

Meyer, Steffen; Urban, Linda; Ahlswede, Sophie

**Conference Paper**

## Does a personalized feedback on investment success mitigate investment mistakes of private investors? Answers from large natural field experiment

Beiträge zur Jahrestagung des Vereins für Socialpolitik 2015: Ökonomische Entwicklung - Theorie und Politik - Session: Risk Preferences and Loss Aversion, No. E24-V3

**Provided in Cooperation with:**

Verein für Socialpolitik / German Economic Association

*Suggested Citation:* Meyer, Steffen; Urban, Linda; Ahlswede, Sophie (2015) : Does a personalized feedback on investment success mitigate investment mistakes of private investors? Answers from large natural field experiment, Beiträge zur Jahrestagung des Vereins für Socialpolitik 2015: Ökonomische Entwicklung - Theorie und Politik - Session: Risk Preferences and Loss Aversion, No. E24-V3, ZBW - Deutsche Zentralbibliothek für Wirtschaftswissenschaften, Leibniz-Informationszentrum Wirtschaft

This Version is available at:

<https://hdl.handle.net/10419/112988>

**Standard-Nutzungsbedingungen:**

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

**Terms of use:**

*Documents in EconStor may be saved and copied for your personal and scholarly purposes.*

*You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.*

*If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.*

# **Does a personalized feedback on investment success mitigate investment mistakes of private investors? Answers from a large natural field experiment**

COMMENTS WELCOME

## *Abstract*

In this natural field experiment with almost 2.000 customers of an online-broker we test what happens when investors receive feedback on their investment success in a monthly securities account report over a period of fifteen months. We test four designs using different graphical displays and text. All report designs show investors last year's returns, costs, their current level of risk and their portfolio diversification. Depending on the design, we also include peer-group and/or benchmark information. We find that receiving a report results in investors trading less, diversify more and have higher risk-adjusted returns. Results are robust to controlling for potential play money accounts and changes in report designs. The results imply that feedback helps retail investors making better investment decisions.

*JEL classification:* D14, G11, G28

*Keywords:* household finance, natural field experiment, individual investors, reporting, investment mistakes, regulation

## I. Introduction

It is well established that private investors make investment mistakes.

<sup>1</sup> Additionally, investors' ability to learn from past investment mistakes seems limited (Seru et al. 2009; Barber et al. 2005; Koestner et al. 2012). However, Cronqvist and Siegel (2014) show that genetic predisposition and parenting only explain 35% of investment mistakes. Hence, 65% are attributed to experience and other factors that can in principle be changed. Glaser and Weber (2007) argue that people do not learn because they are largely unaware of their own situation. Kahneman (2011) adds that learning is only possible with quick and clear feedback in a stable environment.

Private investors receive little feedback on their investment decisions. A survey conducted in Germany showed that only one of 120 banks regularly informs investors about the return and the risk of their portfolios over the previous year (Stiftung Warentest (2013)). Most financial services providers fulfill their statutory duties and provide information on holdings, transactions and current prices. However, they do not show investors' their portfolio performance. A survey among the investors who later participate in our study shows that investors are bad at estimating their portfolio performance, confirming evidence reported by Glaser and Weber (2007).

Kamenica et al. (2011) showed that providing customers with information on their behavior and use of services would allow them to optimize their decision-making. The feedback in our experiment provides investors with information on past investment success, costs, current level of risk and diversification measures. This is essentially a mix of "outcome feedback" and "calibration feedback". Outcome feedback, i.e. feedback on the status quo or change of a certain measure (e.g. return) has been shown to work in simple, linear environments, but less with regard to complex decisions under uncertainty (Balzer et al. 1989; Hoffman et al. 1981). Unfortunately, in the context of stock markets linear causalities where  $x$  causes  $y$  do not always apply, particularly not in the short run. Since we cannot change the stability of the environment the feedback needs to be adjusted. For these situations, "calibration feedback" or cognitive feedback and particularly task information have proven to be more effective (Balzer et al. 1992). Task information is information on a subject matter, the factors affecting it, or both (Balzer et al. 1989). Transferring this idea to the portfolio information context means that investors need information on what affects their return, i.e. information on costs and risks.

---

<sup>1</sup> There is an extensive body literature with respect to investment mistakes. Therefore, we highlight a few striking examples. Among these are overconfidence (Barberis, Shleifer, and Vishny 1998; Daniel, Hirshleifer, and Subrahmanyam 1998; Odean 1998, 1999; Barber and Odean 2001; Guiso and Jappelli 2006; Niessen-Ruenzi and Ruenzi 2011), underdiversification (Blume and Friend 1975; Dorn and Huberman 2002; Campbell 2006, Goetzmann and Kumar 2008), loss aversion (Benartzi and Thaler 1995; Shumway 1998; Barberis and Huang 2001), the disposition effect (Shefrin and Statman 1985; Odean 1998; Weber and Camerer 1998), the house money effect (Barberis, Huang, and Santos 2001), churning (Barber and Odean 2000), and local and home bias (Lewis 1999; French and Poterba 1991; Ivkovic and Weisbrenner 2005).

By drawing on findings from research on decision-making and behavioral economics we design four different one-page reports. Our intention is to minimize individuals' costs related to information acquisition about their portfolio performance and make relevant information salient. The first report design mimics the one used by Gerhardt and Meyer (2013) to capture the effect of attention that is created by circulating the report. We use this report as a baseline. The other three reports contain information on performance, risk levels and diversification. Of these three, the first type contains no peer information ("no peer"), the second one contains performance, risk and diversification of a peer group ("peer") and the third one is complemented by a brief executive summary ("executive summary"). The period reported in the reports is the past year in order to widen investors' focus which is often too short term.

To the best of our knowledge, there is no evidence on how feedback and/or peer information affects investment decisions of private investors and whether this information helps overcoming widely documented investment biases such as underdiversification, overtrading or non-participation. Research has so far mainly focused on whether ex-ante information on investment products helps individuals make better investment decisions or encourages participation in capital markets. A rare exception is a study by Gerhardt and Meyer (2013). However, their feedback is limited in several ways: the period reported on is one month, they only observe one report design without peer information and they do not provide information on diversification and risk of the portfolio. Gerhardt and Meyer show that feedback leads to more trading but no improvement in the investor's risk-return profile.

In an introductory survey we ask customers on their investment strategies and personal risk capacity<sup>2</sup>. Combining the information from the survey with trading records and portfolio holdings, we design and deliver securities account reports to clients. We then evaluate the effects of receiving a securities account report in a difference-in-differences (DiD) setting using propensity score matching to overcome self-selection issues.

Our findings are as follows: After receiving reports for a period of fifteen months investors trade less, diversify more and have a higher risk-adjusted performance. Results are robust to potential outliers and not driven by information overload. The results imply that a short, visually enhanced and personalized securities account report containing relevant information improves individuals' decision making. Furthermore, we find that effects do not differ much between the different reports. It seems that it is more important to provide investors with feedback, rather than a specific format in which it is delivered. This suggests that the reports create awareness but are likely not the only source of investors' improved decisions.

The structure of this paper is as follows: After an introduction to our natural field experiment the field study is described in chapter II. Chapter III elaborates on the data and in chapter IV, we discuss

---

<sup>2</sup> In order to determine risk capacity we follow the approach of ifa.com. The correlation with the four-item scale from the Survey of Consumer Finances (SCF) is about 80%.

the identification strategy to measure the impact of the reports on investor behavior as well as key metrics. Chapter V presents and discusses the results and chapter VI concludes.

## **II. The Field Study**

### *II.I. Experimental set-up of the field study*

We carry out our experiment with a full-service online brokerage that serves more than 100'000 clients and is not authorized to offer any advisory services to clients.

In order to retain existing customers and attract new ones, the broker set out to introduce a personalized securities account reporting to clients. The reports are not available real-time, but are made available to customers around the 15<sup>th</sup> of the following month, incorporating all information available until the end of the preceding month. For example, the report made available on 15 July 2014 takes all information into account available until 30 June 2014.

To attract subscribers to the securities account reporting service the broker put up banner ads on its website. These ads were clearly visible to users and clients accessing the website. By clicking on the banner ad clients were routed to a landing page, which provided them with details on the offer. Clients found out that the service was perpetual and free of charge. Additionally, they learned that Goethe University's House of Finance scientifically counsels the report creation. However, they never learned they were part of an experiment. Therefore, our study qualifies as a "natural field experiment" following Harrison and List (2004).

From the landing page, interested individual investors could log in using their customer-id and their e-mail address to take part in a survey. The reason for this pre-report survey was to obtain investors' consent to use their account data and obtain legal permission to send them the report.<sup>3</sup> In addition, we also collected information on investor demographics, investment goals and risk-capacity. This approach of creating a sample of report-receivers may create self-selection issues, which we address later when we discuss the identification strategy.

From January 2013 until the first report was sent in August 2013 974 investors with a total of 1'160 securities trading accounts registered as participants.<sup>4</sup> The survey remained online for further registration after the experiment had gone live. Figure A.1 in the appendix provides an overview of the number of new investment accounts being registered for receiving reports. At the end of the 6 month-observation period investors with 1'778 securities accounts were receiving reports.

