

# Psychological Aspects of Household Debt Decision: The Use of the Heckman's Procedure

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**Abstract:** This paper examined the impact of psychological characteristics of consumers on household debt decisions. With the use of the Heckit models (the traditional approach to the selection problem) this study undertook an empirical study of the influence of a wide range of factors on financial decisions. This study used U.S. household-level data that offers detailed information on household debt, expectations about future income, expectations about future economic conditions, the amount of financial risk the respondent was willing to take, and the amount of time allotted for planning family savings and spending. This study showed that respondents with both substantial financial risk tolerance and positive expectations about future income were likely to have larger household debt showing that researchers and policy-makers need to consider consumer sentiment and preference measures in modeling behavior in credit markets. Additional results showed that household debt is significantly related to two key economic variables: income and networth.

**Key Words :** household debt, psychological aspects, Heckit model

## I. Introduction

The life-cycle hypothesis (Modigliani, 1986) posits that individuals have the desire to match household income streams with consumption needs over the course of a lifetime. Rational households borrow in the present to meet present needs, basing these decisions on expected future earnings. In this sense, debt is inevitable for individuals and households in order to maintain steady consumption levels over time. Depending on income levels, many individuals and households resort to various levels of indebtedness at various stages of life.

The financial industry provided more affordable borrowing opportunities to those consumers constrained by the credit market. As a result, consumers were offered lower interest rates, fees, and down payments, as well as more flexible underwriting standards and new financial

instruments (Lyons, 2003). According to the America Total Debt Report (2007), which relies primarily on mortgage and credit debt for conclusions, the amount of debt in the United States totals about \$48 trillion. In 2006, household debt increased 9% from the previous year, taking the total to \$12.8 trillion (this includes \$9.7 trillion in mortgage debt and \$2.4 trillion in credit debt). In Korea, household debt has also expanded rapidly since the economic crisis of 1997, with household debt increasing by 120% from 2000 to 2002 and disposable income increasing by 15.5% in the same period (Park, 2007). According to the Bank of Korea, as of the end of September 2007, the overall credit-based household debt amounted to 610.6438 trillion won and had an increase of 14.2031 trillion won as compared with the end of June. Based on data on the estimated number of households (15.99 million) in 2006, released by the Korea National

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Statistics Office, the average per-household debt is 38.19 million won (Donga Ilbo, 2007).

Although some household debt is essential, the expansion of debt has raised the concern that household debt may now be available to those unable to pay it off, resulting in insolvency (The Federal Reserve System, 2006; Dunkin, 2000). Also of concern is the possibility of consumers resorting to excessive commitments. In less favorable macroeconomic situations (or in the case of financially negative events) the risk of a household being unable to make timely repayments may increase. Further, some households may find themselves continually unable to repay debt and become over-indebted.

Over the past 25 years, the American economy has experienced a historic increase in personal bankruptcy and a concurrent rise in the rate of consumer default (Ji, 2004). The number of non-business bankruptcy filings has increased substantially, from just over 700,000 in 1990 to over 1,600,000 in 2004 (U.S. Courts, 2006). Korea has experienced a similar trajectory, with debt burdens soaring while the ability-to-repay by households deteriorated considerably. As an example, it is now possible look to the debt-to-income ratio, a main aggregate indicator for the ability-to-repay by households. The Korean national debt-to-income ratio increased from 63.8% at the end of 1999 to 113.3% in 2002, a total decrease of 49.3% points. Moreover, the debt-to-asset ratio, an indicator of debt burden, rose by 11.7% points during the same period, increasing to 51.8% in 2002 from 40.1% in 1999 (Park, 2007).

Much discussion has ensued on the topic of consumer credit, and the question of what factors contribute to the total debt of an individual has become crucial amongst both economists and policy makers (Brown *et. al.*, 2005). However, previous studies on household debt have demonstrated at least two limitations in the assessment process: the first relates to statistical considerations, and the second relates to model specifications. In the case of the former, some studies (Godwin, 1998; Getter, 2003; and Lyons, 2004) have analyzed determinants of debt

decision through the use of pooled samples; such investigations lack any consideration of sample selection. As a result, the studies include either only respondents with household debt, or a mix of those with debt and without. The studies may fail to explain the credit behavior of consumers as the samples could be tainted by selection bias.

