

Bergheim, Ralf; Ernstberger, Jürgen; Roos, Michael W. M.

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## How Do Fair Value Measurements of Financial Instruments Affect Investments in Banks?

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# RUHR

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Ralf Bergheim  
Jürgen Ernstberger  
Michael W.M. Roos

## How Do Fair Value Measurements of Financial Instruments Affect Investments in Banks?

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Universität Duisburg-Essen, Department of Economics  
Universitätsstr. 12, 45117 Essen, Germany

Rheinisch-Westfälisches Institut für Wirtschaftsforschung (RWI)  
Hohenzollernstr. 1-3, 45128 Essen, Germany

## Editors

Prof. Dr. Thomas K. Bauer  
RUB, Department of Economics, Empirical Economics  
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Economics – Microeconomics  
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## Editorial Office

Sabine Weiler  
RWI, Phone: +49 (0) 201/81 49-213, e-mail: [sabine.weiler@rwi-essen.de](mailto:sabine.weiler@rwi-essen.de)

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Ralf Bergheim, Jürgen Ernstberger, and Michael W.M. Roos<sup>1</sup>

# How Do Fair Value Measurements of Financial Instruments Affect Investments in Banks?

## Abstract

*This paper experimentally investigates how fair value measurements of financial instruments affect the decision of nonprofessional investors to invest in a bank's shares. Specifically, we assess how investors respond to variations in net income resulting from fair value adjustments in trading assets and how the reliability of the fair value estimates affects their decision. We find that investment decreases as a result of transitions from the first to the third level and we even observe lower investments in case of positive changes in income. Investment decreases most if negative valuation adjustments are based on level 1 estimates suggesting that down pricing by the market is considered as a worse signal than model-based decreases in net income. For larger positive and negative adjustments the impact of valuation levels on investment turns out to be limited. Our results do not provide evidence that Fair Value Accounting per se induces pro-cyclical investment behavior.*

*JEL Classification: C91, G11, M41*

*Keywords: Banks; fair value accounting; nonprofessional investors; investment decision; experiment*

*May 2014*

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<sup>1</sup> RUB. - All correspondence to Ralf Bergheim, Institute for Macroeconomics, Institute for Accounting and Auditing, RUB, 44780 Bochum, Germany, e-mail: ralf.bergheim@rub.de

## 1. INTRODUCTION

This paper experimentally investigates how fair value measurements of trading securities affect the perception and decision of nonprofessional investors to invest in a bank's shares. Fueled by the financial crisis of 2007-2009, the usefulness of Fair Value Accounting (FVA) is a topic of ongoing debate. In response to the collapses of large banks and the bailouts by national governments particular attention is paid to FVA of financial institutions. Of major importance and in the focus of most criticism is the concern that FVA may promote pro-cyclicality. There are two reasonable channels through which pro-cyclicality may be induced. Most research analyzes the impact of FVA in collaboration with regulatory capital requirements (e.g., Brunnermeier et al., 2009).

This paper focuses on individual investors' behavior as a second potential source of pro-cyclicality that has received little attention so far. Since the behavior of individual investors can influence asset prices and return volatility (see, e.g., Kumar & Lee, 2006; Foucault et al., 2011) it is crucial to investigate how they react to FVA. More specifically, this paper investigates whether fair value adjustments in a bank's trading assets causing intertemporal variation in its net income lead to pro-cyclical investments in shares of the bank.

A second question refers to the impact of fair value valuations based on different levels of the fair value hierarchy according to United States Generally Accepted Accounting Principles (US GAAP) on the willingness to invest. Especially level 2 valuations are not considered in the literature so far and it is not clear how they are interpreted by investors. Level 2 is a hybrid with elements of level 1 (market prices) and level 3 (model assumptions). Hence, level 2 valuations should be in between Level 1 and Level 3 but it is in open question what is more relevant in the perception of investors: Market price or model assumption. We examine if investors respond significantly different to these valuations compared to level 1 and 3 valuations. In addition, we investigate which role the reliability of fair value estimates according to the fair value hierarchy plays for investors' response to variation in net income by considering the interaction between different levels of valuation and fair value adjustments.

These issues are of high importance for banks because a substantial part of their total assets are typically trading securities priced at fair value. Moreover, banks are characterized by a high free float

owned by nonprofessional investors. However, existing experimental studies focus mainly on other than banking firms.

Related prior research investigates the relevance and reliability of FVA (see, e.g., Barth et al., 2001; Landsman, 2007; Laux & Leuz, 2009) or the impact of FVA on the fundamental judgments of commercial bank equity analysts (Hirst & Hopkins, 1998) or nonprofessional investors (Maines & McDaniel, 2000) and prove the importance of the valuation level. Other studies contribute by documenting that the presentation format (Hirst et al., 2004; Clor-Proell et al., 2010) has a significant influence on these results. Clor-Proell et al. (2010) document in their experiment that nonprofessional investors assign different reliabilities to fair value valuations based on level 1 and level 3 inputs if these are made salient. In an archival study, Song et al. (2010) examine the value relevance of different fair value levels. By investigating the quarterly reports of banks and stock price movements, they find the value relevance of level 1 and level 2 fair value valuations to be greater than the value relevance of level 3 fair value valuations. Research by Riedl and Serafeim (2011) investigates information risk in the fair values of financial instruments, which they define as investors' abilities to ascertain the valuation parameters underlying a particular asset. Their results indicate that information risk increases across the levels of the fair value hierarchy. In addition, analytical research by Allen and Carletti (2008) and Plantin et al. (2008) argues that the decision usefulness of fair values for decision making depends on the liquidity of the financial market and thus relies on the level of inputs that are utilized for fair value estimates.

Despite the large body of prior research, surprisingly little is known about the direct impact of a bank's fair value measurements on the investment decision and perception of nonprofessional investors, although recent evidence, for example by Hoffmann et al. (2013), document that trading and risk-taking behavior during the latest financial crisis were driven by investors' perceptions. It is an open question how, if at all, these investors incorporate the knowledge about adjustments and different valuation inputs into their willingness to invest when they are confronted with a financial statement. We seek to fill these voids by conducting an experiment in which subjects assess a hypothetical bank's financial statement and then make a decision about investing a certain proportion of a (fictional) endowment in a bank's stock.

Our experiment utilizes a 3x5 design that varies the inputs used to value the gains and losses that are associated with the bank's trading securities (level 1 vs. level 2 vs. level 3) between subjects and



implements different magnitudes of changes in net income (0, -5%, -10%, 5%, and 10% changes in trading assets and corresponding changes in net income) within subjects. Thus, subjects are assigned to treatments that correspond to one of the levels of the fair value hierarchy. Each subject faces five treatments involving intertemporal changes in net income that are caused by fair value adjustments in trading securities. Subjects decide how much of an endowment of 10,000 currency units (CU) they wish to invest either in the bank's stock or in a risk-free outside option.

