Network for Studies on Pensions, Aging and Retirement

Netspar THESES

Patrick Hereijgers

How to Measure and Apply Risk Preferences in the Second Pension Pillar

MSc Thesis 2013-012

How to Measure and Apply Risk Preferences in the Second Pension Pillar

By

Patrick P.C. Hereijgers

August 2013

MSc. Thesis

Supervised By:

Prof. Dr. J.J.M. Potters

Dr. J. Toussaint

Dr. J.S. Binswanger

Acknowledgement

It is a pleasure to thank those who supported me while writing this thesis. I received a lot of help and therefore I would like to take this opportunity to show my gratitude. I would like to thank the *Autoriteit Financiële Markten (AFM)* for giving me the opportunity to do this research. I am especially very grateful to Janneke Toussaint. I have learned a lot from her and this thesis would not have been possible without her outstanding supervision, which provided a great contribution to this project. During the four months I was at the *AFM* she was very supportive and spent many hours reviewing my work. I also received a lot of help from the complete team of *Toezicht Pensioenuitvoerders*. It was a pleasure for me to notice that everybody was interested in what I was doing and that they were all willing to give me feedback on my work. I would like to thank in particular Annelies Verhoeven-Van Velp and Arjanneke Sandtke-Bruggeman for their daily supervision and their encouragement and feedback during the development of this thesis.

I am also grateful to my supervisor Jan Potters (TiU) for his advice. He showed his expertise in the field of behavioral economics, which contributed to this thesis. I would also like to thank Johannes Binswanger (TiU) for taking place in the examination committee. Furthermore, I want to thank Peter Hoopman (*De Nederlandsche Bank*) for giving me more insight in the announced transition to the new pension contract.

On a more personal note, I would like to thank my friends and family members for always showing their support while writing my thesis. People kept asking me what my thesis is about, which showed their interest in my activities. They kept me fresh and motivated to write this thesis by making sure I was also able to relax from time to time.

Amsterdam, August 2013

Abstract

Due to demographic developments and the worrying economic situation, the pension system in the Netherlands is under pressure. In order to make it more sustainable, the government proposed several reforms, including the transition to the new pension contract in the second pension pillar. Pension funds and social partners can choose between the nominal contract and the real contract. In the nominal contract, the creation of the buffer implies that pension members are relatively sure of a nominal payment. In the real contract, there is the ambition to index the pension claims in order to keep the purchasing power of members at a constant level. However, the certainty of the buffer is absent. With the transition to one of these two options, more of the financial and longevity risk is shifted to pension members. It seems therefore fair to take into account the risk preferences of the individuals by pension funds in order to make a choice between the nominal and the real contract. The real contract seems to imply a more risky investment mix. The ambition is higher, making that the expected return of investments done should be higher. Therefore, the funds should measure how strong the willingness by their members is to keep their purchasing power at a constant level or whether they prefer the certainty of a nominal payment.

Measuring risk preferences is however a difficult task. Normative models are not able to explain observed behavior. As discussed in this paper, individuals show several behavioral biases specific for the pension context, meaning that they are often unable to understand the consequences of their choices. In this paper, we will present some criteria and desirabilities a measurement method should have in order to reflect true risk preferences of members in the pension context. Several risk measurement methods found in literature and practice will be discussed. We will conclude that neither of the methods is satisfying all criteria and desirabilities, but that choice-based approaches show more possibilities than direct attitudinal ways of measuring. The possibility to make it interactive and to show members the consequences of their choices contributes to that. However, the threshold to participate in interactive tools like the distribution builder might be rather high for members. As will be discussed, when building in some degree of paternalism the distribution builder might be more practical to use, without losing its attractive elements.

Contents

1. Introduction ——— 5-6

2. Dutch Pension System ——— 7-8

   2.1 Demographics ——— 8-9
   2.2 Current Dutch Pension System and International Comparison ——— 9-11
   2.3 Dutch Pension Reform ——— 11-12
      2.3.1 First Pillar Reform ——— 12
      2.3.2 Second Pillar Reform ——— 12-16

3. Risk Preferences ——— 17

   3.1 Normative Models ——— 17
      3.1.1 Mean Variance Analysis ——— 17-19
      3.1.2 Life Cycle Model ——— 19-21
      3.1.3 Notions of Risk Aversion ——— 21-23
      3.1.4 Notions of Heterogeneity across Individuals and over Time ——— 23-24
   3.2 Behavioral Approaches ——— 25
      3.2.1 Prospect Theory: The effect of Framing ——— 25-26
      3.2.2 Myopic Risk-Seeking and the Isolation of Choices ——— 26-27
      3.2.3 Context Specific Preferences ——— 27-31
   3.3 Current Policies When Measuring Risk Preferences ——— 31
      3.3.1 Duty of Care ——— 31-34
      3.3.2 Inconsistency in Preference Measuring ——— 34
      3.3.3 Requirements ——— 35-36
   3.4 Alternatives ——— 36
      3.4.1 Direct Attitudinal Scales ——— 36-37
      3.4.2 Choice Based Approaches ——— 37-39
         3.4.2.1 Distribution Builder ——— 39-42
   3.5 Concluding Remarks ——— 42-43

4. Conclusion and Discussion ——— 44
   4.1 Measuring Risk Preferences in the Second Pension Pillar ——— 44
      4.1.1 Implications of the Two Contracts ——— 44-45
      4.1.2 Implications of the Human Biases ——— 46-47
   4.2 Ways of Measuring ——— 47
      4.2.1 Duty of Care is Meant for Other Purposes ——— 48
      4.2.2 Direct Attitudinal Way of Questioning Has Shortcomings ——— 48-49
      4.2.3 Choice-Based Approaches Seems More Promising ——— 49-51
      4.2.4 Concluding: Good Practices ——— 51-52
   4.3 Discussion ——— 53
      4.3.1 Implementation Issues ——— 53-54
      4.3.2 Translation to the Collective Pension Arrangement ——— 54

   References ——— 55-58

   Appendix A ——— 59-60

Chapter 1 - Introduction

Elderly in the Netherlands are supported by the government in the first pension pillar with the *Algemene Ouderdoms Wet* (AOW). This benefit is not earnings related, but linked to the minimal wage. This shows that it is just a small part of the pension income; it serves only as a minimal income level for all retirees. The additional pension income is mainly collected in the second pension pillar. Where countries like Italy, Germany and Spain have a very small second pillar, the Dutch pension plan is characterized by a large occupational pension scheme. Due to demographic developments and the unfavorable financial situation, the current pension set-up seems unsustainable (Goudswaard, Beetsma, Nijmand & Schnabel, 2010) and therefore, several reforms are proposed.

The relevance of this paper starts with the transition to the new pension contract in the Dutch second pillar. In 2012, the ministry of Social Affairs and Employment presented the *Hoofdlijnennota,* in which it explains adjustments that they have in mind in order to make the pension plan more sustainable. In general we conclude that it becomes more important that we take individual preferences into account, because plan members are bearing more risk. People do not have the same preparedness to bear specific risks and are heterogeneous in all kind of preferences. Until now, the second pillar is only diversified to a certain extent with regard to employment status (Nijman & Oerlemans, 2008). Pension funds operate in a certain industry, and so, characteristics of that industry are weighted in the pension agreement. The heterogeneity of people who are in the same industry is somewhat smaller. In the construction industry for example, the work is considered as physical heavy, and therefore there should be possibilities to retire early. In that case, the pension agreement in this sector can be adjusted. However, we will show that people diversify on much more individual characteristics besides employment status and most ideally, pension funds should also take these into account when deciding about their investment mix.

Besides the fact that pension risk is shifted to the members, there are also other motives for funds to gauge risk preferences. First of all, as this paper will show later, financial literacy and pension interest are low (Prast, Teppa & Smits, 2012). The pension fund can increase understanding and insight in the pension topic, making people more aware of the risks that are in coherence with the pension income. Also, given people something to choose from can contribute to their satisfaction. This value of choice (Iyengar & Lepper, 1999) might help in restoring the trust in the pension sector and creates pension awareness.

In order to measure individual risk preferences, there are different methods that can be used (Donkers, Lourenço & Dellaert, 2012). Most used due to its ease of implementation is the questionnaire (Dellaert & Turlings, 2011), but this paper will show that this scale does suffer from a number of shortcomings. More promising ways of measuring are interactive tools that make the consequences of certain preferences more salient, which contribute to the understandability of the concept of risk.

This paper describes some criteria an efficient measuring tool should possess in order to reflect individual risk preferences in a correct way. However, there are chances for tools to contribute in

creating more pension awareness and knowledge. This paper therefore also appoints some features a measurement method mot ideally possesses.

In chapter 2 of this paper, the Dutch pension system is discussed. It starts with the demographic developments that influence the sustainability of the scheme. After that, the status of the current Dutch plan is discussed and also compared to other countries. At the end of chapter 2, the *Hoofdlijnennota* and its consequences are discussed. This paper also shows that the new way of organizing the occupational pension scheme has implications for measuring risk preferences.

In chapter 3 the focus is on the concept of risk. First, the normative framework of risk is being discussed, including the life cycle model and expected utility theory, which serves for many decades as the normative model for measuring choices under risk (Bleichrodt, Pinto & Wakker, 2001). However, we will see that these normative models are not predicting the revealed preference of an individual correctly, due to all kind of behavioral biases. This paper names the biases that influence pension decision making. After that, the focus is on the different methods to measure risk preferences. This paper discusses the most commonly used method and presents alternatives. From that evaluation, this paper extracts criteria and features that are desirable for a measurement tool.

In chapter 4 this paper discusses the implementation of those different risk measurement tools in the context of the new nominal and real pension contract. The indexation ambition is for individuals the largest difference between the two contracts and therefore, measurement methods should focus on that. We evaluate the effectiveness of the duty of care, direct attitudinal scales and the choice-based approaches when we want to measure the indexation ambition of individuals. In that way, this paper gives principles for an efficient and relevant way of measuring risk preferences in the occupational pension system. Further, discussed is how approaches can be implemented, when taken into account a certain degree of paternalism, in order to overcome behavioral biases.

Chapter 2 - Dutch Pension System

We could say that, roughly seen, the motives and objectives of pension plans around the world are comparable. Traditionally, economic motives for public pension plans are paternalism, market failures and income redistribution (Barr & Diamond, 2008). Individuals aim to smooth consumption and get insurance with their participation in the pension scheme, while the governments want to prevent elderly living in poverty and therefore uses the pension mechanism as a redistribution tool. However, despite of the comparable aims, there is a large diversity in size and design of pension systems. The way these schemes are organized are very country specific. According to Blinder (1988), the pension system is just *an accident of history*. Historical events determined the trust level and the traditions in a country, which therefore had an effect on the design of the pension plan.

The Dutch pension system relies on three pension pillars that together form the pension income when retired. This three tier system consists of the public pension, the occupational pension and the private savings (Barr & Diamond, 2008). The first pillar is the public pension, which is especially focused on redistributing income across and within generations, in order to prevent old-age poverty. This pillar can be seen as social security, and applies to everybody. The second pillar is an occupational or public pension system, or any combination of those two. The pension income in this pillar is more actuarially fair than in the first pillar, because it is linked to the labor income. Therefore, contributions and benefits are dependent on each other. In this pillar a large variety is possible between a pay-as-you-go versus a funding scheme, and a defined-benefit organized plan in contrast to a defined-contribution one. The third pillar is the private, personal pension and consists therefore mostly of defined contribution products. People themselves can voluntary invest in financial products and in that way, take care of additional pension income. In figure 1 below, an international comparison is made between six European countries. The data used are from 2001 and provided by Börsch-Supan (2004). The numbers are expressed as a percentage of total pension income. From this figure, the importance of the occupational pension income in the Netherlands becomes clear. Where in other countries, people rely much more on the government with respect to their retirement income, in the Netherlands a large part is collected in the occupational pension plans.

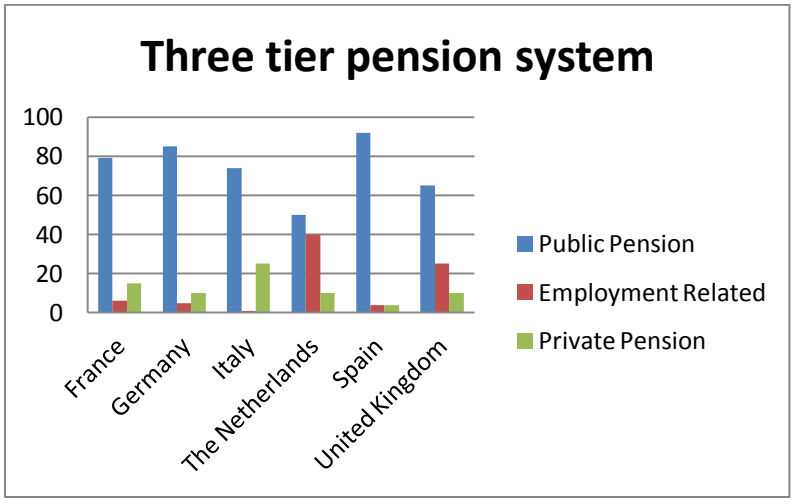

Figure 1 Three tier pension system comparison (Börsch-Supan, 2004)

In this chapter, the characteristics of the Dutch pillars are discussed. This automatically shows the importance of the second pillar in the total pension income in the Netherlands. From that the importance of the reform the government announced in the *Hoofdlijnennota* is visible. The consequences of the two contracts in the *Hoofdlijnennota* will be discussed in the section about the pension plan reform. First however, this chapter starts with the demographic developments that threaten the sustainability of the current pension scheme.

2.1 – Demographics

There are two demographic shocks that together lead to a less sustainable pension plan. The first is the increased longevity. Due to better health care services and the notion on living healthy, the life expectancy of both woman and men at the age of 65 is increasing. Therefore, the length of the inactive working live compared to the active life is increasing. As a consequence, pension expenditures increase. In figure 2 below we see the life expectancy of both men and women at age 65. This expectancy shows the number of years forecasted that people are not working and therefore the number of years they receive pension income. We see that this period increased rapidly over the past decades, showing the increase in pension costs.

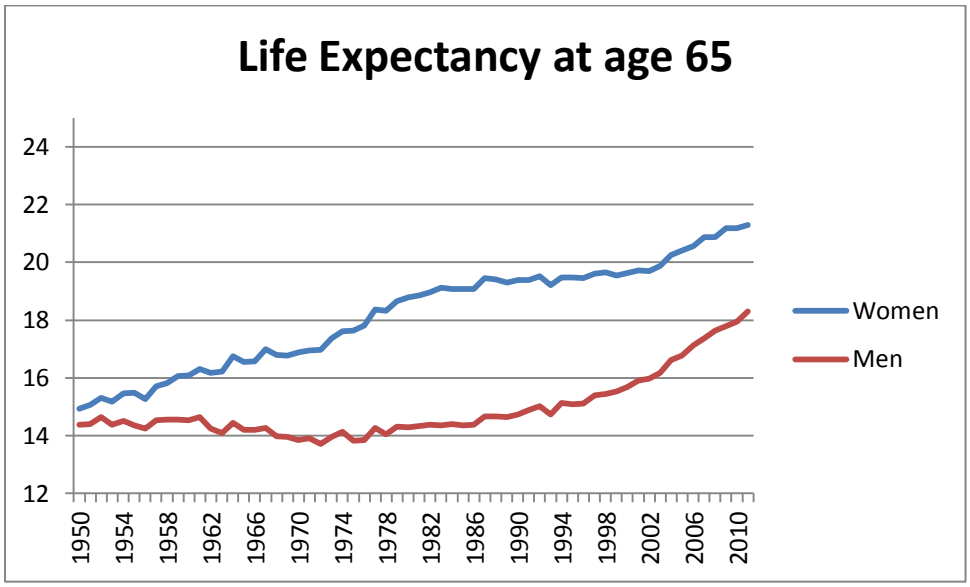

Figure 2 Life expectancy at age 65 (CBS Statline)

Also, contributions ceded to the pension plan are relatively less. Women are participating more on the labor market and therefore, the opportunity costs of having children increases, leading to a diminishing fertility rate. Nice to notice is that this diminishing fertility rate might be in a kind of vicious circle (Sinn, 2005). Sinn claims that for a part, the decrease is caused by the introduction of the public pension plans. Before the introduction, children were seen as a kind of old-age security, as an investment good. The parents expected that the children would support them when they themselves were retired. After the introduction of the AOW, the government plays this insurance role. The effect of the AOW introduction was that the fertility rate decreased immense. The average number of children per women almost halved, from 3,1 in 1950 to 1,7 in 2007 (Van der Grift, 2009). This fall can however not totally be ascribed to the introduction of the AOW. For example,

contraceptives were allowed to use by law since 1969 in the Netherlands, which might also had a negative effect on the number of children born. The trend of the fertility rate over the last decades is showed in figure 3 below.

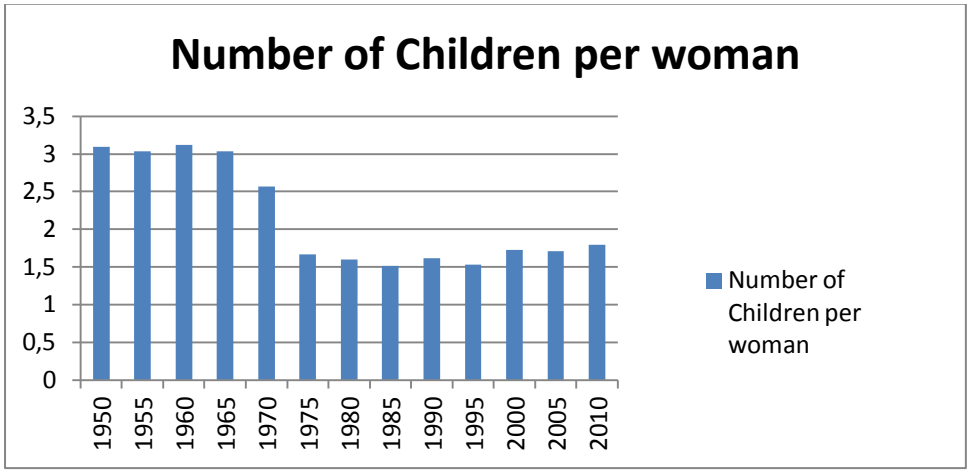

Figure 3 Number of Children per woman (CBS Statline)

These two developments make the dependency ratio to explode in the future. The dependency ratio is defined as the ratio of people who are 65 years and older to the number of people between 15 and 65 years old. It measures whether the public pension stays affordable (Giannakouris, 2009). It is clear that both demographic developments lead to an increase of the dependency ratio. This ratio is expected to be doubled around 2030 compared to a couple of years ago (Giannakouris, 2009), as is showed in table 1 below.

