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Essays in Dynamic Household Finance with Heterogeneous Agents

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# Essays in Dynamic Household Finance with Heterogeneous Agents

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Essays in Dynamic Household Finance with Heterogeneous Agents

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Two central themes in asset pricing theory are how averse households are to taking on risks, and how willing they are to substitute consumption over time in response to the incentives provided by asset returns. These issues are central to understanding both asset returns and consumption patterns. Most work in this field operates on the basic observation that not all households invest in the stock market. Studies that account for market segmentation assume that all stockholders hold a financial index (S&P, NYSE) and use one of these indexes as a proxy for household-specific portfolio. According to the latest data from the 2004 Survey of Consumer Finances, however, the median US stockholders who own stocks directly hold only 3 stock securities. Another data observation from the SCF (and other sources) is that stockholders with different wealth levels have different returns on their stocks. These data observations call into question the validity of financial index as a proper proxy for household-specific portfolio.

This research starts from the two basic observations that most stockholders hold only a few individual stocks and stockholders with different wealth levels have a different rate of return on their stocks. If a large fraction of households do not hold a financial index, then how does that affect our inference about households' willingness to substitute consumption over time for the incentives provided by asset returns and to accept risks? Furthermore, what does it teach us about what a good model of assets prices looks like? And why do households hold only a few individual stocks?

My research addresses these issues. Specifically, in the first chapter I study the heterogeneity in households' portfolio choice and performance and find that the trade-offs between average payoffs and risk alone cannot explain heterogeneity in portfolio returns. In the second section, I address a long-standing question in macroeconomics and finance- the value of the risk aversion for households with different wealth levels. In the third chapter, I study the effect of political affiliation on portfolio choice.

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## Chapter 1

# Do Wealthy Investors have a Higher Return on their Stocks?

**Abstract**

An analysis of the Survey of Consumer Finance shows that wealthy investors have a higher return on their stocks than their poorer counterparts. Three key empirical facts emerge: (i) wealthy investors employ more productive search efforts, (ii) financial risk bearing and search efforts are complementary, and (iii) wealthy investors have a higher risk adjusted return. These facts present a challenge to the "standard" asset pricing theory, which assumes that the return on stocks is uncorrelated with wealth and omits any relationship between search activity and portfolio returns. This study presents a search theoretic model of portfolio choice to understand the relationship between wealth, return, and search behavior.

*Keywords*: Investment decisions, financial behavior, and search and risk behavior, Econometrics.

JEL Classification: D01, D11, D12, D81, D83, G10, G11, G12.

# 1. Introduction

This paper investigates the relationship between wealth and the unrealized gains from stocks. By examining data from the Survey of Consumer Finance (SCF), three empirical facts relating wealth and return across investors emerge. First, wealthy investors have a higher risk adjusted return on their stocks. Second, wealthy investors adopt a more productive strategy of search activity. Third, there is a complementary relationship between financial risk bearing and search for stocks; the greater the financial risk-bearing,[1] the greater the search effort. These facts present a challenge to the "standard" asset pricing theory, which assumes that the return on stocks is uncorrelated with wealth and omits any relationship between search activity and portfolio returns.

We document and explain these facts about wealth and return. Our approach asserts that investor's return on stocks is a function of the level of search effort employed when buying stocks. The greater the search effort is, the higher the expected return. There are two types of search: informal and professional. The informal search method summarizes investors' personal search efforts which include utilization of the internet, newspapers and magazines, while professional search methods are the services provided by professional experts including financial planners and brokers. Not only are there different types of searches, but there are also differences in the cost of searches for each type. There is a time opportunity cost for informal searches and a pecuniary cost for professional searches.[2] The levels of informal and professional searches are endogenously determined as a function of investor's wealth level, labor earnings, and risk

[1] Financial risk-bearing reflects the variance in the portfolio of stocks.
[2] A study by Vissing-Jorgensen (2003) shows that the search effort cost explains the limited participation in the stock market. However, her study ignores the contribution of the search on the return on stocks.

preference. On average, we find different search patterns across investors with different wealth levels. Wealthy investors employ fewer informal searches due to their higher time opportunity cost, but invest in more professional searches than their poorer counterparts.[3] We also find a complementary relationship between search effort and the level of financial risk tolerance.[4] The greater the risk bearing is, the greater the informal and professional searches effort. The intuition behind this finding is that those who bear greater financial risks mitigate these risks with intensified search for stocks.

We examine how different patterns of search for stocks influence the Sharpe ratios and the risk adjusted return for investors with different wealth levels.[5] We use the SCF data for the year 1998, especially; the stockholders distribution of log annual rate for top (wealthy) and bottom (poor) quartiles and we find that wealthy investors have higher Sharpe ratios. We also estimate the productivity of the search for stocks, which measures the contribution of a unit of search to the return on stocks. We find that wealthy investors have more productive informal as well as professional searches, which enlarge their return on stocks significantly. These empirical findings suggest that wealthy investors have higher Sharpe ratios. A simultaneously and independent study by Calvet, Campbell, and Sodini (2006) also notes that wealthy households have higher Sharpe ratios using Swedish data. In their study, they employ different econometrics methodology and focus on portfolio diversification, but they do not consider the key role of search for stocks.

We provide a micro foundation theory on investors' portfolio choice to illustrate the

[3] For the purpose of this study, we define wealthy investors as stockholders who are in the top 25 percent of gross wealth distribution, whereas the poor (least wealthy) investors are stockholders in the bottom 25 percent of the wealth distribution.
[4] We do not observe the parameter of risk aversion for each investor, but we use other proxies such as the self-reported risk attitude toward risk and the ratio of bonds (riskless assets) to stocks (risky assets). These proxies used widely in the literature (see Haliassos and Bertaut [1995], Carroll [2001] and Blume and Zeldes [1994]). Further details are in the financial facts sections.
[5] The risk adjusted return measures the return on stocks per unit of risk.

above financial findings. Our theory model confronts three issues. First, why do wealthy investors employ greater professional search and fewer informal search? Second, why do investors who bear higher financial risk employ greater informal and professional searches? Third, why do wealthy investors have a higher return on their stocks? The theory is presented using a two-period model where investors maximize utility from consumption by optimizing the amount of investment in stocks and adopting the optimal search for stocks strategy. In the first period, there is an endowment of one unit of time that households can allocate between labor market and search for stocks. Also, investors can utilize professional services in their search process for stocks. To smooth consumption, households can invest on assets that pay either high or low. The probability of a high investment return is a function of the level of informal and professional searches chosen by the investor. Investors who employ great deal of informal and professional searches expect higher return.

The empirical evidence in this study questions the validity of financial indexes (Standard and Poor or the New York Stock Exchange) as a proper proxy for households' returns and that has implications for a host of economic issues and policy analysis including: wealth inequality, limited stock market participation, the equity premium puzzle, and social security reform. This paper suggests that by accounting for the heterogeneity in household portfolios, we would have different analysis and conclusion.

The rest of the paper proceeds as follows. The data and key variables are described in Section 2, and the financial facts are demonstrated in Section 3. To illustrate the financial fact, we introduce a theory and employ a two period model in Section 4. We draw conclusions about wealth, search, risk, and return in Section 5.

# 2. Data

This paper analyzes cross-section data from the Survey of Consumer Finance (SCF) for 1989, 1992, 1995, 1998, 2001, and 2004. The SCF provides detailed information on U.S. assets and liabilities, labor force participation, and social demographic characteristics. The survey also collects information on total family earnings and wealth. The actual number of respondents in each survey is approximately 4,300 where for each observation there are another 5 imputed observations. The total number of observations in the full dataset is 21,500. Since this study is mainly concerned with stockholders, our descriptive statistics distinguish between stockholders and non-stockholders. Stockholders are those who either own publicly-traded stocks, or possess stocks in a company where they work (or have worked), or hold stocks in a company headquartered outside of the United States.[6] Table 1.1 reports the descriptive statistics of the stockholder in Panel A, whereas the non-stockholders are reported in Panel B. Three key variables are described: the return on stocks, the willingness to bear financial risk, and the search efforts that are employed by investors when they buy stocks.

## 2.1 Return on stocks

For those who own publicly traded stocks, the SCF collects information about the percent gained/lost on their stocks since purchase. In particular, the SCF asks each stockholder about her portfolio: “How much has it gained in percent since it was obtained?” The total return on stocks (reported in percent) measures the unrealized capital gains or losses in the investors' stockholdings. We convert the total return for each

[6] Stocks held through pension accounts, annuities, and trusts are not included.

investor into an annualized rate of return as follows. Let $r_h^T$ denotes the total return on stocks for household $h$ and $r_h^A$ as the annual rate of return. The relationship between the total return and the annual rate of return is described in the following geometric mean equation:[7]

$$(1+r_h^T)=(1+r_h^A)^{t_h}$$

Here $t_h$ is the average holding period of stocks.

In the data, respondents report the total return, $r_h^T$, and the frequency of trades which accounts for the average holding period, $t_h$. The SCF reports trades in "Hourly, daily, weekly, biweekly, twice a month, monthly, bimonthly, quarterly, twice per year, yearly, and over two years" frequencies. The following is an example that illustrates our approach of calculating the average holding period. Suppose a stock holder reports that the frequency of trades is every 6 months. Then, the holding period is at most (6/12)=0.5, and the minimum holding period is zero, so we assume that the frequency is uniformly distributed and the average holding period is $t_h = (6/12)*0.5 = 0.25$. Only investors who hold brokerage accounts provide information on the frequency of trading. About 74 percent of the observations among stockholders report that they have a brokerage account; we impute data for the other 26 percent of the missing values on trading.[8]

[7] In measuring the return on stocks, we take an arithmetic average across investors. However, the measured return for each investor is a geometric average of that investor's returns over time, because we convert the total return for each investor into an annualized rate of return. Using an arithmetic formula to measure the average annual return, hence $r_h^T = r_h^A / t_h$, does not change our results significantly.

[8] Wermers (2000) and Calvet et al, (2006) use the imputation method to account for missing information.

From the data, our measure of $t_h$ might include noise since we assume that the hazard rate for each stock or for a given investor is the same.[9] As a result, this assumption might cause measurement error in our estimates. Let $\varepsilon_h$ denote the measurement error and assume $\mathrm{E}\varepsilon_h = 0$, thus, the true average holding period, which is not observed by econometrician, is $t_h(1+\varepsilon_h)$. Recall the geometric mean equation:

$$\left(1+r_h^T\right)=\left(1+r_h^A\right)^{t_h(1+\varepsilon_h)}$$

Here $1+\varepsilon_h > 0$ for every $h$. By passing the log in both sides, we can write the previous equation as follows:

$$\ln\left(1+r_h^T\right)=t_h\left(1+\varepsilon_h\right)\ln\left(1+r_h^A\right)$$

Dividing the above equation by $t_h$ and taking expectation:

$$\mathrm{E}\frac{\ln\left(1+r_h^T\right)}{t_h}=\mathrm{E}\ln\left(1+r_h^A\right)+\mathrm{E}\left\{\varepsilon_h\ln\left(1+r_h^A\right)\right\}$$

We assume that the measurement error, $\varepsilon_h$, are independent of a household's annual rate of return. So, given $\mathrm{E}\varepsilon_h = 0$, then $\mathrm{E}\left\{\varepsilon_h\ln\left(1+r_h^A\right)\right\}=\mathrm{E}\varepsilon_h\mathrm{E}\ln\left(1+r_h^A\right)=0$, and:

$$\mathrm{E}\ln\left(1+r_h^A\right)=\mathrm{E}\frac{\ln\left(1+r_h^T\right)}{t_h}$$

In expectation, the log annual rate of return is equal to log total return divided by observed average holding period because we assumed that the measurement errors $\varepsilon_h$ are independent of household's annual rate of return.[10]

[9] The hazard rate measures the probability of trading as a function of how long an investor holds the stock.

[10] It is important to mention that the endogenous decision to rebalance is unobserved in Calvet et al, (2006) study. They estimate the moments of asset returns in order to investigate the properties of household portfolios, and then inferring the household portfolio characteristics.

## 2.2 Search Methods

SCF (1998) asks investors about the way that they search when making decisions about savings and investments. The SCF provides about twenty search methods; investors are asked to choose up to ten methods.[11] Table 1.2 reports the listed methods as well as the fraction of investors who use each of the methods.[12] The methods can be divided into two groups: informal search and professional search. The groups can be further distinguished by two categories: the cost of the method and whether the search is conducted by the investor herself or by hiring an expert.

When reviewing the cost of the method, it is important to note that there are two different costs: time opportunity cost and pecuniary cost. The category in which investors conduct the search by themselves and requires time opportunity cost is called "informal search," whereas the category in which investors rent the service of an expert and incur a pecuniary cost is called a "professional search." The informal search includes calling around, reading newspapers or material in the mail, and using information from television, radio, and online service, or advertisements.[13] The professional search includes using the service of one or more professionals: lawyers, accountants, bankers, brokers, financial planners, etc.

Table 1.2 shows that using a financial planner for managing the portfolio is the most frequent search strategy among investors. The search effort is introduced by two variables, informal search and professional search. The informal search variable is the sum of the informal methods that an investor uses; the professional search variable is the

[11] Only 1 percent of the entire sample used all ten methods.
[12] We report 18 out of the twenty methods since the other two methods have not been chosen by any investors.
[13] A recent study by Barber and Odean (2006) shows that investors are net buyers of attention grabbing stocks in the news.

sum of professional search methods that an investor uses. Table 1.3 reports the descriptive statistics of the search variables for stockholders and non-stockholders. The informal and professional searches are the sum of all methods. This approach was used by Blau and Robins (1990) and Holzer (1987) to indicate who uses more search methods among employed and unemployed youth.

# 3. Financial Facts

In this section, we examine three financial facts: there is a positive correlation between wealth and return across investors; wealthy investors search more productively; and investors who take substantial financial risks search more intensively.

### 3.1.1 Fact 1- Positive correlation between wealth and return.

The relationship between the return on stocks and gross wealth as well as net wealth can be explored in two different ways.[14] The first is to look to the average net wealth for those who have positive returns and compare them with those who have negative returns. Although the SCF asks respondents to provide documentations to support their reported information, the purpose of this way is to demonstrate that even if some respondents do not report accurately wealthy investors still have a higher return on their stocks. The second is to employ a regression where the return on stocks is the dependent variable and the independent variables are gross or net wealth levels, demographic characteristic variables, and time adjustment.

[14] The gross wealth consists of assets minus total debt. The net wealth is the gross wealth minus (plus) the unrealized gains (losses) from stocks minus income from dividend.

Using SCF data sets from the years 1989, 1992, 1995, 1998, 2001, and 2004, Table 1.4 reports the average and standard deviation of stockholder with positive total return and compares it with those who have negative returns. It also reports a t-test on the difference between these two samples. The t-test measures whether the difference is statistically significant. Across several years, we find that investors who have positive returns on their stocks are wealthier than those who have negative returns; the difference in net wealth is statistically significant.

We also employ regressions where the dependent variable is the log annual rate of return on stocks $\ln\left(1+r_h^A\right)$, and the independent variables are the log gross or net wealth levels and other demographic variables. The following is the regression model that we employ:

$$\ln\left(1+r_h^A\right)=\phi_0+\phi_1\ln Wealth_h+\delta x_h+\eta$$

Here $\phi_0$ and $\phi_1$ are parameters; $\delta$ is a set of parameters, $x$ is a vector of demographic variables, and $\eta$ is the residual term. The wealth variables that we use are gross wealth as well as net wealth. The reason we use both variables is because when considering the relationship between wealth and returns, one must determine whether reverse causality might drive the results. The causality issue concerns what initially causes the wealth level of investors; is it because they have higher returns on their stocks, or do they have high return because they have an initially high wealth? To neutralize the causality problem, the net wealth variable is used rather than the gross wealth. We exclude observations of those who have not participated in the stock market, since the purpose of this specific regression is only to show that both gross wealth and net wealth are positively correlated with the return on stock.[15] Table 1.5 reports the estimation results of the model. The coefficient $\phi_1$ measures the elasticity of return on stocks and wealth.

In our sample, less than one percent of the observations (65 observations) have negative wealth values. Using the log distribution of the gross and net wealth, we recode those observations to be lower by two standard deviations than the minimum observation in the distribution. The results show that the elasticity of gross wealth and net wealth is between 0.01 and 0.048 and it is positive and significant. If we exclude the 65 observation from our estimates, we still have significant positive correlation between wealth and the rate of return. Another possible solution to treat the negative observation is to use the *Inverse Hyperbolic Sine* (IHS) function. Karen (2006) demonstrates how the inverse hyperbolic sine transformation solves the problem of negative wealth values without restricting the sample or distorting the standard errors.[16] We estimate the same model using the IHS instead of the log and we still have found positive and significant results.[17]

### 3.1.2 Robustness of the positive correlation between wealth and return.

There are two other data sets that have information on households' return on stocks: the data set provided by the Internal Revenue Service (IRS) and the data set provided by the UBS Index of Investor Optimism. We do not use the IRS data set since it cannot be a

[15] In the estimation section, the estimation is conducted using not only stock holders but also the entire sample. This regression is evidence that gross and net wealth and returns are positively correlated.

[16] Other studies that use the IHS function are Burbidge, Magee, and Robb (1988), Carroll, Dynan, and Krane (2003), Kennickell and Sundén (1997), and Kapteyn and Panis (2003).

[17] We would like to mention that the SCF also provides information about the number of trades over the past year, which can also be used a measure for the average holding period for stocks. For example, if the stockholder reports that she traded 4 times last year, then we assume that she trades every three months (12/4)=3; then the holding period is at most (3/12)=0.25. We have conducted the same set of regressions (as in Table 1.5) using the number of trades as a measure of portfolio's average holding period and we still find positive and significant elasticity between wealth and return on stocks.

representative sample for the purpose of this study. The IRS does not provide information about household wealth. In addition, households that own stocks but have no financial income in a particular year from selling stocks (according to the IRS) are classified as non-stockholders. From the SCF (1998), about 58 percent of stockholders report that they have financial income either from dividends or from selling/buying stocks. This detail alone raises serious concerns about whether the IRS provides a representative sample.

