

Determinants of investment policy of Dutch pension funds

Keywords: pension fund, pension fund investment policy, pension fund determinants, sponsoring firm determinants, risk management theory, financial distress costs, life-cycle theory, moral hazard and governance

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Chapter 1: Introduction

March 2015, the total amount of assets of Dutch pension funds amounts to 1,353 billion euros. This makes pension funds one of the biggest players of the Dutch institutional investment market. The total amount of assets is influenced by the contributions and investment returns, the latter one being the most important. Despite, the fact that the total amount of assets of Dutch pension funds is rising, there are concerns regarding the ability to pay pensions when due (Bikker and De Dreu, 2007; Centraal Bureau voor de Statistiek, 2015). This is due to the fact that the necessary payments increase relatively faster (85% for the period of 2010-2015) than the assets itself (70% for the period of 2010-2015)(Centraal Bureau voor de Statistiek, 2015). Reasons for this are the lower interest percentage that in turn lowers the expected return on investment as well as the ageing population (Centraal Bureau voor de Statistiek, 2015). Due to these current concerns, the topic of pensions is popular nowadays.

Several researchers have studied the relationship between pension plans and financial decisions of firms and pension funds. In particular, the influence of pension plans on financial decisions such as asset allocation, capital expenditures, capital structure, and the likelihood of mergers and acquisitions have been examined before. For example, Shivdasani and Stefanescu (2010) examined the influence of pension plans on sponsoring firm's capital structure choices. The study focuses on corporate DB pension plans sponsored by US companies and found that firms take into account their pension assets and liabilities in deciding about leverage ratios. They found a 0.36 percentage points decrease in the leverage ratio due to a 1 percentage point increase in the pension liability to total assets ratio. Most of these studies are focused on the US and study the influence of DB type of corporate pension plans only. The Netherlands is different from the US since in The Netherlands mandatory supplementary firm contributions do not exist. Furthermore, the Dutch pension system differs in terms of regulations regarding maximum contributions and the non-existence of public pension benefit insurance (Davis and De Haan, 2012).

This research will focus on the asset allocation decisions of pension funds itself. More specifically, this research attempts to determine the factors that influence the strategic investment policy that has been created to reach a certain asset base, which is supposed to be sufficient to

meet liabilities. In this way, the strategic investment policy takes into account (future) liabilities. This is also confirmed by the fact that many pension funds base its strategic investment policy on the asset liability management (ALM) study.

In the past, pension funds invested with the perspective that investment returns should exceed an arbitrary benchmark return with no eye for the obligations. However, some economic shocks as the “tech” crash in the early 2000’s, the financial crisis of 2008, and the lower interest rates in the current bond environment changed this approach. Pension funds became to feel the pressure and started to appreciate the importance of taking into account the liabilities for their pension asset management. The goal of taking into account the liabilities is to make assets and liabilities develop in the same way. The inclusion of liabilities for a pension fund’s pension asset management changed the investment portfolio structure of pension funds. E.g. increase in fixed-income securities and diversification into new asset classes such as private placements (Iasplus.com, 2016). The influence of the economic situation and its changes on investment decisions of amongst others pension funds make differences in results compared to previous studies plausible. However, there are opponents of the view that pension fund’s investment policies should match assets to liabilities. Alestalo and Puttonen (2006) argue that pension funds should attempt to increase the spread between assets and liabilities in order to add value.

Previous literature mainly focused on the U.S. and does not provide a clear picture on the determinants of pension funds investment portfolios. Rauh (2009) studied the influence of pension plans on capital expenditure choices of the pension fund assets. The study was based on corporate DB pension plans sponsored by US companies and found that firms with well-funded pension plans make riskier investments with their pension fund assets compared to firms with poorly funded pension plans. Rauch (2009) also found that large public firms with better credit ratings allocate a smaller share of pension fund assets to safer securities such as government debt and cash. Instead, they allocate a relatively greater proportion to equity or other more volatile assets. Rauch (2009) argues that the reason for this might be that firms with better credit ratings have lower expected costs of financial distress. Friedman (1982) emphasizes the importance of pension plans for employees, corporations’ shareholders and other stakeholders such as corporations’ creditors. Friedman (1982) found that firms with higher rates of return do invest

pension assets for a relatively greater part in equities and less in debt securities. Webb (2007) found that firms with high future pension liabilities are incentivized to make riskier investments. As opposed to this, Davis and De Haan (2012) suggest that more mature pension funds (those with a greater proportion of inactive participants or pensioners) are more risky due to the higher immediate obligations and therefore are motivated to make less riskier investments. Davis and De Haan (2012) investigated the influence of characteristics of the sponsoring firm on the funding and portfolio allocation of corporate pension funds for both the DB type of plan as well as for the DC type of plan. This study examined the interaction from the ‘sponsor’ company to the decisions regarding pension funding and asset allocation. Regarding asset allocation, Davis and De Haan (2012) did not find a relationship between the leverage of the sponsor company and the pension asset allocation decisions. Davis and De Haan (2012) found that defined benefit funds invest relatively more in riskier assets such as equity and less in less riskier assets such as bonds compared to their defined contribution counterparts.

These previous studies thus took into account firm determinants (such as credit rating, rates of return on investment and leverage) and/or pension fund determinants (such as funding status of the fund, future pension liabilities as well as the type of pension plan in the form of a defined benefit or defined contribution pension plan).

This research is special since it attempts to explain pension fund investment policy by pension plan as well as sponsoring firm determinants. Furthermore, another and more recent period of investment policy of pension funds is studied by this research, namely 2013 till 2015. Data will be retrieved from DNB, annual reports of pension funds and reach. In addition, a detailed spectrum of assets and their riskiness is used. It makes sense to explain pension fund investment policy by both pension fund as well as sponsoring firm determinants since the investment policy and resulting risk return profile is based on the preferences of both the beneficiaries and the sponsoring firm (De Dreu and Bikker, 2012). These preferences will not always be the same for both parties and they are also subject to change. Regression analysis will be conducted to study the research question. The research question of this study is:

What are the determinants of the investment policy of Dutch pension funds?

This study has practical relevance since policy makers and employees might benefit from the provided insights about the determinants of the investment policy of Dutch pension funds. The risks inherent to the pension funds investment policy influences the ability of pension funds to pay the retirement income to employees.

In order to motivate and examine this research, the theoretical lense will comprise of risk management theory, life-cycle theory, moral hazard issues, financial distress costs and governance theory.

The main results are that the Dutch pension landscape of nowadays is way different to the past, which might be an argument for the insignificant relationships. In general, the results do show some positive relationships between the funding ratio and strategic risk exposure. In addition, a negative relationship between the defined benefit dummy and strategic risk exposure has been found in general.

The paper is constructed as follows. First chapter 2 will outline the institutional setting by describing the different types of pension plans, the three pillars of the Dutch pension system and the regulatory environment. Next, chapter 3 provides literature about the pension fund investment policy including its process and the availability of pension fund asset classes will be explained. After that, chapter 4 explains the pension fund determinants, whereas the sponsoring firm determinants will be introduced in chapter 5. Afterwards the research methods will be explained by introducing the regression model, variables, its measurement, data sources and sample criteria in chapter 6. Chapter 7 will then describe the data and make a comparison with previous studies. Chapter 8 will describe the results and give possible explanations. Lastly, chapter 9 will provide a conclusion.

Chapter 2: Institutional setting

There are several reasons why firms offer pension plans to their employees. First, firms can offer pension plans in order to attract and retain valuable employees. Many people view pension plans and the related income at retirement as a valuable job characteristic. This has also been mentioned in many annual reports of Dutch (listed) firms. For example, AkzoNobel stated: *“Our remuneration policy has the objective of providing remuneration in a form which will attract, retain and motivate members of the Board of Management as top managers of a major international company, while protecting and promoting the company’s objectives”* (AkzoNobel, Annual Report 2015, p.130). Although, the statement is mainly pointing at managers instead of general employees. Second, pension plans can be a useful tool in lowering a firm’s tax burden. This because contributions to pension plans are often tax-deductible (as interest payments on debt are). Furthermore, employee taxes are deferred and this is beneficial since employee income tax rates are usually lower at retirement compared to employment years (Shivdasani and Stefanescu, 2010). So it can both benefit a firm’s employees as the business itself. There are two basic types of pension plans, namely defined benefit (DB) and defined contribution (DC) pension plans. These two basic types have their own specific characteristics and risks from the perspective of both firms and employees.

2.1. Type of pension schemes: defined benefit, defined contribution and hybrid schemes

Regarding DB plans, there is no risk involved from the perspective of the employees. The employer is responsible for any shortfalls and for the employees specific benefits at retirement are guaranteed. Therefore, the employer bears all the risk as they have to make additional contributions in case of a shortfall. DC plans do only specify the amount of contributions that the employer has to make to the employee’s retirement account. In case of a shortfall, the employer has no obligation to make additional contributions in the employee’s account (Bikker and De Dreu, 2007; Shivdasani and Stefanescu, 2010).