In the problem of model specifications behavioralist researchers do not assert that people act "irrationally"; rather, they contend that people behave in ways that systematically diverge from the "rational choice" model of traditional economic analysis and potentially fail to maximize utility (Kilborn, 2005). This occurs not because the individuals in question are irrational, but because their rationality is "bounded" by consistent biases and mental shortcuts. These "bounds" of rationality are assumed to affect consumer behavior in a variety of contexts, particularly in situations of high-consequence financial decision-making, such as household borrowing. However, most studies on decisions related to household debt (Cox and Jappelli, 1983; Duca and Rosenthal, 1983; Gropp, Sholz, and White, 1997; Crook, 2001; Grant, 2003; Fabri and Padula, 2002) have emphasized the role of demographic variables (household size, age, and education level) and economic variables (income, employment status, and net worth). Only a few studies (Livingstone and Lunt, 1992; Davies and Lea, 1995; Godwin, 1997) have focused on the psychological factors of consumers in an effort to explain debt-related decisions.

The purpose of this paper is twofold. First, this study proposes to account for the debt-related decisions of consumers using (1) what this study will call sentiment (expectations for future income or future economic conditions) as well as (2) preferences, which might take the form of a time preference or a particular tolerance for financial risk. Second, this study addresses the statistical bias that might occur given the selected sample. The theoretical framework predicts a positive association between optimism about personal future financial situations or the future of the overall economy and the

amount of debt an individual carries. This study will also examine the relationship between individual preferences and household debt. This study presents the relevant theoretical framework, reviews existing research, and describes the dataset and methodology used in the study. Finally, this study presents the empirical findings and conclusions.

## II. Theoretical background

### 1. Economic perspectives

The life cycle saving theory explains individual consumption and lifetime saving by focusing on systematic variations in both income and need. With an initial period of earning followed by retirement, the model assumes a hump-shaped trajectory of wealth over life cycle (Modigliani, 1986). Under this theoretical framework, people are projected to borrow against future earnings during the early stages of employment (when income is low), save more during the most productive higher-earning working years, and be expected to consume accumulated assets during retirement. Ultimately, more consumer debt is projected for early life than for later life. An additional factor in this equation is level of income and it is expected that those with higher earnings are less likely to incur debt than those with lower incomes.

Bryant (1990) interprets borrowing as the transfer of future resources to the present time in order to increase current consumption. Constrained by budgets, consumers make borrowing decisions to maximize utility. The cost of goods and consumer time preferences, as well as consumption needs, and budget constraints, can also influence the substitution between current and future consumption. Static views of consumer utility-maximization posit that consumers choose an optimal combination of goods based on the budget constraints, the current year household income, and consumer preferences between two goods in the current period

(Godwin, 1998).

### 2. Psychological perspectives

Although particular preferences vary, neoclassical economists assume that individual preferences are exogenous and stable. Given a set of opportunities and constraints, these preferences will determine individual behavior (Beverly, 1997). Economic psychologists examine how the effects of external stimuli on the economic decision of people are influenced by intervening variables such as motives, aspirations, and expectations (Katona, 1975). Such scholars explore the effect of such variables on economic decisions.

Consumer sentiment is believed to be a function of individual evaluations and expectations of the economic circumstances of particular households, as well as the nation as a whole (Katona, 1975). Several types of preferences are likely to affect economic behavior. For example, if an individual's perceptions of household finances, and interest rates are pessimistic, the household is less likely to incur debt and more likely to postpone consumption to save for future security. Conversely, an individual who strongly prefers current consumption to deferred consumption will be more inclined to borrow.

Several studies have explored the role of psychological factors in predicting household debt. Livingstone and Lunt (1992) focused on a student population to assess the intersection of debt and personal attitudes. They concluded that debt-related attitudes are strongly correlated with the individual amount of debt. They also pointed out that a clear conceptual model integrating all factors influencing personal debt had yet to emerge; this could be attributed to the lack of an available data set possessing the sufficient demographic, economic, psychological, and situational factors necessary for the full specification of an explanatory model.

Davies and Lea (1995) used a sample of undergraduate students to undertake a similar investigation of the relationship between debt-related attitudes and actual debt levels. The result was consistent with a life-cycle

approach to debt, where students borrow as an investment in their own human capital and in anticipation of higher expected earnings in the future. Some of the variables previously found to be associated with debt in general public samples (religion, age, number of credit cards, and high tolerance for borrowing) were also correlated in this study. Although the students did not initially hold favorable attitudes toward debt, they found themselves increasingly amenable to the idea in the interest of sustaining acceptable lifestyles. These attitudes typically changed once they had incurred debt, resulting in increased tolerance for borrowing. Some of these students were projected to end up as crisis debtors, through a result of unforeseen adverse circumstances. Though the study did not specifically focus on expectations, it was apparent that expectations play a key role in any life-cycle model. Additionally, Livingstone and Lunt (1992) analyzed the determinants of individual debt levels and debt repayments and emerged with the finding that attitudinal factors such as whether individuals are pro- or anti-debt are key predictors. In another study, Godwin (1998) used U.S. panel data to explore the dynamics of household credit usage and credit-related attitudes. The findings suggest that the 1980s saw considerable mobility in the area of debt status, with the majority of households shifting debt quintiles between 1983 and 1989. In addition, results indicate that attitudes towards debt were subject to change with credit-related attitudes becoming increasingly negative over the course of the 1980s.

