Household Debt in Korea: Empirical Evidence from Micro Data

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Abstract

Using a recent survey of household finance in Korea, we found the following characteristics of household debt. Firstly, the debt to income ratio seems sound at the household level in Korea. However, 5% of households are in seemingly risky situation, and they are distributed across all income groups. Secondly, while household sector as a whole has financial assets in excess of debt holding, the households with debt greater than assets are also found in most income groups. Thirdly, based on some suggested standards for evaluating financial health of households, about 3% of households are estimated as having risky debt level while more than 80% of households seem to be sound in their portfolio.

Lastly, we explore the determinants of debt and financial asset accumulation at the household level using the household survey data. Given that both debt and assets are components of household financial portfolios, we explore the degree of interdependence between households assets and debts by jointly modelling these two aspects of their portfolios with a bivariate Tobit model. Our empirical findings support a negative inter-dependence between debt and financial asset holding, although there is a high degree of positive inter-dependence between debts and total assets with housing assets included.

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I. Introduction

As household debt in Korea has rapidly snowballed in recent years, there are steadily rising concerns about households' debt servicing capacity. Notably, as economic conditions deteriorate, such concerns can be exacerbated into concerns about a "financial crisis or an "economic crisis"[1)]

For Korea, after undergoing the Asian Financial Crisis during 1997-98, the possibility of crisis was suggested continuously for a while but then disappeared. However, concerns about household debt and the likelihood of a subsequent crisis have steadily increased since the 'credit card debt crisis' in 2002. So what would be the reasons for these concerns about a household debt crisis? When the analysis and data on something are inaccurate and insufficient, this amplifies the uncertainty, reproduces concerns, and leads to growing rumors of a crisis. One of the reasons for these rising concerns is that no objective assessment and in-depth analysis of households' debt servicing capacity have been made, despite the growing household debt.

So far, the approaches of studies of household debt and the relevant assessments of households' debt servicing capacity are mostly based on the concept of aggregates, and thereby mainly use aggregate statistics for the whole economy or the household sector as a whole. As indicators for assessing households' debt servicing capacity, the capital gearing ratio and the debt-to-income ratio are used.

However, the assessment of households' debt servicing capacity based on aggregates using the indicators above has a limitation in that it does not reflect the differences in characteristics[2)] among households. That is, if households' debt is assessed on the basis of aggregate concept, it is impossible to figure out which types of households are in sound financial situations and which ones are facing bankruptcy. In addition, this method might provide unrealistic information in accordance with the distribution of households' debts. For example, if households having sound abilities of debt service(those having high levels of income or assets) own most of the household debt, this will generate little problem to the whole economy. However, when assessed with aggregate data

1) The concerns about economic or financial crisis stemming from household debt are as follows: that if the burden for repayment of debt on households increases, this leads to delays in payment, driving financial institutions insolvent and causing enterprises to have difficulties in their financing, and with the increase in personal and business bankruptcies, domestic demand goes into recession. For more detail, refer to Yoo and Lee (2009)

2) The economic, social and demographic differences among the heads of households (incomes, ages, occupations, assets, etc)

alone, their financial soundness can be said to have deteriorated simply because their debts have grown faster than their assets or incomes. From this perspective, it is required to conduct analysis of household debt using micro data as well as macro indicators, and by doing so we will be able to assess the financial soundness of households more accurately.

Therefore, I analyze the situation of Korean household debt to make an appropriate assessment of it and its implications, in consideration of the following two issues:

First, as each household has a different capability to repay its debts in line with its characteristics, it is necessary to grasp the distribution of household debt and to conduct analysis of financially vulnerable households. To see the likelihood of eruption of household debt problems, it is required to understand how the debt burdens on households have been progressing, and assessment should be made of which classes of households have mostly which amounts of the household debt, of how their capabilities of repaying their debts are and of which classes of households are relatively vulnerable to debt so to practically determine the severity of household debt.

Second, for evaluating the possibility that household debt problems are transmitted into the financial markets, prior analysis should be made on the relationship between the holding of financial assets and real estate which serve as collateral, and household debt. In conducting this analysis, it is essential to consider the heterogeneity of households and the features of the distribution of household assets and debt mentioned earlier.

The academic fields that deal seriously with household debt are mainly two: consumer studies and economics. As household debt is emerging as one of the major economic issues lately, studies on household debt in the economics field are actively ongoing, led mainly by central banks.[3)]

Studies on households' debt were initiated earlier in the field of consumer studies than in economics. These studies are focused mostly on analyzing the demographic and social characteristics of households that are likely in debt or behind on debt payments, and provide solutions for managing the household debt. Notably, their focuses are put on the debt burdens of some classes that are behind in their debt or go bankrupt, which is pointed out as a social issue, and

3) The former chairman of the FRB, Alan Greenspan (2004) mentioned that it is hard to appropriately assess households' financial soundness with simultaneous consideration of their financial assets and financial debt, and the Bank of England (2002) also argued that studies of whether identical households have accumulated their financial assets along with their debt can be used as important works for assessing households' financial soundness.

they offer desirable measures for resolving debts for households from the financial perspective by analysing the causes of their defaults and bankruptcies, or suggest the importance of financial education (Sullivan and Worden, 1986; Lee and Huh, 2005; Sung, 2006).

In the economics field, mainly macroeconomic studies have been conducted on household debt. That is, study has centered on the aggregates or trends of household debt or the trends of defaults on financial debt, and the macro-economic effects of increases in household debt have been analyzed using time series data (Mustafa and Rahman, 1999; Korea Institute of Finance, 2004; Samsung Economic Research Institute, 2009; Kim and Kim, 2009a).

Recently, micro studies on household debt are also actively ongoing. However, most of them put their emphasis on identifying the causes of household debt in accordance with the demographic and social characteristics of households, just as are done in consumer studies (Bridges and Disney, 2004; Karasulu and Schiff, 2007; Kim, 2008; Kim and Kim, 2009). More recent studies are using micro data to determine the characteristics of indebted households, in a recognition of the limits of macroeconomic analysis of household debt (Choi and Min, 2009; Kim, Kim and Kim, 2009). However, the analysis of household debt in these studies seems not to be conducted in a more comprehensive way from the perspective of households' asset compositions, as they do not reflect the contemporaneous relationship between household debt and assets since most of them deal with household debt and assets, separately.

