Market Performance and the Timing of Retirement

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Abstract

This study is the first to utilize nine interview waves of the Health and Retirement Study and multilevel discrete-time survival analysis to investigate the effect of market returns on individual elective retirement decisions. Individuals who retire at a market peak have an increased risk of shortening the longevity of their retirement income. Unfortunately, market returns were found to have a significant positive effect on the probability of retirement. Researchers, employers, financial educators and financial practitioners should help pre-retirees overcome the stock market's influence on their decision-making to avoid the negative effect of market sequencing on their retirement wealth.

Keywords: Behavioral finance, Retirement behavior, Market sequencing, Projection bias, Health and Retirement Study

Introduction

The economic crisis of 2008-2009 made retirees painfully aware of the importance of having a realistic understanding of investment risks and returns when making retirement decisions. Many retired investors saw substantial decreases in their retirement portfolios, due not only to the stock market plunge, but also to declining housing prices, and questioned whether they could maintain their desired level of consumption and avoid outliving their retirement assets. Most of today's retired individuals receive relatively modest income support from Social Security. A small segment receives monthly payments from defined benefit retirement plans. By 2036, the combined assets of the Social Security Trust Funds will be exhausted (Social Security Board of Trustees, 2011), which implies a reduction in the amount of Social Security benefit that future retirees would receive. Additionally, defined benefit plans are increasingly uncommon as many employers transition to defined contribution plans such as 401(k)s. The risk of securing an adequate retirement standard of living has shifted to individuals and retirement planning has become more important than ever.

In addition to these exogenous factors, individuals' endogenous longevity risk keeps raising the bar for retirement success higher and higher. Financial professionals have noticed the effect of market return sequencing on the longevity of retirement income and warned investors of potential financial disasters in extreme markets (e.g., Fox & Denning, 2009). The current workforce should be aware that retirement timing may have a significant effect on the longevity of their retirement income given the current endogenous and exogenous situations and should seek potential solutions to this problem. Studies are needed to help pre-retirees make rational retirement decisions. Research can help the financial industry better advise clients regarding

how to prepare for their retirement. This study helps meet this research need by investigating the relationship between market returns and retirement decision-making.

Economic theories assume investors are completely informed and rational when making decisions. However, evidence is abundant that investor decisions are not always made that way. Both astute and naive individual investors may have a target amount for adequate retirement wealth and decide to retire when that amount is reached (Schleef & Eisinger, 2007). A portfolio is more likely to reach this self-perceived benchmark when market returns are positive.

Professionals and non-professionals alike appear to naively extrapolate current trends into the future (Plous, 1993). This extrapolation represents a projection bias since market returns go through ups and downs although, in general, the market has gone up in the long run. In addition, the sequencing of returns proves that the earlier the retirement portfolio experiences low or negative returns, the more the retirement income longevity will be affected if annual withdrawals are not adjusted downward and no additional resources are obtained. Reaching the benchmark when the market is at its peak does not provide the same amount of security for the longevity of retirement income as reaching the benchmark when the market is down (Pfau, 2011a; Pfau, 2011b). The consequence of retiring when the market is high may be costly to investors.

Many of the numerous studies conducted on retirement are focused on the asset accumulation phase (e.g., Jacobs-Lawson & Hershey, 2005; Lusardi & Mitchell, 2007; Mitchell & Moore, 1998; Wiener & Doescher, 2008) or estimation of the amount of wealth one should have saved before retirement (e.g., Keister & Deeb-Sossa, 2001; Scholz, Seshadri, & Khitatrakun, 2006; Skinner, 2007). About an equal amount of studies have focused on the decision-making process and examined the factors that affected the decision to retire (e.g., Brown, Coile, & Weisbenner, 2010; Goodstein, 2008; Gustman & Steinmeier, 2000; Farnham &

Sevak, 2007; Hurd, Reti, & Rohwedder, 2009; Samwick, 1998). Little research has directly investigated the effect of market returns on elective retirement decisions over time.

The rate of growth of the elderly population has greatly exceeded the growth rate of the population of the country as a whole, and is projected to keep growing in the future (Administration on Aging, 2010). This fact underscores the importance of research related to retirement timing and resource adequacy. This study contributes to the literature on retirement behavior by directly estimating the effect of market returns on individual elective retirement decisions, using nine interview waves of the Health and Retirement Study and a multilevel discrete-time survival analysis. This study also adds to the general understanding of retirement by providing some perspective on the influence of retirement timing on retirement income longevity. Analyzing future retirees' retirement decisions has implications for researchers, financial advisors, and retirement plan product designers and providers.

Literature Review

The demand for leisure, like the demand for any other good, is influenced by its price, an individual's budget, and his/her preference for leisure. Retirement is a form of leisure. Labor income is the price (or opportunity cost) of retirement. Wealth is one's budget. Taste and preferences for retirement are not directly observable. However, empirical research indicates retirement timing is a household level decision, influenced by the timing of spouse retirement for married couples. Reviewing literature on the effect of income, wealth, and spousal influence on the retirement decision is relevant for this study.

The Effect of Income on Retirement

Empirical evidence on the relationship between income and retirement behavior is mixed.

Kalemli-Ozcan and Weil (2010) examined individual labor/leisure choices over a lifetime subject to uncertainty about date of death. An increase in earned income made retirement more desirable, indicating the dominance of the income effect. Other studies confirmed a positive effect of earnings on retirement (Bartel & Sicherman, 1993; Farnham & Sevak, 2007; Holtz-Eakin, Joulfaian, & Rosen, 1993). Conversely, Samwick (1998) and Dwyer and Mitchell (1999) found that the effect of current wages on retirement was negative, supporting dominance of the substitution effect. The negative effect of income on the likelihood to retire was also found by An, Christensen, and Gupta (2004), Goodstein (2008) and Sevak (2002).

