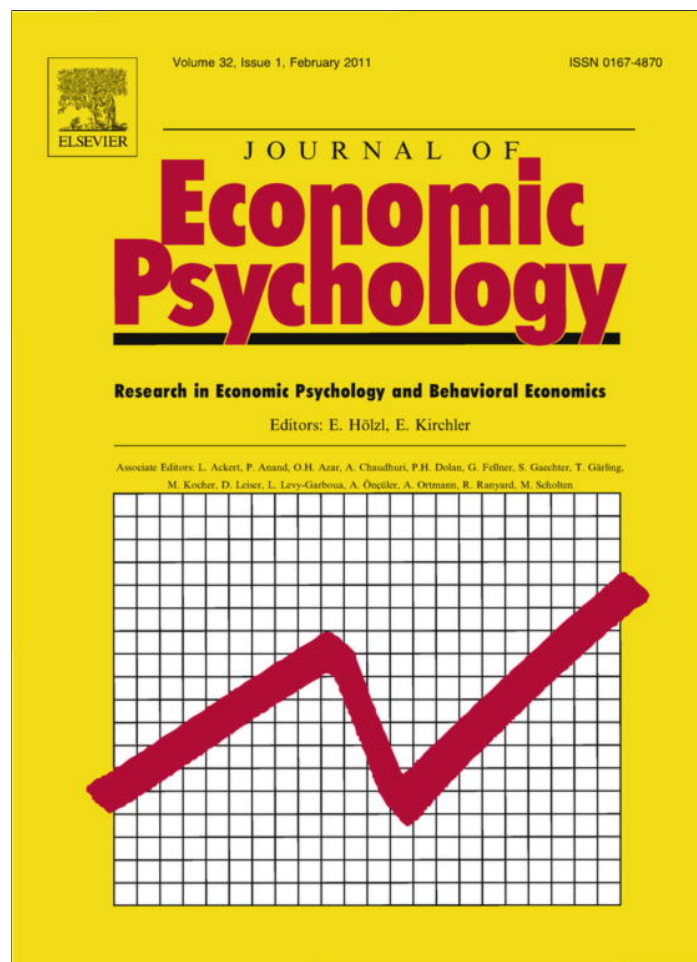


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## Investment risk – The perspective of individual investors

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## ABSTRACT

The aim of the research presented in this paper is to investigate the perceived investment risk of lay investors. Two surveys were conducted to examine the financial risk perception of German individual investors ( $N = 119$  in study 1;  $N = 171$  in study 2). Participants were asked to rate the risk and several aspects of different types of investment products (e.g. *shares* and *bank savings books*).

Study 1 analyzed the specificity of risk perception of various common investment products. Separate regression analyses showed only minor differences in the composition of the risk perception models between the types of investment. A factor analysis revealed two dimensions of perceived investment risk, where one factor consists of aspects of loss and variability (*factor risk*), while the other comprises aspects of transparency and liquidity (*factor manageability*). The dimensions were used to classify the types of investment with regard to perceived risk.

Study 2 focused on effects of individual characteristics on financial risk perception. Only *financial literacy* (measured by means of a knowledge test) proved to be relevant in a regression analysis where perceived investment risk was explained by using *gender*, *age*, *investment experience*, and *financial literacy* as predictors.

Implications for an appropriate investment risk communication in financial consultancy were derived from the results.

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## 1. Introduction

Risk is an inherent feature of all investment options. Even bank savings books can contain risks, as some discovered in the course of the financial crisis in 2008. Many investors who lost (parts of) their funds claimed that they had not been informed about these risks when making their investment decisions. In some cases, the investment advisor might have forgotten to remind their clients of the risks, although he is legally bound to do so.<sup>1</sup> But it is also conceivable and even more probable that the risk information was presented in a way that was not suitable and useful for the client.

How are clients informed about investment risks? Frequently they are faced with numerical risk measures proposed by financial theories. A very common risk measure is *volatility*, i.e. the variance of returns. It is oftentimes used to inform investors about the risk of bonds. Other measures focus on potential losses. One approach is to assume the *worst case* of return. Another is to define the *value-at-risk*, i.e. the value which is fallen below only with a small probability (Siebenmorgen &

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<sup>1</sup> In the Europe Union, the *Markets in Financial Instruments Directive* (MiFID) regulates requirements for financial services. Article 19 (3) demands: "Appropriate information shall be provided in a comprehensible form to clients or potential clients about: ... financial instruments and proposed investment strategies; this should include appropriate guidance on and warnings of the risks associated with investments in those instruments or in respect of particular investment strategies," (MiFID, 2004, p. 24).

Weber, 1999). However, only the minority of clients are knowledgeable in statistics or financial mathematics, and mere information on financial risk measures is therefore likely to be insufficient. As Finucane noted: “Narrow statistical definitions of risk are limited in their descriptive and predictive capacity and may lead to misunderstandings and unhappy clients.” (Finucane, 2002, p. 239).

Another approach to inform about investment risks is to provide detailed information about financial markets mechanisms. In Germany, a brochure of more than 150 pages with “basic information” about economic relationships, chances and risks of securities is handed out to each individual investor who intends to invest in shares or funds (Bank Verlag, 2004). Various investment risks are explained in this leaflet, for instance *issuer risk*, *currency risk*, and *inflation risk*. Most individual investors may be overwhelmed by this vast amount of information and by its abstract nature. Furthermore, this way of informing about risks might be hardly helpful when making a particular investment decision, because this kind of standardized information neglects different levels of experience and financial literacy of the clients. From this perspective it is even possible that investment decision quality suffers from too much information (so called *information overload*, Hwang & Lin, 1999). As studies conducted by consumer protection organizations show, adjustment of information to the needs of the client is rare. If at all, information is tailored by using obvious features of the client, such as age, gender, or recent investment behavior (Kolbe, 2011).