Finally, the broker provided us with anonymized securities account data including all transactions at the single investor level for three years prior to the start of the field experiment for all

---

<sup>3</sup> Without such permission, sending out the reports would have been considered unsolicited commercial material.

<sup>4</sup> Aside from the opportunity to obtain a securities account report at no charge, a lottery for prizes of a total value of approximately EUR 1,000 was tendered.

customers that signed up for the report as well as for a random sample of approximately 35,000 customers whose (aggregated) data<sup>5</sup> is used for computing the peer group information.

## *II.II. Report design*

The securities account report provides feedback, which should help customers to assess their past investment, decisions as well as their current situation. Our hypothesis is that the increased awareness of their personal situation enables customers to take better decisions and results in more efficient portfolios.

The investor as the recipient of information plays a crucial role in its perception: The ability to process information increases with the investor's knowledge in the respective area (Alba and Hutchinson 1987) or the ease with which information is acquired (Russo et al. 1986). At the same time, the number of different informational items that can be processed at one time is limited (Miller 1956), more information can potentially lead to an impairment in decision quality (Hwan and Lin 1999). On the other hand, it can be dangerous to present an incomplete set of information: All information that is not part of the report may be considered irrelevant or is not considered at all for subsequent investment decisions (Lurie and Mason 2007). Therefore, it is crucial to answer the following three questions: 1. What information to convey to customers? 2. How to convey this information to customers? and 3. How often to provide the information?

Regarding content we prioritize based on the literature on how costly certain investment mistakes are for investors on average. We pick three investment mistakes, which have been shown to impede the efficiency of private investor portfolios: underdiversification, lottery-stock preference and overtrading. The literature shows that investors hold portfolios with high idiosyncratic variance shares (Calvet et al. 2007) or have a serious home and/or local bias (Lewis 1999; French and Poterba 1991; Ivkovic and Weisbrenner 2005). Second, investors seem to have difficulties in assessing the risk of their own portfolio (Calvet et al. 2009) and to prefer lottery stocks (Kumar 2009). Finally, literature argues that private investors are overconfident, do not benefit from trading and hence trade too much in stock markets (Odean 1998, 1999; Barber and Odean 2001). All three investment behaviors have been shown to have a negative impact on the performance of private investors. For underdiversification Goetzmann and Kumar (2008) argue that it is associated with a return loss of 2%, for lottery stock preference Kumar (2009) shows a return loss of 3%, and for overtrading Barber and Odean (2000) measure a return loss of 5% for net returns. Weber et al. (2014) study a large sample of German investors and show that these figures also apply there.

---

<sup>5</sup> Data protection laws do not prohibit using aggregated and anonymized data in research studies.

We decide to show portfolio-level information, because asset allocation contributes to investment success more than stock selection (Brinson et al. 1986) and most of the investment biases can only be recognized from a portfolio perspective.

Regarding the display of information in the securities account reports we consider findings from different relevant research areas, including behavioral economics, neuro-finance, (financial) decision making, feedback and learning, risk perception, and information disclosure. With respect to the frequency, we decide to send monthly reports covering the respective past year. More information on the detailed motivation for different designs and frequencies can be found in the appendix.

The three newly designed reports share three common sections, which are depicted in figure 1. Section I displays the change in the portfolio value within the last year as a result of in-and outflows, returns and trading costs. Section II presents a line-chart summarizing the portfolio return over the last 12 months, in percent or euros. To the right of the line-chart we also display a projection of the portfolio return for the next quarter based on the end-of-period portfolio allocation. Section III provides information on the diversification and the actual level of risk in comparison to the level desired as expressed in the survey. More details on the design process and examples of the final reports are in the appendix.

### **III. Data**

The broker provides account holdings for each end-of-month, transactions during the month, as well as the investors' cash holdings, together with demographic information collected in the account opening process. We complement the investor data with market data for the more than 350,000 different securities traded by the investors over the time horizon of the experiment. These daily market data are from Thomson Reuters Datastream and cover 78% (value weighted) of the required universe. If a security is missing in Datastream we use month-end dates as well as intra-month trading prices to interpolate a time-series.

The broker provides the data for three years prior to the start of the field experiment for the participants as well as for a random sample of approximately 35,000 investors whose aggregated data is used to calculate peer group data. From the information provided by the broker we calculate for each investor their total portfolio size, portfolio return, turnover, age and sector of employment.

For those who register to receive a report and answer our survey we gain responses to 32 questions on additional demographics, investment goals, investment behavior, and performance. The information from the survey is used to categorize investors into a risk category. The categorization is based on Commission Regulation No 583/2010. However, instead of seven risk categories we group investors into ten categories. Category one is for the most risk-averse and 10 for the least risk-averse investors. Investors may overrule the risk category we suggest to them based on their answers. If

investors do not complete the questionnaire a risk category of five is set by default. The investor can change this risk category at any time via a link incorporated in every securities account report.

In total, from January 2013 until the first report was sent in August 2013, 678 customers of the broker with a total of 783 securities trading accounts filled in the survey.<sup>6</sup> The survey remains online for further participation after August 2013 when the experiment went live. Until the end of January 2015 investors with 1,612 securities accounts answered the questionnaire and received a securities account report.

Table 1 contains an overview of the average characteristics of subscribers and non-subscribers. The reference date for the computation of all time-varying variables is July 31<sup>st</sup>, 2013. This date is used because it is unaffected by circulating reports as the subscribers received the first report in August 2013. The investors who subscribe to the securities account report are on average 45.8 years old, are predominantly male and own an average investment portfolio of 94,000 Euros. In comparison to non-subscribers, subscribers are almost 3 years younger, more likely to be male and own larger portfolios.

All investors in our sample trade quite heavily with an average annual turnover far above 100% (median: 98%). In comparison, those who subscribe to the securities account report trade less. Additionally, the alphas (1-factor and 4-factor) of both subscribers and non-subscribers are negative. However, independent of whether we consider means or medians subscribers have better alphas before we start sending reports. Comparing subscribers and non-subscriber in terms of portfolio diversification we find that subscribers generally have a lower Herfindahl-Hirschman-Index (HHI) (0.24 vs. 0.34) and a lower unsystematic variance share (0.35 vs. 0.46). All previously reported differences between subscribers and non-subscribers are statistically different as t-test on the mean reveal. This result raises concerns on a potential selection bias which may affect our results. In the section on identification we explain how we cope with this issue.

[INSERT TABLE 1 ABOUT HERE]

The questionnaire subscribers complete when registering for the securities account report allows for further interesting insights. The information is displayed in Table 2. From the answers we conclude that the investors are financially literate. The average subscriber answers 3 out of 4 financial literacy questions correctly. The financial literacy questions are based on Lusardi (2011). Moreover the questionnaire answers show that subscribers do not use their account as “play money accounts”: 72% of subscribers state that this is their main securities account and only 3% state they had a short-term investment horizon.

[INSERT TABLE 2 ABOUT HERE]

---

<sup>6</sup> Aside from the opportunity to obtain a securities account report at no charge, a lottery for prizes of a total value of approximately EUR 1,000 was tendered.



## IV. Methodology

### IV.I. *Difference-in-Differences Analysis*

We seek to test whether receiving a securities account report results in an increase in diversification, lower trading (costs), an increase in capital market exposure and in the end to a better portfolio performance.

The starting point of such an investigation is a simple difference-in-difference approach used in economics and household finance to model the effects of a policy change or a product or service innovation (e.g., Johnson et al. 2006 or Bhattacharya et al. 2012). Such a model is given by (1)

$$Y_{i,t} - Y_{i,t-1} = \alpha_i + \beta_1 d_{report} + \beta_2 X + \varepsilon_i \quad (1)$$

Where  $Y_{i,t} - Y_{i,t-1}$  represents the change in any key metric for portfolio  $i$  measured before and after the securities account reports are sent.  $\alpha_i$  displays the constant;  $d_{report}$  is set to one for subscribers and zero otherwise;  $X$  is a vector of control variables to account for heterogeneity between households. The effect we are interested in is measured by  $\beta_1$ . The null hypothesis is that the effect of reports on diversification, trading, performance or investment is zero.

The advantage of this setup would be that trends that affect both the treatment and the control group are eliminated as long as receiving reports is exogenous. However, we are legally obliged to let investors choose whether to participate in the survey and subscribe to the securities account reporting. The data section already indicated that subscribing to reports is not independent of (observable) investor characteristics, which may lead to self-selection and hence biased result. Thus, running the regression implied by equation (1) using OLS yields the unbiased effect of the reports on investment behavior.

### IV.II. *Propensity Score Matching*

To deal with the problem of a potential selection bias we implement a propensity score matching initially introduced by Rosenbaum and Rubin (1983). We estimate the propensity score using a logit specification.<sup>7</sup> We choose a rather simple matching estimator as we match for each subscriber one non-subscriber that minimizes the difference in propensity score. The downside of propensity score matching is, however, that a lot of observations are discarded from the analysis.<sup>8</sup> We match without replacement to avoid a loss in precision. The potential drawback is that we risk being unable to find non-subscribers that best resemble subscribers.

