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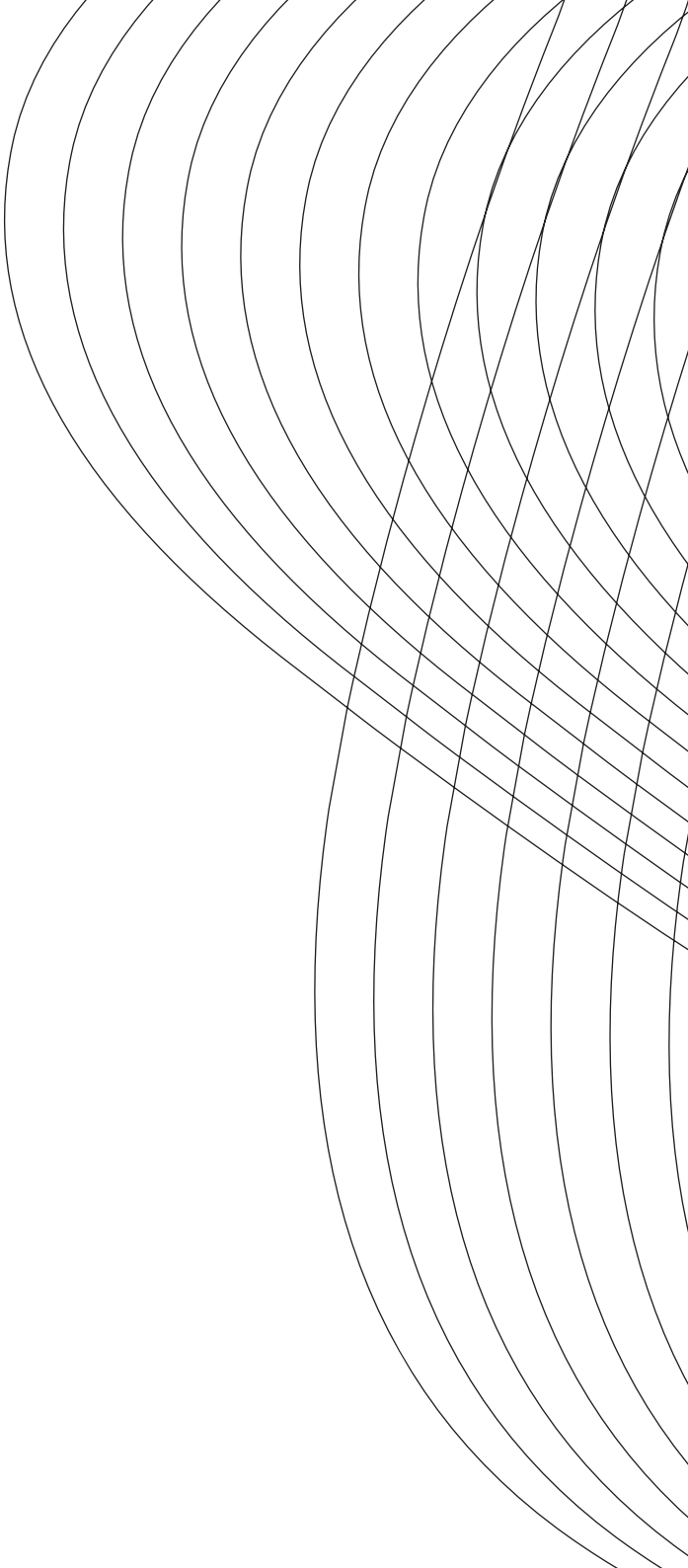
Bas Donkers, Carlos Lourenço and Benedict Dellaert

Measuring and Debiasing Consumer Pension Risk Attitudes



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PREFACE

Netspar stimulates debate and fundamental research in the field of pensions, aging and retirement. The aging of the population is front-page news, as many baby boomers are now moving into retirement. More generally, people live longer and in better health while at the same time families choose to have fewer children. Although the aging of the population often gets negative attention, with bleak pictures painted of the doubling of the ratio of the number of people aged 65 and older to the number of the working population during the next decades, it must, at the same time, be a boon to society that so many people are living longer and healthier lives. Can the falling number of working young afford to pay the pensions for a growing number of pensioners? Do people have to work a longer working week and postpone retirement? Or should the pensions be cut or the premiums paid by the working population be raised to afford social security for a growing group of pensioners? Should people be encouraged to take more responsibility for their own pension? What is the changing role of employers associations and trade unions in the organization of pensions? Can and are people prepared to undertake investment for their own pension, or are they happy to leave this to the pension funds? Who takes responsibility for the pension funds? How can a transparent and level playing field for pension funds and insurance companies be ensured? How should an acceptable trade-off be struck between social goals such as solidarity between young and old, or rich and poor, and

individual freedom? But most important of all: how can the benefits of living longer and healthier be harnessed for a happier and more prosperous society?

The Netspar Panel Papers aim to meet the demand for understanding the ever-expanding academic literature on the consequences of aging populations. They also aim to help give a better scientific underpinning of policy advice. They attempt to provide a survey of the latest and most relevant research, try to explain this in a non-technical manner and outline the implications for policy questions faced by Netspar's partners. Let there be no mistake. In many ways, formulating such a position paper is a tougher task than writing an academic paper or an op-ed piece. The authors have benefitted from the comments of the Editorial Board on various drafts and also from the discussions during the presentation of their paper at a Netspar Panel Meeting.

I hope the result helps reaching Netspar's aim to stimulate social innovation in addressing the challenges and opportunities raised by aging in an efficient and equitable manner and in an international setting.

Roel Beetsma
Chairman of the Netspar Editorial Board

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MEASURING AND DEBIASING CONSUMER PENSION RISK ATTITUDES

Abstract

This panel paper addresses the issue of how best to measure and debias consumer risk attitudes in the domain of pension product decisions. The paper first reviews the academic literature on the measurement of attitudes towards risk. Next, after reviewing past and current approaches to measuring consumer risk attitudes, the paper discusses potential biases in these approaches. A review is also made of the literature on whether or not customers will accept product advice that is based on unbiased measures of consumer risk attititudes. This review may assist firms in understanding why customers may or may not appreciate financial recommendations based on debiased risk profiles. The paper then contrasts the academic state-of-the-art on measuring consumer risk attitudes with current practice in the financial advice industry. The paper concludes by summarizing the different challenges in improving and debiasing risk measurement in pension risk communication.

Policy Implications

The review in this paper yields four specific policy implications for firms currently providing pension products, and provides suggestions to improve risk measurement and debiasing strategies in pension product advice. The first implication is that pension product providers would benefit from developing a measurement approach that allows them to measure consumer preferences for pension product risk in line with the established descriptive models of risky decisions (i.e. Cumulative Prospect Theory (CPT)). The second policy implication is that this measurement approach should be designed such that it can reflect customer risk preferences for the key outcome of interest. In case of pension products, this would have to be the risk involved with the customer's income level *at retirement*. These measurements also will have to be periodically updated to account for shifts in customer risk attitudes (e.g., due to variations in budget allocations). The third policy implication is that there is a need for a new modelling approach that allows firms to provide their customers with recommendations for (a limited number of) investment portfolios on the basis of their individually (CPT-based) debiased risk attitudes. Finally, the fourth implication is that it would be advantageous to pension product providers to design channel interfaces (online, in the real world, or some combination thereof) that can be used to convey (debiased) pension product recommendations to customers in a highly transparent and interactive way to inform and attract customers.

1. Introduction

Most individuals make financial decisions only infrequently, which means that the accumulation of personal experiences with and learning about the relevant financial issues take a great deal of time. As a result, individual investors often resort to professional financial advice. In the US alone, the Financial Planning and Advice Industry is estimated to have a size of 37 billion dollars;[1] 73% of all investors consult a financial advisor before purchasing shares (Hung et al. 2008), and 80% of private investors state that they obtain financial advice from professional advisors or other sources, a proportion similar to that in Germany, Europe's largest economy (Battacharya et al. 2010, Bluethgen et al. 2008; The Investment Company Institute 2007; DABbank 2004).