We argue that current ways of informing clients about investment risks by providing detailed information about financial market mechanisms and statistical risk measures fail to address the needs of the clients. This can in turn result in suboptimal investment decisions where aspects of risk are not fully taken into account. To provide comprehensible and relevant information concerning the risks of different financial options, it is necessary to take the risk understanding of the clients into account. Hence, financial advisors should know how investment risks are perceived by private investors and if and how these risks are considered for investment decisions.

The main aim of our study presented in this paper is to examine and describe the perceived investment risk of lay investors. The specific aims are (1) to identify the relevant aspects of financial risk perception, (2) to compare the identified aspects of lay investors' risk perception with aspects used by financial advisors, (3) to test if individual characteristics of the investor are related to perceived risk, and (4) to analyze which aspects of perceived risk can predict the intention to invest. Results can be used to tailor risk communication by presenting financial risk information in a way that reflects the risk understanding of laypeople.

## 2. Findings in risk perception research

Aspects of investment risk perception can be investigated in several ways. One approach is to directly ask participants in an open question what comes into their mind when they think about investment risk. Olsen (1997) and Vlaev, Chater, and Stewart (2009) used this method and found that *loss of capital*, *returns below expectation*, and *economic uncertainty* are prevalent associations with investment risk. Other responses are related with *perceived knowledge deficits* and a *feeling of lack of control*.

These aforementioned studies give insight into the abstract conceptualization of investment risk and can be used for the design of more structured investigations of investment risk perception. In those more structured studies, risk aspects are assessed quantitatively by asking participants to rate various types of investment on scales representing different characteristics of risk. This method is known as psychometric paradigm and is commonly used in risk perception research, mainly in technology and health domains (see Slovic, 2000, for an overview). The core finding is that perceived risk is a subjective construct which is not only determined by quantitative facts but also by qualitative features of the situation. With the psychometric approach it is possible to compare the risk perception of different groups of people. A typical finding is that experts and laypeople disagree in their risk judgements. Experts' judgements are based on quantitative facts about probabilities and magnitudes of potential harms, while risk judgements of laypeople are also influenced by qualitative characteristics of the situation and the risk object, e.g. the controllability of the risk, the familiarity with the risk, and affective reactions (McDaniels, Axelrod, Cavanagh, & Slovic, 1997; Slovic, 1986). Besides, the psychometric paradigm allows for the classification of different objects (e.g. investment options) regarding its perceived risk. It can be used to identify perceived similarities and differences between various risky activities and to explain, for instance, why some of them are perceived to be riskier than the others.

The psychometric approach was also used to investigate investment risk perception. In their studies, MacGregor, Slovic, Berry, and Evensky (1999) and Koonce, McAnally, and Mercer (2005) asked financial experts to rate the risks of various types of investments. In addition, participants had to assess various other aspects of the investment situation and the investment product, both economic and psychological features. The results of these two studies are comparable and in line with each other: Quantitative aspects (*volatility*, *probability* and *magnitude of loss*) and qualitative aspects (*worry*, *knowledge*) were both significant predictors of perceived risk. In both studies, *worry* was the predictor with the highest predictive power. These findings are of particular interest since all participants were professionals whose risk judgements were expected to be based on quantitative information only. Since it is known that there are usually differences in the risk perception of experts and laymen, the results of MacGregor et al. (1999) and Koonce et al. (2005) cannot be directly transferred to explain investment risk perception of individual investors.

Studies comparing risk perceptions of experts and laypeople in the financial domain are rare. To our knowledge, only two studies have addressed this question, both within the psychometric approach (Diacon, 2004; Olsen, 1997). Olsen (1997)

applied the results of his qualitative study (see above) to construct items for a survey with which he compared risk perceptions of professional and individual investors. Ratings on the risk aspects were used to predict the perceived *overall risk*. All aspects had substantial predictive power in explaining the variance of the risk judgement. The best predictor was *control*, the second was *loss of capital*, the third was *returns below expectations*, and the last one was *knowledge*. Furthermore, no differences between professionals and laypeople were observed, however, this congruency between the risk perceptions of experts and laymen may be due to the selection of the participants. Olsen (1997) only asked experienced and wealthy private investors and financial risk perception might differ according to the degree of experience that can range from very low to very high.

The participants in the study of Diacon (2004) rated various aspects of different types of investments (e.g. *volatility*, *uncertainty of returns*, *risk of total loss*, *transparency*), but not the overall perceived risk. A factor analysis revealed interesting differences between professionals and individual investors. For laymen three factors resulted, whereas for experts only two factors could be interpreted. For the data of the laymen, aspects regarding *uncertainty* and *adversity (losses)* load on different factors. The *uncertainty* factor contains not only quantitative aspects of uncertainty (*volatility*) but also uncertainty due to insufficient investor protection. On the *adversity* factor load aspects such as *seriousness of potential negative consequences* and *risk of total loss*. In the data of the experts, *uncertainty* and *adversity* load on the same factor. Besides these differences, there is also a common factor which explains variances in both groups that reflects *knowledge* aspects (e.g. *complexity of the investment product*, *immediate noticing of losses*, and *knowledge about charges*). The results of Diacon (2004) corroborate the findings of risk perception research: Experts and laymen differ in the construction of their risk judgement.

