



## Full length article

## Aging, overconfidence, and portfolio choice

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## ARTICLE INFO

## Article history:

Received 4 August 2016

Accepted 4 October 2016

Available online 18 October 2016

## JEL classification:

E2

D8

G1

## Keywords:

Cognitive aging

Cognitive bias

Overconfidence

Financial sophistication

Portfolio choice

Two-part model

## ABSTRACT

Research has shown that older investors' confidence in financial skills and capability does not diminish with declining financial proficiency, and this overconfidence gap rather widens with age. Using data from the Cognitive Economics Study (CogEcon), this study examines whether and to what extent the age-related increase in overconfidence explains the riskiness of retirement portfolio. Results from the two-part models indicate that rising overconfidence is associated with a greater risky asset ownership and less share of cash equivalents, even after accounting for post-crash sentiment changes and market conditions. Further analyses find that financial advice plays an essential role in dampening the effect of overconfidence. Overall, our findings highlight the importance of cognitive bias in explaining late-life equity ownership and financial advisor as an emotional circuit breaker.

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## 1. Introduction

A growing body of literature has explored the role of cognitive functioning in explaining late-life financial decisions.<sup>1</sup> One of the most plausible explanations is rising information and transaction costs due to declining cognitive skills (Christelis et al., 2010). Those with limited cognitive abilities may have to spend considerably more time to gather and process investment information, or invest in human capital to slow down cognitive aging process. In either case, cognitive aging increases the cost of risky asset ownership and thus reduces optimal exposure to financial risk.

Especially for the elderly, keeping up fast-changing financial products and investment opportunities can be particularly costly, given the increasing complexity of financial instruments and market environment. Old investors with degenerating cognitive skills would then have to bear more costs to be successful in the equity market, and in turn, reach a tipping point where information costs exceed the long-term yields on risky investments. Even for those with enough cognitive skills, their ability to make

savvy financial decisions would decline gradually (Korniotis and Kumar, 2011), and preference features such as risk aversion and impatience would vary with a general aging process (Bonsang and Dohmen, 2015; Dohmen et al., 2010). Regardless of the mechanism, cognitive aging plays a major role in rebalancing retirement portfolio towards riskless assets at the end of life-cycle.

Notwithstanding the ample evidence linking cognitive decline to a less risky portfolio, the rationale behind such mechanism remains ambiguous because people are, in general, unable to judge their cognitive deficits. Finke et al. (2016), for instance, documented that old investors tend to remain confident about their financial proficiency, even though they lose financial knowledge and skills over time. In a closely related study, Gamble et al. (2014) reported a consistent decline in financial knowledge and cognitive abilities, coupled with a rising confidence in their ability to manage everyday money matters. This mismatch could reflect their beliefs about accumulating experience, reluctance to admit natural aging, or systematic deviations from a rationality rule due to cognitive aging. While recent evidence casts some doubt on the mechanism through which aging leads to biased decision-making (Kovalchik et al., 2005), it is generally accepted that older adults are more prone to overconfidence bias, particularly when they encounter cognitively demanding tasks (Bruine de Bruin et al., 2012). If these individuals show a typical investment pattern of overconfident investors (Barber and Odean, 2001), the age-related increase in overconfidence might be able to explain why some retirees still

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E-mail addresses: [tpak@ches.ua.edu](mailto:tpak@ches.ua.edu) (T.-Y. Pak), [swarn@uga.edu](mailto:swarn@uga.edu) (S. Chatterjee).<sup>1</sup> See, for instance, Christelis et al. (2010), Grinblatt et al. (2011), Kezdi and Willis (2003), and Kim et al. (2012).

hold unnecessarily risky portfolio even after accounting for bequest motives. That is, cognition-stockholding correlation is inherently multi-faceted which entails a rational motive that leads to less risky portfolio, and an irrational force that keeps old investors stay in the equity market.

Despite recent evidence calling for research on age-related increase in overconfidence, the impact such transition has on household finance is yet to be fully explored. Departing from previous analyses focused only on cognitive decline, we pay attention to a failure of realizing cognitive deficits and examine how this mismatch influences the riskiness of retirement portfolio.<sup>2</sup> In particular, we hypothesize that the fraction of financial wealth held in risky assets positively associate with rising overconfidence gap. To demonstrate such argument, we take advantage of data from the Cognitive Economics Study (CogEcon), which assess disparity in financial sophistication and confidence using a half-range percentage scale. The analyses begin with the replication of well-known age-related pattern in financial sophistication and confidence. The primary specification examines the extent to which this rising overconfidence affects portfolio composition, with a particular emphasis on the changes in equity ownership and conditional equity share. The models for riskless assets and indirect investments are estimated as the baseline models and then compared to the models for risky assets. This set of models reveals the substitution pattern between asset classes with different risk contents.