DB plans are pension schemes in which the wealth accumulation depends on, amongst others, the participant’s years of service for the employer, wages, and plan parameters (Bodie et al., 1988; Poterba et al., 2007). DB plans limit the risk-return choice regarding the investment portfolio of the pension plan for employees (van Rooij et al., 2007). DB plans are comparable to

financial debt in the sense that pension contributions are tax-deductible (like interest expenses on debt are) and failure to meet the mandatory pension contributions can lead to bankruptcy (Shivdasani and Stefanescu, 2010). The main types of DB plans are DB final pay and DB average pay plans. In 2015, 59,4% of all pension funds were based on DB average pay pension plans ("Pensioenfondsen - De Nederlandsche Bank", 2017). The average pay variant takes the average of the participant's salary during the entire career. In the end, the pension is dependent upon the total years that the participant has worked for the employer and the course the salary has gone through. The accrued pension is a weighted average of all the pension bases during the working period (TNT, 2015, Annual report). Most DB average pay schemes are conditional defined benefit schemes, which means that the pension rights of the employees as well as those already receiving their pension are revised annually for inflation or increase in wages in the sector. This indexation is conditional on the fund's financial health (Ponds & van Riel, 2007). Regarding DB final pay plans, the accrued pension rights are increased at each career step to the level of the new pension basis (Dutch Association of Industry-wide Pension Funds (VB) and Dutch Association of ~~OBJ:OBJ~~Company Pension Funds (OPF), n.d.).

DC plans are pension schemes in which the employee bears the investment risk of the plan and plan assets are independent of the firm's own financial position (Webb, 2007). A DC plan is by definition fully funded and the firm does not have an obligation beyond making its periodic contribution (Bodie et al., 1988). Wealth accumulation depends on the participant's contributions to the pension scheme, the interest rate at retirement, as well as on investment returns of the accumulation in the account (Bikker and De Dreu, 2007; Bodie et al., 1988; Poterba et al., 2007). For DC plans, the primary risk to an employee is the investment performance of the fund. However, low variance investment strategies can decrease this type of risk. For this type of plan, there is the possibility to select a risk-return strategy that suits the individual employee (Van Rooij et al., 2007).

There is no consensus on which type of pension plan is most favourable for employees. Some researchers view DC plans as most favourable due to the decision making autonomy of employees. Under DC plans, employees have more choices regarding risk-return issues of the pension plans. Therefore, DC plans have the potential of introducing the market discipline

theory. Under DB plans, market discipline is in fact non-existent since employees have no choice regarding e.g. the risk profile of the pension fund (van Rooij et al., 2007). Other researchers suggest that it is unfavorable for employees to select their desirable portfolio themselves. For example, Thaler and Benartzi (2004) found that if employees have autonomy regarding their pension plan, they save less money than their optimal life cycle savings rate would predict. Regarding portability issues, in practice, DC plans are often favoured compared to DB plans (Bodie et al., 1988). Furthermore, Bikker and De Dreu (2007) found that operating costs of DC plans were lower compared to those of DB plans.

Currently, many listed firms in The Netherlands do apply DC (Defined Contribution) pension plans in addition to DB (Defined Benefit) pension plans. The DB pension plans are often frozen, meaning not available to new employees. In The Netherlands, the shift to DC plans is due to the insufficient funding ratios of many pension funds. This because the transition to DC plans transfers part of the risk associated with the pension plan from the employer to the employees (Bikker and De Dreu, 2007). However, in 2015, DB (defined benefit) pension schemes do still dominate the Dutch market regarding pension funds. About 78,32% of the pension funds in The Netherlands were DB type of plans compared to 9,1% of DC (defined contribution) type of plans. 12,1% belongs to the hybrid form (mixed-scheme type). The number of pension funds in The Netherlands have been decreased for the period of 2010-2015. In 2010, 838 pension funds existed, compared to 429 in 2015, which amounts to a decrease of 48,81%.

In addition to DB and DC type of plans there exist some other variations. Collective defined contribution (CDC) plans concern a hybrid type between DC and DB plans. For CDC plans the sponsoring firm's liability is limited and participants' benefits are fixed.

Table 1 provides a further breakdown of the different pension scheme types in The Netherlands.

Defined benefit					Defined contribution	Capital agreement	Mixed-scheme type	Other	Total	
Final pay	Average pay	Mixed final and average pay	Level amounts	Other						
ear	Number of pension funds/percentages									
2010	149 (17,8%)	448 (53,5%)	38 (4,5%)	7 (0,8%)	6 (0,7%)	84 (10%)	4 (0,5%)	97 (11,6%)	5 (0,6%)	838 (100%)
2011	141 (17,8%)	434 (54,9%)	31 (3,9%)	5 (0,6%)	7 (0,9%)	77 (9,7%)	2 (0,3%)	93 (11,8%)	-	790 (100%)
2012	106 (15,8%)	376 (56,0%)	30 (4,5%)	3 (0,4%)	11 (1,6%)	65 (9,7%)	3 (0,4%)	78 (11,6%)	-	672 (100%)
2013	100 (16,6%)	334 (55,4%)	27 (4,5%)	4 (0,7%)	8 (1,3%)	60 (10%)	2 (0,3%)	68 (11,3%)	-	603 (100%)
2014	81 (15,0%)	305 (56,5%)	26 (4,8%)	4 (0,7%)	6 (1,1%)	52 (9,6%)	1 (0,2%)	65 (12,0%)	-	540 (100%)
2015	54 (12,6%)	255 (59,4%)	17 (4,0%)	4 (0,9%)	6 (1,4%)	39 (9,1%)	2 (0,5%)	52 (12,1%)	-	429 (100%)

Table 1: Pension scheme types in The Netherlands, source: DNB.

2.2. Company-, and industry-wide pension plans and plans for professionals

Pension funds in The Netherlands can be divided into three different types. First, company-wide pension plans are pension plans for employees of the sponsor company provided by company funds. Although these company funds are separate legal entities, they are run directly by the sponsor company and often the labour union of the employees. Second, industry-wide pension plans are pension plans for employees in a certain industry provided by industry funds. The basis for these plans is the collective labour agreement (CLA) between labour unions that represent the employees in a certain industry and an industry's companies. These pension funds can be compulsory and non-compulsory, where the compulsory funds are based on a CLA that makes participation for all employers and employees of a certain industry mandatory. Non-compulsory funds are based on a CLA that makes participation a choice for the employers. Third, pension plans for professionals are pension plans for employees of a certain profession provided by a professional group fund. Here, the professional group fund directly deals with workers instead of their employers. Next to these three types of pension funds there are saving funds and insurance companies that also offer pension plan (Bikker and De Dreu, 2007).

In The Netherlands, the majority of pension funds belong to the company-wide type of pension funds, also called corporate pension funds. Both, the employer (also called 'sponsor' company) and company's employees make contributions in the pension scheme. Responsibility for pension fund management is also shared by both the employer and the company's employees, since they are both represented in the pension fund's board (Davis and De Haan, 2012).

There are some researchers that studied differences between the types of pension funds. For example, Bikker and De Dreu (2007) studied the determinants of operating costs (administrative and investment costs) of pension funds and suggest that industry-wide pension funds are operating significantly more efficient compared to company-wide pension funds and other funds.

2.3. Dutch pension system: three pillars

In The Netherlands the pension system is built on three pillars. The first pillar is the basic pension, also called the Old Age Pension Act ('Algemene Ouderdomswet', AOW) provided by the Dutch national government. People who have lived or worked in The Netherlands and have reached the retirement age (currently 67 years and 3 months) are entitled to receive the basic pension. The government finances current AOW pensions with current contribution income (Bikker and De Dreu, 2007; Dutch Association of Industry-wide Pension Funds (VB) and Dutch Association of ~~OBJ:OBJ~~ Company Pension Funds (OPF), n.d.). The second pillar refers to collective pension schemes, which are administered by a pension fund or insurance company. These pension schemes are financed from participant's contributions and return on the investment of these contributions. As already mentioned before, three different types of pension funds do exist in The Netherlands (company-, and industry-wide pension plans and plans for professionals). Dutch law does not obligate people to become a member of a pension fund. However, the government can make certain pension schemes mandatory for an entire industry or profession. These mandatory pension schemes are motivated by economies of scale and cost efficient management of the schemes. Furthermore, it allows people to easily switch between jobs, without being restricted by implications regarding their pensions. If there is no mandatory pension scheme, firms can opt for a pension fund or insurance company to manage the pension schemes. (Dutch Association of Industry-wide Pension Funds (VB) and Dutch Association of Company Pension Funds (OPF), n.d.). The third pillar is based on people's individual contributions to self-arranged pension schemes (Bikker and De Dreu, 2007). Employees in sectors that do not have a collective pension scheme mainly use the third pillar, however, anyone can use the third pillar to meet their own future pension requirements. Moreover, saving extra pensions often associates with tax benefits (Dutch Association of Industry-wide Pension Funds (VB) and Dutch Association of ~~OBJ:OBJ~~ Company Pension Funds (OPF), n.d.).

2.4. Regulatory environment regarding pensions in The Netherlands

In The Netherlands, the government has assigned the task to supervise the pension administrators, to two regulators, namely the AFM (Authority for the Financial Markets) and DNB (Dutch Central Bank).