---

<sup>7</sup> In unreported tests we also try probit specifications. The results do not depend on the specification we choose.

<sup>8</sup> We also tried to estimate eq. (1) without any matching estimator in place. Results are slightly stronger than without matching. The relevant tables are available upon request.

We use both investor and portfolio characteristics as well as information on the investors' profession, which is clustered<sup>9</sup> in five groups to estimate the probability of investors ordering securities account reports. To ensure that the variables are unaffected by receiving securities account reports all independent variables are measured at the end of July 2013 (or over the course of the twelve months prior to July 2013). July 2013 is the month just prior to distributing the first securities account report. Beyond including level effects, we also included changes from January 2013 to July 2013.

The logit-regression results displayed in Table 3 reveal that investors that subscribe to receive securities account reports tend to opt for a higher WpHG<sup>10</sup> risk class. Moreover, they are better diversified (using HHI and unsystematic variance share), they perform better (higher alphas) and trade less (lower turnover). Overall, investors who subscribe seem to be more sophisticated. This finding is in line with previous literature in household finance (cf. Bhattacharya (2012)). We tested the variables for potential multicollinearity issues using an OLS-framework and found no evidence for problems.

[INSERT TABLE 3 ABOUT HERE]

For matching subscribers and non-subscribers we use model (6) of table 3. Heckman and Navarro-Lozano (2004) show that there is no justification for using goodness-of-fit statistics for selecting variables for matching. Therefore, it is crucial to ensure the validity of the match. We firstly test if there is common support for the subscriber and non-subscriber. Figure 3 depicts kernel densities for estimated propensity score and indicates that there is indeed common support. As the goal of the matching is to eliminate differences in observable variables between subscribers and non-subscribers we run t-tests to test for differences between means for subscribers and non-subscribers. Each t-test tests whether the means are different for subscribers and matched non-subscribers. The t-tests are reported in table 4 and provide no evidence for any remaining differences between the two groups.

The assumption that the both groups are indeed comparable can be further tested by comparing changes in the portfolio performance, the trading behavior, the diversification and the investment decisions at any date prior to actual introduction of the reports. In our case, we assume the reports would have been introduced any time between January and end of July 2013. Under the null hypothesis that the matching works well we expect no difference in behavior between the two groups. This test is in the spirit of Heckman and Hotz (1989). Table 5 depicts the results of this test. For the vast majority we find no differences between subscribers and non-subscribers. In the rare occasions where there are

---

<sup>9</sup> The four groups are split to reflect the differences in education as well as domain specific jobs. Job class 1 refers to finance-related occupations which require university education, job class 2 refers to finance related jobs which only require apprenticeships, job class 3 refers to jobs for which attending university is obligatory, but which have no connection to finance, job class 4 comprises people with jobs unrelated to finance and not requiring university attendance, finally, job class 5 contains other jobs as well as unemployed.

<sup>10</sup> WpHG = Wertpapierhandelsgesetz, the German securities investment law which requires a categorization of clients into risk classes.

differences the effects are opposite to the direction we would expect them to be. In unreported tests we also verify that the results hold if we do not use the changes in variables in the match.

Overall, these three tests do not reject the null that the two groups are comparable. Hence, we conclude that our matching works well and use the results to evaluate the effects of the securities account reports on the investment decisions of investors.

Besides exploring the overall effect of report provision on the investment decisions of investors, we also seek to test whether providing calibration feedback (reports 2-4) is superior to outcome feedback (report 1). Recall that outcome feedback just allows drawing conclusion on the results, whereas calibration feedback shows clues on the drivers behind the outcome observed. For example, report designs 2 - 4 show costs and diversification as drivers as well as benchmark or peer group information to show the effect of costs and diversification on performance. For this test we exploit the random assignment of the four securities account report designs to investors and test whether those showing calibration feedback lead to superior outcomes.

Furthermore, the setup of the study allows for testing the robustness of our findings and for further exploring how the securities account reports affect trading decisions of investors.

#### *IV.III. Key Metrics*

Recall that the securities account reports seek to mitigate excessive trading, enhance the diversification of investors and to guide investors towards a better performance. Furthermore, we conjectured that the reports may encourage investors to increase the portfolio value and their risky share.

To measure the change in trading activity we calculate the portfolio turnover and the fees paid for trading. Note that in unreported analyses we also used the number of trades. Results are not different from the ones reported later. We follow Barber and Odean (2001) in computing the turnover.

The HHI is a simple but commonly accepted measure of diversification (Dorn et al. 2008; Ivkovic et al. 2008). It is calculated as the mean of the average absolute squared weights of the single investments in a portfolio on any given day in the observation period over the total portfolio value. Lower values of the measure indicate a higher degree of diversification. Following Dorn et al. (2008) we count investment funds as 100 different securities. It is supposed to reflect the idea of naïve diversification and goes beyond the simple count of securities in a portfolio otherwise used (Mitton and Vorking 2007; DeMiguel et al. 2008). In addition, we compute the idiosyncratic variance share of the different securities accounts using a 4-factor model with the German CDAX Index as the applicable market as well as SMB, HML and MOM factors computed for the German market. In this respect, we follow Bhattacharya et al. (2012).

As performance measures we use gross and net returns, 1- and 4-factor alphas on net returns as well as the Sharpe-Ratio. For computing the alphas, we again apply the factors also used for computing the unsystematic variance share.

Finally, to assess change in absolute value of participation as well as the absolute value of the stock portfolio we determine the Euro value invested in the portfolio (*risky share*) and then divide it by the total value of the respective portfolio, i.e. including the cash holdings (*size of portfolio*).

## V. Results

We investigate whether the reports affect trading, diversification and performance based on the fifteen months ranging from end of July 2013 to end of January 2015.

[INSERT TABLE 6 ABOUT HERE]

Results are summarized in table 6. We first focus on changes in trading activity. Turnover measures trading activity in relation to total portfolio value, while fees are an absolute measure of trading activity. We find that the provision of reports has a negative effect on both fees paid and turnover. However, only the effect on turnover turns out to be statistically significant at the 1%-level. All other control variables are statistically insignificant. Turning the attention to diversification we find that receiving a securities account report seems to help investors diversifying their portfolio better. Both the HHI and the unsystematic variance share decrease for report subscribers. The effect is statistically significant at the 1%-level. In contrast to previous results we do not find effects of reports on the risky share or the size of the portfolio. Finally, when we turn our attention to performance receiving reports affects the performance of investors positively. The annual 4-factor alpha before transaction costs increases by more than 7 percentage points. The effect is statistically significant at the 5%-level. Using the gross alpha shows that the increase in performance is not driven by mere savings in transaction costs, but by improved investment decisions of report subscribers.<sup>11</sup>

In table 7 we focus the attention to those investors who trade within a 5 day period after having received a report. About 10 % of subscribers to the security account reports do not trade within this time period at all. We conjecture that the remaining 90% of investors have likely read the reports and assume that trading after the reception of the report is at least partially influenced by the report. Overall, the results remain qualitatively unaltered, however, the effects become slightly larger.

[INSERT TABLE 7 ABOUT HERE]

---

<sup>11</sup> In order to mitigate potential outlier problems we also run a quantile regression on the median. The effects for trading, diversification and investment remain unaltered. While the coefficients also hold for performance statistical significance are weaker. The table is available from the authors.

In further analyses we test whether a “need for change” drives investor’s reaction to the reports. The reports reveal the fees paid over the last twelve months by investors. We conjecture that those investors with above average fees will benefit more from the report as they will quickly grasp their overtrading and adopt their behavior. To test if the “need for change” is an important driver we compute median fees paid in the sample and split the sample at this value. We then repeat our analysis for investors with above median fees. The results are depicted in table 8. Whereas all effects remain qualitatively unaltered we do not find that a larger need for changes drives results for investors. The economic magnitude as well as the statistical significance do not change for the two proxies for trading behavior.

[INSERT TABLE 8 ABOUT HERE]

Finally, the reports do contain a lot of information. It may well be the case that subscribers suffer from information overload. If the reports were too complicated and too difficult to understand we may expect that reactions for those investors who are more financially literate are larger and potentially statistically more significant. To test this we use the financial literacy answers from the survey and keep only those investors and their matches in the sample whose literacy is above 3 (i.e., above average). Table 9 shows that results are qualitatively unaltered for more financially literate investors. These results suggest that information overload is not a key driver of reaction to the reports. Of course, one may argue that the reports are too complicated for all investors and hence also for the most literate ones. However, this argument seems less plausible given the overall supportive evidence for the benefit of a securities account report we are presenting here.