The reason for the disparity between the two sets of results may be use of different measures of income and the two counteracting effects that labor income can have on retirement. Labor income is the price of retirement. It can have a positive or a negative effect on retirement depending on whether the substitution effect or the income effect is dominant. Non-labor income is not directly related to retirement and, as such, can only produce a positive income effect on the demand for retirement.

Inheritance and lottery winnings provide an extra unexpected source of non-labor income. Recipients were found to have a higher probability to exit the labor force. Holtz-Eakin, Joulfaian, and Rosen (1993) analyzed data from the Internal Revenue Service sample of estate tax records in 1982 and 1983 combined with personal income data from 1982 to 1985. They found that a significant amount of inheritance reduced the labor supply of inheritance recipients. The positive effect of inheritance on exiting the labor force was also confirmed by other studies (Brown, Coile, & Weisbenner, 2010; Imbens, Rubin, & Sacerdote, 2001; Joulfaian & Wilhelm, 1994). Imbens, Rubin, and Sacerdote (2001) examined a sample of lottery winners and concluded that lottery winnings, too, significantly reduced labor supply.

The Wealth Effect on Retirement

A pre-retiree holds two types of wealth: accumulated net worth and the present value of future retirement income, including Social Security and pension income. Samwick (1998) estimated the combined effect of Social Security and pension benefits on the probability of retirement in a cross-section of the pre-retiree population. He found no significant effect of retirement wealth on the probability of retirement. Dwyer and Mitchell (1999) found that a $100,000 increase in net worth only induced retirement two weeks earlier. The effect was significant but very small. Recent research has considered the effect that fluctuation of stock market wealth has on retirement decision-making. Using the 1992 to 1998 waves of the Health and Retirement Study (HRS) data, Sevak (2002) found that a $50,000 unexpected increase in stock market wealth resulted in a 1.9% increase in the probability of retirement for those between ages 55 to 60. Findings from later studies supported the positive effect of stock market wealth on retirement (Coronado & Perozek, 2003; Goodstein, 2008; Kezdi & Sevak, 2004). However, using the 1992 to 2002 waves of HRS, Hurd et al. (2009) concluded that large capital gains did not significantly accelerate retirement.

Housing equity is a part of wealth. The empirical findings are inconsistent as to whether retirees use housing wealth to fund retirement. Using data from the 1983 and 1986 Surveys of Consumer Finances, Samwick (1998) found that housing equity had a negative effect on the probability of retirement. Conversely, using data from the 1992 to 2002 waves of HRS, Farnham and Sevak (2007) found that a rise in housing wealth increased the probability of actual retirement transitions and decreased expected retirement age. However, changes in home prices were not found to have a significant influence on retirement decisions (Coile & Levine, 2009).

Empirical evidence shows that changes in Social Security benefits have affected the retirement decisions of older workers. Using data from 1968-1978 Social Security Administration's Retirement History Survey, Burtless (1986) found that the increase in Social Security benefits in the 1970s decreased the average male workers' retirement age. The decrease was small but highly statistically significant. Simulation results from French (2005) showed that removing the tax wedge embedded in the Social Security earnings would delay job exit by one year; while a 20% reduction in Social Security benefits would result in a delay in retirement by three months. Krueger and Pischke (1992) examined data from the Current Population Survey (CPS) from 1976 to 1988 and found that decreases in Social Security benefits lowered the rate of self-reported retirement status for the cohort born between 1916 and 1921.

Cross-sectional estimates of the effect of wealth on retirement timing only measure differences between individuals at various wealth levels. Longitudinal estimates of such an effect may be biased since changes in wealth may have different effects on leisure consumption for individuals with different levels of wealth due to variations in their preferences and tastes for work. In an effort to reduce such a bias, some researchers employed a measure of exogenous variations in wealth, such as market returns, to investigate the effect of wealth changes on retirement timing. Gustman, Steinmeier, and Tabatabai (2010) examined the 1992 to 2000 waves of HRS to study the effects of the boom and bust in the stock market on retirement decision. Results from a structural dynamic stochastic model showed that consecutive high returns in the late 1990's accelerated the retirement date for the HRS sample of workers. Using the 1980 to 2008 cross-sectional March CPS data, Coile and Levine (2009) analyzed the relationship between stock market returns and retirement behavior. Respondents in the 62-69 age group were found to be more likely to retire when the S&P 500 index went up. The

examination of such exogenous factors is not without flaw. One major issue is the variation itself. Once the target wealth for retirement is reached, such variations still will cause one's wealth to fluctuate. However, for retirees, once retired, reentering the labor force is not as easy as reducing consumption.

The Spousal Influence on Retirement

Retirement is considered a joint decision-making process of the husband and wife in a household (Henkens, 1999; Smith & Moen, 1998). Empirical work has examined factors that can affect this decision. Hall and Johnson (1980) found that those with a working spouse were more likely to retire later. Shaw (1984) concluded that having a retired husband made earlier retirement more desirable for women. Using data from the 1982 Social Security New Beneficiary Survey, Hurd (1990) produced a table of distribution of the differences in retirement dates between husband and wife. Results show that 24.6% of couples retired within one year of each other. Later empirical evidence confirmed the fact that respondents were more likely to retire if their spouse had already retired (Blau, 1998; Blau & Gilleskie, 2001; Gustman & Steinmeier, 2000; Gustman & Steinmeier, 2004; Henretta, O'Rand, & Chan, 1993; Johnson & Favreault, 2001). Complementarities of leisure may be the main reason for the coordinated retirement (An, Christensen, & Gupta, 2004; Coile, 2004).