A third approach to the investigation of investment risk perception is to ask participants to invest a given amount of hypothetical money into some fictitious investment options which differ from each other regarding their risk characteristics. These options are usually presented with full information about probabilities and magnitudes of gains and losses. Additionally, participants have to rate the risk of the investment options. Results of studies using this experimental method consistently show that potential losses loom larger than variance of outcomes (*volatility*) both for explaining risk judgements and predicting investment decisions (Duxbury & Summers, 2004; Klos, Weber, & Weber, 2005; Nosis & Weber, 2010; Veld & Veld-Merkoulova, 2008).

To sum up, although investment risk perception has been investigated within different approaches, the results show a common pattern: Perceived investment risk is a complex construct comprised of various aspects. Besides financial parameters (potential losses, *volatility*) qualitative features (*knowledge*, *worry*) play also a role when judging the risk of investments, even for financial experts. Findings from studies comparing experts and laymen (Diacon, 2004) suggest that risk judgements of lay investors are yet more complex. Thus, to inform individual investors about risks by giving them a single quantitative measure, such as *volatility*, seems to be inappropriate. To enable financial consultants to address the needs of their clients when informing about investment risks, more empirical research is needed.

In our study we address questions that are not answered yet. The study will provide some insights into various individual, situational, and financial aspects which may be relevant for risk communication in financial consultancy. Therefore, it is necessary to use real investment products for analyses instead of fictitious ones as used in experimental studies. We concentrate on the most common types of investments, since we want to reach different types of private investors, i.e. ranging from bank savings books to stock or investment fund owners. First, we analyze if individual investors focus on different aspects when they rate the risk of various types of investment. Additionally, investment types will be classified regarding its perceived risk characteristics. The second study focuses on individual characteristics of the investor and their effects on perceived investment risk. By using the same approach as other researchers did before (Diacon, 2004; Koonce et al., 2005; MacGregor et al., 1999; Olsen, 1997) we are able to compare the results as well as to extend them.

### 3. Empirical analysis of investors' risk perception

#### 3.1. Pilot study

To identify relevant risk aspects for the investigation of private investors' perceived risk we conducted a pilot study where several common types of investment (e.g. bank savings books, bond funds, and shares) were presented to 98 participants (50% male, 50% female, mean age 31). We tried to reach a sample consisting of individuals with different investment experiences. Hence, participants were not only recruited in university courses but also in several courses in adult education (e.g. foreign language courses, evening schools). They were asked to assess one randomly selected investment type on a paper-questionnaire consisting of 19 items which were selected from the surveys of MacGregor et al. (1999) and Koonce et al. (2005). These items measure, for instance, different aspects of losses and gains, qualitative aspects of the investment product and psychological aspects such as *worry*. For each item a seven-point Likert scale with defined endpoints was developed. The questionnaire is presented in Table 1.

##### 3.1.1. Results

The ratings were standardized by calculating Z-scores within each type of investment to eliminate influences resulting from special features of the particular investment product. Interrelations between the risk rating and the other ratings could therefore be attributed to the perception of the judges. Risk ratings were significantly correlated with all aspects of potential

**Table 1**

Questions used in the studies.

*Items and scales***Perceived risk:** Overall, how risky is investing in this specific type of investment?

(No risk at all – x – x – x – x – x – Very high risk)

**Predictability:** To what degree are financial professionals able to predict the future performance of that type of investment?

(Not predictably at all – x – x – x – x – x – Very good to predict)

**Attention:** How much attention should an investor give to the performance of his money when investing into this type of investment?

(Very less attention (less than once a year) – x – x – x – x – x – Very high attention (weekly or daily))

**Worry:** If you had assets in this form of investment, how much would you worry about them?

(No worry – x – x – x – x – x – Worry very much)

**Probability of loss:** How likely is it to lose money with this type of investment?

(Impossible – x – x – x – x – x – Very likely)

**Amount of loss:** How large are possible losses with this type of investment?

(No gains – x – x – x – x – x – Very high losses)

**Probability of total loss:** How likely is it to lose all the invested money?

(Impossible – x – x – x – x – x – Very likely)

**Volatility:** To what degree does the value of the invested money fluctuates over time?

(No fluctuations – x – x – x – x – x – Very high fluctuations)

**Liquidity:** How easy is it for an investor to retrieve his invested money when he needs it?

(Very hard – x – x – x – x – x – Very easy)

**Novelty:** Is this type of investment novel or is it old and familiar?

(Very old and familiar – x – x – x – x – x – Very new and unfamiliar)

**Transparency:** How easy is it for an investor to understand the performance of his invested money?

(Very easy – x – x – x – x – x – Very hard)

**Willingness to invest:** How likely is it that you will ever invest money in this type of investment?

(Impossible – x – x – x – x – x – Very likely)

*Items below were excluded for the final version of the questionnaire (used in studies 1 and 2)***Probability of gains:** How likely is it to gain money with this type of investment?

(Impossible – x – x – x – x – x – Very likely)

**Amount of gains:** How large are possible gains with this type of investment?

(No gains – x – x – x – x – x – Very high gains)

**Probability of status quo:** How likely is it that investing in this type of investment results neither in losses nor gains?

