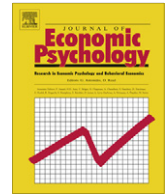




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Review

Does expertise influence the impact of overconfidence on judgment, valuation and investment decision?

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ABSTRACT

Empirical research documents that overconfidence has a strong impact on investment decision. In this experimental study using a within-subject design and an asset allocation problem, we detail this relationship by introducing a stage of judgment (initial knowledge about the assets to invest in) and valuation (forecasts to be made) before the investment decision. We also examine the role of expertise by comparing a group of bankers (20 loan officers) and a group of students (64), control in the role of risk aversion, and implement different measures of overconfidence (miscalibration in two formats – the BTA effect and the illusion of control). Our results show that no differences were observed between bankers and students in the degree of overconfidence. However, overconfidence seems to determine decision-making in a different way across the two groups. Concerning students, we observed that overconfidence influenced general tasks such as global knowledge of the assets but when it came to investing, risk aversion had a major effect. In contrast, bankers were strongly influenced by their overconfidence. For them, it mainly affected specific tasks (valuation and investment choices) but, surprisingly, risk aversion had no effect on investment decision. Our results suggest that introducing an assessment stage in the decision process is an aid to understanding the differences between experts and novices.

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1. Introduction

The human tendency to be overconfident has been widely documented in psychology and has become a central feature in economics and behavioral finance. Many facets of overconfidence have been examined² through the tendency to overestimate our own knowledge (in particular in miscalibration studies), our abilities compared to others (better-than-average effect), or the degree to which we control future events (illusion of control).

In parallel, numerous studies have confronted experts' and novices' decision-making process (Newell & Simon, 1972; Shanteau, 1992a,b; Andersson, 2004). Bedard and Chi (1993) defined expertise as a number of years of experience or practice. It has been shown that experts seldom outperform novices but possess an efficient information-processing (Andersson, 2004; Camerer & Johnson, 1991; Chase & Simon, 1973; Newell & Simon, 1972). In this literature, loan officers have been insufficiently studied (Andersson, 2004; Sarasvathy, Simon, & Lave, 1998; Von Holstein 1972).

In this paper, we analyze the impact of overconfidence along the dynamic process of decision-making in different stages (judgment, valuation, decision). We considered an investment decision between different assets, which are differently known, perceived, judged and evaluated by the participants. Our within-subject experiment also focused on the role of experience by analyzing two groups: 64 students (Bachelor's and Master's Degree levels) and 20 loan officers.

We divided the study into three stages: the judgment, the valuation and the investment decision. We supposed that overconfidence could directly impact these stages, but also the investment decision through the judgment and the valuation process. As a control variable for the investment decision, we included a measure of risk aversion.

The main contributions of our paper to the literature can be summarized as follows. Firstly, people can be overconfident in different ways and this implies different types of measures. In this study, we use four measures. Two of them derive from prior studies that have emphasized the sensitivity to elicitation methods in miscalibration tests, so we have integrated two types of frame in the estimation of confidence (a probabilistic and a frequency judgment). The two others are designed to capture the better-than-average effect and the illusion of control. We have also computed a composite index based on a factor analysis of these four measures. The second goal is to study more closely how overconfidence influences the decision-making process, by comparing a direct impact on investment choices and a mediated impact through a judgment/valuation stage of the assets in which participants could invest. The third goal is to contribute to the literature on expertise, by examining the above relationships between overconfidence and decision for professionals (bankers) and non-professionals (students).

In all, to sum up our main results, overconfidence can be clearly observed among experts and non-experts. However, when we detail its effect on decision-making by including a judgment/valuation stage before the investment choice, we document important differences.

For students, we observe that overconfidence influences general judgmental tasks such as global knowledge of the assets but, when they have to invest in assets, risk aversion has a major effect. In contrast, bankers are strongly influenced by their

² See in particular Hilton, Régner, Cabantous, Charalambides, and Vautier (2011), Moore and Healy (2008), Larrick, Burson, and Soll (2007), Klayman, Soll, Gonzalez-Vallejo, and Barlas (1999), Alicke, Klotz, Breitenbecher, Yurak, and Vredenburg (1995).

overconfidence. For them, overconfidence mainly affects specific tasks (valuation and investment choice) and risk aversion has no effect on investment decision.

The rest of the paper is organized in four sections. In Section 2 we present an overview of the literature and our theoretical model. Section 3 describes the design of the experiment. Section 4 presents the results. Section 5 discusses the results and concludes our work.

2. Literature overview and theoretical design

2.1. Overconfidence and financial decision-making

The literature on overconfidence has broadly investigated its impact on financial decision-making, mainly focused on financial markets and trader behavior. In this area, three major consequences of overconfidence have been documented: overconfidence causes too much trade (Barber & Odean, 2000; Glaser & Weber, 2007; Kim & Nofsinger, 2002; Odean, 1999; Statman, Thorley, & Vorkink, 2004), excessive volatility (Daniel, Hirshleifer, & Subrahmanyam, 1998; Gervais & Odean, 2001) and a combined phenomenon of under- and overreaction to information (Daniel & Titman, 1999; Daniel et al., 1998; Glaser & Weber, 2007; Lee & Swaminathan, 2000). In corporate finance, important impacts have been observed such as overinvestment or preference for debt financing (Malmendier & Tate, 2005).