Limitations of Previous Studies

Previous studies of factors affecting retirement timing have several limitations. Studies using data collected from one survey year (e.g. Dwyer & Mitchell, 1992) can only measure differences between individuals at various wealth levels at a point in time. Those using panel data to observe retirement expectations or behavior between two points of time (e.g. Brown, Coile, & Weisbenner, 2010; Joulfaian & Wilhelm, 1994; Samwick, 1998; Sevak, 2002) can make comparisons but cannot capture retirement decisions over a long period of time.

Some studies have examined expected retirement age (e.g. Dwyer & Mitchell, 1999; Farnham & Sevak, 2007; Hurd et al., 2009). Some have observed the deviation of actual retirement from expected retirement (e.g. Brown, Coile, & Weisbenner, 2010; Coronado & Perozek, 2003; Hurd et al., 2009). Although expectations can and do influence behavior, it is behavior that will affect one's financial well-being in retirement. Further, some people might not have considered retirement and, consequently, do not have an expected retirement date. Others may plan to stay in the workforce as long as possible. Examining changes in retirement expectations or deviations of retirement behavior from expectations would be impossible for these people.

Studies that attempted to observe the relationship between stock market returns and retirement decision have either examined the effect of stock market wealth on retirement or used cross-sectional data (e.g. Coile & Levine, 2009; Coronado & Perozek, 2003; Goodstein, 2008; Gustman & Steinmeier, 2002; Gustman, Steinmeier, & Tabatabai, 2010; Kezdi & Sevak, 2004; Sevak, 2002). Some of these articles observed that a period of time was a market boom and another period of time was a market bust; and then observed the likelihood to retire in these two periods of time. From these observations, they suggested that the probability of retirement was related to market ups and downs. Other articles used cross-sectional data and market returns at

each snap shot of time to examine the relationship between retirement and market returns. This type of analyses could not capture the change trajectory at the individual level. No previous study assigned a market return value to each respondent at each interview and directly included that variable into their regression model to investigate retirement behavior, controlling for wealth.

To address these limitations, this study will 1) use all available interview waves of the HRS longitudinal data (nine waves covering 17 years from 1992 to 2008); 2) focus on actual retirement behavior; and 3) include the market return variable in the model to directly estimate the effect of market returns on individual elective retirement behavior.

Theoretical Framework

The own-price effect of any price change includes the substitution effect and the income effect. Retirement is a form of leisure and labor income is the price of retirement. The substitution effect of an increase in labor income should induce individuals to supply a greater amount of labor and delay elective retirement, holding the preference for leisure constant. At the same time, assuming leisure is a normal good, a higher labor income should lead to an earlier elective retirement, because consumers are net sellers of leisure. Therefore, an increase in labor income should delay (or have a negative effect) on elective retirement if the substitution effect is dominant. Alternatively, if the income effect dominates the substitution effect, a higher labor income should induce an earlier (or have a positive effect) on elective retirement. An increase in wealth also brings about an income effect on the demand for leisure. The probability of elective retirement should increase when wealth increases, holding the price of and the preference for leisure constant.

Under a life cycle model (Ando & Modigliani, 1963), wealth is accumulated during an individual's work life to finance consumption after retirement when earned income stops. A generally accepted definition of retirement preparedness is having adequate income in retirement to support one's retirement standard of living close to the preretirement level (Schulz, 1992). The following model illustrates such definition:

$$W \geq \sum_{t=1}^{T-R} \frac{C-P}{(1+r_t)^t}, \tag{1}$$

where W = accumulated wealth for retirement

C = desired consumption level at retirement, assumed to be constant

P = Social Security and pension income, assumed to be constant

R = age at retirement

T = age at death

r_t = portfolio return of year t

Based on classic asset pricing models, the expected return of a portfolio should be based on its systematic risk (Sharpe, 1964). One form of projection bias is to be more influenced by the most recent observations when forming a perception (Miller & Campbell, 1959). Investors that are influenced by such a bias tend to focus on the most recent returns of the stock market and expect the trend to extend into the future. Several researchers have noted the effect that projection bias can have on expected returns (e.g., De Bondt, 1993; Graham & Harvey, 2001; He & Shen, 2010; Shefrin, 2005; Vissing-Jorgensen, 2003). When market returns are positive, the individuals' wealth is more likely to increase and reach the target retirement wealth W (Equation 1). Pre-retirees who are influenced by projection bias are likely to extrapolate current high market returns into the future and decide to retire. Because the present value of retirement

incomes is lower when r_t is expected to be higher, the already increased retirement wealth W rises faster to meet the lowered present value of retirement incomes. The present value of the retirement income withdrawals is affected by the sequencing of portfolio returns after retirement. Therefore, the longevity of the retirement income, which is positively related to the present value, is influenced by the sequencing of portfolio returns after retirement.

Preferences can also affect leisure consumption. It is plausible that the leisure time of spouses is complementary during retirement. The preponderance of empirical research on retirement suggests that couples desire to share leisure time during retirement and tend to retire within a year of each other (e.g., Blau, 1998; Coile, 2004; Gustman & Steinmeier, 2004; Johnson & Favreault, 2001; O'Rand & Farkas, 2002; Smith & Moen, 1998).

Based on the aforementioned theories and empirical findings, it is hypothesized that:

1. An increase in stock market return increases the likelihood of an elective retirement for those with investment assets;
2. higher net worth leads to earlier elective retirement; and
3. spouse retirement status positively affects elective retirement.

Methodology

Data and Sample

This study used data from nine interview waves of the Health and Retirement Study (HRS), a national biannual panel survey conducted by the Institute for Social Research at the University of Michigan and funded by the National Institute of Aging. The HRS consists of five cohorts: the initial HRS cohort (born 1931 to 1941), the AHEAD cohort (born before 1924), the Children of Depression cohort (born 1924 to 1930), the War Baby cohort (born 1942 to 1947),

and the Early Baby Boomer cohort (born 1948 to 1953). The purpose of HRS is to collect data about the retirement, health, insurance, and economic well-being of individuals over age 50. If the selected respondents were married or partnered, their spouse/partner was included in the study as well. This research used Version J of the HRS data prepared by the RAND Corporation.