The task of the AFM is to monitor the behaviour of pension funds, in particular the AFM checks whether the pension funds do provide sufficient information to their members. For example, pension funds are required to inform people in writing when joining the pension scheme. Furthermore, participants must receive an annual pension statement. This requirement to properly disclose certain information is stipulated in the Pensions Act and is established in order to help people assess their financial situation and to make conscious decisions regarding retirement (Dutch Association of Industry-wide Pension Funds (VB) and Dutch Association of Company Pension Funds (OPF), n.d.).

The Dutch Central Bank (DNB) is responsible for the financial stability in The Netherlands. As part of this role, DNB supervises pension funds and their compliance with laws and regulations (Bikker and De Dreu, 2007). In particular, DNB monitors the financial position of the pension funds and examines whether the pension fund can be expected to be able to pay future liabilities. The pension fund must always have sufficient liquidities available in order to pay current pension liabilities. The Pensions Act includes the Financial Assessment Framework that sets out the requirements regarding the financial situation of the pension fund (Dutch Association of Industry-wide Pension Funds (VB) and Dutch Association of Company Pension Funds (OPF), n.d.). The extent to which a pension fund is able to pay their obligations is expressed by the funding ratio (assets/liabilities). Regarding assets, the current or market value of the assets is used. March 2015, the average funding ratio was 103 per cent, compared to 111 per cent in 2014. DNB requires a funding ratio of 105 per cent. With a funding ratio below 105 per cent, DNB requires the pension fund to come up with a recovery plan to comply with the threshold. Three means of improving the funding ratio are possible including (1) increasing contributions, (2) increasing investment returns (however, often increases risk profile of the investment portfolio), and (3) decreasing the pension rights (Centraal Bureau voor de Statistiek, 2015). In The Netherlands, there is no legal obligation for the sponsor company to make additional

contributions in case of underfunding, as is the case in the United States (Davis and De Haan, 2012). Next to the task to examine the financial position of the pension funds, DNB is responsible for substantive regulation, such as monitoring that pension funds comply with certain standards. The Dutch Pension Act sets requirements and conditions for pension plans. For example, it is required to integrate the plan into either a recognized pension fund or with a recognized pension insurance company. “In principle, a pension fund must be able to continue functioning for the benefit of all existing participants even if the sponsoring company ceases to exist. In general, the sponsoring firm is not liable to the pension fund when the former goes bankrupt. However, the pension fund’s board may be found liable for mismanagement. Some pension funds reinsure, fully or partly, their pension obligations via a reinsurance company. In that case a premium is paid to the reinsurer who guarantees the payment of pension benefits. In contrast to the US, there is no public pension benefit insurance of any sort in the Netherlands” (Davis and De Haan, 2012, p.11).

The government is also reconsidering the pension system and thereby adjusting or implementing regulations, which influences pension funds and thereby the pension system in The Netherlands. For example, 16th December 2014 the Dutch government voted for the nFTK, an adjustment of the financial assessment framework, that came into force in the beginning of 2015. The most important adjustment were the implementation of the “beleidsdekkingsgraad”, the adjustment of the assessment framework regarding the required equity capital and rules related to the surcharge policy (Towers Watson, 2015, Annual report).

Furthermore, regulations in The Netherlands limit the option for a sponsoring company to make additional contributions in order to shield high profits from corporate income taxes. First, the accrual rate limits the growth option of pension rights. Second, it is not permitted for companies to make contributions before due. So, when a pension fund is financially healthy, options to make additional contributions for sponsor companies are limited. As a consequence, the incentive for the sponsor company to make additional contributions in profitable times and refund contributions in bad times (taking advantage of the tax shield) has been diminished (Davis and De Haan, 2012).

Next to the official regulators as the AFM and DNB is The Pensioenfederatie an organization that preserves the quality of the Dutch pension system. It has been established at the end of 2010 and secures the interests of the Dutch pension funds. The Pensioenfederatie promotes the development, preservation and execution of a reliable pension system with good quality. Risks are indispensable for a good, payable and persistent pension, which makes integrated risk management an important issue for this federation (Pensioenfederatie.nl, 2017).

Chapter 3: Pension fund investment policy

Since the total amount of pension fund's assets is influenced by the contributions and investment returns were the latter one is the most important, the pension fund's investment policy is important. Pension funds do make investments in order to be able to satisfy the needs of their beneficiaries. This section explains the investment process of pension fund investment policy as well as the different asset classes pension funds can choose from.

3.1. Pension fund investment process

Brinson et al., (1991) analyzed the investment process of pension funds and distinguished three stages, namely: investment policy, market timing and security selection. Investment policy was classified as the process of making strategic asset allocation decisions by taking into account the risk return trade-off as well as an Asset Liability Management study, whereas market timing and security selection were considered to belong to tactical asset allocation executed by making ad hoc decisions in order to boost returns. Brinson et al., (1991) concluded that the investment policy part of the investment process was the most important for total return. However, Ibbotson and Kaplan (2000) argue that investment policy is able to explain the variance in performance of funds over time, while way less of the variance in performance among funds can be explained by the investment policy. Xiong et al. (2010) found that both investment policy as well as tactical asset allocation was equally important in explaining variance in portfolio returns among funds. Since the performance of pension funds in the long run is determined by its investment policy this study will focus on the fund's strategic investment policy. This has also done by Bikker et al., (2012) who stated that 'a pension fund's strategic investment policy reflects its objectives, presumed to be optimizing return, given the risk aversion of its participants, while 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., 2012, p. 1-2 and Bikker et al., 2010).

Pension funds do consider several factors when deciding upon their (strategic) investment policy. The pension fund considers the obligation of regular payments by taking into account the asset liability management study. Furthermore, the risk attitude of the pension fund is important. The ultimate goal of pension funds is to be continuously able to pay their liabilities. Therefore, pension funds do invest in different asset classes and take associated risks in order to grow their assets. Pension funds can choose to invest in a variety of asset classes. Different asset classes go along with distinct risk-return characteristics. Different opinions on the suitability of each asset class exist based upon preferences regarding those risk-return characteristics and issues. For example, Alestalo and Puttonen (2006) argue that pension funds should attempt to increase the gap between assets and liabilities in order to add value, which means that pension funds should try to increase assets by investing in high-return asset classes. On the other hand, Bodie (1995) argues that pension funds should focus on aligning assets to liabilities by means of investing in fixed-income securities.

3.2. Pension fund asset classes

Dutch pension fund portfolios often exist out of the following asset classes: equity, fixed-income securities, real estate, private equity, hedge funds and commodities. The following will explain certain issues and characteristics of these asset classes and its impact for pension funds.

Equity

Different opinions regarding the appropriateness of investing in equity or stocks for pension funds exist. Generally, stocks are characterized by high risks and high returns. Therefore, the debate regarding its suitability for pension funds is dependent on the view whether pension funds should try to match liabilities and assets or attempt to add value by increase the gap between assets and liabilities.

Many researchers suggest that, in the long run, stock returns do not behave randomly. Rather, it has often been argued that the behavior of stocks follows a mean-reverting process (Poterba and Summers, 1988). Due to the mean-reverting character of equity, the risk of equity decreases over

time, which makes equity an interesting security for parties that have a long-term investment horizon (Hoevenaars et al., 2008; Spierdijk and Bikker, 2012). Since pension funds do have a long-term investment horizon, equity becomes an attractive asset class. However, Bodie (1995) argues for the opposite. Bodie (1995) measures the risk of the investment by taking the cost of insuring against earning less than the risk-free rate of return over the investor's time horizon. The argument for this is that the commonly used measure of risk, the probability of a shortfall, ignores the magnitude of the shortfall. Bodie (1995) found that in the long run, the cost of insuring against earning less than the risk-free rate of interest increases as the lengths of the investment horizon increases. Based upon this finding, Bodie (1995) contradicts the point of view that people with a long-term investment horizon (e.g. young people) should invest more in stocks.

Fixed-income securities

With fixed-income securities as corporate and government bonds, pension funds have the possibility to match assets with liabilities. This is due to the characteristic that fixed-income securities go along with fixed periodic payments and possibly the return of the principal at maturity. This substantially reduces risk for the pension fund. However, the ability to perfectly match assets to liabilities is mitigated by the possibility of changing wages and inflation rates, which in turn affects the liabilities.

Real estate

Similar to equity, investments in real estate are also characterized by a long-term nature. Again, different opinions regarding the appropriateness of investing in real estate exist. Brounen et al., argue that pension fund investments in real estate are not effective in hedging against interest and inflation risks were pension obligations are subject to. On the other hand, Brounen et al., (2010) concluded that real estate investments are attractive due to risk-reward issues and the possibility of portfolio diversification.

Private equity

Private equity concerns equity that is not traded on the public market. Examples are venture capital (VC) and buyout investments (LBO). There are some advantages and disadvantages that

go along with investing in private equity. An advantage of private equity is the high returns, which makes the asset attractive (Kaplan and Schoar, 2005; Ljungqvist and Richardson, 2002). A negative characteristic pertains to the volatility of returns. For example, Cochrane (2005) argues that venture capital returns are highly volatile, especially in early stage deals.