	Old age dependency ratio 2008	**Old age dependency ratio 2030**
Belgium	25.80	37.58
France	25.33	39.02
Germany	30.29	46.23
Netherlands	21.84	40.00
Sweden	26.66	37.43
United Kingdom	24.27	33.23

Table 1 Old age dependency ratio's (Giannakouris, 2009)

Ageing of the population seems a world-wide phenomenon. We see that the situation in the Netherlands is not worse compared to the other countries in the table. The old age dependency ratio depicts nicely the problem. In 2008, the dependency ratio was about 20 percent, meaning that five employees take care of one retiree. We see this number increasing to 40 percent, which means that now that same five employees now are expected to take care of two retirees. This shows that due to the demographic developments, the sustainability of the pension fund is under pressure.

2.2 – Current Dutch Pension System and International Comparison

In this part, the current set-up of the Dutch pension system will be discussed. The first pillar accounts for about half of the pension income for a retiree in the Netherlands, making it a very small component relative to many other European countries (Van der Grift, 2009). The state pension in the Dutch form is typically a basis security scheme. All citizens in the Netherlands are covered by this minimum, flat benefit at a level related to the level of the statutory minimum income level. Even people who do not work but just live in the Netherlands accrue pension rights. In this pillar the redistribution aspect, preventing elderly to live in poverty, is visible. The first pillar is organized as a Pay-as-you-go scheme. This means that the benefits of the retirees are funded by the current workforce. So, the costs of this system are borne by the working population. The increasing costs due to longevity have to be paid by relative less workers due to the lower fertility rate, which shows that the demographic changes do not contribute to a more sustainable first pension pillar. The demographic changes typically affect this pay-as-you-go component in the pension plan.

The second pillar consists of the supplementary pension benefits which are collectively organized in the Netherlands (Van der Grift, 2009). Under the Dutch law, the board of a company does not also run the pension scheme, but this is separately administered by a pension fund or an insurance company. This makes the pension claims of the members relatively safe, they are not directly in danger when the company suffers from the bad financial situation. A bankruptcy of the company for example cannot cause a stop of pension rights or revenues for the plan members.

Participation in the second pension pillar is quasi-mandatory. Under social and labor law, individuals are assigned to pension funds in order to build up pension rights in the second pillar. The occupational pension contract is connected to the labor contract for 91 percent of the employees in the Netherlands, so this means that there are more than six million members (Van der Grift, 2009). The quasi-mandatory nature of this second pillar makes sure pension funds have sufficient economies of scale in order to work cost efficient and the government can promote in this way solidarity, making sure that a pension fund has enough members. The government also plays a paternalistic role, making sure that a large majority of the population saves for retirement in this occupational pension plan. The quasi-mandatory nature makes sure that there is some kind of consumption smoothing over the life cycle possible. Because the income from the first pillar is just a minimum to prevent poverty, the income collected in the second pillar is used to smooth consumption possibilities over time.

The increasing dependency ratio indirectly affects the sustainability in this pillar. The high dependency ratio influences the pension premiums members have to contribute. The ageing population distorts the balance of pension premiums received and pension benefits paid by the pension fund (Bovenberg & Van Ewijk, 2011). Relatively less premiums are collected, while relatively more benefits have to be paid. When the cohort retirees increases relative to the working generation, those workers have to contribute more to the system in order to meet the claims that are build up by the large group of elderly. This is because the Dutch second pillar is characterized as a defined benefit plan. In a defined benefit plan, the member is promised a certain payment when retired. The amount of this benefit is mainly determined by the number of working years, the franchise and the eligibility age, together with the salary. Roughly, there are two variants: the variant

that is based on the end-salary and the variant based on the average of the salaries through an employee's career. The last couple of years there is a shift from the end-salary system to the average, meaning that the benefit is expected to be lower, because the average salary is in general lower than the end salary. Some of the consequences of the disappointing returns and the demographic developments are in this way already passed on to the retirees.

The opposite of the defined benefit plan is the defined contribution scheme. In this scheme, the employer makes a percentage of the contribution of the employee available for accruing pension rights. That amount is invested and dependent on the returns on investment, the employee receives a benefit when retired. This defined contribution scheme creates possibilities, because employees can be ambitious about a higher benefit compared to a fixed payment, but it is clear that it also brings risk. Where the investment risk in a defined benefit plan is for the pension fund, in a defined contribution system the sponsor company bears no risk and the members have to take into account the risks they bear. For the Netherlands, this is however only a small part in this pillar. As we saw, 91% is included in the quasi-mandatory benefit agreements.

Important to note is that the self-employed are often not part of the second pillar occupational pension schemes, because they are not assigned to them by an employer. Therefore, they have to take care for additional pension income in another way. That way is often the third pillar, which consists of the private savings. People can collect on their own some additional pension income. Saving through this pillar is especially popular by self-employed entrepreneurs. They can buy financial products that meet their requirements and preferences. Their choice for a specific financial product is based on their attitude with respect to their willingness to take risk and their ambition regarding the height of the expected returns.

The Netherlands is an interesting example of a hybrid pension system (Bovenberg & Van Ewijk, 2011). It is based on the corporate tradition and focused on solidarity. There is a balance between the social guarantee of the state pension and the occupational pension benefits that can be accrued in the second pension pillar. Because of the quasi-mandatory participation in this occupational pension scheme, a large group of participants pools the risk and therefore, the risk is diversified over and within generations. The weakness of the first pension pillar is that it is very vulnerable to the graying population, because it is organized as a pay as you go system. However, this is also the case in other European countries. The second pillar pensions too suffer indirectly from the higher dependency ratio, and besides that, also the disappointing financial market returns contribute to the unsustainability of this pillar. Due to the magnitude of these occupational pensions, the reforms announced are especially focused on restoring the balance in this pillar between risks, costs and ambitions (Goudswaard et al., 2011).

2.3 – Dutch Pension Reform

The exploding dependency ratio and the disappointing returns on the financial markets leads to the fact that a lot of pension funds do not have enough wealth to pay all pension claims of its members (*Hoofdlijnennota*, 2012). The balance between the nominal certainty and the ambition to index the pension with the inflation is disturbed. In order to make the second pillar more sustainable, the ministry of Social Affairs and Employment presented the new pension contract in the *Hoofdlijnennota herziening financieel toetsingskader pensioenen*. Social partners and the pension

funds should look for a new balance between ambitions, certainty and costs (*Hoofdlijnennota*, 2012). The contract has to be more complete; on forehand there should be appointments about how many risks are taken by the pension fund, how these risks are distributed over their members and what their members get in return for the additional risk they bear (Bovenberg & Van Ewijk, 2011). Noted should be that the reforms does not create more assets or wealth. It is just a redistribution of the resources the pension funds possesses and the risks that are related with the pension context.

Besides the reform in the occupational pension contracts, there are also measures announced for the first pillar. These are however less relevant given our interest in measuring risk preferences of pension plan members.

2.3.1 – First Pillar Reform

The government announced that the partner allowance we currently know in this pillar will be abolished as from 2015. In the Netherlands a retiree gets an additional pension income when he lives together or is married with a person whose age is below the retirement age. This additional amount is economized and this means a cut in the pension income. The government also announced an increase of the retirement age. They proposed a gradual increase from the current 65 to 67 years old in February 2012. The increase will start in 2013 and is spread out over 10 years. When the retirement age in 2023 is 67, it will be linked to general life expectancy. Noted should be that in October 2012 the new Dutch Parliament agreed on a more rapid increase of the retirement age. An eligibility age of 67 will be used for pension entitlement in 2021 already instead of 2023, if the Dutch Parliament settles with the proposal. By increasing the retirement age, the government wants to match this age with the increased life expectancy. By keeping the retirement age constant at 65 when longevity keeps increasing, people spend more and more time in retirement, making the total AOW benefits increasing. By extending the working life, a part of this increased longevity is neutralized, making the first pillar more sustainable.

2.3.2 – Second Pillar Reform

The aim of the *Hoofdlijnennota* is to find a more balanced distribution of all risks. Social partners and pension funds should make appointments about the risk distribution ex-ante, in order to restore the trust in the sector and be transparent to all members. In this way, the contract becomes more complete. Following Goudswaard et al. (2010), the aim is to search for a balance between ambitions, certainty and costs. The ministry offers a choice to the social partners. The current, nominal contract stays, but is adjusted in such a way that it is actually a new contract. There is also the possibility to choose for the new, real pension contract. Then, real indexation is part of the promise. Below, both types of contracts will be explained in more detail.

Nominal contract

The focus of the 'new' nominal contract is on assuring the minimum, nominal benefit for certain. This nominal payment is disconnected from the indexation. When this contract is opted, only nominal guarantees are given. Full indexation is only allowed when the funding ratio in real term is above

100%, while partial indexation is allowed when the nominal funding ratio is above 105%.[1] Also there is an obligatory buffer pension funds should own. This buffer serves two functions. First, the nominal claims are being protected by that buffer. There is a security measure of 97,5%, meaning that the chance of underfunding should be no more than 2,5%. Besides this protection function, the buffer should also generate returns that can be used for indexation. However, due to the strict rules about when a fund is allowed to index, the protection function of the buffer seems more important. Nominal certainty is assured with the buffer. It does however not contribute to the complete making of the pension contract. It is not clear who owns the buffers and from whom the money is.

So, in the nominal contract, only the nominal payment is obligatory and therefore, pension benefits might not be indexed. However, the chance of nominal cuts is relatively small. When there are negative shocks, the fund gets the chance to restore these in three years. This means that there is no need for cuts directly. But still, when after that period of three years the nominal funding ratio of the fund is still below 105%, than cuts are ineluctable. In that case, cuts will be hard and more abrupt. The fact that the restore term is relatively low means that disappointments cannot be spread out over generations, but especially loom for the generation at the time of the shock. So, the current generation is affected in their pension claim. In order to be more transparent about the risk, the pension fund in the nominal contract has to compose a restore plan in advance, so the members know what they can expect. This restore plan has to show which indexation or cut may be expected for a particular funding ratio.

The plan is financed by cost-covering contributions. This means that contrary to the old situation, pension funds are not allowed to mute the premiums on the base of expected returns. It is clear that this old situation is dangerous in times when financial markets yield disappointing returns. Whether the premium is high enough to get the return that is aspired is checked with the feasibility test. Besides that, this is checked also periodically, in order to control whether the consistency between the premium and the cost of the pension claim is continuously there.

Real contract

The other option is to choose for the real contract. In this contract, indexation is always obligated and should be at least equal to the inflation of the prices. The aim of this contract is to keep the purchasing power constant. When only given nominal payments, under inflation, people in real terms are worse off over time. When adjusting the pension payments to the price adjustments, this will no longer be the case. The ambition of this real contract is to prevent the purchasing power to decline. This means that premiums should be invested in such a way that it yields a return high enough to index the pension benefits. This is controlled by *De Nederlandsche Bank* with the use of the feasibility test. It checks whether the ambition and the investment policy are matching. This is also the case for the nominal contract.

Cuts are much more frequent in the real contract. In the nominal contract we saw that cuts are a kind of *ultimum remedium*, meaning that this is only done when nothing else seems possible anymore. In the real contract, cuts are much more frequent and are therefore a tool to deal with

[1] The funding ratio of a pension fund is defined as the assets a pension fund has divided by the liabilities, so the pension promises. When we talk about the nominal funding ratio, the assets are divided by the market value of the hard entitlements. In the real funding ratio, the real liabilities form the denominator. So, those are the liabilities including full indexation to wages.

disappointing returns. A bad financial market is not the only reason why cuts may be necessary. In the real contract, it is also obligated to process the longevity. This is done by the *Levensverwachtingsaanpassingsmechanisme* (LAM). The shocks in longevity are obligated to take into account in the real contract and therefore, the promised payment is not only dependent on the result on the financial market, but also directly on life expectancy. Also rights already built up in the past are adjusted to the life expectancy.

In the real contract, the chance of cuts is relatively high. However, the shocks can be processed over a period of 10 years by the *Aanpassingsmechanisme Financiële Schokken (AFS)*. So, a shortage can be divided by 10 and subsequently, that 10% is directly cut in the first year. This is because there is no difference any more between short term and long term restore plans. This means that every new shock, when the pension fund is already in a restore plan, again can be spread out for a period of 10 years. The consequence is that there are no buffers in the real contract, because economic shocks are directly processed. This spread-out period implies intergenerational distribution, because no cohort is immense negatively affected alone. This means that all generations are somewhat affected in their pension claims. Noted should be that the indexation stays obligated, even if a pension fund should cut. The indexation is a part of the commitment.

A consequence of the AFS is that the premium paid by the working generation is relatively constant. It is not a fixed amount, but because there are no large cuts, the level of the premium should not vary a lot. In this way, increasing premiums as a consequence of increased longevity of disappointing financial returns are prevented. The premium should again be cost-covering.

Nominal versus Real contract

In short, pension funds and social partners can opt for the nominal contract, wherein members count on a minimal, defined benefit, without the promise of indexation, or they choose for the real contract, which indexed the pension at least to the inflation of the prices. The way shocks are processed is very different in both contracts. In the nominal contract, cuts are the *ultimum remedium*, meaning that they are not really expected and this gives the nominal contract a kind of certainty aspect. Contrary, in the real contract cuts are a regular mechanism in order to keep the real funding ratio at a constant level of 100%. In table 1 below, the nominal, the real and the old pension contract are compared on degree of indexation, how to process life-expectancy, the processing of the financial shocks, and the premiums.

Aspect	Contract before transition	Nominal Contract	Real Contract
Indexation	Indexation is not obligated by law, but just an ambition and dependent on the funding ratio of the pension fund.	There is no minimal requirement of indexation level. The promise only contains the nominal payment.	The payments are indexed minimal to the inflation of the prices.
Life Expectancy	Was not taken into account.	Longevity shocks may be taken into account in the contract, but it is not obliged.	Shocks should be taken into account, also with respect to claims of the past. This makes that the pension claim contains indexation and shocks in longevity.
Processing of financial shocks	When the funding ratio falls short, the pension fund has the opportunity to develop and present a restore plan in order to recover the funding ratio.	For each possible funding ratio that falls short, the contract should contain a restore plan. A new shock should be adapted in the restore plan that is than running.	Financial shocks should directly be spread over time in this contract. The pension funds are allowed to spread this shock over a period of 10 years. A new shock may be spread over 10 years again.
Premium	Variable.	Variable.	Rather fixed.

Table 1 Comparison between the nominal, real and old pension contract

Implications for risk measurement

When measuring risk preferences, noted should be that this second pension pillar is a collective arrangement. The two contracts the government proposed try to make the pension contract more complete ex-ante. Pension funds choose together with the social partners for the nominal or the real contract, but within those contracts they are only allowed to choose just one investment mix for all members. The choice for a contract does not necessarily say something about the degree of risk in the investment policy. It also is about the way financial shocks are processed, how life expectancy is taken in to account and to which degree people want nominal claims and real payments.

It may seem like the real contract implies a more risky investment mix. The ambition is higher compared to the nominal contract and therefore, this is easily linked to a more risky investment portfolio. For a part, this is true. When people go for absolute certainty and just want a nominal payment each year when retired, the nominal contract seems more appropriate. So, when the indexation ambition is absent, and people are not interested in keeping their purchasing power at a constant level, the nominal contract fits this preference. However, when people are saying that they have some kind of indexation ambition, it is clear that his ambition should be financed in a way. This can be done with a more risky investment portfolio, meaning a higher expected return on investment, but also more volatility. Other options are to cede a higher premium to the pension fund, making higher total return, or to change technical details of the scheme, like a lower nominal build-up of pension claims. Subsequently, in order to confirm that people really do accept all consequences of that indexation ambition and to determine whether they really prefer the real contract, it should also be clear that this real ambition might be at the cost of the nominal certainty. If people admit that despite of their real ambition, nominal certainty is still most important, they actually choose to have a buffer that can catch disappointing returns. As discussed, in the real contract there are no buffers, so in that case their preference actually still points in the direction of the nominal contract. If people really do attach a lot of value to their purchasing power and find this more important than nominal certainty, they should be made aware of the consequences of disappointing returns. In the real contract, financial shocks are processed by the *AFS* over 10 years, keeping the indexation a part of the promise. If people prefer in that case however a somewhat lower indexation ambition instead of the direct cut, this points again to the nominal contract. Still, people should be made aware that cuts loom harder and are more abrupt when financial shocks in the nominal contract are to be processed.

The fact that the indexation ambition can also be financed by a lower build-up of nominal rights or a higher premium means that the investment policy in the nominal and the real contract can be the same. It is than just dependent on the way you process financial shocks and the way you deal with the indexation ambition. When the pension fund has a shortage in the nominal context, it can restore this on the short term by increasing the premium or decreasing, or even completely abolishing the indexation of the pension payment. This is in contrast with the real contract. Both the premium and the indexation are no control mechanisms, because the premium is constant and the payments should be indexed at least with the price adjustments. Only when indexation was higher than this price inflation, the fund can use the indexation, but this is very minimal. In the real contract, the main control mechanism is the *AFS.* From this, automatic cuts are the consequence of financial bad times. This shows the differences in generational effects between the contracts. In the real contracts, shocks are spread out over a relatively long period, so there is risk shifted from the old to the young. In the nominal contract, this is less the case. Current generations are directly hit, for example by nominal cuttings or the abolishment of the conditional indexation ambition.

So actually, the choice between the nominal and the real contract comes down to the importance an individual attaches to the indexation ambition. This ambition can be found to be really important, leading to the real contract. If people are not interested in the indexation ambition, or if they do not like the implications of the adjustment mechanisms that are part of the real contract, the nominal agreement might be more appropriate. These preferences should therefore be measured. In the next chapter, we are going to look at risk preferences and how these can be measured.

Chapter 3 - Risk Preferences

The transition to the new pension contract has immense consequences for the distribution of the risk between pension plan members and pension funds. In the old situation, the risks associated with pension income were mainly borne by the pension fund. They made a promise to their members and with the returns they achieved they had to make those ambitions true. In the new situation, members bear the risk that the investments do not turn out well and they should also deal with the longevity risk. This shows the uncertainty aspect for individuals that is created with the introduction of the new pension contract. When more risk is shifted to the members, there should be more attention for the risk profile pension funds choose for their members. The question is whether individuals want to achieve real indexation, or if they choose for nominal certainty. Specific for the pension context, those individual preferences should be translated into the collective agreement.

This chapter will discuss why measuring risk preferences is difficult. The pension decision is being viewed as a complex task and people do not like to think about it. Also when using the measurement tools, we should be aware that we organize the method in a correct and consistent way. In this paper, several measurement methods are presented and we will name minimal requirements and desirable features for a measurement tool.

Firstly, in this chapter we are going to sketch the normative approach with respect to risk preferences. Under expected utility theory, people are expected to take the option with the highest expected utility when given them the choice between different options. We will also show the effects of age and labor status on expected risk tolerance and explain the notion of risk averseness already in normative models. Then, we are going to involve behavioral economics in order to see how people actually act and react when exposed to the concept of risk. We will discuss several effects that might influence individual risk preferences, which are not seen as rational choices.