Our findings document that nonprofessional investors distinguish between valuations that are derived from different levels of inputs when making their investments. We find that the willingness to invest is highest for valuations that are on level 1 of the FVA hierarchy but decreases significantly for valuations on the lowest level of this hierarchy. We observe no significant difference between investments in response to level 1 and level 2. With respect to our second research question, we observe a lower willingness to invest in any case of variation in net income caused by fair value adjustments in trading securities, even if net income is *increased*, implying that FVA per se seems not to induce pro-cyclical behavior. We document that negative adjustments of level 1 valuations lead to a significant stronger decrease in investment than in the case of lower level-based valuations suggesting that down pricing by the market is considered worse than model-based decreases in net income. We find that the valuation level has no significant influence on willingness to invest in the case of larger adjustments.

The remainder of this paper is organized as follows. In section 4.2, we provide the theory and the hypotheses. Section 4.3 describes the research design. Section 4.4 discusses the results of the study, and section 4.5 concludes.

## **2. THEORY AND HYPOTHESES**

### ***Fair value hierarchy***

In response to the last financial crisis and to the public criticism of FVA of banks, the International Accounting Standards Board (IASB) and the Financial Accounting Standards Board (FASB) issued the new standards SFAS No. 157 (which was renamed as Topic 820 in 2009) and IFRS 13 that clarify how to determine fair values and require new note disclosures about fair value valuations. Both standards adopt the fair value hierarchy, which includes three levels that reflect the extent of judgment that is involved in estimating fair values. According to FASB ASC Topic 820-35-2, the fair

value of an asset or liability is defined as “the price that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date.” Topic 820 provides a three-level hierarchy of inputs that must be applied to determine the fair values of assets or liabilities. At level 1 of this hierarchy, quoted prices in active markets for identical assets or liabilities are used to determine fair values. The terms of “mark-to-market” or “marking-to-market” are frequently used to describe these valuations. If observable market prices for identical assets or liabilities do not exist, firms must employ valuations based on level 2 inputs, which are derived from observable market prices for similar assets or liabilities by modifications. Because these valuations are primarily based on observable market inputs, most authors nonetheless classify these valuations as “mark-to-market” and not as “mark-to-model”. Level 3 inputs are used if no inputs from observable market prices are available. These inputs consist of model assumptions and produce valuations that are therefore referred to as “marking-to-model”. Shifting from level 1 to level 3 inputs of the fair value hierarchy, the valuation’s vulnerability to managerial discretion increases. In particular, valuations based on level 3 inputs are opaque and most vulnerable to managerial influence (e.g., Fischer & Verrecchia, 2000) while valuations based on level 1 provide most transparency and the opportunities for managerial influences are limited.

We expect significant differences in nonprofessional investors’ willingness to invest when banks’ trading assets are valued using inputs at different levels of the hierarchy. The prediction of nonprofessional investors’ willingness to invest in response to valuations on level 1 and level 3 seems straightforward. It should decrease if trading assets are valued according to level 3 compared to trading assets valued according to level 1. How nonprofessional investors interpret level 2 valuations is less clear since these valuations involve both market prices as well as model assumptions. They could interpret level 2 valuations as mark-to-market or they could attribute more weight to the underlying model assumptions. In case of the former, we should observe a significant difference in the willingness to invest only between level 2 and level 3, in case of the latter, we should observe a significant difference only between level 2 and level 1 valuations. If asymmetric information, information risk and the vulnerability to managerial discretion increased as inputs shift from level 1 to level 3, the perceived risk that investors attribute to an investment will increase for all lower levels of valuation. In this case we would observe that the willingness to invest is significantly higher for level 2 valuations than for level 3 valuations but significantly lower than in the case of level 1

valuations, i.e. valuations on level 2 are perceived as an own class. Following this last assumption, we state the following hypothesis:

*HYPOTHESIS 1. Nonprofessional investors' willingness to invest will decrease as the inputs for fair value valuations shift from level 1 to level 2 to level 3 of the three-level fair value hierarchy.*

### ***Adjustments of fair value valuations***

Compared to historical cost accounting (HCA) or HCA-based measurement rules, FVA practices are associated with greater volatilities in the values of assets or liabilities and therefore with greater volatilities in net income or at least comprehensive income (e.g., Barth et al., 1995; Barth, 2004). To explain investors' reactions to this variation, there are, at least, two substantial and competing reasonings that are distinguished by the assumption whether subjects recognize the information provided in note disclosures or not. Prior literature suggests that subjective judgments of risk have a much greater predictive power than volatility assessments with respect to choices (see, e.g., Brachinger & Weber, 1997). Perceptions of risk incorporate affective reactions to outcome uncertainty that are not solely explained by volatility (e.g., Weber et al., 2005; Loewenstein et al., 2001). Therefore, we expect variations in net income and the risk perception to differ depending on whether subjects recognize the reason for the income variation or not.

Assuming that subjects recognize all information, we expect that increases in net income variations resulting from fair value adjustments in trading assets will induce nonprofessional investors to attribute more risk to an investment. We expect that a decrease in net income will lead to a less favorable judgment of profitability by nonprofessional investors.<sup>1</sup> In contrast, increases in net income resulting from fair value adjustments should not lead to significantly more favorable judgments about the bank's profitability in the subsequent time period. The effect of net income variations on the investment decision also depends on the weighting of risk and profitability judgments. For negative

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<sup>1</sup> This implies at least a partially inverse relationship between the perceived risk attributed to an investment in the bank's stock and the future predicted profitability of the bank. This prediction does not contradict the assumptions of standard investment theory because the prediction does not consider the risk and return of an asset or portfolio. In other words, the predicted future profitability of the bank is different from the expected return of an investment in the bank's stock. Thus, subjects may simultaneously increase their perceptions of the riskiness of a bank as an investment and reduce their judgments of the bank's future profitability. For example, in a situation involving a decrease in net income due to fair value adjustments, subjects may both expect that the bank will be less financially successful in the subsequent period and perceive the bank to be a higher risk because of the presence of higher variation in net income.

adjustments, this reasoning would imply that the perception of risk and the profitability judgment lead to a decrease in investment. Due to the transparent information about valuation levels provided by note disclosures, we expect that subjects will assign a greater weight to their risk evaluations than to their profitability judgments and consequently invest less in the case of positive adjustments as well.

A competing reasoning would be that nonprofessional investors might not incorporate additional disclosures about fair value valuations and changes in their decisions. Since decision makers' exhibit limited processing capabilities their attention may be restricted to the prominent numbers of an income statement (Hirshleifer et al., 2004; Hirshleifer & Teoh, 2003). This reasoning would imply that subjects do not take the underlying cause of an increase or decrease in net income into account. Subjects could judge the future profitability of the bank more favorably in this case. Following this argumentation, investors would behave in opposition to the aforementioned prediction in the case of net income increases. The risk that they attribute to an investment in the bank's shares would not increase and their assessments of the bank's profitability would increase. As a consequence, investors should invest more if net income increases and less if it decreases. Their investments would be procyclical in nature.

