocks (SK) | Amounts in market value. Include foreign currency-denominated stocks and stocks holding with employees stock ownership plan |
| Investment trusts(IT) | Amounts in market value, or par value if market value is unknown. Includes Money Reserve Fund(MRF), Money Management Fund(MMF), Real Estates Investment Trust(REIT) and also foreign currency-denominated products |
| Worker's asset formation savings(WAFS) | Total of ordinary, pension, and home-acquisition WAFS |
| Other financial products | Such as Mortgage securities, gold savings accounts, and so forth. |

(3) Debts

Debts here imply outstanding balance borrowed from any type of lender, either public and/or private financial institutions, sales or credit companies, money lenders such as consumer finance companies and pawn shops, employers, relatives and/or friends, and others. So it includes payables for installment purchases and borrowing under a revolving credit system, but it does not include payable for credit card purchases to be settled in one or two months. Debt information on households is available for whole periods.

## 3.3. Summary of Original Data Statistics and Comparison

As can be seen Table 3-1, real wealth level per household has showed stagnation with the Japanese recession in the 1990's.  Total financial assets per household are at around ¥10 million and net financial asset is at ¥7 million in the 1990's.  This stagnant phenomenon is also observed by other data such as the Family Saving Survey (FSS) data (Table 3-2 (a)) or aggregate data in Flow of Funds Accounts (FFA) of Bank of Japan (BOJ) (Table 3-2 (b)).  But the absolute amount of POSFAL data is quite small in comparison with the amount from the other data. Total wealth of POFAL data is 60~70% of the level of FSS data and 30~40% of the level of aggregate data.[28]

Four explanations are possible for this low level of wealth.  The first is the deviation in the measurement method.  The FFA data includes cash which POSFAL does not contain, and FFA captures insurance and pension reserve by the equivalent amount of the policyholder's claims rather than the premium paid as in POSFAL data.  In addition, the pension reserve in FFA covers "Corporate pension" for employees and "National Annuities Fund" for self-employed individuals besides "personal annuity insurance." The FSS data includes savings in non-financial institutions which POSFAL may neglect. The second is the difference from recognition for saving.  POSFAL considers as saving only when households have a clear intention for saving as we see in description for saving (3.2) while FSS and FFA regard saving balance as all of outstanding balance

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| Ratio of wealth in POSFAL | '89 | '91 | '93 | '95 | '97 | '99 | '01 | '03 |
|---|---|---|---|---|---|---|---|---|
| Over wealth in FSS (%) | 56.5 | 65.6 | 71.3 | 66.5 | 70.7 | 65.8 | n/a | n/a |
| Over wealth in FFA (%) | 30.0 | 38.2 | 39.7 | 36.9 | 39.1 | 37.1 | 39.8 | 43.4 |

regardless of the saving intention. The third reason may be related to the timing of measure. In FSS and FFA, all amounts are reported on the 31 of December every year when households possibly keep the money most in a year while it is reported during second half of June (6/20-6/30) in POSFAL data. The fourth may be deviation from sample households. In FSS, the share of worker households which have a relatively guaranteed stable income is 59~64% during 1989-2000. And the unemployment rate was 2.1~5.4% during 1989-2003. On the contrary, in POSFAL data, the share of worker households is lower at a rate of 40~50% than that in the FSS data. And the share of households where no one is working is higher at a rate of 6~14%. This sample deviation implies that POSFAL data may contain poorer households. The above four reasons will cause a lower level of wealth in average. But this discrepancy on average cannot prevent the good feature of POSFAL data since we consider demographics like income and wealth level of each household.

Summary statistics of POSFAL data demonstrate two clear features in share of financial products and saving rate: First, the share of deposits and savings is increasing (48% → 62%) while share of risky assets like stocks is decreasing over periods(19%→ 10%). Second, the saving rate is also declining over periods (12%→ 7%). Both of these are consistent with the observation of FSS and FFA data. POSFAL data also illustrates the deteriorating economy in 1990's through saving balance and employment status. The portion of the household without saving balance has sharply increased from 7.3% in peak of economy (1991) to 22% in 2003. The portion of household where no one is working has increased from 8.1% in 1991 to 13.8% in 2003. The POSFAL data also reflects the

trend, observed in population statistics, that the family size is smaller, and the age of

household head is older.

<Table 3-1> Summary Statistics of Original POSFAL Data

| Year | 1989 | 1991 | 1993 | 1995 | 1997 | 1999 | 2001 | 2003 |
|---|---|---|---|---|---|---|---|---|
| (a) Number of Observations | 4,248 | 3,979 | 4,107 | 4,218 | 4,286 | 4,278 | 4,234 | 4,158 |
| (b) Financial Assets Balance(FA) per Household (¥10,000, 2000) | | | | | | | | |
| ▪ Total FA | 829 | 1,006 | 1,089 | 1,082 | 1,149 | 1,135 | 1,190 | 1,314 |
| (Std. deviation) | (535) | (709) | (749) | (784) | (812) | (749) | (817) | (1019) |
| ▪ Net FA (=Total FA-Total Debt) | 607 | 701 | 688 | 693 | 691 | 701 | 701 | 838 |
| (c) Share of Assets (%) | | | | | | | | |
| ▪ Deposits and Savings [1] | 47.9 | 51.1 | 50.3 | 53.7 | 56.0 | 57.2 | 58.9 | 62.4 |
| ▪ Illiquid Assets [2] | 32.9 | 31.7 | 34.4 | 34.5 | 32.5 | 32.6 | 32.0 | 27.8 |
| ▪ Risky Assets [3] | 19.2 | 17.2 | 15.3 | 11.8 | 11.5 | 10.2 | 9.1 | 9.8 |
| (d) Income (¥10,000) | *** | 567.2 | 601.1 | 601.3 | 602.6 | 567.0 | 553.6 | 491.2 |
| (e) Average Saving rate (%) | 11.9 | 10.8 | 11.1 | 10.7 | 10.2 | 9.6 | 9.4 | 7.0 |
| (f) Saving Balance (%) — Having Balance | 91.3 | 92.7 | 89.5 | 92.1 | 89.8 | 87.9 | 83.6 | 78.0 |
| (f) Saving Balance (%) — No Balance | 8.7 | 7.3 | 10.5 | 7.9 | 10.2 | 12.1 | 16.4 | 22.0 |
| (g) Demographics | | | | | | | | |
| ▪ Household Size | 4.00 | 3.91 | 3.83 | 3.75 | 3.75 | 3.66 | 3.62 | 3.51 |
| ▪ Age of Household Head | 50.2 | 50.4 | 51.3 | 52.0 | 52.6 | 53.6 | 54.7 | 54.5 |
| ▪ Housing (%) — Owned | 68.0 | 65.9 | 69.9 | 69.8 | 71.2 | 74.9 | 75.0 | 73.0 |
| ▪ Housing (%) — Not Owned | 32.0 | 34.1 | 30.1 | 30.2 | 28.8 | 25.1 | 25.0 | 27.0 |
| ▪ Employment (%) — None Working | 6.1 | 8.1 | 8.7 | 9.9 | 9.7 | 12.2 | 13.0 | 13.8 |
| ▪ Employment (%) — Head Working [4] | 73.4 | 76.5 | 75.4 | 71.7 | 72.0 | 69.6 | 65.8 | 66.9 |
| ▪ Employment (%) — Other | 20.5 | 15.4 | 15.9 | 18.4 | 18.3 | 19.2 | 21.2 | 19.3 |

Source: POSFAL data, 1989-2003

Note: Financial assets and Income is expressed in real value (2000=100)
[1] Bank deposits (BD) + Postal savings (PS)
[2] Money /Loan Trust, Life/Non-life Insurance, Personal Annuity Insurance, Worker's Asset Formation Saving
[3] Bonds, Stocks, Investment Trusts, and Other Financial Assets
[4] It contains two cases one where household head is working and, one where both household head and spouse are working.

<Table 3-2> Statistics from Other Data Source

(a) Family Saving Survey (FSS) Data

| Year | 1989 | 1991 | 1993 | 1995 | 1997 | 1998 | 1999 | 2000 |
|---|---|---|---|---|---|---|---|---|
| (a) Num. of Obs. | 5,734 | 5,701 | 5,449 | 5,481 | 5,350 | 5,419 | 5,458 | 5,466 |
| (b) Financial Assets (FA) pre Household (¥10,000, 2000) | | | | | | | | |
| ▪ Total FA | 1,468 | 1,534 | 1,527 | 1,626 | 1,625 | 1,643 | 1,726 | 1,781 |
| ▪ Net FA | 1,109 | 1,199 | 1,174 | 1,216 | 1,193 | 1,178 | 1,211 | 1,294 |
| (c) Asset Shares (%) | | | | | | | | |
| ▪ Deposits | 45.0 | 52.0 | 53.8 | 55.9 | 56.1 | 56.6 | 56.9 | 58.4 |
| ▪ Money/ Loan Trust | 3.4 | 4.8 | 3.6 | 3.0 | 2.1 | 1.9 | 1.3 | 1.2 |
| ▪ Insurance | 23.8 | 24.4 | 27.3 | 28.2 | 29.9 | 30.2 | 28.9 | 28.7 |
| ▪ Bonds | 2.9 | 2.4 | 2.1 | 2.0 | 2.0 | 1.6 | 2.0 | 1.7 |
| ▪ Stocks | 17.8 | 10.9 | 7.6 | 6.2 | 5.5 | 5.1 | 6.2 | 5.1 |
| ▪ Investment Trusts | 4.5 | 2.7 | 2.5 | 1.9 | 1.8 | 1.7 | 2.3 | 2.6 |
| ▪ Non-financial[1] | 2.7 | 2.5 | 3.0 | 2.6 | 2.4 | 2.8 | 2.5 | 2.2 |
| (Risky asset, %) [2] | 27.9 | 18.5 | 15.2 | 12.7 | 11.7 | 11.3 | 12.8 | 11.7 |
| (d) Demographics | | | | | | | | |
| ▪ Household Size | 3.62 | 3.55 | 3.49 | 3.39 | 3.32 | 3.35 | 3.31 | 3.26 |
| ▪ Head Age | 48.9 | 50.5 | 50.4 | 51.7 | 51.9 | 52.3 | 52.7 | 53.4 |

Source: Ministry of Internal Affairs and Communications (the survey is abolished from 2001)
[1] Deposits in one's own companies, Mutual loan & savings associations
[2] Bonds, Stocks, Investment Trusts and Savings in Non-financial Institutions

(b) Aggregate Data: Flow of Funds Accounts (Bank of Japan)

| Year | 1989 | 1991 | 1993 | 1995 | 1997 | 1999 | 2001 | 2003 |
|---|---|---|---|---|---|---|---|---|
| (a) FA(¥10,000,2000) per Household | 2,760 | 2,635 | 2,742 | 2,934 | 2,940 | 3,061 | 2,989 | 3,030 |
| (b) Asset Shares (%) | | | | | | | | |
| ▪ Currency | 1.8 | 1.8 | 1.7 | 1.8 | 2.0 | 2.2 | 2.7 | 2.9 |
| ▪ Deposits | 43.4 | 48.1 | 47.7 | 47.7 | 50.1 | 49.8 | 51.7 | 51.8 |
| ▪ Trust Beneficiary | 4.1 | 4.8 | 5.0 | 4.5 | 3.5 | 2.5 | 1.6 | 0.9 |
| ▪ Insurance Reserves | 14.1 | 15.7 | 16.9 | 17.3 | 17.5 | 16.8 | 17.2 | 16.5 |
| ▪ Pension Reserves | 5.3 | 6.4 | 7.1 | 7.9 | 8.7 | 9.1 | 10.0 | 10.2 |
| ▪ Bonds | 2.0 | 3.0 | 2.9 | 2.4 | 2.1 | 1.7 | 1.9 | 1.6 |
| ▪ Equities | 20.5 | 12.1 | 10.8 | 11.3 | 9.2 | 10.7 | 7.4 | 8.4 |
| ▪ Investment Trusts | 3.9 | 2.7 | 2.4 | 2.3 | 1.9 | 2.2 | 2.2 | 2.4 |
| ▪ Others | 4.9 | 5.3 | 5.4 | 4.8 | 5.1 | 4.8 | 5.3 | 5.4 |
| (Risky Assets, %) [1] | 26.4 | 17.9 | 16.1 | 16.1 | 13.1 | 14.7 | 11.5 | 12.5 |
| (c) Saving Rate (%) | 13.6 | 15.1 | 13.7 | 11.9 | 10.0 | 10.8 | 6.7 | 7.5 |

Source: BOJ, FFA
[1] Bonds, Equities and Investment Trusts

## 3.4. Data Selection

The final data set is constructed from the original data set of 63,001 observations as follows. For analysis of portfolio choice and saving behavior according to saving motive, information on saving rate (or amount of savings), saving motive and income is needed at the very least. Therefore, missing data for saving rate (6,510 observations) was excluded, missing data for saving motive (1,928 Obs.), and missing and zero value data for income during 1990~2003 and the missing income categories of 1989 (11,590 Obs.). The remainder is 42,973 households as a selected data set. Details for excluded data and selected data are shown in Table 3-3.

Pearson's chi-square test is conducted to check whether there are significant differences between the original data set and the selected data set. The statistics are reported as below:

| Variables | Effective Sample Size | | Degree of Freedom | Chi-square | P-value |
|---|---|---|---|---|---|
| | Selected | Original | | | |
| Age | 42,973 | 63,000 | 6 | 4.17 | 0.6531 |
| Household Size | 42,913 | 62,843 | 5 | 19.09 | 0.0018 |
| Occupation | 42,709 | 62,406 | 6 | 117.76 | <.0001 |
| Employment | 42,858 | 62,688 | 3 | 2.53 | 0.4682 |
| Residential Area | 42,973 | 63,000 | 5 | 8.68 | 0.1223 |
| Housing | 42,410 | 61,943 | 5 | 65.67 | <.0001 |

Source: POSFAL data, 1989-2003

Concerning age group, employment status, and residential area, the null hypothesis ($H_0$), there are no significant differences between two data sets, is failed to reject. However, concerning household size, occupation, and housing, the null hypothesis is rejected. This implies there are significant differences for household size, occupation, and housing

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status between the two data sets.  Therefore, it is important to pay attention interpreting the effects of household size, occupation, and housing status.

<Table 3-3> Excluded Data and Selected Data Set

| Year | Original Data Set | Excluded (Missing) Data | | | | Selected Data Set | |
|---|---|---|---|---|---|---|---|
| | | Saving rate | Motive for saving | Income [1] | Sum | Num. of Observations | Adopted Ratio (%) |
| 1989 | 4,248 | 234 | 317 | 226 | 777 | 3,471 | 81.7 |
| 1990 | 4,142 | 169 | 343 | 492 | 1,004 | 3,138 | 75.8 |
| 1991 | 3,979 | 120 | 309 | 712 | 1,141 | 2,838 | 71.3 |
| 1992 | 4,138 | 124 | 496 | 744 | 1,364 | 2,774 | 67.0 |
| 1993 | 4,107 | 529 | 110 | 939 | 1,578 | 2,529 | 61.6 |
| 1994 | 4,225 | 466 | 111 | 934 | 1,511 | 2,714 | 64.2 |
| 1995 | 4,218 | 440 | 88 | 907 | 1,435 | 2,783 | 66.0 |
| 1996 | 4,317 | 485 | 3 | 820 | 1,308 | 3,009 | 69.7 |
| 1997 | 4,286 | 502 | 5 | 776 | 1,283 | 3,003 | 70.1 |
| 1998 | 4,287 | 509 | 2 | 907 | 1,418 | 2,869 | 66.9 |
| 1999 | 4,278 | 562 | 6 | 910 | 1,478 | 2,800 | 65.5 |
| 2000 | 4,235 | 615 | 6 | 855 | 1,476 | 2,759 | 65.1 |
| 2001 | 4,234 | 773 | 11 | 767 | 1,551 | 2,683 | 63.4 |
| 2002 | 4,149 | 775 | 14 | 734 | 1,523 | 2,626 | 63.3 |
| 2003 | 4,158 | 207 | 107 | 867 | 1,181 | 2,977 | 71.6 |
| Total | 63,001 | 6510 | 1,928 | 11,590 | 20, 028 | 42,973 | 68.2 |

Source: POSFAL data, 1989-2003

[1] Missing and zero value data for income during 1990~2003, and for income categories in 1989

# Chapter 4.

# Study on Saving Motives for Japan

In this chapter, life cycle theory in Japan is tested as a macroscopic approach for saving behavior using income-consumption profile procedure adopted by Carroll and Summers (1989). Saving motives are investigated as a microscopic analysis for saving behavior using methodology of Horioka and Watanabe (1997). The focus in this chapter is to find the dominant factor for saving (consumption) and the precautionary motives related to income risk and liquidity constraints.

## 4.1 Income and Consumption Profile

### 4.1.1 Model and Methodology

Income and consumption profile model is adopted from Carroll and Summers (1989) which is already mentioned in the literature review. Carroll and Summers (1989) model is simple but powerful. The model uses easily observable data and does not require complicated assumptions for computing permanent income and future expectation formation. They constructed two types of models to test the life cycle theory using Consumer Expenditure Survey (CES) during 1960-61 and again in 1972-73 in the U.S.

The first approach is a graphical expression by depicting the association between age-income and age-consumption profiles across different occupational and educational levels. The problem arising from this first approach is how to distinguish whether the consumption pattern is originating from idiosyncratic shocks on permanent income or

from a household's rational behavior at that time. Carroll and Summers suggest that if a control variable about income-consumption profile has "predictability" for future income, then the problem can be solved. Under the life cycle income hypothesis, if households *expect* a higher income later in life they will borrow in youth to finance insufficient earnings for present higher consumption. Conversely if households *expect* a lower income later in life they will save in youth to finance insufficient earnings for future higher consumption. As a result, the income path pattern will not match the consumption path pattern. They choose an educational group and an occupational group as the control variables since the income path of these groups bear similarities within the same group across both time periods (1960-61, 1972-73). The key variables they used in this model are in the following table.

| Variables | Definition |
|---|---|
| ▪ Income | Total after-tax pay of the household |
| ▪ Consumption | Total expenditure, which excludes disbursement for social security, private pension, and home mortgages, and includes disbursement transfer such as gifts and contributions to private charities and to other households |
| ▪ 5 educational groups | Some grade school, Some high school, Finished high school, Some college, Finished college |
| ▪ 9 occupational group [1] | Craftsman, Operatives, Professional, Unskilled, Clerical, Manager, Service, Sales, Self-employed |
| ▪ 8 age group | 25-29, 30-34, 35-39, 40-44, 45-49, 50-54, 55-59, 60-64 |

[1] They exclude retired people and 'other' occupational group. The order of occupation represents an occupation's increasing variance in income so credibility is higher for first occupational group (craftsman) than for the last occupational group (self-employed).

Carroll and Summers (1989) compute mean income and consumption for the nine occupational groups and the five educational sets across all eight age groups, and normalize the mean income and consumption using the mean income of the 25-29 age.

The second approach of Carroll and Summers (1989) is observing whether the saving rate of young people is sensitive to expected long term income growth. They calculated expected income growth as the ratio of *future income* to *current income* for young people in each occupational group and compared it with the observed saving rates of young people.  Here "future income" is defined as the sum of income for people age 30-65 and "current income" as the sum of income for people age 25-29.   They expect that if life cycle income hypothesis would be supported, then those people in occupations with rapidly expected income growth would save less than those in occupations with slowly expected income growth.  Therefore the slope of the figure should be apparently negative since the households with high future income growth would save less when they young under the prediction of the life cycle theory.

**4.1.2 Data and Empirical Test Results**

The POSFAL data from 1991-2003 is used in testing life cycle theory using Carroll and Summers (1989) method since the data has information on consumption from 1991. The definition of variables is already mentioned in section 3.2 and the amount values are converted to real values using CPI (Consumer Price Index) with 2000 as the base year (real values are used in this analysis unless otherwise stated).  POSFAL data contains information on seven age groups and seven occupational groups, but unfortunately it does not include information about educational background of household. For seven age groups and seven occupational groups, the age group of 'over 70s' and the occupational group of 'other.' were excluded.[29]   The Age and Occupational Groups are as follows:

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[29] The 'other' group was discarded as Carroll and Summers did since its characteristics aren't definable.

| ▪ 6 Occupational Groups | Agricultural Worker, Business Proprietor, White-collar worker, Blue-collar worker, Manager, Professional Worker |
| --- | --- |
| ▪ 6 Age Groups | 20's, 30's, 40's, 50's, 60-64, 65-69 |

First, the relationship between age-income and age-consumption profiles is explored across different occupations for 1991, 1994, 1997, 2000, 2003 as well as aggregate years (1991-2003).  The frequency of income and consumption is shown in Table 4-1 by year, age, and occupational group.  As seen in Figure 4-1(1)~(6), each cross section and aggregate data show that consumption over life span fluctuates according to income changes of over life span.  These observations are consistent with the findings of Carroll and Summers (1989) and present clear evidence that income and consumption growth are closely related.  This suggests that the life cycle theory, which predicts the pattern of income profile does not affect the consumption profile, does not hold.  Some exceptional cases appear in the profiles of the manager and professional groups in 1991 and 2003 (Figure 4-1(2), (6)).  However, it does not impair the above conclusion.  As Carroll and Summers (1989) discussed, the credibility of this approach is higher in the occupational group which has a low income variance like white-collar and blue-collar workers in the author's data.  Those particular occupational groups demonstrate the typical pattern of "consumption and income parallel."  Even the occupational groups with an unstable

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The reason for excluding the age bracket, "over 70's" is more substantial. Extended families may affect an individual's income and consumption profile considerably and this may be more prevalent in Japan where there are many households in which parents and their grown children live together. The proportion of young adults (male aged 30-34) with parents is 37% in Japan, while it's 8% in U.S, 6.5% in the U.K and 14% in Germany (Source OECD, 2000; Reprinted from Brugiavini and Weber, 2003). The probability of extended families with dependent elder would be higher for age group of "over 70's".

relationship between income and consumption for one cross section show a closely

related association when the observations is increased by pooling all years' data.

<Table 4-1> Frequency of Income and Consumption Profiles

| Year | Age | Agricultural Worker | Business Proprietor | White-collar Worker | Blue-collar Worker | Manager | Professional |
|---|---|---|---|---|---|---|---|
| Aggre-gate (1991-2003) | 20's | 3 | 159 | 350 | 376 | 23 | 18 |
| | 30's | 35 | 778 | 1764 | 1389 | 439 | 125 |
| | 40's | 139 | 1590 | 1948 | 1969 | 1841 | 225 |
| | 50's | 314 | 1976 | 1365 | 2190 | 2352 | 259 |
| | 60-64 | 358 | 766 | 316 | 537 | 438 | 192 |
| | 65-69 | 371 | 507 | 128 | 213 | 176 | 151 |
| 1991 | 20's | n/a | 17 | 34 | 33 | 3 | 1 |
| | 30's | 6 | 73 | 161 | 133 | 40 | 13 |
| | 40's | 13 | 190 | 183 | 204 | 176 | 26 |
| | 50's | 34 | 169 | 125 | 151 | 188 | 16 |
| | 60-64 | 33 | 52 | 24 | 34 | 33 | 11 |
| | 65-69 | 25 | 27 | 11 | 12 | 6 | 5 |
| 1994 | 20's | n/a | 16 | 29 | 28 | 4 | 8 |
| | 30's | 6 | 69 | 128 | 106 | 32 | 8 |
| | 40's | 9 | 139 | 159 | 185 | 169 | 15 |
| | 50's | 17 | 160 | 101 | 191 | 195 | 23 |
| | 60-64 | 32 | 49 | 14 | 43 | 39 | 16 |
| | 65-69 | 32 | 41 | 10 | 21 | 17 | 6 |
| 1997 | 20's | n/a | 11 | 30 | 31 | 3 | 1 |
| | 30's | 4 | 76 | 165 | 114 | 40 | 3 |
| | 40's | 4 | 148 | 184 | 149 | 147 | 19 |
| | 50's | 20 | 188 | 111 | 180 | 201 | 14 |
| | 60-64 | 30 | 67 | 33 | 62 | 42 | 16 |
| | 65-69 | 35 | 44 | 12 | 18 | 11 | 12 |
| 2000 | 20's | 1 | 12 | 20 | 21 | 1 | n/a |
| | 30's | 6 | 41 | 130 | 99 | 25 | 12 |
| | 40's | 10 | 100 | 127 | 124 | 120 | 15 |
| | 50's | 29 | 118 | 119 | 150 | 211 | 19 |
| | 60-64 | 22 | 57 | 20 | 32 | 39 | 20 |
| | 65-69 | 29 | 51 | 9 | 9 | 21 | 14 |
| 2003 | 20's | n/a | 6 | 25 | 18 | 1 | n/a |
| | 30's | 1 | 26 | 170 | 93 | 22 | 1 |
| | 40's | 5 | 71 | 158 | 105 | 104 | 13 |
| | 50's | 21 | 116 | 136 | 157 | 161 | 15 |
| | 60-64 | 18 | 59 | 28 | 46 | 21 | 10 |
| | 65-69 | 24 | 46 | 12 | 16 | 13 | 10 |

Source: Selected POSFAL data, 1989-2003

<Figure 4-1(1)> Income and Consumption Profiles by Occupational Group (Aggregate: 1991-2003)



**(a) Agricultural**

**(b) business proprietor**

**(c) White-collar**

**(d) Blue Collar**

**(e) Manager**

**(f) Professional**

<Figure 4-1(2)> Income and Consumption Profiles by Occupational Group (1991)

(a) Agricultural Worker



(b) Business proprietor



(c) White-collar Worker



(d) Blue-collar Worker



(e) Manager



(f) Professional

<Figure 4-1(3)> Income and Consumption Profiles by Occupational Group (1994)

(a) Agricultural Worker

(b) Business Proprietor

(c) White-collar worker

(d) Blue-collar worker

(e) Manager

(f) Professional

<Figure 4-1(4)> Income and Consumption Profiles by Occupational Group (1997)

(a) Agricultural Worker

(b) Business Proprietor

(c) White-collar Worker

(d) Blue-collar Worker

(e) Manager

(f) Professional

<Figure 4-1(5)> Income and Consumption Profiles by Occupational Group (2000)

(a) Agricultural Worker

(b) Business Proprietor

(c) White-collar Worker

(d) Blue-collar Worker

(e) Manager

(f) Professional

<Figure 4-1(6)> Income and Consumption Profiles by Occupational Group (2003)

(a) Agricultural Worker



(b) Business Proprietor



(c) White-collar Worker



(d) Blue-collar Worker



(e) Manager



(f) Professional



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Now the second approach of Carroll and Summers (1989) is examined which observes the sensitivity between the saving rate of young people and their expected long term income growth within each occupational group. Young people are defined as in their 30's instead of the 25-29 age group Carroll and Summers (1989) used. This decision was chosen because there are small samples for the 20's age bracket, and the 20's occupation group is premature to be fixed as one's lifetime career. Rather, the expected income growth as the ratio of *future income* (sum of income for people aged 40-64) to *current income* for those in their 30's for each occupational group was computed instead. The slope Carroll and Summers (1989) slope is positive, quite a difference from the prediction of the life cycle theory, which forecasts a strong negative relationship between present savings rate and future income growth. The result of this test with Japan's data is ambiguous, as seen in Figure 4-2. Half of the entire period observed (1991-2003) has a positive slope which is the contradiction of life cycle theory's prediction while the other half of the period has a negative slope.[30] The slope indicator is very sensitive to a young household's saving rate and income level. A smaller sample size for young household, the higher probability would have the variation in saving rate and income of young. The sample size of the 30's bracket is small, especially in the agricultural and professional occupation group as in Table 4-2. When increasing the observations by pooling the data of all years, the association between present saving and future income stream show a clearly positive relationship.[31] A positive slope in this graph implies that those people in

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[30] Negative slope is observed in 1991, 1994, 1998, 1999, 2002 and 2003 and positive one is observed in 1992, 1995, 1996, 1997, 2000 and 2001.

