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Households' Savings and Portfolios

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Abstract

In this paper I present empirical evidence on the cross-sectional variation of portfolio holdings from the Survey of Consumer Finances (the SCF) to show how the presence of home-ownership influences households' savings behavior and choices of financial assets. The idea is to test whether households engaged in large housing investment, or households who expect potential home purchases, hold less stocks, controlling wealth and other sources of background risk. I begin by documenting overall homeownership rates, characteristics as well as financial asset allocations of both homeowners and renters. Then, I look at the portfolio choice of homeowners and renters as a function of wealth, households' characteristics, risk tolerance and exposure to real estate risks. I find evidence that for many households, financial portfolios are biased towards safer assets because of the decision to purchase a home: homeowners facing more non-diversified and levered risks in housing will invest their liquid assets more conservatively than those who have relatively less housing, despite the diversification benefit of housing investments due to low return correlation with the equity market; renters are more risk averse in asset allocations when they expect to purchase a house in the near future. These findings support the idea that frictions associated with housing are fruitful areas to investigate in the portfolio choice literature.

Key words: Portfolio Choices; Savings; Homeownership.

1. Introduction

Housing is a major investment for the two-thirds of households who are homeowners in the US. The 1998 Survey of Consumer Finances shows that the average value of a residential house is 2.68 times a homeowner's net worth. In addition, over 50% of average net worth is home equity. The physical nature of housing and the transaction cost associated with house trade prevent homeowners from incrementally changing housing consumption, so housing investment is lumpy and infrequent. Nonetheless, many financial advisors who focus on liquid financial asset investments overlook the effect of housing. The housing investment is important to study not only because the housing asset is an illiquid risky asset, but also because it is generally associated with significant leverage in the form of a mortgage. The after-mortgage-payment labor income is lower and more volatile. It may provide a liquidity demand for safer assets. Together, the liquidity, leverage and lumpy nature of a house can influence households' financial portfolios.

In this paper I present empirical evidence on the cross-sectional variation of portfolio holdings from the Survey of Consumer Finances (the SCF) to show how the presence of home-ownership influences households' savings behavior and choices of financial assets. The goal is to test whether households engaged in large housing investment, or households who expect housing investment, hold less stocks, controlling for wealth and other sources of background risk.

I begin by documenting overall homeownership rates, characteristics of homeowners versus renters and financial asset allocations for homeowners and renters. Since homeownership and wealth are correlated with age, some facts by age cohorts are presented. Using linear regressions, I relate the stock-to-liquid-asset ratio and stock investment in dollars to a number of variables including wealth, age, education, risk attitude and variables related to owner-occupied housing assets. I find out that homeowners whose wealth is more concentrated in housing have less stock in their liquid asset portfolios. Holding other variables constant, relative mortgage debt also discourages relative stockholdings. Thus, the owner-occupied housing has significant impact on liquid

financial asset allocations. Homeowners facing more non-diversified and levered risks in housing will invest their liquid assets more conservatively than those who have less housing. Renters are significantly poorer than homeowners, their portfolio allocations are biased heavily towards cash. Renters who expect to pay for a new home have less stock holdings relative to liquid assets than renters who do not expect home purchases. This is consistent with the theoretical predictions in Hu (2004) that renters facing potential future housing investments would hold less stock compared to lifetime renters who do not have the chance of housing investments.

Some previous papers on portfolio choice address the issue of house price risk. Goetzmann (1993) uses repeated-sales price indices estimated by Case and Shiller (1990) to calculate risks and returns of the capital appreciation of residential real estate. He found low correlation between returns to housing and other assets. Using panel data on homeowners' self-assessments of house values, Flavin and Yamashita (2002) find similar results. The low correlation between returns on housing and other assets suggests that housing should contribute to financial portfolio diversification. However, current real estate markets do not allow for an optimal risk sharing associated with homeownership. The decentralized nature of housing transactions and the absence of short selling make real estate markets inefficient[1]. Fu and Ng (2000) point out that this market inefficiency may distort real estate return volatility and its correlation with security markets. Studies by Case, Shiller and Weiss (1993), Caplin (1997) and Englund, Hwang and Quigley (2001) suggest that allowing households to hedge homeownership risks by setting up house partnership or providing appropriate financial instruments can improve households' welfare considerably. Most of the above analyses use time series data to illustrate the role of real estate assets in capital markets. The work presented here focuses on cross-sectional portfolio holdings using household level data. Both wealth effect and the risk and return relationship are taken into consideration.