Based on the previously discussed literature and the transparency that is ensured by the disclosure prescriptions according to Topic 820, we expect subjects to incorporate all information into their decision. In sum, we expect nonprofessional investors to invest less in a bank's shares if there is greater variation in net income irrespective of whether adjustments of valuations cause net income to increase or decrease. We state the following hypothesis:

*HYPOTHESIS 2. Nonprofessional investors will invest less if a bank's net income decreases or increases due to changes in recognized fair value valuations for the bank's trading assets.*

#### ***Interaction between adjustments and level of valuation***

We also examine how variations in net income influence the willingness to invest if they are based on different valuation levels. If managers try to present the company in the best possible light they try to limit negative adjustments by using leeway in particular in mark-to-model valuations. A negative adjustment on level 3 might thus be considered as a worse signal since it suggests that even

managers' leeway could not prevent this adjustment. Therefore, one would expect the willingness to invest to be decreasing stronger for lower levels given negative adjustments. For the same reason one would expect a similar pattern for positive adjustments.

In contrast, one could argue that observable market prices might have the greatest impact on nonprofessional investors' willingness to invest. Since the model-based approaches are never fully transparent to outsiders, they might be doubted. For example, managers might pursue other than shareholders' interests and use accounting policies to reach their goals. This would suggest an opposite ordering of the hierarchy's levels' impact on willingness to invest. Level 1-based down pricing would be considered as worst and should lead to the largest fall in willingness to invest, but also to the largest rise in the case of positive adjustments. We state the following hypothesis:

HYPOTHESIS 3. *Variations in net income that are based on higher levels according to the hierarchy will lead to a stronger decrease in investment.*

### **3. METHODOLOGY AND EXPERIMENTAL DESIGN**

#### ***Method***

We use an experiment to test our hypotheses because this approach enables us to control for other potentially biasing effects and to draw causal conclusions. We conducted a pencil-and-paper experiment in which we asked each subject to make hypothetical investment decisions and to subsequently answer additional questions. Our research questions relate to examining the decisions and perceptions of nonprofessional investors, who do not adopt analysts' approach of employing particular models but instead utilize heuristics and rules of thumb to make investment decisions (Gigerenzer & Todd, 1999; Maines & McDaniel, 2000; Frederickson & Miller, 2004; Elliott, 2006). Consequently, the group of investors examined in this experiment does not use a particular investment model or even one type of model but is heterogeneous.

Instead of implementing a monetary incentive scheme based on individual performance, we relied on reciprocity to achieve subjects' cooperation.<sup>2</sup> Prior to the experiment, we introduced ourselves and stressed that subjects would greatly assist us in achieving our research objectives by participating in the study and carefully answering the study questions. In addition, we financially compensated each subject prior to the experiment with the fixed amount of EUR 10 for her or his time and attendance. As noted by Gneezy and Rustichini (2000), intrinsic motivation is not crowded out by fixed positive payments that are independent of performance.

We implemented a payment in the form of a gift exchange in which we pay our subjects prior to the experiment with the expectation that these subjects will reciprocate this generous behavior by exerting legitimate effort during the investigation (for a more detailed discussion of this point see, e.g., Fehr & Gaechter, 1998; Falk & Fehr, 2002; Gneezy & List, 2006).

### ***Subjects***

Studies investigating nonprofessional investors' behavior most frequently use MBA students as proxies because prior research has found that these students provide accurate representations of the behaviors of nonprofessional investors (see Elliott et al., 2007). The subjects in our experiment were 64 graduate students with advanced accounting background. In particular, we asked students from a master's degree program who were enrolled in the course "Special Cases and Issues in Accounting" to participate in the experiment. On average, each of these subjects had completed four accounting courses. The subjects were familiar with the concept of FVA through these accounting courses; however, FVA was not a topic that was addressed by their courses immediately before the performance of the experiment.

Prior to the experiment, we assured that all data would be treated confidentially and that we would not be able to trace the respondents' identities at any time. The average age of the subjects was 24 years, 51.4 percent of the subjects were males, and 32.4 percent of subjects possessed prior experience with trading assets.

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<sup>2</sup> The experiment was designed without a performance-based incentive scheme, because we did not want to assume a particular model that explains and predicts the investment decisions of nonprofessional investors in the examined situations. Thus, it would have been inappropriate to construct a payment function for our experiment because this function would have obfuscated the observation of subjects' natural decisions. Subjects would have sought to maximize their payoffs, which would be specified by the payment function and its underlying model, instead of making decisions in accordance with their inherent preferences.

### ***Experimental Design***

We employed a between-subjects design that involved the three treatments of “Lev1” (26 subjects), “Lev2” (20 subjects), and “Lev3” (16 subjects); each of these treatments corresponded to a level of the fair value hierarchy and addresses primary Hypothesis 1. To investigate Hypothesis 2, each subject faced five treatments with differing degrees of variation in net income and the fair value of trading assets. One treatment did not involve net income variation and fair value adjustments and served as control treatment. The order was reversed to prevent ordering effects.

### ***Task and Procedure***

We explained to subjects that our investigation was focused on their behavior and not on their ability and knowledge and that there were no right or wrong answers to the questions of the study. The case material was then distributed and the subjects were randomly assigned to one level treatment. We explained the task orally by reading the study instructions<sup>3</sup>. Subjects then began the experiment by reading the instructions again. They were directed to imagine that they were actually confronted with the described situation and that they were endowed with 10,000 currency units (CU) for investment purposes. They were required to decide how much of this amount they wished to invest in the stock of a fictitious bank to maximize their profit. We explicitly stressed that the company under study was a hypothetical universal bank. This emphasis was provided because for a bank, the position of “trading assets” in the balance sheet is both an important part of the firm’s core business and a relevant source of income. Subjects could invest any amount between CU 0 and CU 10,000 in the bank’s shares. The remaining amount that was not invested in the bank’s shares was automatically invested in an outside option, namely, a risk-free government bond with a guaranteed interest rate of 2 percent p.a. After reading the instructions, we provided the subjects with the opportunity to ask questions. They were informed that they had 40 minutes to complete the experiment and that they were required to remain at the experimental site for the entire 40 minutes. Finally, the subjects were required to complete a questionnaire with questions about their risk preferences and investment experience.

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<sup>3</sup> The instructions are available in Appendix A.

### *Case Material*

Each subject's case material consisted of instructions, income statements, and balance sheets, as well as the explanation of the fair value hierarchy that is typically provided in banks' annual reports<sup>4</sup>. The case material was stapled together to form a single booklet. The study instructions appeared on the first page of the booklet, whereas the last page contained certain additional questions related to subjects' backgrounds and risk preferences. These treatments involved the same fictitious bank but were clearly isolated by separator sheets with the bold titles of "Investment Decision Number x". We stressed the independence of the investment scenarios in the instructions and in our oral explanations prior to the experiment.