After that, we are going to look at measurement methods that are currently used in the pension domain. The questionnaire is the most popular one due to its ease of implementation, but we will show that this is somewhat unsatisfying. This paper will also discuss some more promising ways of measuring risk preferences. We will present a number of criteria a measurement method should at least meet in order to reflect risk preferences in a correct way.

3.1 – Normative Models

Normative models imply the decisions an individual most ideally takes following from a rational point of view. In literature, there are several models that try to predict behavior. These are discussed in this paragraph.

3.1.1 – Mean Variance Analysis

Expected utility theory was seen as the ultimate normative model for decades (Bleichrodt et al., 2001). Under expected utility, uncertainties are qualified in terms of probabilities. These probabilities can for example be obtained from statistics, or subjective assessments. The accompanying values of

the outcomes are in terms of utilities. These utilities are measured subjectively, dependent on the individual. Mostly, these outcomes are inferred from interviews with clients, and the answers are analyzed according to expected utility. This is called the classical elicitation assumption (Bleichrodt et al., 2001). When people are faced with a choice between a certain outcome and a risky gamble, people should simply calculate the expected value of the risky gamble. This value can be calculated as the sum of each probability multiplied with the accompanying outcome. When that expected value is above the certain amount one can also choose, he should take the gamble. This is due to the assumption that rational individuals act in accordance with the option that gives them the highest expected value.

The trade-off between expected return and the variance mentioned above is widely known. Already in 1952, Markowitz developed the Modern Portfolio Theory, also known as the mean-variance framework. His mean-variance analysis is based on the trade-off between the expected portfolio return and the risk of achieving that return. The underlying assumption is that assets which offer a high mean return also have a relatively high standard deviation. Markowitz' paradigm implies that an investor always chooses for an asset allocation which gives the lowest variance (lowest risk) for a given expected return or the highest expected return for a given level of risk. Therefore, the investor maximizes a linear combination of mean and variance, given by:

$$\max\left(E_t R_{p,t+1} - \frac{k}{2}\,\sigma_{pt}^2\right) \qquad (1)$$

The first part of the expectation is the portfolio return, which is positively weighted. A negative weight is on the variance of the portfolio, with coefficient k representing the risk averseness, which will be discussed later in this chapter. The expectation of the portfolio return and the variance of the portfolio can be rewritten into:

$$\max\ \propto_t (E_t R_{t+1} - R_{f,t+1}) - \frac{k}{2} \propto_t^2 \sigma_t^2 \qquad (2)$$

The expected return is equal to the amount invested in risky asset α_t times the risk premium. A return is also reached with the amount invested in the risk free asset. However, this risk-free return does not change the maximization problem. The variance of the portfolio is equal to the amount invested in the risky asset times the variance of that asset. The risk-free asset is assumed to be without risk and therefore, it is otiose. When we differentiate this expression with respect to α_t, we get the following solution to our maximization problem:

$$\propto_t = \frac{E_t R_{t+1} - R_{f,t+1}}{k\sigma_t^2} \qquad (3)$$

So, this means that the portfolio share in risky assets invested should equal the risk premium, divided by the variance of the risky assets times the aversion to that variance. It is clear that the amount invested in risky assets $\propto_t$ is relatively low, when risk aversion k is high.

Under his theorem, all investors hold a combination of the risk-free asset and the tangency portfolio, in which all wealth is invested in risky assets. Under the mutual fund theorem, the tangency portfolio

can be seen as the best mix of stocks and bonds, so this mix should never be altered (Tobin, 1958). Mean-variance analysis implies that all investors who only care about the mean return and the accompanying standard deviation will hold the same portfolio of risky assets, namely the tangency portfolio. How the combination of the tangency portfolio and the risk-free asset is exactly distributed is dependent on the risk aversion of the investor. Although Markowitz did not really take in the concept of risk aversion, we can derive some implications of his framework for the assumed degree of risk aversion. More conservative, risk-averse investors will combine the tangency portfolio with a relatively large part of their wealth invested in the risk-free asset. In contrast, investors who are willing to take risk might be borrowing in order to leverage their holdings in the tangency portfolio.

The tangency portfolio, the unique best mix of stocks and bonds, seems like a simple general investment advice for every individual. However, in finance this model is rejected, because there are reasons to assume that investors might differ in their asset mix (Campbell & Viceira, 2002). Specific for the pension context, the investment horizon is an important deviation from standard investment. Pension investments are typically focused on the long run. Another reason why investors might differ in the optimal mix of stocks and bonds is the difference in the characteristics of the labor income. Young and old individuals differ in their future labor income, which can be risky to one and relatively risk free to another. Both of these implications are explained by life cycle theory.

3.1.2 – Life Cycle Model

According to this model, individual investors should adjust their portfolios as they move through their life cycle (Campbell & Viceira, 2002). The model gives some normative recommendations on the basis of the trade-off between human and financial capital. With the life cycle model, concluded is that there are effects that influence optimal portfolio choice (Campbell & Viceira, 2002).

The life-cycle model shows an effect of age on the way wealth should be invested. Young households implicitly hold a non-tradable asset, namely their human capital. Together with the financial capital, this makes total wealth. In the early years of life, financial capital is often limited, but this is in contrast to the human capital, which at that moment still is enormous. Over the life-cycle however, this human capital declines, while financial capital is accumulated. This also means that young individuals have a longer term to restore any adverse shocks on the financial market with their human capital (Bodie, Merton & Samuelson, 1991). Risky investments should therefore be attractive to young households. This risky investment policy should be more conservative over time, as human wealth declines and financial assets accumulate. Labor income is realized over time, making financial capital to grow. In the graph below, this trade-off between human and financial capital is shown.

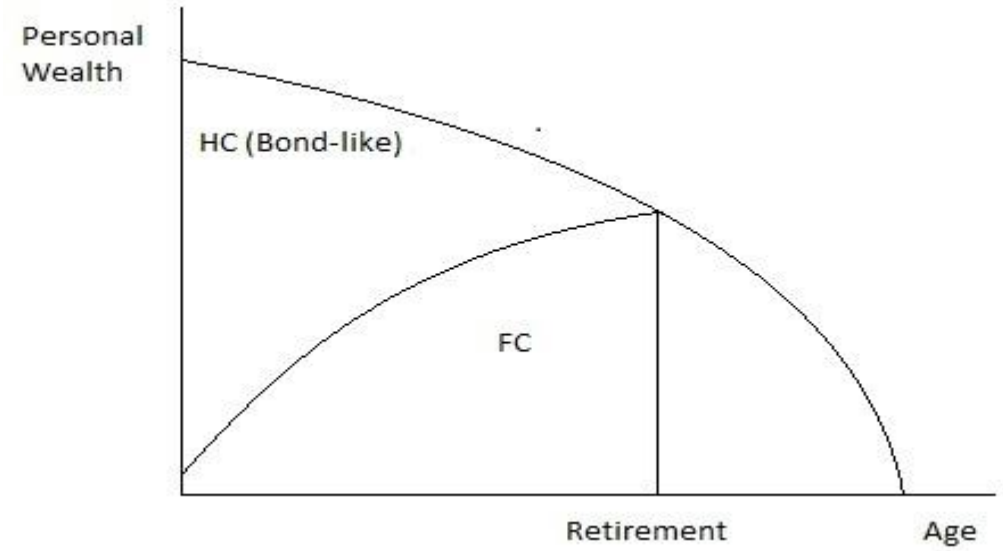

Figure 4 The trade-off between human and financial capital

The optimal asset allocation is also affected when taking the life-cycle model into account (Bodie, Merton & Samuelson, 1991). In contrast to what we saw before, now we can express the amount invested in risky assets $\propto_t$ as:

$$\alpha_x = \frac{(\mu_r - r_f)}{k\sigma_r^2} * \left(\frac{HC_x}{HC_x + FC_x}\right) \qquad (4)$$

The left-most term of the right hand of the equation represents the investment decision strategy we saw before, whereas the right-most term reflects the correction regarding a specific person's capital. As observed when the level of risk aversion is higher, a lower fraction α_x is invested in the risky asset. Furthermore, a younger person should invest a larger fraction in the risky asset relative to an older person, due to his higher human capital.

There is also another point why it should be more attractive for young and less attractive for old households to invest in risky assets. Investments in stocks become less risky the longer the time horizon is, as long as investors are able to hold those equities for the long run (Glassman & Hassett, 1999; Siegel, 2007). The idea that returns are not that volatile in the long run is based on the concept of mean reversion. This concept leads to the notion that returns are rather constant over longer periods (Siegel, 2007), as is showed in table 2 below for the stock market in the United States.

Period	Compounded annual return
1802-2006	6.8%
1871-2006	6.7%
1802-1870	7.0%
1871-1925	6.6%
1926-2006	6.8%

Table 2 Annual stock returns for long horizon (Siegel, 2007)

To show that over the short run the returns are much more volatile and that therefore investing in the stock market is far more risky for short term investors, we show in figure 5 below returns in the postwar period, divided into five sub-intervals.

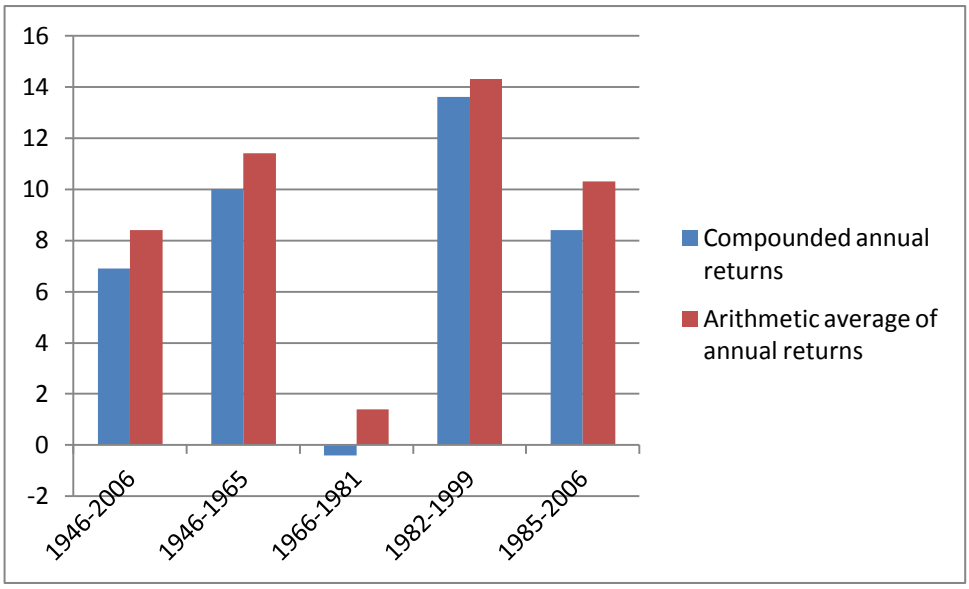

Figure 5 Annual stock returns for short horizon (Siegel, 2007)

The concept of mean reversion gives evidence for the age effect for the optimal portfolio. People who are older have more risk when they are investing into the stock market, because that market is more volatile in the short run. Therefore, as becoming older, investors should shift their strategy to a more conservative policy (Campbell & Viceira, 2002).

When we want to translate these implications of life cycle theory to risk preferences, claimed can be that young households should be less risk averse. They should invest a lot of their financial wealth in risky assets when young. They can bear this additional risk, because of their human capital, which is seen as relatively risk-free. Beside this, the mean reversion of stocks leads to a lower risk of disappointing stock returns, due to rather constant stock returns over the long run. This notion of falling risk tolerance over the life-cycle is also found empirically. For example, Sahm (2007) used a ten-year panel of gamble responses and found that each year of age is associated with a 1.7% decline in an individual's risk tolerance.

From labor economics, there follows another important effect on the optimal investment strategy that has to do with the level of human capital left. The more risky the labor income is the less wealth should be invested in the risky assets. The labor income is not homogeneous between professions and also the character of the labor supply might differ (Campbell & Viceira, 2002). Therefore, the certainty of the job should be taken into account. When labor income is relatively sure, one can invest more in risky assets (Campbell & Viceira, 2002).

3.1.3 – Notions of Risk Aversion

Different studies show that just mean-variance analysis is too simple. Investment mixes may differ between persons, as explained by life cycle theory. In order to build those findings into traditional analysis of portfolio choice, Campbell and Viceira (2002) developed a modified theory. They assume that investors maximize their utility, the value they give to certain outcomes. This maximization problem is defined as $\max\ E_t U(W_{t+1})$, subject to $W_{t+1} = \left(1 + R_{p,t+1}\right)W_t$. The assumption is that

this utility function has a concave form. This type of function implies a risk averse investor, as is showed in the figure below.

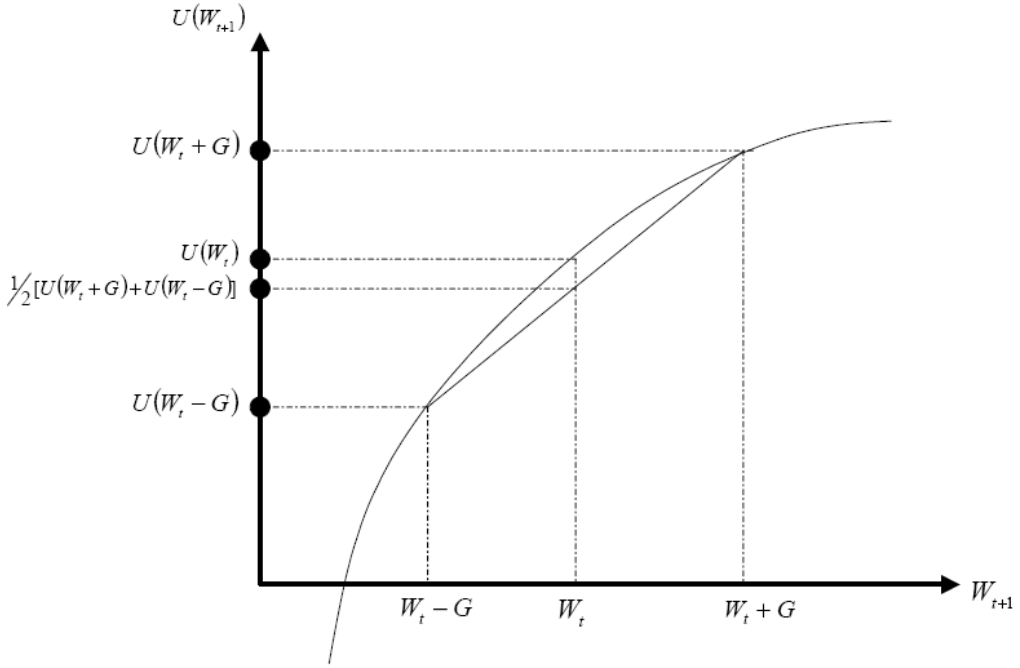

Figure 6 Concave utility function (Campbell & Viceira, 2002)

If the investor would not accept a gamble and chooses for certainty, he has a utility of U(Wt). If the investor would accept the gamble that either adds or subtracts an amount G to the initial wealth W, he has equal probabilities of having a utility of U(Wt+G) and U(Wt-G). Campbell and Viceira (2002) show that the investor turns down the gamble, despite of the equal upward and downward potential G. This is due the curvature of the utility function. The more concave the utility function is, the more risk averse the investor (Campbell & Viceira, 2002). The gap between the mean of the two utilities of the gamble and the utility of the certain outcome increases, meaning that the investor is more motivated to get the certain utility of Wt. This is opposed to an outcome expected under expected utility theory. The value of the certain option and the expected value of the gamble are the same, but we see that people are more motivated to get the certain return.

So, the intensity of risk averseness by the investor is determined by the degree of curvature of the utility function. The degree of curvature can be measured by the coefficient of absolute risk aversion. This is equal to the second derivative of the utility function with respect to wealth, scaled by the first derivative. The absolute risk aversion coefficient determines the absolute dollar amount that an investor is willing to pay to avoid a gamble of a given absolute size (Campbell & Viceira, 2002). Risk aversion is dependent on a number of variables, which will be discussed later, but one of them is wealth (Pratt, 1964). In general it is assumed that risk aversion should decrease, or at least should not increase with wealth. It seems unlikely that a poor person is less concerned about disappointing returns compared to a rich person.

Besides the concept of absolute risk aversion, we also have the coefficient of relative risk aversion. This determines the fraction of wealth that an investor will pay to avoid a gamble of a given size relative to wealth (Campbell & Viceira, 2002) and can be calculated as:

$$RRA(W) = -\frac{WU''(W)}{U'(W)} \qquad (5)$$

Because the choice problem in terms of risks and costs is expressed in wealth, all individuals should make the same decisions independent of wealth. This constant relative risk aversion implies that investments in risky assets will increase when the investor becomes wealthier, but the proportion of wealth invested in those assets stays constant.

Campbell and Viceira (2002) distinguish three alternative utility functions that are in accordance with the mean-variance framework. In their paper they evaluate quadratic, exponential and power utility. Under power utility, it is assumed that asset returns are lognormal distributed, absolute risk aversion (ARA) is declining with wealth and relative risk aversion 'γ' is constant (CRRA) (Campbell & Viceira, 2002). A basic power utility function is defined as follows:

$$U(W_t) = \frac{(W_t^{1-\gamma}-1)}{(1-\gamma)} \qquad (6)$$

There are a number of reasons why this utility function is preferred. As discussed, it seems unlikely that a wealthier person cares more about adverse outcomes relative to a poor person, absolute risk aversion should most ideally be declining in wealth. Besides that, a constant relative risk aversion level is preferred in order to explain the constant fraction that is invested in risky assets. These are both implications of the power utility functions. Further, the power utility function assumes asset returns to be lognormal distributed. This is important because this study focuses on long-term investment decisions where lognormal distributed returns are preferred. The reason for this is that normal returns are unable to hold at multiple horizons of time. Given these nice implications, power utility functions are preferred, leading also to the concave utility function.

3.1.4 – Notions of Heterogeneity across Individuals and over Time

So, with the power utility function, we give a technical description of the risk attitude. This risk attitude might be some inborn characteristic. Evidence for this is found in the study by Irwin and Hart (2003). They studied risky decision making of 5-year old children. They were given a block of gain trials, in which there was a choice between a sure gain of one price and a 50/50 chance of gaining two prizes or no price, and a block of loss trials, which was organized as a surer loss of one price and a 50/50 chance of losing two prizes or none. Irwin and Hart (2003) found that most children and also their parents, made more risky choices in the domain of losses than in the domain of gains. Therefore, risk aversion can be seen at least for a part as a personal trait.