[31] When aggregate mean income and mean saving rate are used for the young during the entire period, the negative slope then changes to a positive slope in 2003.

occupations with rapidly expected income growth save more than those in occupations with slowly expected income growth. In short, there is no evidence to support the life cycle theory from Japanese POSFAL data by Carroll and Summers (1989) model. The test results show consumption (saving) is affected by present income level.

<Figure 4-2> Young Household's Saving Rate versus Future Income Streams by Occupation

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<Table 4-2> Saving Rate and Expected Income Growth from 1991 to 2003

| Job [1] | Aggregate('91-'03) | | | 1991 | | | 1992 | | |
|---|---|---|---|---|---|---|---|---|---|
| | Expected Income Growth [2] | Saving Rate (%) [3] | Obs. [4] | Expected Income growth | Saving Rate (%) | Obs. | Expected Income growth | Saving Rate (%) | Obs |
| AG | 2.73 | 8.46 | 35 | 3.69 | 8.00 | 6 | 2.16 | 6.7 | 3 |
| BP | 3.80 | 11.81 | 778 | 3.92 | 13.11 | 73 | 3.40 | 14.2 | 78 |
| WC | 3.65 | 12.68 | 1764 | 3.59 | 13.18 | 161 | 3.65 | 12.4 | 135 |
| BC | 3.59 | 10.33 | 1389 | 3.31 | 10.90 | 133 | 3.60 | 13.5 | 111 |
| MA | 4.11 | 13.41 | 439 | 4.45 | 10.58 | 40 | 3.64 | 13.9 | 44 |
| PF | 3.87 | 11.22 | 125 | 6.00 | 8.08 | 13 | 4.48 | 10.4 | 17 |
| Year | 1993 | | | 1994 | | | 1995 | | |
| AG | 4.21 | 5.0 | 2 | 3.59 | 7.33 | 6 | n/a | n/a | |
| BP | 3.86 | 13.0 | 75 | 4.06 | 11.81 | 69 | 4.13 | 11.6 | 69 |
| WC | 3.91 | 12.5 | 135 | 3.65 | 12.77 | 128 | 3.60 | 12.6 | 142 |
| BC | 3.57 | 10.3 | 106 | 3.60 | 11.08 | 106 | 3.71 | 10.5 | 123 |
| MA | 4.16 | 13.4 | 40 | 4.05 | 14.22 | 32 | 4.35 | 16.6 | 36 |
| PF | 5.78 | 11.8 | 10 | 2.58 | 15.63 | 8 | 4.14 | 13.3 | 11 |
| Year | 1996 | | | 1997 | | | 1998 | | |
| AG | 3.85 | 18.0 | 1 | 4.20 | 5.75 | 4 | 2.71 | 26.0 | 3 |
| BP | 3.20 | 11.5 | 69 | 4.22 | 9.87 | 76 | 3.62 | 11.0 | 60 |
| WC | 3.72 | 13.0 | 149 | 3.98 | 11.35 | 165 | 3.64 | 12.8 | 129 |
| BC | 3.52 | 10.0 | 101 | 3.60 | 10.02 | 114 | 3.58 | 10.3 | 105 |
| MA | 4.07 | 14.9 | 42 | 4.21 | 10.65 | 40 | 4.09 | 13.4 | 31 |
| PF | 3.59 | 10.2 | 14 | 2.86 | 3.33 | 3 | 4.26 | 7.2 | 13 |
| Year | 1999 | | | 2000 | | | 2001 | | |
| AG | 4.46 | 10.0 | 1 | 1.55 | 4.17 | 6 | 1.68 | 7.5 | 2 |
| BP | 4.07 | 9.5 | 59 | 4.09 | 13.68 | 41 | 3.88 | 10.5 | 45 |
| WC | 3.65 | 13.1 | 96 | 3.50 | 13.62 | 130 | 3.20 | 11.1 | 102 |
| BC | 4.01 | 9.3 | 115 | 3.34 | 8.98 | 99 | 3.73 | 10.7 | 89 |
| MA | 3.52 | 14.7 | 29 | 4.73 | 12.56 | 25 | 4.02 | 17.0 | 27 |
| PF | 4.00 | 11.9 | 7 | 3.58 | 12.67 | 12 | 2.99 | 15.1 | 9 |
| Year | 2002 | | | 2003 | | | | | |
| AG | n/a | n/a | | 4.52 | 5.00 | 1 | | | |
| BP | 3.84 | 11.8 | 38 | 3.92 | 11.08 | 26 | | | |
| WC | 3.47 | 14.0 | 122 | 3.73 | 12.58 | 170 | | | |
| BC | 3.59 | 9.6 | 94 | 3.42 | 8.62 | 93 | | | |
| MA | 4.16 | 11.4 | 31 | 4.48 | 11.27 | 22 | | | |
| PF | 2.85 | 14.1 | 7 | 2.61 | 15.00 | 1 | | | |

Source: Author's calculation using POSFAL data in Japan.
[1] Excluded "Other" occupational group. AG stands for Agricultural Worker, BP for Business Proprietor, WC for White-collar Worker, BC for Blue-collar Worker, MA for Manager, PF for Professional
[2] The ratio of sum of mean income for people age 40-64 to mean income for people age 30's in each occupational group
[3] Observed average Saving Rate for people in their 30's for each occupational group
[4] Number of observation for people in their 30's for each occupational group

## 4.2. Study on Saving Motives

### 4.2.1. Model and Methodology

The second methodology adopted to test the life cycle income hypothesis is the saving motive analysis, which Horioka and Watanabe (1997) introduced for testing the life cycle theory by using Japanese micro data. They examine two issues using descriptive and graphical expression: (a) the dominant saving motives for net saving; (b) and how motives for saving vary within the life cycle. The key variables used for constructing their model are the net saving amounts and the saving motives. The detailed motives they collected from their data are as below.

| Variables | Description |
|---|---|
| ▪Saving Motives | 11 motives for saving are observed (exclude 'other' motive) and the motives are grouped into three categories.<br><br>(1) Life-cycle motives, which arise from differences in timing between income and expenditure in one's life cycle.<br> The motives included in this category are saving for leisure, children's marriage, children's education, purchase of durable goods, acquisition of housing, payment of taxes, business, retirement<br><br>(2) Precautionary motives, which arise from uncertainties of income and expenditure. Saving for illness or disaster, and for peace of mind without specific reason are included in this category<br><br>(3) Bequest motive arising from the desire to transfer assets to descendents |
| ▪Withdrawal Motives | Same as above motive for saving excluding bequest motive |
| ▪Borrowing Motives | Same as above motive for saving excluding bequest, retirement, tax, business, and peace of mind |

Net saving (*NS*) is defined as ($S_1$ + $S_2$ - *DS*) and estimated for each motive through

following steps. Here, $S_1$ represents household's saving in the form of the accumulation

of financial assets. $S_2$ is saving in the form of loan repayment. *DS* means all dissavings,

sum of dissaving in the form of withdrawal of saving, in the form of new borrowing, and

in the form of depreciation for owner-occupied housing. $S_1$ is computed by using

following information. $S_1 = \dfrac{[WT - W(1+r)^T]r}{[(1+r)^{T+0.5} - (1+r)]}$, $WT = \displaystyle\sum_{t=1}^{T} S_1(1+r)^{t-0.5} + W(1+r)^T$

*WT* is target saving balance.

*W* is current accumulated financial assets.

*T* is planned realization years to achieve *WT* from now.

*r* is after-tax interest rate.

$S_2$ is calculated by dividing the household's initial borrowings by its repayment period for

each motive.

Their test results show that most of net saving arises from retirement motive (life cycle

motive) and two precautionary motives (illness and peace of mind) and that share of

saving in the form of accumulation of financial assets for each motive vary closely with

the change of age.[32]

### 4.2.2. Data and Empirical Test Results

To test the life cycle theory using Horioka and Watanabe's (1997) method, POSFAL

data for the years of 1989-2003 are used. There are some differences in available

variables or observation ways between the POSFAL data, and the SFACH data that

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[32] Saving for leisure and housing motive appear high in the 20's and 30's bracket, whereas marriage motive
in the 40's and 50's bracket, and retirement motive in the 50's bracket.

Horioka and Watanabe (1997) used.[33]  Motives for saving are exactly the same between

these two data sets except that a business motive is not observed in POSFAL. However,

the way respondents' choose a motive is quite different.  The SFACH data allows just

one choice for the motive, while the POSFAL data allows three choices, which is thought

to be more reasonable. Proportion by number of answers for the motive choice is as

below.

| | Number of Answers for Choosing a Saving Motive | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6-9 [b] | Missing [b] | |
| Observation | 7,727 | 10,484 | 36,139 | 175 | 38 | 32 | 1,896 | 56,491[a] |
| Proportion | 13.7% | 18.6% | 64.0% | 0.3% | 0.1% | 0.1% | 3.4% | 100.0% |

    a)   Households after excluding missing data in saving rate
    b)   Excluded "selected data" set as discussed in Chapter 3 (3.4)

   Weighted motives for saving by number of answers are used on the assumption that

each answer of a household has the same weight.[34]  The POSFAL data either does not

contain, or has insufficient information on motives for dissaving and borrowing, planned

realization period for a target balance, and price of the owner-owned house.  Therefore,

"Net saving" cannot be derived using POSFAL data.  However, this does not prevent

reproducing their methodology since POSFAL data provides direct information on saving

rate and saving in the form of accumulation of financial assets.  Four analyses are

conducted for saving motives.

(1) Association between Saving Motives, and Financial Indicators and Demographics

    First, saving motives are examined by presenting key financial statistics and

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[33] Survey on the Financial Asset Choices of Households conducted by Ministry of Posts and

Telecommunication of Japan in November 1994. This seems to be special survey for specific purpose

[34] For example, if number of answer of a household is three, then each motive chosen has 1/3 weight each

demographics for each motive. Table 4-3 shows highly reasonable and distinctive figures

for each motive. Both the saving rate and annual savings are high for housing and

bequest motives, and relatively low for illness, education, and peace of mind motives.

The tax motive, however, shows deviation from this trend, low in saving rate but high in

savings. This could be possible if a household is in the high income group with a

relatively high expenditure or high repayment.

<Table 4-3> Saving Rate and Other Financial Indicators for Each Motive (1989-2003)

| Motives for Saving | Saving Rate (%) | Current Financial Assets (¥10,000) | Annual Income (after tax) (¥10,000) | Annual Savings (¥10,000) | Head Age [3] | Family Size [4] | Frequency Ratio (%) |
|---|---|---|---|---|---|---|---|
| 1. Illness | 11.1 | 1,319 | 581 | 90 | 53.2 | 3.68 | 28.5 |
| | (9) | (6) | (8) | (7) | (4) | (6) | (1) |
| 2. Peace of mind | 11.3 | 1,245 | 573 | 88 | 52.2 | 3.63 | 10.1 |
| | (7) | (8) | (9) | (8) | (6) | (7) | (4) |
| 3. Education | 11.3 | 917 | 598 | 87 | 44.0 | 4.34 | 13.7 |
| | (6) | (10) | (7) | (9) | (10) | (1) | (3) |
| 4. Marriage | 12.0 | 1,359 | 680 | 109 | 53.2 | 4.07 | 5.5 |
| | (4) | (5) | (1) | (4) | (4) | (2) | (6) |
| 5. Housing | 13.8 | 1,298 | 616 | 112 | 47.5 | 3.82 | 7.7 |
| | (1) | (7) | (4) | (2) | (8) | (4) | (5) |
| 6. Retirement | 11.7 | 1,623 | 611 | 104 | 56.5 | 3.50 | 21.5 |
| | (5) | (2) | (5) | (6) | (2) | (8) | (2) |
| 7. Durable Goods | 11.2 | 928 | 561 | 82 | 46.3 | 3.84 | 4.5 |
| | (8) | (9) | (10) | (10) | (9) | (3) | (8) |
| 8. Leisure | 12.2 | 1,449 | 609 | 108 | 50.1 | 3.37 | 4.8 |
| | (3) | (4) | (6) | (5) | (7) | (10) | (7) |
| 9. Tax | 10.4 | 1,549 | 671 | 109 | 56.1 | 3.74 | 1.8 |
| | (10) | (3) | (2) | (3) | (3) | (5) | (9) |
| 10. Bequest | 13.1 | 2,488 | 660 | 150 | 61.8 | 3.48 | 0.9 |
| | (2) | (1) | (3) | (1) | (1) | (9) | (10) |
| 11. Other | 8.7 | 963 | 564 | 70 | 51.6 | 3.62 | 1.0 |

Source: Selected POSFAL data, Aggregate 1989-2003. Annual Income is collected during 1990-2003, Annual Savings during 1991-2003.

Notes: 1) All figures are the mean of households for each motive and all amounts are expressed with real value by CPI (2000=100)  2) The figures in parentheses show the order of each motive (excluding 'other') 3) Head Age is computed by using the median for each age group (e.g., the 30's age group is considered at the age of 35; and 72.5 is considered for the age group "over 70's") 4) Computation of 7.5 is used for the "7 or more" Family Size group.

Current wealth (financial assets), and annual income are high for case of bequest, tax, and retirement motive.  However, they are a relatively low value for the motives of illness, education and peace of mind.  These results for wealth are generally consistent with the findings of Horioka and Watanabe (1997).[35]  Target year (planned saving period to accomplish target balance) is high in the case of children's education, purchase of durable goods and housing.   When the household head is older, bequest, retirement and tax motive is stronger, while a younger household head has a stronger motive for education, purchase of durable goods, housing, and leisure.  When a family size is larger, the education, marriage, durable goods, and housing motive for saving are stronger, whereas when a family size is smaller, leisure, bequest, and retirement motive for saving are stronger.  Illness, retirement, and education motives are frequently chosen while bequest, tax, durable goods motives are rarely chosen.

In short, <Table 4-3> shows us some notable figures between saving behavior and demographics using a saving motive for the intermediary:  (a) A precautionary motive like illness and peace of mind are common, regardless of age group and size of household, and so the average for each financial indicator appears relatively low.  (b) The households with an education motive tend to be very young and tend to have a large household size, a long horizon for attaining the planned saving balance but have a low level of income and wealth.  (c) The households with a marriage motive tend to belong to the median age group, have large household size, and have a high level of income, but the wealth level is not so high. (d) The households with a high housing motive tend to be

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[35] One difference between the author's results and Horioka et al (1997) is the tax motive which shows lowest target wealth and current wealth from Horioka et al. Since higher taxes generally signify greater wealth, the author's results appear to reflect a more realistic situation.

fairly young in age, have a strong propensity to save in both saving amount and saving rate even if their income level is not so high. (e) A retirement motive is generally the case for the older age group and households with a motive to accumulate high levels of wealth. (f) The households with the motive to purchase durable goods tend to be young, have a relatively large family and have low level of income and wealth. (g) The households with a leisure motive tend to have the smallest family size and a middle income and wealth level. (h) The households with a tax motive usually belong to high income and wealth levels and are in the relatively older age group. (i) The household with the bequest motive tend to be the eldest group, have a small size of family, and have a high level of income and wealth. In addition, target saving is highest and they show a high propensity to save even though the cases is very few in this bequest motive group.

(2) Association between Saving Motives and Saving Share by Age

How saving shares for each motive change over one's lifetime is now analyzed. Here, the association between motive and age is scrutinized. Figure 4-3 and Table 4-4 show the household share of saving for selected motives using the household head age group. This presents a very interesting trend. Saving for children's education occurs strongly in the 20's, 30's and 40's age group while declining rapidly after 50's. The saving motive for children's marriage appears in the 40's, and reaches a peak in 50's. The housing motive tends to be strongest in the 20's and 30's age category and decreases after 40's. The motive to save for retirement increases rapidly during the 40's and dominates the saving motive after 50's with a proportion of 33%. Saving for both durable goods purchase and leisure attain its peak in 20's and decline afterwards, but leisure motive increase a little

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again in the 60's age bracket. Saving for tax and bequest motive increase with age but their portion is very small.  Savings for both illness and peace of mind is important across all ages, but the trend over the age brackets is different.  The illness motive increases continuously with age while the peace of mind motive takes a V shape, high in younger and older ages while low in the middle age group. In general, a younger household is more likely to be dominated by the life cycle motive while an elder household by the precautionary motive.  This implies that younger households diversify their motives for saving, while elder households concentrate on fewer motives.  In fact, three motives (illness, retirement, and peace of mind) explain most of the motives for age group of 60's and over.

In addition, as can be seen in Figure 4-4 (a) through (f), the above results obtained from the pooled data (1989-2003) are almost the same as the results from each cross section.[36] This is completely consistent with the findings of Horioka and Watanabe (1997).  Their results demonstrate that saving share for each motive in Japanese households' is closely related with one's life stage, and the saving motive is appropriate for that particular life stage.

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[36] The motive for peace of mind causes a few deviations. That motive share is extraordinary high in the 70's age group during 1994 at 21%, and in the 20's age group during 2000 at 21%.

<Figure 4-3> Saving Share for Selected Motives by Age Groups (Aggregate: 1989-2003)



Source: selected POSFAL data, 1989-2003

<Table 4-4> Saving Share for Selected Motives by Age Groups (Aggregate: 1989-2003)

| Age of Household Head | 20's | 30's | 40's | 50's | 60-64 | 65-69 | Over 70 |
|---|---|---|---|---|---|---|---|
| ■ Frequency | 1,302 | 6,450 | 10,573 | 11,246 | 4,940 | 3,940 | 3,999 |
| ■ Share of Saving for motives (%) [1] | | | | | | | |
| 1. Illness | 21.3 | 22.7 | 25.8 | 28.1 | 30.1 | 33.2 | 33.3 |
| 2. Peace of mind | 14.9 | 12.5 | 9.6 | 9.8 | 10.5 | 11.4 | 14.1 |
| 3. Education | 18.7 | 24.0 | 23.3 | 7.0 | 2.2 | 2.2 | 3.5 |
| 4. Marriage | 1.5 | 1.8 | 5.0 | 9.8 | 5.8 | 2.9 | 1.8 |
| 5. Housing | 17.4 | 16.1 | 9.0 | 7.1 | 5.6 | 5.2 | 4.9 |
| 6. Retirement | 4.5 | 8.9 | 16.8 | 28.1 | 32.4 | 31.2 | 29.1 |
| 7. Durable Goods | 8.4 | 7.0 | 4.6 | 3.0 | 2.3 | 2.0 | 1.9 |
| 8. Leisure | 10.2 | 6.0 | 3.5 | 3.9 | 5.6 | 5.6 | 3.7 |
| 9. Tax | 0.9 | 0.8 | 1.1 | 1.5 | 2.2 | 2.8 | 2.7 |
| 10. Bequest | 0.1 | 0.3 | 0.5 | 1.2 | 2.4 | 3.1 | 4.2 |
| 11. Other | 2.1 | 1.2 | 0.9 | 0.7 | 1.0 | 0.6 | 0.8 |
| (a Precautionary Motive | 36.2 | 34.2 | 35.4 | 37.9 | 40.6 | 44.6 | 47.4 |
| (b) Life Cycle Motive | 61.7 | 64.4 | 63.2 | 60.3 | 56.1 | 51.7 | 47.6 |
| ■ Average Saving Rate (%) | 11.7 | 12.0 | 11.3 | 11.8 | 11.1 | 10.2 | 8.9 |

Source: Author's calculation using selected POSFAL aggregate data (1989-2003)

1) Calculated by dividing "separated saving rate" for the particular saving motive of a household by "total saving rate" of the household and multiplying 100

<Figure 4-4 (a)> Saving Share for Selected Motives by Age Groups (cross-section:1989)



<Figure 4-4 (b)> Saving Share for Selected Motives by Age Groups (cross-section:1991)



<Figure 4-4 (c)> Saving Share for Selected Motives by Age Groups (cross-section:1994)

<Figure 4-4 (d)> Saving Share for Selected Motives by Age Groups (cross-section:1997)



<Figure 4-4 (e)> Saving Share for Selected Motives by Age Groups (cross-section:2000)



<Figure 4-4 (f)> Saving Share for Selected Motives by Age Groups (cross-section:2003)

(3) Association between Saving Motives and Saving Share by Occupation

Noticeable effects are observed on saving share for each motive by occupation, as seen in Figure 4-5. For example, the households with agricultural workers tend to have a higher motive for illness and bequest saving. White-collar workers tend to have a lower motive for saving in retirement and an extraordinarily high one for education. A high illness motive for farmers is thought to represent their income risk. A low retirement motive for office workers may be attributed to a well-organized pension plan from their employer. Another distinction shows up in peace of mind saving. The white-collar workers and managers tend to be relatively low choosing the peace of mind motive,

<Figure 4-5> Saving Share for Selected Motives by Occupation (aggregate: 1989-2003)



Source: Selected POSFAL data, 1989-2003.

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whereas farmers, business proprietors and professionals tend to be relatively high in choosing the peace of mind motive. This appears to imply income risk from each occupational group influences precautionary saving.

(4) Change in Saving Motives over Years

Changes in saving motives during 1989-2003 are also examined, as seen in Table 4-6 (a), (b). Noticeable changes are decreasing in motives for education, marriage and housing, and rising in motive for retirement. One possible answer for this trend is the aging society of Japan.[37] Table 4-5 shows that portion of population in 0~19 ages has rapidly decreased. This may decrease saving motives for children's education and marriage. The other possible answer is the deteriorating economic situation after the 1990's. Uncertain future may suppress detailed purposive motives for the young and lead to more precautionary motives (peace of mind profile shift upward in Figure 4-4 (c) through (e)). Downturn of housing prices may also lessen the desire to purchase the home. Whatever the reason of change in motives for saving is, this trend is suspected to cause decreasing saving rate. But further study is needed for clear evidence.

<Table 4-5> Population Trend by Age (%)

|  | 1990 | 1995 | 2000 |
|---|---|---|---|
| 0~19 | 26.3 | 22.8 | 20.5 |
| 20's | 13.7 | 14.9 | 14.4 |
| 30's | 13.6 | 12.7 | 13.3 |
| 40's | 15.9 | 15.6 | 13.2 |
| 50's | 12.8 | 13.4 | 15.1 |
| 60's | 9.6 | 11.0 | 11.7 |
| over 70 | 8.2 | 9.6 | 11.9 |

Source: Statistical Bureau, Japan

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[37] The POFAL data also shows average age of household head is increasing over years: 50.2 in 1989, 52.0 in 1995, 54.5 in 2003 (Refer to Table 3.1 for details)

<Table 4-6> Change in Saving Motives over Years

(a) Frequency Ratio for Selected Motives over Years (%)

| Year | Illness | Peace of mind | Educa-tion | Marri-age | Hous-ing | Retire-ment | Durable goods | Lei-sure | Tax |
|---|---|---|---|---|---|---|---|---|---|
| 1989 | 30.4 | 10.8 | 15.7 | 6.7 | 6.8 | 19.3 | 4.3 | 2.6 | 2.2 |
| 1990 | 29.0 | 10.0 | 15.7 | 6.7 | 7.3 | 20.4 | 4.8 | 3.2 | 2.0 |
| 1991 | 28.4 | 8.8 | 15.8 | 6.7 | 8.5 | 19.5 | 4.7 | 5.1 | 1.4 |
| 1992 | 28.9 | 9.4 | 15.2 | 6.4 | 7.8 | 20.6 | 4.1 | 4.8 | 1.7 |
| 1993 | 28.6 | 9.2 | 14.5 | 6.6 | 8.0 | 20.2 | 4.2 | 5.0 | 1.3 |
| 1994 | 28.6 | 9.9 | 13.6 | 5.8 | 8.0 | 21.4 | 4.1 | 5.0 | 1.7 |
| 1995 | 28.3 | 10.1 | 13.2 | 5.9 | 8.2 | 21.5 | 3.9 | 5.2 | 1.7 |
| 1996 | 27.9 | 10.2 | 13.2 | 5.7 | 8.2 | 21.7 | 4.4 | 4.8 | 1.8 |
| 1997 | 28.1 | 10.0 | 13.0 | 5.3 | 8.2 | 21.6 | 4.2 | 5.1 | 1.9 |
| 1998 | 29.2 | 10.1 | 13.3 | 5.0 | 7.6 | 22.1 | 4.4 | 4.8 | 1.6 |
| 1999 | 28.3 | 10.7 | 12.1 | 4.5 | 7.5 | 22.5 | 4.7 | 5.6 | 1.6 |
| 2000 | 27.0 | 10.6 | 12.9 | 4.5 | 7.6 | 22.4 | 5.0 | 6.0 | 1.9 |
| 2001 | 27.5 | 10.7 | 12.2 | 4.3 | 7.4 | 23.4 | 4.9 | 5.4 | 1.9 |
| 2002 | 27.8 | 10.5 | 12.1 | 3.9 | 7.6 | 22.9 | 5.0 | 5.6 | 1.9 |
| 2003 | 29.0 | 9.9 | 12.4 | 3.5 | 7.0 | 24.3 | 4.8 | 4.7 | 2.2 |

Source: selected POSFAL data, 1989-2003.
Note: Bequest and "other" Motives are not presented in this table

(b) Share of Saving for Selected Motives over Years (%)

| Year | Illness | Peace of mind | Educa-tion | Marri-age | Hous-ing | Retire-ment | Durable goods | Lei-sure | Tax |
|---|---|---|---|---|---|---|---|---|---|
| 1989 | 30.7 | 11.5 | 15.1 | 6.6 | 7.9 | 20.1 | 3.9 | 2.6 | 1.7 |
| 1990 | 28.5 | 10.8 | 15.1 | 7.1 | 8.4 | 20.9 | 4.4 | 3.0 | 1.9 |
| 1991 | 28.0 | 10.0 | 15.1 | 5.9 | 10.3 | 20.7 | 3.8 | 4.8 | 1.4 |
| 1992 | 28.0 | 11.9 | 14.5 | 5.9 | 9.0 | 21.4 | 3.6 | 4.4 | 1.4 |
| 1993 | 28.2 | 10.0 | 13.4 | 6.4 | 8.8 | 21.7 | 3.4 | 4.9 | 1.2 |
| 1994 | 27.4 | 11.0 | 13.6 | 5.7 | 9.0 | 21.8 | 3.8 | 5.3 | 1.3 |
| 1995 | 27.5 | 11.0 | 12.5 | 5.9 | 9.2 | 22.2 | 3.7 | 4.8 | 1.6 |
| 1996 | 27.2 | 10.6 | 12.0 | 5.7 | 9.9 | 22.8 | 4.0 | 4.5 | 1.8 |
| 1997 | 26.8 | 11.2 | 12.1 | 5.6 | 9.4 | 23.0 | 3.4 | 5.0 | 1.5 |
| 1998 | 28.0 | 10.4 | 12.8 | 5.0 | 9.4 | 23.2 | 3.6 | 4.7 | 1.5 |
| 1999 | 27.2 | 11.7 | 11.4 | 4.5 | 8.8 | 23.2 | 4.2 | 5.9 | 1.5 |
| 2000 | 25.2 | 11.6 | 12.4 | 4.5 | 8.2 | 24.4 | 4.6 | 6.0 | 1.8 |
| 2001 | 26.9 | 11.5 | 12.2 | 4.0 | 8.4 | 23.8 | 4.5 | 5.6 | 1.6 |
| 2002 | 26.6 | 12.2 | 11.9 | 3.6 | 9.1 | 23.9 | 4.3 | 5.2 | 1.6 |
| 2003 | 27.5 | 11.3 | 12.5 | 3.5 | 8.3 | 24.0 | 4.1 | 5.0 | 2.0 |

Source: selected POSFAL data, 1989-2003.
Note: Bequest and "other" Motives are not presented in this table

**4.2.3. Interpretation of Empirical Results from Model for Saving Motives**

Horioka and Watanabe (1997) point out their results have a limitation arising from the difference between the planned period and the actual period in reaching target wealth. This paper has a similar limitation. A household saving share for each motive is achieved under the assumption that each household's answer has the same weight. Actually, however, households may give different weights to each motive when they have multiple answers. If motive weights truly are different, this unknown variable would change the results. Weighing motives in future studies would therefore be helpful.