Each treatment contained the income statement and the balance sheet of the bank. The level 3 treatment, "Lev3", additionally contained the mandatory note disclosures that are required by Topic 820, as discussed above. To assure the external validity of this experiment, the balance sheets and income statements were presented in a similar format to the illustrative examples of Topic 820. The information that US GAAP was applied was not provided to the subjects to avoid biases. To control subjects' expectations and avoid externalities, the case material indicated that neither the cash flows nor the returns from sources other than the financial instruments have changed for the bank of interest. This information was conspicuously placed under the income statement in each investment scenario and stressed in the oral explanations of the experiment. The information was provided to ensure that subjects made their investment decisions based on the valuation of trading assets and net income instead of expectations regarding other sources of cash flow or returns. To determine whether subjects recognized and incorporated this information into their decision making, the experiment included a question that asked whether cash flows and/or returns have changed for the bank of interest.<sup>5</sup>

The five investment treatments were identical for all of the subjects, except for the fact that different valuation levels were used for different treatment groups, as explained above. In particular, each treatment group was presented with valuations within a single fair value category that corresponded to the treatment group's level in the aforementioned fair value hierarchy, e.g., treatment group Lev1

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<sup>4</sup> The case material is available in Appendix C.

<sup>5</sup> Only two subjects in treatment Lev2 failed to answer the question correctly. The exclusion of these subjects from the analyses did not change the study results. Nevertheless, we excluded these two subjects from all of our analyses.



was only presented with valuations that were based on level 1 valuations. The valuation level was transparent and according to US GAAP disclosed in a note as shown in Appendix B. For example, the wording for level 1 valuations was “Instruments valued using quoted prices in active markets: These instruments have fair values that can be determined directly from prices that are quoted in active, liquid markets; the instrument that is observed in the market is representative of the instrument in the bank’s assets that is being valued.”

Within the level treatment groups, the five investment treatments themselves were also identical and involved the same fictitious bank. All of the positions in the balance sheet and income statement except for the adjustment of trading assets were equal among the treatments. We manipulated the position “trading assets - of which reported at fair value” in the balance sheet as shown in Appendix C. Moreover, the income statement contained the position “net gains from fair value adjustments”. Thus, it was transparent to subjects that the observed changes in net income resulted from the fair value adjustment of trading assets.

The five investment scenarios or treatments consisted of a control treatment without any variation in net income or fair value adjustment and four treatments in which the variation was altered by fair value adjustments. In particular, the fair values of trading assets were increased by 5 percent and 10 percent and decreased by 5 percent and 10 percent. This part of the experiment was conducted within-subjects, enabling us to investigate the differences in each individual’s behavior in response to the manipulations.

The experiment included questions to investigate subjects’ perceptions of risk and their judgments about the bank’s profitability in the subsequent time period as additional dependent variables. After each investment decision, subjects were asked to use a scale that ranged from 0 to 100 points to rate the perceived risk of an investment in the bank’s shares and their judgment about the bank’s profitability during the subsequent time period.

The previous period value serves as a reference point and provides information for nonprofessional investors to reach judgments about the volatility, risk, and future profitability of the bank. Consequently, this value is also important for their investment decisions and cannot be omitted from our experimental design. Balance sheet and income statements provide the financials of both the current year and the previous year. We label the two years “Year 2” and “Year 1” to avoid associations with specific economic situations that would correspond to a certain year. For example,

subjects would be likely to think of the financial crisis if the year 2007 appeared on the financial statement. To make the experiment more realistic but maintain simplicity, all of the positions in the balance sheet and income statement were increased by two percent from “Year 1” to “Year 2”, matching the fixed interest rate of the outside option. Therefore, all of the positions in the control treatment without variation were increased at the same rate as the government bonds.

#### 4. RESULTS

In total, 62 subjects completed the experiment and were included in the analyses. The overall mean reported investment in the bank’s shares across all level and adjustment treatments was 32.94 percent (CU 3,294) of the initial endowment. The results demonstrate significant differences in terms of willingness to invest both across the examined level treatments and across the various treatments involving manipulations of fair value changes in net income. Table 1 presents an overview of the study results and provides an aggregate snapshot of the reported amounts. We observe the highest willingness to invest in treatment Lev1. On average, subjects invest the highest amount in the control treatment that lacks fair value adjustments.

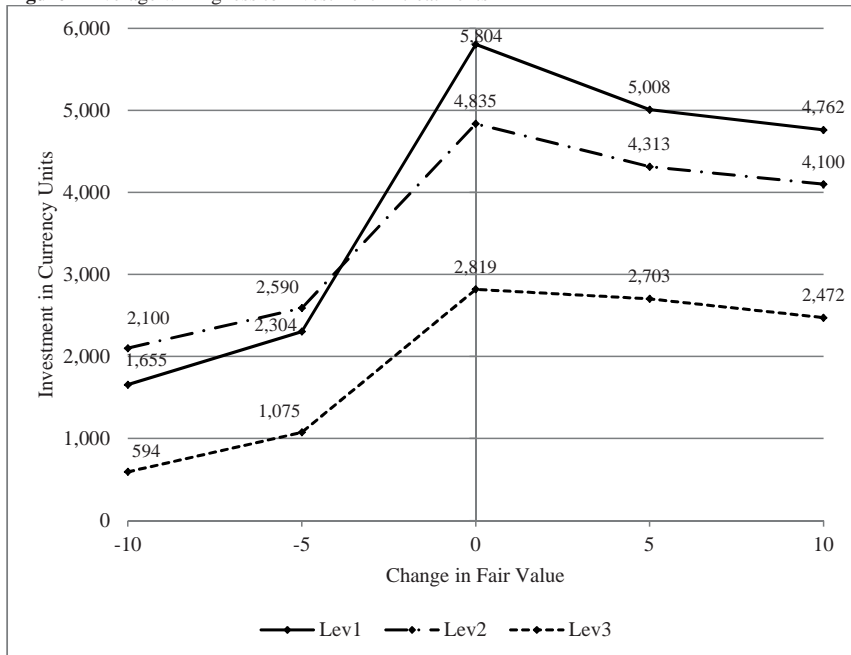
**Table 1** Descriptive statistics on willingness to investment

Change in FV	Descriptives	Lev1	Lev2	Lev3	All treatments
-10%	Mean	1,655	2,100	594	1,525
	(SD)	(1,895)	(2,280)	(779)	(1,893)
	(n)	(26)	(20)	(16)	(62)
-5%	Mean	2,304	2,590	1,075	2,079
	(SD)	(2,521)	(2,494)	(1,081)	(2,280)
	(n)	(26)	(20)	(16)	(62)
0%	Mean	5,804	4,835	2,819	4,721
	(SD)	(2,335)	(1,649)	(1,941)	(2,337)
	(n)	(26)	(20)	(16)	(62)
5%	Mean	5,008	4,313	2,703	4,189
	(SD)	(2,735)	(2,098)	(2,089)	(2,526)
	(n)	(26)	(20)	(16)	(62)
10%	Mean	4,762	4,100	2,472	3,957
	(SD)	(2,918)	(1,627)	(2,368)	(2,560)
	(n)	(26)	(20)	(16)	(62)
All changes	Mean	3,907	3,588	1,933	3,294
	(SD)	(2,956)	(2,278)	(1,948)	(2,626)
	(n)	(26)	(20)	(16)	(310)

Notes: Table 1 reports the mean willingness to investment in currency units depending on level treatment and manipulation of adjustments in fair value.

