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Investor sophistication and risk taking

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ABSTRACT

Using investment policy data of 857 Dutch pension funds during 1999–2006, we develop three indicators of investor sophistication. The indicators show that pension funds' strategic portfolio choices are often based on coarse and less sophisticated approaches. First, most pension funds round strategic asset allocations to the nearest multiple of 5%, similar to age heaping in demographic and historical studies. Second, many pension funds invest little or nothing in alternative, more complex asset classes, resulting in limited asset diversification. Third, many pension funds favor regional investments and as such do not fully employ the opportunities of international risk diversification. Our indicators are correlated with pension fund size, in line with the expectation that smaller pension funds are generally less sophisticated than large pension funds. Using the indicators for investor sophistication, we show that less sophisticated pension funds tend to opt for investment strategies with less risk.

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1. Introduction

During the recent financial banking and sovereign debt crises pension funds sustained huge investment losses. The crash in equity prices, coupled with a dramatic decline of long-term interest rates used to discount liabilities, slashed pension funds' funding ratios (defined as total assets divided by discounted pension liabilities), with only limited relief from increased bond prices. In 2008 alone the market value of total pension assets in the Netherlands dropped by more than 17%. Together with the impact of lower discount rates, the crisis caused the funding ratio to fall in that year by no less than 49% points. Strikingly, however, sustained losses varied considerably across pension funds, illustrating considerable differences among pension fund's investment policies. These losses have severe consequences since in many countries pension funds play a central role in investing pension savings and providing old age benefits. This is particularly evident in the Netherlands where the assets of pension funds exceed GDP. Most Dutch pension funds now face significant funding gaps and are forced to increase premiums, cut wage or price indexation and, in a number of cases, even to cut pension rights. Evidently, these investment losses have profound implications and have raised questions as to risk taking by pension funds and the quality and sophistication of their investment policies.

For pension funds, determining the asset allocation strategy is the most important decision in the investment process. Setting the optimal asset allocation strategy involves two decisions. First, the level of risk preference must be determined in line with the funding ratio and preferences of pension scheme participants and sponsor companies. Second, the allocation of investments to different asset classes should be chosen to maximize expected returns, given a pension fund's liabilities and its risk preference. Both tasks are highly complex and it is to be expected that the expertise and abilities of different investors in performing them will vary. We examine pension fund investors' sophistication in setting an optimal asset allocation (task 2) and how this relates to their risk preferences, expressed in terms of risky investments (task 1).

A major contribution in the finance literature on optimal asset allocation is the two-fund separation theorem, which prescribes investors to hold an optimal portfolio of risky assets in combination with the risk-free asset (Tobin, 1958). This optimal portfolio should be mean–variance efficient, implying that for a given expected return, no additional diversification can lower the

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portfolio's overall risk (Markowitz, 1952). These theorems are building blocks of CAPM, which states that there is only one optimal risk portfolio, that is, the market portfolio (Sharpe, 1964). If this is the correct model, asset allocations for investors with different risk preferences should be simply different linear combinations of the riskless asset and the market portfolio. This implies that investors, including pension funds, should keep the ratio of bonds to equities and other asset classes unchanged across all portfolios and vary allocations to the risk free asset, reflecting varying risk preferences. The finding that investors hold different proportions of risky assets – including the ratio of bonds to equities – conflicts with the two-fund separation theorem and is called the Asset Allocation Puzzle (see also Canner et al., 1997).

While we concern ourself with institutional investors, the literature on the sophistication of asset allocation decisions has mostly focused on private investors (individuals or households). Empirical research has shown that private investors invest in ways that are hard to reconcile with standard theory and that have been labeled investment mistakes (Campbell, 2006; Calvet et al., 2007, 2009a,b). Private investors often use simple rules of thumb in allocating their wealth across asset classes, resulting in suboptimal investment portfolios. The behavioral finance literature classifies such suboptimal investment decisions as behavioral biases or cognitive errors. Individuals use heuristics, or rules of thumb, because they have limited attention, memory, education, and processing capabilities. A number of papers have shown that individual investors often rely on simple asset allocation rules. Examples of such rules are asset allocations that tend to be either zero or 100% in equities (Agnew et al., 2003) and investor's use of the $1/n$ rule to allocate their money among the n funds they invest in (Huberman and Jiang, 2006). Benartzi and Thaler (2001) show that some private investors use the $1/n$ rule to allocate investments equally among eligible investment funds offered in pension plans and, consequently, that the equity allocation of investors is influenced by the proportion of stock funds offered. The natural conclusion is that the use of heuristics can lead to suboptimal asset allocation by private investors.[1] Other recorded investor mistakes are (i) insufficient diversification (Calvet et al., 2007; Goetzmann and Kumar, 2008), (ii) inertia (Agnew et al., 2003; Campbell, 2006; Calvet et al., 2009a) and (iii) holding of losing stocks and selling winning stocks (Dhar and Zhu, 2006; Calvet et al., 2009a).