### 1) Expectation about future

The permanent income hypothesis holds that individuals should base consumption on the projected lifetime resources, rather than on measured income in an arbitrarily-defined period of time. Consumption is planned based on a set of informed expectations because the earnings trajectory of an individual cannot be predicted with absolute certainty.

Ekici (2005) tested the rationality of consumer behavior in the credit card market by analyzing the

effect of price expectations and consumer confidence measures on consumer behavior. The study used data from the Ohio Economic Survey (OES) conducted by the Center for Survey Research (CSR) of the Ohio State University (a project that compiles detailed information on credit card use) price expectations, and consumer confidence measures from respondents. Consumers were found to adjust credit card borrowing based on the expected actual interest rate, and researchers concluded that credit card borrowing was significantly correlated with consumer confidence measures. These findings were interpreted as evidence that consumers act rationally. Crook (2001) aimed to ascertain which factors account for U.S. household debt. Income, home ownership, and family size all evidenced positive impacts on the level of debt of a given household. A note point was that expectations of future interest rate fluctuations were found to have no impact on household debt levels.

### 2) Time preference and risk tolerance

Time preference can be defined as the desire of a consumer to rearrange consumption over the course of a lifetime (Bryant, 1990). Economists, psychologists, and sociologists have all pointed to the possible importance of a "time horizon" for an individual in determining intertemporal choices. Those with a relatively high "subjective discount rate" (Friedman, 1957) are unlikely to be able to "defer gratifications" (Mischel, 1958), and more likely to incur debt.

The marginal rate of time preference ( $\sigma$ ) is a measure of the rate at which a person is willing to trade current pleasure for future pleasure (Komlos *et al*, 2003). The concept of time preference, represents the level of impatience for an individual. Economists refer to the satisfaction obtained from consumption as "utility"; the intertemporal discount rate,  $\frac{1}{1+\sigma}$ , is used to calculate the present value of future utility. If one individual has a higher time preference than another, they will have a lower value of future utility. Alternately, if that individual evidences lesser impatience, they will value

present utility as much as future utility. In that case, consumption in the future yields the same satisfaction as consumption in the present. Individuals who do not value future utility have a discount rate of 0. For them, utility in the future is worth nothing; only current utility is important. Therefore, an increase in time preference means a decrease in the value of future utility.

Maital and Maital (1977) suggest that higher rates of time preference may reflect a distrust of promised future rewards. Perhaps more importantly, apparent differences in time preference may simply reflect variance in economic resources. For low-income households in which economic resources are fully or partially inadequate for meeting basic needs, postponing consumption may be more difficult than for wealthier counterparts. Lawrance (1991) used the Panel Study of Income Dynamics to examine the intertemporal preferences of rich and poor American households. This study argued that poor households tend to have relatively high rates of both time preference and marginal propensities to consume, and are therefore less "patient" than rich households. Lawrance also acknowledged that some of the difference in estimated rates of time preference implies divergent patterns of consumption over a lifetime; this may suggest one possible explanation for the observed heterogeneity in saving behavior across socioeconomic classes, as well as reflecting the fact that rich and poor households encounter different lending rates. Godwin (1998) examined changes in household levels of consumer debt from 1983-89, employing the panel dataset of the Survey of Consumer Finances. A decrease in debt quintile was found to be commensurate with household size, marital status, inflation-related expectations, and time preferences. In this study, time preferences were assessed via the question, "Which of the following statements...comes closest to how you feel about tying up your money in investment for long periods of time?" Potential responses included from "a long period of time, "an intermediate period of time, "a short of time", and "not willing to tie up money at all." This allowed the

study to examine consumer choice between present and future consumption as motivated by credit-related preference.

Several studies tried to explain the effects of individual financial risk tolerance on financial decision-making. Grabel (2000) defined financial risk tolerance as "the maximum amount of uncertainty that someone is willing to accept when making a financial decision." This has historically been assessed in several different ways. Risk tolerance can be measured based on observed risky behavior, or by using survey questions to gauge an individual willingness to assume risk in a given situation (Hanna, Gutter, and Fan, 2001). For example, some studies infer financial risk tolerance from ownership of risky assets or the ratio of risky assets to total wealth (Morin and Suarez, 1983; Schooley and Worden, 1996). One survey, focusing on health and retirement, posed hypothetical scenarios to measure financial risk tolerance as related to the economic concept of risk aversion (Barsky *et al.*, 1997). In the study at hand, financial risk tolerance is defined as individual willingness to take risks when making financial decisions.