Another strand of the portfolio choice literature examines the effect of background risk. Sources of background risk include but are not limited to labor income risk[2], entrepreneurial risk[3], homeownership risk, etc. The idea is to use uninsurable risks to explain the observed heterogeneity in asset allocations. Since the decision to own a house also arises from a consumption need, large housing consumption demand leads to unbalanced investment portfolios for homeowners. Henderson and Ioannides (1983) and Brueckner (1997) both show that homeowners have inefficient portfolios when modelling the investment and consumption aspect of housing simultaneously. Homeowners who hold a large proportion of their wealth in their own homes pay a high cost in terms of extra risk. This extra risk may change homeowners' risk tolerance in the stock market. Some recent papers study the interaction between stock and housing investments in dynamic life-cycle models. Applying numerical solution techniques, Cocco (2004) finds that the share of stocks should be a decreasing function of investors' future labor income risk and an increasing function of the value of their mortgage relative to net worth. Hu (2004) models the life-cycle portfolio choice problem for homeowners when a rental housing market is available. It is shown that young and middle-aged households, regardless of whether they are currently homeowners, have less stock holdings when it is likely that they will buy their homes in future.

This paper analyzes empirically the relationship between stock investment and housing investment. It helps to identify the following two offsetting effects when houses are included in the portfolio: the benefit of diversification due to the low return correlation with the stock market, and the risk aversion caused by the concentration of wealth in risky housing. Evidence from the SCF data shows that the stock-to-liquid-asset ratio is negatively correlated with the size of housing investments. This result suggests that for homeowners making investment decisions, the effect of concentrated risks associated with homeownership dominates the benefit of diversification.

The rest of the paper is organized as follows. Section 2 presents summary statistics from the Survey of Consumer Finances data, households' housing status and the age effect are of par-

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[1] Gatzlaff and Tirtiroglu (1995) provide a more complete discussion of empirical studies on real estate market efficiency.

[2] Papers studied portfolio choices under labor income risk includes Constantinides et al. (2002), Heaton and Lucas (1996), Paxson (1990) and Viciera (2001).

[3] Heaton and Lucas (2000) found that households with high and variable business income hold less wealth in stocks than other similarly wealthy households.

ticular interest. Section 3 examines how risky stock investment varies with homeownership and the relative size of the owner-occupied housing. Renters' portfolio choices are also presented, and how foreseeable future fixed expenses influence renters' stock investment is discussed. Section 5 concludes and summarizes the obtained results.

2. Household Wealth and Asset Allocations

I use the Survey of Consumer Finances (SCF) data conducted by the Federal Reserve Board. The SCF is designed to be the most comprehensive source of wealth data in the United States. It provides detailed financial and demographic information on a large panel of households. The statistics from the data can also be aggregated to represent the entire U.S. population. I begin the analysis by defining summary variables and presenting descriptive statistics from the SCF.

2.1. Homeownership

For a variety of reasons, most houses in the US are owner-occupied: homeownership gives the occupants freedom to modify the house to their specific needs and tastes; homeowners receive favorable tax treatment on the capital gain on their housing investments; interest payments on mortgage and real estate taxes are tax deductible; houses are generally maintained better when they are owner-occupied. However, the advantage of owning has to be compared to costs. Besides searching costs and transaction costs on trading houses, changes in house prices affect homeowners' equity and thus their ability to purchase new houses. Moreover, homeowners typically make trading decisions along with their decisions to move. Frequent movers may prefer renting instead of owning their homes.

Table 1

Home Ownership Ratio by Year and Age Cohort (SCF)

Age	1992	1995	1998
<30	24%	30%	25%
30-39	57%	55%	59%
40-49	73%	70%	70%
50-59	74%	78%	76%
60-69	76%	77%	78%
>=70	76%	72%	78%
All	64%	64%	65%

Table 1 shows the percentage of households who own houses from three waves of the SCF data (1992, 1995, 1998). Households are categorized by survey respondents' age. The probability of homeownership is relatively constant during the 1992-1998 period. The overall homeownership ratio is about 65%. The homeownership ratio is the lowest within the youngest group. In 1998, only 25% of households under age 30 are homeowners. This may be due to two straightforward reasons: the liquidity constraint and the mobility. Financial institutions that provide mortgages typically impose down-payment requirements, hence purchasing a home requires large amount of up front cash, younger households may be liquidity constrained. Linneman and Wachter (1989) and Haurin, Hendershott and Wachter (1997) highlight the impact of lender-imposed borrowing constraints on young households' decisions to buy houses. Presumably, younger households have relatively less wealth and lower income, so the down payment constraints may prevent them from becoming owners. In addition, younger households may live at their current location for shorter duration because they are more likely to face a growing family, changing jobs, etc. As suggested in Hu (2004), a higher mobility rate due to non-financial reasons will lower the probability of homeownership because of the fixed adjustment cost associated with house trades. The homeownership rate increases with age, perhaps because an increasing number of households accumulate enough wealth to make a down payment. Besides, middle-aged and old households are less mobile. So the

advantage of homeownership may outweigh the expected transaction costs of changing houses. More than three-quarters of households over the age sixty own houses, and homeownership rates do not decrease among the elderly.