The tendency to round figures coarsely or to choose attractive numbers is also documented in a number of demographic and historical studies. For instance, self-reported age data in countries or periods characterized by low average levels of education often show high frequencies at attractive, 'round' numbers. This phenomenon is called age heaping. Individuals with limited knowledge about their age are found to have a higher propensity to choose a 'plausible' number. These individuals do not choose random numbers, but instead have a systematic tendency to choose attractive numbers, particularly those ending in 5 or 0. Age heaping is reported for a number of data sources, including census returns, tombstones, and tax data. Demographic studies have shown that age heaping is correlated to education (*e.g.* Bachi, 1951), income (*e.g.* Myers, 1976), illiteracy (Budd and Guinnane, 1991) and, more generally, human capital (A'Hearn et al., 2009).

While there is a growing literature documenting behavioral biases of private investors, much less is known about professional parties. Institutional investors are generally considered to be more sophisticated than private investors and are therefore assumed to invest more optimally. A number of theoretical papers argue that more sophisticated investors suffer less from cognitive biases or irrational behavior (*e.g.* Banerjee, 1992; DeLong et al., 1990; Hirshleifer et al., 1994; Shleifer and Summers, 1990). However, there is little empirical evidence documenting (i) the investment behavior of institutional investors or (ii) how this behavior is influenced by their level of sophistication.

To fill this gap in the literature, we study the investment behavior of institutional investors with varying degrees of sophistication. Scale advantages should enable large pension funds to hire competent experts and consultants and spend more time and resources on optimizing their investment policies. Consequently, large pension funds should have a lower propensity to use heuristics in determining their asset allocation, but should instead use more advanced rules to guide investment policy. The more sophisticated investors are also expected to be more knowledgeable about the range of investment options available to them, and consequently to have a larger proportion of investments in other assets than bonds and equities. These factors should enable more sophisticated pension fund investors to apply better asset class allocation strategies than those of less sophisticated pension funds.

The influence of sophistication on risk taking is not self-evident. Less sophisticated investors may underestimate risks and consequently take more risk by investing in high risk-high (expected) return assets. Alternatively, less sophisticated investors may be more risk shy, thus compensating for weaker risk management skills, *e.g.* the ability to measure and control risk and implement diversification strategies. The latter conjecture is confirmed by previous research, showing that risk tolerance in individuals is negatively correlated with financial knowledge and education (Grable, 2000). We hypothesize that, by analogy, the sophistication of institutional investors correlates also positively to risk taking.

We investigate the investment policies of 857 Dutch pension funds during the 1999–2006 period. At the end of 2010, total pension fund assets in the Netherlands amounted to some € 775 billion, or 132% of GDP, ranking the Dutch pension system in terms of the asset-to-GDP ratio as the largest in the industrial world.[2] We find that pension funds' asset allocation policies often seem to be relatively simple and that they vary widely, in line with the asset allocation puzzle. This raises the question whether all pension funds implement optimal asset allocation strategies, given their specific profiles and preferences.

To investigate this, we develop three measures of sophistication. The first measure assumes that less sophisticated pension funds are less knowledgeable about their (unpublished) optimal asset allocation, or use human judgment more, and are therefore more likely to choose plausible figures rather than the outcomes of detailed calculations. For example, they may use multiples of 5% to set their strategic asset allocation. The strategic investment allocation reflects pension funds' (unpublished) investment objectives, which they report to their prudential supervisor, De Nederlandsche Bank. The strategic asset allocation must meet supervisory requirements. The actual asset allocation may depart from the objective as a result of asset price shocks, since pension funds do not continuously rebalance their portfolios (Bikker et al., 2010). We find that most pension funds do, in fact, apply such a coarse approach in allocating wealth to investment classes. This finding is similar to age heaping found in sociological and historical studies, where it is considered an indication of limited education.

Our second measure records how much pension funds invest in alternative, more complex asset classes such as commodities and

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[1] Whilst the use of the $1/n$ rule points to lower sophistication, it is disputed whether this 'naive' strategy also leads to lower returns. DeMiguel et al. (2007) show that investment strategies following 14 different models derived from modern portfolio theory generate inferior out-of-sample results relative to the use of the $1/n$ strategy. They conclude that the gain from optimal diversification for mean-variance models is more than offset by estimation error.

[2] Fig. 5 in OECD (2011, see p. 7) shows for 2010 that the asset-to-GDP ratio of the pension sector is higher in the Netherlands than in all other OECD countries.

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