[INSERT TABLE 9 ABOUT HERE]

Finally, table 10 shows results for the four different report designs we test. In table 10 we leave out the constant as we want to draw conclusions on all four report designs. However, results are not qualitatively different if we use report design number 1 as the base group. Results from table 10 show that there is no dominant report design. Results seem to imply that reports providing calibration feedback help investors to improve performance and diversification more consistently. However, the pure outcome feedback in report number 1 seems to be better in inducing investors to trade less. Overall, it seems much more important that investors receive feedback on their portfolio rather than on the exact design, which delivers the information. One explanation could be that reports create awareness, but investors may also consider other sources that enable them to take better decisions. Given our results, this seems to benefit investors. However, much more can potentially be done to optimize report designs to make it easier for investors to gauge the main message and act accordingly.

## **VI. Summary and Conclusion**

We use a large field experiment to test whether feedback on securities account performance helps investors to improve financial decision-making.

Based on the current literature we develop four different securities account report designs for a field experiment with a German online broker. Over a fifteen-month period, we provide more than 1,500 investors with insight on the development of the total value of their securities account, their returns, their trading costs and their risk-levels as well as their level of diversification. To assess the impact of the reports we apply a DiD analysis, in which we compare the trading behavior of report receivers to a control group of investors who did not receive the reports. The control group is defined using a propensity score matching to minimize issues of self-selection and endogeneity. This setup allows us to identify changes in investment behavior resulting from receiving a report.

Overall, we find that an increase in transparency regarding individual investment success helps investors improve on trading costs, performance and diversification. However, the investment in capital market and the risky share remain unaltered. Even if we focus on investors with higher financial sophistication, who are more likely to understand the information provided, or investors exhibiting a larger gap between the average fees paid and their own fees, or leave out investors who do not trade within a five-day period after having received a report, we still find that our results hold.

Previous research has found that pre-contractual product information is of limited use to retail investors. Our results in this field experiment support the view that providing outcome and calibration feedback on the total portfolio helps investors improve investment decisions. The results hence complement studies from microeconomic theory like Kamenica et al. (2011).

## References

- Agnew, J., P. Balduzzi, and A. Sunden**, "Portfolio Choice and Trading in a Large 401 (k) Plan," *The American Economic Review*, 2003, 93 (1), 193–215.
- Alba, W., and J. W. Hutchinson**, "Dimensions of Consumer Expertise," *Journal of Consumer Research*, 1987, 13 (4), 411–454.
- Ameriks, J., and S. P. Zeldes**, "How Do Household Portfolio Shares Vary with Age?" Columbia University, Working Paper, 2004.
- Asbury, J.-E.**, "Overview of Focus Group Research," *Qualitative Health Research*, 1995, 5 (4), 414–420.
- Atkins, P. W. B., R. E. Wood, and P. J. Ruttgers**, "The Effects of Dynamic Feedback Format on Dynamic Decision Making," *Organizational Behavior and Human Decision Processes*, 2002, 88 (2), 587–604.
- Barber, B. M., and T. Odean**, "Trading Is Hazardous to Your Wealth: The Common Stock Investment Performance of Individual Investors," *Journal of Finance*, 2000, 55 (2), 773–806.
- Barber, B. M., and T. Odean**, "Boys Will Be Boys: Gender, Overconfidence, and Common Stock Investment," *Quarterly Journal of Economics*, 2001, 116 (1), 261–292.
- Barber, B. M., and T. Odean**, "All That Glitters: The Effect of Attention and News on the Buying Behavior of Individual and Institutional Investors," *Review of Financial Studies*, 2008, 21 (2), 785–818.
- Barber, B. M., T. Odean, and L. Zheng**, "Out of Sight, Out of Mind: The Effects of Expenses on Mutual Fund Flows," *Journal of Business*, 2005, 78 (6), 2095–2120.
- Barberis, N., and M. Huang**, "Mental Accounting, Loss Aversion, and Individual Stock Returns," *Journal of Finance*, 2001, 56 (4), 1247–1292.
- Barberis, N., M. Huang, and T. Santos**, "Prospect Theory and Asset Prices," *Quarterly Journal of Economics*, 2001, 116 (1), 1–53.
- Barberis, N., A. Shleifer, and R. Vishny**, "A Model of Investor Sentiment," *Journal of Financial Economics*, 1998, 49 (3), 307–343.
- Benartzi, S., and R. H. Thaler**, "Myopic Loss Aversion and the Equity Premium Puzzle," *Quarterly Journal of Economics*, 1995, 110 (1), 73–92.
- Beshears, J., J. J. Choi, D. Laibson and B. C. Madrian (2009)**. "How Does Simplified Disclosure Affect Individuals' Mutual Fund Choices?" *National Bureau of Economic Research*, 2009.
- Beshears, J., J. J. Choi, D. Laibson, B. C. Madrian and K. L. Milkman (2011)**. The effect of providing peer information on retirement savings decisions, *National Bureau of Economic Research*, 2011.

- Bhattacharya, U., A. Hackethal, S. Kaesler, B. Loos, and S. Meyer**, “Is Unbiased Financial Advice to Retail Investors Sufficient? Answers from a Large Field Study,” *Review of Financial Studies*, 2012, 25 (4), 975–1032.
- Blume, M. E., and I. Friend**, “The Allocation of Wealth To Risky Assets – The Asset Structure of Individual Portfolios and Some Implications For Utility Functions,” *Journal of Finance*, 1975, 30 (2), 585–603.
- Brinson, G. P., L. R. Hood, and G. L. Beebower**, “Determinants of Portfolio Performance,” *Financial Analysts Journal*, 1986, 42 (4), 39–44.
- Brunnermeier, M. K., and S. Nagel**, “Do Wealth Fluctuations Generate Time-Varying Risk Aversion? Micro-Evidence on Individuals’ Asset Allocation,” *American Economic Review*, 2008, 98(3), 713–736.
- Calvet, L. E., J. Y. Campbell, and P. Sodini**, “Down or Out: Assessing the Welfare Costs of Household Investment Mistakes,” *Journal of Political Economy*, 2007, 115 (5), 707–747.
- Calvet, L. E., J. Y. Campbell, and P. Sodini**, “Fight Or Flight? Portfolio Rebalancing by Individual Investors-super.” *The Quarterly Journal of Economics*, 2009, 124(1), 301-348.
- Campbell, J. Y.**, “Household Finance,” *Journal of Finance*, 2006, 61 (4), 1553–1604.
- Chua, H. F., J. F. Yates, and P. Shah**, “Risk Avoidance: Graphs versus Numbers,” *Memory & Cognition*, 2006, 34 (2), 399–410.
- Cronqvist, H., and S. Siegel**, “The genetics of investment biases.” *Journal of Financial Economics*, 2014, 113(2), 215-234.
- Daniel, K., D. Hirshleifer, and A. Subrahmanyam**, “Investor Psychology and Security Market Under- and Overreaction,” *Journal of Finance*, 1998, 53 (6), 1839–1885.
- DeMiguel, V., L. Garlappi, and R. Uppal**, “Optimal Versus Naïve Diversification: How Inefficient is the 1/N Portfolio Strategy?” *Review of Financial Studies*, 2008, 22 (5), 1915–1953.
- Dhar, R., W. N. Goetzmann, S. Shepherd, and N. Zhu**, “The Impact of Clientele Changes: Evidence from Stock Splits,” SSRN Working Paper, 2004.
- Dorn, D., and G. Huberman**, “Who Trades?” SSRN Working Paper, 2002.
- Dorn, D., and G. Huberman**, “Talk and Action: What Individual Investors Say and What They Do,” *Review of Finance*, 2005, 9 (4), 437–481.
- Dorn, D., G. Huberman, and P. Sengmueller**, “Correlated Trading and Returns,” *Journal of Finance*, 2008, 63 (2), 885–920.
- Dorn, D., and P. Sengmueller**, “Trading as Entertainment?” *Management Science*, 2009, 55 (4), 591–603.



- Duflo, E., and E. Saez**, “Participation and Investment Decisions in a Retirement Plan: The Influence of Colleagues’ Choices,” *Journal of Public Economics*, 2002, 85 (1), 121–148.
- Duflo, E., and E. Saez**, "The Role of Information and Social Interactions in Retirement Plan Decisions: Evidence from a Randomized Experiment." *The Quarterly Journal of Economics*, 2003, 118(3), 815-842.
- Engelberg, J., and C. A. Parsons**, “The Causal Impact of Media in Financial Markets, “ 2011, *Journal of Finance*, 2011, 66 (1), 67–97.
- European Parliament and European Council**, “Directive 2001/108/EC of the European Parliament and of the Council of 21 January 2002 amending Council Directive 85/611/EEC on the Coordination of Laws, Regulations and Administrative Provisions Relating to Undertakings for Collective Investment in Transferable Securities (UCITS), with Regard to Investments of UCITS,” *Official Journal of the European Communities*, 2002, 41, 35–42.
- Festinger, L.**, “*A Theory of Cognitive Dissonance*,” 1957, revised edition 1985, Stanford University Press, Stanford, California.
- French, K. R., and J. M. Poterba**, “Investor Diversification and International Equity Markets,” *American Economic Review*, 1991, 81 (2), 222–226.
- Gerhardt, R., and S. Meyer**, “The Effect of Personal Portfolio Reporting on Private Investors,” *Financial Markets and Portfolio Management*, 2013, 27 (3), 257–273.
- Glaser, M., and M. Weber**, “Why Inexperienced Investors Do Not Learn: They Do Not Know Their Past Performance,” *Finance Research Letters*, 2007, 4 (4), 203–216.
- Glenzer, F., H. Gründl, and C. Wilde**, ““And lead us not into temptation”: Presentation formats and the choice of risky alternatives.”, mimeo, 2013.
- Goetzmann, M., and A. Kumar**, “Equity Portfolio Diversification,” *Review of Finance*, 2008, 12 (3), 433–463.
- Goldstein, D. G., E. J. Johnson, and W. F. Sharpe**, “Choosing Outcomes versus Choosing Products: Consumer-Focused Retirement Investment Advice”, *Journal of Consumer Research*, 2008, 35(3), 440-456.
- Guiso, L., and T. Jappelli**, “Information Acquisition and Portfolio Performance,” CSEF Working Paper No. 167, 2006.
- Guiso, L., P. Sapienza, and L. Zingales**, “Trusting the Stock Market,” *Journal of Finance*, 2008, 63 (6), 2557–2600.
- Harrison, G. W., and J. A. List**, "Field Experiments," *Journal of Economic Literature*, 2004, 42(4): 1009-1055.