Except for the limitation, Horioka and Watanabe (1997) assert that their findings show strong evidence for the life cycle model, which is highly applicable in the case of Japan. However, Horioka and Watanabe's conclusion seems to be too hasty when the following problems are considered:

(a) The first serious problem is that they neglect the influence arising from other factors, especially from income and wealth. As can be seen from Table 4-3 and Figure 4-5, level of income and wealth, and other demographics like family size and occupational group may considerably affect the motives for household saving. Therefore, separating effects on saving motive originating from the life cycle by controlling income variable or other demographics except age is needed.

(b) There may be a gap between actual saving and motives for saving. For example, life-cycle types of motives dominate the saving motives for households in the 20's and 30's age group as the life cycle theory expects. Motives for saving reflect that there are strong needs for consumption. So if there is no income risk, nor liquidity constraint, no reason

exists to put off their consumption for an uncertain future. This tends to suggest young

people in their 20's and 30's would have a lower saving rate if the life cycle theory is

correct. However, the observed actual saving rates of the 20's and 30's age bracket is not

lower than those of 40's and 50's age group, at least in average value (Table 4-4). This

has two implications: One implication is researchers should be very cautious in

interpreting life cycle motives. The fact that a household has a life cycle motive for

saving may explain why he or she saves, but it does not mean that he or she actually

follows the saving behavior in accordance with the prediction of the life cycle income

hypothesis. The other implication is that younger households show behavior without a

long horizon for their consumption in a reverse pattern with the presumption of the life

cycle theory.

(c) This study observes a large portion of saving relies on a precautionary motive for

saving (40~50%, Table 4-4), which is consistent with the finding of Horioka and

Watanabe (1997). Precautionary saving is quite a different type from the saving in the

life cycle theory. This is relevant to future uncertainty and a liquidity constraint, but not

relevant to age. So even with consensus that saving share for a life cycle motive is

ascribed to the saving behavior of that particular part of the life cycle, the research

importance for precautionary saving does not weaken.

# Chapter 5.

# Study on Portfolio Choice in Japan

In this chapter, various aspects of the Japanese portfolio choice are presented.  The criteria of classification of thirteen financial products are described.  To do so, characteristics of each product is overviewed.  Portfolio trend over time and some features from the portfolio participation and diversification are presented also.  Portfolio distribution is examined through age-portfolio profile and wealth-portfolio profile. These analyses will provide the brief clues for the predictions of theoretical model about associations between portfolio and age, wealth, and participation barriers such as transaction costs and information.

## 5.1. Characteristics and Categorization of Financial Products in Japan

### 5.1.1. Overview of Thirteen Financial Products

POSFAL data reports thirteen types of financial products mentioned previously in section 3.2.  Characteristics of these financial products are explored in more detail in order to analyze household's portfolio selection efficiently by grouping some categories according to their similarities and differences.

(1) Deposits and Savings (excluding Postal Savings)

Deposits and savings are extended by banks and postal savings which are depository financial institutions.  Here, banks consists of: (a) Domestically licensed banks

(DLB)[38]; (b) Foreign-owned banks in Japan (FBJ); (c) Financial institutions for

agriculture, forestry, and fisheries (FIAF)[39]; and (d) Financial institutions for small

businesses (FISB).[40]  Total deposits outstanding come to 770 trillion yen in 2003.  In

2003, bank market share are 69.4%[41] and that of postal savings is 30.6%.  Deposits can

be classified by three types as of demand, time and foreign currency deposits. Demand

deposits are deposits with no fixed term, which are redeemable on demand and are

primarily used for settlement.  They include current deposit, ordinary deposit, notice

deposit and saving deposit.  Time deposits have a fixed term and are primarily used for

interest revenue.  They include the time deposit and installment deposit.

Deposits by products[42] (Table 5-1) have largely changed in their each portion.  The

portion of demand deposits has increased continuously from 27% in 1985 to 45% in 2003,

while time deposits have simultaneously decreased from 71% in 1985 to 51% in 2003.

The foreign currency deposit is very small but the share is rising (1998: 0.2%→

2003:0.9%). The term of time deposit (Table 5-2) varies from one month up to ten years

and term of installment deposit extends usually from one year to five years.  Main

maturity term of time deposit has changed from less than one year to more than one year.

The most common time deposit is between one and three years (51.5%, 2003).

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[38] Consists of City, Regional, Regional 2, Long-term Trust, and Trust Banks

[39] Consists of Agricultural cooperatives, Fishery co-ops, Credit federation of Agricultural Co-ops, and
Perfectural Credit Federations of Fishery Co-ops

[40] Consists of Shinkin banks, Shinkin Central bank, Credit co-ops, Labor Credit Associations, Shoko
Chukin bank, National Federations of Labor Credit Associations

[41] DLB has 44.3%, FBJ 0.4%, FIAF 9.7%, FISB 14.9%

[42] This statistics is relying on the figure of City banks, Regional banks, Regional 2 banks and Shinkin banks.
It is because these banks take usually ¾ portions of individuals' deposits and there is no available data from
other financial institutions.

<Table 5-1> Individual's Deposits Outstanding by Institutions and Products

| Year | Total (trillion yen) | By Institutions (%) | | | | | By Deposit Products (%) [1] | | |
|------|------|------|------|------|------|------|------|------|------|
| | | DLB | FBJ | FIAF | FOSB | Postal Saving | Demand | Time | Foreign Currency |
| 1985 | 337.8(5.6) | 31.7 | 0.1 | 12.8 | 23.0 | 32.4 | 27.0 | 70.8 | - |
| 1990 | 461.0(6.4) | 42.6 | 0.1 | 10.9 | 17.1 | 29.3 | 26.3 | 71.4 | - |
| 1995 | 581.3(5.2) | 39.0 | 0.2 | 9.9 | 15.8 | 35.1 | 30.1 | 67.7 | - |
| 2000 | 717.9(4.3) | 41.4 | 0.3 | 9.0 | 14.6 | 34.7 | 36.1 | 60.6 | 0.7 |
| 2003 | 770.1(2.4) | 44.3 | 0.4 | 9.7 | 14.9 | 30.6 | 45.0 | 50.7 | 0.9 |

Source: Flow of Funds and Deposits by Depositor (End of Period basis, 2000 year=100), BOJ
Note: Parenthesis in Total column show growth rate by simple average rate for 1985, 1986-1990,
    1991-1995, 1996-2000, 2001-2003 respectively
1) Data only from City, Regional, Regional 2 and *Shinkin* Banks


<Table 5-2> Individual's Time Deposit Outstanding by Deposit Term

| Year | Total (trillion yen) | Share (%) | | | | | |
|------|------|------|------|------|------|------|------|
| | | 1 month ~3 month | 3 month ~1 year | 1 year ~3 years | 3 years ~5 years | Over 5 years | Maturity Designated |
| 1985 | 4.1    (-) | - | 94.2 | 5.8 | - | - | - |
| 1990 | 176.8(118.7) | 32.5 | 53.0 | 14.5 | - | - | - |
| 1995 | 273.2  (9.3) | 19.2 | 26.4 | 41.0 | 4.2 | 0.7 | 8.4 |
| 2000 | 288.7  (1.1) | 9.7 | 21.7 | 45.4 | 7.5 | 7.0 | 8.7 |
| 2003 | 240.1 (-5.9) | 5.5 | 12.9 | 51.5 | 9.9 | 10.7 | 9.4 |

Source: Outstanding. Deposits by Depositor (End of Period basis, 2000 year=100), BOJ
Note: Parenthesis in Total column show growth rate by simple average rate for 1986-1990, 1991-1995,
    1996-2000, 2001-2003 respectively


 (2) Postal Savings


   Postal savings are extended by Japan Post, which is a depository corporation other than

banks.  It is operated by the government[43] and individuals can only have postal saving

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[43] Independently operated by Postal Services Agency under Ministry of Posts and Telecommunications

(MPT) from BOJ, MOF and now reorganized as public corporation at 2003.4. The Cabinet announced on

accounts with deposit ceilings[44]. Postal savings (Table 5-3) hold a substantial market

share in individuals' deposits; about 33%[45]. It is a very unique Japanese phenomenon

different from other advanced countries. *Teigaku* saving holds highest portion of postal

saving even though its share is declining. *Teigaku* is a kind of time deposit that can be

held up to ten years with a fixed rate at the time of opening account and that can be

withdrawn freely without any penalty after six months. The minimum amount for a

*Teigaku* account is ¥1,000. So *Teigaku* has both characteristics of demand and time

savings.

<Table 5-3> Postal Savings by Products

| Year | Total (trillion yen) | Growth Rate ( %) | By Products of Savings (%) | | | |
|------|------|------|------|------|------|------|
| | | | Ordinary | *Teigaku* | Time | Others |
| 1990 | 135.6 | - | - | - | - | - |
| 1995 | 204.4 | 8.6 | 9.0 | 86.9 | 3.7 | 0.4 |
| 1996 | 216.9 | 6.1 | 9.6 | 86.5 | 3.5 | 0.4 |
| 1997 | 230.4 | 6.2 | 10.6 | 84.4 | 4.7 | 0.3 |
| 1998 | 243.4 | 5.6 | 11.2 | 82.1 | 6.4 | 0.3 |
| 1999 | 254.9 | 4.7 | 11.9 | 82.0 | 5.8 | 0.2 |
| 2000 | 249.9 | -2.0 | 16.3 | 77.5 | 5.9 | 0.2 |
| 2001 | 241.7 | -3.3 | 20.1 | 73.5 | 6.2 | 0.2 |
| 2002 | 240.2 | -0.6 | 21.9 | 72.0 | 5.9 | 0.2 |
| 2003 | 237.1 | -1.3 | 23.6 | 70.4 | 5.7 | 0.2 |

Source: Postal Savings Balance by Type (2000 year =100), Japan Post

2003.9 that they have planned to divide the company into four, which are postal services, postal savings

services, postal life insurance services and window networks (post offices), and privatize each in 2007.4

[44] Deposit ceilings have changed throughout the period: Y3 million (~88.3)→ Y5 million (88.4~89.12)

→Y7 million (90.1~91.10) → Y10 million (91.11~)

[45] The reason of Postal saving's success is said due to convenient accessibility and exclusive products

called as "Teigaku" time deposits. Postal office handling savings and life insurance together are more than

bank branches handling only saving in almost prefectures(24,100 in total, 2003)(Thomas Cargill &

Naoyuki Yoshino, The postal saving system, fiscal investment and loan program of Japan's financial

system)

(3) Money Trusts and/or Loan Trusts

Money and loan trusts are extended by Trust banks, Long-term trust banks and domestically licensed banks with trust accounts[46]. Money & loan trusts are basically long term savings.[47] The maturity of a money trust is at least one year[48] but usually three to five years. The term of loan trust is at least two years but usually five years. As a result, the portion of five years and more term come to 71% in 2003. This long-term saving appears to have caused a decrease in trust savings with super low interest rate after 1995.

&lt;Table 5-4&gt; Individuals' Money and Loan Trust

| Year | Total (trillion yen) | Growth rate (%) | Money trust | | Loan trust | | 5 or more years (share, %) |
|------|------|------|------|------|------|------|------|
| | | | (trillion yen) | share (%) | (trillion yen) | share (%) | |
| 1990 | 37.3 | - | 4.7 | 12.6 | 32.6 | 87.4 | 96.7 |
| 1991 | 39.9 | 6.8 | 5.6 | 14.0 | 34.3 | 86.0 | 94.4 |
| 1992 | 42.4 | 6.4 | 6.8 | 16.1 | 35.6 | 83.9 | 90.8 |
| 1993 | 43.6 | 2.7 | 7.9 | 18.1 | 35.7 | 81.9 | 85.6 |
| 1994 | 43.8 | 0.6 | 9.3 | 21.2 | 34.6 | 78.8 | 80.2 |
| 1995 | 41.6 | -5.2 | 9.8 | 23.6 | 31.8 | 76.4 | 73.0 |
| 1996 | 37.5 | -9.8 | 8.6 | 23.0 | 28.9 | 77.0 | 72.0 |
| 1997 | 30.5 | -18.7 | 7.3 | 23.9 | 23.2 | 76.1 | 74.4 |
| 1998 | 25.5 | -16.3 | 6.4 | 25.1 | 19.1 | 74.9 | 76.6 |
| 1999 | 22.2 | -13.1 | 5.9 | 26.6 | 16.3 | 73.4 | 77.7 |
| 2000 | 18.7 | -15.6 | 5.4 | 29.1 | 13.3 | 70.9 | 79.6 |
| 2001 | 14.1 | -24.7 | 4.6 | 32.9 | 9.5 | 67.1 | 78.1 |
| 2002 | 10.9 | -22.7 | 4.3 | 39.3 | 6.6 | 60.7 | 77.0 |
| 2003 | 9.0 | -17.1 | 4.1 | 45.9 | 4.9 | 54.1 | 71.3 |

[46] Trust banks have dealt with long term loans and were seriously damaged during Japanese financial crisis in the middle of 1990's. (Hoshi et al, 2000)
[47] Cancellation before maturity is possible if trust term is over 1 year but it requires some cancellation fee
[48] Newly introduced products in the money trust such as *Hit* and *Super Hit* have a flexible designated term if the term is larger than 1 month.

Source: Trust Companies Association of Japan (2000=100)
(4) Life Insurance (including Non-Life Insurance and Postal life Insurance) / Personal

Annuity Insurance

Life insurance and individual annuity insurance are extended by life insurance

companies, non-life insurance companies, and Japan Post (*Kampo*).[49]  Life insurance,

non-life insurance and annuity insurance[50] are examined together since insurance

companies manage mingled assets from the life and annuity insurance,[51] and the

premium paid for "saving type insurance" of non-life insurance is included in POSFAL

survey.[52]  Numerous life insurance products can be classified primarily by main

purposes; death coverage, living coverage, and medical care coverage as shown in Table

5-5.  Life insurance and annuity insurance are basically long term saving over five years.

The types of term and whole life insurance are saving for one's family rather than

oneself.  Endowment and annuity insurance is savings for oneself.   Cancellation during

the period of insurance causes substantial loss: no refund or only part of the paid

premium is refunded.  As seen in Table 5-6, life insurance purchases are declining every

year since 1996 when the peak was reached in business in force as of 2,098 trillion yen.[53]

Individual annuity holds 5% out of personal life insurance (excluding group insurance

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[49] Agricultural Co-ops, Labor co-ops etc are dealing with mutual aid insurance similar to life insurance

[50] Japan's pension system is called as a "three legged stool," with a basic government pension, work-related pensions, and individuals' own pension plans.(Harner, Japan's financial revolution, p94). Third layer is covered here.  Refer to reference for details

[51] Japan's Life insurance company separate their management assets between "fixed life insurance" and "variable life insurance"(From author's inquiry, Life Insurance Association of Japan, 07/26/2006)

[52]  The resulting premium paid for property and accident insurance is excluded in the financial assets

[53] In April 1997, Nissan Life failed.  "Negative interest carry" from guaranteed yield on investment under super low interest circumstances  and bad loan from bubble bursts cause this crisis in life insurance industry (Harner, "Japan's Financial Revolution",2000, p84)

and annuity).  Whole life type insurance is the most popular among personal life insurance products with a portion of 60~70%.  Japan Post takes a 12~14% share in individual life insurance and has an approximate 3% share in the personal annuity insurance. The components of Japan Post life insurance products are quite different from those in private companies: endowment insurance makes up the largest in amounts of 83% share in 2003.  Until 1996, products of life insurance and annuity were safe and profitable financial assets in which insurance companies guarantee a higher rate of yield than banks. But this pattern ended after Nissan Life went bankrupt in 1997.  The Ministry of Finance introduced a protection system for policy holders beginning in December 1998.  90% of the policy reserves of insurance contracts are protected by The Life Insurance Policyholders Protection Corporation of Japan and The Non-Life Insurance Policyholders Protection Corporation of Japan.[54]   To promote life insurance and annuity, the Japanese government provides some tax benefits.[55]

<Table 5-5> Life Insurance Products by Main Purpose

| Main purpose | Example | Products |
|---|---|---|
| Death Coverage | Supporting the remaining family's living expenses after one's death | Term life insurance Whole life insurance |
| Living Coverage (Long-term Saving) | A fund needed for special plan such as children's education/ marriage and one's life after retirement | Endowment insurance. Education insurance. Individual annuity insurance |
| Medical Care Coverage | Covering medical expenses associated with an accident or illness | Medical/Health/Nursing Insurance. |

Source: Encyclopedia of Financial Products (2006), The Central Council for Financial Services Information

[54]Postal life insurance are fully protected by government

[55] For payment of premium, income deduction is applied up to 50,000 yen of income tax and 35,000 yen of inhabitant tax.  For benefits of insured amount, income exemption is applied as of 50% profit (=insured amount minus total premium minus 500,000 yen)

&lt;Table 5-6&gt; Life Insurance Business in Force by Type: Private Insurance Companies

| Year | Total (trillion yen) | Individual insurance (trillion yen) | Individual annuity (trillion yen) | Share of products in life insurance (%) | | | |
|------|------|------|------|------|------|------|------|
| | | | | Whole life | Term | Endowment | others |
| 1990 | 1,597 (11.3) | 1,086.4 | 41.6 | * | * | * | * |
| 1995 | 2,063 (5.3) | 1,407.4 | 84.6 | * | * | * | * |
| 1996 | 2,098 (1.7) | 1,442.9 | 84.0 | * | * | * | * |
| 1997 | 1,886(-10.1) | 1,401.3 | 79.2 | * | * | * | * |
| 1998 | 1,840 (-2.4) | 1,357.9 | 78.7 | * | * | * | * |
| 1999 | 1,824 (-0.9) | 1,338.1 | 76.4 | 69.6 | 8.2 | 7.8 | 14.4 |
| 2000 | 1,802 (-1.2) | 1,312.0 | 74.1 | 67.5 | 8.9 | 7.1 | 16.5 |
| 2001 | 1,753 (-2.7) | 1,268.9 | 70.3 | 65.3 | 10.5 | 6.5 | 17.7 |
| 2002 | 1,724 (-1.6) | 1,245.8 | 70.3 | 63.4 | 12.0 | 5.9 | 18.7 |
| 2003 | 1,677 (-2.7) | 1,201.5 | 72.5 | 62.5 | 13.1 | 5.4 | 19.0 |

Source: The Life Insurance Association of Japan
Note: Parenthesis in Total column show growth rate. Growth rate in row of 1990 and 1995 mean simple
average rate for 1986-1990 and 1991-1995 respectively.


(5) Worker's Asset Formation Savings (WAFS)


There are three types of WAFS: ordinary, pension, and home acquisition WAFS.

All kinds of financial institutions like banks, cooperatives, security companies, life and

non-life insurance companies, and Japan Post offer these savings.  This product is

available only for employees under the age of 55 at the time of account opening and

restricted by having one account per employee across all financial institutions.  Minimum

maturity is three years for ordinary WAFS and five years for pension and home

acquisition WAFS.  These savings have relatively a high profitability with interest rates

almost equivalent to the rate of time deposits (90~95%) even though they are almost the

same as installment saving type. Furthermore, the Japanese government provides a

special tax exemption: Non-taxable up to 5.5 million yen in principle base for pension and home acquisition WAFS.  Depositors may be guaranteed for an educational loan or a housing loan from the banks with relatively low rate.

(6) Investment Trust

There are three types of investment trusts according to investment objects: Stock (SIT), Bond (BIT)[56], and Real estate investment trusts (REIT).  SIT and BIT will receive the focus in this study since REIT introduced in 2000 and hold a minute market share (1.6% in 2003).  The share of SIT increased in the second half in the 1980's up to 78% (1989) and declined in the 1990's to 25% (1997), and is increasing since 2000.  SIT composes its portfolio with stocks, bonds, loans and other investment assets.  The stock portions of SIT vary with fluctuations in the stock market.  BIT only invests in bonds, loans and other investments. Stocks, bonds and other investments include each foreign currency financial assets.  There has been a big change in the investment trust market since 1998, in which the "Privately placed investment trust (PPIT)"method was newly introduced in addition to the traditional "Publicly offered investment trust (POIT)" method.  PPIT is rising rapidly.[57]  More importantly, PPIT relies highly on SIT sale: the share of SIT in PPIT is 90% while that in POIT is 57% in 2003.  Investors using investment trust may expect a high return, but must consider considerable transaction cost such as sales commission fee, contribution fee and reserve fee as well as interest rate risk or exchange rate fluctuations.

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[56] Include MRF(Money Reserve Fund) and MMF(Money Management Fund)

[57] PPIT market share is 7% in 2000, 22% in 2003, and 32% in 2005

<Table 5-7> Investment trust: Outstanding Balance by Product and Portfolio Composition

| Year | Total (trillion yen, %) [1] | Share by Type (%) | | Share in Asset Portfolio (%) | | | Ratio of Foreign Currency Asset to Each Asset (%) | | |
|---|---|---|---|---|---|---|---|---|---|
| | | SIT | BIT | Stock | Bond | Call Loan, Others | Foreign Total/ Total | Foreign Stock [2] | Foreign Bond [2] |
| 1990 | 45.8(-23.5) | 76.3 | 23.7 | 33.7 | 31.8 | 34.5 | 7.4 | 5.2 | 15.1 |
| 1991 | 40.1(-12.3) | 68.9 | 31.1 | 33.7 | 37.0 | 29.3 | 13.0 | 5.6 | 26.9 |
| 1992 | 41.4 (3.0) | 48.7 | 51.3 | 24.5 | 42.6 | 32.9 | 9.7 | 5.0 | 15.6 |
| 1993 | 48.3 (16.7) | 38.5 | 61.5 | 23.2 | 42.7 | 34.1 | 7.3 | 10.4 | 9.9 |
| 1994 | 41.3(-14.4) | 40.2 | 59.8 | 26.9 | 44.1 | 29.0 | 6.7 | 11.3 | 6.7 |
| 1995 | 45.9 (11.1) | 30.6 | 69.4 | 20.7 | 47.7 | 31.6 | 5.8 | 11.1 | 6.8 |
| 1996 | 46.9 (2.2) | 26.3 | 73.7 | 17.2 | 49.1 | 33.7 | 5.9 | 10.8 | 7.4 |
| 1997 | 38.9(-17.1) | 24.6 | 75.4 | 13.2 | 56.5 | 30.3 | 8.5 | 13.3 | 10.8 |
| 1998 | 41.2 (5.8) | 26.9 | 73.1 | 11.9 | 50.9 | 37.2 | 12.2 | 20.9 | 17.6 |
| 1999 | 51.9 (25.9) | 32.0 | 68.0 | 20.3 | 43.4 | 36.3 | 7.1 | 11.2 | 10.1 |
| 2000 | 53.1 (2.4) | 33.5 | 66.5 | 20.3 | 51.3 | 28.4 | 6.2 | 11.0 | 7.1 |
| 2001 | 51.9 (-2.2) | 38.8 | 61.2 | 21.2 | 49.2 | 29.6 | 8.3 | 11.9 | 11.1 |
| 2002 | 44.7(-14.0) | 52.6 | 47.4 | 25.5 | 49.9 | 24.6 | 15.3 | 9.0 | 25.1 |
| 2003 | 49.8 (11.6) | 64.3 | 35.7 | 29.1 | 49.8 | 21.0 | 22.4 | 11.1 | 36.7 |

Source: The Investment Trust Association of Japan

1) 2000=100. Parenthesis show growth rate in percentage. Privately placed investment trusts is included in "Total" and "Share by type" column from 1999 but excluded in other columns due to data availability.
2) Stocks (Bonds) in foreign currency / Stocks (Bonds) in total

(7) Stock/ Bond Investment

Table 5-8 shows the overview of the Japanese stock market.  In spite of large

fluctuations in stock prices (Nikkei 38,915 in 1989 and 8,578 in 2002), the number of

individual stock holders has continuously increased from 20 million in 1985 to 32.1

million in 2002.  However, individuals' share of stock transactions has decreased from

23% in 1990 to 15% in 2002.  Table 5-9 reports the bond market in Japan.  According to

a deepening Japanese budget deficit, the volume of government bonds (GB) in the bond

market is continuously rising and the size of total bond market is greatly expanding.