Hypothesis: A relationship between psychological characteristics and personal debt

Consumer sentiment and preference are assumed to influence financial choices and borrowing decisions in particular. Controlling for the effects of life-cycle consumption demands, net worth, and current income, it is possible to determine whether consumer sentiment (for example, expected future income, and economic conditions) and preference (for example, financial risk tolerance and time preference) would affect borrowing patterns. If consumers have high rates of time preference and prefer present to future consumption, they will be more likely to borrow money and incur more household debt.

If a household has negative expectations about future income, this may flatten the previously outlined consumption path. A flatter consumption path could result in less saving and more borrowing in the early stages of employment. Alternatively, increased certainty

about future earnings decreases precautionary saving that tends to motivate borrowing. For households experiencing an increase in expected future income, desired consumption can shift upward, also tending to increase borrowing.

The relatively rapid productivity growth of the past decade may have led households to increase expectations for future income, despite the fact that the median household income has not increased to nearly the same extent (at least, not yet). Saving less and borrowing more constitutes a natural response to this situation (Dyman and Kohn, 2007); related hypotheses are constructed as follows:

#### Hypothesis 1 Consumer sentiment

##### Hypothesis 1-1 Expectations about future income

People with optimistic expectations about future earnings are projected to have more household debt than those with pessimistic expectations.

##### Hypothesis 1-2 Expectations about future economy

People with optimistic expectations about future economic conditions are projected to have more household debt than those with pessimistic expectations.

#### Hypothesis 2 Preference

Hypothesis 2-1 Time preference People who have lower time preference expected to have larger household debt than people who have higher time preference.

Hypothesis 2-2 Financial risk tolerance People with higher tolerance for financial risk are likely to have more household debt than those with little or no tolerance.

### III. Analysis

#### 1. Data

The data analyzed comes from the Survey of

Consumer Finances (SCF). This cross-sectional survey, sponsored every three years by the Board of Governors of the Federal Reserve System, provides detailed information on the finances of U.S. families (The Federal Reserve Board, 2007). It also contains information on credit and debit use, as well as rich details on household characteristics and relevant psychological dimensions of respondents. The SCF is well-suited for this purposes of this study in that it asks a number of questions related to psychological characteristics, including consumer sentiment and preference. In particular, the 2004 SCF is used in the current study.

#### 2. Variables and Measurement

In the first equation, the dependent variable is whether a household has incurred debt. In analyzing individual demand for debt in this first stage, this study has included those explanatory variables used in the aforementioned studies. The second dependent variable is the amount of debt incurred. This is measured by the sum of the following: principal residence debt, other residential real estate debt, balances on lines of credit (other than Home Equity Line of Credit) installment debt, and other debts.

This study employs a planning horizon for saving and spending as a proxy for individual time preferences that has been theorized to explain the relationship between time preference of consumers and household debt. Individual time preference is assessed by the SCF question, "In planning your family's saving and spending, which of the time periods is most important to you?" A response of "next few months" or "next year" is indicative of a short horizon time preference; a response of "next few years" or "next 5-10 years," medium-length time preference; and a response of "longer than 10 years," long-horizon time preference.

The second proxy for consumer preference is individual risk tolerance, assessed via the question concerning the actions that respondents are willing to

take when they save or make investments. The four possible answers are: (1) take substantial financial risks, expecting to earn substantial returns; (2) take above-average financial risks; (3) take average financial risks; and (4) not take any financial risks.

Consumer expectations about future income appear in the answers to two SCF questions: (1) "Over the next year, do you expect your total family income to go up more than prices, less than prices, or about the same as prices?"; and, (2) "Do you have a good idea of what your family's income for next year will be?" The responses are divided into positive expectations, negative expectations, neutral expectations, and no expectations at all. Similarly, consumer expectations about future economic conditions were measured by a question asking, "Over the next five years, do you expect the U.S. economy as a whole to perform better, worse, or about the same as it has over the past five years?"

With an eye toward previous studies, this study has also accounted for demographic variables: age, race, education, and marital status. Categorical variables of age can represent the life cycle stage of the household, as outlined by the life cycle theory. The marital status of respondents fell into the categories of single, married, or partnered, with individuals who are widowed, divorced, or separated categorized as single. The economic variables include household income and net worth. All variables used in this estimation can be found in Table 1, along with the sample means.

### 3. Statistical consideration

#### 1) Heckit model

Some studies (e.g. Godwin, 1999; Getter, 2003; Lyons, 2004) disregarded all rejected credit applicants, as well as those without outstanding balances, for the purposes of the sample segmentation. It is notable that not all individuals are given credit cards by banks; therefore, the set of credit card holders is a selected sample. The estimates in this study must account for this sample

selection bias in order to be as accurate as possible.