The other source of data that we use is the UBS/Gallup survey. The UBS survey provides data about households' asset holdings, income, return on portfolio, and expectations about the future economy, interest rate, and return on stocks. Graham, Harvey, and Huang (2005) and Vissing-Jørgensen (2003) use this survey to characterize household portfolio choice. The question that interests us most is: "What was the overall percentage rate of return you got on your portfolio in the past twelve months?" It is important to mention that the UBS index considers only households who have at least \$10,000 in financial assets.[18] Using the 1998 SCF dataset, Vissing-Jørgensen (2003) argues that "households with \$10,000 or more in financial assets owned more than 99 percent of stocks owned directly or indirectly by U.S. households, more than 99 percent of household financial wealth, and about 95 percent of household net worth" (Page 145). However, using the same SCF (1998) dataset, we find that among investors who hold stocks, mutual funds, bonds, saving bonds, and IRA(s)/Keogh, about 34 percent possess less than \$10,000, which means that the UBS index sample is truncated from below.[19] This is because poor households hold a relatively small amount of assets, but they also

[18] The UBS defines financial assets as "stocks, bonds, or mutual funds in an investment account, or in a self-directed IRA or 401(k) retirement account."

[19] It is a well known fact that the majority of wealth is concentrated in the top 10 percent of the population (see Quadrini, Vincenzo, and Rios-Rull, Jose-Victor [1997]).

have loans so their overall wealth is very fairly small and close to zero. The other problem with the UBS index data set is that it does not provide specific information on wealth levels. Instead, it provides data on family income levels by bracket where the top bracket consists of those who have income higher than $100,000. Additionally, they provide data on asset holdings, but also only in brackets of $100,000, where the top bracket is for those who have more than one million dollars. Thus, we cannot generate a continuous wealth variable like the SCF data set provides.

In order to test our hypothesis, we examine the UBS index data sets for the December 1998 and December 2001 surveys. We chose these surveys because they overlap with the SCF's data sets (1998 and 2001). The overlap is needed since we imputed from the SCF data information on wealth levels that is updated at the end of each December. Since the UBS index has no information on wealth, we imputed the average net wealth from the SCF to each bracket of asset holding of the UBS index data. Given the imputed gross and net wealth levels, we employ a regression where the return on portfolio (in percent) is the dependent variable and the independent variables are net wealth levels, age, age square, education by groups, and race. Finally, we exclude observations that do not have information about portfolio returns and asset holdings. The sample size for the UBS December 1998 and 2001 indexes are 668 and 625 observations, respectively. For the UBS December 1998 survey, investors who report less than one percent in their returns (including negative responses) are coded as one category. We follow Vissing-Jørgensen's approach (2003) and set these values to zero. Table 1.6 demonstrates the estimated results. Columns two and three report the estimated results for years 1998 and 2001, respectively. In columns four we pooled the two years together. The results show that the marginal influence of wealth on the return on portfolio is positive and significant at 1 percent level for the year 1998 and at 8 percent level for the year 2001. In the pooled data, the coefficient of the wealth variable is significant at one percent level. The marginal yield of one million dollars is between 0.907 and 1.095 percentage points.

### 3.1.3 Sharpe ratio for wealthy and poor investors

In this section, we compare the Sharpe ratio for wealthy and poor investors. The following is the formula for the Sharpe ratio: $S = \frac{R^s - R^f}{\sigma^s}$. Here $S$ is the Sharpe ratio, $R^s$ is the annual rate of return on portfolio of stocks, $R^f$ is the risk free return, and $\sigma^s$ is the standard deviation on the portfolio. Although we observe the annual rate of return for each household, we do not observe the variance in their portfolio. To compare Sharpe ratios for wealthy investors with the poor investors, we use the SCF (1998) data on the distribution of return on stocks. We divide the entire sample into two samples. The first sample includes the return distribution for the top quartile and the second sample contains the return distribution for the bottom quartile; we consider each group as one portfolio and then we calculate the average and the standard deviation of log annual rate of return for the wealthiest top 25 percent of the sample, which are denoted $R_T^A$ and $\sigma_T$ respectively. From the Ibbotson (2002), we find that the return on the Treasury bill for the year 1998 is 4.86 percent. Given $R_T^A$, $\sigma_T^A$, and the log rate of return on treasury bill, $\ln R^f$, we are able to calculate the adjusted log rate of return. We apply the same approach for the poor investors, calculating $R_B^A$ and $\sigma_B$.

The results show that the mean log annual return for wealthy stockholders is 0.320 and the standard deviation stands at 0.74, whereas the mean log annual rate of return for poor stockholders stands at 0.235 and the standard deviation is 1.08. The Sharpe ratio for wealthiest top 25 percent investors stands at $S_T = 0.37$ and for the poor investors in the bottom is $S_B = 0.17$.[20] The historical average return on the S&P is 7.2 and the average return on short term treasury bills is 0.8 percent (See Mehra and Prescott [1985]), so the Sharpe ratio for the market portfolio is 0.38. The average Sharpe ratio for wealthy stockholders is fairly close to the market portfolio Sharpe ratio and that because wealthy stockholders hold considerably diversified portfolios. Regarding poor stockholders, the reason that they do not hold the market portfolio is because the market portfolio has specific level of risk and poor stockholders desire to bear different level of financial risks.

### 3.2 Fact 2 - Search strategy differs by wealth and labor earnings.

To show that there is a different strategy of search for stocks by investors with different wealth levels, we compare the search strategy for wealthy stockholders with that of the poor stockholders. We find wealthy stockholders benefit more from financial planners, accountants, and brokers. Less wealthy investors call around more; they rely on magazines and newspapers, online services, and friends or relatives as they search for stocks. Table 1.7 reports the search methods for the top 25 percent wealthiest (top quartile) stockholders compared with the stockholders who are in the bottom 25 percent of the wealthy. Table 1.7 shows that the top quartile has a different search behavior than the bottom one. The bottom quartile uses on average more informal searches than

[20] The annual growth of the Standard & Poor (S&P) index in the year 1998 was 24.25 percent (see Standard & Poors: Security Price Index Record).

professional searches. The reason that wealthy investors employ fewer informal searches is because their time opportunity cost is higher. From the SCF data we find that the average labor earnings for the bottom quartile is 40,368 and the standard deviation is 27,310, whereas the average labor earnings for the top quartile is 352,879 and the standard deviation is 1,289,796. The difference between the averages is statistically significant at 1 percent level. We also employ a regression where the informal search variable is the dependent variable over labor earnings and other characteristic variables, and we find that the labor earnings coefficient is negative and statistically significant.

### 3.3 Fact 3 - complementary relationship between search and risk bearing.

SCF provides investors' self-reported attitudes toward risk (which are widely used in the literature) to explain their limited stock market participations.[21] Studies by Kahneman, Wakker and Sarin (1997), Oswald (1997), Barsky, Juster, Kimball, and Shapiro (1997), and Ng (1997) argue strongly that answers to questions about preferences are considered reliable and useful information.

SCF asks respondents:

> "Which of the statements below comes closest to the amount of financial risk that you and your (spouse/partner) are willing to take when you save or make investments?"

1. Take substantial financial risks expecting to earn substantial returns.
2. Take above average financial risks expecting to earn above average returns.
3. Take average financial risks expecting to earn average returns.
4. Not willing to take any financial risks.

[21] Such as Haliassos and Bertaut (1995), Carroll (2001) and Blume and Zeldes (1994).

Table 1.8 reports the fraction of investors who report that they are willing to take substantial financial risks expecting to earn substantial returns for each of the listed methods versus investors who report that they are not willing to take any financial risks.[22] The percentage using every method except two (banker and self/spouse/partner) is higher for the investors who are willing to take substantial financial risks. Most importantly, investors who are willing to take substantial financial risks search more with both informal and professional searches.

Another way to show the complementary relationship between search and financial risk bearing is by introducing a ratio - bond holdings divided by stock holdings - that measures the riskness in the entire portfolio. Carroll (2001) uses a similar approach to measure households' "risk tolerance."[23] The ratio reflects the relation of the risky investment to the less risky investment. The correlation between this ratio and the informal or professional search is positive; however, since asset holdings are endogenous, this ratio is also an endogenous variable. Thus, we estimate the relationship between the ratio and search effort by employing a regression where the ratio is the dependent variable over the informal and professional searches, wealth level, and other demographic variables. Table 1.9 reports the results where we find negative coefficients on the informal and professional searches which lead us to conclude that there is a complementary relationship between search and risk bearing.

We should mention here that wealthy investors bear more financial risk than their poorer counterparts. Carroll (2001) documents that portfolio of the rich is heavily skewed

[22] It is important to mention that this method of reporting the results in Tables 1.2, 1.8, and 1.9.a is widely used in the literature. For example, Blau and Robins[22] (1990) and Holzer (1987) present summary statistics on the search choices of employed and unemployed job seekers.
[23] Carroll (2001) defines "safe portfolio" as a portfolio that mostly includes riskless assets; and risky portfolio as a portfolio that includes mainly risky assets.

toward risky assets. In addition, data from the SCF shows that the average gross wealth for the group of investors who chose to take substantial financial risks is 956,186 dollars, whereas the average gross wealth for the group of investors who are not willing to take any financial risks is 429,432 dollars. The gross wealth difference between those two groups is statistically significant.

# 4. Theory

We introduce a micro foundation theory concerning investors' behavior in order to illustrate the above financial facts and generate some intuition for the explicit investor policy of search. We employ a two-period model; investors maximize the utility from consumption by optimizing the amounts of asset holdings, labor supply, and search effort for stocks.[24]

## 4.1 The Environment

We consider an economy occupied by heterogeneous agents with respect to their labor earnings, $w$, and wealth, $W$. Agents live for two periods and maximize their lifetime utility from consumption. In the first period, agents are endowed with one unit of time that can be allocated to the labor market and search for stocks. Agents can save by investing in the stock market, so they can consume their investment in the second period. An investment in the financial market, $s$, yields return of $R^H$ in the good state and $R^L$ in the bad state; here $R^H > R^L$. The probability to be in the good state is a function of the

[24] Our model can be viewed as a modified version of Grossman and Stiglitz (1980). The main difference is that in Grossman and Stiglitz (1980) there is a fixed cost to be informed, whereas in our model we endogenous the levels of being informed.

search effort that investors employ. There are two types of searches: informal and professional searches. The time opportunity cost from informal search is denoted by $w * \ell$, where $\ell$ is the informal time search. In addition, there is another search method, professional search, denoted by $m$ that has a pecuniary cost. The probability of being in the good state is denoted by $P^H(\ell, m)$.

Formally, an investor's optimization problem is:[25]

$$\underset{c,s,m,0\le\ell\le1}{Max}\, U(c)+\beta\left\{p^H(\ell,m)U(c^H)+(1-p^H(\ell,m))U(c^L)\right\}$$

$S.T$

$$c+s\le w(1-\ell)+W-I(s)F-m$$

$$c^H=R^H s, \qquad c^L=R^L s$$

$$m\ge 0, \qquad R=\left\{R^L,R^H\right\}, \qquad p^H(\ell,m) \quad is \quad given$$

The utility from consumption is denoted by $U(c)$, with $U'(\cdot)>0$ and $U''(\cdot)<0$. Let $P^H(\ell,m)$ be a differentiable function with respect to $\ell$, $m$; here Here $P_\ell^H(\ell,m)$ and $P_m^H(\ell,m)$ are the derivatives of the probability function with respect to $\ell$ and $m$, respectively, and $P_\ell^H(\ell,m)>0$ and $P_\ell^H(\ell,m)>0$.

The first order conditions with respect to $s$, $\ell$, and $m$ are:

$$(1) \qquad -U'(c)+\beta\left\{p^H(\ell,m)R^H U'(c^H)+(1-p^H(\ell,m))R^L U'(c^L)\right\}=0, \quad < \;\Rightarrow\; s=0$$

$$(2) \qquad -wU'(c)+\beta\left\{P_\ell^H(\ell,m)\left[U(c^H)-U(c^L)\right]\right\}=0, \quad < \;\Rightarrow\; \ell=0$$

$$(3) \qquad -U'(c)+\beta\left\{P_m^H(\ell,m)\left[U(c^H)-U(c^L)\right]\right\}=0, \quad < \;\Rightarrow\; m=0$$

[25] For tractability, the model assumes a two-point distribution. A more general model would have search activities generating a first-order stochastic shift on the distribution of returns, whereas in our single model search increasing the probability of a high return. A simulation of the more general model produces qualitatively the same results.

We specify the utility function as $U(c)=\ln c$, and furthermore, we define the probability of the good state as: $P^H(\ell,m;\alpha)=\alpha\frac{\ell}{1+\ell}+(1-\alpha)\frac{m}{1+m}$. The technology parameter $\alpha$ reflects the productivity of informal search over the return on stock and $(1-\alpha)$ is the professional search productivity.

$$P_\ell^H(\ell,m)=-\frac{\alpha}{(1+\ell)^2} \quad \text{and} \quad P_m^H(\ell,m)=-\frac{(1-\alpha)}{(1+m)^2}$$

The expected return on stocks is: $\mathrm{E}R(\ell,m;\alpha)=P^H(\ell,m;\alpha)\left(R^H-R^L\right)+R^L$.

In the Supplementary (A) we solve for the policy function of the professional search. The closed form solution for the professional search is:

$$(4) \qquad m=-1-(\tau_2/(2*\tau_1))+\sqrt{(2*\tau_1+\tau_2)^2-4(\tau_1)^2+4\tau_1*\left(W+2w-\left(\frac{w\alpha}{(1-\alpha)}\right)^{1/2}\right)}/2*\tau_1$$

Here $\tau_1=\dfrac{(1+\beta)}{\beta(1-\alpha)\ln\left(R^H/R^L\right)}$ and $\tau_2=\left(\dfrac{w\alpha}{(1-\alpha)}\right)^{1/2}$.

$$(5) \qquad \ell=(1+m)\left(w\frac{(1-\alpha)}{\alpha}\right)^{-1/2}-1$$

Equation $(5)$ demonstrates the relationship between informal and professional searches.

## 4.2 Demonstration of financial facts 1 and 2

The next step is to show how the benchmark model illustrates the financial facts that we described. In financial fact 1 we showed that wealth and return on stocks are positively correlated. Fact 2 demonstrates that wealthy households have different search patterns than poor households. In order to demonstrate facts 1 and 2, we shall first calculate the following derivatives: $\frac{\partial m}{\partial W}$, $\frac{\partial \ell}{\partial W}$, $\frac{\partial m}{\partial w}$, and $\frac{\partial \ell}{\partial w}$. From equation $(4)$, we calculate:

$$\frac{\partial m}{\partial W} = \frac{2}{\sqrt{(2*\tau_1+\tau_2)^2 - 4(\tau_1)^2 + 4\tau_1 * \left(W + 2w - \left(\frac{w\alpha}{(1-\alpha)}\right)^{1/2}\right)}} > 0$$

From equation $(5)$, we calculate: $\frac{\partial \ell}{\partial W} = \frac{\partial m}{\partial W}\left(\frac{w\alpha}{(1-\alpha)}\right)^{-1/2} > 0$

The effect of wage rate on the professional search is:

$$\frac{\partial m}{\partial w} = \frac{\tau_4 + (2\tau_4\tau_2 + 8\tau_1)\left[(2*\tau_1+\tau_2)^2 - 4(\tau_1)^2 + 4\tau_1 * \left(W + 2w - \left(\frac{w\alpha}{(1-\alpha)}\right)^{1/2}\right)\right]^{-1/2}}{2\tau_1} > 0$$

Here $\tau_4 = \frac{\alpha}{2*(1-\alpha)}\left(\frac{w\alpha}{(1-\alpha)}\right)^{-1/2}$. And finally, in Supplementary B we calculate the effect of wage rate on the informal search variable.

$$\frac{\partial \ell}{\partial w} = \frac{\alpha/(1-\alpha)}{4\tau_1}\left(1 - \frac{2*\tau_1}{\tau_2} + \frac{4\tau_1 W}{\tau_2^{\,2}} + \frac{8(1-\alpha)\tau_1}{\alpha}\right)^{-1/2}\left(-\tau_1\left(\frac{w\alpha}{(1-\alpha)}\right)^{-3/2} - 4\tau_1 W\left(\frac{w\alpha}{(1-\alpha)}\right)^{-2}\right) < 0$$

In our model, the return on stocks is a function of informal and professional searches. To show the positive correlation we need to show that the informal and professional searches are increasing with respect to wealth. Since $\frac{\partial m}{\partial W} > 0$ and $\frac{\partial \ell}{\partial W} > 0$, an increase on the net wealth $W$ increases the informal and professional searches, which increases the expected return on stocks. But search is also a function of wage rate. We find that there is a negative relationship between wage rate and informal search, which explains why wealthy investors employ fewer informal searches. Remember, there is a positive correlation between labor earnings and wealth. Wealthy investors have more benefit of search, but their time opportunity cost is high so they search less informal. There are two effects that are working in two different directions, and which effect is dominant depends on the magnitude of the two affects.

To sum up, we are able to demonstrate the search wealth relationship as well as the search wage rate relationship. Fact 2 demonstrates that wealthy households have different search patterns than poor households. Wealthy investors have fewer informal searches than their poorer counterparts because they have higher wage rates but they have a higher professional search. On the other hand, we cannot illustrate the wealth return relationship because it depends on investors' search productivity $\alpha$, wage rate $w$, and wealth $W$. Of course, if we control for the search productivity $\alpha$ and wage rate $w$ then we learn that wealthy investors have a higher return on their stocks. In the next section, we estimate the search productivity and examine how much search contributes to the discrepancy.

