

## Did Greater Income Uncertainty Reduce Stock Ownership? Evidence from the 2007-2009 Survey of Consumer Finances Panel Dataset

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### Introduction

Based on the life-cycle and permanent income hypothesis, to maintain their utility, households prefer to smooth consumption over their lifetimes by accumulating assets (Ando & Modigliani, 1963). The main proposition of the hypothesis is that households' consumption should not be correlated with expected income growth. Contrary to this theory, McCarthy (2004) found empirical evidence that individuals do respond to expected income growth when they consume and save. How can we fill this gap between the theoretical predictions and empirical findings? Deaton (1991) answered this question by incorporating a new component of income streams, uninsured income risks. That is, when saving, households react not only to expected income growth, but also to the variance in expected income growth (income risks). To buffer their risks, rational households decrease their demand for risky assets in their investments if they face uninsured income uncertainty (Bertaut & Haliassos, 1997).

In order to test Deaton's theoretical prediction, we used the 2007-2009 Survey of Consumer Finances (SCF) panel data to investigate how subjective income risks influenced household portfolio decisions among working households during the Great Recession. Our subjective income risks measure was based on the simple binary indicator of subjective income uncertainty in the SCF panel data. Further, we used two-stage least squares (2SLS) estimates with an instrumental variable (IV) to mitigate the omitted variable bias and assure a causal relationship between subjective income uncertainty and stock ownership (Angrist & Krueger, 2001). To our knowledge, this is the first study to employ IV estimators to determine this relationship in the SCF panel data.

### Method

The newest panel, the 2007-2009 SCF panel dataset, was used to investigate how the Great Recession influenced subjective income uncertainty of future income, and whether or not households responded rationally to subjective income risks when investing in stocks. In the 2009 follow-up survey, 3,857 households were included in the SCF panel dataset, which is approximately 87% of the participants in the 2007 SCF cross-sectional survey. In both survey waves, we included households whose heads were employed in order to see shifts in stock ownership during the recession; ultimately, we selected 2,386 households for our analyses.

This study was designed to examine the relationship between subjective income uncertainty and stock ownership among working households. We used 2SLS estimators with an IV to avoid selection bias and ensure a causal inference.

In the first step, subjective income uncertainty was used as a dependent variable as a proxy of the variance of expected future income (income risk). Unemployment rates by industrial categories were used as an instrument. The SCF provides seven industrial categories and an indicator of self-employment in the public dataset, and we matched that information to the unemployment rates by industry retrieved from Bureau of Labor Statistics (BLS) data for 2007 and 2009. Using a fixed effects model, subjective income uncertainty was regressed on: unemployment rates by industry in each year, a time (2009) dummy variable, age of household head, education level, household type, presence of children under the age of 18, the logarithm of income, the head's occupational categories, spouse's/partner's employment status, net worth, risk tolerance, and household-specific unobserved characteristics. These variables were chosen following previous studies (Angerer & Lam, 2009; Guiso, Jappelli, & Terlizzese, 1992, 1996).

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We excluded race/ethnicity and health status from the model as the two variables did not vary during the period, and including them resulted in multicollinearity of variables.

Actual proportions and predicted probabilities of households that expected income uncertainty in the following year's income are shown in Figure 1. We found an increasing trend of subjective income uncertainty in all estimators in the two survey waves. This supported our underlying assumption that the Great Recession had a negative influence on how households perceived their future income during the period.

In the second step, stock assets ownership was selected as a dependent variable. As the explanatory variable, the predicted subjective income uncertainty obtained from a fixed effect model in the first stage was included. For comparison, we estimated a separate model with an actual income uncertainty variable. The same control variables from the first stage were included (age of household head, education, occupation of head, employment status of spouse/partner, household type, presence of children under the age of 18, household net worth, household income, and risk tolerance). We also added age squared to see if a non-linear effect could explain household stock ownership. For household net worth, we subtracted the dollar amount of financial assets to avoid possible endogeneity. Control variables were coded as in Hanna et al.'s (2010) study. We used the Repeated Imputation Inference (RII) technique for our multivariate analyses to provide better estimates of true variances (Lindamood, Hanna, & Bi, 2007), and present more precise hypothesis testing.