Despite much research that has covered the impact of overconfidence on the financial decision involving various financial agents, few studies have focused their attention on bankers. Sarasvathy et al. (1998) compared entrepreneurs with bankers in a variety of problems including financial risk. Their results tend to demonstrate strong differences between the two groups. Entrepreneurs seem to accept the risk whereas bankers try to reduce and control it.

2.2. Research on experts and laymen

In this paper, we focus our attention on the differentiation between laymen and experts. Such opposition will be studied concerning the degree of overconfidence and decision-making. In past literature, differences have been observed between these two populations both on their level of overconfidence and their performance ability.

In field experiments, a “process–performance paradox” has been cited by Camerer & Johnson (1991) whereby “individuals with vast knowledge about a domain nevertheless are unable to render highly accurate predictions in that arena” (Önkal, Yates, Simga-Mugan, & Öztin, 2003). In some domains such as stock prices and earnings forecasts, professionals do not outperform laymen (Von Holstein, 1972; Yates, McDaniel, & Brown, 1991). Önkal et al., 2003 confirmed these results by analyzing the judgment accuracy between experts and novices in foreign exchange rates forecasting. They observed that many novices made more accurate predictions than experts. However, Glaser and Weber (2007) found that experienced investors are more accurate than novice investors when they estimate their past portfolio performance.

Overall, the analysis of the effect of expertise on decision-making has shown ambiguous results. Several studies document the fact that experts are prone to overconfidence (for example Russo & Schoemaker, 1992). Glaser, Langer, and Weber (2007) show that professional traders possess a higher degree of overconfidence than students but emphasize the fact that “the question of the strength of professionals’ biases compared to that of non-professionals is difficult to answer”.

2.3. Research on the relation between overconfidence and risk aversion

Empirical and theoretical studies have analyzed the determinant of risk-taking or the impact of overconfidence in portfolio choices. Numerous formats have been used to measure attitude against risk – the majority of studies conclude that there is a negative relationship between overconfidence and risk aversion.

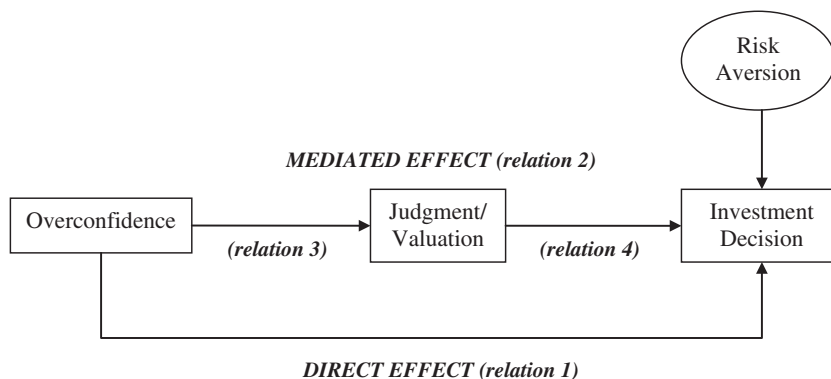


Fig. 1. Overconfidence and decision – direct and indirect (mediated) relationship.

Risk aversion has been expressed in different ways such as an allocation between a risky and a safe investment (Brockhaus, 1980; MacCrimmon & Wehrung, 1990; Simon, Houghton, & Aquino 1999; Nosić & Weber, 2008) or such as herding behavior (Diamond, 1991; Hirshleifer & Thakor, 1992; Menkhoff, Schmidt, & Brozynski, 2006).

Theoretical models such as that of Odean (1998) found that overconfident traders possess more risky portfolios than rational traders. This risk-taking behavior results from an undiversified portfolio. Similar results have been observed by De Long, Shleifer, Summers, and Waldmann (1990), Benos (1998), Gervais and Odean (2001), Odean (1999); Barber & Odean (2001) and Kim & Nofsinger(2002)). Moreover, these studies showed that overconfident traders had a lower performance level than rational traders.

Menkhoff et al. (2006) provided a survey of 117 German fund managers and analyzed the relationship between experience, risk-taking and overconfidence. The authors found that overconfidence (defined as miscalibration) decreases with experience as does risk-taking.

Despite these persuasive results, some other studies found no relations between overconfidence and attitude toward risk, in particular Kirchler & Maciejovsky (2002), who measured risk attitude with the cash-equivalent method. Similar results have been observed in empirical studies and theoretical models (Frascara, 1999; Heath & Tversky, 1991; Li, 2002; Prendergast & Stole, 1996).

2.4. The model

Our model supposes that overconfidence positively influences investment decision, in line with numerous studies. But this influence could be direct or indirect through an additional stage devoted to judgment and valuation. Fig. 1 depicts both influences.

Overconfident people can express overconfident judgment or valuation but do not necessarily act upon them when they make a decision. In this case, the influence of overconfidence on decision would not be mediated by judgment. So we tested a direct relationship between overconfidence and decision (relation 1 in Fig. 1) but also a relation which is mediated by a judgment/valuation procedure (relation 2). We also integrated risk aversion as a control variable (and examined the relationship between overconfidence and risk aversion), in line with the literature that has pointed out its role on investment decision. According to the literature, risk aversion drives negatively and directly the level of investment in risky assets.