### 4.3 Demonstration of financial fact 3

In financial fact 3 we find that there is a complementary relationship between financial risk bearing and the search effort. To illustrate financial fact 3, we extend our model by introducing another riskless asset called a bond where the return on this asset is deterministic and equal to $R^f$, where $R^L < R^f < R^H$. Here is the formal model:[26]

[26] It is important to mention that by setting parameters for the model and simulating data on wealth, financial facts 1 and 2 still hold.

$$\underset{c,s,b,m,0\le\ell\le1}{Max}\ U(c)+\beta\left\{p^H(\ell,m)U\left(c^H\right)+\left(1-p^H(\ell,m)\right)U\left(c^L\right)\right\}$$

$S.T$

$$c+s+b\le w(1-\ell)+W-I(s)F-m$$

$$c^H=R^f b+R^H s,\qquad c^L=R^f b+R^L s$$

$$m\ge 0,\qquad R=\left\{R^L,R^H\right\},\qquad p^H(\ell,m)\quad is\quad given$$

Here $F$ is a fixed cost participation in the stock market, and $I(s)$ is an indicator function that takes the value of one only if the investor holds a positive amount of stocks; otherwise it is zero.

In Supplementary (C), we solve the model by taking the first order conditions. Here is the analysis of the results in the case of interior solution:

$$(12)\qquad \frac{1}{p^H}\widetilde{R}-\widetilde{R}=\left(R^f\frac{b}{s}+R^L\right)/\left(R^f\frac{b}{s}+R^H\right)$$

Here, $\widetilde{R}=\left(R^f-R^L\right)/\left(R^H-R^f\right)$. A decrease in the ratio $\frac{b}{s}$ increases the risk in the portfolio and decreases the right term $\left(R^f\frac{b}{s}+R^L\right)/\left(R^f\frac{b}{s}+R^H\right)$. To maintain the equality in equation $(12)$, the informal or professional search has to increase, which decreases the quantity $\frac{1}{p^H}\widetilde{R}-\widetilde{R}$. Therefore, the relationship between the stock bonds ratio and the informal and professional searches is complementary. As the ratio of bonds to stocks decreases, the portfolio becomes more risky, and then an investor increases both the amount of informal and professional searches ( $p^H$ increases, thus, the quantity $-\widetilde{R}+\widetilde{R}/p^H$ decreases) so equation $(12)$ holds. That is what we introduced in financial fact 3: financial risk bearing and search are complementary.

# 5. Conclusion

We have focused on three facts characterizing U.S. investors' behavior toward risk and searches. First, wealthy investors have a higher risk adjusted return in their stocks. Second, investors who are willing to bear higher financial risk employ greater search effort; this fact leads us to believe there is a complementary relationship between search intensity and financial risk bearing. Third, wealthy investors adopt search strategies that are more productive than those adopted by the less wealthy. We believe this paper presents an innovative empirical study on search for stock, and will be useful when placed together with other empirical search studies, such as search for job. The unique element in the search for stock that differs from other search families is the financial risk bearing for investors which influences the search strategy.

This study has implications on different areas in macroeconomics studies that use financial indexes instead of households' actual returns. For example, Mankiw and Zeldes (1991) and Vissing-Jørgensen (2002) assume all stockholders own the market portfolio when they estimate the elasticity of intertemporal substitution for stockholders with different wealth levels. This paper suggests that their results would be different if they account for the heterogeneity on household portfolio returns. Finally, this study can be complementary to Markowitz's mean-variance efficient frontier study. The relationship between our search and risk bearing theory and Markowitz's mean-variance efficient frontier is that the more intense the search is, the closer the expected portfolio's return to Markowitz's mean-variance efficient frontier.

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# Supplementary

## A. Solving the closed form solution

Recall first order condition $(1)$:

$$-U'(c)+\beta\{p^H(\ell,m)R^H U'(c^H)+(1-p^H(\ell,m))R^L U'(c^L)\}=0$$

$$\beta\left\{\frac{p^H R^H}{R^H s}+\frac{(1-p^H)R^L}{R^L s}\right\}=\frac{1}{c}$$

So, $\frac{\beta}{s}=\frac{1}{c}$ or $c=\frac{s}{\beta}$. But $c=W+w(1-\ell)-F-s-m$, then;

$$\beta(W+w(1-\ell)-F-s-m)=s$$

(6) $$\frac{\beta(W+w(1-\ell)-F-m)}{(1+\beta)}=s$$

Recall first order condition $(3)$:

$$-U'(c)+\beta\{P_m^H(\ell,m)\ [U(c^H)-U(c^L)]\}=0$$

But, $U(c^H)-U(c^L)=\ln(s'R^H/s'R^L)=\ln(R^H/R^L)$, thus;

$$\beta\{P_m^H(\ell,m)\ln(sR^H/sR^L)\}=\frac{1}{c}=\frac{\beta}{s}$$

$$P_m^H(\ell,m)\ln(R^H/R^L)=\frac{1}{s}$$

(7) $$s=\frac{(1+m)^2}{\ln(R^H/R^L)\ (1-\alpha)}$$

From equation $(6)$ and $(7)$:

$$\frac{\beta(W+w(1-\ell)-F-m)}{(1+\beta)}=\frac{\beta(W+w-F-m)}{(1+\beta)}-\frac{\beta(w\ell+m)}{(1+\beta)}=\frac{(1+m)^2}{\ln(R^H/R^L)\,(1-\alpha)}$$

But from FOC 3 and 4: $\frac{p_\ell^H(\ell,m)}{p_m^H(\ell,m)}=w$ or $\frac{\alpha(1+m)^2}{(1+\ell)^2(1-\alpha)}=w$

$$\ell=(1+m)\left(w\frac{(1-\alpha)}{\alpha}\right)^{-1/2}-1$$

Thus, $$w\ell=w(1+m)\left(\frac{\alpha}{w(1-\alpha)}\right)^{1/2}-w=(1+m)\left(\frac{w\alpha}{(1-\alpha)}\right)^{1/2}-w$$

So;

$$W+w-w\ell-F-m=W+w-(1+m)\left(\frac{w\alpha}{(1-\alpha)}\right)^{1/2}+w-F-m=W+2w-\left(\frac{w\alpha}{(1-\alpha)}\right)^{1/2}-m\left(\frac{w\alpha}{(1-\alpha)}\right)^{1/2}$$

$$\frac{\beta(W+w-w\ell-F-m)}{(1+\beta)}=\frac{(1+m)^2}{\ln(R^H/R^L)\,(1-\alpha)}$$

$$(W+w-w\ell-F-m)=\frac{(1+\beta)}{\beta}\frac{(1+m)^2}{\ln(R^H/R^L)\,(1-\alpha)}$$

$$W+2w-\left(\frac{w\alpha}{(1-\alpha)}\right)^{1/2}-m\left(\frac{w\alpha}{(1-\alpha)}\right)^{1/2}=\frac{(1+\beta)}{\beta}\frac{(1+m)^2}{\ln(R^H/R^L)\,(1-\alpha)}$$

Denote: $\tau_1=\frac{(1+\beta)}{\beta(1-\alpha)\ln(R^H/R^L)}$, $\tau_2=\left(\frac{w\alpha}{(1-\alpha)}\right)^{1/2}$, and $\tau_3=W+2w-\left(\frac{w\alpha}{(1-\alpha)}\right)^{1/2}-F$

Then; $$\tau_3-\tau_2*m=\tau_1+\tau_1*2m+\tau_1*m^2$$

$$0=\tau_1*m^2+m(2*\tau_1+\tau_2)+\tau_1-\tau_3$$

$$m=-(2*\tau_1+\tau_2)+\sqrt{(2*\tau_1+\tau_2)^2-4\tau_1*(\tau_1-\tau_3)}$$

$$m = \frac{-(2*\tau_1+\tau_2)+\sqrt{(2*\tau_1+\tau_2)^2-4(\tau_1)^2+4\tau_1*\left(W+2w-F-\left(\frac{w\alpha}{(1-\alpha)}\right)^{1/2}\right)}}{2*\tau_1}$$

## B. The derivative of informal search with respect to wage rate.

Recall equation $(5)$: $\ell = (1+m)\left(w\frac{(1-\alpha)}{\alpha}\right)^{-1/2} - 1 = (1+m)\frac{\alpha/(1-\alpha)}{\tau_2} - 1$

From equation $(4)$ and the above equation, $(5)$, the informal search is:

$$\ell = \frac{-\tau_2+\sqrt{(2*\tau_1+\tau_2)^2-4(\tau_1)^2+4\tau_1*(W+2w-\tau_2)}}{2*\tau_1} * \frac{\alpha/(1-\alpha)}{\tau_2} - 1$$

$$\ell = \frac{\alpha/(1-\alpha)\sqrt{(2*\tau_1+\tau_2)^2-4(\tau_1)^2+4\tau_1*(W+2w-\tau_2)}}{2*\tau_1*\tau_2} - \frac{\alpha/(1-\alpha)}{2\tau_1} - 1$$

$$\ell = \frac{\alpha/(1-\alpha)\sqrt{4\tau_1^{\ 2}+2*\tau_1*\tau_2+\tau_2^{\ 2}-4\tau_1^{\ 2}+4\tau_1*(W+2w-\tau_2)}}{2*\tau_1*\tau_2} - \frac{\alpha/(1-\alpha)}{2\tau_1} - 1$$

$$\ell = \frac{\alpha/(1-\alpha)\sqrt{-2*\tau_1*\tau_2+\tau_2^{\ 2}+4\tau_1*(W+2w)}}{2*\tau_1*\tau_2} - \frac{\alpha/(1-\alpha)}{2\tau_1} - 1$$

$$\ell = \frac{\alpha/(1-\alpha)}{2\tau_1}\sqrt{\frac{-2*\tau_1*\tau_2+\tau_2^{\ 2}+4\tau_1*(W+2w)}{\tau_2^{\ 2}}} - \frac{\alpha/(1-\alpha)}{2\tau_1} - 1$$

$$\ell = \frac{\alpha/(1-\alpha)}{2\tau_1}\sqrt{1-\frac{2*\tau_1}{\tau_2}+\frac{4\tau_1*(W+2w)}{\tau_2^{\ 2}}} - \frac{\alpha/(1-\alpha)}{2\tau_1} - 1$$

$$\ell = \frac{\alpha/(1-\alpha)}{2\tau_1}\sqrt{1-\frac{2*\tau_1}{\tau_2}+\frac{4\tau_1 W}{\tau_2^{\ 2}}+\frac{8\tau_1 w}{\tau_2^{\ 2}}} - \frac{\alpha/(1-\alpha)}{2\tau_1} - 1$$

$$\ell = \frac{\alpha/(1-\alpha)}{2\tau_1}\sqrt{1-\frac{2*\tau_1}{\tau_2}+\frac{4\tau_1 W}{\tau_2^{\ 2}}+\frac{8(1-\alpha)\tau_1}{\alpha}} - \frac{\alpha/(1-\alpha)}{2\tau_1} - 1$$

The derivative of informal search with respect to wage rate is:

$$\frac{\partial \ell}{\partial w}=\frac{\alpha/(1-\alpha)}{4\tau_1}\left(1-\frac{2*\tau_1}{\tau_2}+\frac{4\tau_1 W}{\tau_2^{\ 2}}+\frac{8(1-\alpha)\tau_1}{\alpha}\right)^{-1/2}\left(-\tau_1\left(\frac{w\alpha}{(1-\alpha)}\right)^{-3/2}-4\tau_1 W\left(\frac{w\alpha}{(1-\alpha)}\right)^{-2}\right)<0$$

## C. Solving the model with two types of assets: bond and stocks.

The first order condition with respect to $s, b, \ell$, and $m$ are as follows, respectively:

$$(8) \qquad -U'(c)+\beta\left\{p^H(\ell,m)R^H U'(c^H)+\left(1-p^H(\ell,m)\right)R^L U'(c^L)\right\}=0, \quad < \;\Rightarrow\; s=0$$

$$(9) \qquad -U'(c)+\beta R^f\left\{p^H(\ell,m)U'(c^H)+\left(1-p^H(\ell,m)\right)U'(c^L)\right\}=0, \quad < \;\Rightarrow\; b=0$$

$$(10) \qquad -wU'(c)+\beta\left\{P_\ell^H(\ell,m)\left[U(c^H)-U(c^L)\right]\right\}=0, \quad < \;\Rightarrow\; \ell=0$$

$$(11) \qquad -U'(c)+\beta\left\{P_m^H(\ell,m)\left[U(c^H)-U(c^L)\right]\right\}=0, \quad < \;\Rightarrow\; m=0$$

Notice from the first order conditions $(10)$ and $(11)$ we derive the same relationship between informal and professional searches that we derived on equation $(5)$.

By combining equations $(8)$ and $(9)$ we have:

$$\left\{p^H(\ell,m)R^H U'(c^H)+\left(1-p^H(\ell,m)\right)R^L U'(c^L)\right\}=R^f\left\{p^H(\ell,m)U'(c^H)+\left(1-p^H(\ell,m)\right)U'(c^L)\right\}$$

Again, we assume that $U(c)=\ln c$, thus:

$$\left\{\frac{p^H(\ell,m)R^H c^L+\left(1-p^H(\ell,m)\right)\,R^L c^H}{c^H c^L}\right\}=R^f\left\{\frac{p^H(\ell,m)c^L+\left(1-p^H(\ell,m)\right)\,c^H}{c^H c^L}\right\}$$

$$p^H R^H c^L+\left(1-p^H\right)R^L c^H=R^f p^H c^L+R^f\left(1-p^H\right)c^H$$

$$c^L p^H\left(R^H-R^f\right)=c^H\left(1-p^H\right)\left(R^f-R^L\right)$$

Let us define $\widetilde{R}=\dfrac{\left(R^f-R^L\right)}{\left(R^H-R^f\right)}$ and $\tau_4=\dfrac{\left(1-p^H\right)}{p^H}\widetilde{R}$, then, $c^L=\tau_4 * c^H$.

but: $\qquad c^H=R^f b+R^H s, \qquad c^L=R^f b+R^L s$

Then, $R^f b + R^L s = \left(R^f b + R^H s\right) * \tau_4$, divide both sides by $s$, then we have:

$$R^f \frac{b}{s} + R^L = \left(R^f \frac{b}{s} + R^H\right) * \tau_4$$

And then; $\dfrac{R^f \frac{b}{s} + R^L}{\left(R^f \frac{b}{s} + R^H\right)} = \tau_4$. But $\tau_4 = \dfrac{\left(1 - p^H\right)}{p^H} \widetilde{R} = \dfrac{1}{p^H} \widetilde{R} - \widetilde{R}$

Finally,

$$(12) \qquad \frac{1}{p^H} \widetilde{R} - \widetilde{R} = \frac{R^f \frac{b}{s} + R^L}{\left(R^f \frac{b}{s} + R^H\right)}$$

**Table 1.1: Descriptive statistics of stock and non-stockholders – SCF 1998**

| Variable | Median | Mean | Standard Deviation | Minimum | Maximum |
|---|---|---|---|---|---|
| **Panel A – Stockholders** | | | | | |
| Gross wealth (thousands $) | 281.8 | 862.2 | 3,847.3 | -15,200 | 515,000 |
| Net wealth (thousands $) | 271.4 | 780.3 | 3,460.9 | -16,000 | 489,000 |
| Stock holding (thousands $) | 18.0 | 159.7 | 1,296.2 | 0.0 | 300,000 |
| Age | 49 | 50.9 | 15.6 | 20.0 | 95.0 |
| Education | 15 | 14.5 | 2.3 | 1.0 | 17.0 |
| **Panel B – Non-stockholders** | | | | | |
| Gross wealth (million $) | 47.6 | 146.4 | 748.8 | -1,071.4 | 456,000 |
| Age | 45 | 48.2 | 17.7 | 17.0 | 95.0 |
| Education | 12 | 12.7 | 3.0 | 1.0 | 17.0 |

**Gross Wealth** consists of assets minus debt.

Assets include financial nonfinancial assets. Financial assets include stocks, bonds, CDs, and T-bills, whereas nonfinancial assets include a vehicle or house.

Debt is defined as: mortgage debt, home equity loans, debt for other residential property, nonresidential real estate, credit card debt, loans against pensions, loans against life insurance, margin loans, and miscellaneous.

**Net wealth** is the same as the gross wealth variable from the previous definition minus (plus) the unrealized gains (losses) from stocks minus income from dividend.

**Stock holding** corresponds to the total market value of stock in dollars.

**Age** represents the number of years old.

**Education** reports the highest grade of school or year of college completed.

**Table 1.2: Reported methods of search effort**

| Number | Search choice | Fraction | (Std) |
|---|---|---|---|
| **A. Informal search** | | | |
| 1 | Calling around | 0.192 | 0.394 |
| 2 | Magazines/newspapers | 0.322 | 0.467 |
| 3 | Material in the mail | 0.115 | 0.319 |
| 4 | Television/radio | 0.118 | 0.322 |
| 5 | Online Service/internet | 0.164 | 0.370 |
| 6 | Advertisement | 0.120 | 0.325 |
| 7 | Friend or Relative | 0.377 | 0.485 |
| 8 | Self/spouse/partner | 0.153 | 0.360 |
| 9 | Material from work/business contacts | 0.024 | 0.153 |
| 10 | Investment club | 0.001 | 0.035 |
| 11 | Other personal research | 0.007 | 0.086 |
| **B. Professional search** | | | |
| 12 | Lawyer | 0.051 | 0.221 |
| 13 | Accountant | 0.160 | 0.366 |
| 14 | Banker | 0.217 | 0.412 |
| 15 | Broker | 0.243 | 0.429 |
| 16 | Financial planner | 0.294 | 0.456 |
| 17 | Investment seminars | 0.001 | 0.036 |
| 18 | Insurance agent | 0.003 | 0.054 |

**Table 1.3: The mean, standard deviation, and difference of informal and professional search variables by stockholders and non stockholders**

| Search method | Stock-holders | Non stockholders | Diff Std. Err. | t-statistic |
|---|---|---|---|---|
| Informal search | 1.588<br>(1.564) | 1.235<br>(1.322) | 0.353<br>(0.020) | 17.254* |
| Professional search | 0.968<br>(0.914) | 0.589<br>(0.785) | 0.379<br>(0.012) | 31.359* |
| Sum of all methods used | 2.556<br>(1.772) | 1.823<br>(1.553) | 0.732<br>(0.023) | 30.878* |

*Significant at 1 percent level.