The total number of people that HRS interviewed between the 1992 and 2008 waves was 30,548. Respondents included for this project were exclusively from the initial 1992 HRS cohort and were between 51 and 61 years of age in 1992. The rationale for only using the 1992 HRS cohort was that the cohort's age in 1992 uniquely positioned them as pre-retirees. The total sample size of pre-retirees who were age 51-61 in 1992 was 9,761. For households with two respondents (n=3,325), the financial respondent was selected. To isolate respondents prior to retirement, only those who were working full-time or part-time were included. Respondents who reported a working status in 1992 but stated a retirement year prior to 1992 were excluded from this study. After applying the above sample selection criteria, the final sample size in this study was 4,054.

Measures

Retirement-related Variables.

Elective Retirement. In the HRS, the labor force status for the respondent at each wave includes working full-time, working part-time, unemployed, partly retired, retired, disabled, or not in the labor force. This study is to determine factors that affect people's choices between work and retirement. Involuntary retirement was not a decision made by individuals and these individuals are, therefore, not the focus of this research. Involuntary retirement is likely to occur when one is unemployed, is disabled, and/or has a health problem that limits the type and amount

of their work. Therefore, in this project, elective retirement is defined when the respondent reported a partial or a full retirement status in the current wave and working full-time or part-time with no health problems that limited their work in the prior wave. This variable was the outcome variable in the multivariate analysis.

Probability of retirement. The probability of retirement in each calendar year was calculated as the ratio of the number of respondents who retired during the year divided by the number of respondents who were not retired at the beginning of the year.

Market Performance Variables

Wave. Wave was identified by its corresponding year. For example, wave 2 was coded as 1994 and wave 9 was coded as 2008. Waves served as intercepts in the multivariate analysis.

S&P 500. When the respondent was defined to be retired, his/her reported retirement month and year was recorded. The 12-month trailing return of S&P 500 prior to that month was assigned to this respondent. If the retirement year was provided but not the month, then the prior year's annual S&P 500 was assigned. If the retirement year was not reported, then this respondent's data from the current wave and subsequent waves were deleted. Respondents who did not report retirement when interviewed were assigned the 12-month trailing return of S&P 500 prior to the interview month.

Market Sequence. Each year was either an up year or a down year based on the S&P 500 annual total return. If the year was an up year, the number of previous consecutive up years, including the current year, was assigned to the respondents. If the year was a down year, the number of previous consecutive down years, including the current year, was assigned to the respondents. A negative sign is added to a number if it was a measure of the number of consecutive down years.

Other Time-varying Variables.

Demographic Variables. Age at interview was divided into three groups: less than 62 (the earliest retirement age for Social Security benefits), between 62 and each respondent's full retirement age (earliest retirement age for full Social Security benefits), and older than full retirement age. Presence and employment status of spouse/partner included: no spouse/partner due to being separated or divorced, widowed, or never married; married/partnered with a retired spouse/partner (reference); married/partnered and spouse/partner working; married/partnered and spouse/partner not currently working. Presence of dependent children was a dichotomous variable (1=yes, 0=no). Household size was a continuous variable centered at 2. Occupation was divided into five categories: managerial (reference), professional, sales, service, and other.

Economic Variables. Pension ownership included defined contribution (DC) plans only (reference), defined benefits (DB) plans only, both DB and DC plans, and no pension. Labor income was measured as the annual household income from all jobs in the calendar year prior to the interview year, adjusted to 2008 dollars. One dollar was added to all values of household labor income to eliminate zeros prior to log transformation. Net worth was calculated by subtracting total household debts from total household wealth, adjusted to 2008 dollars. An amount equal to the lowest observed value plus $1 was added to the household's net worth to eliminate non-positive values prior to log transformation. Log-transformed net worth was centered at its mean to reduce its correlation with time. Investment asset ownership was a dichotomous variable and was given a value equal to 1 if the household had any of the following assets: real estate other than primary residence, business, IRA, Keogh, stock, bond, mutual fund, and investment trust. Home ownership was a dichotomous variable (1=yes, 0=no). Health insurance coverage in retirement was a dichotomous variable that indicated whether the

respondent reported that they had an employer-provided health insurance that covered the respondent in retirement (1=yes, 0=no).

Time Invariant Variables. In the HRS, some demographic information was collected only at the first interview of a respondent. If there was a missing value, the respondent was asked the question again in subsequent waves until a valid response was obtained. The time invariant independent variables included gender (1=female, 0=male), highest degree (less than high school [reference], GED, high school, some college, or college and above), and race (White [reference], Black, or other).

Data Analysis.

Censoring. Between 1992 and 2008, some respondents stopped participating in the survey and did not return; these respondents' data were included until they stopped responding. Some respondents dropped out of the study and reentered in a later wave; data from these respondents were included until they first stopped responding. Data provided by these intermittent respondents in later waves were excluded because there was no way to monitor their labor force status while they were not reporting. These respondents were referred to as censored. If the respondent reported a partial or a full retirement in the current wave and a labor force status other than full-time or part-time employment in the previous wave, they were treated as censored at the current wave.

Methods of Analysis. Since the purpose of this study was to estimate the probability for near retirees to electively retire from a full-time or part-time employment status, all respondents selected were in the general pre-retirement age between 51 and 61, and were in the labor force in 1992. For households with two respondents that met the age criterion, the one who reported being more knowledgeable about household finances in the first wave was selected. Financial

respondent in a household can vary by wave. However, the longitudinal nature of this research requires consistency of the sample respondents. Therefore, once selected, the respondents stayed in the sample unless they failed future sample selection criteria. Retired respondents' data were excluded from subsequent waves.