In this study, therefore, I examine household's debt servicing capacities by income quintile, using the data on household debt and assets available in Korea. Unlike the research in consumer studies which is limited to that on the debt service of some vulnerable households, this study conducts analysis for the entire household sector. The analysis in this study is also distinguished from the existing economic analyses, which are mainly macroeconomic ones, in that it empirically analyzes the contemporaneous relationship between household debt and assets in the composition of household assets based on micro data.

Specifically, it is possible in this analysis to compare the relative debt servicing abilities of households and, as a consequence, to find out which quintile are vulnerable in terms of financial soundness, by grasping the financial condition of each income quintile. For the analysis, I use the financial debt-to-income ratio, which represents the overall likelihood of debt repayment, and the financial debt-to-assets ratio, which refers to the overall possibility of collateral. And given the heterogeneity of each household, I analyze the relationship between assets and debt in order to gain implications as to the financial conditions of

households. Analyses using indicators such as the financial debt-to-income ratio, have limitations in representing the contemporaneous relationships between debts and assets, and these indicators do not provide information on whether the highly indebted households also hold high or low levels of assets.

It is therefore necessary to test the correlation between assets and debt. In this analysis, I apply the empirical analytical method using a bivariate Tobit model. Given that assets and debt have non-negative values, this model is chosen to verify whether the decisions on assets and debt in households' portfolio compositions are made simultaneously. In this analysis, I estimate a behavioral equation that determines assets and debt and verify the correlation between them vsing coefficients that denote the relationship among the residues. If the coefficients are negative, highly indebted households are interpreted to have relatively low levels of assets.

The remaining part of this paper is organized as follows. In Chapter Ⅱ, I look over the macro data of the current status of household debt, and using household micro data, examine the distributions of household debt and its characteristics. In Chapter Ⅲ, I look into the debt servicing capacity of households on the basis of income flows and asset stocks. In this chapter, I verify that the debt servicing capacities of some quintiles are vulnerable, in addition to the fact that each quintile has a different capacity to repay its debts. In Chapter Ⅳ, I carry out an empirical analysis of whether the highly indebted households also have high assets, all other conditions being equal. Chapter Ⅴ, I summarize the analytical results of this study and offer some implications.

II. Current Status of Household Debt

1. Trends of Household Debt

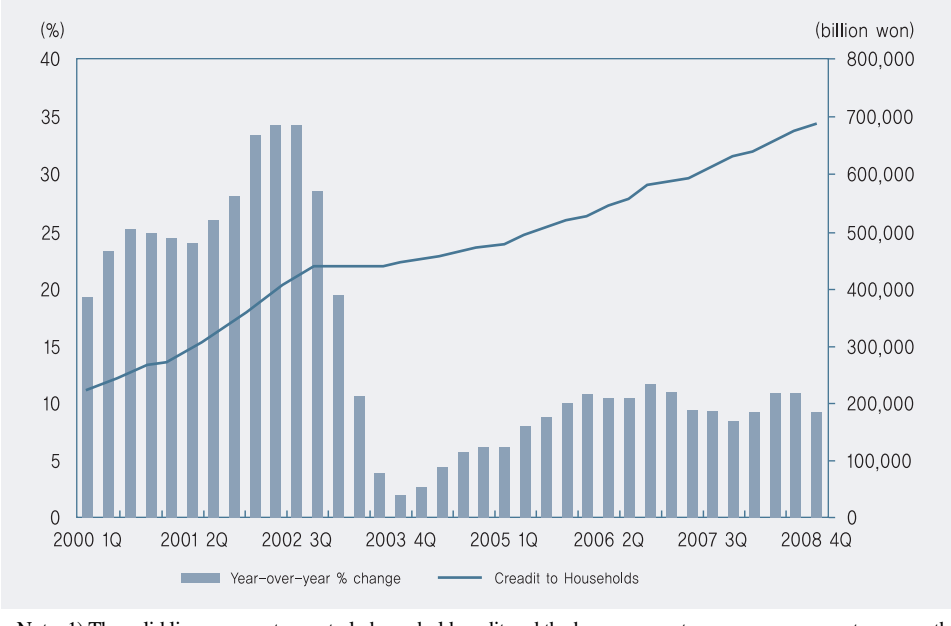
The size of the household debt in the whole economy is obtained from the data on household credit and the households' flow of funds account. Household credit is defined as the sum of household loans offered by financial institutions including banks and credit sales (household loans + credit sales) offered by credit card and finance companies.[4] When using the flow of funds account, it is

4) The Bank of Korea has gathered data on household credit (releasing quarterly statistics since 1996) in order to figure out the household credit supply situation since 1997. However, the analysis period is relatively shorter than those of other macro time series data.

possible to gauge household debt based on the size of individual debt.[5)]

Looking at the trends of household debt, household credit in Korea more than doubled between 2000 and 2008. The rate of increase in household debt, which had stayed at around 20 to 30% during 2000 to 2002, slowed down during the 2003 to 2004 period but has since gradually increased at an annual rate of 10% since 2005. As a consequence, household credit and individual sector financial debt had reached 688 trillion won (household loans: 648 trillion won; credit sales: 40 trillion won) and 802 trillion won, respectively as of end-2008.

Figure 1 **Household Credit Trends**

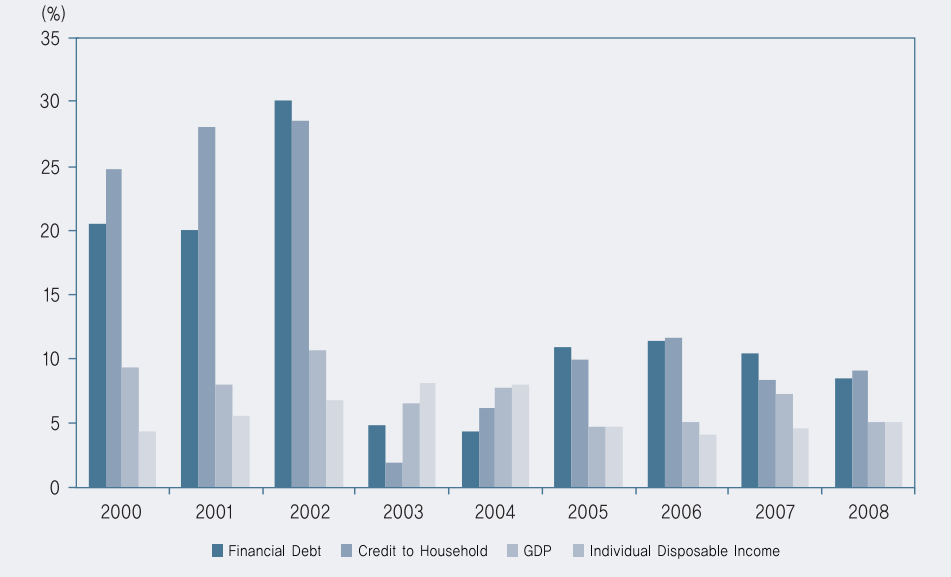


Note: 1) The solid line represents quarterly household credit and the bars represent year-on year percentage growth.
Source: Bank of Korea, ECOS