Furthermore, extensive evidence accumulated over the past decades on the pervasiveness of consumer biases and cognitive and literacy limitations in financial contexts has raised concerns among policy makers, making all the more relevant the challenges and responsibilities for financial advisors (Campbell et al. 2011; see also e.g. Campbell 2006, Barberis and Thaler 2003, Benartzi and Thaler 2007). One such challenge faced by financial advisors is the improvement of risk communication. In fact, the provision of adequate information to consumers tops the list of priorities of the recently created Consumer Financial Protection Bureau in the US (Campbell et al. 2011). Risk communication strategies may be regarded as insurance policies, as they can be seen as fixed costs that can prevent larger damages resulting from biased or sub optimal decisions (Fischoff 1995), and the literature increasingly acknowledges the nuances and difficulties of risk measurement

1 *http://www.ibisworld.com/industry/default.aspx?indid=1316* (c.f. Battacharya et al. 2010)

and communication (e.g. Peters et al. 2007). For instance, risk preferences are deemed to be profoundly influenced by the way in which information is presented or "packaged" (e.g. Mauboussin 2002), and (visual) presentation of numerical information can increase comprehension and perception of risks (Lipkus and Hollands 1999, Stone et al. 2003, Chua et al. 2006).

This panel paper aims to discuss and enhance our understanding of a critical component of risk communication that is faced by financial advisors, which is the responsibility to measure and – where possible – debias consumer risk attitudes in financial choices (Mullainathan et al. 2009). This will help investors to correctly identify their risk preferences (Bluethgen et al. 2008). The prevailing notion is that risk advice could stand improvement, considering how complex risk decisions (including those related to pension and retirement) are for individuals (Merton 2006). Bodie (2002), for instance, argues that the general public has a limited ability to perform complex investment tasks (e.g., for retirement), and lacks training to handle and understand financial risk.[2] Improving investment advice is even more challenging, as there is a clear discrepancy between the descriptive and prescriptive models for decision making under risk (Bleichrodt et al. 2001). As a consequence, stated preferences often suffer from biases that should be corrected before proper advice can be given.

Sharing this view and making use of a marketing-based perspective, we conjecture that effective debiasing of risky decisions entails an accurate measurement of the risk profile of individual investors, which should be the basis of good decision

2 In this vein, Robert Merton and colleagues have recently patented a tool designed to offer financial advice regarding investment for retirement (US patent 2010).

support and risk communication. Specifically, the assessment of an investor's risk profile should guide the set-up of investment alternatives for consideration and the composition of a financial portfolio, which – by meeting the needs of individual investors revealed by their risk profiles – should greatly improve communication.

With these purposes in mind, the paper begins by reviewing the academic literature on measurement of attitudes towards risk and uncertainty[3]. Next, after reviewing past and current approaches to measuring consumer risk attitudes, the paper reviews potential biases in these approaches. Also reviewed is the literature on whether or not customers will accept product advice that is based on unbiased measures of consumer risk attitudes. This review can assist firms in understanding why customers may or may not appreciate financial recommendations based on debiased risk profiles. The academic state-of-the-art on measuring consumer risk attitudes is then contrasted with current practice in the financial advice industry. The paper concludes by summarizing the different challenges in improving and debiasing risk measurement in pension risk communication – for example, by the use of preferred pension outcome distributions (Goldstein, Johnson and Sharpe 2008).

3 To simplify the discussion, we do not distinguish between risk and uncertainty. Refinements in this direction are possible; see, for example, the recent work by Abdellaoui et al. (2011).

2. Consumer attitude towards pension risk – an overview

Risk and uncertainty play a dominant role in pension decisions. While in day-to-day life many people take an occasional gamble, the common view is that pension risks are to be avoided unless substantial rewards are provided for taking those risks. A consumer's risk attitude towards his or her pension income could be loosely defined as a summary measure of the consumer's evaluation of the (un)attractiveness of different possible levels of risk involved in receiving his or her target income. Ideally, a measure of this risk attitude should be informative about the consumer's behaviors with regard to risk. Note here that there is a distinction between the consumer's *actual* behavior (as reflected in his or her attitude) and the consumer's *optimal* behavior (which would be normatively prescribed). This distinction is particularly relevant because actual behaviors are often suboptimal, due to biases or misperceptions that affect the decision process (Bleichrodt et al. 2001; Kapteyn and Teppa 2011; Van Rooij, Koolen and Prast 2007).

2.1 Expected Utility Theory (EUT) and Cumulative Prospect Theory (CPT)

Early research on consumer risk attitudes focused on Expected Utility Theory (EUT), which was developed by Von Neumann and Morgenstern (1947) and still serves as a normative benchmark of consumer risk behavior (Bleichrodt et al. 2001). EUT was the first model that enabled the quantification of risk attitudes. Within this framework, risk attitudes are quantified by the shape of the utility function, resulting in the well-known Arrow-Pratt measures of *absolute* and *relative* risk aversion, $-U''(x)/U'(x)$ and

$-xU''(x)/U'(x)$, respectively, which can be used to describe optimal consumer behavior.

However, starting with the work by Allais (1953) (and followed by many others), the normative expected utility model was rejected empirically as a descriptive model of consumer behavior. These findings led to several competing models that describe decision making under risk and uncertainty. Eventually, the most prominent and successful descriptive model has become Cumulative Prospect Theory (CPT) which was developed by Kahneman and Tversky (1979) and Tversky and Kahneman (1992). Interestingly, even though CPT has been widely accepted as a valid descriptive model of consumer behavior, the EUT model is still regarded by most to be the correct normative model (see Bleichrodt et al. (2001) and the references therein). This suggests that there is a discrepancy between the way in which most individuals evaluate decision alternatives under uncertainty and what would be considered the normatively correct way of evaluating such alternatives. Debiasing consumers' evaluations and providing recommendations based on these debiased evaluations can be one way to overcome this discrepancy.

In EUT, each outcome (or more specifically, the utility derived from that outcome) is assigned a weight that corresponds to the objective probability that this outcome will occur. Using this appropriately weighted average, the expected utility value can be computed as

$$EU = \sum_j p_j U(x_j).$$

In the original formulation of prospect theory (Kahneman and Tversky 1979), the weight assigned to (the utility of) each of the possible outcomes is no longer the objective weight, but a subjective weight. The most important feature of these weights

is that low-probability events receive disproportionately more weight than high-probability events. This original formulation, however, leads to some undesirable and unrealistic features of the model. Most importantly, it results in violations of first-order stochastic dominance, which means that lotteries can be constructed—where a lottery with lower payoffs is preferred over one with higher payoffs.

As a solution to this undesirable property, CPT was developed (Tversky and Kahneman 1992). CPT assigns weights based on a transformation of the cumulative distribution function following the earlier work of Quiggin (1981) and Schmeidler (1989), for example, who proposed the use of rank-dependent preferences. Formally, this can be expressed as follows. Let the outcomes be ordered from the highest (x_1) to the lowest (x_j), as the weights used in computing the "expected" value will depend on the ranking of the outcomes.[4] The resulting representation of the evaluation of a risky outcome is then given by

$$\sum_j \pi_j v(x_j),$$

with $\pi_1 = w(p_1)$ and for all $j>1$ $\pi_j = w(\sum_j^{k=1} p_k) - w(\sum_{j-1}^{k=1} p_k)$,

with $w(.)$ representing the transformation function. In case $w(x)=x$, this representation is the same as EUT.

Another major difference between the typical use of EUT versus CPT is the shape of the function that links outcomes x_j to values/utilities $v(x_j)$. While EUT is traditionally associated with a utility function that assigns utility levels of the outcome x_j independent

4 In the discussion of the probability-weighting function, we focus on the case where all outcomes are perceived as gains. In CPT, there are different weighting functions for gains and losses. This is discussed in more detail in Tversky and Kahneman (1992), and an empirical examination of the differences is provided by Abdellaoui et al. (2005).

of the specific context, CPT assumes reference-dependent preferences in combination with loss aversion The next two subsections explain in more detail what these two characteristics of the probability-weighting function *w(.)* and of the value function *v(.)* in CPT entail. See Wakker (1994) for an axiomatization of risk attitudes resulting from each of these two components.