Figure 1 addresses Hypothesis 1, which predicts that nonprofessional investors' willingness to invest will depend on the input category and that higher levels of input in the fair value hierarchy will be associated with a higher average investment for all recognized fair value changes in trading assets. The figure provides an overview of the investments in each treatment and distinguishes between the manipulations of fair value adjustments; in other words, it differentiates among the different treatments with investment decision situations that had to be considered independently by the subjects. The mean investment in treatment Lev1 amounts to CU 3,907, which is higher than the mean investment in treatment Lev2 (CU 3,588) and the average investment in treatment Lev3 (CU 1,933).

**Figure 1** Average willingness to investment in treatments



Notes: Figure 1 shows the willingness to invest on average in each treatment distinguished by manipulations of fair value changes in net income due to fair value adjustments of trading assets. The initial endowment was 10,000 currency units.

Table 2 shows the results of non-parametric Wilcoxon-Mann-Whitney tests with the mean reported investments as observations. We find that the differences between Lev1 and Lev3 ( $p = 0.003$ ) and between Lev2 and Lev3 ( $p = 0.001$ ) are significant at the 1 percent level. However, we find a

statistical significant difference only between mark-to-market and pure model valuations. The difference between Lev1 and Lev2 turns out to be statistically insignificant ( $p > 0.1$ ).

**Table 2** Means of willingness to invest, perceived risk, and profitability judgment

Treatment	Descriptives	Investment	Diff Lev1	Diff Lev2
Lev1	Mean	3,907		
	(SD)	(2,956)		
	(n)	(26)		
Lev2	Mean	3,588	-319	
	(SD)	(2,278)		
	(n)	(20)		
Lev3	Mean	1,933	-1,974***	-1,655***
	(SD)	(1,948)		
	(n)	(16)		
Treatment	Descriptives	Risk	Diff Lev1	Diff Lev2
Lev1	Mean	54		
	(SD)	(25)		
	(n)	(130)		
Lev2	Mean	56	2	
	(SD)	(23)		
	(n)	(100)		
Lev3	Mean	60	6**	5*
	(SD)	(26)		
	(n)	(80)		
Treatment	Descriptives	Prof.	Diff Lev1	Diff Lev2
Lev1	Mean	45		
	(SD)	(24)		
	(n)	(130)		
Lev2	Mean	49	4*	
	(SD)	(23)		
	(n)	(100)		
Lev3	Mean	39	-6**	-10***
	(SD)	(22)		
	(n)	(80)		

Notes: Table 2 shows the average investment, perceived risk and profitability judgment depending on treatments across all investment scenarios. Risk and profitability judgments are presented on a scale between 0 and 100. "Diff Lev1" and "Diff Lev2" denote the difference to treatment 1 and 2, respectively. \*, \*\*, and \*\*\* denote significance at the 10%, 5%, 1% level (Wilcoxon-Mann-Whitney tests).

Table 3 reports the results from the OLS regressions considering willingness to invest, subjective risk perception and individual profitability judgment as dependent variables. They confirm the previously discussed findings. We included binary variables for level treatments and for the treatments with manipulations of fair value adjustments. In model (2), the binary variable for level 3 valuations is negative and significant at the 0.1 percent level for willingness to invest. The subjectively perceived

risk is found to be higher for level 3 valuations in model (3). In addition, as documented in model (4), judgments about future profitability are significantly less good for valuations on the lowest level of the hierarchy ( $p = 0.064$ ). In contrast, we find for none of the three dependent variables the binary variable for level 2 valuations to be significant. This result indicates that subjects do not consider valuations based on the second level as significantly different from those based only on market prices. Instead, model (1) shows that the responses in terms of investment to level 2 valuations compared to level 3 valuations are significantly different ( $p < 0.1$  percent). Thus, the results provide only partial support for Hypothesis 1. We find that the level of input according to the hierarchy affects the investment decisions, the perceived risk and the profitability judgment but our results suggest also that investors might only distinguish between mark-to-market and pure mark-to-model approaches and not between all three levels of the fair value hierarchy.

**Table 3** Multivariate OLS regressions

<i>Dependent Var.</i>	(1)	(2)	(3)	(4)
	<i>Investment</i>	<i>Investment</i>	<i>Risk</i>	<i>Prof</i>
$D_{Lev1}$	318.96	-	-	-
$D_{Lev2}$	-	-318.96	3.74	4.03
$D_{Lev3}$	-1655.00***	-1973.96***	8.53***	-5.54*
$D_5$	-532.26	-532.26	6.07	2.00
$D_{10}$	-763.71*	-763.71*	12.21***	1.5
$D_{-5}$	-2,641.94***	-2,641.94***	20.81***	-17.73***
$D_{-10}$	-3,196.13***	-3,196.13***	30.92***	-22.40***
$\beta_0$	5,014.31***	5,333.27***	37.72***	17.39***
Observations	310	310	310	310
Adj. $R^2$	0.31	0.31	0.19	0.21

Notes: Table 3 shows the results of multivariate OLS regressions. The dependent variable “*Inv*” denotes mean investment, “*Risk*” denotes subjective perceived risk, and “*Prof*” denotes individual judgment of future profitability. “ $D_x$ ”,  $x = 5, 10, -5, -10$ , are binary variables for the investment scenarios equal to one if the subject faces the corresponding manipulations of fair value adjustment (5%, 10%, -5%, -10%); zero otherwise. “ $D_{Lev x}$ ”,  $x = 2, 3$ , are binary variables equal to one if the valuation is based on Level 2 or 3, respectively; zero otherwise. \*, \*\*, and \*\*\* denotes significance at the 10%, 5%, 1% level, respectively.

Hypothesis 2 states that non-professional investors will invest less if there is more variation in net income due to decreases or increases of recognized fair value changes in trading assets. Table 1 and Figure 1 above also present an overview of the experimental results with respect to Hypothesis 2.

Irrespective of the valuation level, we observe always the highest willingness to invest in the control treatment, which includes no variations in net income. As predicted by Hypothesis 2, the average reported investments in the other treatments, which include income variations, are lower, regardless

of whether the fair values of trading assets and the net income increases or decreases as a result of fair value adjustments. However, the impact on willingness to invest, risk perception and profitability judgment differs across the level treatments and in response to both the extent as well as the direction of fair value adjustments.