**Table 1.4: Average net wealth comparison between investors with a positive return and households with negative returns on stocks.**

| Year | Average net wealth | | Difference (Std. Err.) | t-test |
|---|---|---|---|---|
| | $r_h^T > 0$ | $r_h^T <= 0$ | | |
| 1989 | 610,984<br>(33,802) | 438,364<br>(49,151) | 172,620<br>(80,445) | 2.146 |
| 1992 | 596,221<br>(35,857) | 372,228<br>(47,332) | 223,993<br>(84,118) | 2.662 |
| 1995 | 695,024<br>(3,199,948) | 390,150<br>(1,886,320) | 304,874<br>(125,149) | 2.436 |
| 1998 | 885,056<br>(3,753,672) | 626,305<br>(4,762,232) | 258,751<br>(151,138) | 1.712 |
| 2001 | 1,265,290<br>(4,691,032) | 814,473<br>(2,416,502) | 450,817<br>(102,268) | 4.408 |
| 2004 | 1,394,277<br>(5,415,234) | 882,151<br>(2,509,134) | 512,126<br>(129,856) | 3.943 |

**Table 1.5: Regression estimates of the annual rate of returns and wealth.**

| Explanatory variables | Gross wealth | Net wealth |
|---|---|---|
| $\ln$ Gross wealth | 0.048* | - |
| $\ln$ Net wealth | - | 0.035* |
| Age | -0.017* | -0.013** |
| Age Square | 0.001*** | 0.001 |
| Education (years school) | -0.961* | -0.960* |
| Education Square | 0.034* | 0.034* |
| Race (one if white) | 0.071 | 0.075 |
| Gender (one if male) | 0.055 | 0.057 |
| Marital status (one if married) | 0.006 | 0.001 |
| Kids | -0.067* | -0.065* |
| Constant | 6.831* | 6.859* |
| **R-squared** | 0.1445 | 0.1398 |

* Significant at 1 percent level. ** Significant at 5 percent level. *** Significant at 10 percent level.

**Table 1.6: Regression estimates of the portfolio returns over explanatory variables**

| Explanatory variables | The results by year | | |
|---|---|---|---|
| | **1998** | **2001** | **Pool** |
| Net wealth (Millions) | 1.095<br>(0.422) | 0.907<br>(0.520) | 1.039<br>(0.413) |
| Age | -0.030<br>(0.245) | -0.779<br>(0.326) | 0.004<br>(0.261) |
| Age square/100 | -0.149<br>(0.243) | 0.623<br>(0.306) | -0.183<br>(0.258) |
| Edu1 (high school or below) | 0.952<br>(1.743) | 5.800<br>(2.460) | 0.623<br>(1.853) |
| Edu2 (some college) | 0.974<br>(1.368) | 2.194<br>(2.121) | 0.935<br>(1.454) |
| Edu3 (college graduate) | -1.695<br>(1.188) | 1.779<br>(1.989) | -2.044<br>(1.263) |
| Race (one if white) | -1.892<br>(1.564) | -6.472<br>(2.548) | -1.841<br>(1.663) |
| Constant | 20.509<br>(6.023) | 23.999<br>(8.728) | 19.314<br>(6.404) |
| **R-squared** | 0.0394 | 0.0336 | 0.0370 |

**Table 1.7: Search choices of top wealthy quartile and bottom wealthy quartile stockholders: fractions, standards, differences, and the t-statistics.**

| Variable | Fraction (Std) | | Difference Std. Err. | t-statistics for Difference |
|---|---|---|---|---|
| | Top 25 percent | Bottom 25 percent | | |
| Sum informal search (Std. Dev) | 1.580<br>(1.621) | 1.617<br>(1.575) | -0.037<br>(0.065) | -0.568 |
| Sum professional (Std. Dev) | 1.253<br>(1.029) | 0.677<br>(0.758) | 0.576<br>(0.040) | 14.331* |
| Sum of all methods used | 2.833<br>(1.891) | 2.294<br>(1.747) | 0.539<br>(0.075) | 7.139* |

* Significant at 1 percent level. ** Significant at 5 percent level.

**Table 1.8: Search choices of stockholders who are willing to take substantial financial risk (column (1)) versus stockholders who report that they are not willing to take any financial risk (column (2)): fractions, standards, differences, and the t-statistics.**

| Search Measure | Fraction (Std) | | Difference in mean (Std. Err.) | t-statistics for Difference |
|---|---|---|---|---|
| | (1) | (2) | | |
| Sum informal search (Std. Dev) | 2.247<br>(1.675) | 1.029<br>(1.072) | 1.218<br>(0.078) | 15.579* |
| Sum professional (Std. Dev) | 0.968<br>(1.064) | 0.705<br>(0.679) | 0.263<br>(0.049) | 5.300* |
| Sum of all methods used | 3.216<br>(1.942) | 1.735<br>(1.069) | 1.481<br>(0.087) | 16.988* |

* Significant at 1 percent level. *** The same statistics like the material from work/business contacts.

**Table 1.9: Regression estimates of the bonds/stocks ratio over explanatory variables**

| Explanatory Variables | Dependent Variable: The return on stock | | |
|---|---|---|---|
| | **Coefficient** | **Std.** | **P>\|t\|** |
| Informal Search | -0.664 | 0.190 | 0.000 |
| Professional search | -1.626 | 0.747 | 0.030 |
| Age | -0.133 | 0.057 | 0.021 |
| Education (year of schooling) | -1.007 | 0.376 | 0.007 |
| Race (one if white) | 4.442 | 1.727 | 0.010 |
| Marital status (one if married) | 2.790 | 1.178 | 0.018 |
| Gender | -0.708 | 1.005 | 0.481 |
| Constant | 23.901 | 8.287 | 0.004 |

**Table 1.10: The estimation results of the return on stocks.**

| Explanatory variables | **Return on stocks** (dependent) | **Participation** (selection) |
|---|---|---|
| Informal search | 0.037* | 0.072* |
| Professional search | 0.101* | 0.096* |
| Age | -0.035* | -0.017* |
| Age square/100 | 0.023* | 0.009** |
| Education | 0.024* | 0.052* |
| Race | 0.231* | 0.190* |
| ln Gross wealth | 0.382* | 0.341* |
| ln (1+Wage rate) | 0.376* | 0.334* |
| Future interest rate (one if high) | - | -0.037* |
| Constant | -5.365* | -5.222* |
| Inverse Mills ratio | 1.214* | |

* Significant at 1 percent level. ** Significant at 5 percent level.

**Table 1.11: The average informal and professional search productivity by quartile**

| **Average search productivity** | **Search Productivity by Quartile** | | |
|---|---|---|---|
| | **Top Quartile** | **Bottom Quartile** | **Diff** |
| Informal - $\Delta\ell$ | 0.011 | 0.0001 | 0.0109 |
| Professional - $\Delta m$ | 0.066 | 0.038 | 0.028 |
| The average search productivity $SP$ - (percent) | 10.01<br>(0.084) | 2.58<br>(0.068) | 7.42*<br>(0.003) |

* Significant at 1 percent level.

# Chapter 2

# Estimating the Elasticity of Intertemporal Substitution with Household-Specific Portfolios

**Abstract**

This paper estimates the elasticity of intertemporal substitution (EIS), allowing for household-specific portfolio. Previous studies that estimated the EIS used financial indexes as a proxy for the risky return on a representative household portfolio. According to the latest data from the 2004 Survey of Consumer Finances, however, the median US stockholders who own stocks directly hold only 3 stock securities. If a large fraction of stockholders do not own a financial index and hold only few individual stocks, then how does that affect inference about household risk aversion? We estimate the EIS using the log-linearized Euler equation derived by Hansen and Singleton (1983) and accounting for household-specific portfolio choice instead of a financial index. Our results show two main findings. First, financial indexes are not a proper substitute for household-specific portfolio. Second, we find support for the standard representative agent assumption that there is a high degree of homogeneity in the EIS across households with different wealth levels (the EIS approximately is 0.22). Our findings have implications for models that assess the comovement between consumption and return on stocks since the value of EIS reflects the comovement level. We argue that a consideration of financial indexes instead of household-specific portfolio explains the small comovement puzzle introduced by Mankiw and Zeldes (1991).

Keywords: Asset pricing, portfolio choice, heterogeneous agents, and risk aversion.
JEL Classification: G10, G11, G12.

# 1. Introduction

The elasticity of intertemporal substitution (EIS) is considered one of the main behavioral parameters in macroeconomics and financial economics. The magnitude of the EIS is central for policy analysis and for a host of economic issues including: (1) The value of the EIS determines the consumption saving decisions, since it measures the sensitivity of changes in the expected consumption growth rate in response to changes in the expected return on the portfolio (interest rate) for a typical stockholder (bondholder). (2) The effectiveness of fiscal and monetary policies depends on the level of the EIS. Specifically, the higher the value of the EIS, the less effective fiscal policy, and the higher the value of the EIS the more effective monetary policy in increasing output (see Hall [1988]). (3) The EIS plays a key role in fitting the data in a real business cycle. The value of the EIS is a central determinant of the level and volatility of interest rates over the business cycle.

Two generations of empirical studies estimated the EIS based on asset pricing models developed by Lucas (1978), Breeden (1979), and Brock (1982). The first generation employed the representative agent assumption and used per capita consumption growth and found that the EIS is small and perhaps close to zero (see Hall [1988] who summarizes the evidence up to the late 80s). The second generation accounts for heterogeneity in the consumption growth rates across households and showed: (i) the EIS is significantly greater than zero and (ii) wealthy stockholders have a higher EIS than their poorer counterparts (see Attanasio and Browning [1995] and Vissing-Jørgensen [2002]). Both generations used a financial index (the Standard and Poor [S&P], the New

York Stock Exchange [NYSE], or the 25 Fama and French portfolio) as a proxy for household-specific portfolio.

Do households hold the portfolio which comprises the financial index? A variety of data resources have shown that investors who own stocks directly hold only few stocks in their portfolios. Conine, Jensen, Tamarkin (1989), and Polkovnichenko (2005) summarize studies that account for portfolio diversity and argue that the majority of individual investors in the U.S. hold highly undiversified portfolios. Moreover, Barber and Odean (2000) and Goetzmann and Kumar (2001) utilize data at a brokerage firm with more than 60,000 stock accounts in the period between 1991 and 1996 and find that the mean number of stocks in a portfolio was four and the median was three.[27] Studies by Calvet et. al (2006) and Bonaparte (2006) show that as a result of the heterogeneity in households' portfolios, wealthy stockholders have higher Sharpe ratios. If a large fraction of stockholders do not own a financial index and hold only few individual stocks, then how does that affect our inference about how willing households are to substitute consumption over time for the incentives that asset returns present?

The purpose of this paper is to estimate the EIS using a household-specific portfolio instead of a financial index.[28] In the absence of appropriate U.S. data on consumption and asset holdings at the household level over time, estimating the EIS brings some econometric challenges. Although some U.S. data sets that provide micro panel data on nondurable consumption, these data sets provide little information on households' portfolios. Specifically, the Panel Study of Income Dynamics (PSID) provides panel data

[27] See Statman (2004) for literature review of the diversification puzzle, wherein households own only a few individual stocks.
[28] Gruber (2005) conducts a tax-based estimate of the EIS for bondholders and shows that even the T-bill cannot be a good proxy for bondholders because households face different tax rates.

on food consumption and the Consumer Expenditure Survey (CEX) provides quarterly data on consumption. The Survey of Consumer Finance (SCF) is the only available U.S. data that provides substantial details on households' portfolio allocation and diversification. Unfortunately, the SCF is not a panel and does not have information on consumption.

Our methodology for estimating the EIS follows three steps and uses a two-sample approach in order to characterize household-specific portfolio and consumption.[29] In the first step, we use the comparable financial data that is provided in surveys of the SCF to characterize household-specific portfolio. In the second step, we match these portfolio characteristics into the CEX data, and then impute the rate of returns on stocks from two data sets to the CEX based on the observable portfolio characteristics.[30] In the third step, we employ the generalized method of moments (GMM) and estimate the EIS using household-specific portfolio returns.

We consider Vissing-Jørgensen's (2002) results as a benchmark to our estimation of the EIS. While Vissing-Jørgensen (2002) allows heterogeneity in households' consumption growth rate, she uses a representative market portfolio (specifically the NYSE index). Our results indicate that there is a bias in estimating the EIS when we assume that all stockholders hold a financial index. In particular, there is a downward-bias in the EIS for poor stockholders and an upward-bias for the wealthy stockholders. These measurement biases are statistically significant, which means that financial indexes are not a good proxy for household-specific portfolio.

[29] Moskowitz, Vissing-Jørgensen, and Malloy (2006) and Gruber (2005) also employ this two-sample approach to characterize households' portfolios of stocks and bonds in the CEX.
[30] Specifically, for direct holdings of stocks we use Household Account Data (HAD) and for indirect holdings we use the CRSP index.

Another important result is that there is a high degree of homogeneity in the EIS for stockholders with different wealth levels. Contrary to previous studies, this paper shows that wealthy stockholders are not less averse to risk than their poorer counterparts. Our findings strengthen the representative agent assumption that households have a high degree of homogeneity in their risk preference.

The economic intuition behind our results is as follows. Models that allow heterogeneity in the EIS to explain the high concentration of risky assets for wealthy stockholders have not accounted for the effect of size on diversification of stock securities. Although wealthy stockholders hold a relatively large portion of stocks directly (which increase the unsystematic risk), they rebalance and own larger numbers of stock securities in their portfolios (that decreases the unsystematic risk in their portfolios). We show that there is a substitution relationship between the share of indirect stockholdings of assets and the number of stock securities in a portfolio (see Figures 3 and 5). The larger the portion of indirect stockholdings assets in a portfolio is, the smaller the number of stock securities. Due to the substitution relationship, the overall portfolio unsystematic risk for wealthy stockholders does not far exceed the unsystematic risk for poor stockholders, since they own larger selections of stock securities, so their EIS does not have to be larger than their poorer stockholders' counterparts.

Our results have implications for the comovement between consumption growth rate and the return on stocks. Mankiw and Zeldes (1991) introduce the comovement puzzle by finding that the covariance between consumption growth rates and return on stocks is small and stands at 0.0022. This puzzle has implication for the value of EIS since the value of EIS reflects the comovement level between consumption and return on stocks.

We argue that the consideration of financial indexes instead of household-specific portfolio helps to explain the small covariance puzzle.

The rest of the paper is organized as follows. Section 2 presents the econometrics theory problem and the indicated bias attributed to the assumption that all stockholders hold a financial index. Section 3 characterizes U.S. households' portfolios, and Section 4 estimates the EIS accounting for household-specific portfolio. We draw the conclusion that financial indexes are not a proper substitute for households in estimating the EIS in Section 5.

# 2. Households' Portfolio choice

This section develops the econometrics methodology that we employ to estimate the log-linearized Euler equation. First, we solve the household's optimization problem and present the log-linearized Euler equation with household-specific portfolio, and then we examine the bias associated with the assumption that all stockholders hold a financial index.

## 2.1 Household's optimization problem

The following dynamic programming presents household's optimization problem:

$$V\left(a_t^h, y_t^h\right) = \underset{a_{t+1}^h}{Max} \quad U\left(c_t^h\right) + \beta \mathrm{E} V\left(a_{t+1}^h, y_{t+1}^h\right)$$

$$s.t.$$

$$c_t^h + q_t a_{t+1}^h \leq \left(q_t + d_t\right) a_t^h + y_t^h$$

Here $V(\cdot)$ is value function; $a_t^h$ is a vector of asset holdings at period $t$ for household $h$; $y_t^h$ and $c_t^h$ are the levels of real labor income and consumption for household $h$ at period

$t$, respectively; $U(\cdot)$ is the utility from consumption and specified as $U(c_t^h) = \frac{c_t^{h\,1-\alpha}}{1-\alpha}$, where $\alpha$ is the parameter of risk aversion; $\beta$ is the discount factor, and $\mathrm{E}$ is the conditional expectations operator. We assume that there are $N$ assets in the market, and we refer to an asset by the index $i$, $i = 1,...,N$. In real consumption values, we denote $q_t$ and $d_t$ as vectors of prices and distributed dividends associated with the same assets in real consumption values, respectively.

From the above dynamic programming problem, the first-order necessary conditions for the maximization that involve the equilibrium prices of the N securities (see Lucas [1978]; Brock [1982]), are:

$$(1) \qquad \mathrm{E}_t\left[R_{i,t}\frac{U'(c_{t+1}^h)}{U'(c_t^h)}\right] = 1/\beta; \qquad i = 1,...,N,$$

Here $R_{i,t}$ denote the net return on the $i$th security from period $t$ to $t+1$.

Let $\varpi_{i,t}^h$ denote the share (weight) of asset $i$ from the overall portfolio for household $h$, and $\sum_{i=1}^{N}\varpi_{i,t}^h = 1$. By multiplying equation $(1)$ for asset $i$ with the comparable weight $\varpi_{i,t}^h$:

$$\mathrm{E}_t\left[\varpi_{i,t}^h R_{i,t}\frac{U'(c_{t+1}^h)}{U'(c_t^h)}\right] = (1/\beta)\varpi_{i,t}^h$$

Summing up over asset $i$:

$$\sum_{i=1}^{N}\mathrm{E}_t\left[\varpi_{i,t}^h R_{i,t}\frac{U'(c_{t+1}^h)}{U'(c_t^h)}\right] = (1/\beta)\sum_{i=1}^{N}\varpi_{i,t}^h$$

$$\Leftrightarrow \qquad \mathrm{E}_t\left[\sum_{i=1}^{N} \varpi_{i,t}^{h} R_{i,t} \frac{U'\left(c_{t+1}^{h}\right)}{U'\left(c_t^{h}\right)}\right] = 1/\beta$$

We define household's portfolio return as $R_t^h = \sum_{i=1}^{N} \varpi_{i,t}^{h} R_{i,t}$ , then we can write the above equation as:

$$(2) \qquad \mathrm{E}_t\left[R_t^h \frac{U'\left(c_{t+1}^{h}\right)}{U'\left(c_t^{h}\right)}\right] = 1/\beta$$

It is important to mention that in Hansen and Singleton (1983) as well as in Vissing-Jørgensen (2002) the employed weight vector for all households is equal to NYSE index weight.