In 1998, households' principle residence is categorized by: a ranch, a farm, a mobile home and all other type of housing, households who live on a ranch/farm or in a mobile home are of small population--total around 5%. Households who live in other types of houses consist of 69% homeowners, 29% renters, and 2% who neither own nor rent. Neither own nor rent means that housing is either part of job compensation (such as for a housekeeper, a live-in servant), or in transition (such as living in the house which will be inherited; or sold home but has not moved yet). Since the focus of this paper is to show whether and how homeownership affects households' savings and portfolio choices, I exclude households who neither own nor rent their living place from the entire analysis. I also exclude households who live on a ranch/farm or in a mobile home. Therefore, in the remaining analysis, households in the sample either rent or own their houses, and their houses are not farms, ranches or mobile homes.

2.2. Wealth and Income by Housing Status

Before trying to understand homeowners' financial portfolios, it is informative to first look at characteristics that distinguish homeowners from renters. I divide households in the SCF data into two groups according to their current housing choices and then provide some descriptive statistics. Measures of labor income, wealth and asset categories are defined as follows. Labor income is the sum of wages and salaries. It includes both the respondent and the spouse's job income. I use two measures of wealth. Total asset is the value of all households' assets, including liquid assets, real estate assets, the value of pensions, and the value of all private businesses. Net worth is defined as total asset value minus total debt. Total debt includes liquid debt, such as credit card balances, and mortgage debt associated with real estate assets. Since my interest is in the effect of homeownership on portfolio composition, I also report the value of owner-occupied housing[1] and the value of non-residential real estate assets. Home equity is the owner-occupied-home value minus mortgage. Other household demographic information such as age, years of education are presented next. The SCF asked households about their attitude towards financial risks. The willingness to accept risks is classified by integer numbers 1 to 4, with the higher number indicates more risk averse. Households' portfolio choices should depend on their reported risk preference, so I name this variable as risk attitude in the following tables.

Table 2 summarizes the characteristics of renters and homeowners in the SCF 1998. About 70% of households in sample are homeowners. Note that in every wealth category, the median value is much lower than the mean value, which implies that both earnings and wealth are positively skewed. As expected, homeowners are considerably wealthier in all asset categories. They have more labor income, more assets and are much older than renters. The median net worth among homeowners is $120,200, but only $900 among renters; the median total asset value is $175,900 for homeowners, but only $3,000 for renters. The median value of homeowners' houses is $103,000, the median value of home equity is $61,000. Renters on average are 11 years younger than homeowners are. They have similar years of education and risk attitude.

Evidence from previous studies suggests that most households accumulate wealth and assets over working life, part of the huge wealth difference between homeowners and renters may be due to differences in ages. To separate out the age effect, I then report the same statistics by the housing type and also along the age dimension. In Table 3, I define two age groups, a young group with the head of household's age less than 40, and an old group with the head of household's age at least 40. Table 3 shows that in the 1998 SCF, more than 50% of the population are homeowners and are at least 40 years old. Older households are much wealthier than younger ones, although they on average have less labor income. The median net worth for a homeowner in the old group is $142,700, while it is only $54,200 for a homeowner in the young group. Renters are still much poorer in both age groups. The median net worth for a renter in the old group is $2,210, while only

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[1] The value of owner-occupied housing is the self-reported market value of the principle house.

$500 for a renter in the young group. This evidence suggests that homeownership is highly corre-lated with wealth. As discussed in the previous section, prospective homebuyers need to meet down payment requirements when purchasing houses. Engelhardt and Mayer (1996) suggest that a median household has to accumulate between $12,000 and $24,000 for the up front payment. This is clearly too large an amount for poor households, who may never save enough to buy a home base on their expected income. If house prices increase quickly and unexpectedly, more house-holds will become discouraged and choose to rent[1]. Therefore, budget constraints may be the major barrier that prevents homeownership.

Table 2

Characteristics of Homeowners and Renters (SCF 1998)

	Homeowners		Renters	
	Mean	Median	Mean	Median
Total Assets	441,762	175,900	44,387	3,000
Net Worth	367,367	120,200	36,952	900
Owner-occupied Housing	146,741	103,000	-	-
Home Equity	94,371	61,000	-	-
Non-residential Real Estate	49,572	0	8,344	0
Labor Income	41,295	28,000	26,802	19,000
Age	52.8	51	41.8	38
Years of Education	13.4	13	13.2	13
Risk Attitude	3.02	3	3.19	3
Percentage of Population	70.61%		29.39%	

Table 3

Characteristics of Homeowners and Renters by Age (SCF 1998)