Table 4 reports the results of Wilcoxon-Mann-Whitney tests with the invested amounts as observations. The findings indicate that the differences between the investment treatments are significant in all cases of negative fair value adjustments and corresponding changes in net income. However, we observe this effect only in the case of a 10 percent increase in net income but not if the adjustments of trading assets lead only to a 5 percent increase in net income.

**Table 4** Means of willingness to invest, perceived risk, and profitability judgment

Change in FV	Descriptives	Investment	Diff C	Diff 5	Diff 10	Diff -5
(Control) 0%	Mean (SD)	4,721 (2,337)				
5%	Mean (SD)	4,189 (2,526)	-532			
10%	Mean (SD)	3,957 (2,560)	-764*	-232		
-5%	Mean (SD)	2,079 (2,280)	-2,642***	2,110***	1,878***	
-10%	Mean (SD)	1,525 (1,893)	-3,196***	2,664***	2,432***	-554
		Risk				
(Control) 0%	Mean (SD)	41 (22)				
5%	Mean (SD)	47 (23)	6			
10%	Mean (SD)	53 (24)	12***	6		
-5%	Mean (SD)	62 (23)	21***	15***	9*	
-10%	Mean (SD)	72 (22)	31***	25***	19***	10***
		Prof.				
(Control) 0%	Mean (SD)	52 (21)				
5%	Mean (SD)	54 (21)	2			
10%	Mean (SD)	54 (21)	2	0		
-5%	Mean (SD)	34 (21)	-18***	-20***	-20***	
-10%	Mean (SD)	30 (22)	-22***	-24***	-24***	-4

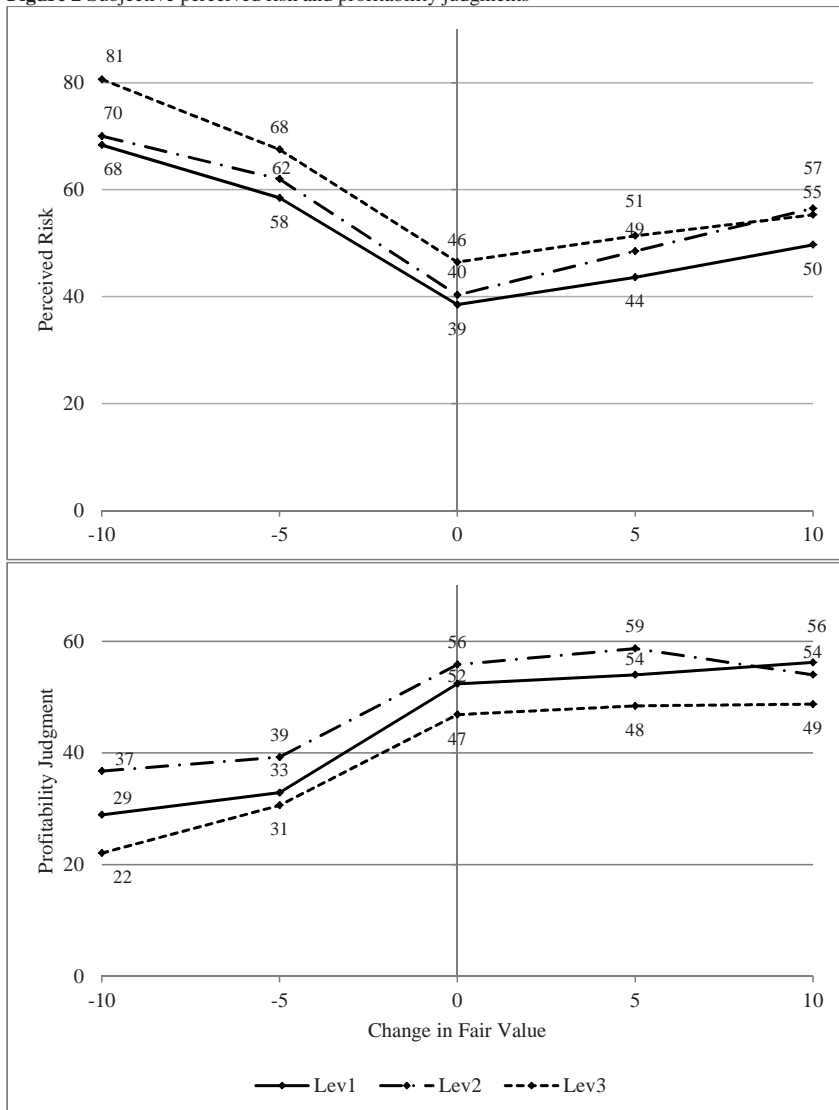
Notes: Table 4 shows the average investment, perceived risk and profitability judgment depending on fair value manipulation (investment scenarios) across all treatments. 62 observations in each of the five scenarios were included. Mean investment is presented in currency units and perceived risk and profitability on a scale between 0 and 100. "Control" denotes the control treatment without variation. "Diff C", "Diff 5", "Diff 10" and "Diff -5" denote the difference to the control treatment and the treatments with 5%, 10% and -5% changes, respectively. \*, \*\*, and \*\*\* denote significance at the 10%, 5%, 1% level (Wilcoxon-Mann-Whitney tests).

The mean investment is higher in situations involving positive fair value changes than in treatments involving negative changes, although mean investment is smaller in the former situations than in the control treatment.

Figure 2 illustrates the reported risk perception and profitability judgments and Table 4 also reports descriptive statistics as well as the results of the Wilcoxon-Mann-Whitney tests for those two depended variables. We observe that the differences in perceived risk between each treatment and the control treatment are significant for all of the treatments except for the one involving a positive fair value change of 5 percent. With regard to subjects' profitability judgments, Wilcoxon-Mann-Whitney tests indicate highly significant differences between the treatments with negative adjustments in fair value of trading securities and the control treatment. However, no significant differences in profitability judgments are observed between either of the treatments that involve positive fair value adjustments and the control treatment.



**Figure 2** Subjective perceived risk and profitability judgments



Notes: Figure 2 shows the perceived risk attributed on average to an investment in the bank's shares and the average of the judgments about future profitability (each on a scale from 0-100) for each treatment distinguished by manipulations of fair value adjustments in trading assets.

Multivariate regressions confirm our results with regard to all three dependent variables, as can be seen in Table 3. The binary variables for the manipulations in net income are statistically significant on the 0.1 percent level for negative fair value changes in net income. By contrast, binary variables for positive changes are only significant on the 10 percent level in the case of larger adjustments,

mirroring the results previously discussed and indicating that in this study, nonprofessional investors incorporated the fact that observed variations in net income were caused by fair value adjustments into their decision making.