Moreover, we tested whether these relationships between overconfidence and decision are influenced by expertise. According to the literature, experts are prone to overconfidence, just as people in general, and their overconfidence influences their decision-making. But its effect might not be so direct because they are used to acting through procedures, particularly for important decisions such as investment choices. They are used to integrating valuation processes in their professional decision-making. Therefore, the impact of their overconfidence on decision-making could be much better mediated through a valuation stage compared with non-professionals.

3. Experimental design

3.1. Participants

Our within-subject experiment included two types of participants: a group of students and a group of bankers. The first group was composed of 64 business students from Montpellier University (46 were male). Due to their sparse background in Economics and Finance (39 students were in Bachelor's Degree groups and 25 students were from a Master's program specialized in New Technology Management), they were assimilated as novice loan officers (Andersson, 2004; Hoffman, Shadbolt, Burton, & Klein, 1995).

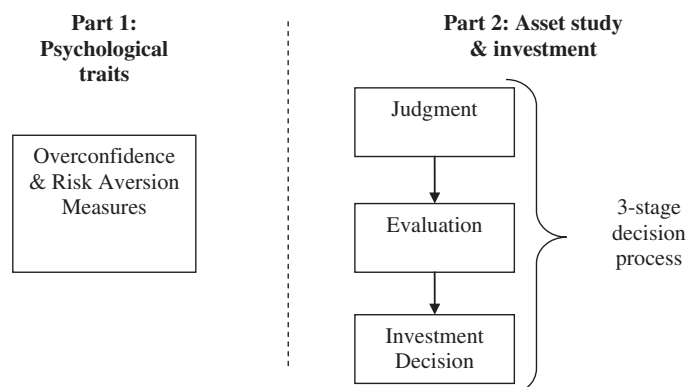


Fig. 2. Experimental process.

The second group consisted of 20 loan officers from major French banks with a variety of experience (mean = 7.75; standard-deviation = 4.16). 11 loan officers were male.

3.2. Task and procedure

While the instructions were being explained, participants could ask questions. Afterwards they were asked to fill out the survey (detailed in the [Appendix A](#)), which was divided into two parts. The experiment took 1 h to complete.

Due to the complexity of organizing a seminar session with all the bankers, we decided to elaborate the questionnaire on a laptop and arrange individual sessions with each loan officer. We considered that an appointment to participate in the experiment might evoke sufficient interest for the study so we did not offer any compensation (Andersson, 2004; Hodgkinson, Bown, Maule, & Glaister, 1999). Each question was similar for different bankers and took the same time to fill out. Software was added to establish when the time had elapsed in order to manage their time equally and to be homogeneous with the students' settings.

For the students, we organized four sessions during the same morning. They had to fill out the same survey as that of the bankers (few items were different due to the specificity of the bankers' experience), with the same amount of time to answer. Each student received a compensation of €15.

The different steps of the experiment are summarized in [Fig. 2](#).

In the first part, the questionnaire measured overconfidence and risk aversion. Then, the second part was designed to detail the stages preceding the decision: (1) a judgment stage with a general perception of each asset (initial risk perception and knowledge), (2) a valuation stage with forecast estimations for each asset, and (3) the investment choice. These different stages, namely the judgment/valuation stage before the investment stage, were designed to recreate the model described in [Fig. 1](#), and we also wanted to emulate circumstances from decision-making in real life.

3.3. Assets

Our experimental assets are based on 20 stocks listed on international markets. We defined two classes of assets: familiar and unfamiliar stocks (consistent with [Ganzach, 2000](#)) with 10 stocks in each group. Within these two groups, we also selected stocks with a high and a low degree of risk, along with 10 stocks in each group. Familiar stocks were chosen from well-known companies (such as Rolls-Royce). Unfamiliar stocks were initially selected according to our judgment and we also modified their names to assure their unfamiliarity (e.g. Cobham became Haboham). To determine the degree of actual risk, stocks were selected according to their beta. We considered that a low-risk stock has a beta below 0.8, while a high-risk stock has a beta above 1.2. Associated with the assets' name and beta, we collected their previous 5 quarterly results, describing the volatility linked to the beta.³ So, we were able to study whether the investment choice was driven by a general judgment (in particular risk perception) conveyed by the name of the company, or by a valuation of risk derived from past volatility. As a whole, we studied 20 assets: five were well-known with high-risk, five well-known with low-risk, five were unknown with high risk, and five were unknown with low risk.

3.4. Measures

3.4.1. Overconfidence

We measured four different forms of overconfidence: miscalibration in interval estimates with probabilistic and frequency judgment, better than average effect (BTA) and illusion of control. The first calibration measure, with a probabilistic judgment, comprised 10 questions. Each participant provided a range of possible values for every question (i.e. an interval estimate), which had only one correct numerical answer. Thereafter, he/she had to comment on his/her confidence as to the question's accuracy. To be precise, the participant had to indicate a subjective probability that his/her interval was correct. The level of overconfidence was calculated by subtracting each participant's actual proportion of correct answers from that same person's respective average of self-assessed confidence. Below 0, the participant was underconfident and above 0, the participant was overconfident. The subjective probability methodology has been used in a number of other studies ([Alpert & Raiffa, 1982](#); [Busenitz & Barney, 1997](#); [Campbell, Goodie, & Foster, 2004](#); [Fischhoff, 1977](#); [Fischhoff, Slovic, & Lichtenstein, 1977](#); [Gigerenzer, Hoffrage, & Kleinbölting, 1991](#); [Juslin, Laukka, Liljeström, Västfjäll, & Lundqvist, 2011](#); [Nelson & Narens, 1980](#); [Teigen & Jorgensen, 2005](#)) and has generally shown a lower level of overconfidence, compared to the objective probability methodology (in which a given probability – e.g. 90% – is assigned, see for instance [Russo & Schoemaker, 1992](#)).