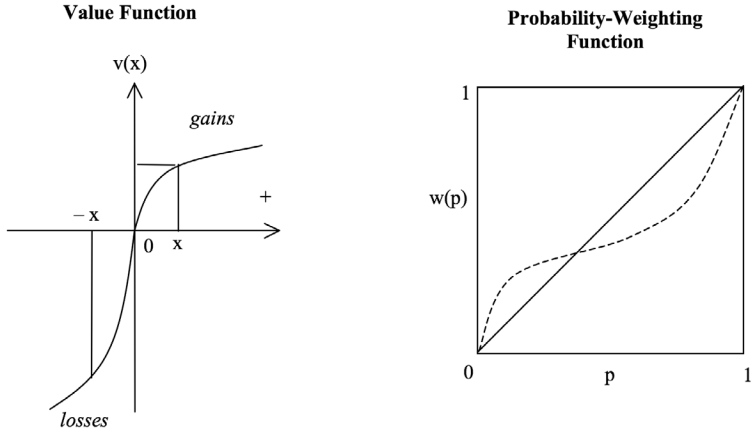
2.2 Disentangling the components of CPT

2.2.1 CPT probability-weighting function

The experiment by Allais (1953) triggered the idea that – descriptively – low-probability outcomes receive more weight in consumer evaluations than they actually should in the process of making a normative decision. Subsequent research validated this notion, mostly by the use of (hypothetical) lotteries where the low-probability events studied were also the extreme events (e.g. a very small chance of winning a million dollars). The weighting function *w(.)* in CPT accommodates the finding that extreme events with a low probability receive more weight than they should, without assuming that *all* low-probability events receive too much weight. In CPT this is achieved by transforming the cumulative distribution function instead of the individual outcome probabilities. Figure 1 highlights the main characteristics of the CPT weighting function.

First, recall that weights are assigned starting with a transformation of the probabilities for the largest outcomes. The probability-weighting function in Figure 1 then shows how CPT can explain participation in a low-probability lottery, as a low probability of winning the prize gets transformed into a substantial decision weight. For small probabilities of winning a prize, $w(p)>>p$, which is represented by the steep slope of *w(.)*

Figure 1: Graphical example of CPT value function (left) and probability-weighting function (right).



near 0. At the other end of the probability range (so, near 1) the slope is also very steep. This suggests that a small probability on the worst outcome also receives more weight than it objectively deserves. With the extreme outcomes receiving unduly large weight, the intermediate outcomes receive relatively low weight, corresponding to the rather low slope of *w* in the range from 0.1 to 0.6. Overall, individuals will thus pay too much attention to the extreme outcomes and much less to the intermediate outcomes.

2.2.2 CPT value function

An important aspect that differentiates the CPT value function from traditional utility functions is that outcomes are evaluated relative to a reference point. In many of the gambles used in developing and testing CPT, such a reference point is fairly natural and often equal to a zero payoff. In real-life situations, the reference point is often far more ambiguous. With regard to pension decisions, for example, individuals may consider a yearly net retirement

income of 70% of their last earned salary to be a natural reference point, or they may consider 70% of their average salary, or some other income level. The presence of a reference point is important, as it has strong implications for the evaluation of an outcome, relative to the reference point. In particular, outcomes below the reference point will be perceived as a *loss*, while outcomes above the reference point will be perceived as a *gain*. Normatively, such reference points should not affect consumer trade-offs of the payoffs. However, one of the important experimental findings pertaining to the evaluation of gains and losses is that people tend to perceive losses as having greater impact than gains. That is, losses loom larger than gains. This phenomenon is called loss aversion, and occurs not only in risky choices, but also in other, riskless, contexts (Tversky and Kahneman 1991).

The typical shape of the value function used in CPT is depicted in the left panel of Figure 1. This value function exhibits loss aversion— as for every gain (say, x) the value of that gain is smaller in absolute size than the value assigned to an equally large loss (that is, $v(x)<-v(-x)$). What also becomes immediately clear from this graph is that the value function is concave in the domain of gains, but convex in the domain of losses. The intuition behind this is that there is in general a diminishing marginal sensitivity to changes (Prelec and Loewenstein, 1992). When it comes to characterizing risk attitudes, however, the curvature is very important, as can be seen from the Arrow-Pratt measure of risk aversion defined above. Using this measure of risk aversion, individuals tend to be *risk averse* in the domain of gains, but *risk seeking* in the domain of losses. As a consequence—depending on the context and the actual customer preferences being measured—caution is advised in loading large risks on customers in the domain of losses.

2.3 Alternative views on risk attitudes

Many decisions made under uncertainty deviate from classical normative expected utility models in economics in the way described by CPT. Yet, an additional reason for this discrepancy between EUT and actual consumer decisions was proposed by Weber and Hsee (1998), who relate these deviations to the *perception of risk* held by individuals. If an individual perceives a high-variance option to be less risky, he or she may choose this option and thus should be classified as a 'perceived' risk-averse investor (Weber and Hsee 1998). Entrepreneurs, for instance, have been found to have the same risk-taking propensity as other managers, but, as it turns out, they exhibit overly optimistic judgments of risk (Cooper, Woo and Dunkelberg 1988) and appear to be risk lovers. Empirical studies have suggested the existence of a relationship between risk perceptions and financial measures of risk (e.g. Weber and Hsee 1998), but despite recent empirical evidence documenting the effects of perceived risk on risk preferences, we know little about the factors governing the formation of such perceptions of risk. For example, it could very well be the case that the observed optimism of entrepreneurs is driven by a more elevated probability-weighting function (e.g., Gonzalez and Wu 1999).

One final framework to describe how consumer decision making under risk deviates from EUT assumes that individuals choose in order to minimize the (expected) regret that they will feel ex-post (Bell 1982). In this framework, the outcomes of all alternatives serve as reference levels from which one might regret a choice in case the alternative choice would have resulted in a higher payoff. This framework has also been frequently applied in the context of more general consumer choices (Van Dijk and Zeelenberg, 2005) —but often in an informal way, making it less suitable as a framework for the construction of (financial) advice for customers.

3. Measuring Risk Attitudes

Given that a functional form is established for risk evaluations, the question of how to measure risk attitudes is challenging because different methods are likely to induce their own set of idiosyncrasies inherent to the specific approach that is taken, thereby carrying advantages and disadvantages. The approaches towards measuring risk attitudes may be classified in two categories: (1) direct attitudinal scales that capture risk preferences, and (2) choice-based approaches to infer risk preferences.

Whereas methods that employ direct attitudinal questions enjoy great flexibility due to their ease of implementation across different contexts (possibly the reason why they are extensively used in practice), they suffer from the serious well-known shortcomings that plague self-reported measurements (e.g. social desirability bias, weak relation with actual behavior and low predictive validity). Methods able to better capture actual risk-taking behavior, as expressed in choices, are generally considered superior methods, and choices among alternative gambles associated with specific outcomes have become the academic standard for the study of decision making under uncertainty and risk.

3.1 Direct attitudinal questions: generic- and context-specific measures

Risk perceptions are typically measured by direct attitudinal questions, which can be broadly classified into generic and context-specific, depending on whether risk is viewed as a multidimensional concept. One of the most general measures of an individual's risk attitude is the sensation-seeking scale

developed by Zuckerman et al. (1978). The scale measures an individual's tendency to prefer risky or safe courses of action in life. Typical questions in this measure include "I can't stand watching a movie that I've seen before" and "I often wish I could be a mountain climber", which individuals answer to on a Likert scale.

Risk can also be conceptualized as a multidimensional construct (e.g. Goldstein et al. 2008) – and (perceived) risk and risk-taking behavior may thus depend on the specific context in which risky decisions are made. Weber, Blais and Betz (2002) recently constructed measurement scales related to domain-specific risks such as financial (further divided into investments and gambles), recreational, social, health and ethics. In a study of the multidimensional risk related to cigarette smoking, Rindfleisch and Crockett (1999) examined the perceived risk with regard to different types of consequences: addiction, finances, health, time and social. Perceived risk has also been suggested as being linked to emotional responses, in a view of risk as 'feelings' as opposed to risk as 'analysis' (see e.g. Loewenstein et al. 2001 and Slovic et al. 2004).[5]

3.2 Choice-based approaches

3.2.1 Arbitrary sets of independent gambles

In the context of EUT, rather straightforward questions could be used to infer risk attitudes, resulting in the development of certainty equivalence and probability equivalence questions. The

5 Another risk dimension that may be at play, especially in the context of pension plan decision making, is that of biological risk. On top of the various risk dimensions, individuals' characteristics (e.g. age, gender) and cognitive styles (e.g. need for control, elaboration on potential outcomes; see Nenkov et al. 2008) may further lead to differences in perceived risks.

fact that EUT poorly describes the actual choices made, however, results in rather different results, depending on the questions that were asked (Farquhar 1984, Hershey and Schoemaker 1985). Still, arbitrary sets of lotteries can also be informative about the CPT functions.