- Heckman, J. J., and V. J. Hotz**, “Choosing among Alternative Nonexperimental Methods for Estimating the Impact of Social Programs: The Case of Manpower Training.” *Journal of the American Statistical Association*, 1989, 84(408), 862–74.
- Hollands, J. G., and I. Spence**, “Judgments of Change and Proportion in Graphical Perception,” *Human Factors: Journal of the Human Factors and Ergonomics Society*, 1992, 34 (3), 313–334.
- Hollands, J. G., and I. Spence**, “Judging Proportion with Graphs: The Summation Model,” *Applied Cognitive Psychology*, 1998, 12 (2), 173–190.
- Hwan, M. I., and J. W. Lin**, “Information Dimension, Information Overload and Decision Quality,” *Journal of Information Science*, 1999, 25 (3), 213–218.
- Ivkovic, Z., C. Sialm, and S. Weisbenner**, “Portfolio Concentration and the Performance of Individual Investors,” *Journal of Financial and Quantitative Analysis*, 2008, 43 (3), 613–656.
- Ivkovic, Z., and S. Weisbrenner**, “Local Does as Local Is: Information Content of the Geography of Individual Investors’ Common Stock Investments,” *Journal of Finance*, 2005, 60 (1), 267–306.
- Johnson, D., J. Parker, and N. Souleles**, “Household Expenditure and the Income Tax Rebates of 2001.” *American Economic Review*. 2006, 96 (5), 1589–1610.
- Kahneman, D.**, “*Thinking, Fast and Slow*,” 2011, Penguin Books, London.
- Kamenica E., S. Mullainathan, and R. Thaler**, “Helping Consumers Know Themselves.” *American Economic Review*. 2011, 101(3), 417-422.
- Kaufmann, C., M. Weber, and E. Haisley**. "The Role of Experience Sampling and Graphical Displays on One's Investment Risk Appetite." *Management Science*, 2013, 59(2), 323-340.
- Keller, C., M. Siegrist, and V. Visschers**, “Effect of Risk Ladder Format on Risk Perception in High- and Low-Numerate Individuals,” *Risk Analysis*, 2009, 29 (9), 1255–1264.
- Kling, J. R., S. Mullainathan, E. Shafir, L. Vermeulen, and M. V. Wrobel**, “Misperception in Choosing Medicare Drug Plans,” Working Paper, 2008.
- Koestner, M., S. Meyer, and A. Hackethal**, “Do Individual Investors Learn from Their Mistakes?” SSRN Working Paper, 2012.
- Kozup, J., E. Howlett, and M. Pagano**, “The Effects of Summary Information on Consumer Perceptions of Mutual Fund Characteristics,” *Journal of Consumer Affairs*, 2008, 42 (1), 37–59.
- Kumar, A.**, "Who gambles in the stock market?" *The Journal of Finance*, 2009, 64(4), 1889-1933.
- Langer, T., and M. Weber**, “Does Commitment or Feedback Influence Myopic Loss Aversion? An Experimental Analysis,” *Journal of Economic Behavior and Organization*, 2008, 67 (3), 810–819.
- Legge, G. E., Y. Gu, and A. Luebker**, “Efficiency of Graphical Perception,” *Perception & Psychophysics*, 1989, 46 (4), 365–374.

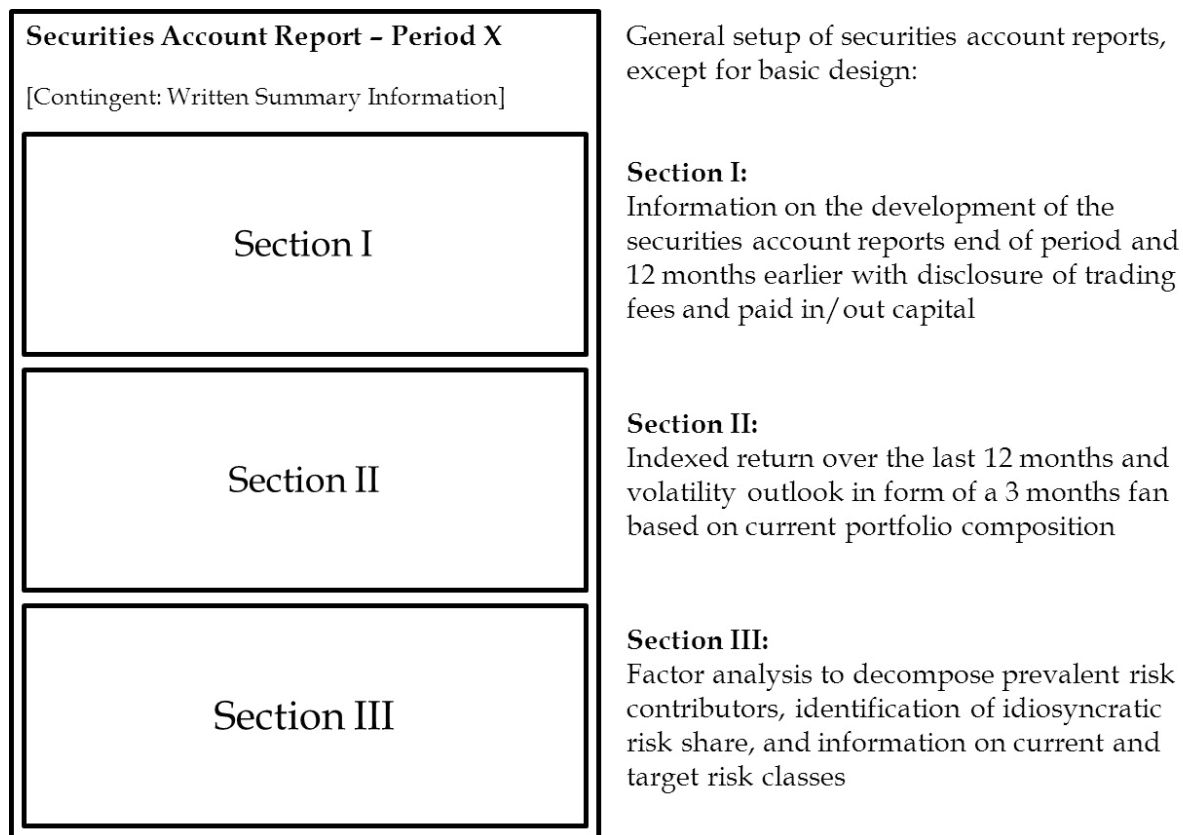
- Lewis, K. K.**, “Trying to Explain Home Bias in Equities and Consumption,” *Journal of Economic Literature*, 1999, 37 (2), 571–608.
- Lipkus, I. M., and J. G. Hollands**, “The Visual Communication of Risk,” *Journal of the National Cancer Institute Monographs*, 1999, 1999 (25), 149–163.
- Lurie, N. H., and C. H. Mason**, “Visual Representation: Implications for Decision Making,” *Journal of Marketing*, 2007, 71 (1), 160–177.
- Merton, R. K.**, “The Focussed Interview and Focus Groups: Continuities and Discontinuities,” *Public Opinion Quarterly*, 1987, 51 (4), 550–566.
- Miller, G. A.**, “The Magic Number Seven, Plus or Minus Two: Some Limits on our Capacity for Processing Information,” *Psychological Review*, 1956, 63 (2), 81–97.
- Mitton, T., and K. Vorking**, “Equilibrium Underdiversification and the Preference for Skewness,” *Review of Financial Studies*, 2007, 20 (4), 1255–1288.
- Niessen-Ruenzi A., and S. Ruenzi**, “Sex Matters: Gender and Prejudice in the Mutual Fund Industry“, Working Paper, 2011.
- Novicki, J. R., and B. G. Coury**, “Individual Differences in Processing Strategies for a Bar-graph Display,” *Proceedings for the Human Factors and Ergonomics Society 37<sup>th</sup> Annual Meeting*, 1993, 37 (19), 1315–1319.
- Odean, T.**, “Are Investors Reluctant to Realize their Losses?” *Journal of Finance*, 1998, 53 (5), 1775–1798.
- Odean, T.**, “Do Investors Trade Too Much?” *American Economic Review*, 1999, 89 (5), 1279–1298.
- Petersen, M. A.**, "Estimating standard errors in finance panel data sets: Comparing approaches." *Review of Financial Studies*, 2009, 22(1): 435-480.
- Rogers, W. H.**, “Regression Standard Errors in Clustered Samples,” *Stata Technical Bulletin*, 1993, 13, 19–23.
- Rosenbaum, P. R., and D. B. Rubin**, “The Central Role of the Propensity Score in Observational Studies for Causal Effects,” *Biometrika*, 1983, 70 (1), 41–55.
- Russo, J. E., R. Staelin, C. A. Nolan, G. J. Russell, and B. L. Metcalf**, “Nutrition Information in the Supermarket,” *Journal of Consumer Research*, 1986, 13 (2), 48–70.
- Ryvkin, D., M. Krajc, and A. Ortmann**, “Are the Unskilled Doomed to Remain Unaware?” *Journal of Economic Psychology*, 2012, 33 (5), 1012–1031.
- Sharpe, W. F.**, “Asset Allocation: Management Style and Performance Measurement,” *Journal of Portfolio Management*, 1992, 18 (2), 7–19.