The fundamental tool to describe the sample distribution of event occurrence is a life table, which records the event history throughout a period of time (Singer & Willett, 2003). In this analysis, since the research interest of this study is the first self-elected retirement, respondents who reported a health situation that limited the type and amount of their work were excluded from the current wave. A life table was produced to observe, at the end of each year, the number of respondents who retired, did not retire, or were censored. In each wave, those whose health situation limited the type and/or amount of work were excluded from the current wave and added back in later waves if they met the sample selection criteria.

The associations of time, S&P 500 returns, net worth and spouse retirement status, and other variables with the outcome of retirement were analyzed using a multilevel discrete-time survival analysis to examine whether market returns, net worth and spouse retirement status affected the probability of retirement over time, controlling for the other factors in the model. The multilevel analysis produces standard errors that are corrected for clustering at the individual level from repeated measures (Raudenbush & Bryk, 2002). A survival analysis is commonly used to examine whether events occurred (Singer & Willett, 2003). A discrete-time model was selected because the HRS data were collected in discrete time. It is likely that those who never owned any investment assets may respond differently to market returns from those who once owned investment assets (including those who always owned investment assets and those who owned some investment assets intermittently). In order to test the first hypothesis that "an

increase in stock market return increases the likelihood of an elective retirement for those with investment assets" a multilevel discrete-time survival analysis was separately conducted to each of these two groups.

In this study, it was important to select those individuals who had clearly moved from working status in the immediate prior wave to retired status in the wave observed. Because information about prior employment status was not included in the first wave (1992 HRS), the analysis excluded wave 1 observations and began with wave 2 (1994 HRS) so that prior employment status could be empirically verified. The number of respondents who were married or partnered but whose spouse/partner's employment status was unknown was very small. Consequently, they were excluded from the current wave. Respondents with missing values in the outcome and independent variables were excluded from waves where the missing values existed. A descriptive analysis of the households selected for the multivariate analysis was conducted to illustrate the characteristics of those households at the baseline year (1992).

Interaction terms between S&P 500 and other independent variables were tested and none of them were significant. Correlations between other independent variables were examined and no obvious interactions between variables were identified.

Results

Observed Probability of Retirement and Sample Characteristics

The life table (Table 1) shows the uncontrolled observations of the number of respondents who retired, did not retire, censored, and the probability of retirement over time. The number of respondents who did not retire at the end of each year decreased, as other

respondents retired and were censored. The probability of retirement from a full-time or a part-time employment status strictly increased from 1993 to 2000 and again from 2003 to 2006.

[Insert Table 1 about here]

As shown in Figure 1, the probability of retirement increased as the number of consecutive up years increased, except from 2006 to 2007, when the probability of retirement decreased from 14.2% to 7.9%. During the general up trend in markets from 1993 to 1994, the probability of elective retirement increased by 38.9%. Similarly, from 1995 to 1999, the probability of retirement in each year was higher than the previous year. During the next upswing in the market, pre-retirees continued to respond in the same fashion. The probability of retirement increased from 9.9% in 2003 to 14.2% in 2006. The drop in 2007 from the previous year was likely due to the high percentage (45.7%) of the respondents not retired in 2006 who expected to never retire. By August 2007, the youngest respondents reached their full retirement age (65 and 8 months). It is reasonable to assume that if they expect to never retire, they will not voluntarily retire from the labor force regardless of market performance.

[Insert Figure 1 about here]

Table 2 shows the characteristics, at baseline (year 1992), of sample respondents who were selected for the discrete-time survival analysis. The majority of the respondents were male (57.6%), White (78.3%), married (64.6%), and with dependent children (91.3%). Median household labor income and net worth in 1992 was $39,900 and $100,000 (in 2008 dollars), respectively. Most respondents (61.7%) had at least a DB or DC pension plan, owned some investment assets (61.9%), owned a home (79.2%), and had employer-provided health insurance that would cover retirement (62.8%). Median age was 55 and median household size was two. Less than a quarter (23.3%) of the respondents had earned a college degree.

[Insert Table 2 about here]

5.2 Discrete-time Survival Analysis Results

Table 3 presents results of the discrete-time survival analyses. The relationship between S&P 500 returns and the probability of retirement was significant and positive. A one percentage increase in market returns increased the probability of retirement by 2.8% for those who once invested and by 2.2% by those who never invested, *ceteris paribus*. Since interaction terms between S&P 500 and other independent variables were not significant, the influence of S&P 500 returns on retirement decisions was the same for all respondents regardless of their demographic characteristics and economic status other than investment asset ownership.

[Insert Table 3 about here]

Results of the discrete-time survival analysis indicated that significant relationships existed between the probability of retirement and other independent variables. Among those who once invested, those who were between age 62 and full retirement age were 3.5 times as likely to retire, those who passed their full retirement age were 4.0 times as likely, than those who were younger than 62. For those who never invested, the odds ratios were much higher (6.4 and 9.7, respectively). For both investment asset ownership groups, respondents whose spouse was retired were significantly more likely to retire than those whose spouse was working (2.5 times as likely for the once invested group and 2.4 times as likely for the never invested group) and those whose spouse was not currently working (2.3 and 2.0 times as likely). These respondents were also significantly more likely to retire than those who were separated or divorced, widowed, and never married (odds ratios ranged from 1.8 to 3.2). Household size had a negative relationship with the probability of retirement. One additional person in the

household decreased the likelihood to retire by 11.1% for the once invested group and by 15.9% for the never invested group.