In econometrics literature, the selection problem has traditionally tackled using a parametric approach, based on the so-called Heckit model developed by Heckman (Heckman, 1979). The current study first obtains the probit estimate from the probit selection equation in order to estimate the inverse mills ratio. The inverse mills ratio is then included in the second equation, which allows for measurement of estimates. Use for data when self-selected is as follows.

$$z_i^* = \gamma' w_i + \zeta_i \quad (\text{Equation 1})$$

$$y_i^* = \beta' x_i + \varepsilon_i \quad (\text{Equation 2})$$

but only observe  $y$  such that

$$z_i = 1 \text{ if } z_i^* > 0 \quad z_i = 0 \text{ if } z_i^* \leq 0$$

$$y_i = y_i^* \text{ if } z_i = 1 \quad y_i \text{ not observed if } z_i = 0$$

The Heckit model employs two dependent variables. In the first stage, the dependent variable will be coded 1 if the respondent had debt and 0 otherwise (Equation 1). In the second stage, the dependent variable is continuous, determined by the amount of household debt as described earlier (Equation 2). The theoretical framework demonstrates that the amount of debt borrowed can be viewed a function of consumer sentiment and preference variables as well as demographic and economic variables.

#### 2) Pooled Probit

The first equation examines the relationship of household debt demand to demographic variables and economic variables. Expressed algebraically,

$$\text{Debt\_Y} = \gamma_0 + \gamma_1 X + \zeta_i \quad (\text{Equation 3})$$

Debt\_Y, here, is a dummy variable that equals 1 if a respondent holds household debt as of 2004 and 0 if not. Vector X includes regressors reflecting socioeconomic differences and  $\zeta_i$  is the disturbance term. Equation 3 is estimated as pooled probit with robust standard errors.

**3) Ordinary Least Squares (OLS) regression based on the Heckit model**

The second equation examines the relationships of the amount of household debt to psychological factors, such as preference and sentiment. Consumer sentiment and preference vectors correspond to measures for the

psychological variables of the respondent for the year 2004. These measures include indicators as to an individual level of time preference, risk tolerance, and positive expectations about future income and economic conditions. Expressed algebraically,

<Table 1> Variable Descriptions and Summary Statistics

Variables	Descriptions	Mean or %
<b>Dependent Variable</b>		
Debt	The summation of principal residence debt, other residential real estate debt, balances on lines of credit other than home equity line of credit (HELOCs), installment debt, and any other debts	\$79,083.13
Debt_Y	1 if a household currently carries debt, 0 otherwise	76.4%
<b>Independent Variables</b>		
<i>Consumer Sentiment and preference variables</i>		
Expectation about future economy		
Positive expectation about economy	1 if over the next five years respondent expects the U.S. economy to perform better as it has over the past five years, 0 otherwise.	44.09%
Neutral expectation about economy	1 if over the next five years respondent expects the U.S. economy to perform about the same as it has over the past five years, 0 otherwise.	18.21%
Negative expectation about economy	1 if over the next five years respondent expects the U.S. economy to perform worse as it has over the past five years, 0 otherwise. (reference)	32.70%
Expectation about future income		
Neutral expectation	1 if respondent expects his/her income to go about the same as prices and he/she has a good idea of what his/her income for next year will be, 0 otherwise	32.87%
Positive expectation	1 if respondent expects his/her income to go up more than prices and he/she has a good idea of what his/her income for next year will be, 0 otherwise	12.85%
No expectation	1 if respondent does not have a good idea of what his/her income for next year will be, 0 otherwise	32.97%
Negative expectation	1 if expects his/her income to go up less than prices and he/she has a good idea of what his/her income for next year will be, 0 otherwise (reference)	21.32%
Financial risk tolerance		
No risk	1 if respondents are not willing to take any financial risk, 0 otherwise (reference)	42.31%
Average risk	1 if respondents are willing to take average financial risks, 0 otherwise	38.44%
Above risk	1 if respondents are willing to take above average financial risks, 0 otherwise	15.88%
Substantial risk	1 if respondents are willing to take substantial financial risks, 0 otherwise	3.37%
Time preference		
High time preference	1 if respondent prefers a response of "next few months" or "next year" in planning his/her family's saving and spending, 0 otherwise (reference)	33.2%
Mediate time preferences	1 if respondent prefers a response of "next few years" or "next 5-10 years" in planning his/her family's saving and spending, 0 otherwise	53.49%
Low time preferences	1 if respondent prefers a response of "longer than 10 years" in planning his/her family's saving and spending , 0 otherwise	13.32%



&lt;Table 1&gt; Variable Descriptions and Summary Statistics (continued)