Using such sets of arbitrary lotteries, in combination with parametric assumptions on the shape of the utility function, Hartog et al. (2003) linked these risk-attitude measures to individual characteristics. In the context of prospect theory (again making use of parametric assumptions on the shapes of these functions), Donkers et al. (2001) linked the main characteristics of the value function and probability-weighting function to individual characteristics.

3.2.2 Systematically generated repeated gambles

In a quest for more precise insights into the shapes of the value function and the probability-weighting function, researchers have developed specific combinations or chains of lotteries. The answers to these sets of lotteries allow for the nonparametric identification of the shapes of the CPT functions. Examples of such methods include not only the well-known trade-off method (Wakker and Deneffe 1996), but also work by Abdellaoui et al. (2007), Abdellaoui et al. (2008) and Van de Kuilen and Wakker (2011), which have focused on inferring the shape of the CPT functions.

One of the most frequently used methods to elicit individual risk-attitude measures is the approach used by Holt and Laury (2002), in which a sequence of choices between pairs of lotteries is presented in a list. In this sequence of lotteries, one of the options typically has more variability in the payoffs and also starts with a lower expected payoff. Proceeding down in the list of pairs of

lotteries, the expected payoff of the option with more variability is increasing faster than that of the other option. Only an extreme risk seeker would prefer option B over option A in the first choice set. Further down the list, option B becomes more attractive, and in the final choice set option B is strictly better than option A. The point in the list at which somebody switches from option A to option B is informative about the risk attitude of that person.

An alternative approach is to work with chained lotteries that are constructed to permit estimation of rank-dependent utility models, including the well-known Cumulative Prospect Theory (Tversky and Kahneman, 1992). A representative approach in this line of research is the trade-off method of Wakker and Deneffe (1992). For this method, a researcher selects two reference levels, r and R, with $R>r$. For a given probability p and outcome x, questions are asked to establish the value of X that results in indifference between $(X,p;r)$ and $(x,p;R)$, where a lottery $(z,q;w)$ has a probability q of winning prize z, and otherwise prize w is obtained. In the second step, p, r and R are kept the same, a value for y (not equal to x) is chosen and again questions are asked to establish the value of Y that results in indifference between $(Y,p;r)$ and $(y,p;R)$. The benefit of keeping p, r, and R the same is that even under rank-dependent utility models, it has to hold that $u(X)-u(x) = u(Y)-u(y)$.

Chaining these lotteries and using the value for X obtained in the first question as the value for y in the second question (and repeating this in subsequent questions) provides a sequence of answers $X1, X2, X3,...$ with the property that $u(X1)-u(x)=u(X2)-u(X1)=u(X3)-u(X2)$, and so forth. In other words, the utility differences between each pair of subsequent answers are the same. To support respondents in answering the indifference questions, either a sequence of choice is used that converges to

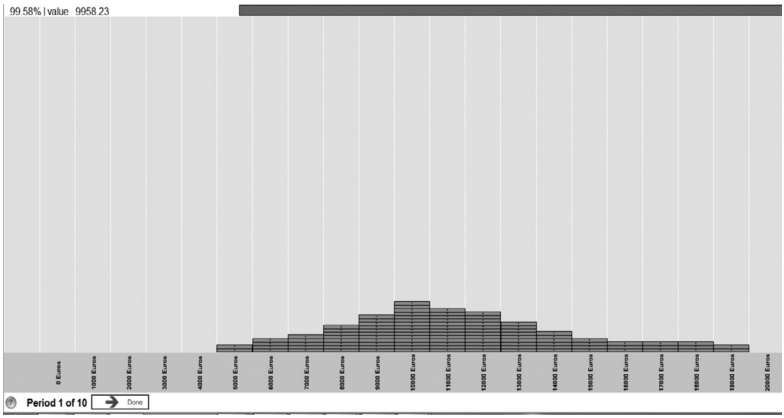
indifference, or more elaborate graphical displays are used, like the one below.

A disadvantage of these methods is that they rely on a chain of risky choices, where the answers to one lottery question are used to construct the next question. This may introduce *error propagation* and lead to imprecise inferences (e.g. Wakker and Deneffe 1996). Moreover, chained lotteries often suffer from the so-called *incentive compatibility* problem (see Harrison and Rutstrom 2008). This problem results in "strategic misrepresentation," where "subjects have a transparent incentive to overstate the first value of (the prize or outcome), and indeed all other elicited amounts" (c.f. Harrison and Rutstrom 2008). That is, individuals have an incentive to overstate the amount of money they require to be indifferent between initial risky prospects, as this raises the expected payoffs in later rounds of the chained sequence of lotteries. Finally, standard 'gamble tasks' (chained or otherwise) are also known to suffer from biases that result from too strong a focus on either probabilities or outcomes (Hershey and Schoemaker 1985).

3.2.3 Distribution builder

The starting point of a relatively recent method, the distribution builder (DB), is the notion that preferences are or can be constructed. Preference construction methods are dynamic in nature, in that preferences are the result of a behavioral learning process by the individual decision maker that takes place in an interaction between the individual and the choice environment. Therefore, the DB approach was developed to allow for interactions between subjects and the risk-preference measurement tool in a number of practice rounds. In the financial investment context, individuals using the DB interface build their

Figure 2: An example of a constructed outcome distribution in the DB interface



most-preferred probability distribution of payoffs/income under a budget constraint.

Individuals using the DB interface are typically asked to build their most-preferred future (pension) income distribution under a budget constraint. They can do so by moving markers in an interactive user interface to choose their most-preferred risk-payoff structure. Each marker in the DB interface represents a state of the world. The preferred configuration of the markers on the interactive DB graph – subject to a budget constraint – is determined by the trade-offs a consumer makes in terms of expected income and expected income variability. Figure 2 illustrates a possible configuration by an individual in a basic version of a DB interface.

Payoffs in the DB interface are priced using state prices, which are ordered from high to low, corresponding to increasingly better states of the world. 'Better' refers to the situation in which asset returns are relatively high, compared to not-so-good states of the

world. The intuition that state prices are lower in better states is that guaranteeing (insuring against) a payoff in a bad state of the world (low asset returns) is more expensive than guaranteeing the same payoff in a good state of the world.

Assuming that utility does not depend on the materialized state of the world (which seems a reasonable assumption), it is possible to estimate a consumer's risk attitude and extent of probability bias, as expected utility will depend only on the distribution of the possible outcomes. Under the DB approach, one does not need to consider which outcome to assign to what state of the world, because the cheapest way of generating a specific outcome distribution requires the most expensive states to be assigned the lowest outcomes; see Sharpe et al. (2000) for more details.

Sufficient variation in the DB approach to allow for the estimation of both the parameters describing risk preferences and the parameters describing the extent of probability weighting can be achieved by experimentally asking individuals to construct their preferred outcome distributions in multiple relevant scenarios. For instance, in the DB tasks, the researcher can vary the available investment budget or the market conditions such as the return of investment (which affects state prices). By changing the instructions leading up to the DB use or graphically including a reference point in the DB-graph, researchers can also test the impact of different reference points (e.g., "typical" market returns) on individuals' preferred outcome distributions in the DB task.