	Homeowners				Renters			
	Age < 40		Age >= 40		Age < 40		Age >= 40	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Total Assets	249,034	144,400	500,408	192,640	74,939	2,530	67,444	4,250
Net Worth	155,910	54,200	431,713	142,700	17,103	500	59,699	2,210
Owner-occupied Housing	122,761	98,000	154,037	109,000	-	-	-	-
Home Equity	48,122	29,000	108,444	73,000	-	-	-	-
Other Real Es-tate	17,844	0	59,226	0	3,855	0	13,667	0
Labor Income	54,394	45,000	37,309	18,400	31,103	23,000	21,703	10,000
Age	33.3	34	58.8	57	29.3	29	56.6	52
Years of Educa-tion	13.8	14	13.3	13	13.5	13	12.9	13
Risk Attitude	2.73	3	3.11	3	3.1	3	3.3	4
Population in %	16.50%		53.63%		16.23%		13.64%	

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[1] Engelhards (1994) examines the effect of house prices on renters' decision to save for home purchases and finds evidence of discouragement.

2.3. Asset Allocation by Housing Status

Given the variation in wealth across households, it is sensible to analyze asset portfolios relative to wealth rather than absolute asset values. Households' asset portfolios are reported in Table 4. Again, households are grouped by their housing status. The first part of Table 4 presents ratios of various asset values to the household's net worth. Cash is the sum of the household's cash, checking and savings account. Stocks and bonds consist of direct and indirect holdings of equity and bonds. Indirect holdings are from assets such as mutual funds and defined contribution pensions. For instance, households are asked to classify their mutual funds into equity mutual funds or bond mutual funds. If they hold balanced funds, half of the fund value will be included as stocks, the other half as bonds. The value of Owner-occupied housing is a self-reported market value of a homeowner's principle house. Other real estate asset value is the sum of vacation homes and commercial real estate. Home equity is the value net of mortgage debt of the owner-occupied housing asset. Business value is the total value of the household's private businesses. Pension is total retirement account value other than that reported in other categories. Liquid assets are defined as the sum of cash, stocks and bonds. Finally, the table shows ratios of cash, stock and bond holdings to liquid asset value.

As Table 4 shows, homeowners have a large proportion of their wealth in the form of owner-occupied housing, while renters hold mostly cash. On average, the value of owner-occupied housing is 2.68 times of a homeowner's net worth. The home equity value weighs more than half in the median net worth. Clearly, the owner-occupied housing asset is the major investment for most homeowners. Since owner-occupied housing is relatively illiquid and not diversified, homeowners' financial portfolios should depend not only on current wealth, but also on the composition of wealth. Recent theoretical studies by Flavin and Yamashita (2002), Cocco (2004) and Hu (2004) imply that the current housing stock should be considered as a state variable that affects investors' portfolio allocations. By using the ratio of housing to net worth as the state variable, Flavin and Yamashita (2002) show that the consumption demand for housing places a constraint on the portfolio problem, households with larger holdings of real estate relative to net worth have less relative stockholdings. In later sections, I would test whether we could observe this relationship in the SCF data.

Table 4

Portfolio Choices by Housing Choice (SCF 1998)

	Homeowners		Renters	
	Mean	Median	Mean	Median
Labor Income / NW	1.14	0.1719	119	0.7018
Cash / NW	15.04%	5.74%	92.00%	59.67%
Stocks / NW	12.56%	0.00%	24.69%	0.00%
Bonds / NW	4.36%	0.00%	12.49%	0.00%
Owner-Occupied / NW	268.00%	88.81%	-	-
Home Equity / NW	67.50%	54.36%	-	-
Other Real Estate / NW	9.59%	0.00%	27.97%	0.00%
Business Value / NW	5.32%	0.00%	7.95%	0.00%
Pension / NW	14.32%	0.00%	30.63%	0.00%
Liquid Asset/ Total Asset	19.64%	11.50%	75.41%	100.00%
Cash / Liquid Asset	60.88%	70.40%	76.67%	100.00%
Stocks / Liquid Asset	27.94%	0.00%	10.93%	0.00%
Bonds / Liquid Asset	11.18%	0.00%	12.39%	0.00%

Table 4 also shows that homeowners on average have proportionally more stocks relative to liquid assets than renters. Many renters have only liquid assets and in fact, only cash. As in Table 2, the median total asset value for a renter is $3,000, the median net worth is $900. It is possible that their lack of stocks could be explained by small fixed costs associated with equity market investments. Cocco (2004) shows that introducing a fixed cost to enter the stock market will lower the rate of stock market participation. In a recent study on finite horizon models, Liu and Loewenstein (2001) provide explicit necessary and sufficient conditions under which an investor might optimally never buy stocks subject to transaction costs. They show that when transaction costs increase, an investor's optimal portfolio is biased towards cash.