## 2.2 Bias in estimating the EIS

In this subsection, we examine the bias that comes from the assumption that all stockholders hold the market portfolio. Let $R_t^{Index}$ denote the net return of the financial index from period $t$ to $t+1$. There is a bias term denoted by $\varepsilon_t^h$, where $\varepsilon_t^h R_t^{Index} = R_t^h$. For CRRA utility preference with risk aversion $\alpha$ (the inverse of the EIS with CRRA preference), the Euler equation using the financial index return on assets is:

$$(3) \qquad \mathrm{E}_t\left[\beta\left(\frac{c_{t+1}^{h}}{c_t^{h}}\right)^{-\alpha} R_t^{Index}\right] = 1$$

On the other hand the Euler equation with the true net return, $R_t^h$, is:

$$(4) \qquad \mathrm{E}_t\left[\beta\left(\frac{c_{t+1}^{h}}{c_t^{h}}\right)^{-\alpha} R_t^{h}\right] = 1 \qquad \Leftrightarrow \qquad \mathrm{E}_t\left[\beta\left(\frac{c_{t+1}^{h}}{c_t^{h}}\right)^{-\alpha} \varepsilon_t^h R_t^{Index}\right] = 1$$

Here $\mathrm{E}_t$ is the conditional expectations operator at time $t$. If we assume that $\varepsilon_t^h$ is independent of the index return and consumption then we can rewrite equation $(4)$ as follows:

$$1 = \mathrm{E}_t\left[\beta\left(\frac{c_{t+1}^h}{c_t^h}\right)^{-\alpha}\left(\mathrm{E}_h\varepsilon_t^h\right)R_t^{Index}\right]$$

If, for instance, $\ln\varepsilon_t^h \sim N\left(\mu_\varepsilon, \sigma_\varepsilon^2\right)$, then the moment condition using the index return will be satisfied at a value for the discount factor that will be scaled by the amount $\mathrm{E}_h\varepsilon_t^h = \exp\left(\mu_\varepsilon^h + \frac{1}{2}\sigma_\varepsilon^{h2}\right)$. On the other hand the moment condition will be satisfied at the true value for the risk aversion parameter.

If, on the other hand, $\varepsilon_t^h$ is correlated with the return on the financial index or the consumption growth rate, then the moment condition using the financial index will be satisfied at values that differ for both the discount rate and the risk aversion parameter. The degree of inconsistency depends on the magnitude of the value of $\ln\varepsilon_t^h$ (and/or the quantity $\mu_\varepsilon + \sigma_\varepsilon^2/2$), and the level of correlation between $\varepsilon_t^h$ and the return on the financial index or the consumption growth rate.

# 3. Household-specific portfolio

In this section, we investigate the properties of households' portfolios and show that there is a substitution relationship between the share of indirect stockholdings and the number of stock securities, but first, we present the data sets that we use.

## 3.1 Data

This paper analyzes cross-sectional data from the Survey of Consumer Finance (SCF) for 1989, 1992, 1995, 1998, 2001, and 2004. The SCF provides detailed information on U.S. assets and liabilities, labor force participation, and social demographic characteristics. The survey also collects information on total family earnings and wealth. The actual number of respondents in each survey is approximately 4,300, where for each observation there are another 5 imputed observations. The total number of observations in the full dataset is 21,500. Because the SCF tilts towards the wealthier segment of the economy, the SCF sample weights are employed in the estimation. The weights in the SCF are designed to down-weight the over-sample so that the cases taken together are representative of the population of households. Furthermore, the additional cases in the upper tail tend to make for more efficient estimates of highly skewed variables, as are many wealth variables.

Since this study is mainly concerned with stockholders, our descriptive statistics distinguish between stockholders and non-stockholders. Households may hold stock in publicly traded companies in two different ways: (1) directly through ownership of shares, (2) indirectly through investing in mutual funds, retirement accounts, or other managed assets. The direct holders of publicly-traded stock include those that own stocks in a company where respondents work or have worked and stocks in a company headquartered outside of the United States.

There are two main statistics that characterize households' portfolios: the share of direct stock holdings in the entire portfolio and the number of stock securities. The larger the share of direct holdings of stocks, the larger the risk in the portfolio, and the smaller the number of stock securities, the larger the portfolio risks. The next subsection reports these statistics for households with different wealth levels.[31]

### 3.2 The number and share of direct holdings of stocks securities

The SCF asks households who own publicly traded stocks "In how many different companies do you own stock?" Figure 1 demonstrates the distribution of average number of stocks by wealth level. Figure 1 shows that wealthy stockholders own stocks in many companies. To demonstrate the imperative role that the number of stocks plays on portfolio risks, we use the study by Campbell, Lettau, Malkiel, and Xu (2001) that measures the benefit of diversification and "excess" standard deviation from the market portfolio.[32] In particular, they measure the excess standard deviations of portfolios containing different numbers of stocks by randomly selecting stocks, grouping them into portfolios, and calculating a simple average of portfolio standard deviations across portfolios.

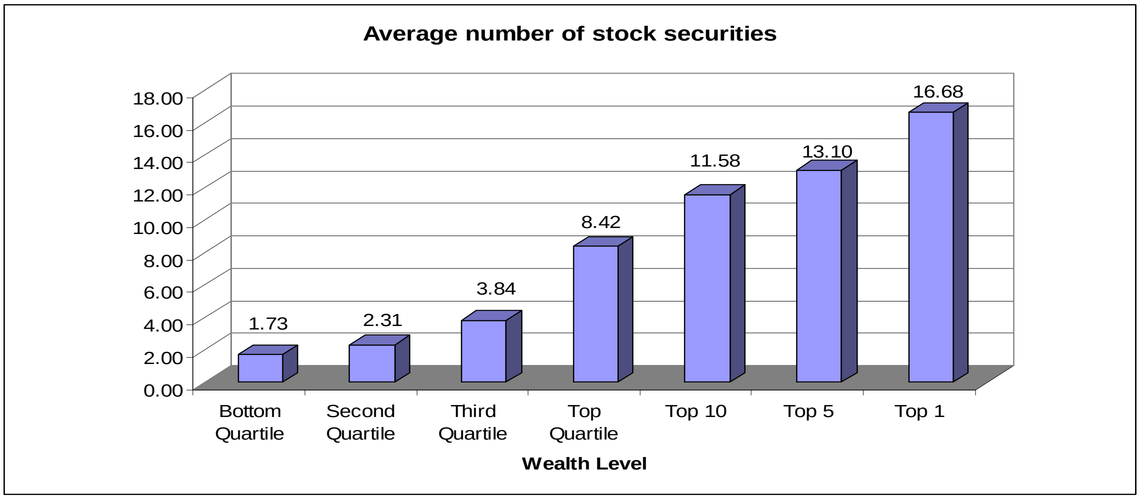


**Figure 1: The average number of stocks by wealth level- SCF years 1989-2004**

[31] See Polkovnichenko (2005) for further details about the properties of U.S. households' portfolios.
[32] The excess standard deviation of a portfolio is the difference between the portfolio's standard deviation and the standard deviation of an equally weighted index.

Figure 2 depicts the annual excess standard deviation for a given number of stocks for sample period 1986–1997.

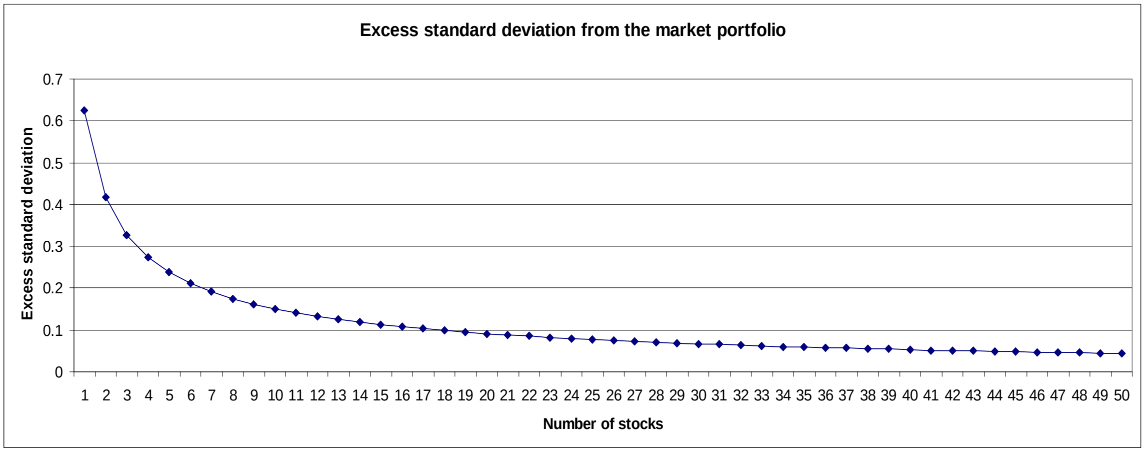


**Figure 2: Excess standard deviation against the number of stocks**

According to the SCF data for years 1998-2004, about one third of households who hold publicly traded stocks have only one stock, which means their excess risk is 63 percent. The median stockholder holds only 2 stocks, which indicates that the excess risk is 42 percent. Campbell et. al. show that a portfolio containing at least 20 stocks attains a large portion of the diversification benefits. According to the SCF for the same years, only 4.2 percent of households who owned publicly traded stocks had 20 stocks or more.

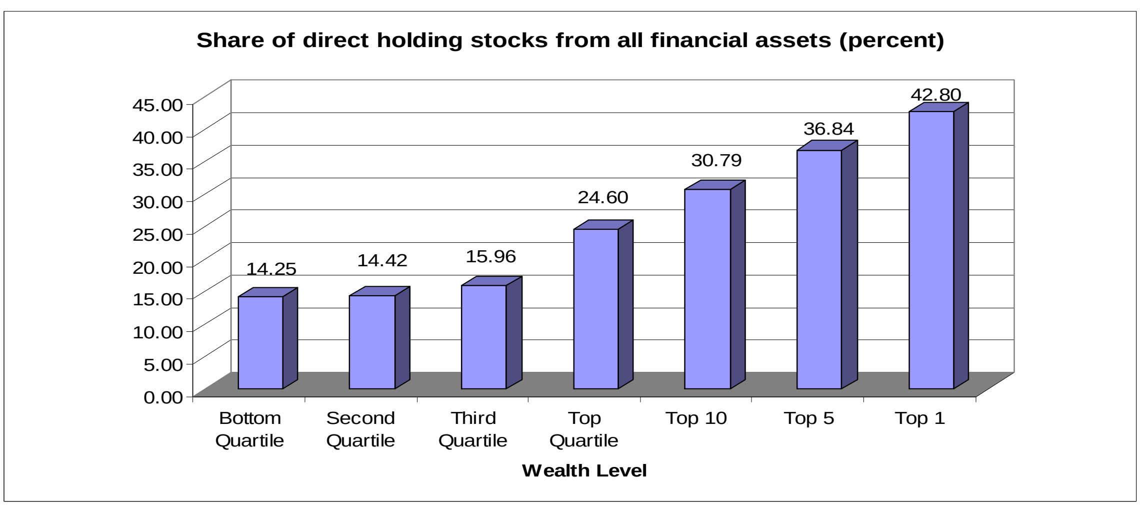


**Figure 3: Share of direct holding of stocks from all financial assets- SCF years 1989-2004**

Next, we report another important statistic, which is the share of direct holdings stocks in the total financial assets (for only stockholders). Figure 3 demonstrates that the share of direct holdings of stocks increases as wealth increases. That means wealthy households bear higher financial risk since they own more risky assets in their portfolios. Figures 1 and 3 demonstrate that there is a substitution relationship between the share of indirect stockholdings assets and the number of stock securities in a portfolio. The smaller the number of stock securities is, the larger the portion of indirect holding assets in a portfolio.

These findings question the validity of financial indexes as a proxy for household-specific portfolio, especially for the less wealthy households who do not have enough diversification in their portfolios.

### 3.4 Household Account Data (HAD)

This data set contains information from a large discount brokerage firm on the investments of 78,000 households from January 1991 through December 1996. The data set contains information on the common stock investments of households and does not include information on investments in mutual funds (both open-end and closed-end), American Depositary Receipts (ADRs), warrants, and options. About 66,465 households have positions in common stocks during at least one month (the remaining households hold either investments in other than individual common stocks or cash). In our sample, the median household holds 2.61 stocks worth $16,210, and the mean household holds 4.3 stocks worth $47,334. It is important to mention that this data used by Barber and

Odean (2000) and Goetzmann and Kumar (2001) and in December 1996, these households held more than $4.5 billion in common stock.

Our main target is to measure the return performance of investments in common stocks by households. We analyze the net performance by accounting for commissions, the bid-ask spread, and the market impact of trades. Using the CRSP (Center for Research in Securities Prices) monthly returns file, we estimate the net monthly return on each common stock investment using the beginning-of-month position statements from our household data. We follow the Barber and Odean's (2000) methodology (see more details in their methodology in Section II, B; page 781) in estimating the monthly net returns. Since the consumption data from the CEX is semiannual, we estimate the semiannual net return for households based on households' characteristics and portfolio properties such as the number of stock securities in the portfolio. We use the average number of stock securities during the semiannual period if the number of securities varies during the 6 months.

# 4. Estimating the EIS

In this section, we estimate the EIS by accounting for household-specific portfolio using a two-sample approach. The two-sample approach is employed in order to characterize households' portfolios, specifically the share of direct holdings of stocks and the numbers of stock securities.

## 4.1 Econometrics procedure

Our methodology follows three steps. Step 1 uses comparable SCF data that is provided in the surveys in 1989, 1992, and 1995 to compute the asset properties of portfolio holdings for households. From the SCF data, we define a variable called the *Share* variable that measures the share of direct stockholding in the entire portfolio (share of stocks in the sum of stocks, mutual funds, retirement accounts and bonds) and another variable called *Number* that measures the number of stock securities. We run regressions and save the regression coefficients. Step 2 utilizes those same characteristics in the CEX along with the regression coefficients from the SCF to calculate the *Share* and *Number* variables for each household in the CEX (see Supplementary A and B for more details about the above two steps). We divide assets in 2 categories: directly through ownership of stocks and indirectly through investing in mutual funds or other managed assets and retirement accounts. We assign a corresponding rate of return for each category and take a weighted average of log returns (using the *Share* variable). For the mutual funds and other indirect assets, we use the rate of return of the CRSP index.[33] For the rate of return of the direct ownership of stocks, we use imputed data from the HAD to the CEX. Table 2.1 reports the rate of return for households with different wealth levels.

In step 3, we employ the GMM to estimate the log-linearized Euler equation (or linear instrumental variables). Due to the endogeneity of asset returns (caused by the inclusion of the expectational error in the error term), instrumental variables estimation is

[33] Wermers (2000) considers the CRSP index as the closest representative to households' mutual fund returns. In future work, we will impute the actual households' return on mutual fund returns to the CEX.

employed instead of ordinary least squares.[34] We use the log dividend-price ratio as an instrument for the log stock return since it is considered to be among the best predictors of real stock returns. The dividend price is the ratio of dividends over the previous 12 months, and is based on data from Ibbotson Associates (1997).

Recall equation $(2)$, Hansen and Singleton (1983) and Vissing-Jørgensen (2002) show that the standard log-linearized Euler equation can be employed as:

$$\Delta \ln C_{t+1}^{h} = \gamma \ln R_{t}^{h} + \delta D_{h} + \xi \Delta z_{h} + u_{t+1} \tag{5}$$

Here $\Delta \ln C_{t+1}^{h} = \ln\left(c_{t+1}^{h} / c_{t}^{h}\right)$ and. Also, $D_h$ is a vector of binary variables that accounts for seasonal adjustments, and $\Delta z_h$ is a vector that contains the change in family size. This is similar to the approach of Dynan (1993) and Vissing-Jørgensen (2002) using these CEX data. The error term $u_{t+1}$ includes the expectational errors for log consumption growth and log stock returns and the measurement error in log consumption growth. Finally, $\gamma$ is the EIS $(\gamma = 1/\alpha)$, $\delta$ and $\xi$ are estimators. Vissing-Jørgensen (2002) argues that in the CRRA case, the $\delta$ vector is a function of $\beta$ and of the conditional variance and covariance of the gross stock return and the log consumption growth.

### 4.2 Comparison to previous literature

Fundamental differences distinguish the log linearized Euler equation that we estimate and that estimated by Hansen and Singleton (1983) with a representative agent model, as well as the one by Vissing-Jørgensen (2002) using heterogeneous agents'

[34] We use small sets of instruments since the bias of the two-stage least squares estimator progressively worsen as the degree of overidentification increases. In addition to the instrument, we include 12 seasonal dummies and the log difference in family size.

setup. We start with the representative agent model employed by Hansen and Singleton (1983). The log linearized Euler equation that Hansen and Singleton (1983) employ is:

$$\Delta \ln C_{t+1} = \gamma \ln R_t^{Index} + u_{t+1}$$

Here $\Delta \ln C_{t+1}$ and $\ln R_t^{Index}$ are the log per-capita consumption growth rate and the log net return of the financial index from period $t$ to $t+1$, respectively; $u_{t+1}$ is the error term, where $\mathrm{E}(u_{t+1} | \psi_t) = 0$.