Both the DB approach and the 'repeated gambles' approach have typically been employed without being incentive compatible. That is, tight research budgets do not allow setting monetary incentives that replicate in the laboratory the high stakes that may be encountered in a real setting. Research has

shown, however, that behavior in the lab comes quite close to theoretical predictions. Moreover, both methods overcome the disadvantages of self-reported attitudinal measures in which no actual choices are observed. The key difference between the two choice-based methods is that while gambles often induce a focus only on the probabilities or on the outcomes, the distribution builder approach forces respondents to combine probabilities and outcomes.[6]

6 Recent research using choices over gambles has looked at the differences in individual-level parameters describing risk preferences and parameters describing the extent of probability weighting—not only in a descriptive context that emphasizes probabilities but also in a context where outcomes can be experienced (Abdellaoui et al. 2011). Although this recent research underscores the importance of focusing on both probabilities and outcomes, it uses lengthy sequences of choices over gambles that are time consuming and cumbersome, and difficult for individuals to negotiate. Moreover, it also still suffers from the drawbacks mentioned above (namely, error propagation).

4. Debiasing Risk-Attitude Measures

While CPT is the benchmark when it comes to describing consumers' actual behavior towards risk, EUT remains the normative prescriptive benchmark. Therefore, in order to provide individuals with investment advice about what they *should* do, a prescriptive model based on EUT may be more desirable than a CPT-based model. Obtaining such a model, however, requires excluding biases such as probability weighting and loss aversion in the recommendation (see Bleichrodt et al. 2005 for a detailed discussion on the normative versus prescriptive nature of CPT and EUT). Which aspects of consumer attitudes towards risk should be labeled as non-normative and how they can be corrected is a challenging issue.

Academic work accumulated over the past thirty years has established the value- and probability-weighting functions of the CPT model (see sections 2.1 and 2.2) as describing consumer preferences for risk (see Abdellaoui et al. 2011). As mentioned, the descriptive CPT model has three main components that deviate from the normative EUT model: (1) a reference point to which outcomes are compared and encoded as either gains (above the reference point) or losses (below the reference point), (2) a non-linear value function that is steeper in the domain of losses than in the domain of gains, reflecting loss aversion, and (3) a probability-weighting function representing consumers' transformation of objective probabilities. From a debiasing perspective, the first two deviations from the optimal risk behavior relate to the influence of the (often arbitrary) reference point on the evaluation of the outcomes, while the third issue is markedly different and relates to the probability dimension of risky behavior and the corresponding decision weights.

4.1 Correcting for reference-point effects

Although it is rarely the case that there should be a specific unique point at which a change in income would have strong consequences for a consumer that would not occur at other closely adjacent values (e.g., a pension income of 70% vs. 69% of the average wage is unlikely to have dramatically different consequences for an individual's life style), framing outcomes as either 'gains' or 'losses' in relation to a specific reference point is still intuitively reasonable. We propose therefore that corrections for reference-point effects should be made in consumer advice insofar as these reference points are "real". This implies that arbitrary reference points that are, for example, induced by the preference elicitation technique, should be avoided because they will not occur in the real world. At the same time, some outcomes might actually be below a certain point of reference that is indeed problematic to the consumer—and these should really be coded as a loss. Such reference points should pertain to highly impactful outcomes, such as receiving an income shock that forces one to sell one's home or a health state that has a negative quality of life.

Taking the viewpoint of constructed preferences, and when using a detailed preference elicitation task such as the DB approach, where one is able to construct an individual's preferences, we suggest aiding individuals in establishing those reference points that would really affect their lives. When multiple reference points are established, most intermediate outcome levels will not be perceived as a strict gain or a strict loss. Instead, they will be a loss with respect to some of the reference points in the distribution and a gain with respect to others. We therefore expect that, between the few high-impact reference points, it is unlikely that very strong kinks in the utility function will be

observed. Thus, in most contexts, and depending on the relevance of the reference points in a given decision, one most likely would wish to debias for other "non-normative" deviations. Still, in case outcomes are coded as losses, and risk-seeking in the domain of losses is observed, one might want to be cautious in recommending extensive risk-taking behavior.

4.2 Correcting for biases in probability weighting

As proposed by the CPT model, probability weighting is the result of a misperception of the objective probabilities of outcomes and reveals a distortion in how risk information is integrated in the decision-making process: a bias that individuals are usually not aware of or have a hard time correcting for. Take the example of risk taking in gambles with small probabilities, such as playing the national lottery. Despite the fact that participation is costly, and hence individuals should properly obtain and process all relevant information about the payoffs, most individuals largely overestimate the probability of winning (Rogers 1998).

An important feature of the probability-weighting function is that the weights used in a decision do not correspond to the relative importance each outcome should have, in case one would want to maximize expected utility. From a normative viewpoint, each potential outcome should receive a weight that is proportional to its true, objective likelihood of eventually occurring.

In sum, we propose 'debiasing' the behavior that is captured by CPT to generate investment advice that is normative in nature, so that it describes what people 'should' do more than what they 'naturally' do. Crucial in any debiasing procedure that corrects for probability misperceptions is that one ends up estimating flexible value functions that allow for non-linear shapes and "kinks"

at the relevant reference points (see the left panel of Figure 1). 0therwise, when the researcher imposes a particular form on the functions representing how individuals value outcomes, this imposed form could mask the extent to which the probability weighting of such individuals deviates from the objective probabilities, which results in misguided advice.

5. Consumer acceptance of debiased advice

Normatively, individuals should recognize the superior value of a debiased distribution. Therefore, they should always choose the debiased advice alternative, regardless of the scenario in which they find themselves (three experimental conditions: (a) bias is not communicated, (b) bias is communicated without explanation and (c) bias is communicated with explanation). Within this perspective, any additional information is merely redundant or reassuring at best.

It is reasonable to expect, however, that there will be departures from full acceptance of advice, and that there will be differences in advice acceptance rates across different scenarios. Two main mechanisms serve as a guiding principle for our predictions: 1. In general, most individuals will fail to recognize the optimality of the advice alternative and will discount the value of the advice they receive (i.e., egocentric discounting of advice), and 2. Individuals' responsiveness to advice will differ, depending on personal characteristics (i.e. heterogeneity in advice acceptance).

5.1 Advice discounting

A common feature of advice seeking, information acquisition and persuasive advertising is the fact that initial beliefs are integrated with the incoming new evidence. Yet, advice differs from promotion and communication or persuasive advertising, in the sense that advice is not considered manipulative or invasive but rather aims at improving decision quality (Yaniv 2004). Schrah, Dalal and Sniezek (2006) further highlight the fact that advice is *prescriptive* or evaluative in nature and more easily associated with a third party. Hence, when the advice is sought

after, following the advice implies a shared responsibility for the outcome of a decision between the advisor and the customer receiving the advice (Harvey and Fischer 1997). A prominent finding in the advice-taking and decision-making literature is that of so-called "egocentric" advice discounting, a term that is used in the psychology literature to express the tendency of individuals to overweight their own opinion relative to that of an advisor (Bonaccio and Dalal 2006; Harvey and Fischer 1997, Yaniv and Kleinberger 2000). Individuals engage in egocentric advice discounting because they have access to their own reasons and motivations leading to a particular decision, but do not have access to the reasons and motives justifying the advisors' decisions (Yaniv 2004, Yaniv and Kleinberger 2000). As a consequence, individuals tend to remain faithful to their initial decisions and are resistant to shifting in the direction of any particular advice.

Advice discounting is stronger for novice rather than expert advice (Goldsmith and Fitch 1997), and has been found to be more pronounced for larger expertise discrepancies (e.g. Harvey and Fischer 1997, Sniezek, Schrah and Dalal 2004), which results from the difference between the expertise of an individual and that of an advisor. In the context of financial decision making, individuals' expertise may be assessed by means of their financial literacy (e.g. Lusardi and Mitchell 2011, Lusardi, Mitchell and Curto 2010). Given the relatively low level of financial expertise of most individuals, this also implies that they may not be able to assess the value of financial advice. If indeed, a large expertise discrepancy results in more discounting of the advice, those most in need of decent advice (the financially illiterate) will use it the least.