3. Portfolio Choices in the Presence of Housing

3.1. Effects of Homeownership on Portfolio Choices

In order to analyze the effect of housing investment on portfolio choices more carefully, I first run some simple regressions. I need to control households' characteristics and most importantly, wealth, while studying effects of homeownership. I define a dummy variable I_{own}. It takes the value one if the household is a homeowner, and zero otherwise. I run two regressions that relate stockholdings to a number of independent variables and the homeownership indicator I_{own}. The structure of the regression is described below:

$$
\begin{aligned}
Stock-to-LqAsset_i = a_0 &+ a_1(TotalIncome)_i + a_2(NetWorth)_i + a_3(NetWorth\_sq)_i \\
&+ a_4(Age)_i + a_5(Ed)_i + a_6(RiskAtt)_i + a_7(BusiNW)_i + a_8(PenNW)_i \\
&+ a_{10}(NRENW)_i + a_{11}(I_{own})_i + \varepsilon_i
\end{aligned}
\tag{1}
$$

$$
\begin{aligned}
Stock_i = a_0 &+ a_1(TotalIncome)_i + a_2(NetWorth)_i + a_3(NetWorth\_sq)_i \\
&+ a_4(Age)_i + a_5(Ed)_i + a_6(RiskAtt)_i + a_7(BusiValue)_i + a_8(PenValue)_i \\
&+ a_{10}(NREValue)_i + a_{11}(I_{own})_i + \varepsilon_i
\end{aligned}
\tag{2}
$$

The first regression focuses on the relative stockholdings to liquid asset value, while the second one emphasizes the dollar value of stocks. *Stock-to-LqAsset* is defined as total value of stocks divided by total value of liquid assets. *Stock* is the total dollar value of stocks. *TotalIncome* is a household's total dollar labor income plus business income. *NetWorth* is a household's net wealth as defined in Table 2. I also include the square of the net wealth (*NetWorth_sq*) as one of independent variables. *Age* is the age of the survey respondent, *Ed* is the length of education, *RiskAtt* is a quantitative variable that measures the respondent's self-reported attitude toward risk. *BusiNW, PenNW* and *NRENW* are private business value relative to net worth, pension value relative to net worth and non-residential real estate value relative to net worth, respectively. In the second regression, *BusiValue, PenValue* and *NREValue* are dollar value of private business, pension and non-residential real estate respectively.

Regression results using the 1998 SCF data are reported in Table 5. Since the key interest here is relative stockholdings, to avoid bias caused by mass data around zero, I exclude households with less than $100 in stocks or less than $1,000 in net worth. The first column reports estimates from equation (1), t-statistics are reported next to estimate. The adjusted R-square is very low, only 0.16, which means little variation is explained by this regression. The positive and significant coefficient on net worth implies that wealthier people invest more liquid assets in stocks. The coefficient on education variable also has a positive sign, which means people with higher level of education invest proportionally more in stocks. Risk attitude indicator has the expected negative sign, indicating more risk-averse households have less relative stockholdings. The effect of relative business value, relative pension and relative non-residential real estate assets are all negative and significant, which are consistent with the argument in Heaton and Lucas (2000) that background risks depress stockholdings.

The coefficient on the homeownership indicator is positive and significant, suggesting that households that already own houses are willing to invest more in stocks. There might be several rea-

sons to explain this. First of all, most renters are poor, more than half of the renter population is deleted due to the sample selection, only 10% of the sample data are from renters, so the effect might be dominated by homeowners' stockholdings. And secondly, a renter who wants to buy a house in future may be saving for a down payment or other initial costs to become a homeowner. There are two offsetting effects when renters are facing the choice between risky and riskless assets as savings vehicles. On one hand, the higher expected return on stocks may shorten the time to save; on the other hand, the riskier stock return may lead to more uncertainty on potential homeownership. For those renters who are very risk averse towards home buying in future, the latter factor dominates. In this case, renters' portfolio could be tilted towards cash. I will further investigate the relationship between renters' portfolio choices and expected future expenses in later sections.

Table 5

Effect of Homeownership in Stockholdings (SCF 1998)

Explanatory Variable	Stock Relative to Liquid Asset		Dollar Stocks	
	Estimates	T-Stat	Estimates	T-Stat
Intercept	0.65656	23.91	-305,107	-14.12
Total income	-1.10E-10	-2.63	0.000467	2.12
Net Worth	7.10E-10	3.61	0.0007632	12.51
Net Worth_SQ	-1.53E-18	-2.71	-1.07E-11	-12.39
Age	-0.0006176	-2.77	3,394	18.74
Years of Education	0.00864	6.34	2,223	20.09
Risk Attitude	-0.06947	-18.03	-32,840	-10.22
Busi. / NW	-0.0153	-1.9		
Pension / NW	-0.04812	-3.68		
Nonres. Real Estate / NW	-0.02593	-5.06		
Business value			-0.000734	-6.22
Pension value			-0.0672	-5.68
Nonresidential Real Estate			0.00078	0.59
I(Own home)	0.03208	3.27	28,125	3.31
Adjusted R	0.16		0.18	