There are at least three pathways through which aging-driven behavioral bias can churn portfolio allocation. First, those who experienced cognitive decline but remain confident may overestimate their cognitive abilities to deal with information-intensive but risky financial instruments. This type of investors may shift their portfolio away from cash equivalents and allocate more wealth to equities with an unsupported belief of their cognitive capacity to handle the investment information. Second, although the cognitively impaired face a considerable amount of information costs, those who failed to recognize cognitive decline might be unable to identify such cost barriers. On the contrary, individuals aware of such natural degeneration may perceive the search costs correctly, and adjust the riskiness of portfolio accordingly. Third, overconfident individuals may systematically underestimate the risk involved in financial transactions while exhibiting too much optimism concerning their ability to pick winning securities (Kinari, 2016; Puri and Robinson, 2007). People who remain highly confident about cognitive skills, in this case, are likely to invest a larger fraction of savings in risky alternatives.

Collectively, our estimation results are in support of the past research and hypothesis. The CogEcon respondents display much higher confidence than their actual financial sophistication, and this lack of awareness is associated with (a) a smaller fraction of financial wealth held in cash equivalents and (b) greater likelihood of stock ownership. Those who remain overly confident about their financial acumen stay longer in the equity market, even without enough cognitive capacity to handle investment information. Our estimates from the two-part models indicate a positive association of financial sophistication with bondholding and mutual fund ownership. It seems financially sophisticated and well-calibrated individuals rebalance their financial wealth towards less risky assets (i.e., bonds) or professionally managed accounts (i.e., mutual funds), in order to minimize information costs incurred by cognitive aging. Accounting for unobserved heterogeneity, post-crash sentiment changes, and time fixed effects does not alter our findings, dismissing the potential impact of confounders. Further examination shows that financial advice significantly attenuates the overconfidence-stock holding correlation.

Although the present study does not provide conclusive evidence on the welfare outcomes, it is worth noting that these associations are not driven by actual investment skills but rather triggered by cognitive illusions. Given the general economic principles that recommend a fixed income stream after retirement, this aspect of cognitive aging might, in part, have an adverse impact on retirement well-being.

## 2. Literature review

Economists have long been interested in how one's economic behaviors evolve over the life cycle. In a study of credit behaviors, Agarwal et al. (2007) found that financial performance follows a hump-shaped pattern which peaks around the mid-50s. According to their estimates, individuals in their early 50s borrow financial resources at a considerably lower APR, make less rate-changing mistakes for home equity loans, and exhibit a lower propensity to pay unnecessary credit card fees. This U-shaped pattern turned out to be independent of income, education, and credit worthiness, signifying age-related drops in analytic functions as a possible mechanism. Lusardi and Mitchell (2011) also found a similar age-related pattern in Americans' financial literacy. By analyzing 2004 Health and Retirement Study, they found that financial literacy – an ability to understand and use financial information, falls sharply with age after the 50s.

Korniotis and Kumar (2011) viewed the issues from a different angle, assuming that older investors may benefit from their previous investment experiences and eventually, get wiser. That is, there might be two conflicting outcomes of aging – greater investment skills as a result of accumulating experiential capital, and less investment knowledge due to declining cognitive abilities. Investment performance and welfare outcomes would then depend on the relative sizes of potentially offsetting effects of cognitive aging. Their estimates showed that some of the investment skills indeed increase with age, but the negative impact of cognitive loss dominates the influence of accumulating experience. By examining the risk-adjusted return on household investment, they found that about 3%–5% of the annual decline in investment return is attributable to cognitive aging.

In a study of European retirees, Christelis et al. (2010) found that information-intensive assets, such as stocks or stock mutual funds which require an ability to do calculations, represents a larger fraction of financial wealth among the cognitively smart. When less information-intensive instruments such as bonds and money market funds are considered, the impact of cognitive abilities was not significant or, at best, trivial. This pattern bolsters our understanding that cognitive skills are indeed a crucial determinant of portfolio riskiness. Arguing along related lines, Banks et al. (2010) examined the extent to which cognitive ability relates to the portfolio performance and retirement income adequacy. They showed that the effect of numeracy is relatively minor when it comes to explaining broader and longer-term economic decisions such as wealth accumulation (or, decumulation).

An alternative explanation to cognition-portfolio choice nexus is proposed by Browning and Finke (2015). Unlike the previous studies emphasized the role of cognitive skills for informed choices, this study argues that deteriorating cognitive abilities lower individuals' ability to moderate negative emotional response to a loss. By analyzing portfolio reallocation during a recent financial crisis, the authors claimed that some of the portfolio reallocation away from stocks is characterized by a lower cognitive capacity and lack of ability to control emotional responses. Their findings are broadly consistent with the literature but suggest an alternative mechanism that explains portfolio reallocation during an economic downturn.

<sup>2</sup> The basic premise of this study is that older investors are somewhat forgetful but unable to realize such loss.

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