(Impossible – x – x – x – x – x – Very likely)

**Knowledge:** How knowledgeable are you about this type of investment?

(Not knowledgeable at all – x – x – x – x – x – Very knowledgeable)

**Time horizon:** To what degree should this investment be considered a short-term versus a long-term investment?

(Very short-term – x – x – x – x – x – Very long-term)

**Voluntariness:** How voluntarily do investors invest in this type of investment?

(Very involuntarily – x – x – x – x – x – Very voluntarily)

**Fairness:** In your opinion, how fair resp. just is this type of investment?

(Very unfair/unjust – x – x – x – x – x – Very fair/just)

losses (*probability of loss*,  $r = .41^{**}$ , *amount of loss*,  $r = .41^{**}$ , *probability of total loss*,  $r = .43^{**}$ ) and *volatility* ( $r = .38^{**}$ ). Conversely, potential gains (*probability of gains*,  $r = -.04$ , *amount of gains*,  $r = .13$ ) were not correlated with risk. There were also some substantial correlations between risk and qualitative aspects (*predictability*,  $r = -.27^{**}$ , *attention*,  $r = .38^{**}$ , *novelty*,  $r = .36^{**}$ , and *worry*,  $r = .48^{**}$ ). Surprisingly, no correlation between the judgement of *knowledge* and the *risk* rating was found ( $r = -.02$ ), as expected from previous studies where knowledge proved to be a predictor of perceived investment risk (see above). The correlations between risk rating and the other variables were not significant (*probability of status quo*,  $r = .14$ , *transparency*,  $r = .17$ , *liquidity*,  $r = -.06$ , *time horizon of investment*,  $r = -.16$ , *voluntariness*,  $r = .01$ , and *fairness*,  $r = -.07$ ).

## 3.2. Study 1

### 3.2.1. Design

The results of the pilot study were used to re-design the questionnaire. Aspects were selected which had proven to be significant to risk judgement (*predictability*, *attention*, *novelty*, *worry*, *volatility*, *probability of loss*, *amount of loss*, *probability of total loss*). Although *transparency* and *liquidity* were not correlated to risk ratings in the pilot study, they were added here to test if these features might indicate a willingness to invest. The most common investment types in Germany were selected for this study (shares, equity funds, bond funds, building loan contract, endowment life insurance, bank savings book, federal treasury notes). In order to avoid misconceptions, the name of each investment type was presented together with a short description of its major characteristics.

### 3.2.2. Procedure and sample

Participants were contacted via online mailing lists and announcements on several homepages, and invited to take part in an internet based survey on financial decision making. We made sure that none of them had taken part in the pilot study.

**Table 2**  
Results of the regression analyses.

| Type of investment       | Adjusted $R^2$ | Significant predictors   | Beta  | ANOVA   |
|--------------------------|----------------|--|---|---|
| Shares                   | .297           | Worry<br>Probability of loss   | .420 ( $p = .00$ )<br>.227 ( $p = .00$ )  | $df_{\text{Reg}} = 2^a$<br>$df_{\text{Res}} = 115^b$<br>$F = 25.743$<br>$p = .00$ |
| Equity funds             | .416           | Worry<br>Volatility  | .426 ( $p = .00$ )<br>.334 ( $p = .00$ )  | $df_{\text{Reg}} = 2$<br>$df_{\text{Res}} = 115$<br>$F = 42.749$<br>$p = .00$     |
| Bond funds               | .437           | Worry<br>Volatility<br>Predictability  | .373 ( $p = .00$ )<br>.255 ( $p = .00$ )<br>-.191 ( $p = .02$ )                       | $df_{\text{Reg}} = 3$<br>$df_{\text{Res}} = 114$<br>$F = 31.220$<br>$p = .00$     |
| Building loan contract   | .414           | Probability of loss<br>Worry<br>Amount of loss                                       | .291 ( $p = .00$ )<br>.284 ( $p = .00$ )<br>.230 ( $p = .01$ )                        | $df_{\text{Reg}} = 3$<br>$df_{\text{Res}} = 114$<br>$F = 28.586$<br>$p = .00$     |
| Endowment life insurance | .500           | Probability of loss<br>Amount of loss<br>Transparency                                | .465 ( $p = .00$ )<br>.241 ( $p = .00$ )<br>-.169 ( $p = .02$ )                       | $df_{\text{Reg}} = 3$<br>$df_{\text{Res}} = 114$<br>$F = 39.986$<br>$p = .00$     |
| Bank savings book        | .358           | Probability of loss<br>Worry<br>Transparency<br>Amount of loss                       | .268 ( $p = .00$ )<br>.203 ( $p = .03$ )<br>-.195 ( $p = .01$ )<br>.192 ( $p = .03$ ) | $df_{\text{Reg}} = 4$<br>$df_{\text{Res}} = 113$<br>$F = 17.330$<br>$p = .00$     |
| Federal treasury note    | .596           | Probability of loss<br>Predictability<br>Amount of loss<br>Probability of total loss | .321 ( $p = .00$ )<br>-.310 ( $p = .00$ )<br>.190 ( $p = .02$ )<br>.174 ( $p = .05$ ) | $df_{\text{Reg}} = 4$<br>$df_{\text{Res}} = 113$<br>$F = 44.215$<br>$p = .00$     |

<sup>a</sup>  $df_{\text{Reg}}$ : Degrees of freedom of the regression.

<sup>b</sup>  $df_{\text{Res}}$ : Degrees of freedom of the residuals.

They were asked to rate seven different types of investment products presented in a random order. In order to reduce the time needed for completing the whole survey, the investment types were not presented one by one. Rather, the participants had to rate all investment types on one risk scale before going onto the next. This procedure was expected to decrease reading efforts and to promote differentiation between the various investment types.

One hundred and thirty-three persons participated in the study. 15 of them were excluded from analysis due to incomplete answers or time deviations according to the following rule: Participants were excluded who finished the survey conspicuously fast or slow. “Fast” was defined by more than one standard deviation (SD) below the mean handling time. “Slow” was defined by more than two SD<sup>2</sup> above mean. This procedure should ensure that only participants who diligently answered the questions were included in the final sample, while those who rushed through the questionnaire, or possibly were distracted by other activities, were excluded. The resulting sample consisted of 118 participants, ranging in age from 20 to 69 (mean = 35, SD = 10.96) with 29% males and 71% females.