The 10 questions in this test were selected in order to avoid too difficult or too easy questions because subjects typically appeared to be overconfident for difficult questions (percentage of correct answers below approximately 75%), but underconfident for easy questions ([Lichtenstein & Fischhoff, 1977](#); [Griffin & Tversky, 1992](#)). These questions were elaborated after pre-experimental face-to-face meetings with the bankers in which we interviewed them to better understand their domain-specific issues and professional environment. For students, the questions were initially sampled by means of a preliminary study with a test group.

³ We selected stocks for which past earnings volatility was consistent with their betas (high volatility associated with high beta).

Table 1
Overconfidence measures and risk aversion – Mean and SD.

N = 84 (20 bankers, 64 students)	Bankers	Students	t-Test
Miscalibration (probability judgment)	19% (14%)	17% (19%)	.450
Miscalibration (frequency judgment)	5% (16%)	6% (20%)	–.160
Better than average effect (BTA)	18% (21%)	17% (27%)	.112
Illusion of control	26% (20%)	23% (32%)	.462
Overconfidence index	16% (12%)	15% (16%)	.483
Risk Aversion	28,500€ (18,469€)	35,689€ (25,467€)	–1.156

None of the *t*-tests between bankers and students are significant. All the overconfidence variables are significantly different from zero, at least at the 1% level.

In order to compute the overconfidence index, we converted the five-point scale into percentage for BTA and illusion of control (1 = 0%, 2 = 25%, 3 = 50%, 4 = 75%, 5 = 100%).

A mean above 0% shows overconfidence (with a maximum at 100%) and a mean below 0% shows underconfidence (with a maximum at –100%). At 0%, the subject is neither over nor underconfident.

Following the 10 questions, participants were asked to estimate the number of correct answers. By comparing this number with the actual number, we measured the second form of overconfidence: miscalibration by frequency judgment (Cosmides & Tooby, 1996; Gigerenzer et al., 1991; Granhag, Strömwall, & Allwood, 2000; Sniezek & Buckley, 1991). The interpretation was similar to the previous measure, but this form of confidence was designed to capture more retrospective confidence.

To measure the BTA effect, we replicated the well-known example of Svenson (1981) who found that 90% of drivers estimated that they were above average in their driving ability. We added two questions to estimate the ability of participants compared to the others. The average of a 5-item scale captured the BTA and was transformed into a percentage.

Our last form of overconfidence measured the illusion of control with three questions adapted from Simon et al. (1999) and Langer and Roth (1975). We added two questions from Dumont, Schwarzer, and Jerusalem (2000) that focus on the concept of self-efficacy (Bandura, 1977a). As well as the BTA variable, a 5-item scale measured the illusion of control and was converted into a percentage.

All those four confidence measures combined general and professional questions (as detailed in the appendix). Our methodology was globally designed to capture different forms of confidence. This multifaceted form of overconfidence has been recently highlighted by Hilton et al. (2011) and Fellner & Krügel (2012).

Finally, to test overconfidence as a whole, we created an aggregated measure of these four variables. We weighed each variable in an index by using its eigenvalue according to the methodology of Hayward and Hambrick (1997).⁴

3.4.2. Risk aversion

The subjects had to allocate an amount ranging from 0€ to 100,000€ between a risky and a safe investment. A participant was considered as very risk averse when having a high amount in a safe investment. This measure replicated the Nosić and Weber (2008) study and is also used by a major French bank to measure risk aversion.

3.4.3. Judgment

This stage took place before participants got any information about assets. Here we captured initial judgments about the degree of knowledge and risk perception, solely based on the name of each asset. Each participant was required to state his/her level of knowledge and risk perception. Both variables were on a 5-point scale ranging from 1 – zero knowledge (low degree of risk) to 5 – well known assets (high degree of risk).⁵ The methodology of a single-item instrument to measure such variables has been widely used (Ganzach, 2000; Payne, 1975; Slovic, 1967; Weber, Anderson, & Birnbaum, 1992; Weber & Milliman, 1997).

3.4.4. Valuation

After forming a judgment based on initial perceptions, participants were given information to produce forecasts. They had to estimate the future result for each company on the basis of the five consecutive previous results. Then they were asked to give an estimation of (1) the accuracy of their forecasts and (2) the difficulties they encountered in completing the forecasts (Du & Budescu, 2007), ranked on a 5-point scale from low to high difficulty (or accuracy). We should notice that the accuracy of the estimation was not required in order to compute performance but to improve each participant's awareness in the difficulty of the estimation, which was our key variable here. Indeed, the core interest was to examine what type of risk perception yields the decision: a risk perception based on initial and general knowledge (that is, judgment, at the previous stage) or a risk perception based on a forecasting process and a valuation of past volatility (at this stage).

⁴ Hayward & Hambrick measure CEO overconfidence while explaining corporate acquisitions. They use three indicators to estimate CEO overconfidence and derive a composite measure of overconfidence from a factor analysis of the three indicators. They then integrate this index in their empirical tests.