Risk averseness can be described on the basis of employment and age from the life cycle model. There have also been a lot of experiments focusing on other aspects that might affect individual risk preferences. One of the most researched aspects is gender. The general held view is that men are less risk averse than woman (Clark & Strauss, 2008). This result was not only found in the study of

Clark and Strauss (2008) but is also confirmed in both survey-based research (Bajtelsmit et al. 1999; Papke 1998) and in experimental settings (Clark, Caerlewy-Smith & Marshall, 2007). The lower risk aversion of men is in accordance with the more confidence men have (Bucher-Koenen et al, 2012) and the higher financial literacy of men (Haiyan & Volpe, 2002). When asked about fundamental concepts of economics and finance, women are more likely than men to answer question wrong and to answer the doesn't know option (Bucher-Koenen et al., 2012). Both show the higher level of financial illiteracy of woman, while the don't know option might also explain the low level of confidence. Haiyan and Volpe (2002) also found that men are more financially educated and know more about financial concepts.

Besides gender differences, also marital status is studied a lot. Clark and Strauss (2008) didn't find a significant effect of marital status on risk averseness. However, the effect of the absence of a spouse's pension was significant. They found that when the spouse did have pension entitlements, the individual was less risk averse. It seems like risks are pooled within the marriage and therefore, when one already has pension entitlements, the other partner is willing to bear more risk. From this, we see that a divorce might have consequences for the saving behavior of individuals. This means that when the partner who was determining his asset allocation on the knowledge that his spouse had pension entitlements, now suddenly cannot claim this entitlements anymore. Therefore, marital status and changes in it might have an effect on the risk one is willing to bear. Noted should be that the expectation of the pension income is not changed after a divorce. AFM (2010) found that divorced and non-divorced consumers hold the same expectations regarding their pension income.

Further, education plays a role. Bertaut (1998) finds that people with a higher education level are more likely to hold stocks. This finding can be interpreted as the higher ability of better-educated individuals to process information, also about the market and investment opportunities. When people are more informed, they feel more comfortable about their decision to invest in stocks. Another point that partly explains the unequal distribution of who possesses the stocks is the fact that low-income workers might be borrowing constraint, what would imply that only people that are above a certain wealth threshold are being able to own stocks (Guo, 2001). So besides the education aspect, lower stock participation can also be explained by practical limitations.

Besides the heterogeneity between individuals, also risk tolerance seems to differ over time (Sahm, 2007). Ageing and changes in macroeconomic conditions may lead to a systematic change of an individual's risk tolerance. Changes in macroeconomic conditions in general are studied by the visibility of cohort effects. Sahm (2007) found for example that individuals who are in a generation closer to the Great Depression are less willing to take risk compared to a cohort that is further away from that event. This we can also translate to the pension situation nowadays. The trust in the pension funds is low and there is a lot of negative publicity, meaning that people are less willing to take risk in this context.

Concluding, already showed was in this paragraph that risk preferences are not purely normative explainable. There are several factors that might affect the willingness to take certain risks and therefore, people differ in their individual willingness to take risk. In the next section, behavioral biases are discussed which also affects the preparedness to take risk in the pension domain.

3.2 – Behavioral Approaches

"God must love those common folk that behavioral scientists write about, because She made so many of them" (Paul Samuelson, 2006).

Under expected utility theory and mean-variance analysis, people are expected to choose the option that gives them the best trade-off between mean returns and variance. However, the implication of the concave utility function makes that the individuals are assumed to be risk averse. In that case, they choose for the certain option, even if this does not give the highest rational expectation. In addition, the life cycle model explains why the tangency portfolio of Markowitz might not be that unique best mix as argued. Normative models seem therefore not good in explaining the risk aversion observed. In this section, we will discuss some behavioral insights. As the quote of Samuelson (2006) shows, this should help us in explaining human behavior.

3.2.1 – Prospect Theory: The effect of framing

Starting with Allais (1953), the normative expected utility model was rejected as a descriptive model of behavior. The preferences people should have according to the normative models are not the preferences observed. When deviating from the normative model, people are assumed to make decisions based on the potential value of losses and gains, using certain heuristics. Many descriptive models are mentioned in literature, but the most prominent and successful descriptive model (Donkers et al., 2012) was prospect theory, presented by Kahneman and Tversky (1979). In expected utility, people are assumed to be rational and therefore make their decision on the basis of the expected final outcome. Prospect theory tries to model real-life choice, and does not present a normative solution, that gives the optimal decisions.

Prospect theory distinguishes two phases in the choice process (Kahneman & Tversky, 1979). The first phase is a phase of framing and editing. It is the preliminary analysis of the problem. Framing can be caused by the way the problem is presented. The second phase is the evaluation of the problem and the definite choice, which is dependent on the framing phase. Prospect theory is designed in order to explain preferences, not rationalizing them. Unlike the assumption that the reference point of individuals is zero (Markowitz, 1952), prospect theory uses an S-shaped value function. This means that the function above the reference point is concave and below the reference point it is convex, as is showed in figure 7 below.

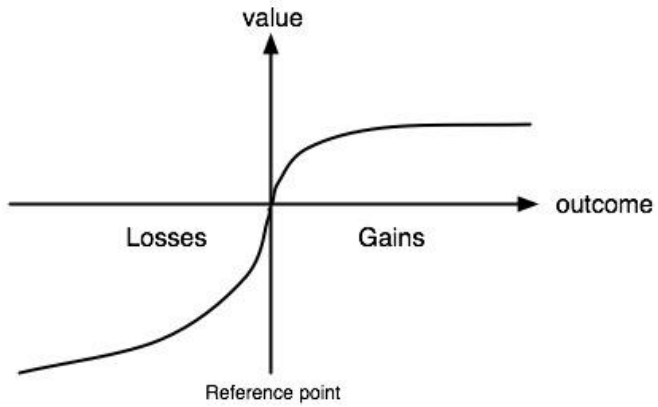

Figure 7 Value function of Prospect Theory (Kahneman & Tversky, 1979)

We see that the further away from the reference point, the effect of a marginal change decreases. Also, the value function implies loss aversion. We see that the response to losses is more extreme than the response to gains, meaning that the absolute amount that is lost feels larger than the same amount as a gain. This is opposed to expected utility theory because the outcomes are apparently not evaluated rational (Bleichrodt et al., 2001). The concept of loss aversion is in coherence with the regret theory. This theory explains that people anticipate on the possible regret they may get for different options (Alserda, 2013). People evaluate which option gives them the least anticipated regret and tend to choose for that possibility. Because people are risk averse, the regret for choosing a safe option when things go fine is less than the regret of choosing a risky option when things go wrong. Risky decisions under regret theory are then made on an emotional base.

So we see that behavior is determined by a reference point. Individuals can perceive the reference point as the default choice, or the recommended choice. Given that people are risk seeking in the domain of losses, and risk averse in the domain of gains, we can influence behavior by giving people a reference point. This framing effect implies that the way information is presented, influences the behavior of individuals (Levin, Schneider & Gaeth, 1998). People react different to losses than to gains and therefore it is important whether an outcome is considered as an improvement or as a deterioration compared to the reference point. A well-known example is the Asian disease problem of Kahneman and Tversky (1981). When the consequences of a certain decisions are framed as a gain, people will prefer the safe option over the uncertain one.

This has implications when we want to measure risk preferences. When people are giving a reference point, they are going to evaluate outcomes around that reference point. Also, questions can be framed in a direction, making that we can argue what the answer will be. We will show this later on in this chapter. First we are going to evaluate other behavioral biases with respect to behavior under risk.

3.2.2 –Myopic Risk-Seeking and the Isolation of Choices

Bernartzi and Thaler (1995) linked the concept of loss aversion mentioned in prospect theory to the behavioral concept of mental accounting. Mental accounting refers to the implicit method individuals use to code and evaluate financial outcomes (Kahneman & Tversky, 1984). Mental accounting explains the tendency of people to frame different forms of income or wealth, now and in the future, into different buckets (Alserda, 2013). Combining this leads to the concept of myopic loss aversion.

Bernartzi and Thaler (1995) assume that investors take a short time horizon. As discussed, stock returns are then more likely to be negative (Siegel, 2007). For these loss averse investors this is enough reason to dislike stocks compared to bonds. Van Rooij, Kool and Prast (2007) found that people are reluctant to take control of retirement saving investments. When framed with future income streams, people tend to switch to a riskier investment portfolio. From this we can conclude that the normative preference is to take some risk in order to increase the expected return, while the revealed preference is to take less risk than is most optimal for the individual. This can be explained by the myopic loss aversion principle; the probability of a short-term loss receives too much weight in long-term portfolio decisions. The combination of a high sensitivity to losses with a strong tendency to frequently monitor wealth makes people unwilling to accept return variability in the short run.

Myopic loss aversion is closely related to the notion that people are not aggregating several risks (Read, Loewenstein & Rabin, 1999). A combination of the isolation of choices and myopic loss aversion leads to this segregation of several risks. Aggregating many choices together can make an individual to accept a certain level of risk, while he would reject the same choices if they are evaluated individually. Read, Loewenstein and Rabin (1999) introduce the concept of choice bracketing, a term that refers to grouping individual choices together in sets. This bracketing effect occurs when decisions made are dependent on whether the risks of all choices are aggregated or not. Choices can be bracketed together, meaning that the effect of one choice is taken into account when the other choices are made. Most formal models of risk attitude assume this broad bracketing of outcomes and hence that consumers judge each risky choice according to the impact it will have on the aggregated, long-term risk. When all risks are pooled together, the total effect is evaluated, leading to a decision that is most optimal for total well being. Broad bracketing is therefore more in line with the assumed behavior consistent with expected value maximization (Haisley, Mostafa & Loewenstein, 2008). However, Read, Loewenstein and Rabin (1999) found that people tend more to the concept of narrow bracketing. Narrow bracketing generally shifts people's attention from the macro to the micro level. This means that all choices are evaluated separately and therefore the risk associated with the choices are judged in isolation. Decision makers may accept several gambles when they are bracketed broadly, but reject them if they are bracketed narrowly (Read, Loewenstein & Rabin, 1999). When decisions are made isolated, this can lead to an extreme unwillingness to take risk (Thaler, 1999). Myopic risk aversion therefore does not produce rational decision making. The more frequently returns are evaluated, the more risk averse investors will be (Gneezy & Potters, 1997). Providing individuals with frequent feedback and information may therefore lead to adverse effects. Because the investor does not take into account the longer term and the aggregation of the different risk, this may induce hasty decision making, that does not yield to value maximization. Therefore, when we want to inform individual, we should take into account whether the feedback is relevant for the investor.

3.2.3 – Context Specific Preferences

Evidence has showed (MacCrimmon & Wehrung (1986,1990); Schoemaker, 1990; Weber et al., 2002) that individuals are not consistent in their risk seeking behavior across different domains. Even when the same measurement methods are used, risk preferences are not stable across different contexts. Dohmen, Falk, Huffman, Sunde, Schupp and Wagner (2005) found strongly correlated risk attitudes, but this correlation was imperfect. This means that they found some support for stating that risk averseness is a personal trait, but they also found that risk preferences are not the same in each domain. Preferences may differ between contexts because people perceive the riskiness of the expected benefit and the impact of the risk as different over domains (Sarin & Weber, 1993). Therefore, Dohmen et al. (2005) recommend asking context-specific questions when measuring risk preferences for a specific domain.

Pension domain

When it is about the pension domain, people experience difficulties with assessing their own preferences. The first is about their self-control problem. People are simply unwilling to think about the pension decision. Especially in this time, when they hear a lot about cuts in pension benefits and the deferred retirement age, thinking about your own pension situation seems not attractive. Van Rooij, Kool and Prast (2007) found that a majority of employees supports the system of quasi-mandatory participation in the second pillar of the pension plan. In addition to this point, Montae (2012) also found that more than 3/4 of the respondents were willing to keep the collectively organized pension arrangement; just 16% wants to take care of pension income themselves. The reason for this is not that they think in that way they will get the highest returns or that the money is invested in the most optimal way, but they simply mention that they are concerned that they otherwise do not save for retirement. This unwillingness to take action when it is about pension income is also showed in the study by Choi et al. (2005). In the US, individual organized plans are offered to employees. An US firm organized a seminar, in order to inform people about the savings possibilities. After the seminar, all attendees planned to enroll in the employer pension plan. This shows that they see the importance of saving for retirement, when confronted with it. However, after a while, the percentage that actually made the change was just 14% (Choi et al., 2005). People seem to be aware of the fact that they should act in order to secure a satisfying pension income, but due to their self control problem, they keep postponing it. This is the procrastination effect, which is the tendency to put off important but complex tasks to the future. People do not feel comfortable when they have to take complex decisions.

The second reason is about the aspect of financial illiteracy. People simply do not understand all financial and pension terms. Van Rooij, Kool & Prast (2007) show that people know about themselves that they do not possess the ability to take decisions about their own degree of taking risk in the pension domain. Using a survey under Dutch citizens, they found that the average respondent considers himself as financially uninformed. In the light of the *Hoofdlijnennota* the real contract with indexation ambition is communicated. However, Montae (2012) found that more than 1/3 of the people do not even know what indexation is. Pension plan participants do not appear to understand all risk and characteristics associated with different types of retirement savings and retirement plans, and do not have a sufficient background in order to make saving decisions (Bodie, Prast & Snippe

(2008); Clark & Strauss (2008); Lusardi (2008); Van Rooij, Kool & Prast (2007)). Also, a majority of 56% does not know how much pension income they get when retired, but they are expecting to receive more than 70% of their current salary. However, due to the average salary scheme instead of the final salary scheme, this percentage of 70% is often not reached (AFM, 2010). This is known in literature as the expectation gap and it underscores the unconsciousness of people with regard to their pension.

Both difficulties in the pension domain are showed by the study from Prast, Teppa and Smits (2012). Their study focused on the effect of 'simple and made-to-measure' information about future pension shocks that should be comprehensible for the average individual. The Dutch respondents in the survey were asked the following: *Would you change your behavior if you were informed that your real pension income will be 25% lower than you had expected thus far?* Those who answered yes were then asked what they would have changed, and those who answered no or didn't know where asked about their reasons. Noted should be that the research is focused on the intention to change behavior. It is doubtable whether behavior actually changed. The results on these questions are summarized in table 3 below, which is directly retrieved from Prast, Teppa and Smits (2012).

	Frequency	Percent	Cumulative
Yes	235	21.27	21.27
No	313	28.33	49.59
Wise to do, but probably would not	371	33.57	83.17
Don't know	186	16.83	100
TOTAL	1,105	100	
If YES: What would you do? (Multiple answers)			
Retire later	93	39.57	
Work more hours	36	15.32	
Saving more	169	71.91	
Repay my mortgage quicker	40	17.02	
Other reasons	19	8.08	
TOTAL	235		
If NO: Why not? (Main reason)			
Settle for less	88	28.12	28.12
Not interested in pension now	67	21.41	49.52
Do not want to adjust current life(style)	46	14.70	64.22
Can not adjust anything	63	20.13	84.35
Other reasons	49	15.65	100
TOTAL	313	100	
If WISE BUT DO NOT DO: Why not? (Main reason)			
Do not know what I can do	34	9.16	9.16
Can not adjust anything	92	24.80	33.96
Not interested in pension now	82	22.10	56.06
Postpone to later	118	31.81	87.87
Other reasons	45	12.13	100
TOTAL	371	100	
If DO NOT KNOW: Why not? (Main reason)			
Not interested in pension now	65	34.95	34.95
Do not know what the consequences are	30	16.13	51.08
Do not know what I can do	36	19.35	70.43
Other reasons	55	29.56	100
TOTAL	186	100	

Table 3 Results of the study by Prast, Teppa and Smits (2012)

In the results, we see that people are inclined to answer that they are not interested in their pension, that they do not know what to do or that they think they can not adjust anything. From these

answers, the financial illiteracy effect and the unconsciousness with regard to the pension topic are visible. When people are asked about their preferences, policy makers should aim to overcome these biases as good as possible, in order to let individuals understand what the consequences of their preferences are.

Increase understanding and insight

In order to close the expectation gap, tried should be to educate people in the pension topic. The AFM (2010) recommended that pension funds should strive to give individuals more insight in their own pension. These might even be more important at this moment due to the transition to the new pension contract. Risks are increasingly borne by fund members and therefore, these persons should be informed about the consequences of the new pension contract. However, information should not be given in extreme proportions. Given the low financial literacy and the limited interest of individuals in the pension domain, information should be clear and presented in such a way that it catches the interest of the individual (Sunstein, 2013).

However, in literature it is doubted whether there really is a link between more and better financial education and more desirable financial behavior. Mandell and Klein (2009) found that young adults who were more financially educated did not show better financial behavior compared to less educated adolescences. They show that being more literate not necessarily implies taking better financial decisions. This relationship was also found by the study of Cole and Shastry (2008). This might be caused by the fact that more financial education might lead to overconfidence. People then might think they can beat the market, people consider themselves as better-than-average. So, there is a counterproductive effect of being more educated (Prast, 2013). Therefore, higher financial literacy may even lead to worse financial outcomes (Bell, Gorin & Hogart, 2009; Braucher, 2001). Therefore, it seems like retirement saving and investment decisions are too complex for the average individual, even after being financially educated (Merton, 2006). Also, according to a study by TNS NIPO (2012), about 71% of the plan members are not open for pension communication.

This however does not give an argument to simply stop informing and educating people about their pension. Risk communication is needed as kind of prevention tool for larger damages resulting from the sub-optimal decisions individuals take. The low interest of individuals for pension decisions can for a part be caused by the way they get the information. This is often very extensive, and difficult formulated. Discussed was that in the pension domain behavioral biases are playing a crucial role. Current policies about informing people are based on normative models of behavior. They are expecting from individuals that they are acting based on reasoning, but in this part explained was that people do not always do so. In the case of the new pension contract, we are aware of the fact that investment strategies are organized collectively. Individual biases do not necessarily cause too low saving rates, because still the pension fund decides how contributions are invested. However, when measuring risk preferences and using these when determining the investment mix, funds should be aware of these behavioral biases. It might be difficult for funds to reach their members. As we saw, people are not willing and most of the time also not able to think about retirement. They feel uncomfortable about their retirement period and unable to fully understand all the information. Also when asked about their preferences, we should take this problems into account. It is of extreme importance that people really do understand what their stated preferences are implying. They need

to know what they are saying when they are asked about their preferences. Therefore, pension funds which are curious about their members' preferences should make sure that they also educate and make clear all the information to the individuals. Giving the members more insight in the pension topic will lead to better financial planning and more realistic expectations of individuals with respect to their pension income (Kortleve, Verbaal & Kuiper, 2013). The effects of specific choices on the pension income should be made clear.

Enumerating, in this section discussed was that there are many differences between what we expect people to do following normative models and what they actually do. This makes that risk measuring is a difficult task. People are often not aware of their deviations and therefore take suboptimal decisions. Therefore, it is important that measurement methods are designed in such a way that people are able to see the consequences of their actions. When increasing the level of understanding in the pension domain and give people insight in where it is about, we can possibly reduce the effect of framing. With more knowledge and insight, people may be less vulnerable for reference points and framing effects.