### 3.2.3. Results

The individual ratings on the risk questionnaire were used for data analysis. Linear stepwise regression analyses were conducted for each type of investment separately, to assess which aspects of risk were important for perceived risk. The resulting models are presented in Table 2.

All models explain a substantial portion of variance with adjusted  $R$ -squares ranging from .30 for shares and .60 for federal treasury notes. *Worry* and *probability of loss* turn out to be the most prominent predictors of perceived risk, being significant predictors in five out of seven regression models. *Worry* is the best predictor in those models explaining perceived risk for securities (shares, equity funds and bond funds), while *probability of loss* has the highest explanatory power in the models for investment forms with fixed returns. Other aspects proving relevant for the explanation of perceived investment risk are *volatility*, *predictability*, *amount of loss*, *probability of total loss*, and *transparency*. Though the compositions of the resulting models vary, the similarities seem to be larger than the differences.

To analyze where the various types of investment are located in the mental model of investment risk, a principal component factor analysis with varimax rotation was conducted. Appropriateness of the data was checked by calculating the KMO-value, which was .955, and analyzing the anti-image-covariance-matrix. Both procedures indicate suitability.

<sup>2</sup> We used a less severe criterion to define slow processing times, because longer times may be due to slow internet connections.

**Table 3**

Results of the factor analysis.

|                           | Factor 1<br>Explained variance: 62.70% | Factor 2<br>Explained variance: 11.83% |
|---------------------------|--|--|
| Volatility                | .912                                   |  |
| Probability of loss       | .911                                   |  |
| Worry                     | .904                                   |  |
| Perceived risk            | .898                                   |  |
| Attention                 | .886                                   |  |
| Amount of loss            | .881                                   |  |
| Probability of total loss | .878                                   |  |
| Predictability            | -.772                                  |  |
| Novelty                   | .535                                   |  |
| Liquidity                 |  | .846                                   |
| Transparency              |  | .679                                   |

Extraction method: Principal component analysis.

Rotation method: Varimax with Kaiser normalization.

Rotation converged in three iterations.

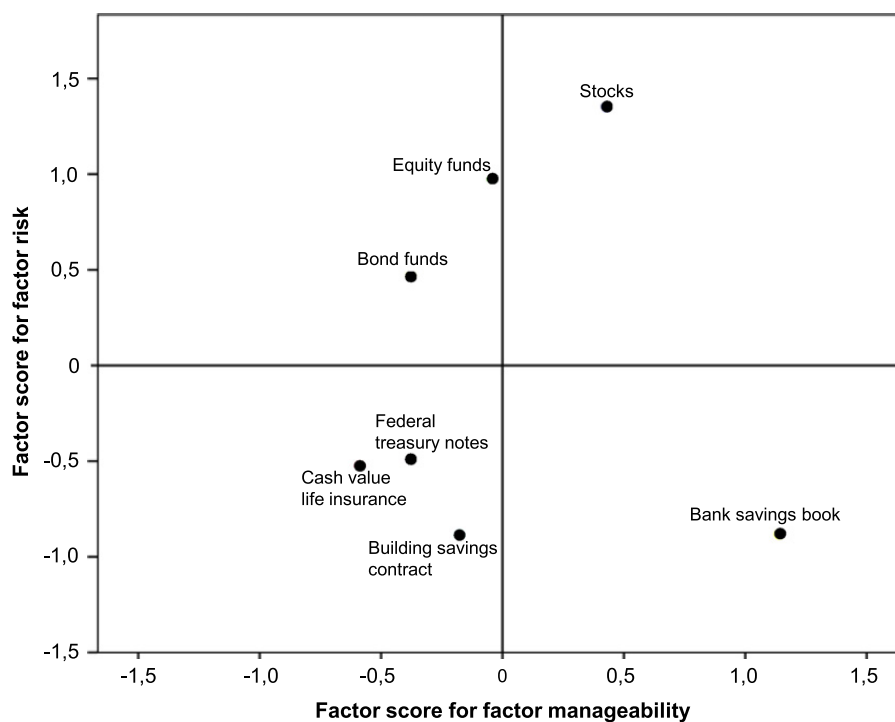
Factors with eigenvalues larger than 1 were extracted, resulting in a two-factors-solution. The factors are presented in Table 3.

For factor interpretation, only variables with factor loadings larger than .5 were considered. On the first factor we find aspects of *loss* and *variability*, as well as their (behavioral) consequences (*worry*, *attention*, and (*un*)*predictability*). Also, the overall perceived risk loads high on this factor. Hence, this factor can be interpreted as a factor that combines risk-relevant components and can therefore be labelled as factor *risk*. The second factor consists of two aspects: *liquidity* and *transparency*, both of which are facets of the individual handling or control of investments. An investment is transparent if the investor can easily observe and understand the development of his assets. Liquidity means, that the invested money is easily available without any time constrains. This factor may be interpreted as factor *manageability*.

To determine the location of the different types of investment in the factor space of the two factors, we calculated individual factor scores by conducting multiple regressions and averaging the resulting values within investment types. Fig. 1 presents the results.

Investment types vary over the whole range of the *risk* factor with *shares* at the upper end and *bank savings books* and *building loan contracts* at the lower end. On the *manageability* factor only two types of investment are located above the mean (*shares* and *bank savings books*). The other investment forms are regarded as rather low on the *manageability* factor.