Hedge funds

Ackermann et al., (1999) characterizes hedge funds as having a relatively unregulated organizational structure, flexible investment strategies, sophisticated investors, and large managerial incentives. Ackermann et al., (1999) also found that pension funds are associated with high returns (as compared to mutual funds), which are at the same time highly volatile. Malkiel and Saha (2005) examined hedge fund returns and argue that it is relatively easy for hedge funds to report biased returns. When they corrected for the biases, the returns were lower than supposed before. In addition, Malkiel and Saha (2005) suggest hedge funds to have diversification potential for an all-equity portfolio (as hedge funds have low correlations with general equity indices). However, riskiness results from “cross-sectional variation and the range of individual hedge fund returns that are far greater than they are for traditional asset classes” (Malkiel and Saha, 2005, p.87).

Commodities

Pension funds can attempt to profit from the volatile price movements of commodities like grains, gold and oil. However, this volatility also makes the asset class more risky. These financial commodity contracts are suggested to have diversification potential since they appear to have low correlations with both stocks and bonds (Hoevenaars et al., 2008). Pension funds can use the diversification potential in order to reduce risks. Diversification can not only be reached by diversifying within a certain asset class, but diversifying by investing in different asset classes can help pension funds to reduce risks as well.

Chapter 4: Pension fund determinants

There are different pension fund determinants with the potential to influence the investment policy or strategic asset allocation decisions for (Dutch) pension funds. This chapter will outline these different pension fund determinants and the development of the hypotheses.

4.1. Average wealth plan members

Bikker et al., (2012) found a positive relationship between the wealth of individual plan members and the strategic equity allocation or risk exposure of the pension fund. This finding is similar to the behavior of private individuals who are also willing to take higher risks regarding their investments when they are wealthier. Regarding risk management, it is expected that wealthy individuals are better able to manage risks. Thus, in case pension funds do take into account the risk management issues of individuals such as their wealth, a positive relationship between the average wealth of participants and strategic risk exposure will be expected.

H1: There is a positive relationship between the average wealth of plan members and the riskiness of the pension fund investment policy.

4.2. Pension fund's maturity

Davis and De Haan (2012) suggest that based on riskiness, more mature pension funds will invest less in equity. This because the more mature the pension fund the larger the proportion of inactive participants will be. A larger proportion of inactive participants indicate more immediate obligations and therefore these pension funds may be more risk averse compared to pension funds which are less mature with fewer inactive participants (pensioners). Based on the risks associated, it is expected that pension funds with a large proportion of pensioners (mature pension fund) will invest less in equity. Webb (2007) investigated interactions between firm's financial and real investment decisions with the financing of DB pension plans. For example, Webb (2007) found that firms with high future pension liabilities are incentivized to make riskier investments. Based on the life-cycle theory, human capital including its flexibility decreases as people become older. This movement is associated with increasing risk, which could be compensated by investing pension fund assets in lower risk securities. In the situation where pension funds do take into account the elements of the life-cycle theory, a negative relationship

between age of participants and risk exposure is expected (Bikker et al., 2012). The reason for this is that “young workers have more human capital than older workers. As long as the correlation between labor income and stock market returns is low, a young worker may better diversify away equity risk with their large holding of human capital” (Bikker et al., 2012, p. 2). The assumption for this relationship between maturity and riskiness of the pension fund investment policy is based upon the assumption that human capital is almost risk free or not correlated with capital return (Bikker et al., 2012). This result has been supported by Alestalo and Puttonen (2006). The second hypothesis is therefore as follows:

H2: There is a negative relationship between pension fund’s maturity and the riskiness of the pension fund investment policy.

4.3. Pension fund’s size

Professionalism often comes with size and thus larger funds are often associated with a higher degree of professionalism. De Dreu and Bikker (2012) argue that size is related to investor sophistication and investor sophistication is related to risk-taking. In addition, size is positively related to economies of scale, which can result in decreasing marginal costs of human capital or expertise. As a consequence, it is more efficient to hire managers with good knowledge of investing in equities or other high-risk assets. Thus, based upon the relationship of professionalism and economies of scale, a positive relationship between size and investment in risky assets is expected. Other researchers also suggested a positive relationship between size and the proportion of equity investments and a negative relationship between size and the proportion of bond investments (Bikker and De Dreu, 2007 and Davis and De Haan, 2012). Therefore, the third hypothesis will be the following:

H3: There is a positive relationship between size and the riskiness of the pension fund investment policy.

4.4. Pension fund’s funding ratio

Based on financial distress costs theory, it is expected that risk management incentives will avoid riskier investments when performance is lower and probability of default is thus higher. Rauh

(2009) also finds that pension funds have less risky pension fund asset allocations when their financial condition is weaker. More specifically, Rauh (2009) found that a lower credit rating of the sponsor company and a corporate pension plan that is less funded results in allocations of pension fund assets to safer assets (debt and cash). Rauh (2009) suggests that this result is based upon the motivation of corporate pension funds to limit financial distress costs.

H4: There is a positive relationship between a pension fund's funding ratio and the riskiness of the pension fund investment policy.

4.5. Governance and structure board of trustees

Several researchers have examined the influence of institutional ownership by pension funds on firms and viewed pension fund ownership as positively influencing governance reforms (Guercio, 1999; Woidtke, 2002). For example, Guercio (1999) suggests that pension funds were successful in monitoring and promoting change (mainly regarding corporate governance issues) in target firms through the submission of shareholder proposals. However, no significant effect on the firm's stock returns or accounting measures of performance was found. However, the other way around is interesting as well. From this view, the possibility of the firm influencing the pension fund is meant. Hess (2005) empirically analyzed the systematic impact of different governance structures and practices on pension fund performance for public pension funds and found that the way how members of the board of trustees were elected determined the fund's assets. Since in The Netherlands, both the employers as the employees are equally represented in pension fund's board of trustees, it is not the relatively representation that could influence the fund's investment policy. However, the inclusion of certain (powerful) people from the sponsoring firm could be influential. Hess (2005) argued that board members who are also plan members may positively influence the performance of the plan due to their direct financial interest. In addition, the inclusion of the firm's CEO and or CFO within the board of trustees of the pension fund may potentially influence the pension fund (investment policy). This since a firm's CEO and or CFO are often well educated and often has considerable experience, which enhances their professionalism and knowledge regarding more riskier and complex assets. Hess (2005) also considers education and experience as able to influence pension fund investment.

The pension fund's board of trustees has the power to decide upon the fund's investment decisions (Hess, 2005).

Also the composition of the board of trustees might impact the riskiness of the pension fund's investment policy. Carter et al., (2003) studied the influence of board diversity on firm value. Several lines of reasoning that suggest a positive relationship between board diversity and firm value have motivated this study. In summary, corporate governance and diversity promotes a better understanding of the marketplace, increases creativity and innovation, produces more effective problem-solving (due to variety of perspectives), enhances leadership and promotes more effective global relationships. In line with this expectation, the study found a positive relationship between the inclusion of women and minorities in the board of directors and firm value measured by Tobin's Q. Nowadays, board diversity is a popular concept and often included in policy statements. For example, pension fund Abbott mentioned in its 2015 annual report that it has established a policy regarding the diversity of its board. The policy attempts to have a minimum of one male director and one female director in its board. In addition, the policy aims to have minimal one director aged above 40 years and one director aged below 40 years. Currently, the pension fund does (partly) not adhere to its policy since there is no female director part of the board. However, the fund does abide to the diversity regarding age since the chairman is below 40 years old. Thus, the fund adheres partially to its diversity policy. Ones per three years the fund evaluates its diversity policy. In their search for new candidates the fund takes into account its diversity policy, however, knowledge and skills will have priority. Researchers have not only investigated the relationship between corporate governance issues and firm value, but have also examined the influence of corporate governance mechanisms on for example risk taking regarding investment policies (which is of relevance for this study). For example, John et al., (2008) investigated whether better investor protection leads to corporations undertaking riskier investments. Their results suggest that corporate risk-taking is positively related to the quality of investor protection. Thus, better corporate governance leads to more risk-taking for firms. The reasoning behind this is that good corporate governance constraints corporate decision makers in their pursuit of self-interest, which in turn leads to firm value-maximizing behavior. Extending this line of reasoning to pension funds, it is expected that board diversity based on gender and age characteristics is positively related to the riskiness of the pension fund investment

policy. However, there are also arguments that suggest a negative relationship between corporate governance and risk-taking. For example, better investor protection goes along with less fear that managers will pursue their self-interest. In this situation, monitoring is less beneficial and shareholders become less prevalent across firms, which gives greater discretion to managers to reduce risk-taking. Moreover, Faccio et al., (2016) suggest that female CEO's are associated with lower leverage, less volatile earnings and a higher chance of survival. Their result shows that female CEO's thus avoid riskier investment and financing opportunities and that this risk-avoidance behavior of female CEO's leads to distortion in corporate investment policies. Thus, this study implies that women tend to be more risk-averse than men and consequently do not prefer to take on profitable investment opportunities that are associated with high risk. This study treats CEO gender as a trait that is able to explain corporate choices and ultimately influence corporate outcomes. Moreover, Barber and Odean (2001) found that men trade 45% more compared to women and this might be due to overconfidence and in turn that men are less risk-averse. Huang and Kisgen (2013) found similar results regarding the relative overconfidence of men compared to women in making corporate decisions. Bernasek and Shwiff (2001) also found that women are more conservative investors compared to men. Sundén and Surette (1998) examined whether people differ systematically by gender in the allocation of assets in DC pension plans and found that when controlling for some demographic variables, gender indeed plays a role. Francoeur et al., (2007) found a positive relationship between inclusion of women in the board and stock market returns for firms within a turbulent environment. Extending this line of reasoning to pension funds leads to the expectation that there is a negative relationship between a female CEO and the riskiness of the pension fund investment policy. Thus, women can both have a positive as well as negative relationship with the riskiness of the pension fund investment policy. Based upon these lines of reasoning, the following two hypotheses regarding pension fund's board of trustees will be examined:

H5: There is a positive relationship between pension fund's board diversity regarding age and the riskiness of the pension fund investment policy.