Among respondents who had some investment assets, those who only had DB plans were 88.3% more likely and those who had both DB and DC plans were 102.8% more likely to retire than respondents who only had DC plans. However, those without any kind of pension plan were 35.8% less likely to retire than those who participated in DC plans only. For the never invested group, those who only had DB plans were 2.2 times as likely to retire as those who only had DC plans.

Separate analyses with different control groups were conducted for both investment asset ownership groups. Controlling for factors including wealth, those who once invested and had no pension were found to be less likely to retire than pension plan participants (62.5% as likely as the DC only group; 34.5% as likely as the DB only group; and 31.3% as likely as the DB and DC group). Among the never invested group, those who did not have a pension plan were 58.8% as likely to retire as those with DB plans.

One percentage increase in annual household labor income decreased the probability of retirement by about 0.2% for both the once invested and the never invested groups. The probability of retirement increased 1.2% with a 1% increase in net worth for the once invested group. However, changes in net worth did not change the probability of retirement for the never invested group. Self-reported health insurance coverage in retirement increased the probability of retirement by 63.6% for those who never invested.

Discussion and Implications

The purpose of this study was to utilize longitudinal data to investigate changes in elective retirement decisions over time in response to stock market returns. In general, the probability of the market experiencing a down year increases after prolonged bull markets. An increasing probability of retirement was observed as the number of up years increased. Findings from a discrete-time survival analysis indicated a positive relationship between the probability of retirement and market returns.

Baby boomers are starting to leave the workforce. Facing the changes in Social Security and pensions, and having experienced the recent market crash and the housing slump, today's pre-retirees are in uncharted territory. Consequently, it is important to consider the effect of market returns, economic characteristics, and spousal influence on the retirement timing decision.

The Effect of Market Returns for Those Once Invested

This study contributes to the literature by supporting the projection bias hypothesis. It is important for financial practitioners to recognize the tendency of their clients to be overly optimistic and believe the good years will last forever and retire when markets are high.

The 12-month trailing returns of the S&P 500 index had a significant positive effect on the probability of retirement for those who once invested. This result is consistent with the first hypothesis but may not be the best circumstance for pre-retirees in terms of retirement planning. Given market variations, the possible downside of retiring at the market peak is twofold: (1) reaching target retirement wealth when the market is up does not provide the same security level as achieving the target amount of wealth when the market is down; and (2) the probability of retirement wealth experiencing a market correction is higher when the market is at its peak.

Retiring at a market peak creates an increased risk of shortening retirement income longevity for those with stock market wealth in their retirement portfolio.

If retiring when the markets are high is due to lack of knowledge, financial education may help retirees avoid succumbing to projection bias. As fiduciaries for their clients, financial practitioners should help clients with this bias find ways to reduce the likelihood of outliving their retirement income. Advising clients about the difference between reaching the target amount of retirement wealth in an up market and in a down market is necessary. Retirement plan product designers and providers should explicitly address this risk exposure.

Investment style philosophies differ. The portfolio of efficient market advocates tends to be concentrated in indices like the S&P 500. Active management supporters tend to select individual investment components. As long as the managed portfolio has a positive correlation with the market, investors should find this research valuable, regardless of the investment style philosophy they use.

The Effect of Market Returns for Those Never Invested

It is worthwhile to note, however, the effect of market returns was not the same for those who once owned investment assets and those who never owned investment assets during the 17 years between 1992 and 2008. After controlling for age, a one percentage increase in market returns increased the probability of retirement by 2.2% for those who never invested (significant at the .05 level) and by 2.8% for those who once invested (significant at the .001 level). Although age had a significant positive effect on the probability of retirement for both groups, such an effect was more impactful for the never invested group than for the once invested group. Looking at the effect of market returns and the effect of age together, it is not difficult to see that for those who never invested, age was the more important among these two factors; and for those

who once owned investment assets, market returns was the factor that played a more important role.

It can seem unusual for those who never owned investment assets to respond to market returns. Research (e.g. Bram & Ludvigson, 1998; Fisher & Statman, 2003; Jansen & Nahuis, 2003) shows that market returns affect consumer sentiment, which positively affects people's consumption behavior (e.g. Carroll, Fuhrer, & Wilcox, 1994; Ludvigson, 2004). Retirement is a form of leisure, which is usually considered a normal good. It is likely that when market returns are high, regardless of their investment asset ownership, people feel more positive about the economy and their future financial well-being and choose to retire.

The Effect of Economic Characteristics

The negative effect of labor income on the likelihood to retire suggests that the substitution effect was dominant. Labor income is the price of leisure, i.e. the opportunity cost to retire. At the same wealth level, those with more income may have a higher amount of target retirement wealth. Their desired standard of living is probably higher than that of respondents with a lower level of income. Furthermore, individuals with higher labor incomes are likely to have a higher preference for work than those with lower incomes. The success and corresponding high compensation of individuals with more income may be a result of a higher level of motivation to work. Higher income earners may postpone retirement because they derive more satisfaction from their work than others. Future research may consider measuring the preference for leisure and include such a variable in the study of retirement behavior.

The result that wealth had a significant positive relationship with the likelihood to retire for the once invested group partially confirmed the second hypothesis that wealth positively affects elective retirement. Previous research found that people are likely to have a target

amount for retirement wealth and tend to retire when this amount is reached. This target amount will be first achieved in an up market, giving pre-retirees a false sense of security. When the stock market goes down, retirement portfolios with stock market wealth will go down in value, increasing the risk of outliving retirement resources. The income effect resulting from this decline in wealth would induce retirees to go back to the workforce. Job reentry is more difficult in down markets when unemployment rates are high. For retirees who have started collecting Social Security benefits, the amount they can make without losing their Social Security benefits provides a further constraint on how much they would like to work even if they could successfully return to the workforce. Financial advisors need to work with their clients to make appropriate adjustments to either their retirement wealth or retirement timing, or explore a financial product that can secure reasonable retirement income longevity.