3.3 – Current Policies When Measuring Risk Preferences

Due to the transition in the second pillar, the discussion about risk measurements for pension products is in the Netherlands high on the agenda. The practice of measuring risk perception in the second pillar is relatively new, because it was not that much of interest in the old situation. Given the shift of the investment and longevity risk to the members, it seems fair if their willingness to take risk is taken into account in the policy of the pension fund.

When risk preferences are measured for individual purposes with freedom of choice where to invest in, for example in the third pension pillar, the duty of care is leading in determining the risk in the investment policy. In this paragraph, this paper discusses the consequences of implementing these items also in the second pension pillar. Further, on the base of the behavioral biases we observed, we name some criteria which should be met by a measurement tool when we want to measure more consistent risk preferences.

3.3.1 – Duty of Care

To explore the current practice in the Netherlands to measure risk preferences, Dellaert and Turlings (2011) focused especially on third pillar products. A major difference between second and third pillar pension products is about the collectiveness. The second pillar is collectively organized, while in the third pillar, individuals choose their own financial products to invest in. However, some collective pension agreements allow individual flexibility in choosing investment risk portfolio's (Nijman & Oerlemans, 2008). Under the duty of care, when there is freedom of choice with respect to investment decisions, the pension fund is obliged to advise the participant, when the participant himself invests his pension contributions (Pijls, 2010). On the base of *artikel 4:23 Wet op financieel toezicht,* a financial institution should gather information about an individual's current financial position, knowledge, experience, aim of investing and willingness to take risk. Under pension law however, the duty of care is only meant for defined contribution schemes in which the member himself has some investment freedom. This is not the case in most pension arrangement in the

Netherlands, as discussed in chapter 2. Most plans are collectively organized as a defined benefit scheme, also after the transition to the new pension contracts. Below, all items of the duty of care are discussed. We will argue why asking about the items of the duty of care in the second pillar pension is not recommended. It is meant for investments with individual freedom of choice and is therefore not directly applicable in the pension domain.

Aim of the investment

This point is included in the duty of care in order to determine whether the financial product meets the aim of the investment done by the individual (Pijls, 2010). This is done in order to prevent people from taking risk while this is actually not needed, or whether the financial product cannot yield a return that an individual wants. In the pension context however, the aim of the pension premium that is paid in the second pillar is to yield a return that is satisfying for the individual. In order to determine which level is satisfying, often the member is asked to define their estimated dependency of the second pillar pension income (Dellaert & Turlings, 2011). However, it is hard for people to determine their dependency of the pension benefit, because they cannot take into account future shocks. It is questionable whether the uninformed and the unaware individual can determine the dependency of one source of income for the long run. It is hard for people to form a view of their future income and therefore also the role the pension income should play in that. Therefore, more effective would be to question about future income streams. An example of this is whether someone owns a house. With a long time horizon, this is probably paid off at the time of retirement, making the investor less dependent on the pension income. All choices should be bracket broad in order to help the individual determining his dependency on the pension benefit.

Financial position

Here, the focus is on the current financial position of the participant. Under the duty of care, this point is taken into account in order to determine whether someone can financially bear the risks that are an implication of the chosen aim of the investment. This is done in order to prevent people from getting in financial trouble when investing. However, in the pension context, this is somewhat more complex. The aim of the pension fund when asking about current financial position is to get insight in the current income- and wealth position of the individual. This makes sense, because profound changes in the financial situation have an impact on the preparedness to take risk. An example is when a woman with children suddenly becomes a widow. This has implications for the wealth- and income situation of the family and therefore, the willingness to bear risk might decrease extremely. However, noticed should be that this can not be anticipated on the moment the participant is being questioned. It is impossible to take into account the death of a spouse, or other profound changes, negative but also positive. Without a link to the financial position at retirement, current financial position as an indicator of one's preferred risk profile in the pension domain is therefore not satisfying. Only when the current financial position is not a single thing, but a starting point from which a participant should think of his future financial position, it makes sense to take this aspect into account. However, individuals often cannot relate their current financial position with their future one (Dellaert & Turlings, 2011). Perhaps most important to measure is the human capital instead of the financial capital, especially when the individual is still young. It stays difficult to give a value to the remaining human capital, but it is some kind of aggregation of personal competences,

knowledge and skills. We can look for example at education when we want to say something about the remaining human capital. Highly educated individuals have more promising prospects to convert human capital in a relatively large amount of financial capital, which offers a relatively positive expectation about their future financial position. The remaining human capital tells something about the financial position of the individual in the future and this should determine the risk profile. The pension situation is one in which the focus is on the long run and therefore, the current financial position is not telling that much about one's ideal risk profile.

Knowledge and experience

This aspect is taken into the duty of care in order to determine whether someone can understand which risks are allied to a certain transaction of investment portfolio (Pijls, 2010). In that way, advisors can determine to which degree they should accompany the investor. An important determinant of the knowledge and experience criterion is about the financial education and the investments done before. However, in the pension context, the aspect about knowledge and experience is somewhat different than it is the case with ordinary investments. In general, knowledge and experience is low in the pension context for starters. When this leads to a defensive risk profile, then this is against life cycle theory (Campbell & Viceira, 2002). From that point of view, people in the early state of their lives, with relatively low experience, should invest in the more risky assets, because they can bear the additional risk. Besides the arguments from life cycle theory, one should also claim that it is difficult to determine one's risk profile on the base of investment knowledge. One should be made aware of the additional risk borne when investing in assets that yield a higher expected return, but technical knowledge about investments should not be a requirement. Second pillar pension is namely a collective arrangement. The pension fund is responsible for the execution of an investment policy.

Willingness to take risk

This item especially focuses on the willingness to take risk mentally. People should feel comfortable about a certain degree of risk taking. The aspects about the financial position and the dependency of the pension benefit is more about the possibility to take financial risk, but people also psychically differ in the amount of willingness to take risk. In a measurement method, the willingness to take risk is being asked in rather different ways. It is clear that the concept of risk can be examined very broadly, but also very narrow, so, completely focused on the pension domain. It should be focused on the pension income on the retirement date. Out of this we can say that this category should be linked to the knowledge/experience one. The pension fund should communicate transparent and clear to the participant that he invests in the very long term and that therefore intermediate changes should not determine the risk profile of the individual. When this mental accounting aspect can be taken away, or at least be communicated to the participant, the participant can take into account the long-term character of the pension investment.

Together, this shows that all the aspects out of the duty of care might be useful to determine the risk profile of an individual, but that the results should be interpreted carefully. Funds should not forget where it is about, namely the income when retired. Because of the context specific risk preferences, it is important that the measurement methods should focus on the long run. The investment horizon

therefore should not be a determinant of the risk profile, but the knowledge out of life cycle theory about the horizon should be taken into account in each risk profile. Also the fact that there is financial illiteracy by people and they are not able and willing to think about retirement, makes that all consequences of certain actions should be made clear on forehand. Therefore, we think that a measurement method should focus much more specifically on the pension specific aspects, rather than elements out of the duty of care, meant for individual investments as is the case in the third pension pillar. This shows the large difference when we compare the collective second pillar with individual investment decisions.

3.3.2 – Inconsistency in Preference Measuring

Besides the problems with a very static way of questioning, Dellaert and Turlings (2011) found that the translation of the items of the duty of care to a risk profile is not consistent. Different methods are likely to result in different outcomes. Dellaert and Turlings (2011) took four different stereotypes and used three characteristics of that member, based on the duty of care, in order to show the different risk classifications by four different funds. It shows the inconsistency in the translation of certain answers to a risk profile. In the table below, the results are shown for the stereotype that is 25 years old. They conduct the same test for a person of 60 years old.

Knowledge/Experience	Financial Position	Dependency	Pension fund I	Pension fund II	Pension fund III	Pension fund IV
Low	Weak	Large	1/5 – 3/5	1/5 – 3/5	1/4 – 1/4	1/5 – 2/5
Low	Weak	Minimal	3/5 – 4/5	2/5 – 4/5	1/4 – 4/4	1/5 – 2/5
Low	Good	Large	1/5 – 3/5	1/5 – 3/5	1/4 - 1/4	1/5 – 2/5
Low	Good	Minimal	3/5 – 4/5	2/5 – 4/5	1/4 - 4/4	1/5 – 2/5
Large	Weak	Large	2/5 – 3/5	1/5 – 4/5	1/4 – 1/4	1/5 – 2/5
Large	Weak	Minimal	3/5 – 5/5	3/5 – 5/5	1/4 – 4/4	1/5 – 2/5
Large	Good	Large	2/5 – 3/5	1/5 – 4/5	1/4 – 1/4	1/5 – 2/5
Large	Good	Minimal	3/5 – 5/5	3/5 – 5/5	1/4 – 4/4	1/5 – 5/5

Table 4 Classification for a 25-year old (Dellaert & Turlings, 2011)

The risk profiles assigned by the pension funds are showed as fractions. The numerator stands for the assigned risk profile (the lower the number, the more defensive the risk profile), while the denominator stand for the total number of risk profiles the pension funds distinguishes. In each column, there are two fractions. The first fraction deals with the 25-year old with a minimal risk appetite, the second fraction for the same person with a maximal risk appetite. They use these given risk appetites in order to see the effects of the three characteristics on the risk profile. Out of the findings of Dellaert and Turlings (2011) presented in the table above, we can indeed conclude that the current practices lacks consistency. For example, the 25-year old, risk-loving individual with limited knowledge and experience, a weak financial position and minimal dependency of the pension benefit, is classified in (one of) the most aggressive investment mix for pension funds I, II and III, while pension fund IV classifies the same person in a defensive profile. The table shows more inconsistencies. Therefore, it is very important that the measurement method used is designed in such a way that it gives a true view and consistent in their outcome. In order to do so, each tool should meet a number of requirements in order to make it a more consistent measurement tool for risk preferences.

3.3.3– Requirements

Discussed before is that people are sensitive to framing and in that way, pension funds could send people already in a particular direction. Also, due to the limited financial literacy and interest in the pension context, information should be presented in a clear and inviting way. Disclosure of information is an important regulatory tool. However, we have to ensure that disclosure will be not merely technically accurate, but also meaningful and helpful (Sunstein, 2013). The more abstract the information is, the more problems people have with translating it to their own situation.

In order to make the measurement tools acceptable, this paper tries to give a number of criteria they should meet in order to give a true and fair view of individual risk profiles. In this way, we try to contribute to a more consistent way of measuring. Besides that, the measurement tools should also contain a communication and education function in order to overcome the human biases in decision making. Simply asking about the five items the duty of care seems undesirable in the collective pension contract. The items should be asked in a more broad way. In the list below, the minimal requirements a measurement method should meet are summed up, based on the human biases this paper described in this chapter.

I. Relevance. The tool should gauge the opinion of members about the context it is about, so the pension domain. This context is characterized by a long investment horizon. For people, the pension decision is about making sure that they can maintain a certain standard of living after retirement. Measurement tools should also focus on this. In order to diminish the effect of myopic loss aversion, returns reached on the short term should not be communicated, because it is not relevant for the pension situation. It is all about the eventual outcome. Also, when the measurement is executed in order to make a choice between the nominal and the real contract, it should focus on the differences between those two contracts that are interesting for members, namely the real indexation ambition and the adjustment mechanism used to restore funding ratios.
II. Objectivity. The way information is presented influences the behavior of individuals (Levin, Schneider & Gaeth, 1998). Measurement methods should not be framed in order gauge true preferences. The risk when measuring is that the question are designed in such a way that respondents might tend to answer in a way the board wishes. We know for example out of prospect theory that people are becoming more risk averse when a question is framed in terms of gains. However, when it is asked in terms of losses, people are going to take risks (Kahneman & Tversky, 1981). Therefore, the question should be as objective as possible and the framing effect should be avoided as much as possible. This can be done for example by giving feedback about the choice made, and in that way increase financial literacy. Then, people might be less vulnerable for reference point and framing effects.
III. Comprehensible. The terms used should not be very technical, but accessible for the average individual. Complexity or vagueness can ensure inaction, even when people are informed about risks and potential improvements (Nickerson & Rogers, 2010). The information should be vivid and salient, because that has a larger impact on behavior than information that is statistical and abstract (Sunstein, 2013). Given the limited knowledge about the topic (Prast, Teppa & Smits, 2012), this criterion is very applicable to the pension domain. People should be able to complete the measurement.

We can conclude that when a measurement method is used, it should be relevant for the pension domain, framed as objective as possible and also presented in a very accessible way. As we will show in the next section, besides the duty of care, there are therefore better alternatives for measuring risk preferences in this occupational, collective pension pillar that meets the three criteria. Some of them also show some promising features that might create chances to measure risk preferences more efficiently and also increase pension knowledge and interest. Besides that, it seems unlikely that a general questionnaire that can be used by all pension funds can be developed. There are differences between funds that will lead to heterogeneity in the questionnaires used (Donkers et al., 2012). In the next paragraph, we are going to discuss some alternative measurement tools.

3.4 – Alternatives

Donkers et al. (2012) classify the approaches towards measuring risk attitudes in two categories. The first category they distinguish is the direct attitudinal scales. These methods are characterized by their great flexibility due to their ease of implementation. The other category of measurement methods are the choice-based approaches. This method infers the risk preference of an individual by capturing risk-taking behavior, which is expressed in the choice. In the sections below, we are going to discuss both possibilities.

3.4.1 – Direct Attitudinal Scales

Under this category, we can name the questionnaire as the most used method in practice. People are probed about their preferences by asking them how they feel about propositions. This way of questioning is popular due to their ease of implementation (Donkers et al., 2012). It can therefore be used in all kinds of circumstances, because you can determine yourself about what you are asking. However, initially the focus was on risk attitude in general. A well-known example of such a a general measure of risk attitude is the sensation-seeking scale (SSS), originally introduced by Wundt in 1873, but further developed by Zuckerman et al. (1978). The SSS was developed in order to predict responses to experimental situations of sensory deprivation. The rather general scale can be used in many contexts, and is used in many domains (Zuckerman, 1974). The SSS is divided into four sub-clusters, namely Thrill and Adventure seeking, Experience seeking, Disinhibition and Boredom Susceptibility. All scales represent a kind of risk aversion, it all measures the extent one deviates from certain norms. People who score low on the scales are considered as rather risk averse, while people who score high are considered as risk taking.

However, already discussed are the differences in risk perception in different domains. Risk preferences for a part are a personal trait, but they seem also context specific. When risk perception is measured in general, this may not reflect the domain-specific risk perception of the individual (Weber et al., 2002). So, this is a disadvantage of such a general scale like the SSS of Zuckerman et al. (1978). It does not meet the relevance criterion for a specific context.

The measurement method can also be arranged in a context specific way. The questions asked are than explicitly pointed to the domain about one is interested. We already presented a list of minimal requirements a good designed questionnaire should meet. However, using the method of asking

people about their own preferences still suffers from shortcomings, besides the inconsistency in translating the answers to a risk classification that was discussed before.

These shortcomings are being represented in the so-called Social desirability bias. This is the tendency by respondents to answer the questionnaire in a way that will be seen as ideal by others. So, in this context, when informed about a lower pension income and then asking whether they will come into action (Van Rooij, Kool & Prast, 2007), people might feel they will answer with Yes. In the experiment by Van Rooij, Kool and Prast (2007) we already saw that the percentage answering Yes is small, and in reality, this might even be less. Intention and really do change something is a different thing, meaning that the percentage that actually adjusts behavior is probably even smaller.

So, this shows together the weak predictive value of questionnaires. The direct attitudinal scales are often general in nature and lack consistency. This makes that the direct attitudinal method of using questionnaires to measure risk preferences is criticized. Choice-based approaches seem more promising.

3.4.2 – Choice Based Approaches

With these methods, researchers try to derive risk preferences by giving the respondents a choice set. Dependent on which option is chosen, we can say something about the preference to take risk. The standard way of this choice based approach is to present a lottery. Dependent on where people switch between the more safe option and the more risky option, we can derive the shapes of the value and probability function underlying prospect theory (Donkers et al., 2012).

These lottery gambles can be organized in two ways, as Donkers et al. (2012) explain. The more basic set-up is the arbitrary sets of independent gambles. In this method, different unrelated surveys are used from which individual levels of risk aversion can be deducted. This is often done by asking people to value a lottery ticket's reservation price. Before this valuation takes place, individuals are informed about the probability of winning a prize of a specific magnitude. By combining their valuation of the lottery with expected utility theory, the Arrow-Pratt level of absolute risk aversion is derived. These risk-attitudes measures are being linked to individual characteristics, like gender and employments status. However, when using this, they still use the notions of expected utility theory. As discussed, that method poorly describes actual behavior. Another problem is that the risk aversion is measured in general. This does not meet the relevance criterion on the desirability list.

Besides the independent gamble chains, we also know systematically generated repeated gambles (Donkers et al., 2012). With these methods, the shape of the prospect theory functions can be more identified. The method relies on a chain of risky choices. This means that the answers to one lottery question are used to construct the answer for the next question. This might be a disadvantage, because it might result in the error propagation (Wakker & Deneffe, 1996). Another problem with this type of repeated gambles is the incentive compatibility problem (Harrison & Rutstrom, 2008). Individuals tend to overstate the amount of money they require to be indifferent, because expected payoffs increase over time. The first value is overestimated and therefore, this raises the expected payoffs in later rounds. This together might lead to a conflict with the objectivity criterion. Choices

are based on preceding choices and therefore the decision process might be influenced by the two problems Wakker and Deneffe (1996) and Harrison and Rutstrom (2008) point out.

A lot of research is of the same form as the approach used by Holt and Laury (2002). They presented a list with a sequence of choices between pairs of lotteries. In the method by Holt and Laury (2002), people continuously had to choose between two options. Typically, one of the options has more risk in the payoff and also starts with a lower expected payoff. However, this expected payoff is increasing when going down on the list. The increase is faster compared to the other option, with less variability, so in that way, researches can observe where the turning point is, that is indicative about the risk attitude of that person. In table 5 below, this is showed. Option A is considered as the more safe option, while option B is the more risky one.

