Prior investment outcomes and stock investment in defined contribution plans

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Abstract

In this study, we employ the 2001-2013 Survey of Consumer Finances to examine how prior investment outcomes affect portfolio allocation in defined contribution (DC) plans. Results show that investors with prior gains are more likely to invest all DC plan assets in stocks. Factors such as risk tolerance and investment horizon positively affect investors' tendency to allocate all DC assets to stocks. These findings have important implications for investors, researchers and financial professionals.

Keywords: behavior; defined contribution plans; house money effect; prior outcome

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I. Introduction

Social Security and defined benefit pension plans used to be the main income sources for many retirees. As more and more empoyees are eligible for defined contribution (DC) plans as versus defined benefit (DB) plans (US Department of Labor, 2014), they have to shoulder the responsibility to manage their plan assets in order to achieve the desired level of consumption during retirement. With the well-known projections of the Social Security program and the longevity expectation of individuals, the retirement financial outlook for today's workforce is a concern.

Portfolio allocaition affects retirment wealth (Papke, 2004). When making portfolio allocation decisions, investors should focus on factors such as financial goals, risk and return of the portfolio, risk tolerance and investment horizon. 'Buy low and sell high' is a simple concept. However, prior literature documented behaviors in ways contrary to this simple concept (Statman, Thorley, and Vorkink, 2006; Ciccone, 2011; Yao, Ying, and Micheas, 2013). Some investors moved to more of a cash position when their investments experienced large decreases (Lei and Yao, 2015). When the market is up, investors put more money into it (Beach and Rose, 2005). If investment transactions are not based on consumption or asset rebalancing needs, the decision is likely to be more emotional than rational.

Based on the prospect theory, Thaler and Johnson (1990) caliberated a risky choice model and proposed that prior outcomes affect risky choices. They identified the house money effect (prior gains increases the likelihood of risky choices) and the break-even effect (prior losses increases the likelihood of risky choices if the investor expects an opportunity to break even). Although several empirical studies have also noted the effects of prior investment outcomes on investors' portfolio allocation decisions (Agnew, Balduzzi, and Sunden, 2003;

Duxbury *et al*., 2013; Huang and Chan, 2014), very few studies focused on the influence of prior investment experience on stock allocations in DC plans.

The purpose of this study is to examine the effect of prior investment outcomes on investors' subsequent stock allocations in their DC plans. Based on the above theory and empirical findings, we will test the following hypotheses:

(1) Prior gains increase the likelihood of stock investments in DC plan accounts; and

(2) With a positive expectation in future US economy, prior losses increase the likelihood of stock investments in DC plan accounts.

II. Data and Method

In this study, we used the 2001 - 2013 Survey of Consumer Finances (SCF) datasets. The SCF is a cross-sectional survey conducted triennially and sponsored by the Federal Reserve Board with the support from the Department of Treasury. This data range includes a wide range of market performances, especially before and after the Great Recession, and is adequate to serve our research objective. The total sample size for the five SCF datasets was 25 876. Respondents ineligible for a DC plan or eligible but have no discretion over investment choices were excluded. The final sample size for this study was 4798.

The dependent variable was whether households' DC plans were invested all in stocks (1=Yes, 0=No). In the SCF, the investment channels for DC plans included: 1) all in stocks; 2) all in bonds; 3) a combination of stocks and bonds. Information on the exact investment percentages are not provided. Furthermore, the change of each asset's proportion in a portfolio can be due to the variation of assets' value affected by the market. Whether allocating all assets to stocks better reveals investors' intention to invest in stocks in their DC plans.

Based on the conceptual framework and the literature review, we selected independent variables to be included in the statistical analyses. The main independent variable was prior investment outcome (prior gain, prior loss with positive expectation and prior loss with nonpositive expectation). We used the monthly S&P 500 return index starting from May 2001 to calculate the annualized rolling market returns by rolling a data window of 12 months along each survey interview period (May to December). If the market return was positive, then the household had a prior gain, and vice versa. Next, we combined prior investment outcome with respondents' expectation of the US economy in the next five years to define the three categories of the major independent variable: 1) prior gain; 2) prior loss with a positive economic expectation; and 3) prior loss with a nonpositive economic expectation.