5.2 Heterogeneity in consumer advice acceptance

Several individual differences may help in explaining heterogeneity in advice acceptance. This section focuses on locus of control, need for cognition and cognitive styles, need for closure, self-esteem and gender and income. An individual's Locus of Control (Rotter 1966) is generally expected to affect advice discounting and the acceptance of advice. Individuals tend to have a locus of control that is either internal (feeling responsible for one's welfare) or external (feeling that outcomes in life are determined by forces beyond one's control – luck, fate, other people). Autonomy (i.e. people's longing to feel like they are the origin of their own actions, and have a voice in determining their own behavior; see e.g. Koestner and Losier 1996, Deci and Ryan 1987) has been related to expert advice (c.f. Bonaccio and Dalal 2006). Also, locus of control has been found to affect information search behavior, with 'internals' tending to search more for information than 'externals' do (Narasimhan and Tikoo 1992). Hence, 'internals' may on the one hand be expected to discount advice more strongly than 'externals' – due to their need to feel responsible for their actions and choices. On the other hand, however, if the advice is perceived to have informational value, 'internals' may discount advice to a lesser extent than 'externals' do. Which of these effects prevails is an empirical question, and it may be worth noting that locus of control might in itself be related to individuals' risk.preferences.

Intelligence has been related to advice discounting (c.f. Bonaccio and Dalal 2006), and it is reasonable to expect that individuals' Need for Cognition (i.e. the tendency to engage in and enjoy activities that are cognitively demanding; Cacioppo, Petty and Kao 1984) will also impact the discounting and acceptance of advice. In the context of advice conveyed through

an objective online decision-support system, advice discounting may be expected to be lower among high-need-for-cognition individuals – who focus more on relevant arguments (central route to persuasion) – than among their lower-need for cognition counterparts – who focus more on peripheral cues (peripheral route to persuasion), such as source attractiveness. In other words, individuals with high need for cognition are expected to have higher rates of advice acceptance.

Another important psychological variable that has been found to be related to advice taking and task persistence is an individual's self-esteem (McFarlin, Baumeister and Blascovich 1984). Self-esteem may have an important influence on the extent of advice discounting. We expect egocentric advice discounting – overweighting of one's opinions and choices – to be higher among individuals with high self-esteem. In other words, individuals with high self-esteem are less likely to shift their choices towards the advice. However, self-esteem may act in the opposite way, in the sense that an individual with high self-esteem may feel less affected by changing his or her opinion in the advisor's direction. In this case, an interaction between internal locus of control and self-esteem can be expected.

In addition to these psychological traits, an individual's gender and income can be expected to affect advice taking, especially in the context of financial decisions. Compared to men, women have been found to be less certain about their ability to handle financial matters (c.f. Lundeberg, Fox and Punccohar 1994, Prince 1993)[7]. Females might therefore be expected to accept advice more than males do. Finally, low-income individuals are also expected

7 When investing, women tend to be less confident, trade less frequently, rely more on brokers, believe that returns are less predictable, and anticipate lower returns than men do (e.g., Looney, Poston and Akbulut 2007, Barber and Odean 2001).

to accept advice more than wealthier individuals do. In a financial decision context, poorer individuals have a higher incentive to make a 'good' choice and therefore should discount the advice less (i.e. they will value the advice more) than individuals with higher income levels do.

6. Current practice in pension risk attitude measurement in the Netherlands and challenges for the future

6.1 Current practice in the Netherlands

In a recent Netspar discussion paper Dellaert and Turlings (2011) described current practice of risk attitude measurements for pension products in the Netherlands. This type of measurement is especially relevant in practice for so-called third-pillar products, which are pension products in which individuals invest to supplement their government base pension and collective retirement income. Also, some collective pension agreements allow individuals flexibility in choosing investment risk portfolios, in which case risk attitude measurement is also very relevant (Nijman and Oerlemans 2008). The review shows that use of questionnaires is by far the most commonly used method in practice. However, there is a large variety in the number of questions asked and the type and content of questions between pension product providers. Moreover, firms typically apply a limited number of predefined risk profiles (varying between three and five).

The questions used in practice can broadly be categorized in five different areas:

1. *Financial position*. These questions refer to the current financial situation of an individual (e.g., the individual's salary and/or the assets at the time of answering the questionnaire).
2. *Knowledge and/or experience*. In many cases these questions measure investment literacy and experience with investing.
3. *Investment horizon*. These questions refer to the consumer's investment horizon, from the start of the pension investment to the actual pension date.

4. *Degree of dependence on payment*. These questions address the degree of dependency of the individual on the return of the pension investment.
5. *Willingness to take risks*. These questions specifically aim to measure the attitude of employees, as individuals, towards investment risks. Most of these questions refer to the possibility of experiencing an investment value reduction at any point in time rather than an income variation at retirement age.

Overall, there is significant diversity in the specific questions used per category, and also in the method of classifying customers into risk profiles (and hence investment portfolios) on the basis of their answers.

Given the differences between firms, it is worthwhile noting that the results from the questionnaires typically do not automatically commit a customer to one particular investment portfolio. Often the advisor provides descriptions of more than one investment option that is linked to the risk profile and explains the risks that are connected to the investments. Then a customer can reconsider his or her responses and recommended investment portfolio. If in disagreement, the participants can change their decision. Nevertheless, different methods and ways of questioning can lead to different risk classifications for the same person. Because of these differences, it is difficult for consumers to make comparisons between different advisors. Most important, there is no guarantee that the results of the questionnaires provide a good representation of an individual's risks preferences. In fact, because of the large variation in the resulting profiles, it is very unlikely that most of them do.

6.2 Challenges for the future: measurement and debiasing

Based on the review of current practice, there seems to be a clear discrepancy between the commonly applied methods to measure consumer risk attitude in practice and the present scientific descriptive and prescriptive models of consumer decision making under risk. This poses the first challenge for the future– which is to develop a measurement approach that allows pension product providers to measure consumer preferences for pension product risk in line with the established descriptive models of risky decisions. The review in this paper suggests that, in contrast to current approaches to measuring the willingness to take risks, such a measurement approach will have to be *choice based* (to allow for a direct connection between behavior and risky alternative) and *interactive* (to allow for consumer learning and preference construction while responding to the task) (e.g. Goldstein, Johnson and Sharpe 2008). This implies that some questions from current practice could be eliminated (e.g., knowledge and expertise), while others (e.g., willingness to take risks) could be pursued in greater detail and in a more systematic fashion. An additional benefit of such an approach is that because it can be built around a benchmark risk-return choice task it more easily facilitates comparisons between different risk-attitude measurements and product recommendations – which further supports consumers in comparing products offered by different firms.

A second challenge of developing such an approach is for it to be designed in such a way that it can reflect customer risk preferences for the key outcome of interest. In case of pension products, this would have to be the risk involved with the customer's income level *at retirement* (Dellaert and Turlings 2011). It is particularly challenging to design and communicate

a risk-attitude measurement approach that can incorporate all components of the customer's income at retirement. Typically – in practice as well as in academia – only a limited relatively well-defined investment is evaluated in risk-attitude measurement tasks. A related challenge will be to periodically update the risk attitude measures and pension product advice of individual customers in order to account for factors such as shifts in expected income level, variations in budget allocations (e.g. buying a new home) that may affect an individual's reference points, or shifts in his or her investment portfolio.

The third challenge that may be highlighted here is to develop a modelling approach that allows firms to provide their customers with recommendations for investment portfolios on the basis of their individually (CPT-based) debiased risk attitude. Not only will this require a market model to match portfolios individually to the customer's preference but firms will also have to trade off the cost of communication and individualized product development against the expected positive returns (such as increased sales and customer satisfaction) of a more personalized portfolio advice (e.g., Liechty, Ramaswamy and Cohen 2001). This will most likely lead to a shift in the number and specifications of the pension product portfolios that are offered to consumers. An implementation challenge will be to find an optimal balance between meeting consumers' individual preferences and dealing with the complexity of implementing highly flexible pension products. From a policy makers' perspective, it is also complex to monitor the extent to which individuals' needs are indeed met correctly and whether pension product providers provide sufficient care in matching products to individual needs. For example, if only few portfolios are offered to consumers, then a less fine-grained classification of their risk return may be sufficient.

The fourth challenge that can be seen involves the design of channel interfaces (online, in the real world, or some combination thereof) that can be used to convey (debiased) pension product recommendations to customers in a highly transparent and attractive way. Pension product decisions are notoriously unattractive to customers and developing customer interfaces that may support and enhance customer decision making has the potential to greatly improve customer involvement and decision quality. In this respect it is also relevant to study which criteria are preferred by individuals as a basis for pension product recommendations and whether individuals recognize the value of debiasing their own risk attitudes.