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One of characteristic of the Japanese bond market is that it is composed of very safe

bonds concerning solvency.  Most bonds in the Japanese market (over 90%) are

government bonds or bonds related to the government, like public corporation bonds and

bank debentures.[58]

<Table 5-8> Stock Market Overview

| Year | Stock Transaction (trillion yen in 2000) | Share of Transactions by Investment Sectors (%) | | | | Individual Stock Holders (million) | Nikkei Average Stock Price (yen) |
| --- | --- | --- | --- | --- | --- | --- | --- |
| | | Individual | Securities | Foreigners | Banks & Others | | |
| 1985 | 145.3 | 36.9 | 24.2 | 12.5 | 26.4 | 20.0 | 13,113 |
| 1990 | 400.3 | 23.3 | 24.8 | 9.8 | 42.1 | 25.0 | 23.849 |
| 1995 | 201.4 | 15.7 | 33.6 | 17.7 | 33.0 | 27.3 | 19,868 |
| 2000 | 510.8 | 15.0 | 31.3 | 29.1 | 24.6 | 30.0 | 13,785 |
| 2002 | 368.4 | 14.8 | 35.8 | 31.7 | 17.7 | 32.1 | 10,676 |

Source: Tokyo Stock Exchange, Statistics Bureau in Japan

<Table 5-9> Bond Market Overview

| Year | Total Bonds (trillion yen in 2000) | Share of Bonds by Issuer (%) | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| | | Central GB | Local GB | Public Corporation | Bank Debenture | Corporate Bond | Samuri Bond |
| 1985 | 307.4 | 50.8 | 7.2 | 20.2 | 15.1 | 4.9 | 1.9 |
| 1990 | 376.9 | 48.8 | 5.1 | 18.9 | 17.9 | 7.8 | 1.6 |
| 1995 | 487.2 | 50.6 | 7.1 | 16.1 | 15.0 | 9.3 | 2.0 |
| 2000 | 672.5 | 63.3 | 7.8 | 10.9 | 7.2 | 9.7 | 1.2 |
| 2003 | 911.4 | 73.5 | 6.5 | 8.3 | 3.4 | 7.7 | 0.7 |

Source: Bank of Japan, Financial Bureau, Ministry of Finance

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[58] Public corporations are usually guaranteed by the Japanese government directly or supported by the credit of government.  Banks are managed and supervised lest should be insolvency by Ministry of Finance, Financial Service Agency and Deposit Insurance Corporation.

**5.1.2. Categorizing Thirteen Japanese Financial Products**

(1) Previous studies on financial asset classifications

    Grouping a number of financial products into some categories is very important in measuring household portfolio choice. Each researcher uses different categories of financial assets in studying portfolio choices according to the study purpose, various financial systems among countries, and data availability (Table 5-10). Guiso et al (1996) use two categories for risky assets and they define all financial assets except highly liquid assets like M1 as broad risky assets. In addition to the definition of risky assets, Bertaut et al (2002) and Guiso et al (2002) subdivide safe assets into clearly safe assets and fairly safe assets. In studies on Japanese portfolio selection for Japan, the narrower definition of risky assets is used. Nagagawa et al (2000) and Iwaisako (2003) exclude all types of bonds from risky assets while defining bonds as an independent category.

<Table 5-10> Various Financial Asset Classifications

| Researchers (Data set) | Dependent Variables | Classification of Financial Assets |
|---|---|---|
| Guiso et al ('96, AER) (Italy, SHIW) | Share of risky assets in the portfolio | ▪ Risky assets (narrow): long-term government bonds, corporate bonds, investment fund units and equities<br>▪ Broad risky assets: savings accounts, postal bonds, all government bonds and paper, corporate bonds, investment fund units and equities<br>(Only checking accounts, certificates of deposit, and postal deposits are not included in broad risky assets) |
| Bertaut et al ('02, MIT, pp 181-217) (US, SCF) | Diversification in the portfolio | ▪ Safe assets: Liquid accounts(checking, saving, money market, and call), certificates of deposit, and U.S saving bonds<br>▪ Fairly safe assets: Other government bonds, tax-free bonds, cash-value life insurance, and amounts in mutual funds, retirement accounts, trusts, and other managed assets that are not invested in stock |

| | | |
|---|---|---|
| | | ▪ Fairly risky assets: Directly held stock; stock held through mutual funds, retirement accounts, trusts and other managed assets; and corporate, foreign, and mortgage-backed bonds. |
| Guiso et al ('02, MIT, pp 251-290) (Italy, SHIW) | Share of risky assets and diversification in the portfolio | ▪ Clearly safe assets: Checking and saving accounts, certificates of deposit<br>▪ Fairly safe assets: Short-term government bonds(up to one year), cash value of life insurance<br>▪ Risky assets: Stocks, long-term government bonds, other bonds, mutual funds, and defined contribution pensions. |
| Nagagawa and Shimizu (BOJ, 2000) (1991, 1999 POSFAL) | Ratio of risky asset to total financial wealth | ▪ Safe assets: Deposits, loan and money trust, worker's asset formation savings<br>▪ Risky assets: Stocks and shares, investment trusts<br>▪ Bonds: All types of bonds directly held, Open-end bond trust<br>▪ Insurance and pensions: Life and non-life insurance, Postal life insurance, personal annuity insurance |
| Iwaisako (NBER, '03): (Nikkei Radar data (1987, 1990, 1993, 1996, 1999) | Participation and share of equities to total wealth | ▪ Safe assets: All deposits including worker's asset formation savings.<br>▪ Bonds: All type of bonds directly held, bond-only mutual funds.<br>▪ Equities: All stocks held directly, all mutual funds containing any stock |

(2) Financial Asset Classification for Japanese POSFAL data

Generally three criteria for individuals selecting financial assets are considered; profitability, risk versus safety, and liquidity.[59]  So far most portfolio studies only consider one criterion− whether it is risky or safe.  However, in order to analyze the effects of income uncertainty and borrowing constraint for portfolio choice, liquidity must be considered as well as risk versus safety since income risk and borrowing problems are closely associated with liquidity.  So, in this study, both risk versus safety

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[59] POSFAL survey includes question for selecting financial product with similar criterion to above three.

criteria and liquidity criteria are considered for the categorizing of all financial assets.

First, risky assets are separated safe assets. There exist two risk types in financial investment: (a) Risk from loss of principal due to interest rate, exchange rate and market price fluctuation; and (b) Risk from insolvency or lack of credit from financial institutions or issuer of securities. Therefore, this study includes stocks, bonds, investment trust (mutual funds), and 'other' financial assets into risky assets. Bonds are clearly safer assets than stocks. But investors take a risk from interest rate fluctuation of even if there is no risk for insolvency, especially in government bonds. Stock and bond investors must consider considerable transaction costs as well as risks. Therefore, this study classifies all types of bond investment as risky assets. All investment trusts are considered risky assets regardless of bond-only-investment trust (BIT). BIT is exposed to risk of market value change due to interest rate fluctuations and risk of exchange rate loss. 'Other' assets such as gold accounts and mortgage securities are exposed to price change risks and insolvency.

Second, safe assets (other than risky assets) are classified into three categories by liquidity degree: liquid safe assets, fairly liquid safe assets, and illiquid safe assets. Liquid safe assets contain Demand Deposits and Postal Demand Savings. They are redeemable on demand and are primarily used for settlement. Fairly liquid safe assets contain Time Deposits and Postal Time Savings. They are not as liquid as the liquid safe assets category. However, it is possible to cancel them before maturity without serious loss and time depositors are able to borrow any time by securing against its time deposit and saving. Especially *Teigaku* is nearly the same as a liquid asset from six months after

opening the account.  Money and Loan trust, Life/Non-Life insurance, Personal annuity insurance, and WAFS are included in illiquid safe assets.  They have a usually long-term maturity. Cancellation before maturity is possible but there are some restrictions (minimum holding period) or some disadvantages such as cancellation fee.  In the case of insurance surrender, surrender value is seriously depreciated.

A broad risky asset is defined by summing up narrow risky assets and illiquid safe assets. Illiquid safe assets accompany some risks.   For example, Money and Loan Trusts or WAFS include some products which do not guarantee principal and performance on return varies.  All insurances are protected within 90% of the policy reserves.

## 5.2. The Picture of Financial Asset Portfolios in Japan

### 5.2.1. The Trend of Household Portfolios in Japan

As mentioned in the Introduction (Chapter 1), one of the stylized facts in Japan's macro economy during the 1990's is that the share of risky assets is declining and the share of liquid safe assets is rising.  As seen in the macro FFA data in Table 5-11, composition of risky assets has decreased from 26.4% in 1989 to 12.5% in 2003 and that of liquid safe assets has increased from 7.9% in 1989 to 17.4% in 2003.  Main reasons for this trend are ascribed to the increasing share of demand deposits and the decreasing share of equities.

As for micro POSFAL data, Table 5-12 reports financial asset compositions from 1989 to 2003 every two years.  The trend of decreasing share of risky assets is consistent with the observation from the macro data.  However, share of liquid safe assets presents a

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different trend between macro FFA data and micro POSFAL data. The share of liquid

safe assets in the POSFAL data shows a high variation during the period rather than a

consistently increasing trend. Instead, the share of fairly liquid safe assets demonstrates a

clearly increasing trend.

This difference could be attributed to measurement problems. In the macro FFA

data, Time Deposits include all Postal Savings without distinguishing Postal Demand

Savings from Postal Time Savings. Therefore, it does not capture the change of Postal

Demand Savings.[60] Another reason is that the POSFAL survey excludes temporary

deposits and savings[61] from the saving balance, so the POSFAL data may report lower

demand deposits than the macro data. The other possible reason is variation in

recognition for scope of each financial product over the years. In some years, the

POSFAL survey illustrates details scope of each product, but in other years it does not.

For example, in 1989-1991, the survey shows certificate of deposit (CD) and money

market certificate (MMC) belonging to deposits or postal savings. However in other

years, it does not mention to which product CD and MMC belong. Therefore,

considering the above measurement problems, investigating change in fairly liquid safe

assets as well as liquid safe assets for POSFAL data is needed.

As seen in Figure 5-1, Japanese financial portfolios from 1989 through 2003 show

two clear features: First, the share of risky asset is decreasing. Second, the share of

deposits (liquid and fairly liquid safe assets) is rising.

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[60] In fact, share of demand postal saving over total postal saving has increased from 9% in 1990 to 24% in
2003 as seen in section 5.1

[61] Direct deposit of salary or temporary deposit for automatic payment of utility bills.

This declining share of risky asset throughout 1990's is a substantially different feature from other developed countries.[62]

As seen in Table 5-12, comparing ratios of averages and average ratios from the POSFAL data briefly suggests portfolio preference by wealth distribution. Risky assets and fairly liquid safe assets in ratio of averages is larger than those in average ratio while liquid safe assts in ratio of averages is smaller than that in average ratio. It implies that the rich households hold risky assets and fairly liquid safe assets while the poor households hold liquid safe assets.

<Table 5-11> Financial Asset Portfolio: Flow of Funds Accounts (Bank of Japan)

| Year | 1989 | 1991 | 1993 | 1995 | 1997 | 1999 | 2001 | 2003 |
|---|---|---|---|---|---|---|---|---|
| (a) Asset shares (%) | | | | | | | | |
| ▪ Currency | 1.8 | 1.8 | 1.7 | 1.8 | 2.0 | 2.2 | 2.7 | 2.9 |
| ▪ Deposits | 43.4 | 48.1 | 47.7 | 47.7 | 50.1 | 49.8 | 51.7 | 51.8 |
| (Demand deposits) | 5.7 | 5.4 | 5.3 | 6.3 | 7.6 | 8.2 | 11.9 | 13.6 |
| (Time deposits) | 37.7 | 42.7 | 42.4 | 41.4 | 42.5 | 41.6 | 39.9 | 38.1 |
| ▪ Trust Beneficiary | 4.1 | 4.8 | 5.0 | 4.5 | 3.5 | 2.5 | 1.6 | 0.9 |
| ▪ Insurance Reserves | 14.1 | 15.7 | 16.9 | 17.3 | 17.5 | 16.8 | 17.2 | 16.5 |
| ▪ Pension Reserves | 5.3 | 6.4 | 7.1 | 7.9 | 8.7 | 9.1 | 10.0 | 10.2 |
| ▪ Bonds | 2.0 | 3.0 | 2.9 | 2.4 | 2.1 | 1.7 | 1.9 | 1.6 |
| ▪ Equities | 20.5 | 12.1 | 10.8 | 11.3 | 9.2 | 10.7 | 7.4 | 8.4 |
| ▪ Investment Trusts | 3.9 | 2.7 | 2.4 | 2.3 | 1.9 | 2.2 | 2.2 | 2.4 |
| ▪ Others [1] | 4.9 | 5.3 | 5.4 | 4.8 | 5.1 | 4.8 | 5.3 | 5.4 |
| (b) Grouping | | | | | | | | |
| ▪ Risky assets [2] | 26.4 | 17.9 | 16.1 | 16.1 | 13.1 | 14.7 | 11.5 | 12.5 |
| ▪ Liquid safe assets [3] | 7.9 | 7.6 | 7.4 | 8.5 | 10.1 | 11.0 | 15.4 | 17.4 |

Source: Flow of Funds Account, BOJ
1) Financial derivatives, deposit money, account receivable, outward investment in securities, gold etc.
2) Bonds, Equities and Investment Trusts
3) Currency + Demand Deposits

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[62] Share of risky assets in U.S has increased from 31.1% in 1989 to 40.3% in 1995 and 55.3% in 1998 (Bertaut et al, 2002). Risky assets share in Italy from 11.9% in 1989 to 25.7% in 1995 and 38.3% in 1998 (Guiso et al, 2002).

<Table 5-12> Financial Asset Portfolio:  Selected POSFAL Data

| Year | 1989 | 1991 | 1993 | 1995 | 1997 | 1999 | 2001 | 2003 |
|---|---|---|---|---|---|---|---|---|
| (a) Num. of Observations | 3,471 | 2,838 | 2,529 | 2,783 | 3,003 | 2,800 | 2,683 | 2,454 |
| (b) Asset Shares (%) | | | | | | | | |
| ▪ Deposits and Savings | 34.0 | 36.7 | 34.8 | 36.0 | 37.5 | 37.9 | 38.3 | 41.8 |
|   - Demand Deposits | 15.5 | 12.1 | 9.1 | 11.0 | 12.9 | 9.4 | 11.5 | 15.8 |
|   - Time Deposits | 18.5 | 24.6 | 25.7 | 25.1 | 24.5 | 28.5 | 26.8 | 26.0 |
| ▪ Postal Savings | 13.8 | 13.8 | 14.6 | 16.5 | 18.4 | 18.3 | 20.1 | 19.9 |
|  -Postal Demand Savings | 6.4 | 4.3 | 3.0 | 3.5 | 4.2 | 3.1 | 3.4 | 5.3 |
|  -Postal Time Savings | 7.4 | 9.5 | 11.6 | 13.0 | 14.2 | 15.2 | 16.7 | 14.6 |
| ▪ Money & Loan Trust | 5.6 | 6.2 | 6.5 | 5.6 | 3.9 | 2.9 | 2.0 | 1.3 |
| ▪ Life Insurance | 19.9 | 18.8 | 19.6 | 20.2 | 20.9 | 20.2 | 20.8 | 18.0 |
| ▪ Non-Life Insurance | 2.4 | 1.7 | 1.9 | 1.8 | - | 2.1 | 2.2 | 2.2 |
| ▪ Personal Annuity | 1.8 | 2.1 | 3.6 | 4.2 | 4.7 | 4.8 | 4.4 | 4.6 |
| ▪ Bonds | 2.7 | 2.2 | 2.8 | 2.3 | 2.0 | 1.5 | 1.1 | 1.4 |
| ▪ Stocks | 11.8 | 11.3 | 10.0 | 7.4 | 6.7 | 7.6 | 5.8 | 6.8 |
| ▪ Investment Trust | 3.4 | 3.0 | 2.4 | 2.2 | 1.8 | 1.1 | 1.7 | 1.6 |
| ▪ WAFS | 3.2 | 3.0 | 3.0 | 3.3 | 3.0 | 3.0 | 3.0 | 2.1 |
| ▪ Other Financial Assets | 1.2 | 1.2 | 0.8 | 0.4 | 1.2 | 0.5 | 0.6 | 0.3 |
| (c) Grouping (%) | | | | | | | | |
| ▪ Risky assets [1] | 19.1 | 17.7 | 16.0 | 12.4 | 11.7 | 10.7 | 9.2 | 10.1 |
| ▪ Liquid Safe assets [2] | 21.9 | 16.4 | 12.1 | 14.5 | 17.1 | 12.5 | 14.9 | 21.1 |
| ▪ Fairly Liquid Safe [3] | 25.9 | 34.1 | 37.3 | 38.0 | 38.7 | 43.7 | 43.5 | 40.6 |
| ▪ Illiquid Safe assets [4] | 33.0 | 31.8 | 34.7 | 35.1 | 32.5 | 33.1 | 32.4 | 28.2 |
| ▪ Broad Risky assets [5] | 52.2 | 49.5 | 50.6 | 47.5 | 44.2 | 43.8 | 41.6 | 38.3 |
| (d)Memo: Average Ratios | | | | | | | | |
| ▪ Risky assets | 10.9 | 9.6 | 8.8 | 7.4 | 6.9 | 6.6 | 5.9 | 5.9 |
| ▪ Liquid Safe assets | 27.9 | 22.9 | 17.3 | 20.4 | 24.1 | 17.0 | 19.8 | 27.2 |
| ▪ Fairly Liquid Safe | 26.3 | 32.2 | 36.5 | 34.2 | 34.1 | 40.8 | 39.9 | 35.9 |
| ▪ Illiquid Safe assets | 34.9 | 35.4 | 37.4 | 38.1 | 34.9 | 35.6 | 34.4 | 31.0 |
| ▪ Broad Risky assets | 45.8 | 45.0 | 46.2 | 45.4 | 41.8 | 42.2 | 40.3 | 36.9 |

Source: POSFAL data, 1989-2003. WAFS stands for Worker Asset Formation Savings
Note: Asset Shares (b) and Grouping (c) are computed by "Ratios of Averages"
1) Bonds, Stocks, Investment Trust, Other Financial Assets
2) Demand Deposits, Postal Demand Savings
3) Time Deposits, Postal Time Savings
4)  Money & Loan Trust, Life/Non-life Insurance, Personal Annuity Insurance, Workers' Asset Formation
5) Risky Asset, Illiquid safe assets

**<Figure 5-1> Portfolio Trend (FFA Versus POSFAL Data)**

Source: FFA (Bank of Japan), POSFAL
Note: POSFAL–liquid is defined as summing up liquid safe assets and fairly liquid safe assets

## 5.2.2. Participation and Diversification

Table 5-13 presents the fraction of households owning financial products during 1989-2003 every two years. Some conspicuous features for holding financial assets are listed below. First, Participants have increased for every financial product between 1989 and the 1990's. This implies that Japanese financial market has improved in quality and quantity after the 1990's. Second, postal account possession ratio has gradually risen. In the beginning of the 1990's, it was led by Postal Time Savings, which seems to be affected by increasing the postal saving ceiling.[63] In the end of the1990's, it was led by Postal Demand Savings. Both lead to a rising share of postal savings. Third, the stock

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[63] ¥ 5million (88.4~89.12) →¥ 7million (90.1~91.10) → ¥10million (91.11~)

participant ratio did not lessen over the period and the ratio is not lower than that in U.S. (19% in 1998). But the portion of stock over financial wealth has considerably decreased as shown in Table 5-12. This implies potential demand for risky assets still exists. But other risky assets decreased in both participant ratio and amounts share. Fourth, the participant ratio of holding life insurance is considerably high by international standards[64] even with the decline since 1995. This decreasing participant ratio is due to life insurance companies' insolvency risk increasing, arising from bad loans from the "bubble burst" and a negative interest rate. Fifth, the participant ratio for personal annuity insurance has greatly increased from 1993, and kept stable after 1993. This seems to be influenced by disputes in public pension reform. In 1994, the Japanese government revised the employee pension system in order to delay the pensionable age from 60 to 65 by 2013.

Now, diversification in Japanese portfolio choice is examined. The majority of Japanese households hold a few financial assets among thirteen financial products. The average number per household is only 3.3-3.8.[65] Table 5-14 demonstrates the allocation of financial products in detail. Diversification is closely associated with income level and age. The lower income group owns the smallest number of financial assets with stability, while the higher income group holds larger number of products but the number is volatile across years. Concerning age, diversification rises up through to 50's and then declines. The Most notable portfolio diversification feature arises from whether or not households own risky assets. Households holding risky assets have 1.7~2 times the number of

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[64] It is 22% for Italy in 1998 (Guiso et al,2002) and 30% for U.S. in 1998 (Bertaut et al, 2002)

[65] Average number owning financial assets in Japan is larger than that in U.S. Bertaut et al (2002) showed the number is three in U.S from the 1998 Survey of Consumer Finances.

financial assets than those not holding risky assets. This implies that risky assets are the highest barrier for portfolio diversification.

Eight combinations are considered in organizing portfolio by three categories of financial assets; deposits and savings (including postal saving), illiquid safe assets, and risky assets. About 50% of households compose their financial portfolio with deposit accounts and illiquid safe assets like life insurance. Around one quarter of households comprise all three categories of financial products. But the share of this complete portfolio combination has moved downward from 27% in 1989 to 22% in 2003. The third largest portfolio combination is holding only deposit accounts. The share of this combination has risen from 16% in 1989 to 22% in 2003. These contrary shifts from only deposit type combination and complete three combination boosted the share of liquid assets (liquid safe assets and fairly liquid safe assets) and lowered the share of risky assets, as seen in Table 5-12.

As Bertaut et al (2002) point out, differences in diversification and portfolio combination imply that there exists a barrier for portfolio choice coming from entry, information, and transaction costs.

<Table 5-13> Participation Ratio (%) for Financial Assets: Selected POSFAL data

| Year | 1989 | 1991 | 1993 | 1995 | 1997 | 1999 | 2001 | 2003 |
|---|---|---|---|---|---|---|---|---|
| ▪ Deposits and Savings | 74.2 | 83.2 | 83.1 | 82.6 | 81.3 | 82.4 | 83.6 | 85.1 |
|   - Demand deposits | 57.4 | 59.1 | 57.5 | 62.6 | 60.5 | 57.2 | 60.1 | 65.4 |
|   - Time deposits | 46.6 | 57.4 | 62.4 | 58.0 | 50.4 | 65.1 | 62.7 | 59.0 |
| ▪ Postal Savings | 53.2 | 58.0 | 59.1 | 61.3 | 61.7 | 64.8 | 65.1 | 65.1 |
|  -Postal Demand Savings | 37.3 | 34.5 | 28.2 | 31.8 | 32.0 | 31.0 | 32.1 | 36.5 |
|  -Postal Time Savings | 28.7 | 38.3 | 47.1 | 47.0 | 45.7 | 53.3 | 53.4 | 49.1 |
| ▪ Money & Loan Trusts | 13.7 | 13.7 | 16.3 | 13.8 | 9.4 | 8.8 | 6.5 | 4.4 |
| ▪ Life Insurance | 61.6 | 69.0 | 70.3 | 70.3 | 64.6 | 66.1 | 64.3 | 61.7 |
| ▪ Non-Life Insurance | 17.5 | 19.8 | 20.7 | 20.2 | - | 20.4 | 18.1 | 22.6 |
| ▪ Personal Annuities | 8.7 | 13.5 | 21.0 | 21.4 | 22.5 | 24.2 | 21.3 | 20.6 |
| ▪ Bonds | 8.1 | 6.2 | 7.7 | 7.2 | 5.8 | 4.1 | 4.2 | 4.6 |
| ▪ Stocks | 16.2 | 19.0 | 21.0 | 20.1 | 17.9 | 21.3 | 18.9 | 21.4 |
| ▪ Investment Trusts | 10.5 | 10.3 | 11.3 | 10.1 | 8.0 | 4.7 | 6.4 | 7.1 |
| ▪ WAFS | 18.2 | 19.3 | 22.1 | 19.6 | 18.6 | 17.3 | 15.2 | 13.8 |
| ▪ Others | 3.3 | 5.0 | 2.6 | 2.3 | 8.2 | 2.5 | 1.8 | 1.4 |

Note: The ratio is computed by percentage of respondents holding a financial asset over all observations

<Table 5-14> Diversification: Selected POSFAL data

| Year | 1989 | 1991 | 1993 | 1995 | 1997 | 1999 | 2001 | 2003 |
|---|---|---|---|---|---|---|---|---|
| (a) Number of Financial Products Held | | | | | | | | |
| ▪ All households | 3.3 | 3.6 | 3.9 | 3.8 | 3.4 | 3.8 | 3.7 | 3.7 |
| ▪ By Income Quintile | | | | | | | | |
|   - First (0~24.9%) | 2.7 | 3.0 | 3.1 | 3.0 | 2.9 | 3.1 | 3.1 | 3.1 |
|   - Third (50~74.9%) | 3.4 | 4.1 | 4.0 | 4.1 | 3.7 | 4.2 | 4.0 | 4.2 |
|   - Fifth (95~100%) | 3.6 | 4.5 | 4.9 | 4.9 | 4.1 | 4.0 | 4.3 | 4.6 |
| ▪ By Age | | | | | | | | |
|   - 30s | 3.2 | 3.5 | 3.8 | 3.6 | 3.4 | 3.6 | 3.4 | 3.4 |
|   - 50s | 3.5 | 3.8 | 3.9 | 4.1 | 3.5 | 4.0 | 3.9 | 3.8 |
|   - 65-69 | 3.6 | 3.7 | 3.9 | 3.8 | 3.6 | 3.7 | 3.7 | 3.7 |
| ▪ By Holding Risky asset | | | | | | | | |
|   - With Risky assets | 5.3 | 5.3 | 5.5 | 5.7 | 5.2 | 5.5 | 5.4 | 5.4 |
|   - Without Risky assets | 2.5 | 3.0 | 3.2 | 3.1 | 2.7 | 3.2 | 3.1 | 3.1 |
| (b) Combination (%) [1] | | | | | | | | |
| ▪ Only risky asset | 0.4 | 0.2 | 0.1 | 0.1 | 0.1 | 0.4 | 0.2 | 0.3 |
| ▪ Only illiquid safe | 3.2 | 2.8 | 2.9 | 2.4 | 3.3 | 3.5 | 2.8 | 3.1 |
| ▪ Risky + illiquid safe | 1.0 | 1.7 | 1.1 | 0.9 | 0.8 | 0.4 | 0.7 | 0.6 |
| ▪ Only deposit [2] | 15.6 | 14.9 | 14.3 | 13.9 | 19.6 | 17.8 | 20.0 | 22.1 |
| ▪ Deposit + risky | 3.3 | 3.0 | 2.0 | 2.3 | 2.7 | 2.9 | 3.7 | 4.5 |
| ▪ Deposit + illiquid safe | 49.9 | 52.4 | 51.6 | 53.4 | 46.9 | 51.8 | 52.2 | 47.7 |
| ▪ Deposit + illiquid +risky | 26.6 | 25.0 | 28.0 | 26.9 | 26.5 | 23.2 | 20.4 | 21.8 |

Note: 1) Exclude no saving balance households   2) liquid safe assets + fairly liquid safe assets

## 5.3. The Portfolio Distribution

### 5.3.1. Age-Portfolio Profile

As seen in the Literature Review (Chapter 2), age effect is a disputable topic in portfolio choice.  King and Leape (1987) argue that share of risky assets are positively related with age: Financial investment knowledge is learned over time and the liquidity constrained households are high ratio among the young.  Bodie, Merton, and Samuelson (1992) predict share of risky assets decline with age: The young have higher labor supply flexibility and have more opportunities to diversify risks from risk shocks over time.