We conducted a descriptive analysis and a logistic regression analysis to examine how prior investment outcomes affected stock investment in DC plans. We used weights provided by the SCF to account for the oversampling of wealthy households and the systematic deviations from the Current Population Survey estimates of homeownership by racial/ethnic groups. To adjust for the violation of the usual independence assumption by the geographically-stratified complex survey method and obtain correct SE, we used the 999 bootstrap replicate weights provided by the SCF. For each missing value, the SCF imputed five values and resulted in five complete datasets. To combine these datasets for statistical analysis, we used the repeated-imputation inference method (Kennickell and Woodburn, 1999). All dollar amounts were converted to 2013 dollars.

III. Results

The percentage for the all-stock allocation was the highest (37.0%) for households who had a prior investment gain (Table 1), followed by households who had a prior loss with a

nonpositive economic expectation (30.1%) and a prior loss with a positive expectation (29.1%). Logistic results (Table 2) showed that compared with households who experienced a loss and with a nonpositive expectation for the US economy in the next five years, those who had a prior gain were almost twice as likely to invest all DC plan assets in stocks (odds ratio=1.9). This result was consistent with our first hypothesis and confirmed the house money effect discussed in prior literature. We found no statistically significant difference between the two groups with a prior investment loss.

Other factors that were included in the logistic model as control variables also affected stock allocation in DC plans. These factors included having stocks in other accounts, income, net worth, consulting with financial planners when making investment decisions, homeownership, education, inheritance expectation, risk tolerance and investment horizon.

IV. Conclusion and Implications

Our study contributes to the literature by providing evidence that investors with an immediate prior investment gain are more likely to allocate all of their DC plan assets to stocks than those who experienced an immediate prior investment loss. This indicates that investors are affected by the 'house money effect' when making investment decisions for their DC plans.

Our findings may help explain why some investors tend to 'buy high' as opposed to following the simple 'buy low and sell high' concept. Investing all DC assets in stocks when prices are high is counterproductive for retirement asset accumulation. More importantly, buying at high prices may indicate that investors are being more risk-taking than their risk tolerance would allow them to be and, consequently, would likely lead to 'selling low', which further holds back retirement asset accumulation.

Most individuals accumulate wealth during work years to finance consumption after retirement. Facing the changes in the pension world, the uncertain Social Security outlook and the increased longevity risk, DC plan participants should be careful when making investment decisions and avoid investment mistakes such as investing all DC plan assets in stocks when prices are high. Knowing that some investors are influenced by the house money effect in their DC plan asset allocation, researchers and financial professionals should focus on identifying methods to facilitate plan participants' investment behavior and reverse this effect. One possible solution is to help investors focus on relevant factors such as consumption needs, risk tolerance and investment horizons rather than past investment outcomes when making retirement asset allocation decisions. Another solution is to develop new and improve existing financial products, such as target-date funds, that automatically adjust portfolio allocations based on relevant factors mentioned above. Reducing the number of times to make decisions may reduce the number of times being affected by behavioral challenges and avoid unnecessary mistakes.

References

Agnew, J., P. Balduzzi, and A. Sunden. 2003. "Portfolio Choice and Trading in a Large 401 (k) Plan." *American Economic Review* 93 (1): 193-215. doi: 10.1257/000282803321455223.

Beach, S. L., and C. C. Rose. 2005. "Does Portfolio Rebalancing Help Investors Avoid Common Mistakes?" *Journal of Financial Planning* 18 (5): 56-61.

Ciccone, S. J. 2011. "Investor Optimism, False Hopes and the January Effect." *The Journal of Behavioral Finance* 12 (3): 158-168. doi: 10.1080/15427560.2011.602197.