As predicted, the result that net income increases lead to a decrease in investment appears to be driven by a higher perceived risk and not by less favorable profitability judgments, whereas the observed decrease in average investment in reaction to a decrease in net income appears to result from both less favorable risk perceptions and less favorable profitability judgments. To put it in a nutshell, we find clear evidence to support Hypothesis 2 only for negative fair value adjustments. Nevertheless, we conclude that at least in our experimental setting, nonprofessional investors recognize and incorporate *all* of the available financial statement information that was provided according to current US GAAP guidelines into their decision making and that they consider carefully both adjustments and level of fair values even if they are asked to invest indirectly in those assets. Subjects do not demonstrate pro-cyclical investment behavior, which would imply that they invest more if net income rises due to fair value adjustments.

To examine the third hypothesis and how the interaction of both independent variables, level of valuation and adjustments of fair value valuations, impact the three variables of interest, we run multivariate regressions including interaction terms between valuation level and binary variables for both positive adjustments of fair value (5 and 10 percent) and negative ones (-5 and -10 percent). To investigate especially the impact of more extreme valuation adjustments, we run also multivariate regressions with interaction terms that only consider larger positive and negative adjustments of 10 percent.

Table 5 shows the results of our interaction regressions. For the investment, we observe a strong positive interaction term between level 3 valuations and negative adjustments that is significant at the 5 percent level. The interaction between level 2 valuations and negative adjustments is also positive and weakly significant at the 10 percent level. These findings are surprising and a little bit unintuitive at the first glance, but they are consistent with Figure 1. They provide evidence for the strong importance of valuations that are based on observable market prices without any inclusion of models for nonprofessional investors in terms of reliability and relevance. While it might be more intuitive to think that negative adjustments are worst if the valuation is model- based and includes some leeway for managers, we find that nonprofessional investors interpret down pricing by the market as an even

worse signal. Thus, negative adjustments turn out to have the strongest impact on level 1. While we do not find a significant difference between all three levels of the hierarchy in terms of willingness to invest in the primary analysis for Hypothesis 1, we find this for negative adjustments by including interaction terms. In contrast, we find no significant interaction terms with positive adjustments, which mirrors our previously discussed findings. Considering the other two dependent variables, perceived risk and profitability judgment, the regressions show also no significant interaction of valuation level and adjustments.

**Table 5** Multivariate OLS regressions

<i>D. Var.</i>	(1)	(2)	(3)	(4)	(5)	(6)
	<i>Investment</i>	<i>Risk</i>	<i>Prof</i>	<i>Investment</i>	<i>Risk</i>	<i>Prof</i>
$D_{Lev2}$	-968.85	1.80	3.46	-459.29	3.41	4.84
$D_{Lev3}$	-2,985.01***	7.94	-5.51	-2,172.84***	8.25*	-4.44
$D_{neg}$	-3,824.23***	24.90***	-21.48***	-	-	-
$D_{pos}$	-919.23*	8.15	2.73	-	-	-
$D_{Lev2} * D_{neg}$	1,334.23*	0.79	3.63	-	-	-
$D_{Lev2} * D_{pos}$	290.48	4.05	2.23	-	-	-
$D_{Lev3} * D_{neg}$	1,839.86**	2.72	0.95	-	-	-
$D_{Lev3} * D_{pos}$	687.98	-1.24	-1.01	-	-	-
$D_{-10}$	-	-	-	-2,716.41***	21.50***	-17.50***
$D_{10}$	-	-	-	389.74	2.83	9.81*
$D_{Lev2} * D_{-10}$	-	-	-	903.91	-1.75	2.98
$D_{Lev2} * D_{10}$	-	-	-	-202.24	3.40	-7.07
$D_{Lev3} * D_{-10}$	-	-	-	1111.20	4.30	-2.42
$D_{Lev3} * D_{10}$	-	-	-	-116.83	-2.63	-3.04
$\beta_0$	5,803.27***	38.5***	52.39***	4,371.80***	46.86***	46.42***
N	310	310	310	310	310	310
Adj. $R^2$	0.32	0.16	0.20	0.20	0.11	0.12

Notes: Table 5 shows the results of multivariate OLS regressions. The dependent variable “*Inv*” denotes mean investment, “*Risk*” denotes subjective perceived risk, and “*Prof*” denotes individual judgment of future profitability. “ $D_{Lev x}$ ”,  $x = 2, 3$ , are binary variables equal to one if the valuation is based on Level 2 or 3, respectively; zero otherwise. “ $D_{neg}$ ” and “ $D_{pos}$ ”, are binary variables for the investment treatments with negative (-5%, -10%) and positive (5%, 10%) adjustments, respectively, and equal to one if the subject faces the corresponding manipulations of fair value adjustment; zero otherwise. “ $D_{-10}$ ” and “ $D_{10}$ ”, are binary variables for the investment treatments with negative (-10%) and positive (10%) adjustments, respectively, and equal to one if the subject faces the corresponding manipulations of fair value adjustment; zero otherwise. \*, \*\*, and \*\*\* denote significance at the 10%, 5%, 1% level.

Our results change only slightly when we include only the more extreme adjustments in models (4) to (6). Most interesting is that the effect of interaction terms on willingness to invest is now insignificant in each case, regardless of whether positive or negative adjustments are taken into account. This suggests that for those more extreme adjustments the valuation hierarchy’s impact on the willingness to invest is fairly limited.

The aforementioned argument might also explain the finding that we do not find a significant difference between level 1 and level 2 valuations in terms of subjects' willingness to invest in general. Without a closer look, this could suggest that nonprofessional investors differentiate only between mark-to-market and mark-to-model valuations. A more detailed analysis shows that our findings can be explained by observing different reactions depending on whether the change in valuation is negative or positive. Figure 1 shows that the reaction to negative variations in net income is stronger in treatment Lev1 than in treatment Lev2 while it is similar for positive changes. In case of adjustments in fair values by minus five percent, the willingness to invest in shares of the bank decreases by about 60 percent in level 1. In treatment Lev2 we observe a weaker reaction and only a decrease of 46 percent. This finding is supported by the previously discussed fact that we find a positive and significant interaction term between level 2 valuations and negative adjustments. We conclude that purely market-based valuations have the largest impact on investment in case of negative adjustments while the valuation level has no significant influence on investment in the case of positive adjustments.

### ***Risk Attitudes***

After the investment decisions subjects faced several questions regarding their risk preferences (for a more in-depth discussion of this topic see, e.g., Dohmen et al., 2011). Our analysis reveals two important facts. First, there is no significant difference in subjects' risk preferences across the various treatments. Thus, randomization was successful with respect to this characteristic, and we can therefore exclude the possibility that differences in willingness to invest can be attributed to differences in risk preferences. Second, the inclusion of individual risk preferences in our regressions did not change the results.