The second column in Table 5 shows estimates from equation (2), which relates the dollar amount in stocks to other wealth and demographic variables. The adjusted R-square is 0.18. When holding net worth constant, the dollar value of stockholdings is negatively correlated with business value and pension value. It highlights the pure substitution effect, households with more investments in other assets hold less stock. Both coefficients on age and years of education have positive signs, indicating that older and well-educated households have more dollar stocks. The positive coefficient on homeownership indicator also suggests that on average, homeowners have more stocks.

3.2. Homeowners' Portfolio Choices

Since most of households in the stockholder sample are homeowners (90%), in this section, I focus on the sub-sample of homeowners only. I investigate how the relative size of residential real estate assets and mortgage affects homeowners' relative risky stockholdings. The owner-occupied housing asset is illiquid and most likely debt-financed. A general conclusion from previous studies states that the correlation between returns on housing and stock returns are close to zero. This makes housing a potentially attractive addition to a portfolio because of the value of diversification. Naturally, the next issue to be addressed is the appropriate size of housing in the portfolio. Under current market conditions, it is not easy to disentangle consumption and invest-

ment aspects of owner-occupied housing. Most homeowners hold a large proportion of their wealth in the form of housing, so their financial portfolios with owner-occupied housing may contain considerable idiosyncratic risk. I use linear cross-sectional regressions to explain how the relative size of residential real estate affects a homeowner's investments in the stock market.

I modify equation (1) in that I remove the homeownership indicator I_{own}, and add following independent variables in separate regressions to equation (1) : $RRENW$, residential real estate relative to net worth, $MortNW$ mortgage debt balance relative to net worth, $HENW$, home equity relative to net worth, LTV, the loan-to-value ratio for the owner-occupied house. In equation (2), I replace I_{own} with: HE, dollar value of home equity; and $MORT$, mortgage balance. Regression results are presented in Table 6. I use the sub-sample of homeowners who have at least $100 in stocks and at least $1000 in net worth. The first four columns report estimates from the regression of the relative stockholdings in liquid assets, the last two columns report estimates from the regression of the dollar amount of stocks.

As expected, homeowners' relative stockholdings in liquid assets are increasing in net worth, education and decreasing in risk attitude. After controlling for other variables, the risky stock share in liquid assets is negatively correlated with the relative owner-occupied housing. This result implies that more concentrated wealth in the residential housing asset is associated with lower relative risky stockholdings. The coefficient on relative mortgage to net worth is also negative and significant, suggesting that when a homeowner has more committed long term expenditure, he would invest relatively less in stocks. The coefficient on relative home equity has a negative sign, but it is not statistically significant. These results support the hypothesis that the lumpy nature of the housing investment depresses risky stock investments. In general, owner-occupied housing yields consumption benefit as well as offering investment returns, homeowners are willing to accept more risk in their asset portfolios by holding a lot of housing. However, homeowners who hold large proportion of their wealth in housing already have non-diversified risks in their portfolio, so they tend to reduce the share of risky stocks in liquid financial markets. Therefore, for homeowners, the effect of concentrated risks associated with housing investment dominates the benefit of diversification.

In the regression of dollar amount of stocks, the coefficient on mortgage debt is positive and significant, suggesting that homeowners who can afford higher mortgage would have more stocks (in absolute value). The coefficient on home equity is positive but not significant. This may be due to two offsetting effects. The absolute dollar amount of home equity and stocks are likely to be proxies for wealth, which is measured by but maybe not perfectly correlated with net worth in this regression. Both home equity and stocks are risky assets that to some extent should substitute for each other. Therefore, after controlling for other variables, the dollar amount of home equity has a mixed effect on dollar amount of equity holdings.

3.3. Renters' Portfolio Choices

Previous analysis shows that renters have less stockholdings than homeowners. Besides the fact that renters are much poorer and may not have enough cash to overcome small transaction costs to invest in the stock market, they may also have different saving motives from homeowners. In the SCF, households are asked to report whether there are foreseeable major expenses in the next five to ten years. Households can list up to six of these major expenses. Home purchase is one of the most reported major expenses, other expenses include education, health care, general support for family members or for a baby, purchase of a car or other durable goods, business and/or investments, etc. In the SCF 1998, 51.7% of households report there are major foreseeable expenses. Among renters, 66.6% report there are such expenses. Table 7 presents detailed statistics of reported types of expenses within the sample of households that expect major expenses. The second and third columns of the table present statistics using sub-samples of homeowners and renters. Since households can list multiple types of expenses, numbers in each column do not necessarily sum to one. The table shows that home purchase (45.07%), education (47.12%) and health care (25.94%) are three most important foreseeable expenses. Among renters, about 63% report that they expect to pay for a new home. Therefore, many renters are accumulating wealth for a home.