A fifth and final challenge is of a more conceptual nature, and refers to the desired degree of "paternalism" in providing individuals with recommendations and guiding them towards a normatively more desirable decision outcome (e.g., Thaler and Sunstein 2008)[8]. Managers and policy makers that wish to promote normatively recommended decision outcomes face the dilemma of respecting individuals' rights to make their own decisions, on the one hand, and guiding them so that clear normative 'mistakes' are avoided, on the other. The trade-offs of these sometimes-competing goals are clearly a matter of public debate. This also provides a more practical challenge when organisations and regulators need to implement a set of rules, or guidelines, on how to design pension risk communication interfaces. For example, while providing truthful recommendations is, in our opinion, a desirable benchmark for firms and policy makers – it may not necessarily lead to pension decisions that are most in line with normative theory, if individuals discount the value of the recommendations provided to them.

8 We thank an anonymous Netspar reviewer for raising this important point.

7. Conclusion

This panel paper has addressed the issue of how best to measure and – if so desired – debias consumer risk attitudes in the domain of pension product decisions. We believe that accurate measurement of customer risk profiles and debiasing their risky decisions should be seen as two sides of the same coin. These actions involve closely interrelated communication and product decisions by the firm. From a marketing perspective, the assessment of a customer's risk profile guides the selection of pension investment alternatives that can be suggested to customers. At the same time, from a financial product design perspective, a better understanding of customer risk preferences is crucial in the creation of optimal pension product portfolios that meet customers' needs.

After reviewing past and current approaches to measuring the risk attitudes of consumers, this paper also reviewed the literature on customer advice acceptance. This made it possible to highlight different specific challenges for firms currently providing pension products and to provide suggestions to improve risk measurement and debiasing strategies in pension product advice. For example, one well-known bias is that customers incorrectly weight probabilities when evaluating financial investment outcomes. This bias does not reflect customer preferences but rather reveals a distortion in how risk information is integrated in the customer decision-making process. This bias therefore warrants a "debiasing" intervention from expert financial advisors or pension providers. This illustrates the present challenges to most firms' current risk measurement and communication strategies.

References

Abdellaoui, Mohammed, Aurelien Baillon, Laetitia Placido and Peter Wakker (2011), The Rich Domain of Uncertainty: Source Functions and Their Experimental Implementation, *American Economic Review*, 101, 699–727.

Abdellaoui, Mohammed, Frank Vossmann and Martin Weber (2005), Choice-Based Elicitation and Decomposition of Decision Weights for Gains and Losses under Uncertainty, *Management Science*, 51(9), 1384–1399.

Abdellaoui, Mohammed, Han Bleichrodt and Corina Paraschiv (2007). Measuring Loss Aversion under Prospect Theory: A Parameter-Free Approach, *Management Science* 53, 1659–1674.

Allais, Maurice (1953). Le Comportement de l'Homme Rationnel devant le Risque: Critique des Postulats et Axiomes de l'Ecole Américaine, *Econometrica* 21, 503–546.

Barberis, Nichols and Richard Thaler (2003), A Survey of Behavioral Finance, In G. Constantinides, M. Harris and R. Stulz (eds), *Handbook of Economics of Finance*, 1052–1121, Amsterdam: Elsevier Science.

Benartzi, Shlomo and Richard Thaler (2007), Heuristics and Biases in Retirement Savings Behavior, *Journal of Economic Perspectives*, vol. 21, no. 3 (Summer), 81–104.

Bhattacharya, Utpal, Andreas Hackethal, Simon Kaesler, Benjamin Loos and Steffen Meyer (2010), Can Unbiased Financial Advice Steer Investors Towards Efficient Portfolios? Answers from a Large Field Study," working paper, Kelley School of Business, Indiana University.

Bleichrodt, Han, Jose Luis Pinto and Peter P. Wakker (2001), Making Descriptive Use of Prospect Theory to Improve the Prescriptive Use of Expected Utility, *Management Science*, 47(11), 1498–1514.

Bluethgen, Ralph, Andreas Gintschel, Andreas Hackethal and Armin Muller (2008), Financial Advice and Individual Investors' Portfolios, working paper, available at SSRN: *http://ssrn.com/abstract=968197*.

Bonaccio, Silvia and Reeshad S. Dalal (1996), Advice Taking and Decision-Making: An Integrative Literature Review and Implications for the Organizational Sciences, *Organizational Behavior and Human Decision Processes*, 101(2), 127–151.

Cacioppo, John T., Richard E. Petty and Chuan Feng Kao (1984), The Efficient Assessment of Need for Cognition, *Journal of Personality Assessment*, 48(3), 306–307.

Campbell, John Y. (2006), Household Finance, *Journal of Finance*, 61, 1553–1604.

Campbell, John Y., Howell E. Jackson, Brigitte C. Madrian and Peter Tufano (2011), Consumer Financial Protection, *Journal of Economic Perspectives*, 25(1), 1, 91–114.

Chua, Hannah Fay, J.Frank Yates and Priti Shah (2006), Risk Avoidance: Graphs versus Numbers, *Memory and Cognition*, vol. 34, no. 2, 399-410.

Cooper, Arnold C., Carolyn Y. Woo and William C. Dunkelberg (1988), "Entrepreneurs' Perceived Chances for Success," *Journal of Business Venturing*, 3(2), 97-108.

Deci, Edward L. and Richard M. Ryan (1987), The Support of Autonomy and the Control of Behavior, *Journal of Personality and Social Psychology*, 53(6) 1024-1037.

Dellaert, Benedict G.C. and Marc Turlings (2011), Measuring Risk Profiles for Pension Investments, Netspar NEA discussion paper (in Dutch), Tilburg: Netspar.

Donkers, Bas, Bertrand Melenberg and Arthur van Soest (2001), Estimating Risk Attitudes Using Lotteries: A Large Sample Approach, *Journal of Risk and Uncertainty*, 22, 165-195.

Farquhar, Peter (1984). Utility Assessment Methods, *Management Science* 30, 1283–1300.

Fischoff, Baruch (1995), Risk Perception and Communication Unplugged: Twenty Years of Process, *Risk Analysis*, 15 (2), 137-145.

Goldsmith, Daena and Kristine Fitch (1997), The Normative Context of Advice as Social Support, *Human Communication Research*, 23(4), 454–476.

Goldstein, Daniel G., Eric J. Johnson and William F. Sharpe (2008), Choosing Outcomes versus Choosing Products: Consumer-Focused Retirement Investment Advice, *Journal of Consumer Research*, 35, 440-456.

Gonzalez, Richard and George Wu (1999), On the Shape of the Probability Weighting Function, *Cognitive Psychology,* 38, 129-166.

Harrison, Glenn W. and Elisabet E. Rutström (2008), Risk Aversion in the Laboratory, In J.C. Cox & G.W. Harrison (eds), *Risk Aversion in Experiments* (vol. 12, pp. 42-196). Bingley, UK: Emerald (Research in Experimental Economics).

Hartog, Joop, Ada Ferrer-I-Carbonell and Nicole Jonker (2003), Linking Measured Risk Aversion to Individual Characteristics, *Kyklos*, 55(1), 3-26.

Harvey, Nigel and Ilan Fischer (1997), Taking Advice: Accepting Help, Improving Judgment and Sharing Responsibility, *Organizational Behavior and Human Decision Processes*, 70 (2), 117–133.

Hershey, John C. and Paul J.H. Schoemaker (1985), Probability versus Certainty Equivalence Methods in Utility Measurement: Are They Equivalent?, *Management Science*, 31(10), 1213-1231.

Holt, Charles A. and Susan K. Laury (2002), Risk Aversion and Incentive Effects, *American Economic Review*, 92(5), 1644-1655.

Hung, Angela A., Noreen Clancy, Jeff Dominitz, Eric Talley, Claude Berrebi and Farrukh Suvankulov (2008), Investor and Industry Perspectives on Investment Advisers and Broker-Dealers, Technical Report, RAND Center for Corporate Ethics and Governance.