A regression analysis was conducted to test if the two factors are related to the willingness to invest in the various types of investment. The mean factor scores for each type of investment that were used to locate them in the factor space were



**Fig. 1.** Location of the types of investment in the factor space, represented as factor scores averaged over individuals.

used as predictors here. The value for the criterion was calculated by averaging the willingness-to-invest-rating over individuals within the seven investment types. Hence, the dataset for the regression analysis consisted of seven observations, each representing one type of investment. A substantial portion of variance is explained by the resulting regression model (adj.  $R^2 = .95$ ,  $F = 61.06$ ,  $df_{\text{Reg}} = 2$ ,  $df_{\text{Res}} = 4$ ,  $p = .00$ ). Only the factor *risk* contributes to the explanation of variance (Beta =  $-.96$ ,  $p = .00$ ), while the factor *manageability* as predictor does not become significant (Beta =  $.23$ ,  $p = .06$ ).

The results show that perceived investment risk is not only influenced by quantitative aspects of potential losses and gains. Qualitative aspects prove to be relevant as well. *Worry*, *attention* and *predictability* load high on the factor representing the perceived risk. Two other qualitative aspects (*liquidity* and *transparency*) build a separate factor which, however, adds no explanatory power to the prediction of the willingness to invest. This suggests that not only monetary aspects of the investment product play a role when lay investors rate the risk and make financial decisions. The first study investigated features of the investment product and situation. In a second study we aim to test if individual features of the investor influence perceived investment risk as well.

### 3.3. Study 2

#### 3.3.1. Design

The same risk questionnaire and the same seven types of investment as in the first study were used for a second online survey with a new sample. To reduce the effort for the participants, only three randomly selected types of investment products were presented in a random order. In addition, we measured financial literacy. The pilot study showed that self assessed knowledge is not correlated with perceived investment risk. Hence, we used an objective measure by including a multiple choice test on financial literacy. Items were selected from a representative survey on general financial education of the German public (Commerzbank Ideenlabor, 2003). We used ten questions that were answered correctly by nearly half of the sample in the original survey. These questions were expected to distinguish participants with high financial literacy from those with low. For example, we asked: “In which case is a front load charged?” – (a) “If a credit is granted”, (b) “At buying of an equity fund”, (c) “At overdrawing a cheque account” or “Do not know” (here the correct answer is b).<sup>3</sup>

Data gauging the investment experience of our participants was collected by asking them to indicate products they had actually invested in so we could test if financial risk perception is linked to experience. In addition, demographical data (gender, age) were collected to test for influences on perceived investment risk.

#### 3.3.2. Procedure and sample

A 232 participants began the survey, but not all of them finished. We checked the demographic data of the 48 dropouts, and found no significant differences between them and those who finished (calculated by Chi-square tests). Participants who finished the survey conspicuously fast or slow were excluded (the same criterion as in study 1 was used). Additionally, answers were tested for patterns that suggested inattentive completion. Two participants were excluded because they answered the last nine questions of the knowledge test by choosing “Do not know”, which may indicate a lack of motivation by the end of the survey. The final sample consisted of 171 participants, 47% of them male, 53% female. Age ranged from 20 to 70, with a mean of 33 (SD = 12.01).

#### 3.3.3. Results

The data set was adjusted before we did the analyses. Z-scores were calculated within each investment form to standardize answers. Therefore, potential differences in the risk ratings can be attributed to individual differences and not to differences between the types of investment. There were three different ratings given by each participant on each variable, since they judged three investment forms (e.g. shares, bonds, and bank savings book). The mean of the three Z-standardized risk ratings was calculated for each participant. All further analyses were calculated using this adjusted data set.

**3.3.3.1. Correlation between risk perception and investment experience.** Bank savings books are the most popular investment product in our sample, which are held by 51% of the participants. The distribution of the other types of investment was as followed: equity funds 43%, endowment life insurances 35%, building loan contracts 35%, shares 22%, bond funds 21%, and federal treasury notes 6%. 46% of the participants had experience with only one or two types of investment, while less than 25% had personal experience with four or more different investment forms. The number of different types of investment a person has or had was used as indicator for investment experience.

Pearson correlation was calculated to test if the perceived overall risk of investment forms is linked to investment experience. The correlation method seemed most reasonable, as a clear causal relationship between experience and risk perception is not assumed. The correlation is significant ( $r = -.21$ ,  $p = .01$ ,  $N = 171$ ), indicating that the higher the experience is, the lower the perceived investment risk.

<sup>3</sup> The complete questionnaire is available on request from the first author.



**3.3.3.2. Correlation between perceived risk and financial literacy.** Financial knowledge level was assessed by counting the number of correct answers in the knowledge test. It turned out that participants were well-educated on financial issues: On average, men answered eight out of ten questions correctly, women seven. When analyzing the answers question by question, the average proportion of correct answers was 73.6% (range from 35.6% to 100%). Since only questions were chosen that had been answered correctly by nearly a half of a representative sample in a previous study (Commerzbank Ideenlabor, 2003, see above), this is far more than the expected 50% of correct answers. The good understanding of financial issues of our participants might be probably due to self-selection of the sample. Presumably, only people who are interested in financial investments participated. Since higher interest is often linked with more knowledge this finding is not surprising.

There is a substantial negative correlation between the mean risk rating and the knowledge test score ( $r = -.36, p = .00, N = 171$ ). The higher the level of financial knowledge is, the lower the perceived investment risk. Additionally, it was tested if financial knowledge is linked with investment experience, measured as number of different types of investment an investor owned. A significant correlation was found ( $r = -.36, p = .00, N = 171$ ), showing that higher knowledge is accompanied by a broader diversification of investments.

**3.3.3.3. Interrelations between risk perception and demographic features.** The average standardized risk rating of each participant was used to investigate the interrelations between demographic features and perceived risk. The effects of gender were analyzed with a *t*-test for independent samples, which revealed no differences between men and women ( $t = -1.34, df = 169, p = .18$ ).