The trend of increase in household debt appears to have been higher than those of individual disposable income or GDP, with the exception of the period from 2003 to 2004. Even since 2004, when the rate of increase in household debt has slowed, the rates of personal disposable income and GDP have increased by 4%

5) The individual sector in the flow of funds account includes household enterprises and non-profit institutions serving households (NPISH) and the relatively high financial debt of the private sector compared to household credit stems mainly from the difference in its scope of inclusion.

Figure 2 **Changes in Household Debt and Income**



Notes: 1) Year-on-year growth, in percent
2) The 1993 SNA is used for the data after 2002 and the 1968 SNA for the data before 2002.
3) Index-based year series are used for GDP and disposable income.
Sources: Bank of Korea, ECOS

to 6%, respectively, while household credit and individual financial debt have risen at relatively higher rates of 8 to 11%.

As a result, the financial debt-to-individual disposable income ratio has increased sharply. It was 139.8% at the end of 2008, 1.8 times higher compared to only 76.8% in 2000. This exceeds the level at the time of the credit card crisis during 2002 to 2003. While the ratio is lower than those of Australia (183%) and the United Kingdom (156%), it is higher than the ratios of most OECD countries including the U.S. (132%). The financial debt-to-GDP ratio has increased at a pace similar to that of the financial debt-to-individual disposable income ratio.

Meanwhile, the financial debt-to-assets ratio which indicates the debt servicing capacity of households, had previously hovered around 40%, with little change, but has now increased slightly since 2008.

Likewise, several studies[6] assess that the debt servicing capacities of households have weakened in line with the sharp increase of the financial debts-to-income ratio. However, these assessments based on aggregate indicators have

6) Kwon(2007), Samsung Economic Research Institute(2009).

Table 1 **Household Debt Servicing Capacity**

Year-end Basis	2000	2001	2002	2003	2004	2005	2006	2007	2008
Financial Debt/Financial Assets	37.9	40.9	46.5	45.0	43.9	42.9	44.0	43.4	48.1
Financial Debt/Individual Disposable Income	76.8	87.4	120.9	117.3	113.2	120.0	128.4	135.5	139.8
Financial Debt/GDP	56.9	64.1	72.5	71.8	69.6	74.2	79.1	82.1	78.3

Notes: 1) The 1993 SNA is used for the data after 2002 and the 1968 SNA for the data before 2002.
2) Index-based year series are used for GDP and disposable income
Source: Bank of Korea, ECOS

a limitation as mentioned above, in that they do not reflect the differing characteristics of households and the distribution of household debt.

2. Distribution of Household Debt

In this section, I examine the current status of household debt using the 「The Survey of Household Assets and Liabilities」[7] released by Statistics Korea Office on the bases of the sizes of debt, income and assets, and the ages[8] of the heads of household.

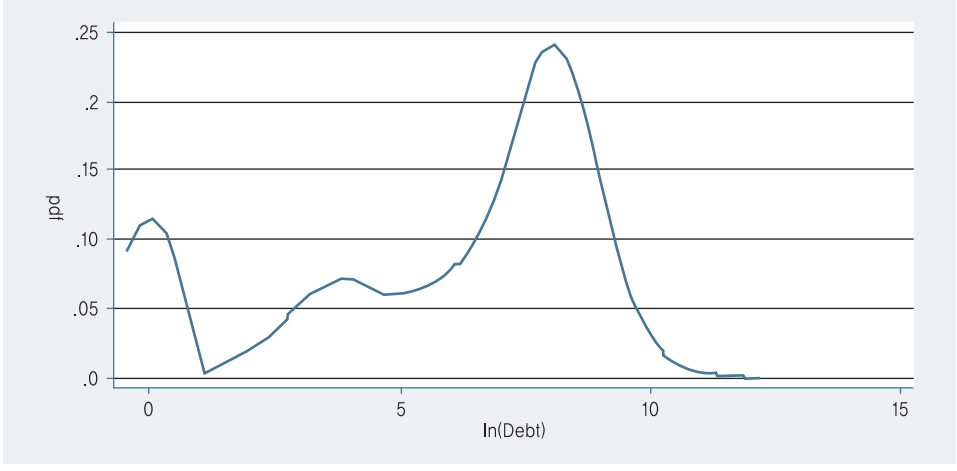
A. Distribution of Household Debt by Debt Size

The distribution of household debt takes a tri-model form, not a conventional normal distribution. That is, significant numbers of households have no debts, and even most of the indebted households are concentrated among those with either small amounts of debt or large amounts of debt. The form of the distribution

7) This survey was released in March 2007 and includes the information on the assets and debts of 9,300 sample households as of May 2006. This survey is conducted by Statistics Korea every five year for the purpose of investigating the current status of households' asset holdings. Incomes in this survey refer to those during 2005, and assets are May 2006 basis. This survey has a significance in that it has representativeness by using all households which are composed of more than one member as samples and is the first reliable survey of household assets publicly released by Statistics Korea. However, its base period is relatively long (five years) and it provides extremely limited data compared to the SCF (Survey of Consumer Finance) of the U.S., and should therefore be improved further. The basic statistics are described in appendix and for comparison on with other household survey, refer to Jun and Lim (2008).

8) The financial assets defined in this paper includes savings, stocks, bonds and installments for *gye* (a kind of traditional private fund popular among Koreans), with the exception of deposits for lease or monthly rent. Total assets in this paper is a concept in which real estate and other assets are included in financial assets. Financial debts include loans from financial institutions and private finance.

Figure 3 Distribution of Household Debt in Korea (2006)



Note: Y-axis represents the probability density.

is tilted toward the right, implying that there are numerous highly indebted households in Korea

In detail, looking over the distribution by size of household debt, the lower 60% of households hold 9% of total household debt with the upper 40% holding 91% of it, and the upper 20% of households (the quintile 5) hold 71%, showing the concentration of debt among highly indebted households.