Option A	**Option B**	**Expected Payoff difference**	**Proportion of turnovers from option A to option B**
1/10 of $2.00, 9/10 of $1.60	1/10 of $3.85, 9/10 of $0.10	$1.17	0.01
2/10 of $2.00, 8/10 of $1.60	2/10 of $3.85, 8/10 of $0.10	$0.83	0.01
3/10 of $2.00, 7/10 of $1.60	3/10 of $3.85, 7/10 of $0.10	$0.50	0.06
4/10 of $2.00, 6/10 of $1.60	4/10 of $3.85, 6/10 of $0.10	$0.16	0.26
5/10 of $2.00, 5/10 of $1.60	5/10 of $3.85, 5/10 of $0.10	-$0.18	0.26
6/10 of $2.00, 4/10 of $1.60	6/10 of $3.85, 4/10 of $0.10	-$0.51	0.23
7/10 of $2.00, 3/10 of $1.60	7/10 of $3.85, 3/10 of $0.10	-$0.85	0.13
8/10 of $2.00, 2/10 of $1.60	8/10 of $3.85, 2/10 of $0.10	-$1.18	0.03
9/10 of $2.00, 1/10 of $1.60	9/10 of $3.85, 1/10 of $0.10	-$1.52	0.01
10/10 of $2.00, 0/10 of $1.60	10/10 of $3.85, 0/10 of $0.10	-$1.85	/

Table 5 Pairs of lotteries (Holt & Laury, 2002)

At the top of the list, only a very extreme (and unrealistic) risk seeker would prefer the option with the more volatility over the option with low volatility. Going down the list, the option with the more volatility becomes more attractive. There comes a moment at which the investor switches from the less risky to the more risky option. A rational individual who wants to maximize expected payoff will

choose option A four times under expected utility theory, before switching to option B (Holt & Laury, 2002). This is because the expected utility of option A is higher in the first four cases, after that, option B is from a rational point of view more attractive. We observe however that about two thirds of the subjects choose more than the four safe choices. So, even at this low payoff level, risk aversion is visible. In order to examine whether the amount of the payoff matters, Holt and Laury (2002) scaled up the payoffs by factors of 20, 50 and 90. They found that risk aversion increases sharply when the payoffs are scaled up. The higher the increase of the payoff, the more dramatic shift towards the safe option found. There is a large body of literature that uses lottery types in order to derive risk aversion levels (Gneezy & Potters, 1997; Hartog, Ferrer-i-Carbonell and Jonker, 2000; Holt & Laury, 2002). A disadvantage of such gamble tasks however, is that people suffer from biases that result from too strong focusing on either probabilities or outcomes (Hershey & Schoemaker, 1985).

3.4.2.1 – Distribution Builder

Bernartzi and Thaler (2001) show that many people are in fact unsatisfied with the probable outcome of their choices. Therefore, people should be informed about what their choices yield. A promising instrument to do so might be the distribution builder. With such an interactive tool, the consequences of certain actions can be showed clearer, making the concept of risk more transparent in the pension context.

The distribution builder is described as an interactive tool that can elicit information about an investor's preference (Sharpe, Goldstein & Blythe, 2000). With a distribution builder, people build and explore the different probability distributions of a future source of utility, under the constraints of a fixed budget (Sharpe et al., 2000). The source of utility in this context is the pension income, but we can imagine also other sources. People themselves distribute the total number of options. It is clear that different levels of retirement income do not have the same cost, upside gain is only possible when accepting downside loss (Goldstein, Johnson & Sharpe, 2008). Each distribution made with the distribution builder has an associated cost, which is displayed on the budget meter (Sharpe et al., 2000). The cost on the meter reflects the budget that would be required to achieve the specific distribution of wealth levels when using the cheapest possible investment strategy. These prices are constructed using the Arrow-Debreu method (see Sharpe et al. (2000) for technical explanations).

So, the individual works in an online setting while building his own distribution. From the distribution chosen, we can derive whether the individual likes some upside potential with as a consequence also downwards risk, or that he likes a relatively safe outcome. This online setting can however be quite different organized. Two studies that are based on the distribution builder and use it explicitly for the pension context are the studies by Goldstein et al. (2008) and Verbaal (2011). How they however organize the setting is different, as we will explain below. For a graphical impression of both methods, see appendix A.

Goldstein et al. (2008) use percentages on the vertical axis that represent income in retirement expressed as a percentage of the final wage, so the replacement rate. Further, there are 100 movable markers, which have to be moved by the respondent to the percentage desired. They can make a probability distribution by selecting different percentages.

Goldstein et al. (2008) give a reference point in the tool. They state that this is optional and not necessary. In their own experiment, they put the reference point at 75% as replacement rate. This seems far too optimistic, especially because it is about the final wage (AFM, 2010). Goldstein et al. (2008) constructed the prices however in such a way that moving all markers to the 75% exactly satisfies the cost constrained. Given the low interest of the average individual in the pension situation, the most markers would probably be moved to the percentage that is given as reference point. This is also confirmed by the outcomes. The distribution of the average investors shows a peak at the 75% level that is twice as high as the next highest replacement rate (Goldstein et al., 2008). In their favor, they only use the 75% as a typical goal. However, when applied nowadays, it is not ideal to communicate such a percentage that seems unrealistic to reach. It is better to inform the people in a fair way. This also contributes to the criteria presented before. The information presented should be relevant for the situation and therefore, we could better be clear about the pension context instead of giving individuals a percentage that seems unrealistic. It therefore seems better to set a reference point at a realistic target instead of using it at a typical goal. Replacement rates around 60% seem more applicable (Centraal Plan Bureau [CPB], 2013).

The other study that was based on the distribution builder was the study of Verbaal (2011), who created the preference indicator. The preference indicator begins with a unique starting point for every member. This point is derived from a number of data the pension fund has about its members. These input-data are: age, full-time gross salary, a part-time factor, already saved pension resources in the second pillar, and expected pension income. So, this deviates from the approach by Goldstein et al. (2008). Participants do not have to drag with markers. This automatic distribution contributes to the customization of the information about pension income. The distribution can be adjusted by the participant by changing their preferences with respect to certainty, retirement age, and additional savings. In that way, participants are able to directly see the consequences of those factors. The interactivity that a participant gets from the distribution builder can support him in constructing own preferences, when these were not yet really established (Donkers, Lourenço, Goldstein & Dellaert, 2013).

So, in the interface of the preference indicator (Verbaal, 2011), we see actually three parts. First, there is the expected pension income, which is based on the five input-variables. In the preference indicator, this is indicated as a nominal amount and as a replacement rate. This expected pension income corresponds to the median of the distribution which follows from the five input variables. Further, there are the three adjustment mechanisms: the desired certainty, retirement age and willingness to save extra. All three variables affect the level of the pension income and the desired certainty does also adjusts the variance of the distribution. Further, there are some instructive elements that should contribute to the understanding of what one is doing. In the distribution, there is a little black dot indicating the current salary, so it is also visible how the expected pension income deviates from the current salary. Also, there is a possibility for the participant to make a line at the point of required pension income, so the amount they think they will need after retirement. As we however saw before (Dellaert & Turlings, 2011), guessing the dependency from pension income is a very complex task for individuals. However, when the participant does set a required pension income, the preference indicator does compare this with the expected income. In percentages, it gives the chance for a pension income that is lower than the required income.

This contributes to giving insight in the pension topic. Interactive environments like the distribution builder or the preference indicator make use of more personal and accurate measurement methods (Verbaal, 2011). Besides this forecasting ability of the tool, it is also aimed at educating the individual. With making the consequences more transparent, in the pension context the awareness among members is likely to improve (Verbaal, 2011). When using the distribution builder, people directly see the consequence of the degree of risk taking. So, when risk preferences are measured with a tool like this, it also contributes to the closure of the expectation gap under pension members (AFM, 2011). Verbaal (2011) studied the education function of the distribution builder. Respondents of the experiment had to fill in a questionnaire before and after they worked with the preference indicator. The focus was on whether the correct answers were given more frequent after the member worked with the indicator. This was found to be the case. One question was about the relation between the level of certainty and the level of the expected pension income. When answering on forehand, only 55% of the respondents knew that a pension with more certainty implicates an expected pension entitlement that is relatively low compared to less certainty. After working with the preference indicator, 80% knew that this was the case. Therefore it seems like the level of knowledge is increased, and so the preference indicator also has an education function.

The feature that a measurement tool also increases understanding and insight under the respondents is a welcome implication in this context. Given the limited literacy and the unconsciousness about the pension topic, we should aim to educate people. Most individuals make financial decisions only infrequently, which means that the accumulation of personal experiences with and learning about the relevant financial issues takes a large effort. Measurement methods should therefore contain certain aspects that show individuals the implications of the preferences or answers they give. It is not only about measuring risk preferences, but also helping people to construct preferences. With making the consequences of certain actions directly visible, we can help people to make decisions that are better in line with what they really want. This shows the promising potential of this kind of measuring methods in informing the people and at the same time, measure risk preferences effectively. It also contributes to effectively involving the participant, because the information in especially the preference indicator is customized and the distribution is presented in a user-friendly online tool, meaning that it is more attractive for participants to think about retirement.

The visualization aspect of the distribution builder also contributes to the attractiveness and comprehensibility to work with a measurement tool. People have difficulties with decisions for the long term, like pension decisions, because it seems like in extreme cases, the future self is not different from a complete stranger (Parfit, 1971; Schelling, 1984). People feel the same about saving for retirement in about 40 years as saving for another person right now. In order to make people more aware of their pension, it is claimed that the retirement period should be made more salient (Brüggen, Rohde & Van den Broeke, 2013; Hershfield et al., (2011)).

Hershfield et al. (2011) tried to let individuals interact with their future selves, by making an picture of the individual ‘old’ and used a slider which divided resource allocation over today and for the period after retirement. When much was allocated today, the old self looked unhappy, while he was happy when the individual allocated much to the future. They claim that more resources will be allocated towards the future when people are interacting with age-progressed renderings of themselves, and so, we should be able to increase the non-optimal, too low saving rate. They found

evidence supporting their claim. Participants who have been confronted with their future self avatar allocated more than twice as much for retirement saving. The immediate gratification component of the intertemporal choice problem, one of the conditions that makes that the normative preferences differ from the revealed preferences (Beshaers et al., 2010), is made less attractive because also the future self is displayed.

One of the criteria presented was that it should not be too difficult for individuals to participate in measurement tools. Another point is however that, in order to get a high response, people should also be willing to participate. People might have the tendency to put off the completion of such a measurement, when it is not attractive enough to participate. In order to do so, measurement tools should be personalized. All different groups a pension fund serves should be approached differently. Generic information seems difficult for individuals to process, and therefore, information should be as personal as possible in order to approach each individual effectively. Together with the education function, we see that the distribution builder has nice features that contribute to the effectively of measuring risk preferences.

3.5 – Concluding Remarks

Discussed was that due to the transition to the new pension contract, pension funds are willing to measure risk preferences. They do this because more risk is shifted to their members and therefore, this transition moment seems an ideal timing to ask members about their preferences. However, there are difficulties with the concept of risk. Normative theories like expected utility theory are found inappropriate in explaining real behavior. People do not make rational choices. Examples of systematic deviations have been described both in economic and psychology literature, and also for the pension domain, people deviate from what we rationally expect them to do. Discussed was that it is important is that pension funds keep monitoring the risk preferences of their members. Risk preferences are not stable when people age and when macro-economic circumstances change (Sahm, 2007), and therefore, risk preferences should not be measured just once, but should be monitored more frequently. The transition only gives a nice motive to start measuring them. By measuring preferences frequently, the pension fund is sure that it keeps serving the wishes of its members. In general Sahm (2007) concluded that in better economic decisions, people behave more risk tolerant, meaning that in the current circumstances people are perhaps more risk averse. Also, the attitude towards risk depends heavily on framing and reference points (Kahneman & Tversky, 1979) meaning that choices of individuals can be influenced. Besides that, risk preferences seem context specific, which leads in the pension domain to difficulties when we want to measure willingness to take risk due to the limited knowledge and interest in the pension topic (Prast, Teppa & Smits, 2012). Also, people tend to be myopic loss averse (Bernartzi & Thaler, 1995), meaning that they evaluate outcomes on the short term and do not focus on the long term of the pension context. They also isolate choices and therefore bracket them narrow (Read, Loewenstein & Rabin, 1999), making them more risk averse. Besides these deviations, we also presented differences in willingness to take risk on the base on personal characteristics. Therefore, when measuring risk preferences, we should take into account that people deviate from outcomes that are rationally seen as optimal.

Dellaert and Turlings (2011) found that the most popular way of measuring risk preferences is the use of the questionnaire. They focused themselves on pension products with some freedom of choice and therefore, funds should ask questions that are in line with the duty of care. However, as we concluded, following strictly the lines of the duty of care in a collective agreement seems undesirable. The measurement tool should at least meet the criteria mentioned in §3.3.3. It is of extreme importance that the methods used are reflecting true preferences. Therefore, questionnaires should be relevant for the pension context, meaning that it should ask preferences about the income when retired. Besides that, the questionnaire should also be objective. We know people are sensitive for reference points and show loss aversion, so in order to get a true view of one's preferences pension funds should be as objective as possible in their measurement method. Also clearness is an important aspect. Given the financial illiteracy and the unconsciousness about the pension context, terms used in a measurement tool should be clear and relatively simple, in order to make sure people are able to complete the measurement method.

Because we saw that people do not want and are not able to understand all risk associated with the pension context, a measurement method should most ideally also give understanding and insight. The communication accompanying the measurement method should be given in order to educate individuals. Consequences of stated behavior should be directly visible, in order to show people what they choose. Given the limited interest and knowledge (Prast, Teppa & Smits, 2012), it is likely that people often simply don't know. In this context it is also important that the information provided is complete. We saw that people tend to isolate choices, but with an interactive tool we should be able to build in more sources of income, leading to a broader bracketing of the choices. Choice-based approaches seem more promising than the direct attitudinal way of questioning, like a questionnaire does. Also attractiveness is an important point in the design of measurement tool. People do not want to think about their future self and therefore, first a threshold should be passed when we want people to participate. As we saw, this can be done by customization of the measurement tool, making it more relevant for the individual.

Especially interactive tools like the distribution builder and the preference indicator are instruments that can combine the requirements mentioned, and the education and attractiveness conditions a measurement tool most ideally has. Making the pension decision more interactive and 'fun' can contribute to solving the challenge of pension funds to stimulate people to think about their retirement income (Brüggen et al., 2013). The preference indicator constructed by Verbaal (2011) allows for consumer learning and preference construction while responding to the task. Therefore, with visualizing the old day, pension communication becomes more effective in bringing the distant future closer. Showing the future selves or graphically show the effects of decisions made may motivate people to change their behavior. When compared to simple questionnaires, it seems like these methods are preferred over questionnaires. Methods like the preference indicator actually contain all criteria on the checklist in §3.3.3, and because of the interactivity, it also supports participants in constructing their preferences in case that they are not already fully established or well thought out.

Chapter 4 - Conclusion and Discussion

In this chapter, the implications of the two pension contracts and the human biases on the risk measuring process in this domain will be discussed first. After that, discussed are four ways risk preferences could be measured. We will discuss specific for the pension context the usefulness of the duty of care, direct attitudinal scales, lottery valuations and interactive tools like the distribution builder in order to measure which contract is preferred.

4.1 Measuring Risk Preferences in Second Pension Pillar

The main question in this paper is how risk preferences should be measured in the second pension pillar. As we saw in chapter 2, the nominal and the real contract are different in the way they process shocks and in the way they strive for indexation of the pension claims to the inflation. More of the financial and longevity risk is shifted to the members and therefore, it seems appropriate that their preferences are taken into account, because it is about a basic income when retired. People are dependent on it when stopped working. However, there are two reasons that make preference measurement difficult in the pension domain. First of all, there are the differences between the nominal and the real contract that should be taken into account when measuring. Pension funds should strive to derive the contract that best fits the preferences of the members. Further, we see that people in the pension context suffer from several behavioral biases, leading to non-rational decision making. People are not willing to think about the pension topic and do not have sufficient knowledge to be able to answer each question in the pension context. Therefore, it is important that we organize the measurement method in such a way that it gives a consistent and fair view of individual preferences.

Besides the measurement function, asking scheme members about their preferences may also lead to a higher level of satisfaction and trust in the pension sector. The measurement of preferences is a way for the pension fund to get in contact with their members and give them the feeling that they are involved in the decision making. This value of choice gives additional value to a measurement test.

4.1.1 Implications of the Two Contracts

There are roughly two aspects that distinguish the nominal from the real contract: the ambition to index the pension payment and the adjustment mechanisms used to process shocks. In the nominal contract, there is a greater certainty of a nominal payment. There might be an indexation ambition, but there is no obligation to keep the purchasing power at a certain level and therefore, it is also not a part of the promise. In the real contract, the indexation ambition is a part of the promised payment when retired and therefore, there is the aim of keeping the purchasing power of the individual at a constant level. It should be clear for the members that the nominal contract gives a more certain payment, but the net value of that payment might decrease due to inflation. In the real contract the payment is less certain, but it is aimed to give a pay off that in real terms stays rather constant with

the price development. People should make a trade-off for themselves between the certainty the buffer gives in the nominal contract, or the indexation ambition that is present in the real contract. The adjustment mechanisms also differ in the two contracts. Cuts in the nominal contract are the ultimo remedium, because funds first have the time to recover the funding ratio with a restore plan. Only after a while, when the restore plan did not lead to a significant improvement of the funding ratio, cuts in the pension claims might be a solution. In the real contract in contrast, cuts are used frequently in order to restore that funding ratio. Financial shocks can be spread out over 10 years and are processed directly. The question about which contract is preferred is also a question about one's willingness to use the cuts as a repair tool. Also the longevity risk is automatically processed in the real contract, while this is no obligation in the nominal contract. This shows the difficulties in the pension domain. When measuring risk preferences, there are different aspects that distinguish the two options. This is different with individual investments for example. In that case, it is actually just the trade-off between the expected return and the volatility of that return.

However, in the second pension pillar context, the ambition to index the pension claim is the most important aspect that distinguishes the nominal from the real contract and therefore, the choice can be reduced to a risk-reward tradeoff concerning pension outcomes. If people are satisfied with the certainty of a nominal contract, then their preference fits the nominal contract. If they however want to achieve indexation of their claims in order to maintain their purchasing power this will point to the real contract. Members should be aware that their indexation ambition implies risk because the higher ambition should be financed with more risky investments. People should determine which value they attach to the maintenance of the purchasing power and therefore the indexation of the pension payment.

In chapter 2, this paper showed that the indexation ambition in the real contract can be financed with a more risky investment mix, or with changing certain aspects in the pension arrangement. Examples of this are to lower the build up of nominal rights or increasing the premium. For risk measurement purposes, we however state that the real contract implies a more risky investment mix. This is also in accordance with Boeijen, Kortleve and Tamerus (2011). They claim that in the nominal contract, investments should match the unconditional guarantee of the nominal certainty. The liabilities of the fund are completely covered by the investments, without risk. In the real contract, the payments of the fund are linked to the inflation. Funds should invest in a more risky way in order to make the real indexation ambition payable. The ambition is higher, making that the expected return of investments done should be higher. The other options to finance the indexation ambition are excluded for measurement purposes. Pension premiums are currently at a level such, that increasing the pension premium in order to satisfy the indexation ambition no longer seems desirable (Goudswaard et al., 2010). Also, plan characteristics like the nominal build-up should be taken as given. This should not be a part of the risk preference measurement methods. Given the financial illiteracy discussed earlier, people do not understand technical details of the pension arrangement. The nominal and especially the real contract imply a lot of technical details, for example about the adjustment mechanisms, that are too difficult to understand for people and therefore, there is no use to communicate these when we want to gauge risk preferences. Therefore, the communication in the measurement tool should focus on the strength of the ambition to keep a constant level of purchasing power.