⁵ For each construct, we used numerical values (1, 2, 3, 4 and 5) to represent the scale points (from very low = 1 to very high = 5, from strongly disagree = 1 to strongly agree = 5, etc.). The 'distance' between items '1' and '2' is likely to be the same as between items '3' and '4', etc. We also developed symmetric scales which include middle points (neither agree - nor disagree = 3 for instance). For convention, when a Likert scale is symmetric and equidistant, the resulting data can generally be assumed to be interval scaled.

Table 2
Correlation matrix, standardized coefficient (prob.).

N = 84	1	2	3	4	5	6
1. Miscalibration – probability	1					
2. Miscalibration – frequency	.676 (.000)	1				
3. Better than average	.247 (.000)	.174 (.000)	1			
4. Illusion of control	.264 (.000)	.264 (.000)	.291 (.000)	1		
5. Overconfidence index	.393 (.000)	.250 (.000)	.866 (.000)	.607 (.000)	1	
6. Risk aversion	-.222 (.000)	-.057 (.020)	-.136 (.000)	-.051 (.038)	-.200 (.000)	1

3.4.5. Investment

During the final stage participants had the possibility of investing in the 20 assets. Following the methodology of Weber, Senmorgen, and weber (2005) we asked subjects to imagine they had won 100,000€ on the lottery and were committed to investing this money. They had the opportunity to invest it (or part of it) in the assets they had selected from the 20, but were informed that this placement was risky. The non-invested money was automatically lodged in a safe depository which yielded an annual rate of 3%. We computed the sum of money invested in each asset to test our model.

4. Results

4.1. Overconfidence

Table 1 presents the degree of overconfidence among the four different measures of overconfidence and the composite index. Consistent with the previous literature, our sample shows overconfidence whatever the measures used⁶ (Biais, Hilton, Mazurier, & Pouget, 2005; Glaser & Weber, 2007; Teigen & Jorgensen, 2005; Nosić & Weber, 2008). However, we observed a significant difference between the two kinds of miscalibration (t -test: 7.048^{***} , $p < 0.001$) as mentioned by Gigerenzer et al. (1991). No differences were observed between loan officers and students (t -tests are not significant), in contrast to Glaser et al. (2007) who studied traders. A possible explanation could be that loan officers are less overconfident than traders. This may be the case, according to the abundant literature on traders' overconfidence, but our study is not designed to provide evidence for such differences. This contradiction may also have risen from the task characteristics. In their experiment, Glaser et al. measure overconfidence in a forecast context while we focused ours on the different aspects of overconfidence (miscalibration, BTA and illusion of control). Traders are experts in trend estimates on financial markets and Glaser et al. based their measure of overconfidence on this particular task.

In addition, both bankers and students were risk averse: they decided to invest very little money in the risky asset as shown in Table 1.

In Table 2, from the total sample ($N = 84$), we documented strong correlations between the overconfidence index and its four measures: Miscalibration – probabilistic judgment, Miscalibration – frequency judgment, Better than average effect (BTA), and Illusion of control. All the Pearson correlations are significant at the 1% level. In addition, we observed a significant correlation between risk aversion and overconfidence: $r = -0.20$ ($p < 0.001$). This negative coefficient means that strong overconfidence is associated with a low risk aversion.

4.2. Judgment, valuation and investment decision

The judgment/valuation stage of the experiment is composed of three variables: *knowledge* and *risk perception*, based on the name of each company (judgment), and the perceived *difficulty* of estimating forecasts (valuation). *Investment* is the amount invested in each asset. In Table 3, we examined differences between loan officers and students. We noted that students tended to invest more than bankers, whereas loan officers had less difficulty of forecasting than students (t -tests are significant at 1% for these two variables solely).

Students and loan officers did not differ in initial judgments, i.e. through knowledge and risk perception ($p > 0.05$). Furthermore, we found a negative correlation between asset knowledge and risk perception ($r = -0.64$, $p < 0.01$ – see Table 4). This result is consistent with those of Sachse, Jungermann, and Belting (2012), who find that the higher the experience of investors is, the lower the perceived investment risk. In the participants' mind, high asset knowledge was often associated with low risk. In their initial judgments, they strongly relied on the name of each company which seemed to enhance a sort of halo effect – be it positive or negative. The two steps of the asset evaluation process were also associated: difficulty of forecasting was significantly correlated with risk perception (0.234 , $p < 0.01$) and asset knowledge (-0.228 , $p < 0.01$).

4.3. The understanding of the investment decision

We hereafter present the results of the determinants of the investment decision excluding overconfidence which will be introduced below. For each participant and for each asset (that is for 1680 observations), we tested a linear causal

⁶ We also computed an equally weighted index for overconfidence (instead of using the percentage of explained variance). The results did not differ.

Table 3
Judgment, valuation and investment decision variable – Mean and SD.

N = 84	Bankers (N = 20)	Students (N = 64)	t-Test
Knowledge	2.29 (1.44)	2.37 (1.57)	–.956
Risk perception	2.88 (1.22)	2.98 (1.31)	–1.330
Difficulty of forecasting	2.69 (1.25)	2.91 (1.09)	–3.467***
Investment per agent	28,940€ (23,901€)	57,620€ (28,838€)	–3.336***

Standard-deviations are reported in parentheses.