Table 6

The Effect of Relative Owner-occupied Housing on Stock Holdings for Homeowners (SCF 1998)

Results of linear cross-section regression of the share of stock in liquid assets and the dollar value of stockholdings are presented in this table, using the 1998 SCF data. Same explanatory variables are as defined in Table 3. *RRENW* is the residential real estate relative to net worth *, MortNW* is mortgage debt balance relative to net worth, *HENW* is home equity relative to net worth, *LTV* is the loan-to-value ratio for the owner-occupied house, *HE* is the dollar value of home equity, *MORT* is mortgage balance. Sample weights rather than population weights are used. Households with less than $100 in stock holdings or less than $1,000 in net worth are excluded. (* Estimates significant at 5% level; ** Estimates significant at 1% level)

Explanatory Variable	Stock Relative to Liquid Assets				Dollar Stocks	
Intercept	0.70956**	0.70028**	0.67747**	0.74226**	-271,693**	-278,721**
Total income	-3.09E-10	-3.07E-10	-2.99E-10	-5.71E-10	0.000469*	0.0003303
Net Worth	5.87E-10**	6.16E-10**	7.37E-10**	4.78E-10**	0.00842**	0.00879**
Net Worth_SQ	-1.36E-18*	-1.42E-18*	-1.69E-18*	1.03E-18*	-1.25E-11**	-1.13E-11**
Age	-0.00099806**	-0.0009485**	-0.0007087**	0.00109**	3,306**	3,668**
Years of Ed	0.00921**	0.0095**	0.01017**	0.00943**	22,598**	20,286**
Risk Attitude	-0.06997**	-0.07039**	-0.07137**	-0.06171**	-35,321**	-32,804**
Business value					-0.00373**	-0.00444**
Pension value					0.06908**	0.06474**
Nonresidential Real Estate					0.0007016	-0.0009609
Home Equity					0.00672	0.00275
Mortgage Balance						0.16887**
Busi. / NW	-0.01351	-0.01166	-0.00891	-0.01565		
Pension / NW	-0.05617**	-0.05616**	-0.06798**	-0.0505**		
Nonres. Real Estate / NW	-0.02339**	-0.02381**	-0.02553**	-0.03415**		
Residential RE / NW	-0.00895**					
Mortgage/NW		-0.00832**				
Home Equity/NW			-0.00191			
Loan-to-Value Ratio			0.00178	0.001602		

Table 7

Households' Foreseeable Major Expenses (SCF 1998)

	All Households	Homeowners	Renters
Home	45.07%	33.90%	62.95%
Education	47.12%	49.50%	43.30%
Health Care	25.94%	24.99%	27.46%
Major Purchase	10.00%	10.31%	9.50%
General Support	2.90%	2.90%	2.90%
Investment	1.18%	1.46%	0.73%
Others	3.03%	3.29%	2.62%

I run several regressions similar to equation (1). I use a new dummy variable I_{exp} to replace I_{own}. I_{exp} takes the value one if there are foreseeable expenses, and zero otherwise. I run the regression in the whole sample as well as in sub-samples of homeowners or renters. I also study specifically effects of foreseeable home purchases, education expense and health care expense.

$$
\begin{aligned}
Stock-to-LqAsset_i = {} & a_0 + a_1(TotalIncome)_i + a_2(NetWorth)_i + a_3(NetWorth\_sq)_i \\
& + a_4(Age)_i + a_5(Ed)_i + a_6(RiskAtt)_i + a_7(BusiNW)_i \\
& + a_8(PenNW)_i + a_{10}(NRENW)_i + a_{11}(I_{exp})_i + \varepsilon_i.
\end{aligned}
\tag{3}
$$

Regression results are reported in Table 8. The first column presents estimates using the entire stockholder sample (i.e., households with net worth more than $1,000 and stocks more than $100). The second column presents estimates using sub-samples. Different types of future expenses are considered in sub-sample regressions. The table shows that after controlling for wealth and other household characteristics, coefficients on foreseeable expense indicators (I_{exp}) are all negative and significant. It implies that when households expect to have major expenses in the near future, they hold relatively less stocks in liquid asset portfolios. To be specific, holding wealth and other characteristics constant, households that expect to pay for some major expenses in the future have about 2.6 percentage points less stock relative liquid assets than households who do not expect such expenses. This effect is stronger for renters. Renters who expect to pay for major expenses have about 5.3 percentage points less stock relative to liquid assets than those who do not foresee major expenses. Hence foreseeable future expenses depress relative stockholdings in general, and in terms of magnitude, renters hold even less relative stocks when they expect large cash outflow in the near future.