For the never invested group, wealth was not a factor that significantly affected the probability of retirement; however, this probability was found to be affected by age and the DB plan ownership. This provides evidence that respondents who do not invest depend more on income from their DB plans rather than their accumulated wealth to meet their consumption needs during retirement.

Among those who once invested and at the same wealth level, DB plan participants have a phantom balance sheet asset item: the net present value of the income stream from the DB benefit, which is non-existent for those with DC plans only and those with no pension. It is not surprising that this type of wealth produced a positive income effect on elective retirement. Moreover, DB plans "define the benefits," focusing on the income stage of a retirement plan, whereas DC plans focus on the accumulation stage of retirement planning. It seems reasonable that decision-making would be influenced by defined benefits. DB plan income payouts are

relatively more guaranteed than those from DC plans. In this sense, DB plans function similar to insurance. The effect of market sequencing on retirement income longevity is offset by the stable income from DB plans.

Controlling for factors including wealth, those who once invested and had no pension were found to be less likely to retire than pension plan participants. Pension plan assets are clearly designated for retirement income purposes. Equal amounts of wealth outside of pension plans may be intended for other purposes (e.g. grandchildren's education). Therefore, it is not surprising to find that those with a DB plan were more likely to retire than respondents who only had DC plans; and pension plan participants were more likely to retire than those with a similar amount of wealth not clearly earmarked for retirement.

Opinions on whether the current primary residence should or would be used by retirees to fund their retirement have not been consistent in academia or among financial professionals. In this study, since ownership of a primary residence was not assigned to mobile home owners in the 1996 HRS, the net value of the primary residence was included in the net worth. If homeowners do not use housing equity to fund retirement, they would be less likely to retire, *ceteris paribus*, since part of their net worth is tied up in their residence. The finding that, after controlling for net worth, home ownership did not significantly affect elective retirement decisions may be evidence that those once invested pre-retirees may plan to use housing equity to fund retirement. The insignificance of the effect of net worth, coupled with the insignificance of the effect of home ownership for the never invested group suggest that these respondents may not consider housing equity as part of their retirement wealth. Again, since DB plan ownership significantly affects their retirement decision, those who never invested may be counting on their income from DB plans during retirement.

The Spousal Influence

Consistent with the third hypothesis, elective retirement decision-making was found to be significantly related to spouse retirement status for both investment ownership groups. Those whose spouse was retired were more likely to retire than all other household types, including those whose spouse remained in the labor force, those whose spouse was not working at the time of interview, and those who did not have a spouse. This result supports the idea that, among married individuals, leisure is a complementary good.

Family preferences make it reasonable that married couples would like to coordinate their retirement decisions and retire around the same time. However, it is also reason for them to be more careful in planning for retirement. If both spouses decide to retire close to the end of an up market, the household would have no cushion should their retirement portfolios be hit by a negative return. The spousal influence on retirement timing may influence long-term retirement income sustainability by increasing the couple's exposure to stock market return sequencing risk . Financial professionals need to educate pre-retirees about this spousal influence on retirement decision-making and discuss the benefit of diversifying retirement timing. Retirement plan product designers and providers should also take spousal influence into consideration when designing solutions for those who do desire to retire together.

Conclusion

This study is the first to use nine interview waves of the Health and Retirement Study and multilevel discrete-time survival analysis to explore the effect of market returns on individual elective retirement decisions. Having experienced the recent market crash and the housing slump and facing the uncertain future of Social Security, baby boomers are starting to exit the

workforce. Acting on projection bias would expose their retirement portfolio to a higher probability of experiencing an early negative hit, and outliving their retirement resources. It is very important that researchers, employers, financial educators and financial practitioners help pre-retirees better understand the challenges they face and overcome projection bias in order to reduce the likelihood of retiring at the end of a long up market.

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Table 1

Life Table Describing the Number of Retirees and Probability of Retirement Over Time

Year	Not Retired	Retired	Censored	Probability of Retirement
1992	3,718			
1993	3,525	133	0	3.6%
1994	2,824	177	524	5.0%
1995	2,676	148	0	5.2%
1996	2,108	170	398	6.4%
1997	1,958	150	0	7.1%
1998	1,587	166	205	8.5%
1999	1,426	161	0	10.1%
2000	1,074	147	205	10.3%
2001	977	97	0	9.0%
2002	697	153	127	15.7%
2003	628	69	0	9.9%
2004	436	80	112	12.7%
2005	380	56	0	12.8%
2006	302	54	24	14.2%
2007	278	24	0	7.9%
2008	221	14	43	5.0%

Note: Analysis of Rand HRS Data, Version J. Sample Size = 4,054.

Table 2

Household Characteristics at the Baseline Year (1992)

Household Characteristics	Mean or %	Median
Age	55.5	55
Female	42.4%	
Education		
Less than High School	19.3%	
GED	4.9%	
High School Degree	30.8%	
Some College	21.7%	
College and Above	23.3%	
Race		
White	78.3%	
Black	18.5%	
Other	3.2%	
Presence of Spouse/Partner and His/Her Employment Status		
Married Working	42.8%	
Married not Working	15.2%	
Married Retired	6.6%	
Separated/Divorced	21.9%	
Widowed	7.8%	
Never Married	5.7%	
Presence of Dependent Children	91.3%	
Household Size	2.6	2
Occupation		
Managerial	17.6%	
Professional	16.9%	
Sales	8.6%	
Service	28.2%	
Other	28.7%	
Pension Ownership		
No Pension	38.3%	
DB Only	26.5%	
DC Only	16.9%	
DB and DC	18.2%	
Annual Household Income	$50,953	$39,900
Net Worth	$223,439	$100,000
Investment Asset Ownership	61.9%	
Home Ownership	79.2%	
Health Insurance Coverage in Retirement	62.8%	

Note: Analysis of Rand HRS Data, Version J. Sample Size = 4,054.