Since Mankiw and Zeldes (1991), many studies show that the per-capita consumption growth rate is not a proper proxy for the actual household's consumption growth rate due to market segmentation. Specifically, the consumption growth rate for stockholders is more volatile. A study by Vissing-Jørgensen (2002) shows that when we do account for limited stock market participation, the estimated EIS for stockholders is statistically higher than if we do not consider market segmentation. We can restate Vissing-Jørgensen's (2002) argument by introducing the following log-linearzed Euler equation:

$$\Delta \ln C_{t+1} = \gamma \ln R_t^{Index} + u_{t+1} + \left(\Delta \ln C_{t+1} - \Delta \ln C_{t+1}^h\right)$$

Here we denote the error term as $\xi_{t+1} = u_{t+1} + \left(\Delta \ln C_{t+1} - \Delta \ln C_{t+1}^h\right)$. In order to derive consistent estimates of the EIS using the representative agent model, one needs both $\mathrm{E}(u_{t+1} | \psi_t) = 0$ as well as $\mathrm{E}(\Delta \ln C_{t+1} - \Delta \ln C_{t+1}^h | \psi_t) = 0$ to hold. If the latter fails, the moment condition $\mathrm{E}(\xi_{t+1} | \psi_t) = 0$ does not hold and Hansen and Singleton's (1983) procedure (the representative agent model) will be inconsistent, with biases depending on the relationship of $\left(\Delta \ln C_{t+1} - \Delta \ln C_{t+1}^h\right)$ to the information set $\psi_t$.

In fact, Vissing-Jørgensen (2002) shows that $\mathrm{E}\left(\Delta \ln C_{t+1} - \Delta \ln C_{t+1}^{h} \middle| \psi_t\right) = 0$ does not hold and a consistent procedure would be required to account for limited stock market participation, i.e. to use individual consumption growth rate instead of the per-capita consumption.

In this paper, however, we argue that Vissing-Jørgensen's (2002) procedure is also subject to inconsistency. Since the EIS reflects the comovement level between household's consumption growth rate and household's portfolio return, using a financial index would explain some of the variation in the consumption growth rate but not most of it. If the CAPM model is true, then the consumption growth rate would covary more with the household's actual return, and in order to measure the EIS accurately, one needs to consider the household-specific portfolio return instead of a financial index.

One can show the potential problem with using a financial index instead of the household-specific portfolio by introducing the following true model:

$$\Delta \ln C_{t+1} = \gamma \ln R_t^{Index} + u_{t+1} + \overbrace{\left(\Delta \ln C_{t+1} - \Delta \ln C_{t+1}^{h}\right)}^{Vis\sin g-\text{Jørgensen}\quad(2002)} + \overbrace{\gamma\left(\ln R_t^{h} - \ln R_t^{Index}\right)}^{This\quad Paper}$$

Here we denote the error term as $\xi_{t+1} = u_{t+1} + \gamma\left(\ln R_t^{h} - \ln R_t^{Index}\right) + \left(\Delta \ln C_{t+1} - \Delta \ln C_{t+1}^{h}\right)$. In order to derive consistent estimates of the EIS, one needs both $\mathrm{E}\left(u_{t+1} \middle| \psi_t\right) = 0$ as well as $\mathrm{E}\left(\gamma \ln R_t^{h} - \gamma \ln R_t^{Index} + \Delta \ln C_{t+1} - \Delta \ln C_{t+1}^{h} \middle| \psi_t\right) = 0$ to hold. Otherwise, the moment condition $\mathrm{E}\left(\xi_{t+1} \middle| \psi_t\right) = 0$ does not hold and Vissing-Jørgensen's (2002) procedure will be inconsistent with biases depending on the relationship of $\left(\gamma \ln R_t^{h} - \gamma \ln R_t^{Index} + \Delta \ln C_{t+1} - \Delta \ln C_{t+1}^{h}\right)$ to the information set $\psi_t$.

The key issue in this paper is that wealthy investors face different investment opportunities than the less wealthy; as a result, we observe cross-sectional heterogeneity in the rate of returns at the household level. Using a financial index as a proxy to the household's portfolio is problematic, since the EIS reflects the comovement between the consumption growth rate and the actual return on household-specific portfolio. This comovement is not fully reflected when we employ a financial index.

### 4.3 Results

Table 2.2 Panel A reports the estimation results of EIS when we account for household-specific portfolio. We consider Vissing-Jørgensen's (2002) study as a benchmark to our results, so we first reproduce her results by estimating the Euler equation using financial indexes and report them in the second column of Table 2.2. The third column of Table 2.2 reports the estimation results of the EIS accounting for household-specific portfolio. In the last column of Panel A, we report results about the Wald test that is performed to examine whether the differences on the estimated EIS are statistically significant.

Table 2.2 demonstrates two main results. First, the estimated EIS using household-specific portfolio derives different results than the financial index, especially for bottom and top layers. The index can be a good proxy only for the middle layer of stockholders, but not for the bottom and top layers. Second, the differences in the estimated EIS for layers of stockholders are not statistically significant when we consider household-specific portfolio, whereas it is more significant when we use financial indexes.

We perform a Wald test on the estimated EIS for the bottom layer to test whether it stands at zero. We find that when we use financial indexes, the test was not rejected, whereas when we use household-specific portfolio, the Wald test rejects the hypothesis that it is equal to zero. In Panel B of Table 2.2, we perform a Wald test to examine whether the difference in the estimated EIS between the top and bottom layers is statistically significant and we find that the difference is not statistically significant. The Wald test does not reject the hypothesis that the EIS is the same for top and bottom layers of stockholders at the 84 percent level. Finally, Panel C of Table 2.2 tests whether the difference between the EIS for layers of stockholders is statistically significant when we use indexes. We find that the difference is statistically significant, and the Wald test rejects the hypothesis that the EIS is the same for top layers when we use financial indexes.

Using financial indexes instead of household-specific portfolio changes our understanding of the comovement between consumption growth rate and return on stocks. Mankiw and Zeldes (1991) find that the covariance between consumption growth rates and return on stocks stands at 0.0022. Since the value of EIS reflects the comovement level between consumption and return on stocks, low covariance implies that the value of EIS is small. In fact, Mankiw and Zeldes (1991) use financial index instead of household-specific portfolio. As we demonstrated in this paper, financial indexes are not a good proxy for household specific portfolio. We argue that using financial indexes instead of household-specific portfolio can be a factor that contributes to the small comovement.

# 5. Conclusion

The goal of this paper has been to estimate the EIS by accounting for household-specific portfolio. The data shows that households with different wealth levels have different portfolio diversification. This heterogeneity across households calls into question the validity of using financial indexes to represent household-specific portfolio.

This paper has two main findings. First, estimating the EIS using financial indexes generate an estimation bias. In particular, there is an upward bias for wealthy stockholders and a downward bias for less wealthy stockholders. Second, there is a high degree of homogeneity in the EIS for households with different wealth levels; this is in line with the standard representative agent assumption.

Our results have implications for the small comovement (covariance) puzzle that was introduced by Mankiw and Zeldes (1991) and the role that EIS plays to reflect this comovement. We argue that using financial indexes instead of household-specific portfolio can be a factor that causes the small comovement. For future work, it is important to study the case of Epstein-Zin preferences using household-specific portfolio instead of a financial index. Perhaps estimating the conditional log-linearized Euler equations with household-specific portfolio provides similar estimates of the EIS, but it is not informative about the risk aversion.

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## Supplementary A - CEX Data

This Supplementary briefly describes the disaggregated CEX household-level data on consumption for stockholders. The CEX data is repeated cross-sectional data so we can conduct cohort analysis, and it is available from the start of 1980. In each cross-sectional survey, about 4,500 households are interviewed per quarter (before 1999). Each household is interviewed five times, though the first time is only for practice, and the results are not included in the data files. Households are interviewed three months apart and report consumption for the previous three months. In each month, new households are interviewed in the sample, so that it is spread out over the quarter. In the fifth quarter, financial information is gathered. Although approximately 60 percent of households make it through all five quarters, the sample is considered to be representative of the U.S. population.

We follow Vissing-Jørgensen's (2002) study on defining the consumption definition and sample selection criteria, in particular:

1. We follow the definitions of nondurables and services in the National Income and Product Accounts (NIPA), and we code the nondurable consumption aggregated from the disaggregate CEX consumption categories.
2. The utility is separable in durables and nondurables services, so we leave out durables.
3. Categories that have substantial durable components are excluded, such as education costs, housing expenses (but not costs of household operations), and medical care costs.

4. The nominal consumption values are deflated by the BLS deflator for nondurables for urban households.
5. In order to account for consumption changes driven by changes in family size, we regress the change in log consumption on the change in log family size at the household level.
6. We account for monthly seasonal adjustment by using binary variables that take the value of one if the month the household was interviewed and zero otherwise.
7. Observations for which the consumption growth ratio is less than 0.2 or above 5 are dropped. These observations may reflect reporting or coding errors, so we consider them as extreme outliers.
8. We use Monthly NYSE value-weighted returns as a measure for the stock return.
9. The middle six months of relevant stock returns is used, hence, if the first interview reports data consumption on months $m$, $m+1$, and $m+2$, then the asset return that associates to this period is: $(1+R_{m+2})(1+R_{m+3})\ldots(1+R_{m+7})$.

**Supplementary B – The two sample approach and the CEX Sample Choice**

The CEX contains information about holdings of "stocks, bonds, mutual funds and other such securities." We call this category "assets." We generate the category of assets from the SCF which includes stocks, mutual funds, retirement accounts, and bonds.

In our regression estimates, data are averaged across SCF imputations, and SCF weights are employed to avoid the estimates being unduly influenced by the over-sampling of high wealth individuals in the SCF. The estimated results of the coefficients from the regression models in the SCF are used to predict the share of direct ownership of stocks as well as the number of stock securities for households in the CEX who have information on the same observable characteristics. The estimated coefficients and t-statistics for the probit model of the share of direct stock ownership are:

$$\Pr ob(Share) = \Phi(x'\delta)$$

$$x'\delta = \underset{(-30.56)}{-0.0839}\ age + \underset{(37.03)}{0.0009}\ age^2 + \underset{(-13.81)}{-0.1990}\ married + \underset{(-7.22)}{-0.1372}\ highschool + \underset{(5.36)}{0.0946}\ college$$

$$+ \underset{(8.04)}{0.2053}\ white + \underset{(-11.60)}{-0.1927}\ y1992 + \underset{(-20.01)}{-0.3406}\ y1995 + \underset{(2.15)}{0.0086} \log(Assets) + \underset{(10.59)}{0.7511}$$

where the pseudo R-squared from the first-stage probit model in the SCF is 0.308.

We also regress the number of stocks and choose the exponential specification so that when we impute the data at the CEX, all the results will be positive. The estimated coefficients and t-statistics for the number of stock securities for stockholders are:

$$Number = \exp(x'b)$$

$$x'b = \underset{(14.77)}{0.0099}\ age + \underset{(0.99)}{0.0216}\ married + \underset{(1.61)}{0.0532}\ highschool + \underset{(5.45)}{0.1447}\ college +$$

$$\underset{(2.26)}{0.1109}\ white + \underset{(-2.16)}{-0.0473}\ y1992 + \underset{(-3.83)}{-0.0828}\ y1995 + \underset{(72.91)}{0.3980} \log(Assets) + \underset{(-41.38)}{-3.646}$$

The $\exp(\cdot)$ specification assures that we have non-negative values for the number of stocks in the CEX.

**Table 2.1: Index return (NYSE) versus households return**

This table reports the average and standard deviation of the log Index returns, which used in Vissing-Jørgensen's study (column two), and the average and standard deviation of log household-specific portfolio returns (column three).

| | **Index** | **Household-specific portfolio** |
|---|---|---|
| | $\ln\left(r_{t+1}^{Index}\right)$ | $\ln\left(r_{t+1}^{h}\right)$ |
| All | 0.048<br>(0.100) | 0.0537<br>(0.172) |
| Top | 0.048<br>(0.100) | 0.129<br>(0.209) |
| Middle | 0.048<br>(0.100) | 0.039<br>(0.092) |
| Bottom | 0.048<br>(0.100) | 0.010<br>(0.073) |

## Table 2.2: GMM estimation of the EIS

This table reports GMM estimation of log-linearized Euler equations: Real value-weighted NYSE Return and household-specific portfolio, separate estimations (CEX, 1982–96, Semiannual Data). In Panel A, we reports the GMM estimation results of the EIS when we use financial index (column two), and when we account for household-specific portfolios (column three). We perform a Wald test in the third column to examine whether the difference in the estimation results between column two and three are statistically significant.

In Panel B, we report the Wald test results that examine the differences in the estimated EIS for different layers of stockholders when we use household-specific portfolio. Finally, Panel C reports the Wald test results that examine the differences in the estimated EIS for different layers of stockholders when we use financial indexes.

| **Group of stockholders (by wealth)** | **Financial Index** $\hat{\gamma}$ | **Household-specific portfolio** $\hat{\gamma}$ | **Wald test** |
|---|---|---|---|
| **Panel A: GMM estimation of the EIS** | | | |
| All stockholders | 0.299<br>(0.126) | 0.226<br>(0.083) | 0.77<br>(0.381) |
| Bottom layer | 0.046<br>(0.232) | 0.219<br>(0.196) | 0.78<br>(0.377) |
| Middle layer | 0.175<br>(0.274) | 0.212<br>(0.230) | 0.03<br>(0.873) |
| Top layer | 0.486<br>(0.284) | 0.181<br>(0.195) | 2.44<br>(0.118) |
| **Panel B: Wald test when we use household-specific portfolio** | | | |
| Top layer vs. Bottom layer | | | 0.04<br>(0.844) |
| Middle layer vs. Bottom layer | | | 0.00<br>(0.975) |
| Top layer vs. Middle layer | | | 0.03<br>(0.873) |
| **Panel C: Wald test when we use financial index** | | | |
| Top layer vs. Bottom layer | | | 2.39<br>(0.287) |
| Middle layer vs. Bottom layer | | | 0.20<br>(0.653) |
| Top layer vs. Middle layer | | | 0.119<br>(0.275) |

## Chapter 3

# Political Affiliation and Portfolio Choice

**Abstract**

This paper demonstrates that political affiliation, optimism, home bias, and overconfidence are related. We find that political affiliations influence people's optimism; specifically, people are more optimistic when they are politically affiliated with the party that is in power. When people are more optimistic about the domestic economy, they are less likely to invest in foreign assets (i.e., exhibit stronger home bias). They also exhibit lower overconfidence because they think they are unlikely to perform better than their inflated forecasts of the domestic economy. We also find that political affiliation influences portfolio performance. For example, when Republicans been in power in all houses (during the year 2002), Republican investors significantly outperformed others approximately by 1.37 percentage points.

*JEL Classification*: G11, G15, F30, P16
***Keywords:*** Behavioral Finance, Political Affiliation, Overconfidence, and Home Bias.

# 1. Introduction

According to data from the UBS/Gallup Investor Optimism for the period 1996-2002, approximately 72 percent of investors identified themselves as politically affiliated to one of the parties that operate in the U.S. This important fact raises questions about the possible connection between political affiliation, political climate, and investor behavior. For example: Does investor's political affiliation influence portfolio choice? Does the political climate influence investors' optimism? Do investors respond the same when a new president has been installed in office? Furthermore, does the split in power between Republicans and Democrats make investors, in general, more optimistic than when one party controls all houses (the White House, the House of Representatives, and the Senate)? Do Republican investors favor different stocks than Democratic investors? How do political affiliations influence portfolio performance? Does the demand for foreign assets change across investors when a new party takes control of all the houses? Is there a link between political affiliation and the level of overconfidence? To address the above questions, we utilize data that contains information on investor's political affiliation as well as their optimism and portfolio choice.

Why does political affiliation matter? Political affiliation influences the optimism level across investors regarding different aspects of the economy and stock market performance.[35] In particular, investors who are politically affiliated with the incumbent president are more optimistic. The discrepancy increases when all houses are controlled by the same party. This discrepancy in optimism across investors with different political

[35] In this paper we refer to optimism as an investor's general disposition and thoughts about the future of the economy and stock market performance.

affiliations has implications for the international finance puzzle of the "home bias problem," which is defined as the idea that too much is invested in the home market.[36] We show that investors who are affiliated with the party that is in control of all houses are more optimistic about the U.S. economy and stock market and less likely to invest in foreign stocks, whereas investors who are not affiliated with the party in control of all the houses are less optimistic and exhibit less home bias.

Political affiliation has also implications for the "overconfidence" investors' paradigm, wherein investors expect to perform "better than the average." When one party controls all houses, investors who are politically affiliated with this party feel that the policy makers are very skillful and knowledgeable in governing the economy and the stock market. They are more optimistic about the stock market and forecast relatively higher returns because the economy is "in good hands," and they feel that they have a good chance to achieve their investment goals. On the other hand, investors who are not affiliated with the party in control of all houses forecast poor performance for the stock market, but they also forecast sizably higher performance on their own stock portfolios than the stock market (better than average), which causes them to be relatively more overconfident than other investors.

We also show that political affiliation influences portfolio performance. Our results demonstrate that investors who are politically affiliated with the party that is in power of all houses outperform other investors. In particular, by pooling all months of the year 2002 and controlling for investors' characteristics, we find that the portfolios of Republican investors significantly outperformed other investors by 1.37 percentage

[36] Studies by Kilka and Weber (2000) and Strong and Xu (2003) show that optimism towards the domestic market impacts the home bias.

points. On the other hand, in the year 2000 when the Republican Party was not in control of all houses, we found no statistical evidence to support the notion that Republican investors outperformed Democrats. We present three possible explanations for these findings: different levels of overconfidence, spread of information through word of mouth, and preferred set of stocks for Republican investors.

The first explanation is associated with the overconfidence level. In this paper, we show that during the year 2002, Democratic investors were more overconfident than their Republican counterparts, which eventually had a negative influence on their portfolios' performance (See Odean and Barber (2000) about overconfidence and portfolio performance). The second explanation is related to the spread of private information by word of mouth from policy makers to investors with whom they have political affiliations.[37] Ziobrowski. A, Cheng, Boyd, and Ziobrowski. B. (2004) find that senators have abnormal returns on their portfolios, because they likely have knowledge of forthcoming government action before the information becomes public. This privileged information that is available to representatives can spread to investors who are close and considered to be core supporters.