- Shefrin, H., and M. Statman**, “The Disposition to Sell Winners Too Early and Ride Losers Too Long: Theory and Evidence,” *Journal of Finance*, 1985, 40 (3), 777–790.
- Shumway, T.**, “Explaining Returns with Loss Aversion,” SSRN Working Paper, 1998.
- Sieck, W. R., and H. R. Arkes**, “The Recalcitrance of Overconfidence and Its Contribution to Decision Aid Neglect,” *Journal of Behavioral Decision Making*, 2005, 18 (1), 29–53.
- Sirri, E. R., and P. Tufano**, “Costly Search and Mutual Fund Flows,” *Journal of Finance*, 1998, 53 (5), 1589–1622.
- Tan, J. K. H., and I. Benbasat**, “The Effectiveness of Graphical Presentation for Information Extraction: A Cumulative Experimental Approach,” *Decision Sciences*, 1993, 24 (1), 167–191.
- Thaler, R. H., and S. Benartzi**, “Save More Tomorrow: Using Behavioral Economics to Increase Employee Saving,” *Journal of Political Economy*, 2004, 112 (1), 164–187.
- Thaler, R. H., and C. R. Sunstein**, “Libertarian Paternalism,” *American Economic Review*, 2003, 93 (2), 175–179.
- Thaler, R. H., A. Tversky, D. Kahneman, and A. Schwartz**, “The Effect of Myopia and Loss Aversion on Risk Taking: An Experimental Test,” *Quarterly Journal of Economics*, 1997, 112 (2), 647–661.
- Weber, J., S. Meyer, B. Loos, and A. Hackethal**, “Which Investment Behaviors Really Matter for Individual Investors?” Available at SSRN 2381435, 2014.
- Weber, M., and C. F. Camerer**, “The Disposition Effect in Securities Trading: An Experimental Analysis,” *Journal of Economic Behavior & Organization*, 1998, 33 (2), 167–184.
- van Rooij, M., A. Lusardi, and R. Alessie**, “Financial literacy and stock market participation.” *Journal of Financial Economics*, 2001 101(2), 449-472.
- Vekiri, I.**, “What Is the Value of Graphical Displays in Learning?” *Educational Psychology Review*, 2002, 14 (3), 261–312.

## Figures and Tables

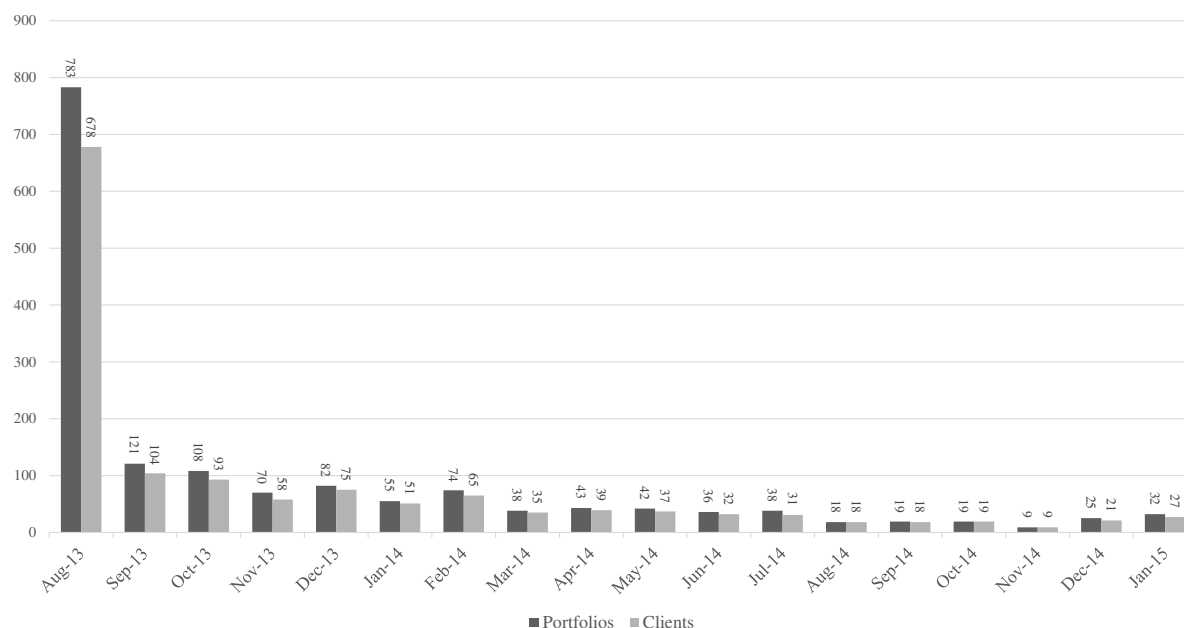
**Figure 1: Schematic Illustration of the Report Designs**

This figure illustrates the general composition of all newly developed securities account reports.



**Figure 2: Number of new subscribers by month**

This bar chart shows the number of subscribers over the sample period. The dark grey bar shows the number of portfolios for which reports are computed, whereas the lighter grey bar shows the corresponding number of clients.



**Table 1: Descriptive Statistics**

This table compares subscribers and non-subscribers of the securities account reporting based on portfolio descriptives and demographics. The daily turnover is computed based on Barber and Odean (2001). The HHI is computed in line with Dorn et al. (2008) assuming that a fund is comprised of 100 single stocks and Alphas (1-factor and 4-factors) are using the CDAX as the market return and SMB, HML and MOM factors following Fama and French (1993) and Carhart (1997) respectively. All factors are computed for the German market using CDAX companies. Unsystematic variance share is derived from a 4-factor model.

Variables	Non subscribers			Subscribers			T-Test
	Obs.	Mean	Median	Obs.	Mean	Median	p-value
<b>Portfolio Descriptives &amp; Performance as of July 31, 2013</b>							
Portfolio Value	21,216	79,852	24,399	1,518	93,887	24,381	0.058
<i>thereof: equity</i>	21,216	46,988	11,895	1,518	48,136	10,851	0.830
Daily Turnover (year before)	21,216	0.0198	0.0038	1,518	0.0103	0.0031	0.000
Daily No. Trades (year before)	21,216	0.4052	0.0913	1,518	0.2704	0.0833	0.000
HHI	21,216	0.3462	0.2300	1,518	0.2452	0.1418	0.000
Fees (year before)	21,216	2.0190	0.4683	1,518	1.4742	0.3958	0.001
Alpha 1-factor (year before) p.a.	21,216	-0.2746	-0.0449	1,518	-0.0284	-0.0128	0.000
Alpha 4-factor (year before) p.a.	21,216	-0.2700	-0.0430	1,518	-0.0279	-0.0133	0.000
Alpha 1-factor (net) (year before) p.a.	21,216	-0.3223	-0.0569	1,518	-0.0481	-0.0235	0.000
Alpha 4-factor (net) (year before) p.a.	21,216	-0.2700	-0.0430	1,518	-0.0279	-0.0133	0.000
Unsystematic variance share	21,216	0.4656	0.5784	1,518	0.3491	0.4294	0.000
<b>Investor Demographics</b>							
Age	21,100	50.24	50.00	1,518	45.77	43.00	0.000
Gender	21,216	0.80	1.00	1,518	0.92	1.00	0.000
WPHG-Risk class	21,216	5.50	6.00	1,518	5.57	6.00	0.001

**Table 2: Descriptive Statistics**

This table provides an overview of results from a survey, which security account report subscribers had to complete upon registering for the report.