Table 2 Distribution of Household Debt by Debt Quintile

Debt Quintile	1Q	2Q	3Q	4Q	5Q
Total(100)	0.02	0.9	8.3	19.9	70.9

Note: Households are ordered in terms of financial debt.

B. Distribution of Household Debt by Income Quintile

Looking at the distribution of household debt by income level, we find that households with high incomes hold more than half of total household debt. In this section, I divide households into five quintiles in accordance with income levels. High income households are defined as those in the upper 40% or the 4th and 5th quintiles, which have the highest incomes. As shown in the following <Table 3>, the debts of high income households (4th, 5th quintiles) account for

Table 3 **Distribution of Household Debt by Income Quintile**

Income Quintile	1Q	2Q	3Q	4Q	5Q
Total Debt (100)	8.0	12.5	16.4	24.9	38.3

Note: Households are ordered in terms of the sizes of their incomes.

about 63% of total household debts and the lowest income households (quintile 1) hold 8% of total debt.

C. Distribution of Household Debt by Asset Size

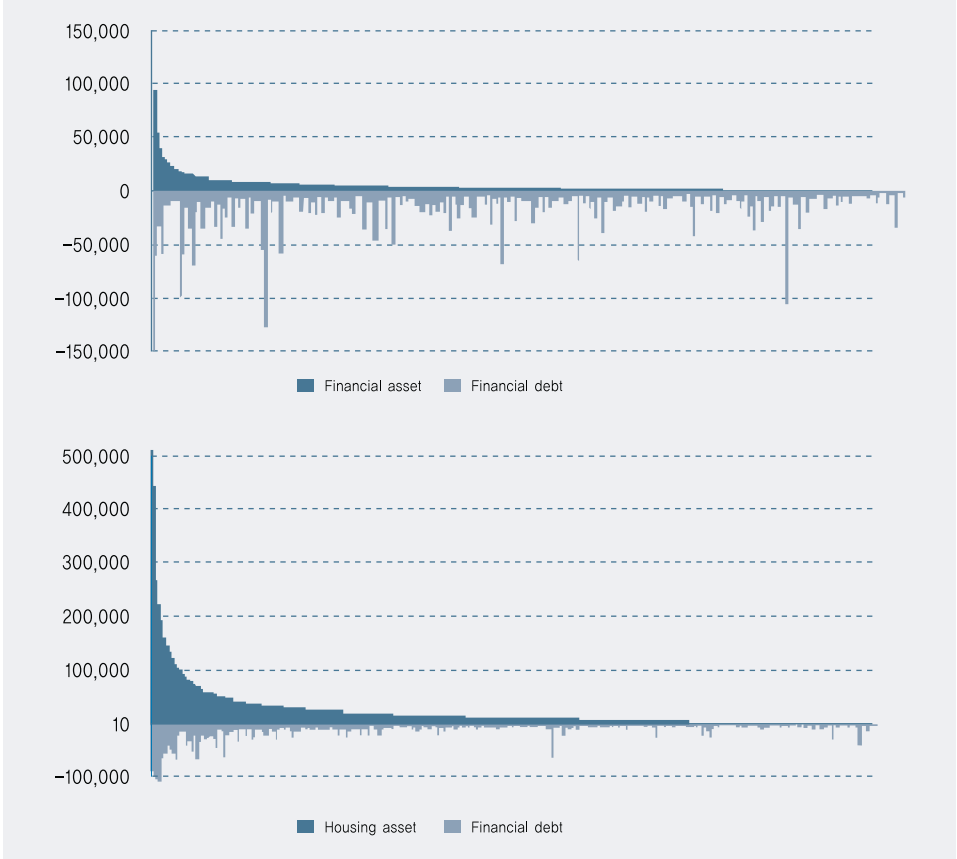
Most studies carry out analyses of households' assets and debts separately. However, it is necessary to analyze household debt and assets simultaneously to assess household debt servicing capacities. Concerning the distribution of household financial debt by the amount of financial assets, it seems difficult to explain the relationship between financial debts and assets in a consistent way. In <Figure 4> where households are arranged by the sizes of their asset holdings and the sizes of the corresponding households' debts are drawn, both households with and without high levels of financial assets, hold financial debts. In terms of the amount of real estate held, households having higher values of real estate tend to have higher amounts of debts. However, these results are derived from examining households' assets and debts without consideration given to households' different characteristics. I will, therefore, carry out empirical analysis by reflecting these characteristics.

D. Distribution by Head of Household Age

The distribution of Korean households' debt and assets by age shows the life-cycle pattern of a hump shape. Comparing the pattern of financial asset accumulation and that of debt accumulation, the times of the peaks of the two differ. As shown in <Figure 5>, financial debts reach a peak at a relatively early time (at the ages between 40 and 43 years old) compared to financial assets, and then gradually decrease.

This phenomenon seems to be related to the differences in household income levels depending upon head of household age. Korean households witness their debts staying high at the time when their incomes rise to all-time highs, and then see gradual declines in debt while their financial asset and real estate holdings increase to their peak levels right before or at around the time of head of

Figure 4 **Distributions of Financial Assets and Debts of Households**



Notes: 1) The X-axis represents 8,300 households, which are ordered by volume of assets held
2) The (+) values of Y-axis represent household asset holdings, and the (–) values are their debt holdings
3) The upper panel shows the relationship between financial asset holdings and debt holdings, and the lower panel that between the housing asset and debt holdings.

household retirement (at between 49 and 54 years old). These trends provide implications about the causes of the steady increase in household debt. For Korean heads of household aged between 40 and 44, the demand for household debt is continuously growing, and this leads to the relatively high increase in debt for Korean households relative to those of other countries.[9)]

Looking at the distribution by age for household debt in Korea in <Table 4>, the 2nd quintile (ages 38 to 44) and the 3rd quintile (ages 45 to 51) seem to have more than half of the total debt.

9) For the structural change in population between 40 and 44, refer to the <Appendix>.

Figure 5 **Household Assets and Debts by Head of Household Age**

Note: The median age of each decile is as follows : 1Q (28), 2Q (35), 3Q (40), 4Q (43), 5Q (46), 6Q (49), 7Q (54), 8Q (59), 9Q(65), and 10Q (74).

Table 4 **Share of Household Debt by Head of Household Age**

	1Q	2Q	3Q	4Q	5Q
Assets (100)	13.0	23.0	23.6	23.2	17.2
Debt (100)	17.8	27.4	23.0	19.9	12.1

Note: 1Q (26~37), 2Q (38~44), 3Q (45~51), 4Q (52~61), 5Q (+62 years old)

III. Debt Servicing Capacities of Households by Income Quintile

In this chapter, I look into the debt servicing capacities of households through descriptive analysis.