4.1.2 Implications of the Human Biases

So, in order to measure the indexation ambition, measurement tools should focus on the preferred asset allocation, from which the level of the indexation ambition can be derived. Simply asking about the indexation ambition in a direct way is not an option, because it is found that people have difficulties with terms like indexation and purchasing power (Montae, 2012). If you simply confront people with the differences between contracts by mentioning different indexation ambitions, this will not work. The unconsciousness about these topics is worrying in the pension domain, because indexation of the pension claims is of crucial importance for the eventual outcome. As already concluded in chapter 3, people do not behave rational, but take decisions that might be sub-optimal for their total well-being. Discussed was that individuals tend to have risk preferences that:

- are not stable over time
- are dependent on framing and reference points
- are suffering from financial illiteracy
- are influenced by myopic loss aversion
- are based on narrow bracketing of choices
- are dependent on personal characteristics

A part of the financial illiteracy problem is that people have a so-called money illusion. Individuals tend to evaluate nominal amounts instead of relative amounts, and so the numerical value is confused with purchasing power (Fisher, 1928). In order to overcome these biases, all outcomes should be given in real terms, regardless of which measurement method is used. Then, people can compare and evaluate the results of their decision. This is a paternalistic role that should be played in order to overcome the money illusions. In that way, funds contribute to giving understanding and insight in the difference between the nominal value and the purchasing power, which is of extreme importance when a choice between the nominal and the real contract has to be made. People should be made aware of their loss in purchasing power when they choose the certainty of a nominal payment. If people see the effect of no indexation, they might realize that the implication of the certain nominal amount in the nominal contract is that they lose purchasing power.

In the same way, we also should make the effect of the more risky investment strategy visible that is necessary in the real contract. We take more risk in the real contract in order to have a higher upside potential. A measurement tool should also focus on the downside of this more risky investment mix. Increasing upside potential does have associated cost, meaning that it also increases the downside risk. The more invested in risky stocks, the more variability possible in expected returns. People should therefore be informed about the consequences of their indexation ambition. The real contract implies that there is no buffer that secures nominal payments, and that the pension benefits will be more volatile, depending on the stock market.

These deviations should be taken into account when we are going to measure risk preferences. Especially in the pension context, the context specificity of risk preferences gives difficulties in this domain, because people are unwilling and unable to think about their retirement. In order to measure risk preferences in a correct way and to take into account the considerations that follow

from the behavioral biases, we presented a list with criteria and desirabilities for a measurement method, that are showed in table 6 below.

Criteria	Desirabilities
Relevance. Should focus on the long-term, pension income.	Attractive. The tool is presented in such a way that it is attractive to participate for individuals.
Objective. Should not influence behavior.	Increase understanding and insight. Given the limited financial literacy, the measurement tool could educate participants.
Comprehensible. Individuals should be able to understand the measurement tool.	Regular updating. Given the time-dependent preferences, the measurement should be repeated frequently.

Table 6 Criteria and desirabilities for a measurement method

So, a measurement tool should be relevant, in the sense that it should focus on what the differences between the two contracts imply for the eventual pension outcome. Besides that it is relevant for the choice to be made, all communications should also be specific for the pension context. Intermediate value declines for example should not be communicated, but instead, it should be focused on long-term pension outcomes. It should be presented objectively, what fits the call for communicating the outcomes in real terms, making people more aware of the impact of inflation. The measurement method should also be comprehensible and most ideally in that way gives understanding and insight about the distinctive aspects of the two contracts and what they imply for the pension claims. Given the low interest, the measurement most ideally should be attractive to perform. People should not only be able to complete the measurement tool, but they should also be willing, in order to get a participation rate that is high enough for a representative view of the preferences of the members. Also, given the fact that preferences are time-dependent and that the population of members changes over the years, the measurement should not be once, but taken multiple times.

4.2 – Ways of Measuring

In the remainder of this chapter, we are going to evaluate the measurement methods discussed before. This is done on the basis of the criteria and desirabilities presented in table 7. We also discuss whether the implications following from the *Hoofdlijnennota* can be fitted in the tools. At the end, we present the characteristics a good practice should have. The point about regular updating is not discussed. The point made there is that the method anyway should be repeated frequently in order to check whether the pension fund is still serving the wishes of the members. Because this risk preference measuring is relatively new in the collective pension context, this process is still in development. We however found some characteristics that might be promising for this purpose, but we also discussed methods that seem inappropriate for the determination of risk preferences in the second pension pillar.

4.2.1 – Duty of Care is Meant for Other Purposes

For individual purposes, items of the duty of care are directly translated to risk preferences. The way risk profiles are being determined when there is individual freedom of choice where to invest in is on the base of the criteria from the duty of care. This implies that suppliers of financial products should get information about the investors current financial position, his knowledge and experience about investing, his willingness to take risk and the aim of the intended investment.

However, simply using the items of the duty of care in this collective setting is unsatisfying, as we already showed in chapter 3. It is clear that we should gauge risk preferences in another way for the collective pension contract then it is the case with individual investments. For example, the knowledge about pension is low and the experience with pension saving is especially when young absent, but this does not imply that the young individual prefers a low-risk investment policy. Opposed, young members should strive for a relatively risky investment profile, given the long-term character of the pension plan and the remaining human capital of the individual. Discussed was also that due to the mean reversion of the stocks, on the long term investing in stocks gives less volatile outcomes then in the short term.

Given our criteria, we also see that the duty of care is not applicable in the second pillar pension domain. Asking questions about knowledge and experience about the pension topic seems not relevant for the ultimate goal of pension savings. People are asked some abstract questions, but these are not directly related to the pension saving. Also in the light of the new pension contract, the opinion whether or not an individual wants to index his claims to the inflation is not clear out of the duty of care. Further, using the duty of care does not contribute to the desirability of creating more understanding and insight in the topic. Consequences of certain choices can not be made visible and for the individual it is not clear what his answers mean for the translation to one of the two contracts and the investment policy. Therefore, we reject the duty of care as a way of measuring one's risk bearing capacity for the occupational pension pillar.

4.2.2 – Direct Attitudinal Way of Questioning Has Shortcomings

The direct attitudinal scales are very straightforward. With these techniques, people are simply asked how they feel about some topics. These are often organized as questionnaires and people can answer on certain scales if they agree or disagree with the proposition given. This attitudinal way of measuring is probably the most used way of measuring preferences of individuals. This might be because the effort that is in the development of such a tool is relatively low compared to other methods we presented. It is also rather easy to implement for example a questionnaire. This contributes to the regular updating point made on our desirability list, because gauging risk preferences can be done in a relatively easy way at multiple moments.

We saw that the way these measuring methods are designed does make a large difference. The study of Dellaert and Turlings (2011) showed already that a questionnaire might lack consistency. This does not contribute to a correct and fair view of individual preferences. Also the questionnaire might suffer from the social desirability bias. People might know what is expected from them and might be

tended to answer the questionnaire such that it fits the expectations. Therefore, the effectiveness of the questionnaire might be determined by its presentation. The way these methods are organized does make a large difference. The presentation of the questionnaire determines whether it is acceptable as a measurement tool in the second pension pillar. Especially the comprehensibility and attractiveness are very dependent on the design, so it is difficult to say something about those aspects in relation to the questionnaire in general. Also relevance and objectivity are dependent on how it is organized. In order to be relevant, the questionnaire should be organized context specific. Simply asking about items in the pension domain is however not relevant enough. It should not focus on intermediate value decreases, but on the income when retired. The second point is about objectivity. When asking question in a direct way, it is often difficult to prevent people to be sent already in a direction. For example, when a questionnaire is used by a pension fund to gauge an opinion about whether the nominal or the real contract is preferred, this should be done in an objective way, without steering toward certain answers. The danger is that people are pointed in a direction, when the pension fund itself already made a choice between the two contracts.

The point about the desirable increase in understanding of the pension topic is difficult to meet when using a direct attitudinal scale. The effects of certain choices cannot be showed directly to the individuals, making it still difficult to show the effects of individual preferences in a comprehensible way. The trade-off between expected return and the degree of risk can only be described, not visualized. Therefore, the consequences of the indexation ambition are difficult to visualize to individuals. Simply describing the consequences of the indexation ambition seems not enough in creating enough insight in the topic, because we saw that people have difficulties with terms like indexation and purchasing power (Montae, 2012).

Concluding, these kinds of methods are a first step in the gauging of risk preferences. The effectiveness is very dependent on the way the questionnaire is organized. If it is designed in such a way that it is relevant, objective, attractive and comprehensible as described above, it might be a correct way of gauging risk preferences. However, given all behavioral biases individuals show, the set-up of the questionnaire might be too basic and the possibilities of the questionnaire to contribute to a better insight in the pension situation are limited. We see that due to the difficulties each point has, it is probably useful to depict the situation graphically. Cuts, longevity and indexation all have implications for the intergenerational risk sharing and for the real payoff, which are perhaps not directly clear to an individual. Members should have the knowledge to correctly interpret all effects and therefore, tools most ideally also perform an educational function. This however is difficult to do in a questionnaire, which also is more vulnerable for framing the questions already into a specific direction. Tools that can also present the pension situation as attractive and comprehensible seem more promising.

4.2.3 – Choice-Based Approaches Seems More Promising

Choice-based approaches show more possibilities to contribute to these aspects. In this paper, we distinguished two different types of choice-based methods. Later on, we will discuss the distribution builder, but first, the focus is on the standard way of a choice-based approach, the lottery. Especially the Holt and Laury (2002) method, which can be classified as a systematically generated repeated gamble, is used a lot in research. However, lottery outcomes are not relevant in the pension context.

Yielding risk preferences from sets of lotteries for the pension context seems therefore not appropriate. In order to make it relevant, it should be translated to pension outcomes. Then we can derive whether people for example prefer a more safe or a more risky payoff in their future pension income. With adjusting the probabilities of safety, one can infer risk preferences in a comparable way Holt and Laury (2002) did. In the more safe option, we can present people a relative high pension payment as secure option, with a determined percentage of a bit more income. The other option involves a low payment for sure, but a chance of relative much more pension income. By changing the percentage slowly, we can derive in a similar way as Holt and Laury (2002) did where people tend to switch from the safe to the more risky option and in that way derive risk averseness levels for the pension domain. If they prefer the safe option relatively long, this can be translated to a preference for the nominal contract. If people are in contrast willing to take some risk in their pension income, this points to the real contract.

With the Holt and Laury (2002) approach, the effects of the safe and the risky scenario are visible, making that people see directly the consequences of their actions. They should be showed that choosing for the safe outcome gives them a rather certain payment, but that the chance of getting a much higher pension income is low. This contributes to the understanding and insight in the pension situation. However, the method might still be somewhat vague for the average individual. There are percentages used, and as we saw in prospect theory, people tend to overreact to small probabilities and underweight large probabilities. Also, the combination of values and probabilities might be difficult for people. Given the financial illiteracy, just communicate in these numbers might not be enough in order to give insight. Visualizing the situation might be more efficient.

Another choice-based approach that shows potential is the distribution builder. As Bernartzi and Thaler (2001) already concluded, many people are in fact unsatisfied with the expected outcome of their choices. The distribution builder might be a solution for this problem observed. This interactive tool tries to help people in their development of preferences and increases understanding and insight. The distribution builder graphically shows to the users the fact that (1) not all investment outcomes have equal value, (2) investments have to be made from a limited financial budget, (3) higher investment outcomes are more costly, and (4) by taking more risk a higher expected return can be obtained (Donkers et al., 2013). The distribution builder nicely reflects the implication that only upward potential can be ambitioned, when also risk downwards is accepted. As Verbaal (2011) showed, the use of his associated preference indicator leads to more understanding of the pension topic. All consequences are directly visualized, leading to better understanding of the situation. A tool like this might also be presented as rather attractive. When you can introduce the tool to the members as something that gives insight in the individual pension outcome, members might be interested to work with it.

Besides this understanding and insight aspect, the distribution builder might also be rather objective. Because people themselves can adjust certain characteristics, they themselves decide their own distribution. A point of discussion in this context is the use of a reference point in the distribution builder (Goldstein et al., 2008). The question is whether we should give the unconscious people a starting point, or let them think about which level of replacement they admire. Given the financial illiteracy, mentioning a reference point in itself is a good way of informing people. To properly establish the income level that will provide a standard of living that is close to the current living

standard may be an important factor in determining the tradeoff between expected return and risk (Donkers et al., 2013). In the pension context, percentages or amounts are often not saying anything to individuals. With a reference point, people have a starting point and can determine how they want to adjust this with respect to expected return and risk. In contrast to what Goldstein et al. (2008) did, the reference point should be a realistic point, not a typical goal. Because we want to increase understanding and insight, funds have to communicate honest replacement rates to their participants. Only in that way, the addition of a reference point is of added value.

Taking into account the limited knowledge of individuals, giving them a starting point can make them more aware of their own situation. This is more in accordance with the method of Verbaal (2011) compared to the initial distribution builder of Goldstein et al. (2008). For a graphical impression of both methods, see Appendix A. The approach of Verbaal (2011) is more in accordance with the relevance criterion of the measure, because it is in this way more customized. Those input data could be based on the four fixed aspects Verbaal (2011) mentioned, namely age, full-time salary, a part-time factor and already saved pension resources. This gives a certain distribution, where the median stands for the expected pension income. This can be adjusted by the individual by changing their desired retirement age, their level of certainty and the amount of additional pension savings, according to Verbaal (2011). So, the customization aspect in the method of Verbaal (2011) does contribute in showing the individual his own situation, in order to make it relevant for that person.

Still, the distribution builder has limitations. It seems difficult to implement, especially when compared with the questionnaire, because there are a lot of technical implications behind the tool (see Goldstein et al. (2008)). Also, for the members, it seems like the threshold to participate might be high for the distribution builder. It can be made attractive by emphasizing the educational task of the tool, giving members the chance to get insight in a topic that all affects them when retired. However, it seems like the distribution builder is rather time-consuming. The question is whether people will take that time to really profit from the nice features the distribution builder offers. So, we could say that the expectations when using the distribution builder are rather ambitious. We might be hopeful, because it is a relatively easy way for people to get insight in their pension situation, but given all literature about the absence of interest in the pension domain, we might not expect very high percentages of participation. However, it seems like interactive tools like the distribution builders best fits the criteria and desirabilities mentioned in table 6.

4.2.4 – Concluding: Good Practices

This paper roughly discussed four observed ways to measure risk preference. These methods were evaluated on the criteria and desirabilities that we derived from the behavioral biases observed. Enumerating, we saw that all methods have difficulties to meet all criteria and desirabilities. However, observed is that some methods show more potential than others. Discussed is that people do not behave rationally and therefore, the measurement method should meet some criteria in order to be sure it measures what is should be measuring.

The main point of measuring risk preferences is to determine an investment portfolio. We saw that the real contract implies more risky investments in order to meet the indexation ambition communicated. Therefore, the aim of the measurement should be to determine how important that indexation ambition is. If people want the certainty of a nominal payment, they should be made clear that this is at the cost of the possible ambition to keep their purchasing power at a constant level. Also, when people want to chase this indexation ambition, clear should be for them that this implies a more risky investment mix, meaning that the return on investment might be disappointing. The feature in the preference indicator of Verbaal (2011) for example, where people can move the level of certainty up- and down and subsequently, see the effects for the distribution, contributes in making this effect visible. From this, we see that the educational part of the measurement method is from importance. People's attention should be focused on the consequences of their indicated preferences. This is part of the role the pension fund most ideally should play: give individuals understanding and insight about their pension. In order to do so, it is important that these consequences are communicated in terms of outcomes and in real terms. In order to make people more aware of terms like inflation and indexation, giving output in real terms will contribute to the financial literacy. Especially because the nominal and the real contract distinguish nominal and real payments, it is important for comparative purposes. Communication should be in outcomes in order to meet the relevance criterion. The pension topic is about the income when retired, so the consequences of certain preferences should be translated over the long term.

Another feature that we saw in the methods described and that might fit in our criteria and desirabilities presented is that the consequences should be visualized. In that way, we make it more attractive for individuals and it also contributes to the comprehensibleness (Brüggen et al., 2013). The low interest in and low knowledge of the pension topic can be countered through visualization. Also giving feedback on the choices made contributes to the comprehensibleness. In that way, we can check whether the individual really understands it. Also, the measurement method should be as objective as possible. Therefore, using a reference point has implications. The reference point must be set in such a way that it fits the expectation, in order to be honest about an individual's pension income. Reference points that reflect a typical goal or a most ideal but unrealistic outcome are therefore not contributing to the objectivity and the insight-giving aspects of the measurement tool.

Another item that should be taken into account in the risk measurement method is the fact that we want people to bracket the choices broad instead of narrow. In that way, people make choices that are rationally better for them. This can be done by involving also other sources of income for the long term. We can think about housing, for example. When people own a house, this can also be used as a source of income for the long term. People should be made aware of other wealth they may possess in the future and in that way, they can see their dependency of the pension benefit when retired better. This can help them when making decision about their preferred degree of risk in the pension income.

4.3 – Discussion

As already concluded, measuring risk preferences is a difficult task. We were therefore not able to extract a method that can be directly used by pension funds. However, an interactive method which shows the trade-off between expected return and the risk reward seems most promising. When we evaluate the method on the base of our criteria and desirabilties, we see interactive methods like the distribution builder meets the items rather well. It is relevant, because the pension income is showed as an outcome. The outcomes in the tool can be presented in real terms, when we build in an estimated percentage of inflation. It is also rather objective. People can be given a reference point, but this is more to give them an idea of what they can expect. It is therefore important that this reference point is given honestly, also in order to close the expectation gap that is observed in the pension domain. It is also rather comprehensible and contributes to the understanding and insight in the pension domain. People see directly the effect of willing more certainty and the increase in retirement age and additional savings.

The only point that might cause a problem is the attractiveness. People should be explained that the tool contributes a lot to understanding their own pension income, but the threshold to participate in the distribution builder might still be rather high. It takes a lot of time and effort for individuals to participate. A person can also be attracted more extrinsic. This can simply be done by rewarding the members with a small present, in order to push them over the threshold to actively think about their retirement. For new members, the completion of such a questionnaire can also be an obligation when they join a pension fund. In this way, you are able to get individuals to think about their retirement. Also, the development of such a distribution builder might be a large cost for the pension fund. It seems rather clear that the development of customized distribution builders like Verbaal (2011) did is more expensive than gauging risk preferences with a uniform questionnaire.

4.3.1 – Implementation Issues

A solution might be found in putting some degree of paternalism in the tool. As we saw, people do not make decisions that are most optimal for them. With the principles of the government with regard to pension in our mind, a paternalistic role can be played in order to protect people from very unwise decision. For example, we can give images of different distributions, and subsequently the individual picks the one he most likes. When assuming the same financial situation, we can give distributions with different levels of certainty, or different retirement ages. In that way, people are still able to see the effects of changing those aspects on the degree of risk in the investment policy. It does however decrease the time and effort individuals have to spend on working with the distribution builder. In this way, pension funds can also set certain minima in what they think an individual at least needs. A very risky outcome seems unlikely to meet the aim of the pension investment, and therefore this will not be presented as a possible outcome of the distribution builder. People are in this way protected from elderly poverty, because we may assume that the distribution options are in a way designed that it assures a minimal income level that is satisfying for the individual.