Table 5-15 and Figure 5-2 display the age pattern of participation and of the share of risky assets for financial assets using the pooled 1989-2003 data.   Distinction between unconditional share and conditional share is quite important for implication of portfolio behavior.  Three notable features are observed.  First, unconditional share of risky assets has a positive association with age.  Second, the participation ratio is rising up to age through the 40's, then remains flat after 50's.  Participation increases, especially by 60% from the 20's to the 30's.  Third, conditional share of risky assets shows a constant profile roughly over the life cycle.  A consistently increasing profile over age as seen in the first feature is quite a different result from other countries studies, which observe a hump-shaped profile.  For example, Guiso et al (2002) found a hump-shaped age portfolio profile in the Italian micro SHIW data.  As for the Japanese case, previous studies do not present a clear hump-shaped pattern for unconditional share of risky assets. Iwaisako (2003) illustrates a hump-shaped pattern for *ownership of equities,* not for share of risky assets, and Nakagawa et al (2000) do not find any significant age effects.  This

would imply that Japanese elder households participate in economic activity positively until a later life stage.[66] The second and third features, however, have consistent results with other studies (Guiso et al, 2002, Bertaut et al, 2002).

These three features point to two important implications: (a) an increasing pattern of unconditional share of risky assets throughout a life-time is arising from increased participation; and (b) there are some barriers like fixed costs in participating and possessing risky assets. There could be an information problem and/or minimum balance barrier for developing financial wealth. Broad risky assets show a similar profile with risky assets, except for a clear hump-shaped profile over life-time with its peak in 40's.

The preceding age effects observed from pooled data may be mixed with cohort and year effects. So age effects are investigated in four cross-sectional data.[67] Summary results are listed in Table 5-16 for 1997, which is the midpoint for sample period. Figure 5-3 and 5-4 shows age effects for 1989, 1993, 1997 and 2003 respectively. As seen in Table 5-16 and Figure 5-3 (a) through (d), participation and unconditional share of risky assets have a positive relation with age similar to the pooled data. However, as seen in Figure 5-4, conditional shares generally show a flat profile. But some age groups have a high volatility. For example, households with the age of 50's in both 1989 and 1993, and the age of 65-69 in both 1997 and 2003 display a fairly strong preference for choosing risky assets. This fact could reveal the existence of cohort effects different from the

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[66] Average retirement age (1998): Japan(68.5), U.S(64.6), U.K(62.6), Germany(60.3), Italy(58.8), Sources OECD Aging and Income (2001), Reprinted from Axel Borsh-Supan (2003)

[67] Here, cohort effects are not considered based on Iwaisako (2003)'s finding. He examines the influence of cohort effects and year effects to age effects and asserts that ignoring cohort effects is more appropriate in analyzing age-related portfolio.

findings of Iwaisako (2003).   Broad risky assets for participation and unconditional share

in 1997 data show a hump-shaped profile like that in the pooled aggregate data.

Age may be closely related with the accumulation of wealth, so separating the

influence from wealth is needed in order to identify pure age effects.  Pure age effects are

considered by controlling the financial wealth quintile[68] using the pooled POSFAL data

(1989-2003).  As viewed in Figure 5-5, the results are remarkable.  The unconditional

share of risky assets *declines* over the life cycle, contrary to the results without

controlling of the wealth level.  So the prediction of Bodie et al (1992) is supported from

the POSFAL data in Japan.[69]

<Table 5-15> Participation and Share of Risky Assets Profile by Age: 1989-2003

| Age group | Risky assets (%) [1] | | | Broad risky assets (%) [2] | | | Saving rate (%) [3] |
|---|---|---|---|---|---|---|---|
| | Participation | Share | Conditional share | Participation | Share | Conditional share | |
| 20-29 | 15.0 | 9.1 | 36.0 | 68.4 | 41.7 | 56.4 | 14.2 |
| 30-39 | 23.7 | 10.7 | 38.5 | 77.4 | 49.6 | 59.4 | 13.0 |
| 40-49 | 26.4 | 11.3 | 34.5 | 80.6 | 51.0 | 58.3 | 12.2 |
| 50-59 | 29.3 | 13.5 | 35.7 | 79.4 | 48.3 | 55.2 | 13.6 |
| 60-64 | 29.4 | 13.2 | 33.5 | 76.8 | 43.8 | 52.6 | 13.2 |
| 65-69 | 30.7 | 15.5 | 36.8 | 74.0 | 43.8 | 53.1 | 12.8 |

Source: Selected POSFAL data (1989-2003).
        Excluded the households over age of seventy and saving rate is over one.

Note: Conditional shares are computed in the group of those holding risky assets. Shares are calculated by ratio of averages and other figures by average ratio.
1) Bonds, Stocks, Investment Trust, Other financial assets
2) Risky assets + Illiquid Safe assets (Money & Loan Trust, Life/Non-life Insurance, Personal Annuity Insurance, Workers' Asset Formation)

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[68] The households in 1st quintile are below 0~24.99% in the financial wealth distribution, those in 2nd are 25~49.99%, those in 3rd are 50~74.99%, those in 4th are 75~ 94.99%, and those in 5th are top 5%.

[69] Declining pattern of share of risky assets over age is roughly observed when controlled by income also.

<Figure 5-2> Portfolio by Age: Pooled Data (1989-2003)

**(a) Unconditional shares on risky assets**



**(b) Conditional share on risky assets**



Source: Selected POSFAL data (1989-2003). Excluded households over age of seventy

<Table 5-16> Participation and Share of Risky Assets Profile by Age: 1997

| Age group | Risky assets | | | Broad risky assets | | | Saving rate |
|---|---|---|---|---|---|---|---|
| | Participation | Share | Conditional share | Participation | Share | Conditional Share | |
| 20-29 | 15.2 | 4.4 | 18.0 | 70.7 | 37.5 | 44.6 | 12.9 |
| 30-39 | 23.8 | 8.9 | 30.0 | 79.7 | 50.4 | 58.5 | 12.9 |
| 40-49 | 28.4 | 8.8 | 26.8 | 80.1 | 50.4 | 58.1 | 13.1 |
| 50-59 | 30.9 | 11.1 | 29.3 | 75.4 | 44.5 | 53.3 | 14.7 |
| 60-64 | 30.7 | 11.2 | 31.1 | 74.6 | 41.7 | 48.5 | 13.7 |
| 65-69 | 31.2 | 17.2 | 39.3 | 73.1 | 45.0 | 55.9 | 12.2 |

Source: Selected POSFAL data (1997). Excluded over age of seventy

Note: all figures in this table are calculated by same methods in Table 5-15

<Figure 5-3> Portfolio by Age: Unconditional Share on Risky Assets for Each Year



**(a) Portfolio by Age(1989)**

**(b) Portfolio by Age(1993)**

**(c) Portfolio by Age(1997)**

(d) Portfolio by Age(2003)

Source: Selected POSFAL, All legends are same with <Figure 5-2>. Excluded over age of seventy

<Figure 5-4> Portfolio by Age: Conditional Share on Risky Assets for Each Year



Source: Selected POSFAL, All legends are same with <Figure 5-2> Excluded over age of seventy

<Figure 5-5> Portfolio by Age: Controlled by Wealth Quintile: Pooled (1989-2003)



Source: Selected POSFAL data (1989-2003),
All legends are same with figure (a). Excluded over age of seventy

### 5.3.2. Wealth-Portfolio Profile

Wealth level is closely associated with a household's portfolio choice. Wealth effects on portfolio choice are examined using the 1997 data, the intermediate year of our sample (1989-2003). Table 5-17 documents portfolio and diversification structure by the financial wealth quintile as follows: (a) share of risky assets clearly rise with financial wealth (from 2.2% in the 1st to 18.9% in the 5th quintile), whereas demand deposits (liquid safe assets) decrease from 37% in the 1st to 11% in the top 5% quintile. (b) Participation in risky assets increases sharply with wealth, while the conditional share of risky assets is stable over wealth level with around one-third of total financial products. This fact would appear to suggest a similar implication found in the age-portfolio profile. Increasing profile of unconditional share of risky assets through wealth is due to increased participation. This suggests there are some barriers like fixed costs in participating and possessing risky assets. (c) Portfolio diversification as well as saving rate also increases with wealth. The average number of financial assets held among thirteen products augments from 1.7 in the 1st wealth quintile to 5.9 in the top 5% of households. Fourth, the primary financial asset is quite different over wealth level. The largest share of financial assets is the liquid asset (demand deposits) for the 1st wealth quintile, life insurance for the 2nd and the 3rd quintile, time deposits for the 4th and the 5th quintile group. Tendency for liquid assets in low wealth households suggests some sort of liquid constraints (Paxson, 1990). Figure 5-6 (b) illustrates wealth effects on portfolio choice (unconditional) when using pooled data (1989-2003). The results are the same with that as seen in the cross-section data of 1997. These findings are confirmed through consumption-wealth ratio portfolio profile also (Figure 5-7. Table 5-18)

<Table 5-17> Structure of Financial Assets by Wealth Quintiles: 1997 POSFAL data

| Wealth Quintile | 1st (0~24.9%_ | 2nd (25~49.9%) | 3rd (50~74.9%) | 4th (75~94.9%) | Top 5 Percent |
|---|---|---|---|---|---|
| (a) Frequency | 691 | 723 | 662 | 522 | 131 |
| (b) Structure of Portfolio (%) | | | | | |
| ▪ Deposits and Savings [1] | 65.1 | 54.3 | 53.9 | 54.6 | 53.0 |
| - Demand Deposits | 36.9 | 21.9 | 21.5 | 16.1 | 10.7 |
| - Time Deposits | 28.2 | 32.4 | 32.4 | 38.5 | 42.3 |
| ▪ Illiquid Safe assets | 32.7 | 40.2 | 38.9 | 33.8 | 28.1 |
| - Money & Loan Trust | 0.8 | 1.3 | 2.3 | 4.6 | 5.4 |
| - Life/Non-life Insurance | 24.9 | 30.5 | 27.4 | 20.3 | 15.2 |
| - Personal Annuities | 3.0 | 3.8 | 4.8 | 5.5 | 5.6 |
| - Workers' Asset Formation | 4.0 | 4.7 | 4.4 | 3.4 | 1.9 |
| ▪ Risky assets | 2.2 | 5.4 | 7.1 | 11.6 | 18.9 |
| - Bonds | 0.0 | 0.3 | 1.0 | 2.0 | 2.7 |
| - Stocks | 1.3 | 3.2 | 3.8 | 6.6 | 11.9 |
| - Investment Trust | 0.4 | 1.2 | 1.2 | 1.7 | 3.0 |
| - Other Financial assets | 0.6 | 0.7 | 1.2 | 1.3 | 1.4 |
| ※ Broad risky assets [2] | 34.9 | 45.7 | 46.1 | 45.4 | 47.0 |
| (c) Participation: Risky assets | 0.1 | 3.0 | 7.9 | 19.7 | 39.7 |
| : Broad Risky | 12.3 | 39.7 | 56.8 | 69.9 | 89.3 |
| (d) Conditional Share: Risky | - | 34.3 | 33.5 | 30.7 | 32.4 |
| : Broad Risky | 68.6 | 64.0 | 59.5 | 54.2 | 48.1 |
| (e) Avg. number of asset held | 1.7 | 3.4 | 3.9 | 4.8 | 5.9 |
| (f) Saving rate [3] | 9.2 | 12.0 | 14.3 | 17.9 | 23.5 |

Source: Selected POSFAL data, 1997. Households over the age of seventy are excluded.

Note: Conditional shares are computed in the group of those holding risky assets. Shares are calculated by ratio of averages. All figures are computed for each wealth quintile group
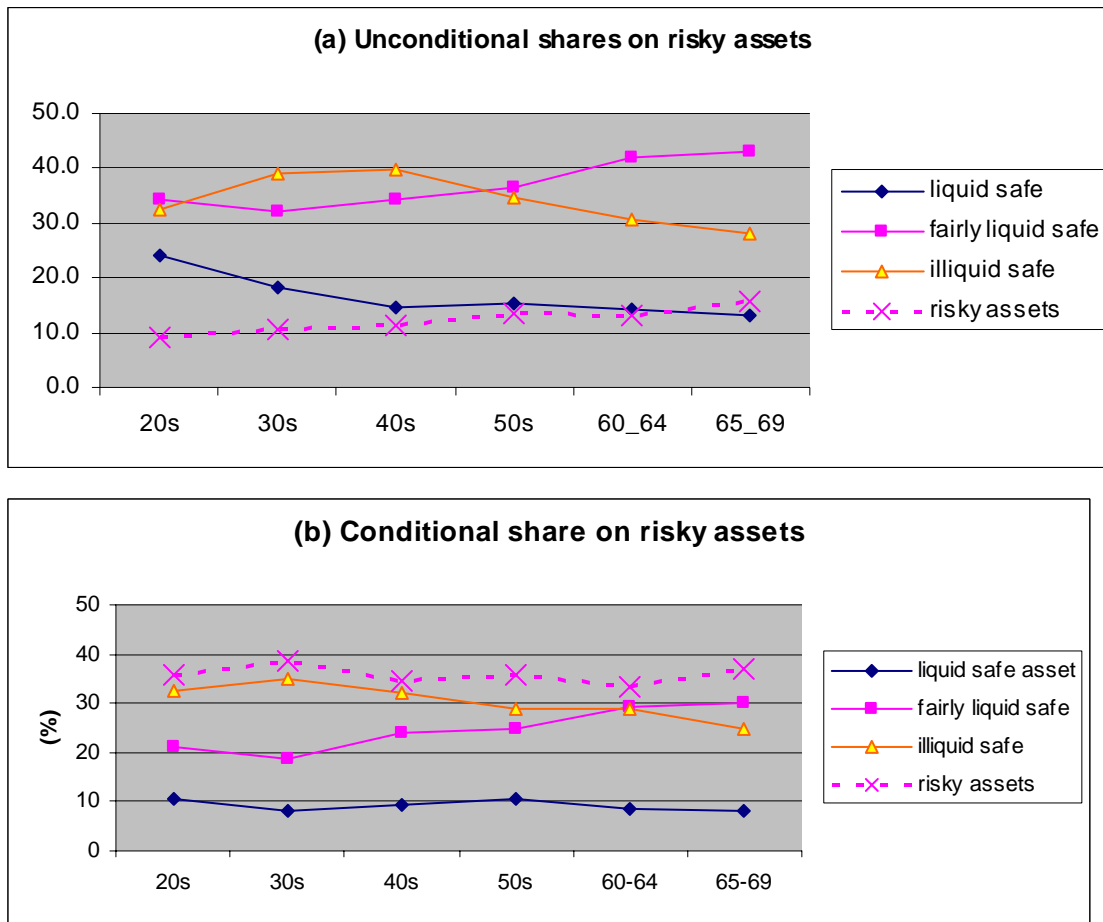1) Includes all postal savings
2) Risky assets + Illiquid Safe assets
3) Divided annual savings by annual disposable income.

<Figure 5-6(1) > Portfolio by Wealth Quintile: 1997



<Figure 5-6 (2)> Portfolio by Wealth Quintile: Aggregate (1989-2003)



<Figure 5-7> Portfolio by Consumption-Wealth Ratio Quintile: 1997

<Table 5-18> Structure of Financial Assets by Consumption-Wealth Ratio Quintiles: 1997 POSFAL data

| Wealth Quintile | 1st (75~100%) | 2nd (50~74.9%) | 3rd (25~49.9%) | 4th (5~24.9%) | 5th (0~4.9%) |
|---|---|---|---|---|---|
| (a) Frequency | 671 | 659 | 654 | 477 | 112 |
| (b) Financial Wealth | 286 | 728 | 1,277 | 2,560 | 5,366 |
| (c) Structure of Portfolio (%) | | | | | |
| ▪ Deposits and Savings [1] | 61.2 | 54.1 | 52.7 | 54.5 | 54.0 |
|   - Demand Deposits | 28.6 | 21.6 | 19.7 | 14.9 | 11.5 |
|   - Time Deposits | 32.6 | 32.5 | 33.1 | 39.6 | 42.5 |
| ▪ Illiquid Safe assets | 33.9 | 38.7 | 38.4 | 32.4 | 28.9 |
|   - Money & Loan Trust | 0.8 | 2.1 | 2.8 | 4.1 | 6.8 |
|   - Life/Non-life Insurance | 24.6 | 28.4 | 25.9 | 19.4 | 15.6 |
|   - Personal Annuities | 4.3 | 4.2 | 4.6 | 3.2 | 1.5 |
|   - Workers' Asset Formation | 4.2 | 3.9 | 5.1 | 5.7 | 5.1 |
| ▪ Risky assets | 4.9 | 7.2 | 8.9 | 13.0 | 17.1 |
|   - Bonds | 1.0 | 1.0 | 1.1 | 1.9 | 2.8 |
|   - Stocks | 1.9 | 4.0 | 5.5 | 7.9 | 9.7 |
|   - Investment Trust | 0.9 | 1.2 | 1.3 | 1.9 | 3.1 |
|   - Other Financial assets | 1.1 | 1.0 | 1.0 | 1.4 | 1.5 |
| ※ Broad risky assets [2] | 38.8 | 45.9 | 47.3 | 45.5 | 46.0 |
| (d) Participation: Risky assets | 12.5 | 22.5 | 32.9 | 48.6 | 64.3 |
| (%) : Broad Risky | 64.5 | 82.7 | 87.3 | 92.0 | 96.4 |
| (e) Conditional Share: Risky | 31.9 | 31.1 | 32.4 | 35.1 | 36.8 |
| (f) Avg. number of asset held | 2.5 | 3.5 | 4.0 | 4.7 | 5.4 |
| (g) Saving rate [3] (%) | 8.6 | 12.0 | 15.3 | 18.9 | 20.5 |

Source: Selected POSFAL data, 1997. Households over the age of seventy are excluded.

Note: Conditional shares are computed in the group of those holding risky assets. Shares are calculated by ratio of averages. All figures are computed for each consumption-wealth ratio quintile group
Consumption wealth ratio is computed by dividing consumption expenditure by total financial wealth
1) Includes all postal savings
2) Risky assets + Illiquid Safe assets
3) Divided annual savings by annual disposable income.

# Chapter 6

## Empirical Tests for Saving and Portfolio Choice

In Chapter 4 and Chapter 5, the pictures of saving, motives for saving, and portfolio choice for Japan during 1989-2003 are examined along with descriptive analysis. Descriptive analysis provide distinctive features about key factors for saving or portfolio in a simple and clear way, but they are limited on capturing the magnitude and significance of the factors' influence and cannot draw the pure effects of a factor when the effect is mixed up with various sources. Testing the effects of various variables on saving and portfolio using the econometric method is needed. The focus here is to find the effects on saving and portfolio choice from income uncertainty and liquidity constraints, which is suspected to greatly influence Japanese households during the sample period. To do so, first, a model and methodology is presented based on the model Guiso et al (1996) introduced. Second, measuring uncertainty and liquidity constraints from this study's POSFAL data is explored. Finally, the test results and some implications will be presented.

## 6.1. Model and Methodology

### 6.1.1 Benchmark Model

Guiso et al (1996) execute an empirical test for portfolio choice using Italian 1989 cross-sectional SHIW data (Survey of Household Income and Wealth). They focus on the effects of income risk and liquidity constraints on demand for risky assets. They refer

to the economic theories predicting that unavoidable risk and expected liquidity

constraints reduce the investment in risky assets (Kimball 1993, Paxson 1990).  To test

this effect, they control for the effect of age, demographics (marital status, gender,

household residence, family size), income and wealth.  They also consider the effect of

health risk on demand for risky assets by introducing "number of days ill" in the model.

The model they employ follows below. They use Tobit estimation to avoid bias arising

from using a Ordinary Least Square(OLS) estimator with censored data.

$$Y_i = Constant + \alpha_1(Age)_i + \alpha_2(Age)_i^2 + \alpha_3(Income)_i + \alpha_4(Income)_i^2 + \alpha_5(Wealth)_i$$
$$+ \alpha_6(Wealth)_i^2 + \alpha_7(Family\ size)_i + \alpha_8(Married)_i + \alpha_9(Divorced)_i + \alpha_{10}(Male)_i +$$
$$\alpha_{11}(Education)_i + \alpha_{12}(Resident\ in\ the\ South)_i + \alpha_{13}(Pension\ recipient)_i + \alpha_{14}(Number$$
$$of\ days\ ill)_i + \alpha_{15}(Income\ variance)_i + \alpha_{16}(Inflation\ variance)_i + \alpha_{17}(Proxy\ for$$
$$liquidity\ constraints)_i$$

Here $Y_i$ is the share of risky assets of household $i$ with upper limit (1) and lower limit (0).

It has both definitions of narrow and broad risky assets as mentioned in section 5.1.2.  So

the Guiso et al model is basically a two-asset system− risky assets and safe assets.

### 6.1.2. Framework and Methodology

(1) Extension and Framework

   In principal, this study follows the model in which Guiso et al (1996) adopted by

focusing on the effects of income uncertainty and liquidity constraints.  However, this

study is extended the model by introducing a four-asset classification,[70] and by adding

saving rate and motives for saving to the model.  The greatest advantage of this extended

model is that it investigates the effects on saving and portfolio choice both

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[70] The four assets are liquid safe assets, fairly liquid safe assets, illiquid safe assets, and risky assets. For
more details, refer to section 5.1.2.

simultaneously and overall. This approach is nearer to the actual process of individual

saving and portfolio behavior. When a household purposely chooses saving over

sacrifice of current consumption, it certainly reveals a motive for saving. In addition,

when a household decides how much to save, how they save is considered at the same

time. However, the previous studies take into account only one side − either saving or

portfolio− concerning the effects of uncertainty and liquidity constraints. The next

advantage of this extended model is the ability to analyze the structure of financial

market with more depth and diversity. Liquidity reflected on a four-asset classification is

another critical point in selecting financial products and it composes a different financial

market structure, which causes different impacts on economy.

 <Figure 6-1> Framework of Model

(2) Control Variables

    As can be seen in Figure 6-1, to test the effects of income risk and liquidity constraints

on saving and portfolio choice, it is necessary to control for the effect of age, income,

wealth, and demographics.  The reasons for controlling age are obvious.  The effect of

age is hotly debated.  For saving rate, some supporting the life-cycle theory predict that

saving rate would have a hump-shaped pattern over age as the result of consumption

smoothing (Attanasio et al, 1995; Horioka, 2006), while others assert that saving rate is

more closely related with current income(Carroll et al,1989; Ogawa, 2006).  For portfolio

choice, some predict that age has a positive association with risky assets (King and Leape,

1987), but others assert that age has a negative association with risky assets (Bodie et al,

1992).  As Guiso et al (1996) did, income and wealth are also controlled in this study as

measures of the effect of nontraded or highly illiquid assets and that of the initial

endowment.  Net financial wealth is used[71], which is calculated by subtracting total

borrowing reported from total financial assets reported.  To avoid endogeneity problem,

as Guiso et al (1996) adopted, this study computes the net financial wealth at the

beginning of each period by deducting the saving amount reported from net financial

assets at the time of survey.[72]  The effects of age, income, and wealth are captured by a

adding quadratic form.  This study also controls for demographics as "proxies for taste

heterogeneity" (Guiso et al, 1996).  Demographic details are different from those of

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[71] Main results are not affected even if net financial wealth is replaced by total financial assets.

[72] The timing of survey is the second half of June every year. Financial assets and liabilities are reported at
the timing of the survey.  So it will be approximately the end of June.  Income and savings refer to amounts
during the year preceding this survey.  It will be approximately from 7/1 of last year to 6/30 of this year.

Guiso et al (1996) due to the variation of data availability. This study employs family size, residential area, employment status, and housing status for demographics.

(3) Model Specification

Portfolio choice, saving rate, and motives for saving are regressed with the following specification using Tobit estimation to test the effects of uncertainty and liquidity constraints.

$Y_i = Constant + \alpha_1(Age)_i + \alpha_2(Age)_i^2 + \alpha_3(Income)_i + \alpha_4(Income)_i^2 + \alpha_5(Net\ Wealth)_i +$

$\alpha_6(Net\ Wealth)_i^2 + \alpha_7(Family\ size)_i + \alpha_8(Employment\ Dummies)_i + \alpha_9(Residence\ Area$

$Dummies)_i + \alpha_{10}(Housing\ Dummies)_i + \alpha_{11}(Income\ Risk)_i + \alpha_{12}(Liquidity\ constraint)_i$

Here, *Y* can be "Share of risky asset," "Share of liquid safe asset," "Share of fairly liquid Safe asset," and "Share of broad risky asset," when *Y* is portfolio choice. When *Y* is the saving rate, *Y* is defined as saving divided by disposal income. And *Y* can be weighted motives for saving, especially precautionary motives for saving. All these dependent variables have a censored value between zero and one as below.

$$Y_i = \begin{cases} 0 & if\ Y_i^* \leq 0 \\ Y_i^* & if\ 0 < Y_i^* < 1 \\ 1 & if\ Y_i^* \geq 1, \end{cases}$$   Here, $Y_i^*$ is a latent variable

Age and family size are reported by categories in the POSFAL data. They are transformed into numerical variables. For the age variable, each age group is put into a median number. 25 is chosen for age group in 20~29, 35 for 30~39, 45 for 40~49, 55 for 50~59, 62.5 for 60~64, 67.5 for 65~69 assuming that age has a normal distribution. The age group over 70 is excluded to avoid the bias from extended families as discussed in section 4.1.2. For the family size with "seven and over" members, 7.5 is used.