1. Financial Debt-to-Income Ratio

Analysis using household microdata shows the financial debt-to-income ratio to be 0.8.[10] Among the different income quintiles, the ratio is between 0.8 and 1, exhibiting little change. The quintile having the highest ratio of financial debt to income is the 1st with 1.0, with the rest at 0.8 or 0.9:

However, it is difficult to grasp the debt servicing capacities of households based upon these indicators alone. Although it is necessary to examine households' specific burdens such as their principle repayments to investigate household debt burdens, the microdata used in this study do not include such things. In this section, therefore, I look into households' debt servicing capacities by comparing their interest payment burdens and the sizes of their surpluses with the assumption of a 10%[11] annual interest rate on loans to verify households' interests burdens. According to the analytical results seen in Table 10 below, households in the third and higher quintiles have lower shares of interest burdens than surpluses.[12] They are thus assessed as able to pay their debts.[13]

Table 5 Debt-to-Income Ratios by Income Quintile

Income Quintile	Total	1Q	2Q	3Q	4Q	5Q
Debt(10,000 won, A)	2,881.0	1,022.1	1,796.9	2,424.7	3,726.3	5,880.1
Annual household income (10,000 won, B)	3,420.9	1,023.2	2,151.8	3,081.3	4,141.8	7,272.8
Debt-to-income ratio(A/B)	0.8	1.0	0.8	0.8	0.9	0.8

Note: All figures are population-weighted averages by income quintile.

10) The financial debt-to-individual disposable income ratio in 2006 based upon aggregate data, exhibits differences from the one in this paper. This stems from the differences between the two data sets in terms of the scope of inclusion and definition of income, and the representativeness of the samples.

11) The weighted average interest rate set by the banking sector (new loans basis as of Novemver, 2008) stands at 7.6%. Taking a conservative perspective, however, I conduct calculation on the supposition of a higher interest rate.

12) Surplus rate is the surplus (disposable income - consumption expenditure) to disposable income for which I use the 「Survey of Household Finance」 released by Statistics Korea.

In contrast, households in the 1st and the 2nd quintiles have higher ratios of interest burdens than surplus rates. The results for quintile 2, however, do require more cautious interpretation. Given that the interest rate is conservatively assumed to be set higher. When the actual interest rate (5.6% in 2006) is applied, the interest payment burden rate falls to 4.5%, almost equal to the surplus rate.

Meanwhile, when examining the financial debt-to-income ratio based on indebted households only, not on overall households as in <Table 5>, the 1st quintiles increases to 1.8 from 1.0 while the 2nd quintile rises to 1.0 from 0.8.

For a closer look at the debt burdens of low-income households, I sub-categorize the debt-to-income ratio by size and analyze the distribution in each income quintile. A very interesting result is that 1st to 2nd quintile households, which are considered to be relatively vulnerable, as well as 3rd to 5th quintile households' show debt-to -income ratios less than 1, which is regarded as sound. It is notable, however, that households with ratios of less than 1 account for a greater share (75.2%) of 1st income quintile households than seen in other quintiles, and that households having ratios over 5[14] are also more frequent

Table 6 **Repayment Capacity by Income Quintile**

	1Q	2Q	3Q	4Q	5Q
Income (A)	y_1	y_2	y_3	y_4	y_5
Debt (B)	$1.0y_1$	$08y_2$	$08y_3$	$09y_4$	$08y_5$
Interest Rate (10%, C = 0.1 × B)	$0.1\times1.0y_1$	$0.1\times0.8y_2$	$0.1\times0.8y_3$	$0.1\times0.9y_4$	$0.1\times0.8y_5$
Interest Payment Burden (E = C/A)	0.10	0.08	0.08	0.09	0.08
Surplus Rate (D)	−0.49	0.04	0.15	0.24	0.35
D − E	−0.59 (−0.55)	−0.04 (−0.004)	0.07 (0.11)	0.15 (0.19)	0.27 (0.31)

Notes : 1) The figures in <Table 5> are used for the calculation of debt (B).
2) Figures in ( ) show the results of evaluation applying the actual interest rate of 5.6%.

13) Analysis conducted for indebted households only results in outcomes similar to those of analysis based on all households although the 1st and 2nd quintiles witness small increases in their deficits.

14) Banking and financial consultants recommend that in the loan underwriting process, lending would not exceed three times borrower income before taxation, as a rule of thumb, and lending of four to five times income is usually considered risky (Riiser, 2006). They refer to the DTI ratio, lending of three times income implies a DTI of 60% on the assumption of 10% annual principle repayment for the loan with a 10% interest rate and 10-year maturity.

Table 7 Debt to Income Ratios by Income Quintile (Indebted Households)

Income Quintile	Total	1Q	2Q	3Q	4Q	5Q
Debt (10,000 won, A)	3,489.9	1,972.8	2,243.1	2,610.6	3,831.2	6,016.2
Annual Household Income (10,000 won, B)	3,802.2	1,100.1	2,173.3	3,085.8	4,144.8	7,226.5
Debt-to-Income Ratio(A/B)	0.9	1.8	1.0	0.8	0.9	0.8

(5.9%) in the 1st quintile than in other quintiles.[15] That is, the 1st quintile includes high shares both of households in sound financial condition and vulnerable households, making this quintile the most heterogenous among the five.

In the 3rd and 4th quintiles, households having debt-to-income ratios above account for more than 4% of the quintiles, while the 5th quintile, the highest income quintile, includes some households having high debt-to-income ratios. Based on the results described above, about 5% of total households appear to have debts more than three times their incomes. Meanwhile, it seems that the 1st quintile has a relatively greater share of highly indebted households, as some highly indebted upper-middle income households entered the 1st quintile due to job losses or business failures. The Korea Labor Institute (2006) shows that, among households entering the low-income class, 61.8% are from the 2nd quintile, 26.8% from the 3rd quintile and 11.4% from the 4th and 5th quintiles.

Table 8 Distributions of Household DTI by Income Quintile

(%)

Debt-to-income ratio (DTI)	1Q	2Q	3Q	4Q	5Q	Total
0 ~ 1	75.2	72.4	72.8	68.0	71.0	73.6
1 ~ 3	14.1	22.3	22.1	27.8	26.3	21.4
3 ~ 5	4.8	3.8	4.0	2.6	1.8	3.0
5 +	5.9	1.5	1.2	1.6	0.9	2.0
Total	100.0	100.0	100.0	100.0	100.0	100

Note: Households are ordered in terms of the sizes of their incomes.