Besides different values for the variables that can be changed in the distribution builder, we can also put in some standard economic situations in the tool. For example, one can think of three economic scenarios, indicated as bad, expected and good. In the same image, one can use a red distribution for the bad economic situation, a neutral color for the expected one and a green distribution for the good economic situation. Problem that arises is the question how these financial situations are determined. They can only be based on expectations, when choosing certain values for all parameters that effect the economic situation. How to do this exactly is outside the scope of this paper. However, in order to contribute to the understanding and insight function of a measurement tool and to give the objective situation, it might be good to show the effects of different financial situation on the expected pension income. We see that in the described way, we are able to lower the threshold of the practical use of the distribution builder. Simplifying the use does however not mean that the nice implications of the distribution disappear. People are still able to see the consequences of adjusting some variables on the expectation of the returns.

Besides such an interactive tool with visualization aspects, it might also be worthy to determine risk preferences in an objective, normative way. In chapter 3 we distinguished certain characteristics that influence risk bearing capacity. Important aspects are for example age, education, marital status and potential long term income sources. When a pension fund is able to get information of all members about these specifications, it should be able to determine an expected willingness to take risk on forehand. From this we can see what role the educational part should play. If the expectation really differs from what is coming out as a stated preference when using a measurement tool, we see there is a large role for the educational part a tool can play. By doing it in this way, we can check whether the participant really did understand it. If for example the individual chooses for a risky investment distribution, but out of the objective method it becomes clear that he does not have a large risk bearing capacity, we see that something goes wrong. By making the consequences of certain behavior as visible as we can, the aim is to close the gap as much as possible.

4.3.2 – Translation to the Collective Pension Arrangement

Specific for this context is that it is about a collective arrangement. Individual preferences are applied to the collective arrangement of the nominal and the real contract and should therefore be translated into a collective investment strategy. In the contracts there are no possibilities for individual accounts and therefore, the pension fund can only implement one investment policy. The young generation in the fund has different interests than the retirees. The task for the pension fund is to find a balance between all those interests and translate this into one collective strategy.

One could say that it all comes down to a mean that might be the same for several pension funds. However, as is showed in this paper, there are many characteristics that influence risk seeking behavior. This is in accordance with the recommendation done by Frijns, Nijssen and Scholtens (2010). This commission concluded that the specific characteristics of members in certain pension funds are not translated sufficiently in the investment policy. Also, as observed in the life cycle model, the amount of human capital depends much on the riskiness of the job. Therefore, measuring individual preferences might show these specific characteristics, which subsequently can be taken into account in the determination of an investment policy by the pension fund.

References

Autoriteit Financiële Markten (2007). Visie op open norm zorgplicht bij premieovereenkomsten.

Autoriteit Financiële Markten (2010). Geef Nederlanders pensioeninzicht.

Autoriteit Financiële Markten (2012). Een volgende stap naar meer pensioeninzicht: pensioeninformatie actief gebruiken.

Alserda, G. (2013). Stated, Revealed and normative risk attitudes in the pension domain. Master thesis Erasmus School of Economics, EUR, February 2013

Angrisani, M., Hurd, D. and Meijer, E. (2012). Investment decisions in retirement: The role of subjective expectations. Working paper WP 2012-274, University of Michigan Retirement Research Center

Barr, N. and Diamond, P. (2008). Reforming Pensions: Principles and Policy choices. Oxford University Press

Benartzi, S. and Thaler, R. (1995). Myopic Loss Aversion and the Equity Premium Puzzle. The Quarterly Journal of Economics, Vol. 110, No. 1

Benartzi, S. and Thaler, R. (2001). How much is investor autonomy worth? The Journal of Finance, Volume 57, Issue 4, 1593-1616

Bertaut, C. (1998). Stockholding Behavior of U.S. Households: Evidence from the 1983-1989 Survey of Consumer Finances. Review of Economics and Statistics, May 1998, 80(2), pp. 263-75.

Bleichrodt, H., Pinto, J. and Wakker, P. (2001). Making Descriptive Use of Prospect Theory to Improve the Prescriptive Use of Expected Utility. Management Science 47, pp. 1498-1514

Blinder A. (1988). Why is the Government in the Pension Business? In: Wachter S.M. (ed): *Social Security and Private Pensions*, Massachusetts.

Bodie, Z., Merton, C. and Samuelson, W. (1991). Labor supply flexibility and portfolio choice in a life cycle model. Journal of Economic Dynamics and Control, 16, 427-49

Bodie, Z., Prast, H. and Snippe, J. (2008). Individuele pensioenoplossingen: doel, vormgeving en een illustratie. NEA Paper 10

Boeijen, D., Kortleve, N. and Tamerus, J. (2011). Reële ambitie of nominale garantie? Een kwantitatieve vergelijking. Pension Magazine, 16^{e} jaargang, januari 2011, nummer 1.

Bovenberg, L. and Van Ewijk, C. (2011). Naar een nieuw pensioencontract: over het failliet van het huidige pensioencontract en bouwstenen voor een nieuw contract.

Brüggen, E., Rohde, I. and Van den Broeke, M. (2013). Different people, different choices. The influence of visual stimili in communication on pension choice. Netspar Design Paper 15

Camerer, C. (1998). Prospect Theory in the wild: Evidence from the field. Social Science working paper 1037

Campbell, J. and Viceira, L. (2002). Strategic Asset Allocation: Portfolio Choice for Long-Term investors. Oxford University Press

Centraal Plan Bureau (2013). Generatie-effecten versobering pensioenopbouw. CPB Notitie Feb. 2013

Dellaert, B. & Turlings, M. (2011). Risicoprofielmeting voor beleggingspensioenen. Netspar Economische Adviezen, paper 39

Dohmen, T., Falk, A., Huffman, D., Sunde, U., Schupp, J. and Wagner, G. (2005). Individual Risk Attitudes: New Evidence from a Large, Representative, Experimentally-Validated Survey. IZA DP No. 1730

Donkers, B., Lourenço, E. and Dellaert, B. (2012). Measuring and Debiasing consumer pension risk attitudes. Netspar Panel Paper 28

Donkers, B., Lourenço, C., Goldstein, D. and Dellaert, B. (2013). Building a distribution builders: design considerations for financial investment and pension decisions. Netspar Design paper 20

Donkers, B., Melenberg B. and Van Soest, A. (2001). Estimating risk attitudes using lotteries; a large sample approach. Journal of Risk and Uncertainty, Springer, Vol. 22(2)

Frijns, J., Nijssen, J. and Scholtens, L. (2010). Pensioen: Onzekere Zekerheid. Commissie Beleggingsbeleid en Risicobeheer

Gneezy, U. and Potters, J. (1997). An experiment on risk taking and evaluation periods. The Quarterly Journal of Economics, May 1997.

Goldstein, D.G., Johnson, E. J. and Sharpe, W.F. (2008). Choosing Outcomes Versus Choosing Products: Consumer-Focused Retirement Investment Advice. Journal of Consumer Research, 35(October), 440-456.

Goudswaard, K., Beetsma, R., Nijman, T. and Schnabel, P. (2010). Een sterke tweede pijler, Naar een toekomstbestendig stelsel van aanvullende pensioenen. Commissie Toekomstbestendigheid Aanvullende Pensioenregelingen

Haisley, E., Mostafa, R. and Loewenstein, G. (2008). Myopic risk-seeking: The impact of narrow decision bracketing on lottery play. Springer Science + Business Media, LLC 2008

Hartog, J., Ferrer-i-Carbonell, A. and Jonker, N. (2000). On a simple measure of individual risk aversion. Tinbergen institute discussion paper TI 2000-074/3

Hershfield, H., Goldstein, D., Sharpe, W., Fox, J., Yeykelis, L., Carstensen, L. and Bailenson, J. (2011). Increasing Saving Behavior Through Age-Processed Renderings of the Future Self. Journal of Marketing Research

Holt, C. and Laury, S. (2002). Risk Aversion and Incentive Effects. The American Economic Review, Vol. 92, No. 5

Iyengar, S. and Lepper, M. (1999). Rethinking the Value of Choice: A Cultural Perspective on Intrinsic Motivation. Journal of Personality and Social Psychology, Vol. 76, No. 3

Kahneman, D. and Tversky, A. (1979). Prospect Theory: An Analysis of Decision under Risk. Econometrica, Vol. 47, No. 2

Kortleve, N., Verbaal, G. and Kuiper, C. (2013). Op naar actieve pensioencommunicatie. Inhoudelijke kenmerken en randvoorwaarden van effectieve pensioencommunicatie. Netspar Design Paper 23

Levin, I., Schneider, S. and Gaeth, G. (1998). All Frames are Not Created Equal: A Typology and Critical Analysis of Framing Effects. Organizational Behavior and Human Decision Processes

Lusardi, A. (2008). Financial literacy: an essential tool for informed consumer choice? NBER Working Paper No. 14084

Lusardi, A. and Mitchell, O. (2005). Financial literacy and planning: Implications for retirement wellbeing. WP 2005-108

Markowitz, H. (1952). Portfolio Selection. The Journal of Finance, Vol. 7, No. 1

Mehra, R. and Prescott, E. (1985). The equity premium: A puzzle. Journal of Monetary Economics 15 (1985), 145-61

Ministerie van Sociale Zaken en Werkgelegenheid (2012). Hoofdlijnennota herziening financieel toetsingskader pensioenen.

Moher, E. and Koehler, D. (2010). Bracketing effects on risk tolerance: Generalizability and underlying mechanisms. Judgment and Decision Making, Vol. 5, No. 5, pp 339-346

Montae (2012). Pensioenbarometer 2012. GfK Panel Services

Nijman, T. and Oerlemans, A. (2008). Maatwerk in Nederlandse Pensioenproducten. Netspar NEA Paper 8

Ortec Finance (2013). Een flexibele invulling van het nominale en het reële contract. Position Paper 2013-01

Pijls, A. (2010). De bijzondere zorgplicht van de financiële dienstverlener. Boom Juridische Uitgevers

Prast, H. (2013). Is pensioeninformatie zinloos? Available on: www.radar.nl

Prast, H., Teppa, F. and Smits, A. (2012). Is information overrated? Evidence from the pension domain. DNB Working Paper No. 360

Read, D., Loewenstein, G. and Rabin, M. (1999). Choice Bracketing. Journal of Risk and Uncertainty, 19:1-4; 171-197

Sahm, C. (2007). Stability of Risk Preferences. FEDS, Division of Research & Statistics and Monetary Affairs Federal Reserve Board, Washington D.C., 2007-66

Sharpe, W., Goldstein, D. and Blythe, P. (2000). The Distribution Builder: A tool for inferring investor preferences. Available on: http://www.stanford.edu/~wfsharpe/art/qpaper/qpaper.pdf

Siegel, J. (2007). Stock for the long run: The definitive guide to financial market returns and long-term investment strategies. 2007- Fourth Edition

Slovic, P., Finucane, M., Peters, E. and MacGregor, D. (2004). Risk as Analysis and Risk as Feelings: Some Thoughts about Affect, Reason, Risk and Rationality. Risk Analysis, 24(2), 311-322

Sunstein, C. (2013). Behavioral Economics and Regulation. Oxford Handbook of B:ehavioral Economics and the Law. Draft 2/16/13

Thaler, R. (1999). Mental Accounting Matters. Journal of Behavioral Decision Making, 12: 183-206.

TNS Nipo (2012). Pensioencommunicatie: behoeften en barrières. Juni 2012

Toussaint, J. (2011). Housing Wealth in retirement strategies: Towards understanding and new hypotheses. Sustainable Urban Areas 42

Van der Grift (2009). Pensioenaanspraken en vergrijzing De Nederlandse economie 2008. Centraal Bureau voor de Statistiek

Van Rooij, M., Kool, C. and Prast, H. (2007). Risk-return preferences in the pension domain: Are people able to choose? Journal of public economics 91 (2007) 701-22

Verbaal, G. (2011). The Preference Indicator. An Online Tool for Closing the Pension Expectation Gap. Netspar MSc Thesis 2011-039

Appendix A

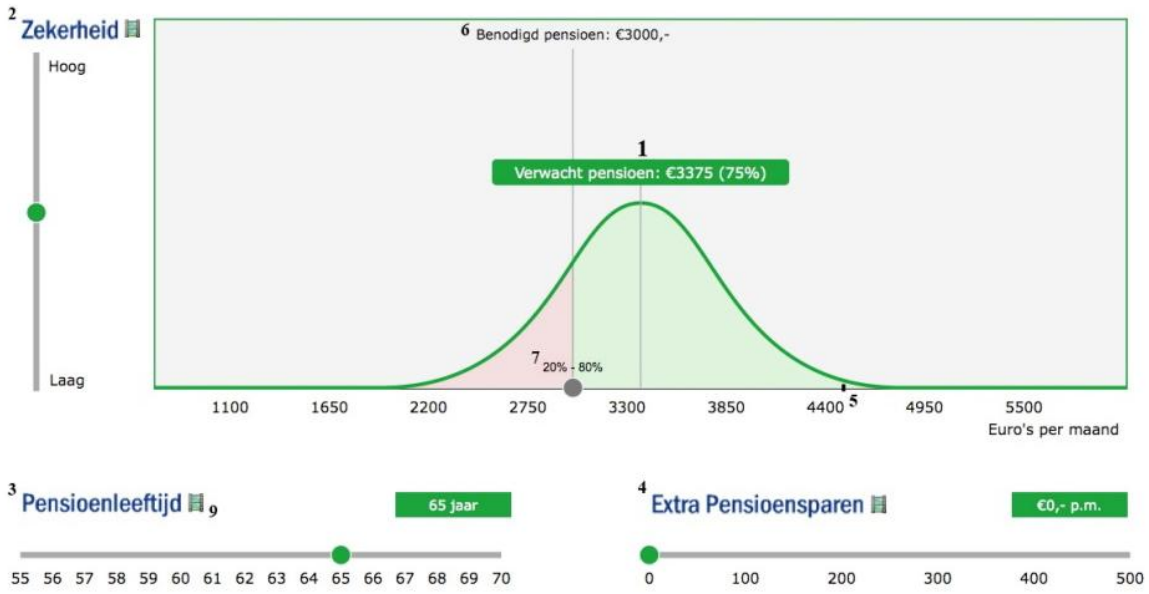

Figure 8 Preference indicator (Verbaal, 2011)

In this figure, the preference indicator of Verbaal (2011) is graphically showed. The initial distribution is based on the five input data. Depending on the choices made, the expected pension is showed. Individuals can make three adjustments. First, they can adjust certainty. When they want a higher level of certainty, the distribution will be narrower, because taking less downward risk implies less upward potential. This also affects pension income. Further, the pension age and the additional pension savings can be adjusted. These both only affect the amount of the expected pension income, not the variability.

In the figure, we see two pension amounts. The one in the green bar is the expected pension income, which is thus based on the choices the individual made. Further, the required pension income is presented. This amount they have to set themselves. In the figure, there are two percentages. The percentage in the red area is the chance that the pension income is lower that the required, the percentage in the green area the chance of getting more than what is required after retirement.

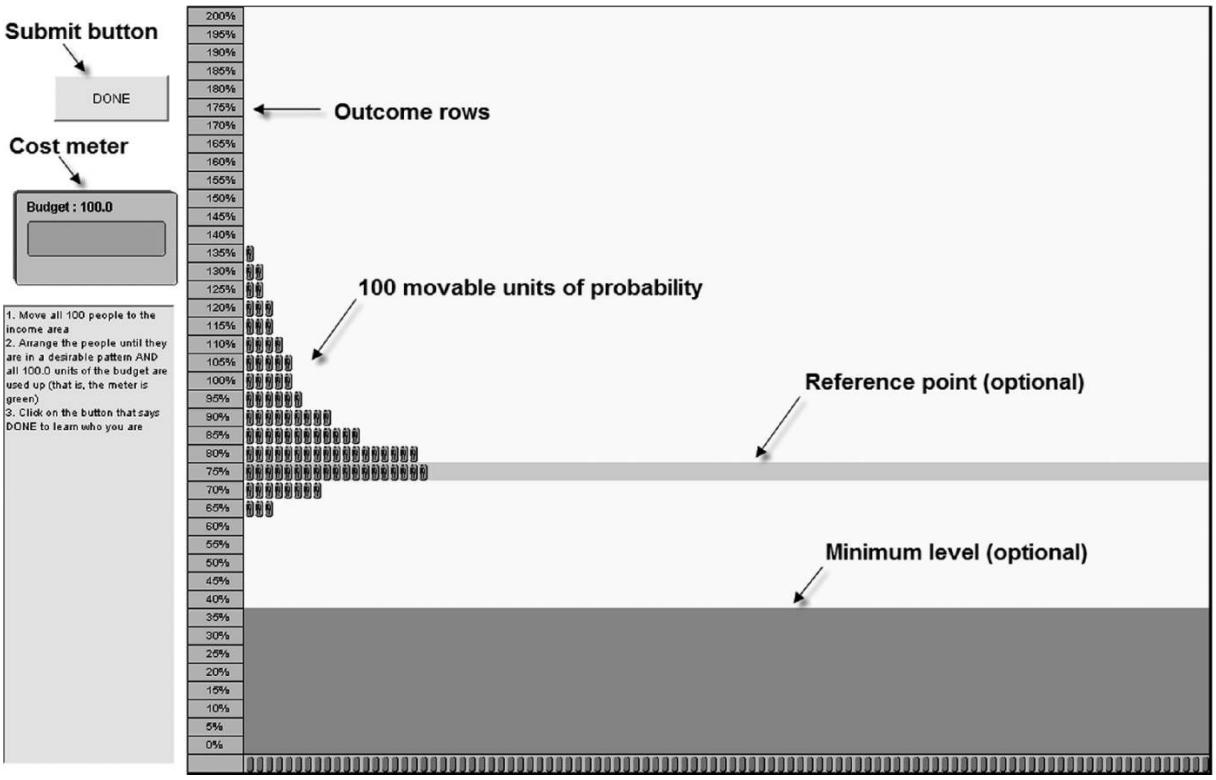

Figure 9 Distribution Builder (Goldstein et al., 2008)

In figure 2, the distribution builder interface of the approach by Goldstein et al. (2008) is displayed. We see on the vertical axis different percentages, representing the replacement rate of the final wage the individual earned. The individual has the option to move 100 units of probability to the different percentages. The cost meter prohibits the possibility to move all units to the highest outcome rows. In that way, people see that upside potential is only possible when accepting downside risk. The reference point and minimal level are optional. They can be used to increase understanding and insight in the topic (reference point) or as a certain degree of paternalism (minimum level).