Employment status include three dummies; if no one in the household is working, then

*Employment 1*=1, otherwise *Employment 1*=0; if only the head of household is working,

then *Employment 2*=1, otherwise *Employment 2*=0; if the head of household and his/her

spouse are working, then *Employment 3*=1, otherwise *Employment 3*=0.

Residential areas include two dummies; if a household lives in 13 large cities nationwide,

*Residential area 1*=1, otherwise *Residential area 1*=0; if a household live in rural districts

(towns and villages), *Residential area 2*=1, otherwise *Residential area 2*= 0.

Housing status include three dummies; if a household doesn't own his/her house, then

*Housing 1* = 1, otherwise *Housing 1* =0; if a household doesn't own his/her house but

plans to buy a house, then *Housing 2* = 1, otherwise *Housing 2* =0; if a household doesn't

own his/her house and wants to finance needed funds from one's own funds, then

*Housing 3* =1, otherwise *Housing 3* =0.

To test the effects of income risk and liquidity constraints, the critical point is how to

measure them.

## 6.2. The Measures of Income Risk and Liquidity Constraints

### 6.2.1. Previous Empirical Studies on the Measures

As Guiso et al (1996) point out, the main difficulty in the empirical analysis is to find

the appropriate measures of income risk and liquidity constraints.  Various methods are

used for the measure of uncertainty and liquidity constraints depending on the availability

of data and main purpose of research.  Guiso et al (1996) capture the income risk and

liquidity constraints using a unique way.  They measure a proxy for income risk by using

respondents subjective opinions about expected inflation and expected income growth for

forthcoming year reported in 1989 Italian survey. They construct a proxy for liquidity

constraint based on information about denied or rejected credit from individual's actual

borrowing trial reported in the previous 1986 Italian survey. However, the Japanese

POSFAL data do not include such information as in the Italian data.

Before exploring the measures from POSFAL data, this study briefly examines

various measures of income risk and liquidity constraints appearing in previous studies

on Japanese saving and portfolio choice as seen in Table 6-1. Nagagawa (1999) and Doi

(2004) construct income risk based on the variance of subjective real income growth

expectation or unemployment rate expectation from CCS data. CCS survey data has the

following question and five possible responses for income growth expectation.

*How will income growth change over the next half year?* (  ) means weighted index

*a) improve (1.0)  b) improve slightly (0.75) c) remain unchanged (0.5)*

*d) deteriorate slightly (0.25) e) deteriorate (0)*

Nagagawa (1999) compute the variance using an indexed mean of expected income

growth among three income groups (low, middle, and high), but it has two limitations.

As Doi (2004) point out, above estimation for income risk cannot capture the risk when

most households expect future income will decrease, as in the 1990's recession. A more

serious problem is that the Nagagawa's income risk is not an individual's actual

subjective income risk since he uses aggregate data from a difference source. The risk

Nagagawa (1999) captured is nearer to macro risk. Therefore, individual's specific

behavior encountering specific unavoidable income risk cannot be analyzed. The same

problem arises for Doi's measurement (2004).

<Table 6-1> Measures of Income Risk and Liquidity Constraints

| Authors (Data set) | Dependent Variables | Measure of Risk (or Liquidity constraint) | Main Finding |
|---|---|---|---|
| (a) Income Risk | | | |
| Nagagawa (BOJ, '99) (Aggregate FIES, CCS) | Saving rate | Variance of subjective real income growth expectation | Risk increases saving rate for low and middle income group |
| Doi (Working paper, '04) (Aggregate FIES, CCS) | Saving rate | Variance of subjective real income growth expectation<br><br>Variance of subjective unemployment rate expectation | No positive relationship between saving rate and income risk in 2nd half of 1990's<br><br>Employment risk raises the saving rate in 2nd half of 1990's |
| Murata(MES, '03) (JPSC) | Financial asset relative to permanent income | Subjective prospects for business condition<br><br>Subjective prospect for public pension benefits | Pension risk explain 1/3 of accumulation of financial asset<br>But no relationship between business prospect and saving |
| Nagagawa and Shimizu(BOJ, '00) ('91, '99 POSFAL) | Ratio of risky asset to total financial wealth | Degree of anxiety about post-retirement | Households do not worry about post-retirement holds more risky assets |
| *Skinner('88, JME) (CES in U.S) | Saving rate | Occupation dummies | No evidence of precautionary motive |
| (b) Liquidity | Constraint | | |
| Ogawa (Working paper, '05) (Aggregate POSFAL, Japan) | Saving rate | Households with no saving balance (financial assets) | Increase of liquidity constrained households lead to decrease of aggregate household saving rate |

FIES: Family Income and Expenditure Survey
CCS: The Consumer Confidence Survey
JPSC: Japanese Panel Survey of Consumers
CES: Consumer Expenditure Surveys

Murata (2003), Nagagawa et al (2000) construct income risk from the micro data

itself and enhance the analysis concerning association between an individual's specific

risk and an individual's specific response.  But the proxy variables for income risk seem

to be too far from an individual's specific unavoidable income risk.[73]  The POSFAL data

includes information on the prospect of public pension and anxiety over in old age life.

However, this type of pension problem is a different type of risk from income risk except

for old people.  So pension risk seems to be inappropriate as a proxy for income risk, and

the result may cause a relevance problem even if it is significant.  The limitation of

previous measure of income risk requires an alternative procedure.  The possibility of the

new measure of income risk will be investigated details in section 6.2.2.

On the other hand, Skinner (1988) constructs a proxy for income risk as the

occupational dummies using the Consumer Expenditure Surveys in U.S.  Sandmo (1970)

argues that between salary earners and self-employed persons exist different income

fluctuations, which causes different saving behavior.  Carroll and Summers (1988) also

discuss that different occupations reflect different income variances.  Therefore,

occupational dummies may become a good proxy of income variance.  However, Guiso

et al (1996) contradict the use of these occupational dummies as income risk since

occupation may capture labor supply effects that have little relation with risk.  Taking

this limitation into account, occupational dummies will be examined as a secondary

proxy for income risk to check the robustness of the primary measure of income risk.

As can be seen in Table 6-1, there are few empirical studies on effects of liquidity

constraints in Japan.  Ogawa (2005) uses information on households with no saving

balance to construct a proxy for liquidity constraints. But following Ogawa's procedure

makes not to analyze household's portfolio behavior at all.  The main problem of this

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[73] People may reply to question about "Prospect for business condition" without considering their own income prospect.

procedure is that even the households with no financial assets may be not constrained either currently or in the future.  So an alternative approach is explored in section 6.2.3.

**6.2.2. Measure of Income Risk from POSFAL Data in Japan**

   POSFAL data provides abundant information about subjective household opinion on current income direction and future income prospects.  The questions and possible answers for current income direction and income prospects are as below:

   *Has current annual income increased or decreased from the level of one year ago?*

      *1. Increased  2. No change 3. Decreased*

   *What's your opinion on your expected level of annual income after one year?*

      *1. Expect to increase   2. Expect no change  3. Expect to decrease*

If we combine both questions, then the fluctuation of household income can be inferred. For example, increased or decreased income clearly presents more fluctuation in upward or downward income than stable income (no change).  The households with a high fluctuation in income can be assumed to face a higher income risk, and those with low fluctuation can be assumed to face a lower income risk.

   Therefore, the equation representing income risk is constructed by putting together income direction and income prospects.  Let *INV* denote the income risk, *Yc* the variation of current income direction over last year, *Ye* the variation of future income prospects over the next year.  *Yc* and *Ye* have the index of 1, 0, -1 for increasing, no change, and decreasing respectively.  Then *INV* is defined as $INV = Yc^2 + Ye^2 + (Yc-Ye)^2$.  *INV* has three values: 0, 2, 6.   The highest value of *INV* is produced for the households with a

higher variation (increased – expect to decrease, decreased – expect to increase).  So *INV*

is weighted income risk.  Computation of *INV* for 9 possible combinations and the *INV*

frequency are presented below.  The available data is 1996 through 2000 for 5

consecutive years.

<Nine Combinations and Computation of Income Risk (*INV*)>

| | | Ye (Future income prospect) | | |
|---|---|---|---|---|
| | | Expect to increase (1) | No change (0) | Expect to decrease (-1) |
| Yc (Current income direction) | Increased (1) | (1, 1) *INV*=2 | (1, 0) *INV*=2 | (1, -1) *INV*=6 |
| | No change (0) | (0, 1) *INV*=2 | (0, 0) *INV*=0 | (0, -1) *INV*=2 |
| | Decreased (-1) | (-1, 1) *INV*=6 | (-1, 0) *INV*=2 | (-1, -1) *INV*=2 |

<Frequency of *INV*>

| INV | 1996 | 1997 | 1998 | 1999 | 2000 | Total |
|---|---|---|---|---|---|---|
| 0 | 1,074 | 1,094 | 1,023 | 983 | 970 | 5,144 |
| 2 | 1,792 | 1,790 | 1,755 | 1,724 | 1,688 | 8,749 |
| 6 | 137 | 116 | 90 | 90 | 100 | 533 |
| Total | 3,003 | 3,000 | 2,868 | 2,797 | 2,758 | 14,426 |

To confirm the validity of this procedure in capturing income risk, the demographics

and behavioral characteristics for nine choices between income direction and income

prospects are examined.  Table 6-2 displays demographics by income direction and

prospects using the pooled data (1996-2000).

(a) Demographics of the household with high income variance: *INV*=6

For combination three, "Increased-Expect to decrease," the households in the 20's and

30's age group, high income and wealth group, and the occupation of white-collar worker take relatively larger portion. For combination seven, "Decreased-Expect to increase," the households in age of 20's and 30's, low income and wealth group, and the occupation of business proprietor take larger portion.

(b) Demographics of the household with low income variance: *INV*=2

For combination two, "Increased-Expect no change," the households in the 20's and 30's age group, high income group and the occupation of white-collar worker take relatively larger portion. For combination four, "No change-Expect to increase," the households in the 30's age group, and middle income and wealth group take a relatively larger portion. For combination six, "No change-Expect to decrease," the households in the 50's and 60's age group, highest wealth and middle income group take a larger portion. For combination eight, "Decreased- Expect to no change," the households in the 60-64 age group, lowest income group, and the occupation of "other" take a larger portion.

(c) Demographics of the household with no income variance: *INV*=0

For combination one, "Increased-Expect to increase," the households in the 20's and 30's age group, high income but lowest wealth group, and the occupation of white-collar worker take a relatively larger portion. For combination five, "No change-Expect no change," the households in the 65-69 age group, low income group and the occupation of "other" take a relatively larger portion. For combination nine, "Decreased-Expect to decrease," the households in the 50's and 60-64 age group, low income and fairly high wealth group, and the occupation of business proprietor take a larger portion.

<Table 6-2> Demographics by Income Direction and Prospect: Pooled (1996-2000)

| Combinations | | 1.Increased-Expect to Increase | | 2. Increased-Expect No Change | | 3. Increased-Expect to Decrease | |
|---|---|---|---|---|---|---|---|
| | | Obs. | % | Obs. | % | Obs. | % |
| Frequency | | 1,896 | 14.6 | 904 | 7.0 | 283 | 2.2 |
| Age | 20's | 139 | 7.3 | 54 | 6.0 | 15 | 5.3 |
| | 30's | 586 | 30.9 | 228 | 25.2 | 62 | 21.9 |
| | 40's | 652 | 34.4 | 299 | 33.1 | 70 | 24.7 |
| | 50's | 402 | 21.2 | 212 | 23.5 | 78 | 27.6 |
| | 60-64 | 71 | 3.7 | 55 | 6.1 | 33 | 11.7 |
| | 65-69 | 46 | 2.4 | 56 | 6.2 | 25 | 8.8 |
| Job | Agricultural Worker | 18 | 1.0 | 17 | 1.9 | 11 | 3.9 |
| | Business Proprietor | 191 | 10.1 | 131 | 14.5 | 32 | 11.3 |
| | White-collar Worker | 575 | 30.3 | 215 | 23.8 | 60 | 21.2 |
| | Blue-collar Worker | 398 | 21.0 | 192 | 21.2 | 57 | 20.1 |
| | Manager | 443 | 23.4 | 200 | 22.1 | 63 | 22.3 |
| | Professional | 26 | 1.4 | 26 | 2.9 | 12 | 4.2 |
| | Other | 245 | 12.9 | 123 | 13.6 | 48 | 17.0 |
| Financial Assets (¥ 10,000) | | 1,079 (9) | | 1,127 (7) | | 1,386 (2) | |
| Annual Income (¥ 10,000) | | 678 (2) | | 660 (3) | | 757 (1) | |

| Combinations | | 4.No Change-Expect to Increase | | 5. No Change-Expect No Change | | 6.No Change-Expect to Decrease | |
|---|---|---|---|---|---|---|---|
| | | Obs. | % | Obs. | % | Obs. | % |
| Frequency | | 335 | 2.6 | 4324 | 33.4 | 1118 | 8.6 |
| Age | 20's | 23 | 6.9 | 98 | 2.3 | 15 | 1.3 |
| | 30's | 87 | 26.0 | 551 | 12.7 | 88 | 7.9 |
| | 40's | 96 | 28.7 | 1148 | 26.6 | 203 | 18.2 |
| | 50's | 82 | 24.5 | 1198 | 27.7 | 399 | 35.7 |
| | 60-64 | 26 | 7.8 | 613 | 14.2 | 230 | 20.6 |
| | 65-69 | 21 | 6.3 | 716 | 16.6 | 183 | 16.4 |
| Job | Agricultural Worker | 11 | 3.3 | 175 | 4.1 | 62 | 5.6 |
| | Business Proprietor | 66 | 19.7 | 701 | 16.2 | 179 | 16.0 |
| | White-collar Worker | 56 | 16.7 | 705 | 16.3 | 172 | 15.4 |
| | Blue-collar Worker | 70 | 20.9 | 867 | 20.1 | 224 | 20.0 |
| | Manager | 75 | 22.4 | 629 | 14.6 | 201 | 18.0 |
| | Professional | 11 | 3.3 | 128 | 3.0 | 42 | 3.8 |
| | Other | 45 | 13.4 | 1119 | 25.9 | 238 | 21.3 |
| Financial Assets (¥ 10,000) | | 1,141 (6) | | 1,260 (4) | | 1,444 (1) | |
| Annual Income (¥ 10,000) | | 624 (5) | | 587 (6) | | 633 (4) | |

*(Continued)*

| Combinations | | 7. Decreased-Expect to Increase | | 8. Decreased-Expect No Change | | 9. Decreased-Expect to Decrease | |
|---|---|---|---|---|---|---|---|
| | | Obs. | % | Obs. | % | Obs. | % |
| Frequency | | 230 | 1.8 | 1232 | 9.5 | 2631 | 20.3 |
| Age | 20's | 7.4 | 36 | 2.9 | 33 | 1.3 | 5.3 |
| | 30's | 24.8 | 167 | 13.6 | 201 | 7.6 | 21.9 |
| | 40's | 30.0 | 322 | 26.1 | 520 | 19.8 | 24.7 |
| | 50's | 23.9 | 368 | 29.9 | 957 | 36.4 | 27.6 |
| | 60-64 | 9.6 | 215 | 17.5 | 590 | 22.4 | 11.7 |
| | 65-69 | 4.4 | 124 | 10.1 | 330 | 12.5 | 8.8 |
| Job | Agricultural Worker | 3.5 | 55 | 4.5 | 165 | 6.3 | 3.9 |
| | Business Proprietor | 24.8 | 247 | 20.1 | 640 | 24.3 | 11.3 |
| | White-collar Worker | 15.7 | 147 | 11.9 | 291 | 11.1 | 21.2 |
| | Blue-collar Worker | 20.9 | 275 | 22.3 | 530 | 20.1 | 20.1 |
| | Manager | 10.9 | 165 | 13.4 | 305 | 11.6 | 22.3 |
| | Professional | 3.9 | 48 | 3.9 | 103 | 3.9 | 4.2 |
| | Other | 20.0 | 295 | 23.9 | 585 | 22.2 | 17.0 |
| Financial Assets (¥ 10,000) | | 1,120 (8) | | 1,227 (5) | | 1,347 (3) | |
| Annual Income (¥ 10,000) | | 579 (8) | | 561 (9) | | 580 (7) | |

Source: selected POSFAL data (1996-2000)

Note: Financial assets and income is expressed in real amount (2000=100). The figures in parentheses in the financial assets and annual income row show the order of average value among the 9 combinations

Table 6-3 illustrates remarkable features about saving and portfolio choice. First, households with a pessimistic prospect ("Expect to decrease") have a higher saving rate tendency, and as the result, they accumulate larger wealth except for combination 9. Second, the saving rate is greatly affected by a household's current income situation. Households with an increase in income tend to save more, whereas those with a decrease in income tend to save less. Therefore, combination three, "Increased- Expect to decrease" displays the highest saving rate (18.9%). Third, the share of liquid safe assets is positively associated with variation in income prospects. Therefore, the households with a high variation in income prospects tend to hold more liquid safe assets (combination one, three, seven). Fourth, the household in combination six (No change-

No change) compose their financial assets with a type of time deposits (fairly liquid safe asset) primarily and tend to hold small portion of risky asset. This result is quite a contradiction to the prediction of precautionary portfolio theory. But, these facts may indicate the household faces another risk such as unemployment rather than income risk when the demographics of this combination are considered, which are older, poorer, and households with an unspecified job.[74] Fifth, illiquid safe assets tend to be held by households with an optimistic prospect (combination one, four).

<Table 6-3> Saving Rate and Composition of Financial Assets by Income Direction and Prospects: Pooled (1996-2000)

| Combinations | Freq | Saving Rate | Share of Each Asset to Total Financial Assets | | | | |
|---|---|---|---|---|---|---|---|
| | | | Risky | Liquid Safe | Fairly Liquid Safe | Illiquid Safe | Broad Risky |
| 1.Increased-Expect to Increase | 1,888 (3) | 0.157 (3) | 0.098 | 0.140 (3) | 0.373 | 0.390 (1) | 0.488 (2) |
| 2. Increased-Expect No Change | 902 | 0.158 (2) | 0.109 | 0.128 | 0.389 | 0.374 (2) | 0.483 (3) |
| 3. Increased-Expect to Decrease | 280 | 0.189 (1) | 0.129 (2) | 0.141 (2) | 0.389 | 0.341 | 0.470 (4) |
| 4.No Change-Expect to Increase | 335 | 0.133 | 0.158 (1) | 0.120 | 0.362 | 0.360 (3) | 0.518 (1) |
| 5.No Change-Expect No Change | 4,321 (1) | 0.128 (1) | 0.099 | 0.123 | 0.438 (1) | 0.340 | 0.439 |
| 6.No Change-Expect to Decrease | 1,118 | 0.143 (4) | 0.119 (3) | 0.129 | 0.417 (2) | 0.335 | 0.454 |
| 7.Decreased-Expect to Increase | 229 | 0.123 | 0.108 | 0.151 (1) | 0.413 (4) | 0.328 | 0.436 |
| 8.Decreased-Expect No Change | 1,231 (4) | 0.122 | 0.111 (4) | 0.131 (4) | 0.402 | 0.357 (4) | 0.467 |
| 9.Decreased-Expect to Decrease | 2,625 (2) | 0.118 | 0.107 | 0.126 | 0.417 (3) | 0.349 | 0.457 |

Source: selected POSFAL data (1996-2000)
Note: The figures in parentheses of each column show the order of the upper four highest combinations. Saving rate is obtained by dividing saving by annual income. Share of financial assets is the share of average of each household's asset

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[74] People without regular occupations; pensioners and those living on interest income; students; and households receiving public assistance (POSFAL Questionnaire, 2003).

But as seen in Table 6-3, the share of risky assets does not present a consistent

tendency with income direction and prospects.  Other factors should be considered to

capture why some combinations show such a low share of risky assets (combination one

or five) and why some combinations present so high a share of risky assets (combination

three or four).  Motives for saving, anxiety for old age life, and the prospect for public

pension are examined to check the possibility of other risks from the POSFAL data.

<Table 6-4> Investigation of Other Risk for Selected Combinations

| Selected Combinations | | Larger Share of Risky Assets | | Smaller Share of Risky Assets | |
|---|---|---|---|---|---|
| | | 3. Increased-Expect to Decrease | 4.No change-Expect to Increase | 1.Increased-Expect to Increase | 5.No Change-Expect No Change |
| (a) Share of risky assets (%) | | 12.9 | 15.8 | 9.8 | 9.9 |
| (b) Motives for saving | | | | | |
| Precautionary Motives | Overall | 0.363 | 0.356 | 0.339 | 0.413 |
| | (Illness) | (0.267) | (0.268) | (0.223) | (0.292) |
| | (Peace of mind) | (0.096) | (0.088) | (0.116) | (0.121) |
| Life Cycle Motives | | 0.618 | 0.615 | 0.643 | 0.564 |
| (c) Subjective Opinions (%) | | | | | |
| Anxiety for old age life | Not so worried | 22.2 | 25.7 | 26.0 | 24.4 |
| | Somewhat Worried | 52.4 | 56.0 | 55.5 | 55.5 |
| | Very worried | 25.0 | 17.8 | 18.4 | 20.0 |
| Public Pension Prospect | No problem | 4.7 | 5.8 | 5.0 | 6.0 |
| | A little problem | 26.4 | 27.8 | 29.6 | 32.2 |
| | Big problem | 68.9 | 66.4 | 65.2 | 61.8 |

Source: selected POSFAL data (1996-2000)

As can be seen in Table 6-4, the household in combination five, which has smaller

risky assets, encounters higher precautionary motives for saving (especially in the peace

of mind).  While the household in combination four, which has the largest risky asset,

faces the lowest precautionary motives for saving.  Another possible risk such as anxiety

for old age life and public pension prospect is insignificant or unreasonable for portfolio

choice.  This result suggests that if a household faces a higher precautionary saving

motive (especially in motives for peace of mind), then the household tends to hold fewer risky assets. In addition, the fact that a household has a higher precautionary motive could mean the household is exposed to some sort of risk. If we exclude the possibility of pension risk, then such risks could be a health risk, an unemployment risk, or a serious asset deflation risk.

The household in combination one looks exceptional case: It has smaller share of risky assets even if it has low precautionary saving motive (high life cycle saving motive). Following explanation will be possible for this observation: Saving motive for marriage, education, and durable goods are classified as life cycle motives. But those motives simply may represent a large demand innovation, similar to a negative change in income. Granting this possibility, both combination one and combination five are under a similar situation for a risk in the future.

In conclusion, income risk measured by income direction and prospects has a strong positive relationship to saving rate. But portfolio choice is more complicated. The share of liquid safe assets has a positive relationship with the income risk. Holding risky asset does not show a clear relationship with the income risk measured by income direction and prospects. Instead, choice for risky assets is greatly affected by precautionary saving motives, which are induced from other risks unidentified in the POSFAL data.

### 6.2.3. Measure of Liquidity Constraint from POSFAL Data in Japan

One of the difficulties in analyzing effects of liquidity constraint is its various definitions. Some define it as "zero net financial asset" (Guiso et al, 1996), others as "zero liquid assets" (Ogawa, 2006), and the others as "low savings" or "low financial

assets" (Zeldes, 1989b, Hayashi, 1985). However, as Ogawa (2006) point out, what is obvious about liquidity constraint is that liquidity constrained households are unable to borrow to sustain current consumption beyond current income. It means fluctuated consumption reflects a possibility of liquidity constraints. Therefore, if we can observe variation in consumption and its reason, we can infer whether a household is under a liquidity constraint or not.

The POSFAL data provide abundant information about current consumption direction, reasons of consumption direction, and future consumption prospects. The questions and possible answers for consumption behavior are in Table 6-5. Using information on consumption behavior, we can measure liquidity constraint by two procedures.

(1) Primary Measure of Liquidity Constraints

The first procedure is using information on reasons for fluctuation in consumption expenditure. Let *LLC* denote the loosing liquidity constraints, *TLC* the tightening liquidity constraints, and *CLC* consumption liquidity constraints. When the consumption expenditure of a household has increased, if one or more of the reasons correspond to "current take-home income increased" or "end of burden in loan repayment make room for consumption" or "it becomes easier to take out a loan in buying something," then we suspect that the household has been under liquidity constraint and now the constraint is loosened (*LLC*). On the contrary, when the consumption expenditure of a household has decreased, if one or more of the reasons correspond to "current take-home income decreased" or "increase of burden in loan repayment decreased room for consumption" or "it becomes harder to take out a loan in buying some thing," then we suspect that the household has been under liquidity constraint (*TLC*).

<Table 6-5> Information on Consumption Behavior from POSFAL data

| | Description in data | Available data |
|---|---|---|
| (1) Consumption Direction | Has current consumption expenditure increased or decreased from the level of one year ago? (Choose one)<br><br>    1. Increased  2. No change  3. Decreased | 1991-2000 |
| (2) Increased current consumption and its reasons | If your consumption expenditure has increased, what are the main reasons? (Choose three)<br>1.current take-home income increased<br>2. future take-home income is expected to increase<br>3. end of burden in loan repayment make room for consumption<br>4. it becomes easier to take out a loan in buying some thing<br>5. general price level is becoming low<br>6. want for purchase of goods and services are increasing<br>7. appreciation of (real) asset value make room for expenditure<br>8. necessary living cost for household member increased due to growth and change in household members(*)<br>9. wedding, funeral ceremony household should attend is increasing (*)<br>10. others | 1996-2000<br><br>('98-'00 for asterisk (*) item) |
| (3) Decreased current consumption and its reasons | If your consumption expenditure has decreased, what are the main reasons? (Choose three)<br><br>1.current take-home income decreased<br>2. future take-home income is expected to decrease<br>3. interest on deposits and dividends on financial investment has decreased<br>4. increase of burden in loan repayment decreased room for consumption<br>5. it becomes harder to take out a loan in buying some thing<br>6. general price level is rising<br>7. want for purchase of goods and services are increasing<br>8. depreciation of (real) asset make to decrease room for expenditure<br>9. necessary living cost for household member decreased due to growth and change in household members (*)<br>10. set aside more money for future life (*)<br>11. others | 1996-2000<br><br>('98-'00 for asterisk (*) item) |
| (4) Consumption Prospects | What's your opinion on your expected level of consumption expenditure after one year? (Choose one)<br><br>1. Expect to increase   2. Expect to be no change 3. Expect to decrease | 1991-2000 |

Source: Questionnaires of POSFAL survey

Thus we can measure liquidity constraints when consumption expenditure has changed over last year's consumption. But it is harder to specify liquidity constraints when consumption remains constant since we do not have information on the reasons for "No change" of consumption. However, we can infer liquidity constrained households by combining consumption prospects and income prospects. If a household expects consumption expenditure to increase when their income will increase, then we suspect that the consumption of the household must be constrained by liquidity (*CLC*). It is because if a household is able to smooth its consumption over time, there would be no need to postpone current consumption to next year.