Kahneman, Daniel and Amos Tversky (1979), Prospect Theory: An Analysis of Decision under Risk, *Econometrica*, 47, 263-291.

Kapteyn, Arie and Federica Teppa (2011), Subjective Measures of Risk Aversion, Fixed Costs and Portfolio Choice, *Journal of Economic Psychology*, 32 (4), 564-580.

Koestner, Richard and Gaetan F. Losier (1996), Distinguishing Reactive versus Reflective Autonomy, *Journal of Personality*, 64 (2), 465-494.

Liechty, John, Venkatram Ramaswamy and Steven H. Cohen (2001), Choice Menus for Mass Customization: An Experimental Approach for Analyzing Customer Demand with an Application to a Web-Based Information Service, *Journal of Marketing Research*, 38 (May), 183–96.

Lipkus, Isaac M. and J.G. Hollands (1999), The Visual Communication of Risk, *Journal of the National Cancer Institute: Monographs*, 25, 149-163.

Loewenstein, George F., Elke U.Weber, Christopher K. Hsee and Ned Welch (2001), Risk as Feelings, *Psychological Bulletin*, 127(2), 267-286.

Lundeberg, Mary A., Paul W. Fox and Judith Punćohać, (1994), Highly Confident but Wrong: Gender Differences and Similarities in Confidence Judgments, *Journal of Educational Psychology*, 86(1), 114-121.

Lusardia, Annamaria and Olivia S. Mitchell (2011), Financial Literacy and Planning: Implications for Retirement Wellbeing, NBER working paper no. 17078.

Lusardia, Annamaria, Olivia S. Mitchell and Vilsa Curto (2010) Financial Literacy among the Young, *Journal of Consumer Affairs*, 44 (2), 358–380.

Mauboussin, Michael J. (2002) Revisiting Market Efficiency: The Stock Market as a Complex Adaptive System, *Journal of Applied Corporate Finance*, vol. 14, no. 4, 47-55.

McFarlin, Dean B., Roy F. Baumeister and Jim Blascovich (1984), On Knowing When to Quit: Task Failure, Self-Esteem, Advice and Nonproductive Persistence, *Journal of Personality*, 52(2), 138–155.

Merton, Robert C. (2006), Allocating Shareholder Capital to Pension Plans, *Journal of Applied Corporate Finance*, vol. 18, no. 1, 15-24.

Mullainathan, Sendhil, Markus Noth and Antoinette Schoar (2009), The Market for Financial Advice: An Audit Study, paper presented at AFA Denver meetings.

Narasimhan, Srinivasan and Surinder Tikoo (1992), Effects of Locus of Control on Information Search Behavior, in *Advances in Consumer Research* vol. 19, John F. Sherry, Jr. and Brian Sternthal (eds), Provo, UT: Association for Consumer Research, 498-504.

Nijman, Theo and Alwijn Oerlemans (2008), Maatwerk in Nederlandse Pensioenproducten, *NEA paper* 8, Netspar: Tilburg, The Netherlands.

Peters, Ellen, Judith Hibbard, Paul Slovic and Nathan Dieckmann (2007), Numeracy Skill and the Communication, Comprehension and Use of Risk-Benefit Information, *Health Affairs*, 26 (3), 741-748.

Prelec, Drazen and George Loewenstein (1992), Decision Making over Time and Under Uncertainty: A Common Approach, *Management Science*, 37 (7), 770–786.

Prince, Melvin (1994), Women, Men and Money Styles, *Journal of Economic Psychology*, 14(1), 175–182.

Quiggin, John (1981) Risk Perception and Risk Aversion among Australian Farmers, *Australian Journal of Agricultural Economics*, 25 160–169.

Rindfleisch Aric and David X Crockett (1999), "Cigarette Smoking and Perceived Risk: A Multidimensional Investigation," Journal of Public Policy & Marketing; 18(2), 159–171.

Rotter, Julian B. (1966), Generalized Expectancies for Internal versus External Control of Reinforcement *Psychological Monographs: General and Applied*, 80(1), 1–28.

Schrah, Gunnar E., Reeshad S. Dalal and Janet A Sniezek (2006), No Decision-Maker is an Island: Integrating Expert Advice with Information Acquisition. *Journal of Behavioral Decision Making*, 19(1), 43–60.

Sharpe, William F., Daniel G. Goldstein and Phil W. Blythe (2000), The Distribution Builder: A Tool for Inferring Investor Preferences, working paper at http://www.stanfordedu/~wfsharpe/art/qpaper/qpaper.html.

Sniezek, Janet A., Gunnar E. Schrah and Reeshad S. Dalal (2004), Improving Judgement with Prepaid Expert Advice, *Journal of Behavioral Decision Making*, 17(3), 173–190.

Slovic, Paul, Melissa L. Finucane, Ellen Peters and Donald G. MacGregor (2004), Risk as Analysis and Risk as Feelings: Some Thoughts about Affect, Reason, Risk and Rationality, *Risk Analysis*, 24(2), 311–322

Stone, Eric R., Winston R. Sieck, Benita E. Bull, J. Frank Yates, Stephanie C. Parks and Carolyn J. Rush (2003), Foreground: Background Salience: Explaining the Effects of Graphical Displays on Risk Avoidance, *Organizational Behavior and Human Decision Processes*, vol. 90, no. 1, 19–36.

Thaler, Richard H. and Cass R. Sunstein (2008), *Nudge: Improving Decisions about Health, Wealth and Happiness*, New Haven, CT: Yale University Press.

Tversky, Amos and Daniel Kahneman (1991), Loss Aversion in Riskless Choice: A Reference-Dependent Model, *Quarterly Journal of Economics*, 106(4), 1039–1061.

Tversky, Amos and Daniel Kahneman (1992), Advances in Prospect Theory: Cumulative Representation of Uncertainty, *Journal of Risk and Uncertainty*, 5, 297–323.

Van Dijk, Eric and Marcel Zeelenberg (2005), On the Psychology of 'If Only': Regret and the Comparison between Factual and Counterfactual Outcomes, *Organizational Behavior and Human Decision Processes*, 97(2), 152–160.

Van Rooij, Maarten C.J., Clemens J.M. Kool and Henriëtte M. Prast (2007), Risk-return Preferences in the Pension Domain: Are People Able to Choose? *Journal of Public Economics*, 91(3–4), 701–722.

von Neumann, John. and Oskar Morgenstern, (1947). *Theory of Games and Economic Behavior* (2nd ed.). Princeton, NJ: Princeton University Press.

Wakker, Peter P. (1994), Separating Marginal Utility and Probabilistic Risk Aversion, *Theory and Decision*, 36(1), 1–44.

Wakker, Peter P. and Daniel Deneffe (1996), Eliciting von Neumann–Morgenstern Utilities When Probabilities Are Distorted or Unknown, *Management Science*, 42 (8), 1131–1150.

Yaniv, Ilan (2004) Receiving Other People's Advice: Influence and Benefit, *Organizational Behavior and Human Decision Processes*, 93(1), 1–13.

Yaniv, Ilan and Eli Kleinberger (2000), Advice Taking in Decision Making: Egocentric Discounting and Reputation Formation, *Organizational Behavior and Human Decision Processes*, 83(2), 260–281.

Zuckerman, Marvin, Sybil B. Eysenck and Hans J. Eysenck (1978), Sensation Seeking in England and America: Cross-Cultural, Age and Sex comparisons, *Journal of Consulting and Clinical Psychology*, 46(1), 139–149

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Measuring and Debiasing Consumer Pension Risk Attitudes

This panel paper by Bas Donkers (EUR), Carlos Lourenço (RSM) and Benedict Dellaert (EUR) addresses the issue of how best to measure and debias consumer risk attitudes in the domain of pension product decisions. The paper first reviews the academic literature on the measurement of attitudes towards risk. Next it discusses potential biases in these approaches. The review on whether or not customers will accept product advice that is based on unbiased measures of consumer risk attitudes, may assist firms in understanding why customers may or may not appreciate financial recommendations based on debiased risk profiles.
The paper then contrasts the academic state-of-the-art on measuring consumer risk attitudes with current practice in the financial advice industry.