15) Once debt exceeds the amount of three times income, most households see their interest burden rates surpassing their surplus rates.

2. Financial Debt-to-Assets Ratio

The financial debt-to-financial assets ratio obtained using household microdata is 0.6, implying that financial assets exceed financial debts as a whole.[16] Examining this by income class, the 1st quintile has a low financial debt-to-financial assets ratio while the 4th quintile has the highest ratio. The ratio with financial assets reaches a mere 0.1, which is much lower than the existing one, and there do not appear significant gaps in the ratio among the different income quintiles.

In an analysis of indebted households only, the low-income (1st and 2nd) quintiles' financial debt-to-financial assets ratio increased to 0.8 each from the 0.5 and 0.6, based upon all households. These ratio gaps stem from the fact that households having no debt account for relatively higher shares in the 1st and 2nd quintiles than in other quintiles.[17] However, the debt-to-total asset ratio appears almost equal in all quintiles, even in the case where indebted households only are considered.

Like in the analysis above, if we observe the distribution by income quintile in accordance with the size of the ratio of financial debts to financial assets, 64% of all households with net financial assets have less than 1 debt-to-asset ratio. However, households having more than five fold[18] debt-to-asset ratios also

Table 9 Capital Gearing Ratio by Income Quintile

	Total	1Q	2Q	3Q	4Q	5Q
Financial debt (10,000 won, A)	2,881.0	1,022.1	1,796.9	2,424.7	3,726.3	5,880.1
Financial assets (10,000 won, B)	4,569.8	2,000.1	2,778.6	3,824.6	4,915.0	10,000.6
Total assets (10,000 won, C)	28,112.3	13,205.8	18,203.0	20,944.1	30,317.9	61,858.3
(A/B)	0.6	0.5	0.6	0.6	0.8	0.6
(A/C)	0.1	0.1	0.1	0.1	0.1	0.1

16) The financial debt-to-financial asset ratio based on aggregate data is 0.4, differing from that of the data in this study. This seems to originate from the difference between two data in terms of scopes of inclusion, representativeness of the sample data, and from overestimated or underestimated reports of debts and assets.

17) Households having no debt accounted for between 2 and 7% of the 3rd, 4th and 5th quintiles. In contrast, their weights were 49% and 20% in the 1st and 2nd quintiles, respectively.

18) Although it is hard to set uniform debt level criteria for households, as households' asset holdings differ depending upon their financial conditions, banking and financial consultants recommend that a household's financial debt do not exceed approximately 50% of its total assets (financial assets + real estate + others).

Table 10 Capital Gearing Ratio by Income Quintile (Indebted Households)

	Total	1Q	2Q	3Q	4Q	5Q
Financial debt (10,000 won, A)	3,485.8	1,985.5	2,254.8	2,609.5	3,840.9	6,017.5
Financial assets (10,000 won, B)	5,002.1	2,400.7	2,809.7	3,786.5	4,923.8	9,854.5
Total assets (10,000 won, C)	31,647.5	17,975.8	19,949.1	21,410.7	30,887.4	61,478.9
(A/B)	0.7	0.8	0.8	0.7	0.8	0.6
(A/C)	0.1	0.1	0.1	0.1	0.1	0.1

Table 11 Distributions of Household Capital Gearing Ratios by Income Quintile (Financial Assets only)

(%)

Capital Gearing Ratio	1Q	2Q	3Q	4Q	5Q	Total
0 ~ 1	70.4	62.3	63.2	57.8	67.0	64.1
1 ~ 3	10.9	15.9	17.7	24.4	20.4	17.9
3 ~ 5	2.9	5.0	7.0	6.1	4.9	5.2
5 +	15.8	16.8	12.1	11.7	7.7	12.8
Total	100.0	100.0	100.0	100.0	100.0	100.0

account for 12% of total households, while those with ratios of from three to five are relatively small in number. Therefore, it seems that some households tend to see massive increases in their financial debts relative to their asset holdings.

Table 12 Distributions of Household Capital Gearing Ratios by Income Quintile (Total Assets)

(%)

Capital Gearing Ratio	1Q	2Q	3Q	4Q	5Q	Total
0 ~ 1/2	90.0	88.1	90.1	91.2	94.1	90.7
1/2 ~ 1	4.5	6.0	6.1	6.1	4.7	5.5
1 ~ 3	2.7	3.0	2.5	1.8	0.8	2.2
3 ~ 5	0.7	0.5	0.4	0.2	0.2	0.4
5 +	2.2	2.4	0.9	0.6	0.2	1.2
Total	100.0	100.0	100.0	100.0	100.0	100.0

If real estate is included in assets, 90% of households have less than 50% debt-to-assets ratio and households whose debts surpass their total assets account for 3.8% of total households.

3. Distribution of Households by Debt-to-Income and Debt-to-Asset Ratios.

If we derive the distribution by simultaneously applying the ratios of debt to income and debt to financial assets, the results can be summarized as in the following <Table 13>.[19] Specifically, households having lower ratios of debt (less than three fold), and at the same time lower ratios of debt to financial assets, make up 79.8% of total households, among which, 57.7% have ratios less than one, of both debt-to-income and debt-to-assets. In contrast, households having over three fold debt-to-income ratios and at the same time more than three fold debt-to-asset ratios account for 2.9%. Households with debt-to-income ratios over three represent 5% (3.0 + 2.0), and those having debt-to-asset ratios over three account for 18% (5.2 + 12.8).

From a general perspective, households for which both of these two ratios are high, can be evaluated as financially vulnerable. However, in order to assess this financial soundness from the perspective of more strict criteria, it is required to additionally verify whether more highly indebted households might also have

Table 13 **Distributions of Households by DTI & Capital Gearing Ratios**

(%)

DTI / Capital gearing ratio	0 ~ 1	1 ~ 3	3 ~ 5	5 +	Sub-total
0 ~ 1	57.7	5.6	0.5	0.3	64.1
1 ~ 3	9.0	7.5	0.8	0.5	17.9
3 ~ 5	2.1	2.5	0.4	0.2	5.2
5 +	4.8	5.8	1.3	1.0	12.8
Sub-total	73.6	21.4	3.0	2.0	100

19) In this section, the analysis is conducted by focusing on financial assets with the exclusion of real estate, which is not liquid. This is for assessing the debt servicing capacities of households in the case of a crisis eruption. If real estate is included in assets, the share of households confronting risk is much lower than seen from the results using financial assets only.

more assets. I therefore conduct empirical analysis of the relationship between household debt and assets by reflecting the characteristics of individual households.