Duxbury, D., R. Hudson, K. Keasey, Z. Yang, and S. Yao. 2013. "How Prior Realized Outcomes Affect Portfolio Decisions." *Review of Quantitative Finance and Accounting* 41 (4): 611-629. doi: 10.1007/s11156-012-0325-9.

Huang, Y. C., and S. H. Chan. 2014. "The House Money and Break-even Effects for Different Types of Traders: Evidence from Taiwan Futures Markets." *Pacific-Basin Finance Journal* 26: 1-13. doi: 10.1016/j.pacfin.2013.10.008.

Kennickell, A. B., and R. L. Woodburn. 1999. "Consistent Weight Design for the 1989, 1992 and 1995 SCFs, and the Distribution of Wealth." *Review of Income and Wealth* 45 (2): 193-215. doi: 10.1111/j.1475-4991.1999.tb00328.x.

Lei, S., and R. Yao. 2015. "Factors Related to Making Investment Mistakes in a Down Market." *Journal of Personal Finance* 14 (2): 34-42.

Papke, L. E. 2004. "Individual Financial Decisions in Retirement Saving Plans: the Role of Participant-Direction." *Journal of Public Economics* 88 (1): 39-61. doi:10.1016/S0047-2727(02)00074-9.

Statman, M., S. Thorley, and K. Vorkink. 2006. "Investor Overconfidence and Trading Volume." *Review of Financial Studies* 19 (4): 1531–1565.

Thaler, R. H., and E. J. Johnson. 1990. "Gambling with the House Money and Trying to Break Even: The Effects of Prior Outcomes on Risky Choice." *Management science* 36 (6): 643-660.

US Department of Labor Employee Benefits Security Administration. December 2014. *Private Pension Plan Bulletin Historical Tables and Graphs*. Retrieved from: http://www.dol.gov/ebsa/pdf/historicaltables.pdf.

Yao, R., J. Ying, and L. Micheas. 2013. "Determinants of Defined Contribution Plan Deferral." *Family and Consumer Sciences Research Journal* 42 (1): 55-76. doi: 10.1111/fcsr.12038.

Table 1. DC Plan Stock Allocation by Prior Investment Outcomes

Prior investment outcomes	*DC plans allocation: all in stocks*	
	Yes	No
Gain	37.0%	60.6%
Loss with a positive expectation	29.1%	71.0%
Loss with a nonpositive expectation	30.1%	69.9%

Table 2. Logistic Analyses of DC Plan Stock Allocation

Parameter	*Coefficient*	*Odds Ratio*
Intercept	0.899	
Prior investment outcomes (reference category=loss with a nonpositive expectation)		
Gain	0.659***	1.933
Loss with a positive expectation	0.106	1.112
Having stocks in other financial accounts (reference category=no)	0.235***	1.265
Homeownership (reference category= owner with a mortgage balance)		
Renter	-0.008	0.992
Owner without a mortgage balance	0.213**	1.238
Log (household income)	0.061***	1.110
Log (household net worth)	-0.130***	0.908
Use Financial Planners (reference category=no)	-0.175***	0.008
Age	-0.011	0.989
Age-squared	0.000	1.000
Female (reference category=male)	-0.119	0.888
Nonwhite (reference category=white)	-0.124	0.884
Education (reference category=less than high school diploma/GED)		
High school diploma or GED	-0.522	0.593
Some college	-0.574**	0.563
College degree or higher	-0.569**	0.566
Married/living with partner (reference category=unmarried)	0.052	1.053
Expecting an inheritance (reference category=no)	0.190***	1.209
Risk tolerance (reference category=none)		
Average	0.081	1.085
Above average	0.395***	1.484
Substantial	0.976***	2.653
Investment horizon (reference category=less than 1 year)		
1-5 years	-0.049	0.952
5-10 years	0.162	1.176
10+ years	0.233***	1.262

Note: *p<.05; **p<.01; ***p<.001.