Variables	Descriptions	Mean or %
<i>Demographic variables</i>		
Respondent's Age		
Age LT 25	1 if respondents' age is less than 25, 0 otherwise (reference)	5.85%
Age 25-34	1 if respondents' age is 25 and 34, 0 otherwise	17.06%
Age 35-44	1 if respondents' age is 35 and 44, 0 otherwise	21.11%
Age 45-54	1 if respondents' age is 45 and 54, 0 otherwise	21.00%
Age 55-64	1 if respondents' age is 55 and 64, 0 otherwise	14.89%
Age > 64	1 if respondents' age is over 64, 0 otherwise	20.09%
Race		
White	1 if respondents describe themselves as white, 0 otherwise (reference)	73.60%
Black	1 if respondents describe themselves as Black, 0 otherwise	13.56%
Hispanic	1 if respondents describe themselves as Hispanic, 0 otherwise	9.17%
Asian and other	1 if respondents describe themselves as Asian and others, 0 otherwise	3.67%
Education level		
LTHH	1 if respondents' highest level of school completed less than high school, 0 otherwise (reference)	14.43%
High	1 if respondents' highest level of school completed is high school, 0 otherwise	30.60%
College	1 if respondents' highest level of school completed is some college, 0 otherwise	18.37%
Bachelor	1 if respondents' highest level of school completed is higher than college, 0 otherwise	36.61%
Marital status		
Married	1 if respondents are currently married, 0 otherwise (reference)	50.49%
Partner	1 if respondents are currently living with a partner, 0 otherwise	7.48%
Single	1 if respondents are currently separately, divorced, widowed, or never married, 0 otherwise	42.03%
Gender		
Female	1 if respondents are female, 0 otherwise	54.90%
<i>Economic variables</i>		
Income	Income of household	\$70,624.86
Net worth	Net worth of household	\$448,010.47
Homeownership		
Homeowner	1 if respondents have homeownership, 0 otherwise	69.00%
Employment status		
Salary	1 if respondent has a salary or wage job, 0 otherwise (reference)	56.83%
Self employed	1 if respondent is self employed, 0 otherwise	11.63%
Nowork	1 if respondent is not retired but not otherwise employed, 0 otherwise	14.19%
Retired	1 if respondent is retired, 0 otherwise	17.35%
Income volatility		
IncLow	1 if income is unusually low compared to what he/she would expect in a "normal" year, 0 otherwise	19.77%
IncHigh	1 if income is unusually high compared to what he/she would expect in a "normal" year, 0 otherwise	8.68%
IncNormal	1 if income is normal compared to what he/she would expect in a "normal" year, 0 otherwise (reference)	71.55%

$$\text{Debt} = \beta_0 + \beta_1 \text{ Consumer sentiment and preference vectors} + \beta_2 \text{ other vectors} + \varepsilon_i$$

(Equation 4)

## IV. Empirical result

### 1. Sample Characteristics

The sample characteristics can be found in <Table 1>. This study employed a weight variable to assure that the descriptive statistics are representative of U.S. households. In this study, the average household income was \$70,624.86 and the average household net worth was \$448,010.47. Approximately 76 % of respondents had household debt, and the debt total was \$79,083.13; this figure includes principal residence debt, other residential real estate debt, balances on lines of credit other than Home Equity Line of Credit (HELOCs), installment debt, and any other debts. Approximately 33% of respondents evidenced a short-term time preference. 21.32% of respondents had negative expectations about future incomes. 44.09% had optimistic expectations about the overall U.S. economic performance within a five-year span. 32.70% were pessimistic. About 42% of respondents said that they would not be willing to take any financial risks, while 3.37% said that they would take substantial ones.

A one way ANOVA test was conducted to examine variation in debt levels according to differences in consumer sentiment and preference. <Table 2> evidenced significant discrepancies in amount of household debt according to the time preferences, financial risk tolerances and expectations about future income or

economic conditions of respondent, even though other independent variables were not controlled.

### 2. Heckman selection model result

The Heckit model result can be found in <Table 3>. In the pooled probit model, the age of a respondent was curvilinearly related to the likelihood that they have household debt. People aged 25-54 are more likely to have household debt and people aged more than 55 are less likely to have household debt than people aged less than 25. Homeowners, women, and married individuals were determined particularly likely to have household debt, while economic variables such as increased income and net worth were negatively related to the likelihood of having household debt.

With respect to schooling, individuals with higher education levels evidenced greater propensity for household debt. Black and Hispanic respondents were less likely than white respondents to have household debt, whereas Asian and other non-white respondents were equally likely. This information, garnered in the first stage of analysis, was then used to provide the expected values of the residuals truncated at the second stage.