Table 6-6 illustrates demographics, saving and portfolio choice by proxy for liquidity constraints. For *LLC*, the households in ages of 30's~40's, highest income but lowest wealth group, and occupation of white-collar worker and manager take a relatively larger portion. For *TLC*, the households in ages of 50's and 60-64, lowest income and wealth group, high burden of repayment, and occupation of business proprietor and 'other' take a relatively larger portion. For *CLC*, the households in age of 30's and 40's, and occupation of white-collar worker take larger portion.

Even though *CLC* has good feature of liquidity constraints logically, sample size and demographics of *CLC* revealed in Table 6-6 make *CLC* be doubtful for belonging to one of liquidity constraints. Based on age group (30's~40's) and income status of *CLC*, consumption prospect of increase may be ascribed to natural life cycle motive such as new baby, children's education not because of expected constraints. Therefore, *CLC* is excluded for measure of liquidity constraints.

<Table 6-6> Demographics, Saving and Portfolio Choice by Liquidity Constraints: Pooled (1996-2000)

| | | Consumption related to liquidity constraints | | Consumption change not related to liquidity constraints | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| | | LLC | TLC | CLC | Increased other than LLC | Decreased other than TLC | No changed other than CLC |
| Observation Number | | 999 | 1,966 | 119 | 2,866 | 822 | 6,119 |
| (%) | | 7.7 | 15.3 | 0.9 | 22.2 | 6.4 | 47.5 |
| Financial Wealth (¥ 10,000) | | 1,071 | 1,100 | 1,222 | 1,264 | 1,277 | 1,322 |
| | | (6) | (5) | (4) | (3) | (2) | (1) |
| Annual income (¥ 10,000) | | 715 | 539 | 624 | 632 | 592 | 607 |
| | | (1) | (6) | (3) | (2) | (5) | (4) |
| Saving rate (%) | | 13.8 | 10.6 | 15.3 | 14.0 | 14.4 | 13.8 |
| | | (4) | (6) | (1) | (3) | (2) | (4) |
| Portfolio (%) | Risky assets | 11.1 | 9.6 | 16.0 | 10.0 | 9.8 | 11.2 |
| | | (3) | (6) | (1) | (4) | (5) | (2) |
| | Liquid Safe | 12.6 | 14.5 | 13.1 | 12.3 | 12.7 | 12.6 |
| | | (4) | (1) | (2) | (6) | (3) | (4) |
| | Fairly Liquid safe | 38.1 | 38.6 | 33.2 | 39.4 | 42.9 | 43.2 |
| | Illiquid Safe | 38.1 | 37.4 | 37.7 | 38.2 | 34.6 | 32.9 |
| | Broad Risky | 49.3 | 47.0 | 53.7 | 48.2 | 44.4 | 44.1 |
| Motives for saving (%) | Precautionary | 35.7 | 40.4 | 31.9 | 35.6 | 39.3 | 40.6 |
| | (Illness) | (24.9) | (30.3) | (21.5) | (25.6) | (28.0) | (28.4) |
| | (Peace of mind) | (10.9) | (10.0) | (10.4) | (10.0) | (11.4) | (12.2) |
| | Life Cycle | 62.2 | 57.2 | 65.3 | 62.7 | 58.5 | 57 |
| Age | 20's | 4.0 | 2.0 | 6.7 | 4.7 | 3.0 | 3.0 |
| | 30's | 22.8 | 9.4 | 39.5 | 20 | 10.9 | 14.7 |
| | 40's | 32.7 | 20.3 | 31.9 | 35.4 | 22.2 | 22.9 |
| | 50's | 28.6 | 35.1 | 17.7 | 23.9 | 32.7 | 29.1 |
| | 60-64 | 7.5 | 21.4 | 2.5 | 8.8 | 15.4 | 15.8 |
| | 65-69 | 4.3 | 11.8 | 1.7 | 7.3 | 15.8 | 14.5 |
| Job | Agricultural Worker | 2.6 | 5.5 | 1.7 | 2.6 | 2.8 | 4.7 |
| | Business Proprietor | 16.0 | 26.3 | 13.5 | 13.4 | 16.9 | 16.6 |
| | White-collar Worker | 22.0 | 9.8 | 25.2 | 22.6 | 15.7 | 16.9 |
| | Blue-collar Worker | 22.4 | 19.8 | 21.0 | 21.4 | 20.9 | 20.1 |
| | Manager | 21.8 | 9.8 | 17.7 | 20.9 | 15.7 | 15.2 |
| | Professional | 2.5 | 4.9 | 2.5 | 2.0 | 2.8 | 3.3 |
| | Other | 12.2 | 23.7 | 17.7 | 16.9 | 24.5 | 22.8 |
| Repayment ratio | | 12.3 | 14.9 | 9.6 | 10.5 | 8.9 | 9.0 |

Source: selected POSFAL data (1996-2000)

Note: The figures in parentheses of financial wealth, annual income, saving rate, risky assets, and liquid safe show the order over 6 categories. Financial wealth and annual income is expressed in real amount (2000=100). Saving rate is computed by dividing saving by annual income. Portfolio is calculated by ratio of averages. Repayment ratio is computed by dividing annual repayment by annual income.

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It should be noted that *LLC* and *TLC* reflect a different phase of liquidity constraints in time: *LLC* implies a past liquidity constraints in the previous period (*t*-1) (Not constrained now), *TLC* a confronting at the present period (*t*). Table 6-6 shows some features for saving and portfolio choice by liquidity constraints. First, the household under *TLC* displays lowest saving rate and share of risky asset but highest share of liquid safe asset. The household under *LLC* displays a roughly average level of saving rate and portfolio composition. These observations are consistent with the prediction of liquidity constraint theory. Second, the shares of illiquid safe assets and fairly liquid assets are almost same between *LLC* and *TLC*. This implies that liquidity constraints do not affect choice of a relatively long term financial products. In short, pressing liquidity constraints cause less saving and increase the portion of liquid safe assets instead of risky assets. But, influence of liquidity constraints on long-term financial investment looks weak.

The above procedure for liquidity constraints through LLC and TLC has an advantage in the sense that the procedure is based on an individual's detailed consumption behavior, so LLC and TLC is employed as a primary measure of liquidity constraints.

(2) Other Measures of Liquidity Constraints

The other procedure for measuring liquidity constraint is using information on consumption direction and consumption prospects as income risk measured in section 6.2.2. Now, let *CNV* denote the consumption volatility, *Cc* the variation of current consumption direction over last year, *Ce* the variation of consumption prospects over the following one year. *Cc* and *Ce* have the index of 1, 0, -1 for increasing, no change, and decreasing respectively. Then, *CNV* is defined as $CNV = Cc^2 + Ce^2 + (Cc-Ce)^2$. *CNV* has three values: 0, 2, 6. The highest value of *CNV* is produced for the households with

the highest variation in consumption (increased – expect to decrease, decreased – expect to increase). The larger the fluctuation of consumption, the more serious is liquidity constraint. The available period of this data is 1991 through 2000.

The other procedure for measuring liquidity constraints is using information pessimistic income prospects and precautionary saving motives to capture *expected* liquidity constraints. If a household expect its income will decrease and the household present precautionary saving motives, then the household can be suspected to be under expected liquidity constraints with high probability. Let *DIP* denote the household with expected liquidity constraints. Then *DIP* is measured when income prospect (Ye) is pessimistic (will decrease), and saving motive is either "illness" or "peace of mind."

Another procedure for measuring liquidity constraints is using information on households' borrowing status. POSFAL data includes detailed information on the amounts of borrowing, purpose of borrowing and type of lender. Funding cost varies with the type of lender, reflecting the credit of the borrower. Table 6-7 presents required credit by type of lender. As seen in this table, even borrowing from a money lender requires minimum credit, like regular income. Therefore we roughly infer a household reporting debt is also able to borrow if liquidity is needed. So it can be assumed that households which do not borrow at all have a higher possibility of liquidity constraints than the households with debt. But there is one exception for this assumption: homeownership represents strong evidence of credit since households possessing one's own home are able to finance easily by providing it as collateral. Therefore, all homeowners are excluded from liquidity constrained households. Thus, liquidity

constrained households are defined as the households with "No borrowing and No

house."


< Table 6-7> Type of Lender and Required Credit

| Type of lender | | Required credit for borrowing |
|---|---|---|
| (a) Housing loans | from public financial institutions | ▪ Home as a collateral<br>▪ Regular income(repayment limit is within 20%~25% of annual income) |
| | from private financial institutions | ▪ Home as a collateral<br>▪ Regular income above 1 million yen(repayment limit is within 25%~35% of income depending on size of annual income)<br>▪ Guarantor |
| (b) Educational loans | from public financial institutions | ▪ Regular income as a employees or self-employed individuals<br>▪ Guarantor or credit insurance |
| | from private financial institutions | ▪ Regular income above 2 million yen with certain period of work(at least 1 years)<br>▪ Guarantor or credit insurance |
| (c) Consumer loans | From Banks | ▪ Regular income above 2 million yen with certain period of service in work<br>▪ Guarantor or credit insurance |
| | From Sales & Credit companies | ▪ Regular and stable income<br>▪ Guarantor |
| | From Money lenders | ▪ Regular income or guarantor<br>(maximum loan is within 10% of annual income) |
| | From relatives/friends and/or others | ▪ Unable to identify |
| (d) Loans from employers | | ▪ Employee with certain period of service in work |

Source: Questionnaires of POSFAL survey for 1st Column (it is reclassified by author)
          Encyclopedia of Financial Products (2006), The Central Council for Financial Services
Information, and Author's internet survey for a leading financial institutions about each type of lender


Finally, Table 6-8 reports means or ratios of average for selected variables by levels of

income risk.   The household heads with higher income risk are likely to be younger,

salaried worker, no-homeownership and face high probability of liquidity constraints.

<Table 6-8> Sample Characteristics by Levels of Income Risk: Pooled (1996-2000)

| Variables | | Selected Sample | Low Income Risk (*INV*=0) | Middle Income Risk (*INV*=2) | High Income Risk (*INV*=6) |
|---|---|---|---|---|---|
| (a) Observation | Number | 12,967 | 4,324 | 8,116 | 513 |
| | (%) | (100.0) | (33.4) | (62.6) | (4.0) |
| (b) Income and Wealth((¥ 10,000) | | | | | |
| ▪ Annual Income | | 609 | 586 | 617 | 679 |
| ▪ Total Financial assets | | 1,253 | 1,259 | 1,248 | 1,289 |
| ▪ Net Wealth | | 747 | 818 | 711 | 719 |
| (c) Demographics | | | | | |
| ▪ Age (Num.) | | 50.8 | 52.2 | 50.2 | 47.4 |
| ▪ Family Size (Num.) | | 3.72 | 3.66 | 3.75 | 3.76 |
| ▪ None is working (%) | | 7.6 | 11.4 | 5.8 | 4.3 |
| ▪ No House (%) | | 25.6 | 22.7 | 26.8 | 31.9 |
| (d) Job (%) | Self-Employed | 21.3 | 20.3 | 21.9 | 21.1 |
| | White-collar Worker | 17.4 | 16.3 | 18.0 | 18.8 |
| | Blue-collar Worker | 20.6 | 20.1 | 20.8 | 20.5 |
| | Manager | 16.2 | 14.6 | 17.1 | 17.2 |
| | Professional | 3.1 | 3.0 | 3.2 | 4.1 |
| | Other | 20.8 | 25.9 | 18.9 | 18.4 |
| (e) Residential Area (%) | 13 Large Cities | 21.2 | 20.7 | 21.4 | 22.8 |
| | Rural | 21.2 | 22.3 | 20.5 | 23.0 |
| (f) Liquidity Constraints (%) | LLC + TLC | 22.9 | 7.9 | 30.7 | 27.3 |
| | No Debt  No House | 16.9 | 15.9 | 17.3 | 18.9 |
| (g) Portfolio (%) | Risky assets | 10.7 | 9.9 | 11.0 | 11.9 |
| | Liquid Safe | 12.8 | 12.4 | 13.0 | 14.6 |
| | Fairly Liquid safe | 41.4 | 43.7 | 40.1 | 40.2 |
| | Illiquid Safe | 35.1 | 33.9 | 35.9 | 33.3 |
| | Broad Risky | 45.8 | 43.9 | 46.9 | 45.2 |
| (h) Motives for Saving | Precautionary | 0.389 | 0.413 | 0.378 | 0.363 |
| | Life cycle | 0.589 | 0.564 | 0.600 | 0.614 |
| (i) Saving Rate (%) | | 13.4 | 12.8 | 13.6 | 15.9 |

Source: selected POSFAL data (1996-2000)

Note: Income and wealth are expressed in real value (2000=100).  Self-Employed includes Agricultural Worker and Business Proprietor.  Portfolio is computed by ratio of average.

## 6.3. Empirical Tests and Results

### 6.3.1. Tests for Model Specification Issues

(1) Stability Test for Pooling Data

The available data for income risk and liquidity constraints is from 1996 to 2000. To check whether pooling of the data is acceptable for estimation, a test of stability over time should be conducted. Interaction terms between years and the main explanatory variables (Age, Net Wealth, Income Risk, Precautionary Motive) are constructed. To achieve convergence in the maximum likelihood algorithm, the interaction terms for precautionary motive (PM) are dropped from the models of the broad risky assets and saving rate.

First, a t -test is used to evaluate the significance of each interaction term. As can be seen in Table 6-9 (a), the t –test results indicate that most of the interaction terms are insignificant at the 1% level, and the general pattern in the results is inconclusive across dependent variables even if a few interaction terms are significant. It implies that the parameters for the most important explanatory variables are stable over the sample period.

Second, a LR (Likelihood Ratio) test is conducted to check the joint significance of the interaction terms in the model. As can be seen in Table 6-9 (b), the joint effects are insignificant at 1% level. Therefore, the difference between the model with interaction terms and the model without interaction terms is insignificant even if some interaction terms are significant individually. Therefore, the pooled data set (1996-2000) can be used for estimation without consideration of variation in the coefficients over time.

<Table 6-9> Test Results for Stability: Pooled data (1996-2000)

(a) t- Test for Stability

| Interaction Variables | Risky Assets | Liquid Safe Assets | Fairly Liquid Safe | Illiquid Safe Assets | Broad Risky Assets | Saving Rate |
|---|---|---|---|---|---|---|
| Age*1997 | 0.0002 | 0.0022** | 0.0007 | **-0.0026†** | -0.0023** | 0.0000 |
| Age*1998 | **0.0038†** | -0.0007 | 0.0019 | **-0.0028†** | -0.0013 | -0.0009** |
| Age*1999 | -0.0008 | -0.0003 | 0.0019 | -0.0006 | -0.0007 | -0.0005 |
| Age*2000 | 0.0015 | -0.0005 | 0.0016 | -0.0007 | -0.0007 | -0.0010** |
| Net Wealth*1997 | 0.0002 | **-0.0025††** | **0.0018†** | 0.0008 | 0.0006 | -0.0001 |
| Net Wealth*1998 | -0.0008 | -0.0004 | 0.0013 | 0.0000 | -0.0008 | 0.0001 |
| Net Wealth*1999 | 0.0003 | -0.0001 | 0.0004 | -0.0002 | -0.0003 | **0.0006†** |
| Net Wealth*2000 | -0.0004 | -0.0009 | 0.0007 | 0.0008 | 0.0005 | 0.0004 |
| Income Risk*1997 | -0.0022 | -0.0091 | 0.0209** | -0.0093 | -0.0114 | -0.0072** |
| Income Risk*1998 | -0.0011 | 0.0111 | -0.0066 | -0.0079 | -0.0058 | -0.0049 |
| Income Risk*1999 | 0.0035 | 0.0046 | 0.0099 | -0.0173** | -0.0154 | -0.0061** |
| Income Risk*2000 | -0.0041 | 0.0057 | 0.0167 | -0.0140 | -0.0164** | -0.0075** |
| PM*1997 | -0.0129 | 0.0786** | **-0.1611††** | 0.0922** | | |
| PM*1998 | -0.0319 | 0.0859** | -0.0909** | 0.0569** | | |
| PM*1999 | -0.0411 | -0.0390 | -0.0287 | 0.0898 | | |
| PM*2000 | 0.0168 | 0.0196 | 0.0075 | -0.0140 | | |

Note: Base year is 1996. MP stands for Precautionary Motives
 **, †, †† indicate the statistical significance of independent variables, at the 5%, 1%, and less than 0.1% respectively.

(b) LR (Likelihood Ratio) Test for Stability

| Dependent Variables | Number of Interaction Terms | (A) Unrestricted Log Likelihood | (B) Restricted Log Likelihood | LR Statistics (=2*(A-B)) | Significance |
|---|---|---|---|---|---|
| Share of Risky Assets | 16 | -5,046 * | -5,055 * | 18 | Insignificant at 5% level |
| Share of Liquid Safe Assets | 16 | -6,776 | -6,804 | 28 | Insignificant at 1% level |
| Share of Fairly Liquid Safe Assets | 16 | -7,692 | -7,720 | 28 | Insignificant at 1% level |
| Illiquid Safe Assets | 16 | -6,656 | -6,674 | 18 | Insignificant at 5% level |
| Broad Risky Assets | 12 | -6,979 | -6,988 | 9 | Insignificant at 5% level |
| Saving Rate | 12 | -2,919 * | -2,904 | 15 | Insignificant at 5% level |

Note: * denote the optimization used is "Newton-Raphson with ridging" (others are quasi-Newton)
 Critical value of Chi-square: $\chi_{16,5\%} = 26.29$, $\chi_{16,1\%} = 31.99$, $\chi_{12,5\%} = 21.02$

(2) Heteroskedasticity Issue

A significance test for heteroskedasticity model is based on the general model,

$$\sigma_i^2 = F(\alpha_0 + \alpha_1 Age_i + \alpha_2 NFA_i + \alpha_3 DI_i + \alpha_j X_i)$$ .where $\sigma_i^2$ is the error variance, and $F$ is

a link function, Age, Net Financial Asset(NFA), Income (DI) and other explanatory

variables ($X$) in the model are also possible explanatory variables for heteroskedasticity.

The available link functions for heteroskedastic models in SAS are "linear" and

"exponential." Through repeated trials of the combination of link functions and

explanatory variables, the following heteroskedastic models proved to be highly

significant: For the all portfolio equation, the exponential link function with income and

net wealth is highly significant: For the saving rate equation, the exponential link

function with income, net wealth, and age is highly significant. The significance level of

the selected variables for the error variance of each equation is reported as follows:

| Variables | Risky Assets | Liquid Safe Assets | Fairly Liquid Safe | Illiquid Safe Assets | Broad Risky Assets | Saving Rate |
|---|---|---|---|---|---|---|
| Hetero. Income | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| | (10.36) | (-6.65) | (-6.85) | (-6.71) | (-7.34) | (-13.98) |
| Hetero. Net Wealth | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| | (-12.78) | (-14.6) | (-13.19) | (-15.38) | (-13.88) | (11.2) |
| Hetero. Age | *** | *** | *** | *** | *** | <0.0001 |
| | | | | | | (15.66) |

Note: Upper figure is P-value and lower figure with parenthesis is t-value

(3) Hausman Test for Endogeneity Problem

The Hausman test is conducted for exogeneity of the income (DI) and net wealth

(NFA) variables by fitting both the risky assets and saving rate equations (Wooldridge,

2001, p530). The test results are follows:

| | V hat for DI | | | V hat for NFA | | |
|---|---|---|---|---|---|---|
| | Estimate | t-value | P-value | Estimate | t-value | P-value |
| Risky Assets | 0.0144 | 1.75 | 0.0802 | 0.0049 | 14.29 | <0.0001 |
| Saving Rate | 0.0056 | 2.48 | 0.0132 | 0.0019 | 24.39 | <0.0001 |

As mentioned in section 6.1.2, this study employs a measure of net financial wealth in the previous period to avoid endogeneity problem in the model, which Guiso et al (1996) adopted. However, the Hausman test results show that there is a strong possibility of remaining endogeneity problems, especially for the net financial wealth variable. A caution should be required when interpreting the estimation results since this endogeneity problem may cause bias in the estimation results.

(4) Interpretation Issues with the Tobit model.

In the Tobit model, the coefficients of each variable do not represent the marginal effects. To get the marginal effects, another procedure is required. For continuous explanatory variables, the marginal effects of $X$ for variable $j$ can be obtained by

$\Phi[(\dfrac{1-X\beta}{\sigma}) - \Phi(\dfrac{-X\beta}{\sigma})]\beta_j$. Here, $\Phi(X\beta/\sigma)$ is the estimated probability of observing a positive response given $X$ (Wooldrige, 2001). Thus, the magnitudes of the estimated parameters are not directly useful. But the signs and t-statistics for the estimated parameters may be focused when interpreting the estimation results in this study.

For the continuous explanatory variables, the average marginal effects are reported in the Table 6-11.

**6.3.2. Effects on Portfolio Choice**

Table 6-10 reports the estimation results about portfolio choice and saving. The signs of coefficients are consistent with the descriptive analysis in the previous chapter. The significant results (less than 5% significance level) for portfolio choice are as follows: (a) The share of risky assets is positively related with income, net wealth, living in 13 large cities, "only household head is working," and income risk. It is negatively related with age, living in rural areas, "Both household head and spouse is working," no homeownership, and precautionary saving motives. (b) The share of liquid safe assets is positively related with "plan to buy house," income risk, and precautionary saving motives. It is negatively related with age, net wealth, and "only household head is working." (c) The share of fairly liquid safe assets is only positively associated with net wealth. It is negatively associated with income, family size, loosening and tightening liquidity constraints. (d) The share of illiquid safe assets is positively related with age, income, family size, living in rural areas, "Both household head and spouse is working," no homeownership, loosening and tightening liquidity constraints. It is negatively related with net wealth and precautionary saving motives.

(1) Age Effects on Portfolio Choice

The age coefficients indicate that younger households hold more risky and liquid safe assets but less illiquid safe assets. The share of risky assets is highest for young households and decreases to reach a minimum at age 52. The same profile is found for liquid safe assets with a minimum at age of 55. Decreasing share of risky assets over age

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< Table 6-10> Tobit Estimation on Saving and Portfolio Choice: Pooled (1996-2000)

| Variables | Risky Assets | Liquid Safe Assets | Fairly Liquid Safe | Illiquid Safe Assets | Broad Risky Assets | Saving Rate |
|---|---|---|---|---|---|---|
| Age | -0.0072* | -0.0200†† | 0.0060** | 0.0207†† | 0.0160†† | -0.0024** |
| | (-1.95) | (-7.35) | (1.97) | (7.61) | (5.66) | (-2.42) |
| Age squared/1,000 | 0.0690* | 0.1851†† | -0.0285 | -0.2300†† | -0.1818†† | 0.0122 |
| | (1.89) | (6.74) | (-0.94) | (-8.42) | (-6.42) | (1.18) |
| Income (Million yen) | 0.0401†† | 0.0021 | -0.0073†† | 0.0038** | 0.0142†† | 0.0128†† |
| | (11.03) | (1.13) | (-3.95) | (2.26) | (8.15) | (18.17) |
| Income squared/1,000 | -1.2139†† | -0.0873†† | 0.1958†† | -0.1187** | -0.3096†† | -0.1802†† |
| | (-6.66) | (-1.42) | (3.7) | (-2.48) | (-6.18) | (-9.02) |
| Net Wealth (Million yen) | 0.0104†† | -0.0014 | 0.0033†† | 0.0000 | 0.0009† | 0.0019†† |
| | (18.5) | (-4.74) | (10.31) | (-0.12) | (3.21) | (24.21) |
| Net Wealth squared/1,000 | -0.0563†† | 0.0026 | -0.0269†† | -0.0040 | 0.0023 | 0.0041†† |
| | (-9.5) | (0.63) | (-6.05) | (-1.0) | (0.57) | (3.23) |
| Family size | -0.0175†† | -0.0024 | -0.0060** | 0.0134†† | 0.0065** | -0.0081†† |
| | (-4.96) | (-0.89) | (-2.06) | (5.08) | (2.39) | (-7.92) |
| 13 large cities | 0.0369†† | -0.0134 | -0.0024 | -0.0002 | 0.0128 | -0.0009 |
| | (3.45) | (-1.58) | (-0.26) | (-0.02) | (1.48) | (-0.28) |
| Rural areas | -0.0390†† | 0.0004 | 0.0024 | 0.0052 | -0.0066 | 0.0110†† |
| | (-3.48) | (0.05) | (0.26) | (0.62) | (-0.76) | (3.39) |
| None working | 0.0149 | -0.0072 | 0.0029 | -0.0066 | 0.0016 | -0.0333†† |
| | (0.84) | (-0.49) | (0.18) | (-0.45) | (0.1) | (-5.15) |
| Only head working | 0.0421† | -0.0294† | -0.0101 | 0.0194** | 0.0353† | -0.0016 |
| | (3.12) | (-2.75) | (-0.86) | (1.84) | (3.22) | (-0.38) |
| Head & Spouse working | -0.0253* | -0.0304† | -0.0043 | 0.0329†† | 0.0266† | 0.0029 |
| | (-1.94) | (-2.99) | (-0.39) | (3.29) | (2.56) | (0.73) |
| No homeownership | -0.0766†† | 0.0148 | -0.0242 | 0.0298† | 0.0033 | -0.0128†† |
| | (-5.73) | (1.51) | (-2.26) | (3.08) | (0.33) | (-3.5) |
| Plan to buy house | -0.0014 | 0.0431** | -0.0294** | -0.0163 | -0.0156 | 0.0243†† |
| | (-0.06) | (2.28) | (-1.39) | (-0.87) | (-0.8) | (3.55) |
| Buy house with own funds | 0.0396 | -0.0266 | 0.0014 | 0.0149 | 0.0240 | 0.0178** |
| | (1.33) | (-1.2) | (0.06) | (0.68) | (1.04) | (2.2) |
| Income risk (INV) | 0.0100† | 0.0049* | -0.0079† | 0.0041 | 0.0064** | 0.0036†† |
| | (3.0) | (1.9) | (-2.76) | (1.59) | (2.39) | (3.66) |
| Precautionary motive | -0.0814†† | 0.0494†† | 0.0195 | -0.0549†† | -0.0750†† | -0.0221†† |
| | (-4.74) | (3.84) | (1.39) | (-4.31) | (-5.69) | (-4.59) |
| Loosening Liquidity Constraints (LLC) | 0.0169 | -0.0165 | -0.0321** | 0.0419†† | 0.0424† | -0.0055 |
| | (1.0) | (-1.28) | (-2.29) | (3.31) | (3.24) | (-1.19) |
| Tightening Liquidity Constraints (TLC) | -0.0118 | 0.0127 | -0.0639†† | 0.0404†† | 0.0424† | -0.0305†† |
| | (-0.91) | (1.28) | (-5.91) | (4.15) | (4.19) | (-7.97) |
| Constant | -0.2237** | 0.5333†† | 0.2639†† | -0.1916† | -0.0344 | 0.1677†† |
| | (-2.48) | (8.03) | (3.58) | (-2.89) | (-0.5) | (6.91) |
| Pseudo R$^2$ | 0.1303 | 0.2087 | 0.1790 | 0.1765 | 0.1310 | 0.2135 |
| Num. of bservations | 12,328 | 12,328 | 12,328 | 12,328 | 12,328 | 12,929 |
| Censored at zero | 8,924 | 4,157 | 2,386 | 2,415 | 2,078 | 2,778 |
| Censored at one | 27 | 477 | 767 | 394 | 512 | 38 |