H6: There is a positive relationship between pension fund's board diversity regarding gender and the riskiness of the pension fund investment policy.

Chapter 5: Sponsoring firm determinants

In addition to the potential of pension fund determinants to influence the investment policy or strategic asset allocation decisions for (Dutch) pension funds, characteristics of the sponsoring firm might be relevant as well. This because the sponsoring firm has the obligation to contribute fixed or variable payments to the pension fund. These payments are fixed for DC type of plans and variable for DB type of plans. In addition, half of the board of trustees of the fund exist out of sponsoring firm employees. Furthermore, although the pension fund is an independent, separate legal entity, the ultimate risk of bankruptcy is for the employer. Lastly, the performance of the corporate pension fund might influence the image of the firm as well. Therefore, the sponsoring firm might have an influence on both strategic as well as actual investment decisions. Due to the relationships between the sponsoring firm and the pension fund it makes sense to investigate sponsoring firm determinants as well.

There are different sponsoring firm determinants with the potential to influence the investment policy or strategic asset allocation decisions for (Dutch) pension funds. This chapter will outline these different sponsoring firm determinants.

5.1. Leverage

Friedman (1982) found that firms with a higher leverage ratio invest pension assets so as to balance the total risk to the firm. Firms with a higher leverage ratio invest a relatively greater part of their pension assets in debt securities compared to investments in equity.

H7: There is a negative relationship between a sponsoring firm's leverage ratio and the riskiness of the pension fund investment policy.

The results of this hypothesis will probably appear stronger for DB plans since for DC plans the sponsoring firm does not bear the risk of an underfunded pension plan. Although mandatory additional contributions are absent in The Netherlands, for DB plans, the ultimate risk of bankruptcy is for the employer.

5.2. Plan type

Based upon the aforementioned differences between DB and DC pension plans, with a DB plan the sponsor company can be motivated to take more risk by the fact that higher returns may lead to lower necessary contributions. For a DC plan this motivations does not exist since the sponsoring firm has to pay fixed contributions independent of the investment return. In addition, pension plan characteristics have the potential to influence the motivation for risk shifting, which can introduce moral hazard problem by inducing risk-taking in the pension fund (Rauh, 2009; Davis and De Haan, 2012). Moral hazard is the risk that a party does not take into account the trade-off between risk and incentives because the party does not incur the losses itself. Davis and De Haan (2012) suggest that moral hazard can exist since the sponsor firm of a defined benefit pension plan owns a put option, which means that if the pension fund fails to meet its liabilities, the existing assets will be transferred to the pension beneficiaries as payments and the fund will be liquidated. In this case, higher value is created by riskier underlying assets. Due to this, the sponsoring firm might have the motivation to increase the risks by investing in securities with higher risks. Thus, combining these two lines of reasoning, a positive relationship between a defined benefit pension plan and the riskiness of pension fund investment policy is expected.

H8: There is a positive relationship between defined benefit pension plans and the riskiness of the pension fund investment policy

Table 2 provides an overview of the hypothesis that this research will study. Were size (hypothesis 3) will function as a control variable.

H#	Formulation	Theoretical references
1	There is a positive relationship between the average wealth of plan members and the riskiness of the pension fund investment policy.	Risk management
2	There is a negative relationship between pension fund's maturity and the riskiness of the pension fund investment policy.	Risk management and life-cycle theory
3	There is a positive relationship between size and the riskiness of the pension fund investment policy.	Risk management, economies of scale and professionalism
4	There is a positive relationship between a pension fund's funding ratio and the riskiness of the pension fund investment policy.	Risk management and financial distress costs
5	There is a positive relationship between pension fund's board	Governance and life-cycle theory

	diversity regarding age and the riskiness of the pension fund investment policy.	
6	There is a positive relationship between pension fund's board diversity regarding gender and the riskiness of the pension fund investment policy.	Governance and risk attitude related to gender
7	There is a negative relationship between a sponsoring firm's leverage ratio and the riskiness of the pension fund investment policy.	Risk management and financial distress costs
8	There is a positive relationship between defined benefit pension plans and the riskiness of the pension fund investment policy.	Risk management, risk-shifting and moral hazard

Table 2: Hypotheses formulation and theoretical references

Chapter 6: Research methods

6.1. Regression model

The regression model is similar to the model used by Bikker et al., (2012) and is as follows:

$$\text{Strategic risk exposure} = \alpha + \beta \text{ average wealth plan members} + \beta \text{ maturity} + \beta \text{ fratio} + \beta \text{ leverage ratio} + \beta \text{ type of plan} + \beta \text{ size} + \beta \text{ Board diversity1} + \beta \text{ Board diversity2} + \varepsilon$$

This method can be used to estimate the amount of variance in the dependent variable explained by the independent variables, indicated by the (adjusted) R2. Furthermore, the influence of the independent variables separately on the dependent variable are estimated and indicated by the coefficients. Several assumptions need to be checked before conducting the analysis, e.g. multicollinearity, normality, heteroscedasticity and linearity issues. SPSS will be used to conduct the statistical analysis (Hair et al., 2013; Huizingh, 2007; De Veaux et al., 2014). In order to comply with the assumptions, some variables were re-expressed to make them more normally distributed. Only for the variables 'maturity' and 'sponsoring leverage' this was not needed.

6.2. Variables and measures

Dependent variables

The riskiness of the pension fund investment policy of Dutch (corporate) pension funds will be indicated by the dependent variable Strategic Risk Exposure. This Strategic Risk Exposure will be measured by the sum of the proportion of the strategic investment policy dedicated to a

certain asset class multiplied by the risk (beta) percentage for that specific asset class established by Jin et al., (2006). Jin et al., (2006) assumed certain betas for the various asset classes and used those to compute the total risk for pension funds.

The following asset classes will be considered:

1. The proportion of the investment policy dedicated to equity (Davis and De Haan, 2012).
2. The proportion of the investment policy dedicated to fixed-income securities (incl. bond holdings) (Davis and De Haan, 2012).
3. The proportion of the investment policy dedicated to private equity.
4. The proportion of the investment policy dedicated to hedge funds.
5. The proportion of the investment policy dedicated to commodities.
6. The proportion of the investment policy dedicated to real estate.

Independent variables

The following variables will be used as independent variables:

1. Average wealth of plan members will be measured via the total assets divided by the total number of participants (Bikker et al., 2012).
2. Maturity will be measured by the ratio of active to total minus passive pension plan participants. As a result, a high ratio will indicate a relatively young fund. Active participants are participants that currently build up a pension with the pension fund. Passive participants are participants that have built up their pension rights with the pension fund, but do not do this anymore. An example of a passive participant is someone who has changed his or her job.
3. Funding ratio as measured by the pension fund's available assets divided by its liabilities (Rauh, 2009; Davis and De Haan, 2012). The funding ratio is given in the fund's annual report and therefore no calculations were made. From 2015 onwards the nFtk introduced the "beleidsdekkingsgraad," which is measured by taking the average funding ratio of the whole year. However, for this research the "normal" funding ratio was used to measure the solvency. This in order to reach consistency, since data has to be collected from several years and pension funds did not report the "beleidsdekkingsgraad" retrospectively.
4. The sponsoring firm's leverage will be measured via total debt divided by total assets (Davis and De Haan, 2012; Shivdasani and Stefanescu, 2010).

5. DB/DC type of plan will be measured via a defined benefit dummy variable, for which 1 indicates a defined benefit fund and 0 indicates a defined contribution type of pension fund.

6. Board diversity¹ will be measured by a dummy variable, for which 1 indicates a diverse age distribution and 0 indicates no diverse age distribution regarding the pension fund's board of trustees. Here, diverse means 1 or more members of the pension fund's board of trustees are below 40 years old.

7. Board diversity² will be measured by a dummy variable, for which 1 indicates a diverse gender distribution and 0 indicates no diverse gender distribution regarding the pension fund's board of trustees. Here, diverse means 1 or more members of the pension fund's board of trustees are female.

Control variable

Size will be the control variable and will be measured by the natural logarithm of total assets of the pension fund.