The third explanation regards the different sets of stocks that are favored by investors with different political affiliations. The Center for Responsive Politics shows that Republican members of Congress favor different stocks than Democratic members. Specifically, Republicans overwhelmingly favored oil giants BP and ExxonMobil as well as tobacco/food company Altria, whereas Democrats tended heavily toward tech stocks such as Sun Microsystems, Texas Instruments, and Vodafone, the British-based mobile-

37 See Duflo and Saez (2002), Madrian and Shea (2000), Kelly and Grada (2000), and Hong, Kubik, and Stein (2004 and 2005) for the effect of word of mouth on the stock market settings.

phone giant.[38] A complimentary government fiscal policy toward companies that are favorable to investors who are affiliated with the party in power would influence portfolio performance. One example of a fiscal policy tool that impacts the economy and stock market is to alleviate or aggravate taxes on firms. The government can award tax treatments or subsidies (credits) to firms preferred by investors from their own party. Another example of fiscal policy influence is awarding government contracts to companies that are favorable to investors who are affiliated with the party that is in power. Levying tariffs, penalizing competitors, and imposing new regulations are additional tools that can be implemented by the decision makers to the benefit of their supporters.[39]

This paper introduces a model of a politically affiliated investor within a two-party system. We propose two possible political situations: either the investor is affiliated with the party that is in control of all houses, or the investor is aligned with the non-dominant political party. This paper presents four different case scenarios of investors. The first scenario involves investors who outperform the market in both situations; we call these investors adaptive investors, because regardless of the party that is in power, these investors adjust and accommodate the investment to the new information. The second scenario includes investors who underperform the market in both political outcomes. Such investors are called overconfident, because they underperform even when their party is in power. The third case, called sweet home investors, involves investors who

[38] More information about the asset holdings of each senator at: http://opensecrets.org/pfds/overview.asp and a related report by Michelle Leder for the financial year 1995 via: http://www.slate.com/id/2152887/

[39] There are other philosophical and historical economic policy differences between the Republican and Democratic parties. While the Republican Party believes in *laissez-faire*, less taxes, and a balanced budget, the Democratic Party believes in more wealth redistribution and social services. These differences may change the economy and financial market settings.

outperform the market only when the party with which they identify politically "the home party" is in power. Finally, the last type of investors is called bitter home investors. In this case, investors underperform only when the party in power is their "home party."

Substantial literature explores firms' contribution to politicians and their effect on political outcomes (see the literature survey by Ansolabehere, de Figueiredo, and Snyder [2003]). Cooper, Gulen, and Ovtchinnikov (2006) find that firms' support for candidates positively and significantly correlated with the cross-section of future returns. They present methods by which politicians can benefit firms including favorable tax treatment, credits, and the awarding of government contracts. Ziobrowski et. al. (2004) have conducted the most closer study to ours; they find that senators have an information advantage that allows them to have abnormal returns. We believe that our study goes one step further by analyzing the link between investors' political affiliation, investors' optimism, and portfolio composition and performance.

The rest of the paper is organized as follows. The next section presents the theoretical model of an investor's political affiliation. Section 3 reports the data that we analyze and Section 4 presents the empirical analyses. Section 5 draws the conclusion that political affiliation, political climate, 'home bias at home,' and overconfidence are connected.

# 2. Model of investor political affiliation

We study investors' portfolio performance in an economy with a two-party political system: parties A and B. There are $J$ investors that own portfolios of stocks, bonds, mutual funds, and other securities. We denote the net overall return for investor $j$, $j \in J$, in a portfolio when party A is in control by $R_A^j$, and when party B is in control by $R_B^j$, where:

$$(1) \qquad R_A^j = \mu_A + \varepsilon_A^j$$

$$(2) \qquad R_B^j = \mu_B + \varepsilon_B^j$$

Here $\mu_A$ and $\mu_B$ are the average net overall return across investors, and $\varepsilon_A^j$ and $\varepsilon_B^j$ are jointly normally distributed with zero means and variances $\sigma_A^2, \sigma_B^2$ and correlation coefficient $\rho$. We assume that investor $j$ is affiliated with party B and denote $I^j$ as the difference between net returns when party B in power and net return when party A is in power. Hence,

$$(3) \qquad I^j = R_B^j - R_A^j = (\mu_B - \mu_A) + (\varepsilon_B^j - \varepsilon_A^j) \geq 0$$

For simplicity, hereafter we stop using the superscript $j$. Let denote $v = (\varepsilon_B - \varepsilon_A)$, then the probability of improved performance on investments when party B is in power is:

$$(4) \qquad P = P_r(v \geq -(\mu_B - \mu_A)) = 1 - \Phi(z)$$

$$z = -\left(\frac{\mu_B - \mu_A}{\sigma_v}\right) = \frac{\mu_A - \mu_B}{\sigma_v}, \ \sigma_v = \sqrt{\sigma_A^2 + \sigma_B^2 - 2\sigma_A\sigma_B\rho}, \quad \text{and} \qquad \rho = \frac{Cov(\varepsilon_B, \varepsilon_A)}{(\sigma_A\sigma_B)}$$

$$(5) \qquad \mathrm{E}(R_A | I \geq 0) = \mu_A + \frac{\sigma_A\sigma_B}{\sigma_v}\left(\rho - \frac{\sigma_A}{\sigma_B}\right)\lambda$$

$$(6) \qquad \mathrm{E}(R_B | I \geq 0) = \mu_B + \frac{\sigma_A\sigma_B}{\sigma_v}\left(\frac{\sigma_B}{\sigma_A} - \rho\right)\lambda$$

Here $\lambda$ reflects the party turnover or the probability that the power changes from party A to party B, and $\lambda = \phi(z)/P$, where $\phi$ is the density of the standard normal.

**Theorem:**

If $Y$ and $X$ are jointly normally distributed, we can write the relationship as: $Y = \mu_y + \rho\frac{\sigma_x}{\sigma_y}(X - \mu_x) + \gamma$, Where $\gamma$ is normally distributed with zero mean and is independent (uncorrelated) of $X$. Let:

$$\varepsilon_A = Y, \quad V = X, \quad \varepsilon_A = 0 + r\frac{\sigma_A}{\sigma_v}(V - 0) + \gamma, \text{ and } r = \frac{Cov(\varepsilon_A, V)}{\sigma_A\sigma_v} = \frac{Cov(\varepsilon_A, \varepsilon_B - \varepsilon_A)}{\sigma_A\sigma_v}$$

$$r = \frac{Cov(\varepsilon_A, \varepsilon_B) - Cov(\varepsilon_A, \varepsilon_A)}{\sigma_A\sigma_v} = \frac{\rho(\sigma_A\sigma_v) - \sigma_A^2}{\sigma_A\sigma_v} = \frac{\rho\sigma_1 - \sigma_A}{\sigma_A\sigma_v}$$

$$\varepsilon_A = \frac{\sigma_A \sigma_1 \rho - \sigma_A^2}{\sigma_v} V + \gamma$$

$$Q_A = \mathrm{E}(R_A | I \geq 0) - \mu_A = \mathrm{E}(\varepsilon_A | I \geq 0)$$

$$Q_B = \mathrm{E}(R_B | I \geq 0) - \mu_B = \mathrm{E}(\varepsilon_B | I \geq 0)$$

Assume initially that $P < 1$, so that at least some investors affiliated with party B are better off when party A is in power. Then the second terms in $(5)$ and $(6)$ define the kinds of investors' selection biases generated by return pattern. Equation $(5)$ shows that the average investor may be "better" or "worse" off than the average investor whose party is in power, depending on $\rho$ and the ratio $\frac{\sigma_A}{\sigma_B}$. Similarly, equation $(6)$ shows that the average investor affiliated with the party in power may have higher or lower net returns than the average depending on $\rho$ and $\frac{\sigma_B}{\sigma_A}$. Let $Q_A$ be net return differential between an investor and the average investor when party A is in complete power, and $Q_B$ be the net return differential between an investor and the average investor when party B is in total control of all houses. Finally, let us denote $k = \frac{\sigma_B}{\sigma_A}$ and consider the following four cases:

***Case 1: Adaptive investors:*** $Q_A > 0$ and $Q_B > 0$. In this case, whatever the political affiliation of these investors; they will always adapt to any political system and accommodate their portfolio to the new political climate. An inspection of equations $(5)$ and $(6)$, however, shows that the necessary (and sufficient) conditions for positive selection to occur are:

$$(7) \qquad \rho > \min(1/k, k), \text{ and } k > 1$$

**Case 2**: ***Overconfident investors*****:** $Q_A < 0$ and $Q_B < 0$. This type of investor is always in the lower tail of the return's distribution, and these investors do not perform well even if their party is in total control. The necessary and sufficient conditions for this selection to occur are:

$$(8) \qquad \rho > \min(1/k, k), \text{ and } k < 1$$

**Case 3: Sweet home investors:** $Q_A < 0$ and $Q_B > 0$. These investors perform below market average market when their party is not in power, but they outperform investors from the rival party when their party is in power. The necessary and sufficient condition for this selection to occur is:

$$(9) \qquad \rho < \min(1/k, k)$$

**Case 4: Bitter home investors:** $Q_A > 0$ and $Q_B < 0$. This is simply the opposite of case 3, where the investor feels overconfident when their party is in control.

$$(10) \qquad \rho < \max(1/k, k)$$

The above four cases represent all possible outcomes for investors with different political affiliations when different political parties are in complete power. The first two cases are not of special interest since they explore cases when political affiliation has no influence on the relative portfolio performance. The third and the fourth cases, on the other hand, are particularly interesting because they show that political affiliation has a positive or negative impact on investors' portfolios. In the empirical analysis section, we demonstrate that case 3 is the one that characterizes most investors with a strong political affiliation.

# 3. Data

We use data from the UBS/Gallup Investor Optimism Index, which recently has attracted more attention and of particular interest to scholars in the field of financial behavior (see for example Graham, Harvey, and Huang [2005] and Vissing-Jørgensen [2003]). The UBS/Gallup poll provides qualitative responses about optimism or pessimism regarding the stock market and other macroeconomic variables, including expectations about future returns on portfolios and investor optimism about the future economy, stock market, inflation, and unemployment.[40] It also presents information regarding a host of demographic and characteristic variables, including: age, education, race, and data about households' asset holdings, income, and overall returns on portfolios.

The survey is organized by The Gallup Organization, and it includes a national cross-section of heads of household or spouses in any household with total savings and investments from "stocks, bonds, or mutual funds in an investment account, or in a self-directed IRA or 401(k) retirement account" of $10,000 or more. According to Vissing-Jørgensen (2003) and based on the 1998 Survey of Consumer Finances, households with $10,000 or more in financial assets owned more than 99% of household financial wealth as well as of stocks owned directly or indirectly by U.S. households. Moreover, about 95% of household net worth is owned by households with $10,000 or more in financial assets.

The data collection is via telephone interviews conducted during the first two weeks of each month with approximately 1,000 interviewees each month, aged 18 years and older. The monthly polls started in October 1996 and were conducted until December 2002. Although the survey is not a panel, cohort analysis is possible due to the large number of interviewed investors each month. It is important to mention that not all the monthly polls have the same set of questions. For example, for the year 1996, no questions were posed about the overall rate of return on investors' portfolios or their future forecast on their portfolio returns. In some cases, some answers to questions were not publicly available. For example, answers to the question about investor's political affiliation are not available for the year 1999. The monthly polls are presented separately,

[40] The data is available for purchase via the Roper Center at the University of Connecticut.

creating the necessity to pool them together into one file. That being said, UBS/Gallup provides one "big file" that includes questions only on political affiliation, demographic information, and investor optimism for the period from October, 1996 until December, 2002.

The total sample size of the big file was 57,428 observations and about 39 percent of investors reported that they considered themselves Republican, whereas approximately 30 percent considered themselves Democratic. In addition, 28 percent of respondents reported that they were independent, and the rest supported other parties.[41] A few variables were generated or recoded. A race binary variable was generated that took the value of one only if the respondent was white and zero otherwise. We recoded the education level by assigning a new variable that took the value of 9 if the respondent was a high school graduate or less. We assigned a value of 14 if the respondent had attended a college or had receiving any educational training. For those who graduated from college, we assigned a value of 15, and finally for those who had postgraduate degrees we assigned the value of 17.

Most importantly, we recoded a new income variable that took the mid value of the categorical income bracket reported by the survey. We also recoded the asset holdings variable that took the mid value of asset the bracket reported by the survey. For the income and asset holdings, the highest bracket is $100,000 or greater for income and $1 million or greater for asset holdings. We recoded the top bracket by multiplying the reported value by 1.5 times. For example, we assigned an income value of $150,000 for those who reported that their incomes were greater than $100,000.

[41] Among the independent investors, about 35 percent lean toward the Republican Party and 37 percent lean toward the Democratic Party.

# 4. Empirical analysis

In this section, we develop the empirical analysis and report results about investor optimism, portfolio performance, future portfolio and market forecasts, overconfidence, and the home bias problem for investors with different political affiliations.

### 4.1 Political affiliation and investor optimism

The UBS/Gallup asks respondents questions about political affiliation and investor beliefs. Here are the questions of particular interest to our study:

1. Political affiliation: "In politics as of TODAY, do you consider yourself a Republican, a Democrat, or an Independent?"[42]
2. Only for those who are independent: "As of today, do you lean to the Democratic Party, or the Republican Party?"
3. Optimism Goal: "Overall, how optimistic or pessimistic are you that you will be able to achieve your investment TARGETS over the next TWELVE MONTHS?"
4. Optimism Goal: "Overall, how optimistic or pessimistic are you that you will be able to achieve your investment GOALS over the next FIVE YEARS?"
5. Optimism over Economic growth: "How would you rate Economic growth, OVER THE NEXT TWELVE MONTHS?"
6. Optimism over unemployment: "How would you rate the unemployment rate, OVER THE NEXT TWELVE MONTHS?"
7. Optimism over stock market: "How would you rate Performance of the stock market, OVER THE NEXT TWELVE MONTHS?"

[42] All emphases are indicated in the actual survey by the UBS/Gallup.

8. Optimism over inflation: “How would you rate Inflation, OVER THE NEXT TWELVE MONTHS?”

We split the sample into two different groups based on the date the poll was conducted. We called the first group “Clinton’s group,” and it covers all survey polls that were conducted before December 1999. We called the second group “Bush’s group,” and it includes all survey polls conducted after January 2001. Since the survey asks “OVER THE NEXT TWELVE MONTHS” we exclude surveys conducted between January 2000 and December 2000, because it was not clear who would be the U.S. president, George W. Bush or Al Gore, twelve months from that January. Clinton’s group contains 22,113 observations, whereas Bush’s group includes 24,053 observations.

For questions 3 to 8, the respondent chooses one of the following answers:

1. Very pessimistic
2. Somewhat pessimistic
3. Neither
4. Somewhat optimistic
5. Very optimistic
6. Don’t know
7. Refused
8. No answer

We created a binary variable that took the value of one only if the respondent chose answer 4 or 5 and zero otherwise. This binary variable measures the optimism level for investors.

We started the statistical analysis by exploring optimism about achieving investment targets. Table 3.1 shows that in Clinton’s period almost no statistical difference existed in optimism about achieving investment goals either over the next twelve months or the next five years, whereas in Bush’s period there were a large gap between Democratic and Republican optimism levels. In particular, Republican investors were more optimistic.

The gap among investors with different political affiliations decreased when they asked about long term optimism about the next five years.

Next, Table 3.2 reports results about investors' optimism over economic growth, unemployment, stock market performance, and inflation. In Clinton's period, Democratic investors were slightly more optimistic than Republican investors, whereas in Bush's period, Republican investors were significantly more optimistic than Democrat investors in all aspects of the economy. We believe that the optimism gap between Republican and Democratic investors was higher in Bush's period because the Republican Party controlled all houses, while during Clinton's period the power was split between Democrats in the White House and Republicans in the Senate and House of Representatives.

Now that we have established the large optimism difference during Bush's period, we next examine how these gaps in optimism influenced investor confidence as well as the home bias problem.

### 4.2 Political affiliation, overconfidence, and portfolio performance

In this subsection, we examine the relationship between political affiliation and overconfidence level for investors. We also test whether political affiliation plays a role in explaining portfolios returns. In particular, we examine whether Republican investors outperformed Democratic investors during the year 2002, at which time all houses were controlled by the Republican Party. In the same line, we examine whether Democratic investors outperformed Republican investors when Clinton was in power but Republicans controlled the other two houses.

The UBS/Gallup poll asked Republican and Democratic respondents:

9. One-year own past return: "What was the overall percentage rate of return you got on your portfolio in the past twelve months?"
10. Expected one-year own return: "What overall rate of return do you expect to get on your portfolio in the next twelve months?"
11. Expected one-year market return: "Thinking about the stock market more generally, what overall rate of return do you think the stock market will provide investors during the coming twelve months?"

Since the Republican Party was in total control in January 2001, we split our sample to include poll surveys for all periods that were 12 months after January 2001, starting January 2002. By selecting these 12 months, we assure that the previous 12 months were under the Republican control. Information regarding political affiliation, including responses to questions 1 and 2 as well as questions 9 to 12 is not available for the period of October 1996 until December 1999; it is available only from January 2000 until December 2002. We follow Vissing-Jørgensen (2003) and drop observations of own portfolio or forecast returns below − 95 or above 95 percent. We exclude the year 2001, because during this year presidential power turned over from Clinton to Bush, and hence part of the past twelve months were during Clinton's period and the other part were during Bush's period.