## Results

### *Descriptive analysis*

Changes in ownership and mean values of stock and financial assets before and after the recession are presented in Table 1. Ownership of stock assets increased even after the dramatic negative effects of the recession on stock markets. Significant decreases in stock prices might have encouraged some households that had not participated in stock exchanges before the recession to enter stock markets. Those households might have been motivated to hold stocks with an expectation of increases in stock prices in the future when the economy recovered. However, both mean values of stocks and financial assets decreased considerably after the recession. A slight increase in mean ratios of stocks to financial assets is probable because we included only working households in our sample.

### *Multivariate analyses*

Table 2 shows estimators obtained from the fixed effects models when using two different specifications of subjective income uncertainty. The first model was a linear model with a dummy variable for actual subjective income uncertainty, while the second model presented 2SLS IV estimators with the predicted subjective income uncertainty. We found inconsistency in the estimators of each model, including explanatory and control variables. As estimators from specification 2 are the most likely to be consistent due to the benefits of using the IV method to eliminate selection bias, we will mainly discuss the results based on specification 2. If researchers do not use IV estimators, estimates may suffer from a serious bias that originates from endogenous variables. The explanatory variable of subjective income uncertainty was significant only when we used the predicted income uncertainty. If households expected to face greater income uncertainty for the following year, they were less likely to hold stocks in their portfolio in order to buffer their potential risks in the current year.

After controlling for household characteristics, working households owned more stocks in their portfolio in 2009 by comparison to 2007. Households with high school degrees were more likely to own stocks than were those with less than a high school degree. Households with heads who worked as professionals/managers/administrators, in clerical positions, as operative/laborers, and in precision crafts were less likely to invest in stock assets than were households whose heads were farmers or who worked in other occupational categories. Single male households were less likely to hold stocks than were married households, which could be because they have a short planning horizon than do married households. Homeowners held more stocks than did renters. Households that were willing to take above average risk invested more in stocks than households that were unwilling to take any risk. Table 3 presents the fixed effects model estimators for robustness checks, including expected future income and borrowing constraints. We tested models with expected future income as a proxy of the mean of expected future income following Jappelli and Pistaferri (2000) and Dominitz (2001) and borrowing constraints following Guiso et al. (1996). The negative effect of subjective income uncertainty on stock ownership was robust even after including variables based on alternative hypotheses.

### Conclusion

Our study used a measure of subjective income uncertainty under the assumption that households may not be able to evaluate their expected income uncertainty correctly, and the subjective uncertainty may contribute more to household portfolio choices. Subjective measures can be more important during dramatic economic events, such as the Great Recession. The recession may have caused diverse systematic errors in evaluating households' income uncertainty. We found evidence that if U.S. households perceived their expected income to be more uncertain, they tended to reallocate to less risky assets to protect against income risks, which is consistent with the economic theory. We showed successfully that even a simple question asking whether households were uncertain about their expected income in the following year had predictive power to explain household stock asset holdings. Our results were robust even after the use of variables based on alternative hypotheses to determine the relationships between income risks and stock ownership, such as an increase or decrease in expected income, to test the existence of asymmetric responses to income risks and borrowing constraints.

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Fig. 1. Actual and predicted subjective income uncertainty by year

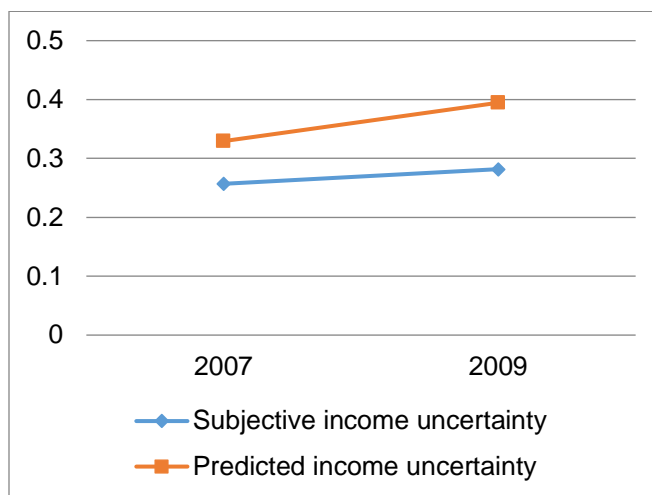


Table 1. Ownership and mean values of stock and financial assets by year

Assets	2007	2009	Change
Stock ownership (%)	60.91	65.13	4.22%
Mean stock assets (\$)	122,113	95,412	-26,701
Mean financial assets (\$)	243,979	214,527	-29,452
Mean ratio of stock to financial assets <sup>a</sup>	.2699	.2824	.0125

Note: 2,386 households whose head is working in both periods are included for our analysis.