6.3. Data sources and sample criteria

Several sources were used in order to gather the required data. Firstly, the supervisory authority DNB offers a dataset with certain information on individual pension funds. DNB has not made any adjustments or calculations on this data, but published the data identical to how it was received. Data regarding funding ratio, returns, sponsoring firms' contributions to the pension funds, pension premiums and indexation (yearly) are available in this data set. This data set was updated on the 15th September 2016. The total data set comprises of a sample size of 249 individual pension funds. The sample for the regression model that will test the influence of pension fund and sponsoring firm characteristics on the investment policy of pension fund assets will include the company-wide pension plans only, since then it is possible to test the influence of the variables of the sponsoring firm on the strategic investment policy of the pension funds. Although these company funds are separate legal entities, they are run directly by the sponsor company and often the labour union of the employees (Bikker and De Dreu, 2007). Therefore, it is useful to examine whether certain firm characteristics can influence the asset allocation decisions of the corporate pension funds. For industry-wide pension funds it is not possible to link the sponsoring firms characteristics or situation to the financial decisions of the industry-

wide pension fund. Combining sponsoring firm characteristics with pension fund decisions for company-wide or corporate pension funds has also been done by other researchers, such as Friedman (1982), Webb (2007), Rauh (2009), Shivdasani and Stefanescu (2010), and Davis and De Haan (2012). After filtering for the corporate pension funds, 156 pension funds remained. However, many (small) pension funds are liquidated nowadays and since information for those pension funds is often lacking, a total data set of 118 remained per year. Those 118 pension funds will be the sample for all the three years as the dataset of DNB has been used as the basis data set and is available for 2014 and 2015. The sample period will pertain to 3 years, namely 2013, 2014 and 2015.

In addition to the DNB data set, data regarding the sponsoring firm (firm characteristics) will be taken from van Dijk's database REACH.

Furthermore, data regarding asset allocation of Dutch pension funds will be collected manually from the annual reports of the pension funds, which are available online. Missing data from the DNB data set will also be supplemented with data from the annual reports. Furthermore, some data that is available in both the DNB data set as well as in the annual reports will be double-checked. Similar to what Davis and De Haan (2012) did, fund and sponsor data will be connected into one dataset.

Chapter 7: Data

During data collection it appeared that pension funds do differ in their reporting style regarding their investment policy. Some pension funds do specify their investment choices in detail, whereas other only distinguish between fixed-income securities and equity. Overall, most of the funds did distinguish between fixed-income securities, equity and real estate. A relatively small number of funds did specify investment details about asset classes such as private equity, commodities, hedge funds and cash. It appeared that some pension funds mentioned some of these asset classes such as cash and commodities under the heading of 'fixed-income securities'. Because of this, this research does distinguish between the asset classes: equity, fixed-income securities and real estate, where "other" asset classes then these will be placed under the heading of other, for which a average beta will be used. In the end, this will not really influence the strategic or actual risk exposure since it pertains to a very small percentage of the overall investment portfolio. It appeared that the proportion of pension fund's investment policy

dedicated towards asset classes such as private equity, commodities, hedge funds and cash was very low.

The dependent as well as the independent variables that were based upon data retrieved from the pension funds annual reports do represent end of the year values. For example, IKEA did report in their 2014 annual report their strategic investment portfolio per January 2015 and the actual investment portfolio anno end 2014. The independent variables such as total participants, total assets and funding ratio were also end of the year values. This means a good match between independent and dependent variables. However, some pension funds that only base their strategic investment policy upon an asset liability study that does not take place every year did hold on to their strategic investment policy established during the year of the most recent ALM study. For example, in the 2014 annual report of Heineken the strategic investment policy was still based upon the ALM study of 2011, which the fund takes once every three years (Heineken, 2014, Annual report). In this situation, it is harder to devote the strategic investment policy to the independent variable values of 2014.

Based upon this observation this research has tried to investigate whether it makes sense to establish year-average values for the independent variables. This in order to see whether there is a stronger relationship between the averages of the independent variables and the strategic risk exposure dependent variable. However, this will reduce the sample period with one year and a final sample size of 104 resulted. The results for this method, using year-average values for investigating the relationship between the independent variables and the strategic risk exposure can be seen in the results section.

Since 2014 the “Code pensioenfondsen” have been entered into force, including norms that are stipulated for pension funds. Since July 2014 these codes have also been anchored in the Pensioenwet. The goal of the codes for pension funds is to improve the functioning and transparency of the pension fund. To adhere to the codes has been required by law and compliance is based on the ‘apply-or-explain principle’, which means that every pension fund needs to at least think about the norms and judge whether or not the norm will add value to the fund (VOPAK, 2015, Annual report). One of the subjects of the codes deals with the diversity policy of the board and committees of the fund. More specifically, norm 67 and 68 relate to the

gender and age of board and committee members. The norms dictate that at least one woman should be included in the board of trustees as well as one member below the age of 40 years. In order to comply with the diversity norms, pension funds do need to include at least one woman and one member below the age of 40 years in the board of trustees and in their committees. This research intends to see whether compliance with the diversity norms do influence the strategic investment policy of the pension funds.

However, this implies that the presence of women and/or members below the age of 40 years will by itself influence the investment policy, regardless of their relative share of the total members in the board of trustees. In other words, this method assumes that there is no difference in influence whether the board consists of 10 or 90 percent of women or people below the age of 40 years. Therefore, this research also attempts to see whether the relative proportion of both diversity indicators do influence the willingness to take risk regarding the strategic investment policies of pension funds in The Netherlands. Unfortunately, it appeared that many pension funds did not comply with the diversity standards in 2015, or did do so to a little extent. As a result, it was not suitable to use the variables Board Diversity 1 (age) and Board Diversity 2 (gender) in the regression analyses. What can be concluded regarding governance and diversity issues from the data collection is that pension funds do not apply the norms to any significant extent. Some pension funds did mention their willingness to take into account the norms in the coming years, however, experience and knowledge will be the most important criteria.

In order to classify a pension plan as either a DB, DC or hybrid plan, first all annual reports of 2015 were checked manually and the classification was based upon the pension scheme description mentioned in the annual report. However, In accordance with IFRS standards regarding employee benefits, some firms had to account for their defined benefit schemes as if it were defined contribution schemes. The IASB (International Accounting Standards Board) sets the international financial accounting standards and is an independent body of the IFRS foundation. The mission of this body is to develop IFRS standards (International Financial Reporting Standards) that bring transparency, accountability and efficiency to financial markets around the world. This should bring trust, growth and long-term financial stability into the global economy (“IFRS - Mission Statement”, 2017). The IFRS rule regarding employee benefits in the form of a DB pension scheme requires the fund to allocate the obligations, investments and costs

to the different participating employers. Often pension funds were unable to do so and had to report as if the plan was a DC type of plan. Due to ambiguity in the classification of a pension plan another method had been implemented. In order to classify the pension plan, it has been checked whether the risks of the investments were for the participant, the fund or for both. For this the relative proportions of investments with risk for participant and investments with risk for the fund have been considered. In case the risk of investments was for both, the plan has been classified as a hybrid plan. In case the risk of investments was for the participant, the plan has been classified as a DC plan. Whenever the risk of investments was for the fund, the plan has been classified as a DB plan.

The dataset has been checked for outliers, which were deleted. For example, outliers regarding assets per participant will be excluded since this probably points towards funds for board members instead of regular employees. In addition, abnormal funding ratios will be excluded from the sample. Table 3 shows the descriptive statistics.

	Mean	Median	Std. Deviation	Minimum	Maximum	N
<i>Dependent Variables</i>						
Strategic Risk Exposure	0.449	0.441	0.093	0.240	0.800	235
Actual Risk Exposure	0.434	0.437	0.082	0.210	0.740	286
Equity holdings strategic	0.328	0.305	0.113	0.090	0.760	235
Equity holdings actual	0.309	0.310	0.100	0.040	0.680	285
<i>Independent Variables</i>						
Average Wealth Per Participant	175.884	149.747	158.275	0.160	1497.170	309
Average Wealth Per Participant (ln)	4.958	5.026	0.718	2.720	7.310	298

Maturity	0.573	0.562	0.246	0.000	1.000	335
Funding Ratio	111.666	110.000	8.747	81.500	163.000	307
<i>Funding Ratio (ln)</i>	<i>4.713</i>	<i>4.701</i>	<i>0.077</i>	<i>4.400</i>	<i>5.090</i>	<i>307</i>
Sponsoring Firm Leverage	0.615	0.629	0.254	0.000	1.000	313
Defined Benefit Dummy	0.648	1.000	0.478	0.000	1.000	332
Board Diversity 1 (age)	0.223	0.000	0.418	0.000	1.000	103
Board Diversity 2 (gender)	0.330	0.000	0.473	0.000	1.000	103
<i>Control Variable</i> Size	2458249.50	489268.00	7695611.13	298.00	5.922E+13	323
<i>Size (ln)</i>	<i>13.312</i>	<i>13.102</i>	<i>1.562</i>	<i>7.410</i>	<i>18.530</i>	<i>320</i>