## **5. CONCLUSION**

This paper investigates how investment in shares of a bank is affected by valuations that are derived by applying different levels of the fair value hierarchy and by variations in net income that are caused by fair value adjustments in trading securities. We find that in their investment decisions, nonprofessional investors distinguish between market-based valuations and purely model-based valuations. In contrast, they seem not to differentiate between valuations on level 1 and level 2

indicating that market inputs used for level 2 valuations are perceived as more relevant. Moreover, the results show that the investment is significantly lower in any case of variation in net income, even for situations in which net income is increased by adjustments in the fair values of trading assets. Additional analyses reveal that negative adjustments lead to the biggest decrease in willingness to invest if they are based purely on observable market prices. This suggests that down pricing by the market is considered as a stronger negative signal than decreases in fair values based on mark-to-model approaches. The level of valuation has no significant influence on investment in the case of positive adjustments. Moreover, for larger adjustments, the hierarchy's impact seems to be fairly limited, irrespective of negative or positive changes in net income.

Our results indicate that nonprofessional investors consider note disclosures about the level of fair value inputs in their investment decisions. They appear to be aware of the source of changes in net income and do not choose to invest more in banks that display higher net incomes as a result of fair value adjustments. Thus, we find no evidence that FVA causes pro-cyclical investment behavior. However, this result does not eliminate the possibility that regulatory requirements, such as minimum capital requirements that are directly related to the equity of each bank, could produce this pro-cyclical effect.

Our results imply that note disclosures are an important and useful tool for assessing the perceived risk to invest in shares of banks and are relevant for the discussion about the impact of FVA.

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## Appendix A. Instructions

### Welcome to this study!

We cordially thank you for your participation and important support of this research project. You were chosen and invited due to your advanced skills. In the following we focus on your behavior and perception. You cannot give wrong answers!

Your participation is anonymous, and we will not be able to determine your identity at any time. We keep all of our data confidential. If you are interested in our research project and the results of this study, please feel free to send us an e-mail.

Please refrain from speaking to other participants for the remainder of this study and complete the following tasks on your own. Please read the following instructions carefully and contact one of the instructors if you have any questions.

#### Task

Assume that you were endowed with 10,000 currency units (CU) for investment purposes.

In the following pages, you will be given the financial statements of a fictitious universal bank, including an income statement and a balance sheet. The financial statements refer to an arbitrary, unknown year.

Your task is to decide how much of your endowment of CU 10,000 you wish to invest in the bank's stock. You are free to invest any amount between CU 0 and CU 10,000. The amount that you do not invest in the bank's stocks will be automatically invested in government bonds.

The **government bond** has a **safe** return of 2% p.a. The return of your **investment in the bank's stock** is **uncertain**. Assume that tax issues are negligible.

In the following, you face five investment scenarios that are **completely independent** from each other!

**Thank you very much for your participation!**



## **Appendix B. Fair value hierarchy**

### ***Fair Value Hierarchy***

Positions that are valued at fair value are assigned to three categories according to the fair value hierarchy. Prices and parameters that are not observable are based on the bank's assumptions and models.

#### **Level 1**

Instruments valued using quoted prices in active markets: These instruments have fair values that can be determined directly from prices that are quoted in active, liquid markets; the instrument that is observed in the market is representative of the instrument in the bank's inventory that is being valued.

#### **Level 2**

Instruments valued with valuation techniques using observable market data: These instruments have fair values that can be determined by referencing similar instruments that are trading in active markets; alternatively, a technique may be used to derive the fair valuations of the instruments of interest, but all of the inputs for this technique are observable.

#### **Level 3**

Instruments valued using valuation techniques using market data that are not directly observable: These instruments have fair values that cannot be directly determined by referring to information that can be observed in the market; thus, another pricing technique must be employed. Instruments that are classified in this category have an unobservable element that has a significant impact on their fair values.

## Appendix C. Case material

Case material in the Level 1 condition for the case without variation in net income (control treatment)

### *Income Statement*

(In million currency units)

	<i>Year 2</i>	<i>Year 1</i>
Interest and dividend income	30,600	30,000
Interest expense	<u>-18,360</u>	<u>-18,000</u>
Net interest income	12,240	12,000
Commissions and fees	14,280	14,000
Net gains from trading activities	3,060	3,000
Net gains from fair value adjustments	0	0
<b>Net revenue</b>	<b>29,580</b>	<b>29,000</b>
<b>Provision for credit losses</b>	-79	-79
Salaries and employee benefits	-15,300	-15,000
Equipment	<u>-9,180</u>	<u>-9,000</u>
Total operating expenses	-24,480	-24,000
<b>Income from continuing operations before taxes</b>	<b>5,021</b>	<b>4,921</b>
Income tax expense	1,121	1,021
<b>Net income</b>	<b>3,900</b>	<b>3,900</b>

### **Returns, cash flows**

*Share returns and cash flows are equal in Year 1 and Year 2.*

## ***Balance Sheet***

(In million currency units)

	<i>Year 2</i>	<i>Year 1</i>
<b>Assets</b>		
Cash and due from banks	66,300	65,000
Central bank funds sold	224,400	220,000
Trading assets	195,840	192,000
<i>of which reported at fair value</i>	<i>195,840</i>	<i>192,000</i>
Other investments	16,320	16,000
Net loans	224,400	220,000
Premises and equipment	6,630	6,500
Intangible assets	306	300
Other assets	81,600	80,000
<b>Total assets</b>	<b>815,796</b>	<b>799,800</b>
<b>Liabilities and equity</b>		
Due to banks	38,760	38,000
Customer deposits	193,800	190,000
Central bank funds purchased	204,000	200,000
Short-term debt	21,420	21,000
Long-term debt	246,840	242,000
Other liabilities	61,200	60,000
<b>Total liabilities</b>	<b>766,020</b>	<b>751,000</b>
<b>Total equity</b>	<b>49,776</b>	<b>48,800</b>
<b>Total liabilities and equity</b>	<b>815,796</b>	<b>799,800</b>

The following table reports for each level of the fair value hierarchy the bank's securities.  
(In million currency units)

Description	31.12. Year 2	Quoted prices in active markets for identical assets (LEVEL 1)	Significant other observable inputs (LEVEL 2)	Significant unobservable inputs (LEVEL 3)
Assets				
Trading Assets	195,840	195,840	0	0
<b>Total</b>	195,840	195,840	0	0

**Changes in the Level 3 Fair Value Category:**

There were no changes of fair value in this category.

.....  
**Investment in shares of the bank (0 - 10,000 currency units): \_\_\_\_\_ currency units.**

Please answer the following questions:

1) Did stock returns or cash flows have changed?

Yes                   No

2) On a scale from 0-100, where 0 represents „very low“ and 100 represents „very high“, how risky do you think is an investment in the bank's stocks?

\_\_\_\_\_

3) On a scale from 0-100, where 0 represents „very low“ and 100 represents „very high“, how do you judge the profitability of the bank in the next period?

\_\_\_\_\_