Asterisk indicate significance level of this test:

*** 1%.

Table 4
Correlation matrix, standardized coefficient (prob.).

N = 84	1	2	3	4	5	6
1 Overconfidence index	1					
2 Risk aversion	–.200 (.000)	1				
3 Asset knowledge	–.075 (.002)	.034 (.158)	1			
4 Forecasting difficulty	.118 (.000)	–.006 (.803)	–.228 (.000)	1		
5 Risk perception	.040 (.104)	.003 (.898)	–.645 (.000)	.234 (.000)	1	
6 Investment decision	–.020 (.402)	.066 (.007)	.324 (.000)	–.187 (.000)	–.246 (.000)	1

Table 5
Impact of the judgment/valuation and risk aversion on the investment.

Regression analysis N = 1680 (Participants × Assets)	Bankers (N = 400) Beta (prob.)	Students (N = 1280) Beta (prob.)	Moderating role of expertise – Bankers vs. students (prob.)
Knowledge	.40 (.000)	.25 (.000)	.011
Risk perception	–.08 (.169)	–.05 (.126)	.393
Difficulty of forecasting	–.12 (.010)	–.13 (.000)	.091
Risk aversion	–.013 (.779)	–.056 (.032)	.246

We report the significance of the *t* value in parentheses. The significance of this test is at 5%.

relationship in which four variables (knowledge, risk perception, and difficulty of forecasting, plus risk aversion as a control) were presumed to directly influence investment decision. To assess multicollinearity in the regression analysis, we looked at the tolerance (i.e. percentage of variance in the predictor that cannot be accounted for by the other predictors) and the variance inflation factor (VIF): for each construct, tolerance values were much larger than .10 (between .57 and .99) and VIF were much smaller than 10 (between 1.00 and 1.74). A moderator variable, the level of expertise (bankers vs. students), was seen as a variable that altered the strength of these causal relationships. So, we simultaneously measured the four causal relationships for two levels of expertise (bankers vs. students). In the regression analysis, we were interested in making explicit comparisons of one level against another (bankers vs. students).⁷ The results are shown in Table 5.

Both groups seemed very sensitive to the assessment stage in their investment choices of two measures – that is – for the “knowledge” component (based on the name of the company) and the “difficulty of forecasting”. But the initial “risk perception” (also based on the name) had no effect on investment decision for both populations, probably because the assessment stage implied a more reliable way of evaluating risk via the difficulty of forecasting. Both groups invested a higher amount in the assets which they considered having good knowledge of (positive coefficients) and low difficulty in estimating forecasts (negative coefficients).

We tested the significance of expertise by regressing investment on each dependent variable (4 variables in Table 5) and by introducing expertise as a dummy (bankers vs. students) moderator variable. The expertise had an impact on the relationship between the knowledge and the investment decision. The effect was significantly more important for bankers ($\beta = 0.40$) than for students ($\beta = 0.25$). However, we did not observe any moderating effect for the other independent variables (relationships between “difficulty of forecasting” and investment and between “risk perception” and investment). Even if we did not observe a moderating effect between the “difficulty of forecasting” and investment, the significance at 9% allowed us to establish a slight difference between bankers and students. We also documented no effect of risk aversion for loan officers, although they are professionals for whom risk is expected to be a main decision driver. Risk aversion had a significant impact

⁷ We also checked on whether our results held when controls were made for within-subject (84 participants) and within-asset effects (20 assets). In our regression analysis, we integrated control variables (name of the participants and name of the assets) as random factors, whereas the level of expertise (bankers vs. students) was seen as a fixed factor. What interested us was to what extent the random factors (participants and assets) accounted for variance in the dependent variable and, thus, could alter other effects. In fact, our results were similar.

Table 6

The effects of overconfidence on judgment and valuation.

Regression analysis $N = 1680$ (Participants \times assets)	Bankers ($N = 400$) Beta (prob.)	Students ($N = 1280$) Beta (prob.)	Moderating role of expertise – Bankers vs. students (prob.)
Knowledge	.024 (.638)	.085 (.002)	.279
Risk perception	-.21 (.014)	-.024 (.394)	.032
Difficulty of forecasting	-.12 (.000)	-.10 (.000)	.000

We report the significance of the t value in parentheses. The significance of this test is at 5%.

on student investment. However, the effect of risk aversion on investment did not significantly differ between bankers and students ($p > .05$).

4.4. The effects of overconfidence on judgment and valuation

In this section we present the results for relation 3 in Fig. 1. To test the implication of overconfidence on judgment and valuation and to analyze the role of expertise, we used an index of overconfidence based on similar items between bankers and students. The results are presented in Table 6. They highlight the fact that overconfidence has an impact on each variable but differs depending on the population.

For the bankers, overconfidence had a negative impact on risk perception whereas for the students no relation was observed. In contrast, the subjective knowledge of the assets was driven by the level of overconfidence only for students. The difficulty of forecasting was influenced by the level of overconfidence and by the level of expertise. In relation 4, a similar impact of the difficulty of forecasting on investment had been documented but here we observed that the impact of this variable was stronger for bankers than for students (respectively $\beta = -.12$ and $\beta = -.10$).