<sup>a</sup> Mean ratio of stock to financial assets are calculated with households who owned financial assets in each period (N=2,252).

Table 2. Fixed effects estimators by each specification

	Specification (1)			Specification (2)		
	Coef.	SE	p	Coef.	SE	p
Constant	0.2851	0.3466	0.411	1.2550	0.4932	0.011
Year						
2009	0.0313	0.0154	0.043	0.1168	0.0328	0.000
Income uncertainty						
Uncertain	-0.0180	0.0141	0.203			
Predicted uncertainty				-1.3531	0.4566	0.003
Age of head						
Age	0.0068	0.0130	0.600	-0.0024	0.0132	0.857
Age-squared	-0.00004	0.0002	0.779	0.00001	0.0002	0.966
Education						
High school	0.1240	0.0977	0.205	0.3466	0.1264	0.006
Some college	0.0533	0.1184	0.653	0.1850	0.1318	0.160
Bachelor's	0.1446	0.1474	0.327	0.0435	0.1503	0.772
Graduate	0.2395	0.2437	0.326	0.0570	0.2532	0.822
Occupation of head						
Prof/Manager/Admin	-0.1978	0.0849	0.020	-0.4075	0.1124	0.000
Clerical	-0.1484	0.0851	0.081	-0.3288	0.1043	0.002
Operative/Laborer	-0.1533	0.0838	0.064	-0.2287	0.0860	0.008
Precision craft	-0.1793	0.0938	0.056	-0.3161	0.1045	0.002
Self-employed	-0.1670	0.0848	0.049	-0.1486	0.0843	0.078
Employment status of spouse						
Working	0.0584	0.0249	0.019	-0.0837	0.0525	0.111
Self-employed	0.0411	0.0260	0.114	-0.0285	0.0341	0.404
Household type						
Partnered	0.0295	0.0489	0.546	0.0105	0.0492	0.832
Single male	0.0403	0.0559	0.471	-0.2058	0.0977	0.035
Single female	0.0268	0.0660	0.685	-0.0532	0.0709	0.453
Presence of kid <18						
kid	0.0235	0.0193	0.223	0.0240	0.0193	0.213
Household net worth						
Ln(positive net worth)	0.0019	0.0049	0.694	-0.0027	0.0053	0.618
Ln(negative networth)	0.0019	0.0051	0.707	0.0008	0.0051	0.880
Household income						
Ln(income)	0.0042	0.0025	0.087	-0.0102	0.0055	0.062
Homeownership						
Homeowner	0.1145	0.0410	0.005	0.1129	0.0411	0.006
Risk tolerance						
Average risk	0.0638	0.0224	0.004	0.0363	0.0236	0.123
Above average risk	0.0919	0.0238	0.000	0.0668	0.0246	0.007
Substantial risk	0.0313	0.0324	0.333	0.0506	0.0331	0.126
R-squared		0.2432			0.2229	

Note: 2,386 households whose head is working in both periods are included for our analysis. Specification (1) used actual income uncertainty as a regressor. Specification (2) used predicted income uncertainty calculated from a fixed effect model using IV estimators. All models are estimated by using a RII procedure. Age of head, education, occupational categories of head, employment status of spouse/partners, household type, presence of children aged under 18 years old, net worth excluding financial assets, household income, home ownership, and risk tolerance are included as control variables.

Table 3. Fixed effects estimators with expected future income and borrowing constraints

	Specification (1)		Specification (2)		Specification (1)		Specification (2)	
	Coef.	p	Coef.	p	Coef.	p	Coef.	p
Income uncertainty								
Uncertain	-0.0172	0.224			-0.0180	0.204		
Predicted uncertainty			-1.3555	0.003			-1.3583	0.003
Expected future income								
Increase	-0.0136	0.335	-0.0152	0.278				
Decrease	-0.0227	0.106	-0.0231	0.096				
Borrowing constraint								
Constrained					0.0096	0.808	0.0137	0.726

Note: 2,386 households whose head is working in both periods are included for our analysis. Specification (1) used actual income uncertainty as a regressor. Specification (2) used predicted income uncertainty calculated from a fixed effect model using IV estimators. All models are estimated by using a RII procedure. Age of head, education, occupational categories of head, employment status of spouse/partners, household type, presence of children aged under 18 years old, net worth excluding financial assets, household income, home ownership, and risk tolerance are included as control variables.