Variables	Subscribers		
	Obs.	Mean	Median
<b>Questionnaire results</b>			
Main Account	1,518	0.72	1.00
Financial Literacy (4 = highest)	1,518	3.16	3.00
Experience with (3 years and more)			
<i>Stocks</i>	1,518	0.86	1.00
<i>Bonds</i>	1,518	0.46	0.00
<i>Funds</i>	1,518	0.59	1.00
<i>Options</i>	1,518	0.44	0.00
Investment goals			
<i>Speculator</i>	1,518	0.03	0.00
<i>Mid-term investor</i>	1,518	0.36	0.00
<i>Long-term investor</i>	1,518	0.61	1.00
Risk-capacity (Survey Assessment)	1,390	6.92	7.00

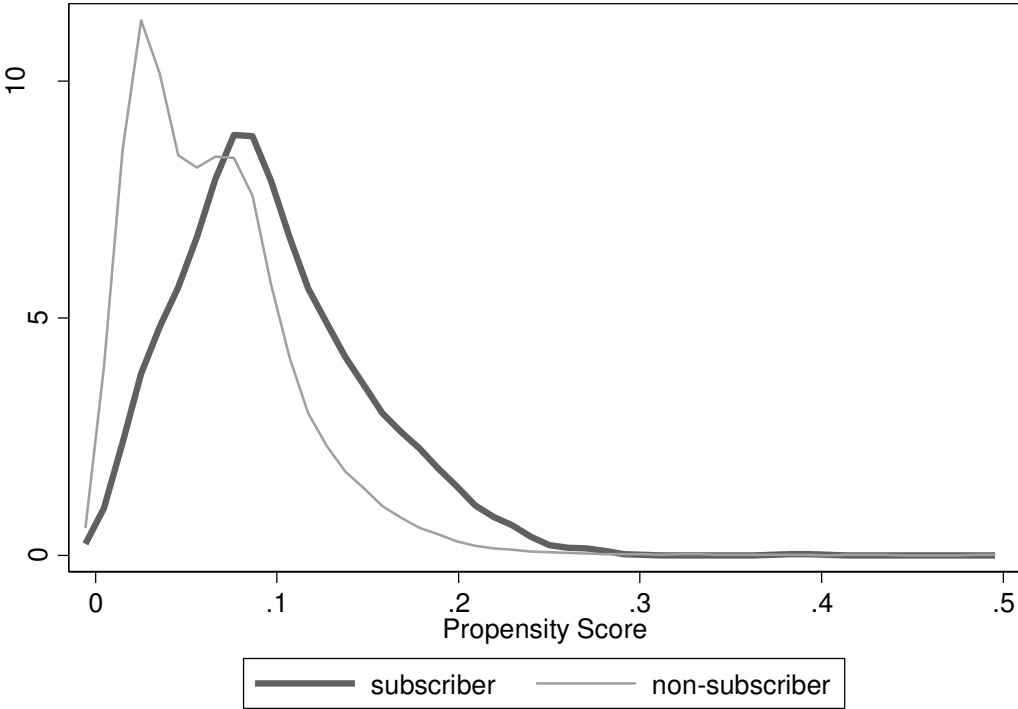
**Table 3: Logit-Regression on subscribing for a Securities Account Report**

This table presents coefficient estimates of logit regressions on a dummy variable set to one if an investor subscribes to the securities account report (the treatment group) and zero otherwise. To ensure that the variables are unaffected by the reports, all independent variables are measured at the end of July 2013, the month before the first securities account report was circulated. Robust z-statistics are reported in parentheses; \*\*\*, \*\*, and \* denote significance at the 1%, 5%, and 10% levels, respectively.

Variables	(1)	(2)	(3)	(4)	(5)	(6)
	Report Subscriber	Report Subscriber	Report Subscriber	Report Subscriber	Report Subscriber	Report Subscriber
Age	-0.082716*** (0.000)	-0.083668*** (0.000)	-0.079253*** (0.000)	-0.077761*** (0.000)	-0.080505*** (0.000)	-0.091427*** (0.000)
Age^2	0.000657*** (0.000)	0.000632*** (0.000)	0.000610*** (0.000)	0.000599*** (0.000)	0.000616*** (0.000)	0.000713*** (0.000)
Gender	1.027057*** (0.000)	1.078246*** (0.000)	1.073074*** (0.000)	1.067962*** (0.000)	1.081320*** (0.000)	1.027263*** (0.000)
Risk-class (WpHG)	0.081364** (0.023)	0.058125 (0.119)	0.066488* (0.077)	0.096111** (0.013)	0.086978** (0.025)	0.078466** (0.041)
ln(portfolio value)		0.043781*** (0.001)	-0.013529 (0.430)	-0.035501** (0.043)	-0.038248** (0.029)	-0.035765** (0.042)
HHI (July 2013)		-1.194966*** (0.000)	-1.573328*** (0.000)	-1.513137*** (0.000)	-1.502395*** (0.000)	-1.501992*** (0.000)
Change of HHI (June 2012 - July 2013)			0.672133*** (0.000)	0.655313*** (0.000)	0.645491*** (0.000)	0.642986*** (0.000)
Risky share (July 2013)			1.433978*** (0.000)	1.233292*** (0.000)	1.253797*** (0.000)	1.241781*** (0.000)
Average Turnover (June 2012 - July 2013)			-5.488457*** (0.001)	-3.999802*** (0.009)	-3.749417** (0.013)	-3.738879** (0.013)
Change of Turnover (June 2012 - July 2013)			2.617915 (0.146)	2.172563 (0.226)	2.094138 (0.239)	2.106428 (0.238)
Alpha (1-factor, June 2012 - July 2013)				63.794426*** (0.000)	63.683664*** (0.000)	63.475739*** (0.000)
Change of 1-factor Alpha (June 2012 - July 2013)				-19.298756* (0.087)	-18.596804* (0.098)	-18.960086* (0.091)
Unsystematic variance share (1-factor, June 2012 - July 2013)				-0.329979*** (0.006)	-0.322472*** (0.007)	-0.303312** (0.012)
Change of unsystematic variance share (June 2012 - July 2013)				0.492687*** (0.004)	0.509559*** (0.003)	0.501507*** (0.004)
Number of portfolios					0.106297*** (0.000)	0.107687*** (0.000)
Job dummy1						0.507046*** (0.001)
Job dummy2						0.509967*** (0.003)
Job dummy3						0.504350*** (0.000)
Job dummy4						0.525254*** (0.000)
Constant	-1.666620*** (0.000)	-1.559489*** (0.000)	-2.412335*** (0.000)	-2.011632*** (0.000)	-2.040877*** (0.000)	-2.175027*** (0.000)
Observations	22,617	22,617	22,617	22,617	22,617	22,617



**Figure 3: Kernel Densities of Propensity Scores for subscribers and non-subscribers**



**Table 4: Balance of Individual Characteristics**

This table presents two sample t-tests of mean differences between subscribers and non-subscribers of securities account reports.

Variables	Non subscribers			Subscribers			T-Test
	Obs.	Mean	Median	Obs.	Mean	Median	p-value
<b>Portfolio Descriptives &amp; Performance as of July 31, 2013</b>							
Age	1,513	46.12	45.00	1,514	45.81	43.00	0.586
Age^2	1,513	2,370.19	2,025.00	1,514	2,330.26	1,849.00	0.473
Gender	1,513	0.92	1.00	1,514	0.93	1.00	0.941
Risk-class (WpHG)	1,513	5.58	6.00	1,514	5.57	6.00	0.700
ln(portfolio value)	1,513	- 0.00	- 0.00	1,514	0.00	- 0.00	0.254
HHI (July 2013)	1,513	0.98	1.00	1,514	0.99	1.00	0.350
Change of HHI (June 2012 - July 2013)	1,513	10.01	10.15	1,514	10.04	10.10	0.701
Risky share (July 2013)	1,513	0.24	0.16	1,514	0.25	0.14	0.439
Average Turnover (June 2012 - July 2013)	1,513	- 0.00	- 0.00	1,514	- 0.00	- 0.00	0.499
Change of Turnover (June 2012 - July 2013)	1,513	0.00	0.00	1,514	0.00	0.00	0.351
Alpha (1-factor, June 2012 - July 2013)	1,513	0.68	0.72	1,514	0.69	0.72	0.552
Change of 1-factor Alpha (June 2012 - July 2013)	1,513	0.07	0.06	1,514	0.08	0.06	0.188
Unsystematic variance share (1-factor, June 2012 - July 2013)	1,513	0.01	0.00	1,514	0.01	0.00	0.866
Change of unsystematic variance share (June 2012 - July 2013)	1,513	0.00	-	1,514	0.00	0.00	0.374
Number of portfolios	1,513	1.50	1.00	1,514	1.47	1.00	0.328

**Table 5: Placebo-Test for Effectiveness of Matching**

This table displays the results for the difference-in-difference analysis using the period before reports had been actually distributed. The columns (1) to (6) measure changes in portfolio performance, columns (6) and (7) changes in diversification, and columns (8) and (9) measure changes in trading behavior. The  $p$ -values from using clustered standard errors are displayed in parentheses, with \*\*\*, \*\*, and \* denoting significance at the 1%, 5%, and 10% levels, respectively.