When taken together, relations 3 and 4 showed that the global decision process was partially similar among both experts and novices, but also provided evidence on differences between them. For both, the difficulty of forecasting was a main driver of the investment decision, meaning that they were both sensitive to a valuation stage. But overconfidence made this valuation stronger for bankers (in Table 6 the “difficulty of forecasting” variable has the strongest coefficient for them and the impact of overconfidence on this variable is significantly stronger than for students). For both, the initial knowledge of the company was also a main driver of the investment decision, meaning that they were also very sensitive to an initial judgment (without any valuation process) in their decision, even if overconfidence drove this perception for students solely (Table 6).

4.5. The role of overconfidence on the investment decision

We tested relations 1 and 2 in Fig. 1. In a primary analysis (relation 1), we found that overconfidence had a direct impact on the investment decision for bankers solely ($\beta = .165^{***}$). For them, the amount invested in assets was positively correlated with the degree of overconfidence, consistent with Odean (1998) and Glaser and Weber (2007). No such relationship was observed among students.

To further investigate the relationship between overconfidence and investment, we introduced the judgment and valuation variables as mediators (knowledge, risk perception and difficulty of forecasting), following the methodology of Baron and Kenny (1986). After the introduction of mediators, the effect of overconfidence on the level of investment remained significant for bankers only, but lower ($\beta = .128^{**}$) than observed in the direct relationship. Bankers appeared to cope with their risk attitude better than they handled their overconfidence.

On the contrary, students selected the assets according to their risk aversion and this strongly drove the investment decision, regardless of their overconfidence. Overconfident students seemed to judge according to their overconfidence but did not directly invest on the basis of this assessment – they seemed rather to invest in accordance with their risk aversion. For them, overconfidence had no direct or mediated effect on investment because the decision to invest was dominated by risk aversion. Overconfidence had only an indirect effect as noted above: it positively influenced knowledge whereas knowledge positively affected investment decision; and overconfidence negatively influenced difficulty of forecasting while difficulty of forecasting had a negative impact on investment decision.

Our findings tend to complete our initial model and our results are given in Figs. 3 and 4.

In the student sample, we were not able to demonstrate any mediating effect of knowledge and difficulty of forecasting since there was no previously significant relation⁸ (relation 1) between the independent (overconfidence) and dependent variable (investment decision). In contrast, in the bankers' sample, there was a direct effect of overconfidence on investment decision. However, the mediation effect – only possible through difficulty of forecasting – was just partial: when relations 3 and 4 were controlled following Baron and Kenny (1986), the previously significant relation between overconfidence and investment

⁸ For Baron and Kenny (1986), “a variable function is a mediator when it meets the following conditions: (a) variations in levels of the independent variable significantly account for variations in the presumed mediator (i.e., Path a), (b) variations in the mediator significantly account for variations in the dependent variable (i.e., Path b), and (c) when Paths a and b are controlled, a previously significant relation between the independent and dependent variables is no longer significant, with the strongest demonstration of mediation occurring when Path c is zero.”

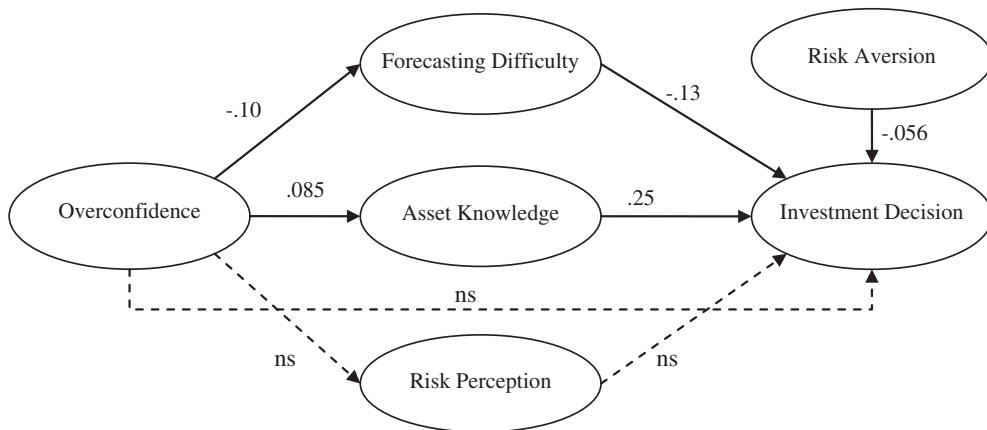


Fig. 3. Students' model of investment decision (beta, $p < 0.05$).

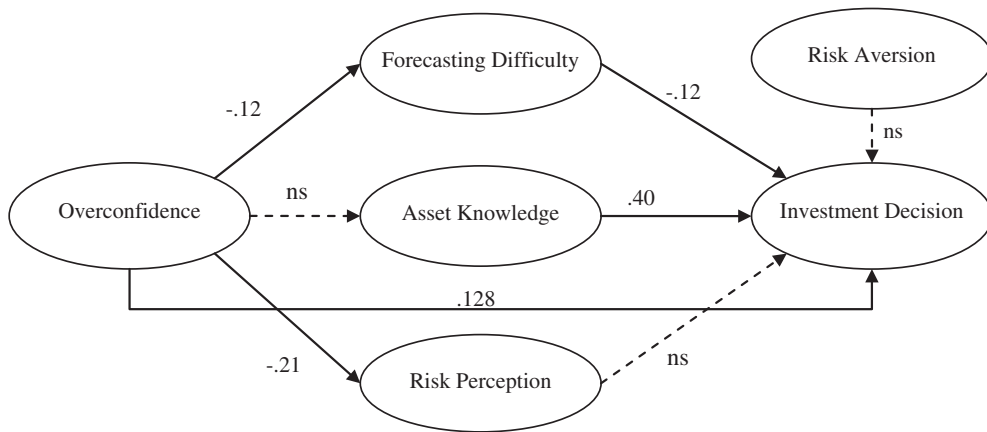


Fig. 4. Bankers' model of investment decision (beta, $p < 0.05$).

decision remained highly significant ($p < 0.01$) but the t value decreased slightly (3.34 vs. 2.88). In other words, the bankers' difficulty of forecasting partially – and not totally – mediated the influence of overconfidence on investment decision.