There is a significant negative correlation between age and perceived risk ( $r = -.20, p = .01, N = 171$ ), indicating that perceived risk declines as age increases. Further analyses show that this effect is due to higher investment experiences and financial literacy of older participants. When controlling for these variables the correlation between age and risk judgement is no longer significant.

**3.3.3.4. Prediction of perceived investment risk and investment intention with individual characteristics.** A linear regression analysis was conducted using the standardized overall perceived risk rating as dependent variable and the individual characteristics gender, age, knowledge quiz score and number of different investments as predictors. The resulting model explains 13% of the variance (adj.  $R^2 = .131, df_{Reg} = 4, df_{Res} = 166, F = 7.389, p = .00$ ) with *financial knowledge* being the only significant predictor (Beta =  $-.317, p = .00$ ). The Beta coefficients of the remaining variables are as following: *age* Beta =  $-.116, p = .14$ ; *gender* Beta =  $.016, p = .83$ ; *investment experience* Beta =  $-.050, p = .54$ .

A second regression analysis was conducted to test if investment intention can be predicted by individual characteristics. We used the same variables as predictors as in the previous regression. The standardized rating on willingness to invest served as the dependent variable. No variance could be explained with the resulting model (adj.  $R^2 = .000, df_{Reg} = 4, df_{Res} = 166, F = .980, p = .42$ ).

The second study was conducted to add further insights into the investment risk perception of financial laypeople by analyzing the link between individual features and the perceived risk. Results show that, besides the correlation between financial knowledge and perceived risk, effects are rather low. Especially demographic characteristics seem not to be relevant to laypeople's investment risk perception.

#### 4. Summary and discussion

The first study examined how perceived risk and its aspects differ with regard to various types of investment. By using the classic psychometric approach, the underlying dimensions of perceived investment risk were explored and common consumer investment products were classified on these empirical confirmed dimensions. Two dimensions were detected, one reflecting aspects of losses and variability of the invested value as well as their accompanying behavioral consequences (worry, attention, (un)predictability), the other reflecting aspects of handling the investment (transparency, liquidity).<sup>4</sup> The results suggest that private investors' perception of financial risks is determined not only by quantitative aspects of the investment form (*volatility, probability of loss*), but qualitative aspects of the investment situation (*worry, transparency*) as well. This finding supports the results of MacGregor et al. (1999) and Koonce et al. (2005), who demonstrated that financial experts' risk perception can be best predicted by a combination of economic and situational aspects. Moreover, the pattern of our factor analysis is in line with the analysis of Diacon (2004) who also found a two-factors solution when analyzing risk perception of financial experts. Not only is the number of the resulting factors the same, but the composition of these factors is also very similar, with aspects of variability (uncertainty) and loss (adversity) loading on the same factor. Interestingly, the factor solution Diacon (2004) found for lay investors differs as it consisted of three factors with uncertainty aspects and adversity aspects loading on different factors. Hence, our results match more the results of previous studies on risk perception of financial experts than the results found when investigating risk perception of (real) lay investors. Furthermore, our results show that lay investors produce a ranking of the investment types on the risk dimension which fits well with the risk classification used for financial advisory (Krumnow, Gramlich, Lange, & Dewner, 2002). Here the investment products are grouped with regard to their risks into five levels. On the lowest risk level are products such as savings books and fixed deposits, while warrants and futures are on

<sup>4</sup> The factor structure was replicated by using the dataset of study 2 for the analysis. Here, the same two factors accounted for 69% of variance.

the highest level. This classification is used to match recommendations for financial products with the risk propensity of the clients.<sup>5</sup> Therefore, it can be assumed that the ranking produced by professionals would be alike.

These findings only refer to the structure of perceived investment risk. Our results show that individual investors use the same characteristics as professionals to judge the risk of potential investments. However, differences between laymen and experts might exist in the perceived level of the risk aspects. Results of [Diacon \(2004\)](#) indicate that lay investors perceive the uncertainty (variability) in expected returns as lower than financial experts do. The perceived variability is highly related with perceived risk, which might lead to an underestimation of investment risk and in consequence result in too risky investment decisions. Future research should address differences in the extent financial experts and individual investors perceive those risk aspects that had proven to be relevant for risk evaluation. If any substantial mismatches are detected, it would serve as a valuable indication for necessary risk information in investment advice. Helping clients to get a more realistic image of the risk characteristics seems to be a promising way to prevent them from suboptimal investments.

The survey has given interesting insights into some effects of individual characteristics on financial risk perception. The only aspect which proved to be of important influence on investment risk perception is financial literacy. Perceived investment risk decreases with an increase in knowledge. At the first sight, this might be conflicting with the results of [Diacon \(2004\)](#) reported above, from which we concluded that lay investors are rather prone to underestimate the risks compared to experts (who should be more knowledgeable than laypeople). A deeper look into the results of [Diacon \(2004\)](#) suggests an alternative interpretation. Here, lay investors perceive lower controllability, higher complexity, and less investors' protection than experts do. These aspects reflect risk characteristics which had proven to be relevant for the risk judgement in our study (e.g. predictability, novelty, worry). For all of these aspects it can be assumed that they are perceived differently when financial knowledge increases (which means that lay investors become more like professional investors), which in turn results in a decrease in perceived investment risk. Additionally, our results show that higher financial literacy is accompanied by a broader diversification of investments. Portfolio diversification is seen as the most important measure to optimize the balance of risk and return in one's assets and hence can be considered as good investment behavior. Despite the fact that a causal relation between knowledge and investment behavior cannot be deduced from our data, it can be assumed that financial literacy helps to invest more wisely. In future studies it should be tested how financial knowledge can be imparted to lay investors in order to support them in their investment decisions.