The second stage regression was corrected for sample selection bias. The Heckman selection model was systematically related to the variables and demonstrated a statistically significant coefficient. The inverse of the Mills ratio, lambda, was estimated, and additional explanatory variables were used to reduce bias when estimating the amount of household debt. In the second stage, individuals over 45 were found to have less household debt than those under 25. Respondents between the ages of 25 and 44 were not different from the reference

<Table 2> Investment Time Horizon and Outstanding Credit Card Balance

Variables	DF	The volume of debt	
		F Value	Pr > F
Expectation about future income	3	44.03	< 0.0001
Expectation about future economy	2	18.60	< 0.0001
Time preference	4	15.98	< 0.0001
Risk tolerance	3	96.04	< 0.0001

&lt;Table 3&gt; Two Step Heckit Model

Parameter	Pooled Probit		OLS	
	Whether household currently carries debt		The amount of household debt	
	Estimates	Pr	Estimates	Pr
Intercept	0.8996	<.0001	-1740615	<.0001
Log income	-0.0551	<.0001	160800	<.0001
Log net worth	-0.0596	<.0001	12206	0.0124
Employment status (Reference : Salary worker)				
Self employed	-0.2867	<.0001	164567	<.0001
No work	-0.4688	<.0001	-9081	0.8447
Retired	-0.5264	<.0001	-73196	0.2124
Homeownership (Reference : No)				
Homeowner	1.0372	<.0001	121349	0.1291
Gender (Reference : Male)				
Female	0.1225	<.0001	-2849	0.903
Marital status (Reference : Single )				
Married	0.2677	<.0001	16377	0.5967
Partner	0.0553	0.1892	-79699	0.0753
Race (Reference : White )				
Black	-0.1888	<.0001	-39405	0.2961
Asian and other	0.0138	0.801	-96846	0.0613
Hispanic	-0.1086	0.0069	-60457	0.1457
Education (Reference : LTHS)				
High	0.3713	<.0001	-34154	0.5189
College	0.6218	<.0001	113612	0.0823
Bachelor	0.5287	<.0001	42990	0.4727
Age (Reference : Age LT 25)				
Age 25-34	0.1875	0.0006	-92246	0.1193
Age 35-44	0.3948	<.0001	-85673	0.1632
Age 45-54	0.1955	0.0003	-134852	0.0243
Age 55-64	-0.1672	0.0026	-139460	0.0238
Age > 64	-0.6834	<.0001	-188939	0.0373
Expectation about future income (Reference : Negative expectation )				
Positive expectation			227010	<.0001
Neutral expectation			9929	0.7395
No expectation			45049	0.1402
Expectation about future economy (Reference : Negative expectation )				
Positive expectation			-60174	0.0436
Neutral expectation			-71506	0.0199
Time preference (Reference :high time preferences )				
Mediate time preferences			-19680	0.4317
Low time preferences			27828	0.2504
Risk tolerance (Reference : No )				
Average			-43958	0.0965
Above			-11866	0.7104
Sub			672651	<.0001
Income volatility (Reference : IncNormal)				
IncLow			-286371	<.0001
IncHigh			-50524	0.0635
Mills ratio			346745	0.0439
Number of observation	4519		2321	

group. Self-employment was positively correlated with household borrowing; the same held true for higher income and net worth. Income volatility was determined to be a significant factor in projecting debt status—those earning with either unusually high or unusually low earnings in a given year were less likely to have household debt than those earning what they had expected. In a departure from the initial hypothesis of this study, the time preference did not exert significant influence on whether or not respondents had household debt.

Respondents who expected prices to rise faster than incomes were more likely to have household debt than those who predicted the opposite. Individuals willing to take average financial risks were less likely to have household debt than those not willing to take any, while those willing to take substantial risks were more likely. In addition, respondents with optimistic expectations about future economic conditions tended to have more household debt than those with pessimistic expectations.

The factors that proved statistically significant in the first stage did not always carry over to the second stage as the determinants of whether or not a respondent had household debt differed from the determinants of debt volume. For example, race, sex, homeownership status, and education level (which were all significant factors in the first stage) did not prove significant in the second stage. Income and net worth were relevant in both stages.

## V. Conclusion and Discussion

### 1. Hypothesis Tests

Using the 2004 Survey of Consumer Finances, this study examines the factors affecting household debt. In addition to addressing the demographic and economic variables highlighted in prior studies, particular emphasis is placed on consumer sentiment, such as expectations about future earnings and economic conditions, and consumer preferences, such as financial risk tolerance and time preference.

It is noteworthy that the Heckit model was employed not only to demonstrate the relationship between explanatory variables and the amount of the household debt for individuals, but also to avoid sample selection bias. In the first-stage, a pooled probit analysis provided inverse Mill's ratios for the second stage of analysis and additional explanatory variable was employed to reduce bias when estimating the amount of individual household debt. This result demonstrated a statistically significant coefficient of inverse Mill's ratio in the second equation showing that there is a sample selection model.