5. Discussion and conclusion

One important result in this study is that the degree of overconfidence is similar between experts and novices, whatever the measures. This result is in opposition to Glaser et al. (2007) who document the fact that traders are more overconfident than students, but we did not reproduce the Glaser et al. experiments and measures. These variations across studies devoted to overconfidence have been recently highlighted by Fellner & Krügel, 2012 who concluded: “only further empirical research can settle speculations about why different methods to assess overconfidence create divergent findings”. (p.152)

The most important result that we have documented is that the two groups are not similarly influenced by their overconfidence. Three major differences have emerged from the experiment, regarding (1) the mediator effect of an assessment stage before making the decision, (2) the distinction between general judgment and specific valuation and (3) the role of risk aversion.

Our intuition had been that professionals are used to implementing procedures before making a decision (in particular for important decisions such as investment decisions), and in fact we observed, only for bankers and not for students, a significant mediated relationship between overconfidence and decision (relation 2) consistent with our intuition.

In addition, when we closely look into how overconfidence influences the three components of judgment and valuation (relation 3), and how those components constitute a decision (relation 4), we can observe that bankers are more influenced by valuation, and students by initial and general judgment. In fact, we have documented that which concerns students only, a significant combined relation 3 and 4, which indicates that initial judgment (“knowledge” based on the name of the company) is important in their decision process. Moreover, when analyzing the difficulty of forecasting in the same manner, we

have shown that both groups are significantly influenced (relations 3 and 4 combined), but this impact is stronger for bankers (as shown by the introduction of expertise as a moderator variable in the analysis).

This analysis is consistent with the literature which has pointed out that experts are prone to overconfidence in their decision-making (in particular traders on financial markets). Our experiment reinforces this result here by showing that overconfidence has a powerful impact on the way experts implement valuation. This result can also be interpreted with respect to the literature which established a positive link between overconfidence and task difficulty (Lichtenstein & Fischhoff, 1977; Griffin & Tversky, 1992). Another important conclusion is that experts act upon their judgments: their investment choices are related to their valuation.

Finally, we have noted the fact that non-experts are strongly influenced by their risk aversion, whereas bankers are not. This is not due to a difference in the degree of risk aversion (no differences are observed). Students seemed to be overconfident in their initial judgment when they perceived the name of the company, and also when they evaluated the difficulty of forecasting. But when it came to decision-making they did not rely on their opinion concerning the assets, whatever their degree of overconfidence. Their investment choices were only driven by their risk aversion. This finding is in opposition to previous results which document a direct link between overconfidence and decision in experimental settings involving students (such as Glaser & Weber, 2007; Odean, 1998; or Maciejovsky & Kirchler, 2002). It appears that the introduction of an additional stage in the experiment, namely a valuation process, might question their initial judgment (strongly determined by their degree of overconfidence). Their initial judgment would be then put in doubt, and this “think twice” in investment decision seems to be guided by risk aversion.

In conclusion, our results suggest that introducing an assessment stage in the decision process helps in the understanding of the differences between experts and novices. The use of professionals as participants in our experiment guaranteed some interesting findings. However, experts are not always accessible and are sometimes reluctant to answer long questionnaires. In our experiment, only 20 professionals participated (as compared with 64 students) and provided us with 400 investment decisions (1280 from students). This resulted in unequal sample sizes. Further research is therefore needed to overcome this limitation and to reinforce our general conclusions. Additional studies should investigate the stability of these findings over different samples, different types of experts along with different tasks and methods for measuring overconfidence.

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Appendix A. Survey items

PART 1: Overconfidence and risk aversion measurement

(bankers' version – some student questions were different)

Miscalibration (probability judgment)

For each of the following questions, provide a low and high estimate and the percentage of confidence.

How many deputies are there in the French Parliament?

How many failures took place in France in 2009?

What was the inflation rate in Europe in 2008 (percentage)?

How many countries are in the OECD?

How many Olympic records were beaten in Beijing?

How many wage-earners worked in the banking sector in France in 2008?

2/3 of corporate loans are under a certain amount, which one (in Euros)?

How many banks were listed on Euronext on September 1st 2009?

What was the highest value of oil (light sweet crude)?

In 2008, what was the trade balance in France (in billions)?

Miscalibration (frequency judgment): According to you, how many answers are correct?

Above average effect

You will rate the following questions from 1 (below the average) to 5 (above the average):

How do you rate your driving skills?

In comparison to your colleagues, how do you estimate your risk analysis?

In comparison to your friends, how do you estimate your general culture?

Illusion of control

Score the following from 1 (do not agree) to 5 (fully agree):

I think I can anticipate a customer's risk

(continued on next page)