Notes: All equations are estimated by Tobit. *t* values are shown in parentheses. Year dummies are used
Pseudo R$^2$ is computed by correlation between square Y and square Y-hat.
*, **, †, †† indicate the statistical significance of independent variables, at the 10%, 5%, 1%, and less than 0.01% respectively. Heteroskedastic estimation is used with exponential function of income and net wealth for all portfolio equation and with exponential function of income, net wealth, age for saving rate equation

< Table 6-11> Marginal Effects for Continuous Variables: Pooled (1996-2000)

| Dependant Variables | Explanatory Variables | Mean | Maximum | Minimum | Standard. Dev. |
|---|---|---|---|---|---|
| Share of Risky Assets | Age | -0.00188 | -3.3E-06 | -0.00661 | 0.001029 |
| | Income | 0.010494 | 0.036976 | 1.83E-05 | 0.005753 |
| | Net Wealth | 0.002733 | 0.00963 | 4.78E-06 | 0.001498 |
| | Family Size | -0.00458 | -8E-06 | -0.01614 | 0.002511 |
| | Income Risk | 0.002625 | 0.009251 | 4.59E-06 | 0.001439 |
| | Precautionary Motive | -0.02133 | -3.7E-05 | -0.07516 | 0.011694 |
| Share of Liquid Safe Assets | Age | -0.01189 | -0.00065 | -0.01668 | 0.001549 |
| | Income | 0.001259 | 0.001766 | 6.87E-05 | 0.000164 |
| | Net Wealth | -0.00083 | -4.5E-05 | -0.00117 | 0.000108 |
| | Family Size | -0.00141 | -7.7E-05 | -0.00198 | 0.000184 |
| | Income Risk | 0.002928 | 0.004106 | 0.00016 | 0.000382 |
| | Precautionary Motive | 0.029273 | 0.041052 | 0.001598 | 0.003814 |
| Share of Fairly Liquid Safe | Age | 0.00447 | 0.005181 | 0.000226 | 0.000434 |
| | Income | -0.0055 | -0.00028 | -0.00637 | 0.000534 |
| | Net Wealth | 0.002503 | 0.002902 | 0.000127 | 0.000243 |
| | Family Size | -0.00451 | -0.00023 | -0.00523 | 0.000438 |
| | Income Risk | -0.00592 | -0.0003 | -0.00686 | 0.000574 |
| | Precautionary Motive | 0.014671 | 0.017004 | 0.000742 | 0.001424 |
| Share of Illiquid Safe Assets | Age | 0.016169 | 0.018678 | 0.000695 | 0.001231 |
| | Income | 0.002949 | 0.003407 | 0.000127 | 0.000224 |
| | Net Wealth | -2.7E-05 | -1.2E-06 | -3.2E-05 | 2.09E-06 |
| | Family Size | 0.010481 | 0.012107 | 0.00045 | 0.000798 |
| | Income Risk | 0.003196 | 0.003692 | 0.000137 | 0.000243 |
| | Precautionary Motive | -0.04292 | -0.00184 | -0.04958 | 0.003267 |
| Share of Broad Risky Assets | Age | 0.012702 | 0.014215 | 0.000648 | 0.000926 |
| | Income | 0.01128 | 0.012623 | 0.000575 | 0.000823 |
| | Net Wealth | 0.000755 | 0.000845 | 3.85E-05 | 5.5E-05 |
| | Family Size | 0.005208 | 0.005828 | 0.000266 | 0.00038 |
| | Income Risk | 0.005091 | 0.005697 | 0.00026 | 0.000371 |
| | Precautionary Motive | -0.05973 | -0.00305 | -0.06684 | 0.004355 |
| Saving Rate | Age | -0.0019 | -0.00031 | -0.00245 | 0.000284 |
| | Income | 0.00992 | 0.012765 | 0.001598 | 0.001479 |
| | Net Wealth | 0.001508 | 0.001941 | 0.000243 | 0.000225 |
| | Family Size | -0.00628 | -0.00101 | -0.00808 | 0.000936 |
| | Income Risk | 0.002804 | 0.003608 | 0.000452 | 0.000418 |
| | Precautionary Motive | -0.01721 | -0.00277 | -0.02214 | 0.002565 |

Note: Original continuous variables are only "Income" and "Net wealth." Unit of explanatory variables is follows: Age is per one year, Income and Net Wealth is per million yen, Family Size is per one person, Income Risk per one, Precautionary Motive per 0.1.

is quite a different result from the findings of Guiso et al (1996).[75]  Bodie et al's (1992)

argument is supported in the Japanese case.  This implies that flexibility of labor supply

or opportunities for risk diversification from young age overcome the lack of investment

information or liquidity constraints from young age in Japan.

(2) Income and Wealth Effects

Either higher income households or wealthier households hold more risky assets,

which is consistent with the results from previous studies.  But, higher income

households and richer households respond differently for choices of other financial assets.

High income households compose their portfolio with less fairly liquid assets and more

illiquid safe assets.  However, richer households choose more fairly liquid assets and less

illiquid safe assets.  Liquid safe assets are held more by poor households.  The portfolio

effects of the income and net wealth reveal two implications: First, illiquid safe assets

(probably life insurance and personal pension) are held within a limit even for richest

households.  Second, the investment in risky assets requires a minimum accumulation of

wealth as a buffer or fixed cost.

(3) Effects of Family Size, Residential Area, Employment Status, and Housing Status

(a) The households with larger family size hold illiquid safe assets instead of fairly

liquid safe assets. This result is natural considering that the participation ratio for life

insurance is about 65% (Section 5.2.2).  The difference in residential area causes quite a

different portfolio behavior for individuals.  The households living in large cities

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[75] Concerning studies on Japan, Nakagawa et al (2000) and Iwaisako (2003) did not find significant age effects.(Refer to section 2.2.3)

obviously invest in more risky assets while those living in rural areas invest in less risky assets. This result suggests that information and accessibility barriers exist in acquiring risky assets. (b) Portfolio choice by employment status is contrary to expectations: The households where "only the household head is working" hold a larger share of risky assets while households where "both the household head and spouse are working" hold a smaller share of risky assets and larger share of illiquid safe assets. It is suspected that a household with working spouses faces some sort of risk or liquidity constraints with high probability. (c) Housing status has a larger impact on the share of risky assets. Households that do not own their home tend to have a smaller share of risky assets than home-owning households and holding larger share of illiquid safe assets. This result is consistent with the findings of Iwaisako (2003).

### 6.3.3. Effects on Saving Rate

The saving rate has a positive relationship with income, net wealth, living in rural areas, having a plan to buy a house, and income risk. It has a negative relationship with age, family size, "No one is working," no homeownership, precautionary saving motive, and tightening liquidity constraints. Two findings are noteworthy from the effects on the saving rate of various explanatory variables: First, the saving rate is sensitive to income variable or income related variables such as net wealth, family size, nobody working, and no house whereas age has a weaker relationship with the saving rate. This econometric evidence does not support the life cycle theory. Second, housing status greatly affects the saving rate. Households without a home have a lower saving rate than households with a home. However, when households plan to buy a home, saving rate is higher.

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**6.3.4. Effects of Income Risk and Liquidity Constraints**

(1) Income Risk

Income risk measured by "income direction" and "income prospects" has a positive association with risky assets and the saving rate. The effect on the share of risky assets is contrary to the prediction of income risk theory. Precautionary saving motives, which is introduced as a variable reflecting some sort of unidentified risk, have a strong negative association with the share of risky assets and saving rate. We investigated if this sort of risk could be an unemployment risk, health risk or a serious asset deflation risk (Section 6-2-2). As discussed in the literature review, Carroll and Kimball's argument (2001) is applicable to this overlapped risk situation. They assert that an additional uncertainty beyond the first one dominates the effects coming from the first constraints. So we suspect that there is a different time lag in response between the saving and portfolio composition of a household. Saving behavior is quickly adjusted to a new situation like income risk, but it takes some time to adjust portfolio composition if the risk is not strong. When a second great risk is introduced, the first effects are absorbed in second greater effect.

(2) Liquidity Constraints

Liquidity constraints measured by current consumption direction show the predicted results for saving rate. The households suffering from pressing liquidity constraints clearly save less. But the liquidity constraints do not present significant and the predicted results for portfolio choice. The share of risky assets and liquid safe assets are

insignificant, and fairly liquid safe assets and illiquid safe assets are significant but the signs are extraordinary. Another measure of liquidity constraints is needed to explore. Table 6-12 shows the regression results when alternative measures of liquidity constraints are used. The regression employing the liquidity constraints measured by consumption risk $(CNV)$[76] shows quite similar results to the tightening liquidity constraints $(TLC)$. The measure by "No debt, No house" illustrates very significant and reasonable results except for the effects on the share of risky assets. The households under this group can be considered to face expected borrowing constraints with likelihood, which causes a higher saving rate, a larger share of liquid safe assets and share of fairly liquid safe assets, and a smaller share of illiquid safe assets. This is consistent with the findings of Guiso et al (1996) from Italian data.

< Table 6-12> Saving and Portfolio Choice by Alternative Measures of Liquidity
Constraints: Pooled (1996-2000)

| Variables | Risky Assets | Liquid Safe Assets | Fairly Liquid Safe | Illiquid Safe Assets | Broad Risky Assets | Saving Rate |
|---|---|---|---|---|---|---|
| (1) Loosening Liquidity Constraints (LLC) | 0.0169 (1.0) | -0.0165 (-1.28) | -0.0321** (-2.29) | 0.0419†† (3.31) | 0.0424† (3.24) | -0.0055 (-1.19) |
| Tightening Liquidity Constraints (TLC) | -0.0118 (-0.91) | 0.0127 (1.28) | -0.0639†† (-5.91) | 0.0404†† (4.15) | 0.0424† (4.19) | -0.0305†† (-7.97) |
| (2) Liquidity constraint: by Consumption Volatility | 0.0033 (1.24) | -0.0054† (-2.84) | -0.0106†† (-4.9) | 0.0172†† (8.85) | 0.0158†† (7.81) | -0.0026†† (-3.43) |
| (3) Liquidity constraint: by Decreasing Income | -0.0153 (-1.38) | -0.0085 (-0.98) | -0.0039 (-0.42) | 0.0146* (1.71) | 0.0076 (0.86) | -0.0033 (-0.98) |
| (4) Liquidity constraint: by No debt, No house | -0.0189 (-0.96) | 0.0391† (2.85) | 0.1217†† (7.64) | -0.1379†† (-9.71) | -0.1441†† (-9.77) | 0.0358†† (6.96) |

Notes: All equations are estimated by Tobit. *t* values are shown in parentheses. All other variables except for alternative proxy of liquidity constraints are the same as in the Table 6-10.
*, **, †, †† indicate the statistical significance of independent variables, at the 10%, 5%, 1%, and less than 0.01% respectively. Heteroskedastic estimation is used with exponential function of income and net wealth for all portfolio equation and with exponential function of income, net wealth, age for saving rate equation. Effects of other explanatory variables are not significantly different from the results in Table 6-10.

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[76] $CNV= Cc^2 + Ce^2 + (Cc\text{-}Ce)^2$. Cc (Consumption direction) and Ce (consumption prospects) have the index of 1, 0, -1 for increasing, no change, and decreasing respectively.

### 6.3.5. Conclusion

In conclusion, the Japanese POSFAL data show that income risk and liquidity constraints affect saving and portfolio choice. Income risk measured by income direction and income prospects causes the saving rate to increase. But portfolio choice is largely affected by other source of risks expressed by precautionary saving motives. Precautionary motives are suspected to be influenced by fundamental and macro risks like unemployment. Precautionary motives lead to a lower share of risky assets and a higher share of liquid safe assets. Liquidity constraints show different results on saving and portfolio choice depending on the way the constraints are measured. The constraints measured through households' consumption behavior causes the saving rate to decrease, but it produces insignificant or implausible results for portfolio choice. However, the constraints measured by households' predicted credit (No debt, No house) show strong and clear effects on saving and portfolio choice. The expected borrowing constraints give rise to a higher saving rate, a larger share of liquid safe assets, and a smaller share of broad risky assets. We also note that the saving rate is more heavily affected by income and income related variables rather than age.

The impact from the above uncertainty and borrowing constraints helps to explain stylized facts on saving and portfolio change in Japan during the 1990's. Increasing income risk and expected liquidity constraints raised the saving rate but the deteriorating income circumstances dominated and decreased the overall saving rate. Other fundamental uncertainties like unemployment risk decrease the share of risky assets and increase the share of liquid assets. Expanded liquid assets contribute to the low interest rates trend.

# Chapter 7

## Summary and Conclusions

This study investigates the effects of income risk and liquidity constraints on household portfolio choice and saving behavior using Japanese household-level data (POSFAL) from 1989 to 2003.   The Japanese economy presented distinctive features in the 1990's: a declining trend in household saving rate, a smaller share of risky assets, and a larger share of liquid safe assets in portfolios.  This household portfolio change deviates from international standard trend.  Two hypotheses are competing to explain the declining saving rate and change in portfolio choice in Japan–life cycle theory based on the rapid aging society of Japan and the uncertainty, and liquidity constraints based on the deteriorating economy in the 1990's.  The latter is focused on in this paper to get a better understanding of the individual's detailed and complicated behavior.  Some extensions are added to Guiso et al's seminal paper (1996) for portfolio choice:  An integrated analysis for both saving and portfolio choice is implemented by examining "Why people save,"  "How much people save," and "How people save" together.  Next, an overall portfolio structure classified by four groups is analyzed by considering liquidity as well as risk as another important criterion for choosing financial assets.  In addition, a unique measure of both income risk and liquidity constraints are newly employed in this paper using each household's own detailed information about income variance, consumption volatility, and borrowing information.  To my knowledge, this is the first attempt about the study of saving and portfolio choice, at least for Japan.

The basic structure of this empirical study consists of three main parts. First, the dominant factor of saving and detailed saving motives is examined. Second, various aspects in portfolio choice of Japanese households are presented. Third, based on the preceding descriptive analysis on saving motives and portfolio choice, an econometric model and methodology is executed for empirical tests.

(1) Study on the Saving Motives for Japan

First, to find the dominant factor for saving in Japan, life cycle theory is tested by employing the income and consumption profile procedure which Carroll and Summers (1989) introduced. The Japanese POSFAL data during 1991-2003 is used for this test. The relationship between age-income and age-consumption profiles across different occupations for 1991, 1994, 1997, 2000 and 2003 as well as aggregate (1991-2003) data is explored by graphical analysis. Test results show that consumption over lifespan fluctuates according to income changes of over lifespan. These observations are consistent with the findings of Carroll and Summers (1989). Thus, it presents clear evidence that income and consumption growth are closely related and cannot support the life cycle income hypothesis. The sensitivity between the saving rate of young people and their expected long term income growth within each occupational group is observed as another procedure. Life cycle theory predicts a strong negative relationship between present saving rate and future income growth. The result of this test with Japan's data is ambiguous, but when increasing the observations by pooling the data of all years, the association between present saving and future income stream show a clear positive

relationship. In short, there is no evidence to support the life cycle theory from Japanese POSFAL data based on Carroll and Summers' (1989) procedure.

Second, to find "why people save," detailed saving motives are examined as Horioka and Watanabe (1997) executed. The POSFAL data during 1989-2003 is used for this analysis of saving motives. The ten motives for saving are observed (exclude 'other' motive) and the motives are grouped into three categories: (a) Life-Cycle Motives, which arise from differences in timing between income and expenditure in one's life cycle; (b) Precautionary Motives, which arise from uncertainties of income and expenditure; and (c) Bequest Motive, arising from the desire to transfer assets to offspring.

Four analyses are conducted with descriptive statistics for saving motives. First, association between saving motives, financial status, and demographics are investigated. This analysis reveals some interesting features: (a) The precautionary saving motive like illness and peace of mind are common, regardless of age; (b) The households with an education motive tend to be very young and have a low level of income and wealth; (c) The households with a marriage motive are likely to be in the median age, and have a high level of income but not for wealth; (d) The households with a high housing motive tend to be fairly young in age, and have a strong propensity to save in both saving amount and saving rate even if their income level is not so high; and (e) A retirement motive is common for the older age group and with high levels of wealth.

Second, the relationship between saving motives and its saving contribution over life time is examined by graphical expressions for aggregate data (1989-2003) and cross-section data (1989, 1991, 1994, 1997, 2000 and 2003). This analysis presents the following features: (a) Saving motive for children's education occurs strongly in the 20's,

30's and 40's age while declining rapidly after 50's; (b) Marriage motive appears in the 40's, and reaches a peak in 50's; (c) The housing motive tends to be strongest in the 20's and 30's age and decreases after 40's; (d) Retirement motive increases rapidly during the 40's and dominates the motive after 50's with a proportion of 33%; and (e) Savings for both illness and peace of mind is important across all ages. The illness motive increases continuously with age while the peace of mind motive takes a V shape, high in younger and older ages.

Third, exploration of the association between saving motives and occupation shows the following results: The white-collar workers and managers tend to have relatively low motives for the peace of mind, whereas farmers, business proprietors and professionals tend to have relatively high motives for it. This observation suggests that uncertainty from each occupational group influences precautionary saving.

Fourth, changes in saving motives during 1989-2003 are also examined. Noticeable changes are decreasing in motives for education, marriage and housing and rising in motive for retirement, which is suspected to cause a decreasing saving rate.

Through this study of saving motives, it is observed that a large portion of saving relies on a precautionary saving motive (40~50%), which is consistent with the finding of Horioka and Watanabe (1997). It implies that a considerable size of saving is relevant to future uncertainty and a liquidity constraint.

(2) Study on Portfolio Choice for Japan

First, the criterion for classification of thirteen Japanese financial products in POSFAL data is examined. For an appropriate classification, thirteen products are

overviewed for characteristics of each product. So far most portfolio studies only

consider one criterion－ whether it is risky or safe. In this study, both risk versus safety

criteria and liquidity criteria are considered since income risk and borrowing problems

are closely associated with liquidity. All financial assets are categorized by four groups:

Risky assets, Liquid Safe assets, Fairly Liquid Safe assets, and Illiquid Safe assets. A

Broad Risky asset is also defined by summing up Risky assets and Illiquid Safe assets.

Second, characteristics of portfolio participation and diversification are investigated.

Eight cross section data (every two years of sample period) is used for this analysis.

Concerning participation, Japanese participant ratio of holding life insurance (60~70%) is

considerably high compared to U.S (30%, 1998). Postal accounts have increased

gradually during the sample period. Concerning diversification, Japanese households

hold a few financial assets (3~4) among thirteen products. Diversification has a positive

association with income level. Age has a hump-shaped pattern for diversification,

peaking at the 50's. Variation in portfolio diversification among households is ascribed

to whether holding risky assets. Households holding risky assets have 1.7~2 times the

number of financial assets than none. This implies that risky assets are the highest barrier

for portfolio diversification. Concerning portfolio combinations, about 50% of

households compose their financial portfolio with deposit accounts and illiquid safe

assets like life insurance. 20~28% of households comprise all three categories of

financial products, this type of households have declined in the 1990's.

Third, the distribution of risky assets over age and wealth is explored. Pooled data

(1989-2003) and four cross-section data (1989, 1993, 1997, 2003) is used for this analysis.

Unconditional share of risky assets shows consistently increasing profile over age, which is a different result from Guiso et al's (2002) hump-shaped profile. Conditional share of risky assets shows a flat pattern over age. These two findings would imply that Japanese elders participate in economic activity positively until a later life stage and there are some barriers in possessing risky assets such as an information problem or minimum balance. However, a *rising* profile of the unconditional share of risky assets over age is altered to a *declining* profile if it is controlled by wealth level. Wealth level has clearly positive association with share of risky assets but negative with liquid safe assets. A tendency for liquid assets of the poor suggests a sort of liquid constraint (Paxson, 1990)

(3) Measure of Income Risks and Liquidity Constraints

The main difficulty in the empirical analysis is to find the appropriate measures of income risk and liquidity constraints (Guiso et al, 1996; Browning et al, 1996). Browning et al (1996) suggest that good measure of uncertainty should be observable, exogenous and significantly variable across the population. Concerning observability, direct subjective measures are considered as more attractive (Murata, 2003).

First, income risk is constructed using subjective opinion on current income direction and future income prospects. A higher income fluctuation over a period is assumed to reflect higher income risk than a stable income over a period. Let *INV* denote the income risk, *Yc* the variation of current income direction over last year, *Ye* the variation of future income prospect over the next year. *Yc* and *Ye* have the index of 1, 0, -1 for increasing, no change, and decreasing respectively. Then *INV* is constructed as $INV = Yc^2 + Ye^2 + (Yc - Ye)^2$. The available data for *INV* is 1996 through 2000 for 5 consecutive years.

Second, liquidity constraints are constructed using subjective opinion on reasons for current consumption direction (LLC, TLC). Other proxies of liquidity constraints are also examined. "Consumption variation" is measured using subjective opinion on current consumption direction and future consumption prospects. "No debt and No house" as borrowing constraints are measured using borrowing and housing information.

(4) Empirical Tests and Results.

Portfolio choice, Saving rate, and Motives for saving are regressed with the following specification using Tobit to test the effects of uncertainty and liquidity constraints. All these dependent variables have a censored value between zero and one. The pooled data of five consecutive years (1996-2000) is used under stability of main variables.

$Y_i = Constant + \alpha_1(Age)_i + \alpha_2(Age)_i^2 + \alpha_3(Income)_i + \alpha_4(Income)_i^2 + \alpha_5(Net\ Wealth)_i + \alpha_6(Net\ Wealth)_i^2 + \alpha_7(Family\ size)_i + \alpha_8(Employment\ Dummies)_i + \alpha_9(Residence\ Area\ Dummies)_i + \alpha_{10}(Housing\ Dummies)_i + \alpha_{11}(Income\ Risk)_i + \alpha_{12}(Liquidity\ constraint)_i$

Regression results show consistent results with the descriptive analysis as following:

(a) Income risk measured by "income direction and prospects" has a positive association with share of risky assets and saving rate. The effect on risky assets is a contrary result to the prediction of income risk theory. Whereas precautionary saving motives, reflecting a sort of unidentified risk, have a strong negative association with share of risky assets. This sort of risk could be unemployment, health, or a serious asset deflation risk. Regression results on precautionary motive presents the younger, lower income, poorer, non-homeownership and self-employed households have higher precautionary motives.

(b) Liquidity constraints measured by reasons of current consumption direction show predicted results for saving rate but do not present significant results for risky assets. The households suffering from pressing liquidity constraints save less clearly. Another measure using "predicted credit" (No debt, No house) can be considered as expected borrowing constraints, illustrates very significant and reasonable results. Expected borrowing constraints lead to higher saving rate and a larger share of liquid assets. This is consistent with the findings of Guiso et al (1996) from Italian data.

(c) Effects of other control variables. (ⅰ) The age variables present that younger households hold more risky and liquid safe assets but less illiquid safe assets and save more. Decreasing share of risky assets over age is quite a different result from the findings of Guiso et al (1996). So Bodie et al's (1992) argument is held for the Japanese case. This implies that flexibility of labor supply or opportunities of risk diversification from young age overcome a lack of investment information or liquidity constraint from young age in Japan. (ⅱ) Both higher income and wealthier households hold more risky assets and save more, which are consistent results with other previous studies. Saving rate especially is sensitive to income variable or income related variable such as net wealth, family size, and "nobody working," whereas age has a less and weak relation with the saving rate. This is other evidence from econometrics that life cycle theory is not supported. (ⅲ) Housing status affect portfolio choice and saving rate significantly. The household not occupying home hold a smaller share of risky assets and save less. But the household having plans to buy a house have higher saving rate. This is consistent results with the findings of Iwaisako (2003). (ⅳ) The households living in large cities obviously

invest in more risky assets, while those living in rural areas invest in less risky assets result suggests that information and accessibility barrier exist in acquiring risky assets

(5) Conclusions

An integrated analysis for three aspects of saving− motive, saving rate, and portfolio choice− and overall analysis for portfolio structure as a whole provide abundant information and implications for saving behavior.

First, a factor entailing precautionary saving does not necessarily accompany a precautionary portfolio (smaller share of risky assets and lager share of liquid assets). Income risk (*INV*) causes the saving rate to increase and tightening liquidity constraints (*TLC*) cause saving rate to decrease. But both affect precautionary portfolio with low significance or insignificance. This suggests that saving response to shocks is direct and quick, while portfolio response takes some time for adjustment.

Second, a study on motives for saving is very useful.  A household with higher precautionary saving motives apparently holds a smaller share of risky assets, a larger share of liquid safe assets and has a lower saving rate.  This precautionary motive seems to reflect other sources of risk like unemployment, health, and serious asset deflation risk.

Third, each financial portfolio has a specific dominant factor. For example, higher income households hold more illiquid safe assets and less fairly liquid assets while richer households do more fairly liquid assets and less illiquid assets. In addition, this overall portfolio analysis shows there are trade-off relations between portfolios over explanatory variables. For example, concerning higher income households, risky assets and fairly

liquid safe assets have trade-off relation. This suggests that if economy recover, risky assets market such as stock and mutual fund will expand.

Fourth, empirical test results shed light on the explanation of Japanese stylized facts during the 1990's. Increasing income risk and expected liquidity constraints cause the saving rate to rise, but deteriorating income circumstances dominate to decrease the saving rate overall. Precautionary motives for saving reflecting other fundamental uncertainty like unemployment risk cause the share of risky assets to decrease and share of liquid assets to increase. Expanded liquid assets seem to sustain the low interest rate despite of decreasing household saving rate and increasing Japanese government debts.

Some limitations should be mentioned for this empirical test results. Portfolio analysis of this study is implemented within only financial assets due to data availability. Comprehensive analysis comprising real estate will provide more complete picture of household portfolio. Risky assets exclude foreign currency denominated deposits due to data consistency (this information is available from 1999). But it will not affect the main results considering its minor portion.

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