Table 3: Descriptive Statistics

Comparing the descriptive statistics with prior studies shows that the pension landscape is way different nowadays. Some interesting differences were found. First of all, the pension funds in the sample of this research are more mature compared to the samples used in previous studies. For example, Davis and De Haan (2012) had a sample with a mean of 34.2 percent inactive participants, whereas the mean of inactive participants of this study was 57.25 percent. Thus, the pension funds in this study were relatively more mature compared to previous studies. This study also had a smaller standard deviation of 24.6 compared to the study conducted by Davis and De Haan (2012) of 34.2. Secondly, the pension funds in the sample of this research have relatively low funding ratios compared to funding ratios of prior studies. Davis and De Haan (2012) for

example found a positive relationship between a pension fund's funding ratio and equity holdings. The mean funding ratio of the study was 130.9 with a standard deviation of 28.4. The mean funding ratio of this research is 111.7 with a standard deviation of 8.75. This means that funding ratios are considerably lower thus the solvency of pension funds is lower compared to the past. Thirdly, the sample of this research did contain of pension funds with a smaller variation regarding size compared to the variation in the other studies. For example, Davis and De Haan used data from pension funds for the period 1996-2005 and had a standard deviation of pension fund size of 2.372 (natural logarithm of total assets), whereas this research had a standard deviation of pension fund size of 1.56 (natural logarithm of total assets). In addition, the number of pension funds is decreasing considerably and the larger pension funds are surviving. This means that the sample of this research consists of relatively larger pension funds compared to previous studies. The mean of pension fund size (natural logarithm of total assets) for this study is 13.3 whereas the mean of pension fund size (natural logarithm of total assets) was 9.8 in the study of Davis and De Haan (2012). Fourthly, the average wealth per participant (th) in this study of 175.8 is higher compared to the average of the study conducted by Bikker et al., (2012) where the mean average wealth per participant (th) was 81.2. This is not surprising since the total amount of assets of the pension funds is increasing as already mentioned in the introduction. However, the necessary payments do increase relatively faster compared to the increase in assets. Fifthly, there is not much difference with the mean sponsoring firm leverage of 0.62 of this research and the mean sponsoring firm leverage found by Davis and De Haan (2012) of 0.67. Also the standard deviations does not differ that much (0.25 compared to 0.22). The dependent variable actual equity holdings does somewhat differ from findings with previous studies. For example, the mean equity holdings found by Davis and De haan (2012) was 0.24 with a standard deviation of 0.21, whereas the mean equity holdings of this study pertains to .31 with a standard deviation of .10.

Table 4 shows the Pearson correlation matrix. The signs of the relationship between the dependent and independent variables were sometimes similar to the hypotheses and sometimes contrary to the hypotheses. The correlation table serves as a check for multicollinearity. There are some significant correlations between the independent variables, which might indicate the problem of multicollinearity. Some correlations might (partly) be due to the construction of the variables as 'assets' is a factor that is needed to measure several independent variables, namely: size, average wealth per participant and funding ratio. This might explain the correlation between those variables. However, the Variable Inflation Factors do not indicate multicollinearity problems, as all the VIF values were below 2.

Table 4: Pearson correlation matrix

	SRE	ARE	E (S)	E (A)	AWPP	M	FR	SFL	DB	BD 1	BD 2	Size
SRE		.508*** (220)	.995*** (235)	.512*** (219)	.069 (206)	-.026 (234)	.086 (229)	.095 (208)	-.057 (232)	-.042 (79)	.010 (79)	-.059 (215)
ARE			.504*** (220)	.985*** (285)	-.016 (250)	-.011 (283)	.048 (276)	-.022 (257)	-.118** (282)	.116 (89)	.121 (89)	-.058 (260)
E (S)				.513*** (219)	.063 (206)	-.023 (234)	.074 (229)	.095 (208)	-.038 (232)	-.038 (79)	.004 (79)	-.067 (215)
E (A)					-.023 (250)	.002 (282)	.026 (275)	-.011 (257)	-.124** (281)	.068 (89)	.136 (89)	-.083 (259)
AWPP						-.291*** (298)	.020 (272)	.118** (270)	-.16*** (291)	.075 (99)	.014 (99)	.417*** (298)
M							.014 (304)	.055 (301)	.065 (328)	.059 (103)	-.138 (103)	-.273*** (307)
FR								.099 (274)	.057 (300)	-.076 (92)	.073 (92)	.172*** (280)
SFL									.056 (296)	-.059 (95)	-.010 (95)	.109 (286)
DB										-.254** (103)	-.118 (103)	-.223*** (303)
BD 1											.210** (100)	.078 (102)
BD 2												.271*** (102)
Size												

* Significant at the 10% level, ** Significant at the 5% level and *** Significant at the 1% level

Chapter 8: Results

8.1. Regression results

In the following table the regression results are shown. Three models have been distinguished, namely: one model regarding pension fund determinants only, one model regarding sponsoring firm determinants only and the full model including all pension fund as well as sponsoring firm determinants.

Table 5: Regression results Dependent variable: Strategic Risk Exposure

AWPP (ln)	0.129 (1.643)		0.035 (0.401)
MAT	-0.012 (-0.160)		-0.061 (-0.769)
FR (ln)	0.159** (2.169)		0.102 (1.274)
SFL		0.134* (1.805)	0.138* (1.722)
DB		-0.152** (-2.046)	-0.164** (-2.079)
SIZE (ln)	-0.146* (-1.795)	-0.094 (-1.225)	-0.142 (-1.536)
Constant	-0.444 (-1.059)	0.509*** (8.240)	-0.083 (0.175)
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R	0.037	0.036	0.048
Adjusted R	0.017	0.021	0.015
Durbin Watson	1.945	2.074	2.070
F	1.877	2.336	1.461
N	203	189	180

* Significant at the 10% level, ** Significant at the 5% level and *** Significant at the 1% level

In general, the hypothesis did not show the expected relationships between independent and dependent variables. The following will describe these results and discuss potential underlying reasons.

Average wealth per participant

The hypothesized relationship between average wealth per participant and strategic risk exposure has not been supported by the regression analysis. The sign is positive, as hypothesized. However, the result is insignificant.

Maturity

Based upon the risk management and life cycle theory it was hypothesized that the relationship between maturity and strategic risk exposure would be negative. As a consequence, we would expect a positive sign between maturity and strategic risk exposure, as this would indicate a negative relationship. However, the relationship of maturity and strategic risk exposure is negative and also insignificant. Prior literature did find a significant (negative) relationship between the maturity of the pension fund and the capital allocation structure. However, this research did not find a significant relationship between the maturity of the pension fund and the strategic risk exposure. A reason for the different results might be the aforementioned differences in the sample regarding the maturity of the pension fund. Pension funds in this sample are more mature compared to samples used in other studies. In addition, this study had a smaller standard deviation compared to samples in other studies.

Funding ratio

The regression model that took into account the pension fund determinants only did show a significant positive relationship between funding ratio and strategic risk exposure of pension funds. This result means that a 1 percentage point increase in the funding ratio will lead to a 15.9 percentage point increase in the strategic risk exposure holding all other variables constant. The full model that took into account both pension fund determinants and sponsoring firm determinants did not show a significant result. Although, the sign is positive and corresponds to the hypothesis.

Partly due to the persistent low interest rate the funding ratio of many pension funds came under pressure. The relatively lower funding ratio's of pension funds in the sample of this study compared to previous studies might explain the less significant or insignificant results of some models. In addition, the standard deviation of the funding ratio of the sample of this study is way smaller compared to previous studies. This might have influenced the results as this might diminish the effect of funding ratios on asset allocation decisions.

Sponsoring firm leverage

The results for the relationship between sponsoring firm leverage and strategic risk exposure are significant and positive. This is an interesting result since the opposite was hypothesized. It thus appears that sponsoring firms that have a relatively high leverage ratio were more inclined to take risks regarding the pension fund asset allocation decisions. More specifically, the results suggest that a 1 percent increase in sponsoring firm leverage will increase the strategic risk exposure by 13.4 percent holding all other variables constant.

Type of plan

For DB plans, higher returns will lead to lower future contributions that the sponsoring firm needs to make. Therefore, it is in the sponsor interest to take more risk. Based upon this the assumption is that pension funds with DB type of plans in a setting (country) with a pension benefit insurance will have a higher incentive to take risks (based on moral hazard and risk-shifting ideas). However, in The Netherlands this relationship will be less significant since there is no pension benefit insurance. This can be an explanation for the fact that the hypotheses were not confirmed. Also, increasing regulations have disciplined pension funds to invest responsibly. In addition, Davis and De Haan (2012) also argued that pension funds with DB schemes could be motivated to invest less in equity (lowering the strategic risk exposure) due to tax advantages of holding debt securities in the pension fund. Thus the negative relationship between DB pension schemes and strategic risk exposure could be due to stronger regulations and tax incentives.

Size

Bikker and De Dreu (2007) as well as Davis and De Haan (2012) did found that pension funds with a larger size tend to invest more in equity, whereas pension funds with a smaller size did

tend to invest more in bonds. A possible explanation for the different result might be that the sample of this research did contain of relatively larger pension funds with a smaller variation regarding size compared to the size and variation in the other studies.