IV. Analysis of Relationship between Household Debt and Assets

In this chapter, I test whether highly indebted households also hold high levels of assets, in consideration of household heterogeneity. As mentioned above, I analyze the behavior of simultaneous decision-making on holdings of household debt and assets with consideration for the heterogeneity of households and the characteristics of the dependent variables (non-negative value). To this end, I estimate the determinants of debt and assets using a bivariate Tobit model, and from this estimation I derive coefficients from the error terms of two estimation equations. By doing so, I determine the correlation between household debt and asset decisions. I furthermore analyze the relationship between debt and assets which include real estate, given the importance of real estate in the composition of household assets. The analysis is also carried out for each income quintile.

1. Analytical Model

In this section, I verify the relationship between assets and debt following Brown et al. (2005), as follows. The equation below represents a typical Tobit model and estimates equations for assets and debt, simultaneously. The estimation method uses full information maximum likelihood function:

$$\ln(Y_{ji}^{*}) = X_{ji}'\beta + \theta_{ji} \qquad (1)$$

where Y_{ji}^{*} is a latent variable denoting the level of the households' debt or assets.

X_{jt} is the characteristic variable vector of household j and
i is asset(a) or debt(d)

For the explanatory variables in equation (1), I use variables that reflect the characteristics of households by following Guiso et al. (2002) and Brown et al.

(2005).[20] $\theta_{j,i} = (e_{ji}, \epsilon_{ji})$ is the vector that includes error terms e and ϵ in the equation that determines assets and debt, and $e, \epsilon \sim N(0, 0, \sigma_d^2, \sigma_a^2, \phi)$. Covariance is represented as $\sigma_{a,d} = \phi\sigma_a\sigma_d$, and the error terms e and ϵ are assumed to be a joint normal distribution where the terms' variances are σ_d^2 and σ_a^2, respectively. If the coefficients ϕ of the error terms e and ϵ in the estimation equations for financial debt and asset are not zero, the simultaneous estimation becomes more highly efficient than other estimation methods.

The criteria for determining whether highly-indebted households also hold more assets are the sign and the size of the coefficients ϕ between the error terms in the two estimation equations. That is, if there exists positive (+) correlation between assets and financial debt, the households having high financial debts also hold large volumes of assets, while if there is negative correlation (−), they have low asset amounts. Meanwhile, the closer to ± 1 the coefficients is, the stronger the robustness of the linear relationship between assets and debt, which is weaker when the coefficient is closer to zero.

2. Empirical Analysis Results

The results of estimating the behavioral equation are presented in the following table. Various demographic and social characteristics are estimated to be significant variables that determine the levels of assets and debt. According to the results, most control variables are significant at the 1% level. The empirical analysis results[21] for major explanatory variables coincide with the previous results of studies on the determinants of assets and debt.

Examination of the relationship between age profile and the accumulation of assets and financial debt shows that the accumulation of assets and financial debt takes a hump shape, which is consistent with the forecasts of the life-cycle hypothesis. In addition, higher educational levels and incomes of households also lead to higher debt and asset levels, coinciding somewhat with the permanent income hypothesis. Marriage has a positive effect on the accumulation of household assets, but has no significant influence on household debt.

The coefficient between asset and debt, a key part of the analysis in this study, has a negative sign when assets are financial asset only but a positive value

20) These variables include the head of household's ages, gender and educational level, the number of household members, the head of household marital status, whether the house is owned by the household, the type of residence, and household income, and are commonly applied to the two equations.

21) Refer to Guiso et al. (2002) and Karasulu and Schiff (2007).

when real estate is included.[22] The negative relationship between debt and financial assets implies that highly indebted households have low amounts of assets. The results imply that indebted households hold large amounts of total asset when real estate is in contrast included. Meanwhile, the coefficients between financial assets and financial debt are close to zero, while the

Table 14 **Bivariate Tobit Estimation**

	I		II	
	Financial Assets	Debt	Total Assets	Debt
Annual Income	0.6932***	0.9166***	0.3373***	0.9043***
	(0.0242)	(0.0503)	(0.0155)	(0.0503)
Age	0.0844***	0.2769***	0.0719***	0.2805***
	(0.0086)	(0.0164)	(0.0055)	(0.0162)
$(Age)^2$	−0.0009***	−0.0030***	−0.0006***	−0.0031***
	(0.0001)	(0.0002)	(0.0001)	(0.0002)
Gender (Female=2)	−0.4678***	−0.3577***	−0.1891***	−0.3650***
	(0.0466)	(0.0825)	(0.0314)	(0.0824)
Education (0∼6)	0.1328***	0.4122***	0.1993***	0.4147***
	(0.0171)	(0.0304)	(0.0120)	(0.0305)
No. of Household members	−0.0694***	0.3827***	−0.0278**	0.3810***
	(0.0204)	(0.0358)	(0.0135)	(0.0359)
Marital status	0.3560***	−0.1063	0.2795***	−0.0962
	(0.0620)	(0.1158)	(0.0401)	(0.1158)
Self-employed dummy	0.3332***	0.3705***	0.2931***	0.3747***
	(0.0472)	(0.0801)	(0.0336)	(0.0802)
Own household dummy	0.4686***	0.9317***	0.9386***	0.9568***
	(0.0476)	(0.0860)	(0.0361)	(0.0863)
Constant	−3.9503***	−12.4859***	−0.1536	−12.4668***
	(0.2883)	(0.5587)	(0.1829)	(0.5569)
σ_{asset}	1.7559***		1.1600***	
σ_{debt}	3.0371***		3.0389***	
$\hat{\phi}$	−0.022**		0.173***	
No. of Obs.	8,275		7,868	

Notes: 1) * 10%, ** 5%, *** 1% significance levels
2) Figures in ( ) are the standard errors

22) The estimated results seems to have differences from the implications of the previous results above. However, this appears to stem from the lack of reflection of characteristics of individual household in the previous analysis.

coefficients ($\hat{\phi}$) between financial debt and total assets that include real estate are estimated to be obviously greater than zero.