I also try different expense indicators I_{home}, $I_{education}$ and, I_{health} in the regression to investigate which type of expense is more important. Foreseeable health care expense has the most discouraging effect on stockholdings. Homeowners who expect medical expenses have on average 5.6% less stock relative to liquid assets, while renters have 12.2% less stock relative to liquid assets. Coefficient estimates are significant at the 1% level. Similarly, education expenses discourage relative stockholdings by two to four percentage points. The coefficient on home purchase is negative and significant in the sub-sample of renters. Renters who expect to pay for a home have 5.4% less stock relative to liquid assets than those who are not expecting to pay for a home. Hence, one possible reason why renters are more risk averse in stock investment is because they are saving for a new home. This finding supports the theoretical prediction in Hu (2004) that when renters have the choice of becoming homeowners in future, they reduce stock market investments. Homeownership not only influences homeowners' portfolios, it also changes a renter's or a potential homebuyer's risk tolerance in the stock market.

Table 8

Effects of Foreseeable Expenses on Stock Holdings (SCF 1998)

	All Households		Homeowners		
Explanatory Variable					
Intercept	0.6866**	0.69454**	0.68383**	0.69133**	0.6741**
Total income	-1.15E-10**	-3.02E-10	-3.06E-10	-2.93E-10	-2.96E-10
Net Worth	6.91E-10**	6.09E-10**	6.16E-10**	6.21E-10**	6.25E-10**
Net Worth_SQ	-1.51E-18**	-1.42E-18*	-1.42E-18*	-1.48E-18*	-1.45E-18*
Age	-0.000672**	-0.00094**	-0.000817**	-0.00096**	-0.000566*
Years of Ed	0.00973**	0.01057**	0.01024**	0.01048**	0.01023**
Risk Attitude	-0.0701**	-0.07147**	-0.07148**	-0.07139**	-0.07103**
Busi. / NW	-0.01243*	-0.00812	-0.00851	-0.0077	-0.0101
Pension / NW	-0.04942**	-0.06837**	-0.06693**	-0.06755**	-0.07025**
Nonres. Real Estate / NW	-0.02873**	-0.02756**	-0.02699**	-0.02734**	-0.02685**
I(expense)	-0.02597**	-0.02188**			
I(home purchase)			-0.01268		
I(education)				-0.02084**	
I(Health care)					-0.05571**
			Renters		
Explanatory Variable					
Intercept		0.78447**	0.78622**	0.77318**	0.7716**
Total income		-1.68E-10*	-1.95E-10*	-1.60E-10*	-1.57E-10*
Net Worth		1.42E-09	1.93E-09	1.19E-09	3.95E-11
Net Worth_SQ		-6.54E-19	-2.01E-18	2.00E-19	3.36E-18
Age		-0.00038793	-0.00057879	-0.00022889	0.00024976
Years of Ed		0.001	0.00091207	-0.00124	-0.00139
Risk Attitude		-0.06278**	-0.06285**	-0.05877**	-0.06249**
Busi. / NW		-0.03843*	-0.03875*	-0.03917*	-0.02901
Pension / NW		-0.02132	-0.02162	-0.02603	-0.01485
Nonres. Real Estate / NW		-0.09308**	-0.08828	-0.08591**	-0.08936**
I(expense)		-0.05287**			
I(home purchase)			-0.05362**		
I(education)				-0.04433**	
I(Health care)					-0.12204**

*   Estimates significant at 5% level
**   Estimates significant at 1% level

4. Conclusions

Although home-buying is the single most important investment decision for many households, the impacts of homeownership on portfolio allocations have not been incorporated into most theoretical or empirical analyses of portfolio choice. This paper examines some of the empirical effects of homeownership on financial asset allocations. Using SCF data, I study the portfolio choice of homeowners and renters as functions of wealth, household characteristics, risk tolerance, future expenses and the exposure to residential real estate risks. The underlying hypothesis is that for many households, financial portfolios maybe distorted because of the decision to purchase a home. When a household is renting but foresee potential home purchase, it may want to save conservatively. When a household owns a house, it may respond to the unavoidable exposure to real estate asset risk by shifting its liquid wealth towards safer assets. Evidence from the SCF broadly supports these hy-

potheses. I find that renters are more risk averse in asset allocations when they expect to purchase a house in the near future. Homeowners hold less stock in liquid assets when a larger proportion of their wealth is concentrated in the form of housing, when homeowners are facing more committed long-term debt relative to wealth, they invest less liquid wealth in risky stocks. Results from this paper suggest that for many households, housing risk is another source of background risks that can discourage risky stock investment. Whether to own a house, when to buy and what size of the house to buy are endogenous decisions to make when households allocate their liquid wealth.

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