8.2. Regression results using year-average values of the independent variables

Table 6: Regression results using year-average values of the independent variables

Dependent variable: Strategic Risk Exposure

Average	0.199**		0.059
AWPP (ln)	(2.039)		(0.510)
Average MAT	-0.007		-0.105
	(-0.073)		(-0.965)
Average FR (ln)	0.176*		0.146
	(1.913)		(1.374)
Average SFL		0.128	0.141
		(1.267)	(1.301)
DB		-0.058	-0.049
		(-0.573)	(-0.464)
Average SIZE (ln)	-0.131	-0.003	-0.083
	(-1.325)	(-0.030)	(-0.682)
Constant	-0.786	0.420***	-0.572
	(-1.259)	(5.194)	(-0.783)
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R	0.067	0.019	0.049
Adjusted R	0.036	-0.010	-0.010
Durbin Watson	1.782	1.824	1.769
F	2.192	0.659	0.833
N	127	107	104

* Significant at the 10% level, ** Significant at the 5% level and *** Significant at the 1% level

As the results in table 6 show, most of the hypotheses are not significant when using year-average values for the independent variables. A reason for this can be the reduced sample size. However, the hypothesis regarding the average wealth per participant is positively significant in the pension fund determinants model only. This will mean that a 1 percent increase in the average wealth per participant (using year-average values) will increase the strategic risk exposure of pension funds with 19,9 percent. Furthermore, some support has been found for the hypothesis regarding the relationship between funding ratio and strategic risk exposure. Overall, the results using year-average values are not that convincing, probably due to the lower sample size.

8.3. Robustness checks

As most previous research measured the dependent variable with the proportion of bonds and the proportion of equity only and this research also took alternative risk categories into account it is possible that the treatment of the dependent variable causes different results. In order to see whether the measurement of the dependent variable was able to explain the different results, this research examined the influence of the independent variables upon several other dependent variables, namely: (1) actual risk exposure, (2) equity holdings strategic, and (3) equity holdings actual. Table 6, 7 and 8 will show these results respectively. The results do not show very different outcomes.

Table 7: Regression results Dependent variable: Actual Risk Exposure

AWPP (ln)	.009 (.130)		-.097 (-1.272)
MAT	-.031 (-.451)		-.056 (-.789)
FR (ln)	.109* (1.659)		.151** (2.166)
SFL		-.007 (-.103)	.051 (.725)
DB		-.148** (-2.189)	-.137 (-1.928)
SIZE (ln)	-.119 (-1.630)	-.077 (-1.114)	-.119 (-1.501)
Constant	-0.014 (-0.044)	0.506*** 10.400	-0.162 (-0.474)
R	.019	.023	.047
Adjusted R	.003	.010	.020
Durbin Watson	1.821	2.066	1.956
F	1.158	1.806	1.725
N	243	232	219

* Significant at the 10% level, ** Significant at the 5% level and *** Significant at the 1% level

Table 8: Regression results Dependent variable: Strategic Equity Holdings

AWPP (ln)	.128 (1.622)		.035 (.406)
MAT	-.006 (-.074)		-.054 (-.675)
FR (ln)	.146** (1.990)		.085 (1.053)
SFL		.137* (1.841)	.138* (1.724)
DB		-.139* (-1.864)	-.147* (-1.861)
SIZE (ln)	-.150 (-1.841)	-.101 (-1.318)	-.140 (-1.505)
Constant	-0.658 (-1.293)	0.406*** (5.414)	-0.193 (-0.337)
<hr/>			
R	.034	.034	.042
Adjusted R	.014	.019	.009
Durbin Watson	1.966	2.083	2.080
F	1.727	2.196	1.259
N	203	189	180

* Significant at the 10% level, ** Significant at the 5% level and *** Significant at the 1% level

Table 9: Regression results Dependent variable: Actual Equity Holdings

AWPP (ln)	0.010 (.138)		-.106 (-1.385)
MAT	-.034 (-.499)		-.065 (-.910)
FR (ln)	.092 (1.400)		.123* (1.774)
SFL		.012 (.180)	.075 (1.057)
DB		-.159** (-2.354)	-.150** (-2.115)
SIZE (ln)	-.141* (-1.931)	-.104 (-1.517)	-.144* (-1.809)
Constant	-0.123 (-0.310)	0.417*** (6.973)	-0.232 (-0.551)
<hr/>			
R	.021	.028	.049
Adjusted R	.004	.015	.022
Durbin Watson	1.831	2.060	1.958
F	1.261	2.195	1.833
N	243	232	219

* Significant at the 10% level, ** Significant at the 5% level and *** Significant at the 1% level

Chapter 9: Conclusion

The goal of this research was to examine whether the hypothesized pension fund and sponsoring firm determinants were able to explain the strategic investment policy of Dutch pension funds for the period of 2013 till 2015. Therefore, the research question has been formulated as follows: What are the determinants of the investment policy of Dutch pension funds?

The sample used consists of Dutch corporate pension funds of both the DB as well as DC type of funds. Regression analyses were conducted to analyze the relationships between the dependent and independent variables that were hypothesized. The results have contributed to the existing literature by providing insights in the pension landscape of nowadays. These results might be relevant for stakeholders such as employees, policy makers and investment parties. Overall, some positive relationships between the funding ratio and strategic risk exposure have been found. In addition, a negative relationship between the defined benefit dummy and strategic risk exposure has been found in general. As already explained, the negative relationship between DB pension schemes and strategic risk exposure could be due to stronger regulations and tax incentives. Overall, the regression results did not show very significant relationship as hypothesized. Therefore, there are probably other determinants of pension fund's strategic investment policies nowadays. As already explained in chapter 8 "Results", the pension landscape of today is way different from a decade ago. The number of pension funds, its size and structure are all subject to change. This might explain the different findings regarding the hypotheses of this research. In addition, other determinants that pension funds do take into account when deciding upon their strategic investment policy nowadays can be investigated in future research. The following will describe possible reasons.

First of all, the influence of the knowledge of the participants in the investment committee of the fund about different asset classes is a possible determinant of a fund's investment policy that is not taken into account by this research. For example, in the 2014 annual report of pension fund Cosun it is mentioned that the fund did no longer invest in the asset class hedge funds because of the lack of knowledge about the strategies that hedge funds apply and the limited transparency that are associated with hedge funds. Also weak results in the past did motivate the fund's choice to stop using hedge funds as an investment. In case the fund's investment committee would have exist out of people who have experience and extensive knowledge about hedge funds it is reasonable to think that the fund in that situation would have used the asset class (more

extensively). In order to investigate this possibility, qualitative research that assesses the knowledge and or experience of the people that make the investment policy is needed.

Another view comes from the macro-economic situation in The Netherlands. The digital economy and globalization do limit the inflation, which was previously a reoccurring phenomenon. For decades, it could be assumed that the growing economy would lead to price increases due to increasing demand. Another way inflation was reached is via the scarcity in the labor market, which enabled unions to negotiate higher wages, which were often compensated by higher prices. However, this re-occurring pattern does not apply for the last years. While the economy grows, inflation remains relatively low. Reasons for the low inflation could be the increasing importance of the digital economy and globalization. More specifically, due to emerging markets the supply of products has been increasing enormously, while simultaneously upcoming countries are able to produce low-cost products, which results in low prices. In addition, ICT has a wide impact due to the endless production of digital products with low or no marginal costs. Another result of the Internet is the increasing transparency (e.g. in the form of price comparison websites), which is another reason of the limited inflation. The different reasons and resulting low inflation are able to influence market players such as pension funds via interest rates. Low interest rates can be a reason and thus tool in order to boost demand and growth. However, for pension funds this low interest is negative. Pension funds do measure and determine their liabilities based upon the interest rate. The lower the interest rate, the more available means the fund needs to have to meet its liabilities to its participants. If the fund does not have the resources it needs, the pension fund is underfunded. Pension funds can protect themselves against the negative consequences of an interest rate decline by hedging with fixed-income securities, of which the value increases with a declining interest rate, as well as via derivatives. However, this is at the expense of returns on other asset classes. In addition, in the situation of a low interest rate, it is challenging for pension funds to retain a certain investment return. Many pension funds do therefore use the option to hedge the interest rate risk. When a pension fund does hedge their interest rate risk for a relatively large part, the fund is less dependent on the interest rate. Because of this, it is possible that a fund's willingness to take risk regarding their investment policy depends on the proportion that the fund hedges the interest rate risk away (Financial Times, 2017, Aantal pensioenfondsen trotseert aanhoudend lage rente). In

this way, the macroeconomic situation might also be an influence of pension fund's investment policy.

Furthermore, the return per asset class of the previous year(s) might influence the strategic investment policy of the pension fund. Past performance might be a factor that influences the willingness to take risk regarding the investment policy.

This research also has its limitations. First of all, a limitation of this study is that the beta for the asset classes has been used from a study that was studying the U.S. It is possible that these will somewhat deviate from the risks associated with the asset classes for Dutch pension funds.

Another limitation could be that the sample size is smaller compared to samples of previous studies. This is also due to the decreasing number of pension funds. According to the DNB, in 2010 the total number of pension funds (including corporate pension funds, industry-wide pension funds and pension funds for professionals) amounts to 838, whereas only 429 pension funds existed in 2015. It is possible that a smaller sample size caused the analyses to result in an incorrect sign or non-significant variable where the reality could be otherwise. However, the ratio of cases relative to variables seems to be sufficient (more than 20 cases per variable).

Based upon this study, future research on the determinants of a pension fund's strategic investment decisions is recommendable. The aforementioned proposed determinants could be studied as well as a similar study with a bigger sample size.

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