Besides financial literacy we examined investment experience, gender, and age as relevant aspects for investment risk perception. Since none of them proved to be of substantial influence, we will discuss them just briefly.

Personal experience and perceived risk were negatively correlated, a typical finding for voluntary risks ([Barnett & Breakwell, 2001](#)). It can be assumed that experience engenders familiarization. Since novelty is positively related to perceived risk, accustoming will decrease perceived risk. But it is also possible that when people perceive that the risk of specific forms of investment is relatively low, they put their money in those investment forms – here risk perception is the cause of choice (and therefore for experience). Answering the question of causality requires longitudinal analysis or an experimental approach.

According to our results, *gender* and *age* seem to play a minor role in the perception of investment risk. No evidence was found suggesting that women perceive higher risks than men do, although this phenomenon was affirmed in numerous previous studies on environmental and health risks ([Flynn, Slovic, & Mertz, 1994](#); [Harris & Jenkins, 2006](#); [Stallen & Thomas, 1988](#); [Weber, Blais, & Betz, 2002](#)). However, age was significantly related to perceived risk, perceived risk decreased as age increased, but the correlation was rather low and it disappeared when controlling for knowledge and experience.

Our results confirm findings of [Gardner and Gould \(1989\)](#) and [Marris, Langford, Saunderson, and O'Riordan \(1997\)](#) who showed that demographic features have little relevance when explaining risk perception. [Siegrist, Keller, and Kiers \(2005\)](#) tested a new way of analyzing individual differences in risk perception by using a three-way component analysis for psychometric data. Their results also showed that the individual differences have a minor impact for explaining risk perception when compared with the impact of the risk objects (hazards) and the risk aspects.

Our study has several limitations. We used a convenience sample whose composition may not map the composition of German individual investors. However, our results fit with those of other researchers. Further, the psychometric paradigm is widespread in behavioral risk research, but not free of criticism. One drawback can be seen in the fact that oftentimes aggregated data are used, neglecting individual differences. Despite of this limitation, the method is often used in studies of investment risk perception and results can be therefore compared. Using raw data in study 1, however, our results are in line with those studies using aggregated data ([Koonce et al., 2005](#); [MacGregor et al., 1999](#)). This supports the result of [Siegrist et al. \(2005\)](#), who also find consistent models of risk perception when comparing analyses with aggregated data and analyses with individual data.

Future research should address the questions remaining from our study. Studies which directly compare the extent financial experts and individual investors perceive those risk aspects, that had proven to be relevant for risk evaluation, would provide information about possible mismatches. These mismatches might be reasons for misunderstandings in investment consultancy and for misperceptions of investment risk, which in turn might result in suboptimal investment behavior. Further, research is needed which directly addresses the risk communication in the investment consultancy and its effects on

<sup>5</sup> In Germany, financial advisors are legally bound to assess the clients risk propensity. However, there is no standard procedure for measuring risk attitude in a valid and reliable way. So the usefulness of the assessments can be doubted.

the decision and satisfaction of the client. To date, there are some investigations of consumer protection institutions, showing that communication in financial consultancy is often unsatisfactory (Kolbe, 2011). Those studies are rather holistic and do not test for effects of special properties or contents of the communication. Here, controlled evaluation studies are desirable.

Longitudinal studies with real investors could give insights into the causal relations between individual characteristics, financial risk perception, and investment behavior. In particular, the role of investment experience deserves further examination, since this feature is often used as an indicator in financial consultancy. Studies should show if risk perception decreases when investors get experienced with a specific type of investment or if it remains stable. Additionally, it should be investigated how individual investors can be (better) educated in financial issues. To date, a majority of consumers has rather low financial literacy (Center for Economic and Entrepreneurial Literacy, 2009; Commerzbank Ideenlabor, 2003), which may result in suboptimal investments and insufficient provision for old-age.

## 5. Practical implications

To conclude, for individual investors risk is more than possible loss or volatility. Those investors construct risk judgements by integrating various aspects of the investment product and the investment situation. Financial experts use nearly the same aspects when evaluating the risk of investments, so communication problems between advisors and clients should not result from different mental risk models. Hence, the task for the advisor is not to convince the client to use the same aspects as a professional for constructing the risk judgement. Instead, the advisor has to ensure that the client processes the relevant risk information in an unbiased manner. Evidence from the study of Diacon (2004) shows that lay investors tend to underestimate volatility (in comparison to the volatility estimation of experts). One possibility is to provide numerical risk information by using standardized graphics with defined time spans and scale graduations. This would allow for better comparability of different investment options.

There are two ways to help clients with limited financial knowledge; which is in fact a large proportion of lay investors, as representative studies show (Center for Economic and Entrepreneurial Literacy, 2009; Commerzbank Ideenlabor, 2003). One way is to improve financial literacy. However, this is beyond the capacity of conventional investment consultancy. Another way is to provide context for financial risk information and to “translate” financial risk characteristics into consequences for the client. Instead of informing a client that an investment product is highly volatile, the consultant could explain that its value might change rapidly, so it is less predictable and demands higher attention.

Risk information should be tailored to the individual situation and conditions of the client. To date, information is tailored, if at all, by using obvious features of the client, such as age and gender. The results of this study suggest that investor typologies based on demographic features may not be needed for providing client appropriate risk education. Instead, individual consultation should meet individual needs. A responsible investment consultant must consider the financial experience, the risk understanding, the financial situation, and the future plans of the investor. Additionally, the individual risk attitude of the client has to be incorporated into the investment advice. Hence, it takes time, effort, and the willingness of the consultant to properly analyze the investment conditions of the individual client in order to give good advices. However, if the needs of the client are met it should result in better investment decisions.

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