*Hypothesis 1:* This hypothesis theorized a relationship between expectations about future income and household debt. Results demonstrated that those with positive expectations about future earnings were likely to incur a larger amount of household debt than those with negative expectations. Individuals who expected the U.S. economy to improve within a five-year span were projected to have less household debt than those who expected it to worsen. These results showed that household debt decisions are influenced by expectations. This finding indicated that those who have a positive expectation about future income and the confidence to pay off debts are more likely to increase borrowing. This result supported that increased certainty about future earnings decreases precautionary saving (which tends to motivate borrowing) and that households behave rationally based on expectations. Households might not be rational enough in making the precise expectations about future income or economic outlook, but based on expectations, they behave rationally.

*Hypothesis 2:* It was expected that individual time preference was a significant determinant of household debt. Those with lower time preferences were projected to have more household debt than those with higher preferences. The results of testing this hypothesis demonstrated that the lower time preference bore no statistically significant relationship to individual debt level. Financial risk tolerance was projected to correlate positively with household borrowing; analysis showed that respondents with substantial tolerance were likely to

have more household debt than those with no tolerance, while respondents with average tolerance were less likely. Ultimately, this hypothesis yielded mixed results.

## 2. Implications

This study argued that personal sentiment and preference play an important role in the decision to borrow. The empirical findings within, based on a U.S. household-level data set that includes detailed information on household debt and psychological factors, provide convincing support for the theoretical priors; specifically, optimistic financial expectations and substantial risk tolerance are positively correlated with the amount of household debt of an individual.

Numerous factors are significantly related to the likelihood of incurring household debt. However, in the second stage the selectivity-corrected OLS analysis leads to the conclusion that those factors affecting the amount of household debt are different from factors related to the likelihood of holding debt in the first place. Taking off from the human capital theory, it may be presumed that higher educational attainment indicates a higher future income and greater job security, and so education-related findings (the higher level of education for a respondent, the more likely they will incur household debt) are consistent with the life-cycle theory. However, education level fails to account for the amount of debt incurred.

Income was found to be negatively correlated with incurring debt in the first place, but positively correlated with the amount of debt incurred. This phenomenon is easily accounted for; among those with access to debt services, high-income respondents tend to have high credit limits and/or incur debt at the lower interest rates, both factors that might make borrowing more attractive. Net worth is also positively correlated the amount of household borrowing, as confirmed by several previous studies. Duca and Whitesell (1995) argue that consumers borrow money using credit cards when they find themselves constrained by liquidity; the ability to repay debt in the future allows consumers with higher net

worth to smooth consumption. These findings are also supported by the life-cycle model of consumption demand, which suggests that higher-income families may be buoyed by presumed job security, and save less and borrow more (Duca and Rosenthal, 1993). Moreover, increased household assets could provide collateral for increased borrowing (Crook, 2006).

Demand for household debt and the amount of debt incurred over a lifetime followed the familiar life-cycle pattern, leading to a hump-shaped trajectory of wealth over time, even when controlling for wealth-holding. Demand typically increased with the age of an individual up to the mid-fifties, at which point it decreased. The amount of debt typically decreased from the mid-forties on. Those between the ages of 25 and 54 were more likely to have household debt, and individuals over 55 were less likely to have it than those under 25. An age of more than 45 was negatively correlated with the amount of household debt, as compared with less than 25.

Overall, this study supported the initial hypotheses, with the issue of time preference being the notable exception. For future research purposes, a more sophisticated assessment of time preference would be necessary to assess the effect of individual impatience on household debt. The two consumer sentiment variables proved consistently significant, even when controlling all other explanatory variables.

The findings related to sentiment about the future indicate mixed results. Those with optimistic expectations about personal income incur approximately three times as much debt as those who evidence neutral expectations; however, optimistic expectations about national economic performance have a negative effect on household borrowing. The finding that individuals with financial substantial risk tolerance incur more debt may help explain why so many consumers are suffering from debt-related problems. In response, government policies might be directed at curbing unrealistic the financial optimism of consumers, or at constraining the amount of credit available, so that credit limits are arrived at in more stringent accordance with actual individual income.

This study implies that researchers and policy-makers need to consider sentiment and preference when modeling consumer behavior in the debt market in order to account for related variance in borrowing habits. Future research will use additional data to investigate how consumer sentiment and preference interact with socioeconomic and other characteristics.

In addition, further study on this topic can assess the impact of both financial education and participation in structured borrowing programs on the psychological states of consumers. If the results in the current study continue to hold true, it can be suggested that economic theory should more explicitly consider the impact of the preference and sentiment of consumers on the over-indebtedness of households.

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