Table 3

Discrete-time Survival Analysis of Retirement Decision

	Once Invested			Never Invested		
Parameter	**Coefficient**		**Odds Ratio**	**Coefficient**		**Odds Ratio**
Period						
1994	-0.4208			-1.0813		
1996	-0.7741	*		-1.2470		
1998	-1.1427	**		-1.4392	*	
2000	-0.2563			-1.2962		
2002	0.4171			-0.6613		
2004	-0.7722	*		-1.5179	*	
2006	-0.4505			-1.3842		
2008	-1.0426	*		-2.4606	*	
Time-varying Variables						
S&P 500	0.0277	***	1.028	0.0214	*	1.022
Age at Interview (reference: Age < 62)						
62 ≤ Age < Full Retirement Age	1.2484	***	3.485	1.8617	***	6.435
Age ≥ Full Retirement Age	1.3912	***	4.020	2.2695	***	9.675
Presence of Spouse/Partner and His/Her Employment Status (reference: Married Retired)						
Married Working	-0.9192	***	0.399	-0.8823	**	0.414
Married not Working	-0.8287	***	0.437	-0.6742	*	0.510
Separated/Divorced	-0.9853	***	0.373	-0.5695	*	0.566
Widowed	-0.7065	***	0.493	-0.6412	*	0.527
Never Married	-0.5709	*	0.565	-1.1506	**	0.316
Presence of Dependent Children	0.2621		1.300	-0.1150		0.891
Household Size (centered)	-0.1177	**	0.889	-0.1736	**	0.841
Occupation (reference: Managerial)						
Professional	0.1861		1.205	-0.0662		0.936
Sales	0.0822		1.086	-0.5320		0.587
Service	0.0267		1.027	-0.2650		0.767
Other	0.0695		1.072	-0.0040		0.996
Pension Ownership (reference: DC only)						
No Pension	-0.4436	***	0.642	0.2330		1.262
DB Only	0.6327	***	1.883	0.7811	***	2.184
DB and DC	0.7070	***	2.028	0.7258		2.066
Labor Income (log)	-0.1593	***	n/a	-0.1618	***	n/a
Net Worth (log, centered)	1.1700	**	n/a	9.9663		n/a
Home Ownership	0.0880		1.092	0.2263		1.254
Health Insurance Coverage in Retirement	-0.0776		0.925	0.4920	*	1.636
Time Invariant Variables						

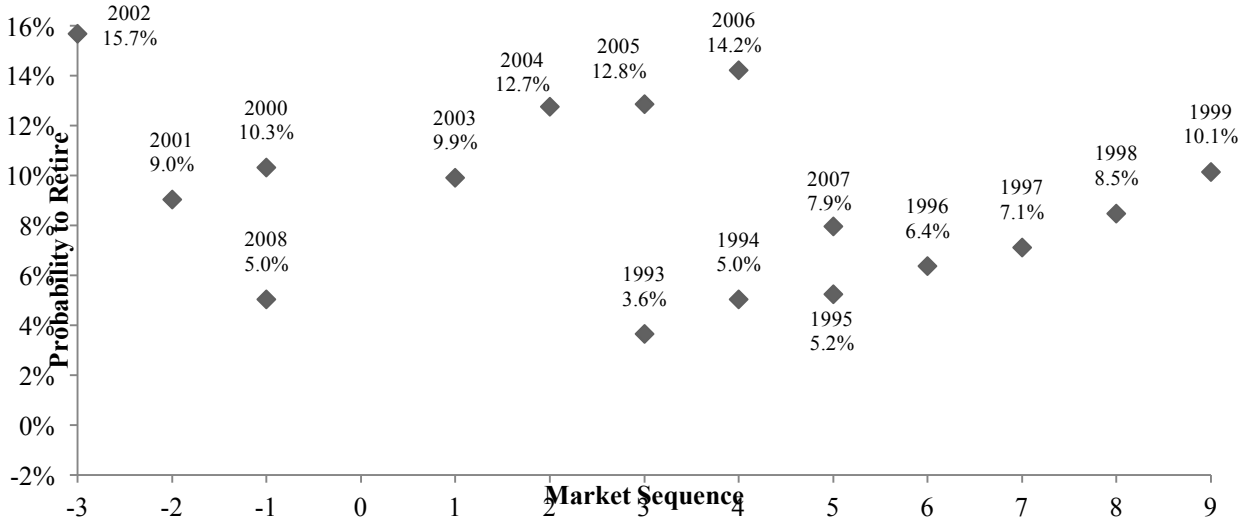
Female	-0.1346	0.874	-0.0424	0.958
Highest Degree (reference: Less than High School)				
GED	0.1582	1.171	-0.0641	0.938
High School Degree	-0.0173	0.983	-0.1058	0.900
Some College	-0.0791	0.924	0.2088	1.232
College and Above	-0.1192	0.888	0.0033	1.003
Race (reference: White)				
Black	-0.1201	0.887	-0.0320	0.969
Other	-0.1845	0.832	-0.8564	0.425
Concordance	76.7%		80.3%	
Model Fit: χ^2 **(*df* = 36)**	3314.1376 ***		1258.8725 ***	

* $p < .05$; ** $p < .01$; *** $p < .001$

Note: Analysis of Rand HRS Data, Version J. Sample Size = 4,054.

Figure 1

Probability of Retirement by Market Sequence



Note: Analysis of Rand HRS Data, Version J. Sample Size = 4,054.