We first report some summary statistics for Republican and Democratic investors in Table 3.3, particularly the mean and standard deviation of overall return on portfolio, twelve month forecast for investors' own portfolio return, and twelve month forecast for market return. We also report the average overconfidence level for Republican and

Democratic investors by generating a variable that measures the difference between the investor's own prediction of portfolio return and the investor's prediction of market return in the next twelve months. This variable is considered to be a proxy for overconfidence because it measures the "better than average" forecast (see Graham et. al. [2004]).[43] In Table 3.3, Panel A, we report the results for the year 2000, whereas in Panel B we report the results for the year 2002. Table 3.3 shows small differences between portfolio forecasts and overall returns in the year 2001 when Clinton was the president and Republicans controlled the Senate and the House of Representatives. For the year 2002, on the other hand, the results show that Republican investors on average did better than Democrats and forecast higher overall returns on their portfolio as well as for the stock market. Democrat investors, however, had lower forecasts for the stock market and expected their portfolios to perform only slightly lower than Republican portfolios, which eventually resulted in greater overconfidence in Democratic than in Republican investors due to the low future forecasts of stock market performance in the next twelve months by Democrats.

We examined whether political affiliation has an impact on overall portfolio return and investor overconfidence. Table 3.4, Panel A shows that for the year 2002, when all houses were controlled by the Republican Party, being a Republican investor would increase the return by 1.37 percentage points, whereas being a Democratic investor would credit -0.49 percentage points (the coefficient of the democrat binary variable is not significant). In addition, Republican investors were less overconfident than Democratic investors (see column 4 for Republican and Democratic sections on Panel A). When

[43] Studies by Dorn and Huberman (2005) and Glaser and Weber (2005) show that the "better-than-average" is associated with trading frequency and both are aspects of overconfidence.

power was divided as in the year 2000, political affiliation had no statistically significant impact on portfolio return and overconfidence (see results in Panel B). We believe that when power is split between the two parties, the spread of privileged information by word of mouth is available to investors allied with either party. Also government spending is split across different types of companies.

One might argue that Republican investors should have outperformed Democrats during the year 2002, because Republican investors bore higher financial risks or had higher abilities to analyze financial market settings, where investor's ability is as the absolute value of: forecasted future market return minus the realized market return. Our answer to these arguments is that if Republican investors bore higher financial risks, then they should be expected to outperform Democratic investors during the year 2000, and yet we fail to find that outcome as shown in Panel B. In addition, from the summary statistic of Table 3.3, we find that the standard deviation for Republican investors in the year 2002 is smaller than for Democrats. That means the spread (standard deviation), which can also be viewed as the risk is small in the Republican portfolio. For the year 2000, standard deviation of the risk for Republican investors as well as for Democrats is almost the same. Second, we examine whether Republican investors have higher abilities, and find no statistical evidence to support this claim.[44] We conclude that overconfidence, word of mouth, and the set of stocks favorites by Republican investors adequately explain the fact that Republican investors outperformed Democrats during the year 2002.

[44] We employed a regression in which investor's ability was the response variable and two factors were used as explanatory variables (additionally to investors' characteristics): investor's characteristics, and a binary variable that takes the value of one only if the investor was politically affiliated with the Republican Party.

## 4.3 Political affiliation and home bias at home

This subsection presents empirical evidence that links investors' political affiliations with the home bias. For the months of February, May, August, and November of the year 2002, the UBS/Gallup poll prompted investors: "Focus on the financial markets in four areas of the world and rank order them by how optimistic you feel about them. The financial markets are: in the United States, in Europe, in Japan, in countries often referred to as the emerging markets." We defined a binary variable that took the value of one only if the investor was "most optimistic towards the U.S. market," and zero otherwise. Approximately 69 percent of investors were more optimistic towards the U.S. market than towards other financial markets, and Republican investors were more optimistic toward the U.S. market than Democratic investors. Specifically, 73.8 of Republican investors were more optimistic about the U.S. economy and only 64.7 percent of Democratic investors. The difference between these two groups was statistically significant and stands at 9.1 percent.

The discrepancy in optimism toward the U.S. economy between Republican and Democratic investors raises concerns about whether Republican investors prefer more domestic stocks over foreign stocks. For the months March, June, and September of the year 2002, the UBS/Gallup poll asked respondents to answer the question: "What percent of your portfolio is currently in assets of foreign countries or foreign currencies?" We use this information to test whether political affiliation and political climate influences the degree of foreign assets. Table 3.5, Panel A shows that there is a "home bias at home" for Republican investors and less bias at home for Democratic investors. In particular, political affiliation with the Republican Party during the time that it controlled the executive and legislative branches would decreased the share of foreign stocks by almost 0.74 percentage points, whereas affiliation with the Democratic Party increased the share of foreign stocks by 0.68 percentage points. These results suggest that after controlling for investors' characteristics, political affiliation partly explain the home bias problem.

Another way to explore the relationship between political affiliation and the home bias issue is by estimating the probability of owning foreign assets. We employ two separate multivariate Logit regressions, where the response variable in both is a binary that takes the value of one only if an investor owns foreign assets. The explanatory variables are investors' characteristics as well as investors' forecasts of the domestic stock market return. Moreover, in the first Logit regression we also employ a binary variable that takes the value of one if the investor is affiliated with the Republican Party, whereas in the second regression we include a binary variable that takes the value of one only if the investor is affiliated with the Democratic Party.

The estimation results are reported in Table 3.5, Panel B, which shows that the coefficient for the Republican binary variable is negative and stands at -0.14, whereas the coefficient for the Democrat binary variable is positive at 0.26. The results demonstrate that during the year 2002 when the Republican Party controlled all houses and after controlling for investors' characteristics, Republicans investors were found less likely to hold foreign assets, whereas Democrat investors were more likely. The magnitude affect of the results is large; for example, if we change the coefficient of the Republican binary variable from -0.14 to 0.26, that increases the probability of owning foreign assets for Republican investors by at least 24 percent.

# 5. Conclusion

The goal of this paper has been to demonstrate that political affiliation has an impact on investors' optimism, overconfidence, and home bias. We show that investors with different political affiliations respond differently to different political climates. When all houses are controlled by one party, investors who are politically affiliated with this party are more optimistic about the economy and the stock market, and prefer more domestic stocks. On the other hand, investors who are politically affiliated with the party that is not in power are less confident in the U.S. economy, have less bias toward domestic stocks, and are more overconfident, because they considerably expect to outperform the market.

We also find that for the twelve months of the year 2002, when all houses were controlled by the Republican Party, Republican investors outperformed other investors. We propose three possible explanations to this finding. First, Republican investors are less overconfident than Democrats. Second, they might have inside private information from agents of the party that is in control and spread information via word of mouth. Third, the party that is in power favors doing business with some companies that are preferred by investors who are politically affiliated with the party that is in power.

The connection between political affiliation and investors' portfolio can have macroeconomic implications on the real business cycle (RBC). For example, a new president might cause some investors to be less optimistic about the U.S. economy, and that would lead to flow of capital out of some sectors or industries in the U.S. economy to foreign countries. For future research, it is important to examine the magnitude effect of political turnovers on the real business cycle (RBC) models and how turnovers influence some specific industry sectors and the RBC in general.

## Table 3.1: Optimism toward investment target by Republican and Democrat investors

Table 3.1 reports the fraction of investors who are optimistic about achieving their investment goals by political affiliation. Panel A reports optimism to achieve investment goals when President Clinton was in power (for the period of October 1996 untill January 2000), whereas Panel B reports goal achievement optimism when Bush was in power (January 2001 until December 2002).

| Optimistic to achieve investment GOALS | Republican | Democratic | Difference Std. Err. | t-statistic |
|---|---|---|---|---|
| **Panel A - Clinton's period** | | | | |
| Over the next TWELVE MONTHS | 0.732<br>(0.443) | 0.733<br>(0.442) | -0.001<br>(0.013) | -0.0397 |
| Over the next FIVE YEARS | 0.720<br>(0.449) | 0.732<br>(0.443) | -0.011<br>(0.014) | -0.8484 |
| **Panel B – Bush's period** | | | | |
| Over the next TWELVE MONTHS | 0.633<br>(0.482) | 0.496<br>(0.500) | 0.136<br>(0.007) | 17.9452 |
| Over the next FIVE YEARS | 0.728<br>(0.444) | 0.624<br>(0.484) | 0.104<br>(0.007) | 14.5267 |

## Table 3.2: Optimism about future by Republican and Democratic investors

Table 3.2 reports the fraction of optimistic investors depending on a host of economic factors, including: economic growth, unemployment, stock market, and inflation by political affiliation. Panel A reports results when Clinton was the president and Republicans controlled both the Senate and the House of Representatives. Panel B reports results in Bush's period when all houses were controlled by the Republican Party.

| Expectation over | Republican | Democrat | Deference<br>Std. Err. | t-statistic |
|---|---|---|---|---|
| **Panel A - Clinton's period** | | | | |
| Economic growth | 0.622<br>(0.484) | 0.709<br>(0.454) | -0.086<br>(0.014) | -5.9159 |
| Unemployment rate | 0.571<br>(0.495) | 0.652<br>(0.476) | -0.081<br>(0.015) | -5.3691 |
| Performance of the stock market | 0.624<br>(0.484) | 0.623<br>(0.484) | 0.001<br>(0.015) | 0.0860 |
| Inflation | 0.501<br>(0.500) | 0.560<br>(0.496) | -0.059<br>(.015) | -3.8601 |
| **Panel B – Bush's period** | | | | |
| Economic growth | 0.574<br>(0.494) | 0.394<br>(0.488) | 0.179<br>(0.007) | 23.5491 |
| Unemployment rate | 0.444<br>(0.496) | 0.318<br>(0.465) | 0.126<br>(0.007) | 16.8582 |
| Performance of the stock market | 0.519<br>(0.499) | 0.372<br>(0.483) | 0.147<br>(0.007) | 19.2562 |
| Inflation | 0.486<br>(0.499) | 0.380<br>(0.485) | 0.106<br>(0.007) | 13.8475 |

## Table 3.3: Forecasting- summary statistics for Republican and Democratic investors

This table reports mean and the standard deviation of All, Republican, and Democrat investors' overall percentage rate of return in the past twelve months, portfolio forecast in the next twelve months, forecast from the Stock market in the Next twelve months, and the overconfidence level. The fourth row in Panel A and B measures the overconfidence level. We create a variable that measures the difference between: [investor's own portfolio forecast] minus [investor's stock market forecast].

| **Overall percentage rate of return** | **All** | **Republican** | **Democrat** |
|---|---|---|---|
| | **Mean (Std.)** | **Mean (Std.)** | **Mean (Std.)** |
| **Panel A - Year 2000** | | | |
| In the PAST twelve months | 16.53 (14.55) | 16.65 (14.43) | 16.27 (14.71) |
| Portfolio expectation in the Next twelve months | 14.83 (11.98) | 14.75 (11.59) | 15.39 (13.09) |
| Expectation from the Stock market in the Next twelve months | 13.15 (11.43) | 12.80 (10.34) | 13.95 (12.79) |
| Difference between expected portfolio and expected stock market in the Next twelve months (overconfidence) | 2.12 (9.44) | 2.32 (9.14) | 2.00 (9.98) |
| **Panel B - Year 2002** | | | |
| In the PAST twelve months | -2.41 (19.35) | -2.00 (18.61) | -2.23 (20.20) |
| Portfolio expectation in the Next twelve months | 8.73 (11.38) | 9.07 (10.77) | 8.62 (12.60) |
| Expectation from the Stock market in the Next twelve months | 7.74 (10.80) | 8.26 (10.01) | 7.72 (11.82) |
| Difference between expected portfolio and expected stock market in the Next twelve months (overconfidence) | 1.29 (9.17) | 1.02 (8.40) | 1.45 (9.86) |

## Table 3.4: Political affiliation, portfolio performance, and forecasting

This table reports estimation results for the Republican and Democratic groups of investors separately. The dependent variables in each group are: the overall portfolio return in the past twelve months in the first column, expected portfolio return in the next twelve months in the second column, expected market return in the next twelve months in the third column, and a proxy of overconfidence in the fourth column which is: [investor's forecast on own portfolio return over the next twelve mounts] minus [investor's forecast on the market return in the next twelve months]. We regress these dependent variables over investors' characteristics including: age, education, income (categorical), asset holdings (categorical), race, and gender, as well as twelve monthly binary variables (those are 12 seasonal binary variables). We pool the twelve monthly surveys for the year 2002 into one file, and we pool the data from all the twelve surveys for the year 2000 into another one combined file. In Panel A, we report estimation results for the year 2002, when all the houses of government were under the control of the Republican Party, and Panel B reports the estimation results for the year 2000 when was power divided between Republicans and Democrats (Republicans controlled the Senate and the House of Representatives, whereas Democrats controlled the White House).

| **Political Affiliation** | **Republican** | | | | **Democrat** | | | |
|---|---|---|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **1** | **2** | **3** | **4** |
| **Panel A - Pooling the twelve monthly surveys for the year 2002** | | | | | | | | |
| Republican (one if Republican) | 1.37<br>(0.47) | 0.92<br>(0.26) | 1.41<br>(0.25) | -0.51<br>(0.23) | - | - | - | - |
| Democrat (one if Democrat) | - | - | - | - | -0.49<br>(0.51) | -0.48<br>(0.29) | -0.78<br>(0.27) | 0.30<br>(0.26) |
| R-squared | 0.053 | 0.031 | 0.047 | 0.044 | 0.052 | 0.031 | 0.044 | 0.042 |
| Number of observations | 7045 | 7941 | 7754 | 6733 | 7045 | 7941 | 7754 | 6733 |
| **Panel B - Pooling the twelve monthly surveys for the year 2000** | | | | | | | | |
| Republican (one if Republican) | -0.17<br>(0.33) | 0.035<br>(0.27) | -0.16<br>(0.26) | 0.20<br>(0.23) | - | - | - | - |
| Democrat (one if Democrat) | - | - | - | - | -0.12<br>(0.37) | 0.54<br>(0.29) | 0.51<br>(0.29) | 0.05<br>(0.25) |
| R-squared | 0.072 | 0.033 | 0.049 | 0.018 | 0.072 | 0.047 | 0.050 | 0.012 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Number of observations | 7423 | 8108 | 7643 | 7098 | 7423 | 8108 | 7643 | 7098 |

## Table 3.5: Political affiliation and "home bias at home"

Table 3.5 contains two tables: Panel A and B

**Panel A: Political affiliation and the percentage of foreign assets**
Panel A reports the estimation results, where the dependent variable is the percentage of foreign assets, and the independent variables are investor characteristics and political affiliations, the latter of which is coded as a binary variables for being Republican or Democrat. We pool data for months March, June, and September of the year 2002 and ran two separate regressions: the first one is when the political affiliation binary variable takes the value of one only if the investor is identified as Republican (second column), and the other regression is when the political affiliation variable takes the value of one only if the investor identified as a Democrat. We add the overall portfolio return in the past twelve months' variable to examine whether holding foreign stocks influences portfolio return and we have not found significant results (see Benartzi [2001] and Huberman [2001]).

| **Explanatory variables** | **Republican** | | **Democrat** | |
|---|---|---|---|---|
| | **Coefficient** | **Std. Err.** | **Coefficient** | **Std. Err.** |
| Overall portfolio return in the past twelve months | 0.002 | (0.012) | 0.001 | (0.012) |
| Age | -0.080 | (0.017) | -0.080 | (0.017) |
| Education (years of schooling) | 0.018 | (0.108) | 0.021 | (0.108) |
| Political Affiliation | | | | |
| Republican (one if republican) | -0.741 | (0.444) | - | - |
| Democratic (one if republican) | - | - | 0.680 | (0.502) |
| Income/1,000,000 | 2.772 | (5.640) | 2.385 | (5.638) |
| Assets/1,000,000 | 2.375 | (0.704) | 2.400 | (0.706) |
| Race (one if white) | 0.017 | (0.756) | 0.015 | (0.758) |
| Gender (one if white) | 0.805 | (0.464) | 0.853 | (0.466) |
| Month binary (March) | 0.140 | (0.535) | 0.139 | (0.535) |
| Month binary (June) | 0.977 | (0.544) | 0.956 | (0.545) |
| Constant | 7.187 | (1.982) | 6.662 | (1.983) |
| R-squared | 0.031 | | 0.030 | |
| Number of observations | 1706 | | | |

**Panel B: Political affiliation and probability of holding foreign assets**

Panel B reports the Logit estimation results, where the dependent variable is a binary that takes the value of one if the investor holds foreign assets, and the independent variables are investor characteristics and political affiliation, the latter of which is coded as a binary variable for being Republican or Democrat. Again, we pooled the data for the months March, June, and September of the year 2002 and ran two separate regressions: the first with a value of one for the political affiliation binary variable only if the investor is identified as Republican (second column), and the other with a value of one for the political affiliation variable only if the investor identified as a Democrat. We add the forecast for stock market return in the next twelve months as a proxy for investors' optimism toward the domestic economy.

| Explanatory variables | Republican | | Democrat | |
|---|---|---|---|---|
| | **Coefficient** | **Std. Err.** | **Coefficient** | **Std. Err.** |
| Forecast for stock market return in the next twelve months | 0.110 | 0.084 | 0.111 | 0.084 |
| Age | -0.012 | 0.003 | -0.013 | 0.003 |
| Education (years of schooling) | 0.095 | 0.020 | 0.094 | 0.020 |
| Political Affiliation | | | | |
| Republican (one if republican) | -0.143 | 0.084 | - | - |
| Democratic (one if republican) | - | - | 0.263 | 0.092 |
| Income/1,000,000 | 2.310 | 1.024 | 2.207 | 1.025 |
| Assets/1,000,000 | 0.653 | 0.143 | 0.672 | 0.144 |
| Race (one if white) | 0.213 | 0.135 | 0.243 | 0.136 |
| Gender (one if white) | 0.089 | 0.083 | 0.113 | 0.084 |
| Month binary (March) | -0.017 | 0.101 | -0.015 | 0.101 |
| Month binary (June) | 0.128 | 0.099 | 0.123 | 0.099 |
| Constant | -1.705 | 0.365 | -1.848 | 0.366 |
| R-squared | 0.032 | | 0.033 | |
| Number of observations | 2620 | | | |

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