The empirical analysis results for Korea, in which more indebted households have less financial assets, are different from those for other major countries. Notably, unlike for Korea, the coefficients between debt and financial assets are positive in the U.S., the U.K. and Germany.[23)]

I gain identical results from applying this method by income quintile. The results suggest the correlation between financial assets and debt to be negative but this is significant only for 2nd and 3rd quintiles. However, there are correlations between total assets and debt with significance for all income quintiles, and particularly the coefficients for the 4th and 5th quintiles are high.

Putting all of the results mentioned above together, the correlation between financial assets and debt is negative, implying that highly indebted households have small amounts of financial assets. This suggest that the financial conditions of highly indebted families can not be sound in terms of their liquidity. In addition, it is interpreted that purchases of real estate are closely related with the sizes of households' financial debt. That is, Korean households use their accumulated financial assets, for purchasing real estate, and make up for any shortage in needed funds by borrowing. This seems to lead to the positive correlation between total asset including real estate and financial debt and the highly estimated coefficients between the two.

Table 15 **Correlation between Assets and Financial Debts by Income Quintile**

Income Quintile	$\hat{\phi}$(Bivariate Tobit)	
	I (Financial asset only)	II (Total asset)
1Q	−0.018 (0.08)	0.09***(0.29)
2Q	−0.063***(0.02)	0.12***(0.31)
3Q	−0.053**(0.01)	0.18***(0.22)
4Q	−0.039*(0.18)	0.24***(0.38)
5Q	−0.028(0.13)	0.25***(0.36)
Total	−0.022**(0.17)	0.17***(0.39)

Note: * 10%, ** 5% and *** 1 % significance level

23) Brown et al. (2005) shows that the coefficients between financial assets and debt are 0.15, 0.12, and 0.11 for Germany, the U.K. and the U.S. ,respectively, all of which are positive values with statistical significance.

V. Conclusion

In this study, I carried out static analysis of the financial situation of Korean households using microdata in order to diagnose and assess the household debt problem in Korea more accurately. Compared to previous analyses using macro aggregate data, I found the following additional characteristics related to household debt in Korea. First, the distribution of household debt takes a tri-modal shape, unlike the forms of conventional distribution. This implies a likelihood that the assessment of debt servicing ability represented as an aggregate indicator does not properly reflect the reality. Second, households' debt-to-income ratios are stable on average. However, 5% of households have ratios of 3 or more and these households are distributed in both the high income as well as in low income quintiles. Third, while most households have financial debt-to-financial assets ratios less than 1, those holding excessive debt relative to their financial assets are distributed across all income quintiles. Fourth, if the financial debt-to-income and debt-to-financial assets ratios are considered at the same time, almost 80% of household have stable ratios (less than 3), but 3% seems to have worryingly high levels for both ratios.

Lastly, the results gained from using microdata show that, when debt and asset holdings simultaneously, more highly indebted families tend to hold less financial assets but more total assets if real estate asset are included. Households having high levels of debts have small amounts of financial assets, implying that their financial soundness could be vulnerable from the perspective of their liquidity. Such estimated results also suggest that the size of household financial debt is deeply related to the purchase of real estate. According to the analytical results in this study, household debt in Korea is across the board mainly owned by households earning high incomes, and is related to the acquisition of real estate, showing that Korean households' financial soundness is in relatively good shape. However, some weak households are incapable of repaying their debts with their incomes and assets, raising the possibility of eruption of a household debt crisis led mainly by these risky households.

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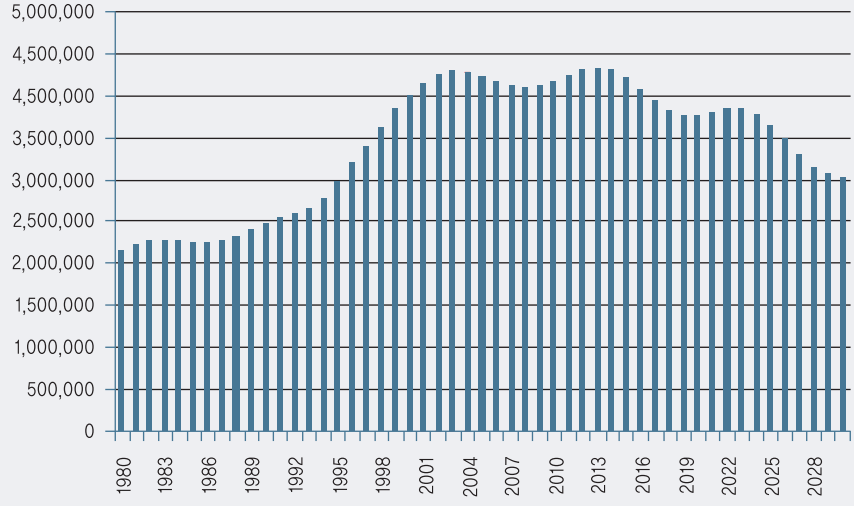
[Appendix 1]

Table 1 **Descriptive Statistics(Survey of Household Finance, 2007)**

	Total households		Indebted households	
	No. of Obs.	mean	No. of Obs.	mean
Age	8275	48.93 (0.21)	6980	47.04 (0.19)
Annual Income(10,000 won)	8275	3420.88 (37.69)	6980	3785.63 (41.97)
Financial Debt(10,000 won)	8275	2881.01 (74.01)	6980	3485.76 (86.14)
Financial Asset(10,000 won)	8275	4569.78 (115.55)	6980	5002.12 (131.66)
Financial Debt+Downpayment (10,000 won)	8275	3947.90 (117.37)	6980	4751.39 (137.88)
Financial Debt-Financial Asset (10,000 won)	8275	1688.77 (116.14)	6980	-1516.36 (133.97)
Income to Debt Ratio	8275	1.26 (0.20)	6980	1.53 (0.25)
Financial Asset+Housing Asset (10,000 won)	8275	27348.84 (687.66)	6980	30763.12 (796.35)
Total =Financial Asset+Housing Asset+Others (10,000 won)	8275	28112.33 (701.67)	6980	31647.52 (812.51)
Financial Asset to Financail Debt Ratio	8198	20.70 (6.10)	6925	24.98 (7.36)
Capital Gearing Ratio (Financial Asset+Housing Asset)	8257	2.32 (1.47)	6969	2.80 (1.77)
Capital Gearing Ratio (Total Asset)	8260	1.93 (1.46)	6971	2.33 (1.76)

Note: ( ) Standard Error

Figure 1 **Trend of Population(Age: 40~44)**



Source: NSO, KOSIS Database