Variables	Return / Performance					Diversification		Trading		Investment	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
	Return	Net- Return	Alpha (gross) (1-factor)	Alpha (gross) (4-factor)	Sharpe Ratio	Unsys. var. (4-factor)	HHI	Fees	Turnover	Size of portfolio	Risky share
Report	-0.000120* (0.081)	-0.000129* (0.066)	-0.000077 (0.396)	-0.000073 (0.416)	-0.016409 (0.280)	0.051375*** (0.006)	0.009030 (0.230)	0.111480 (0.229)	0.000553 (0.392)	4,428.972995 (0.157)	-0.006816 (0.239)
Age	0.000018 (0.202)	0.000019 (0.192)	0.000018 (0.292)	0.000013 (0.417)	0.002318 (0.316)	0.002893 (0.435)	0.000018 (0.990)	0.014570 (0.226)	0.000149 (0.139)	-267.817030 (0.491)	-0.000104 (0.924)
Age^2	-0.000000 (0.163)	-0.000000 (0.149)	-0.000000 (0.282)	-0.000000 (0.356)	-0.000026 (0.306)	-0.000041 (0.258)	0.000005 (0.722)	-0.000111 (0.382)	-0.000001 (0.277)	1.663588 (0.708)	0.000005 (0.674)
Gender	0.000054 (0.552)	0.000058 (0.554)	0.000094 (0.286)	0.000119 (0.167)	0.015848 (0.248)	0.010315 (0.758)	-0.002139 (0.880)	0.190274* (0.078)	0.000320 (0.758)	-2.16850e+04 (0.243)	0.001659 (0.874)
Risk-class (WpHG)	-0.000003 (0.922)	-0.000003 (0.932)	0.000089** (0.026)	0.000081** (0.038)	0.012388** (0.041)	-0.027553** (0.033)	-0.002176 (0.708)	-0.144313 (0.207)	-0.001094* (0.094)	2,363.516596 (0.204)	-0.003684 (0.423)
Number of portfolios	-0.000017 (0.553)	-0.000015 (0.620)	-0.000036 (0.260)	-0.000032 (0.316)	-0.004408 (0.287)	0.014405 (0.134)	0.001750 (0.537)	-0.051336 (0.220)	-0.000576** (0.011)	-3013.540271 (0.163)	-0.003302 (0.175)
Ln(portfolio size)	-0.000029 (0.306)	-0.000025 (0.399)	-0.000108*** (0.003)	-0.000103*** (0.004)	-0.009274 (0.158)	-0.016522*** (0.003)	-0.006036* (0.059)	0.128865*** (0.001)	0.000057 (0.800)	8,179.875601*** (0.001)	-0.006216** (0.029)
Job dummy1	0.000021 (0.858)	0.000017 (0.893)	-0.000033 (0.833)	-0.000034 (0.829)	-0.005540 (0.827)	0.015489 (0.775)	0.009526 (0.615)	0.294259 (0.165)	0.000355 (0.764)	13931.084396 (0.167)	0.020718** (0.046)
Job dummy2	0.000015 (0.932)	-0.000002 (0.993)	0.000050 (0.785)	0.000001 (0.997)	-0.003279 (0.881)	-0.019156 (0.754)	-0.000510 (0.982)	-0.010221 (0.929)	0.002856 (0.225)	5,847.971626* (0.094)	0.002907 (0.769)
Job dummy3	0.000039 (0.659)	0.000029 (0.746)	0.000062 (0.522)	0.000033 (0.739)	0.002885 (0.810)	-0.008581 (0.867)	0.023583 (0.180)	0.062599 (0.396)	0.000501 (0.496)	5,861.993361* (0.070)	0.015371* (0.065)
Job dummy4	0.000074 (0.528)	0.000067 (0.570)	0.000330** (0.016)	0.000300** (0.026)	0.047702** (0.040)	-0.019723 (0.707)	0.010702 (0.562)	0.225338** (0.020)	0.001129 (0.215)	5,977.973299* (0.067)	0.000351 (0.970)
Constant	0.000221 (0.561)	0.000179 (0.642)	0.000377 (0.393)	0.000479 (0.280)	0.003205 (0.956)	0.133804 (0.285)	0.039158 (0.439)	-0.891133* (0.086)	0.002913 (0.445)	-6.44312e+04*** (0.001)	0.089202** (0.016)
Observations	3,027	3,027	3,027	3,027	3,027	3,027	3,027	3,027	3,027	3,027	3,027
R-squared	0.004	0.004	0.011	0.011	0.005	0.010	0.005	0.016	0.006	0.031	0.007

**Table 6: Effect of Securities Account Reportings (15 months after first distribution)**

This table displays the results for the difference-in-differences analysis from July 2013 to end of January 2015 (15 months). The columns (1) to (6) measure changes in portfolio performance, columns (6) and (7) changes in diversification, and columns (8) and (9) measure changes in trading behavior. The *p*-values from using clustered standard errors are displayed in parentheses, with \*\*\*, \*\*, and \* denoting significance at the 1%, 5%, and 10% levels, respectively.

Variables	Return / Performance					Diversification		Trading		Investment	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
	Return	Net- Return	Alpha (gross) (1-factor)	Alpha (gross) (4-factor)	Sharpe Ratio	Unsys. var. (4-factor)	HHI	Fees	Turnover	Size of portfolio	Risky share
Report	0.000344* (0.067)	0.000376** (0.048)	0.000243* (0.068)	0.000291** (0.049)	0.041195* (0.064)	-0.020266*** (0.004)	-0.021542** (0.015)	-0.197848 (0.149)	-0.002881*** (0.001)	970.032520 (0.852)	-0.008407* (0.074)
Age	-0.000027 (0.392)	-0.000027 (0.393)	-0.000016 (0.475)	-0.000019 (0.446)	-0.001745 (0.641)	-0.001949 (0.158)	0.001518 (0.407)	0.018367 (0.337)	0.000102 (0.493)	117.718769 (0.849)	0.002636** (0.011)
Age^2	0.000000 (0.392)	0.000000 (0.402)	0.000000 (0.608)	0.000000 (0.524)	0.000007 (0.846)	0.000006 (0.658)	-0.000026 (0.144)	-0.000135 (0.510)	-0.000001 (0.380)	-0.254151 (0.972)	-0.000024** (0.021)
Gender	-0.000204 (0.142)	-0.000208 (0.158)	-0.000189 (0.115)	-0.000230* (0.059)	-0.039171* (0.094)	-0.002498 (0.845)	-0.005999 (0.705)	-0.305400 (0.249)	0.001207 (0.531)	8,654.498506 (0.590)	-0.001437 (0.842)
Risk-class (WpHG)	-0.000078 (0.156)	-0.000084 (0.130)	-0.000155*** (0.001)	-0.000139*** (0.005)	-0.014673* (0.054)	0.013824*** (0.004)	-0.002201 (0.713)	0.152645 (0.117)	0.000587 (0.345)	2,468.108591 (0.388)	0.001667 (0.547)
Number of portfolios	0.000105* (0.083)	0.000110* (0.073)	0.000082* (0.054)	0.000089* (0.061)	0.012229 (0.109)	0.001837 (0.591)	-0.003031 (0.378)	-0.101687* (0.062)	-0.000360 (0.307)	8,852.404962 (0.134)	-0.002027 (0.535)
Ln(portfolio size)	0.000092 (0.216)	0.000097 (0.192)	0.000085 (0.120)	0.000078 (0.194)	0.017459* (0.079)	0.006309*** (0.001)	0.005020 (0.147)	0.006000 (0.917)	-0.000057 (0.861)	16013.543674*** (0.000)	-0.007009** (0.018)
Job dummy1	-0.000658 (0.121)	-0.000679 (0.115)	-0.000529* (0.055)	-0.000600* (0.057)	-0.087184* (0.058)	-0.016023 (0.343)	0.002928 (0.893)	-0.154898 (0.658)	-0.002944 (0.210)	-2680.920441 (0.831)	0.008080 (0.437)
Job dummy2	-0.000181 (0.471)	-0.000205 (0.420)	-0.000161 (0.510)	-0.000194 (0.427)	-0.054867 (0.320)	-0.011214 (0.561)	0.007637 (0.782)	-0.167530 (0.570)	-0.006483** (0.032)	-6213.324315 (0.474)	-0.001035 (0.943)
Job dummy3	-0.000101 (0.481)	-0.000118 (0.414)	-0.000105 (0.410)	-0.000117 (0.357)	-0.010458 (0.564)	-0.011253 (0.468)	-0.004366 (0.832)	-0.365620 (0.147)	-0.003750* (0.081)	-502.406359 (0.950)	0.007118 (0.480)
Job dummy4	-0.000272 (0.161)	-0.000290 (0.134)	-0.000323* (0.066)	-0.000307* (0.078)	-0.051663* (0.071)	-0.003640 (0.826)	0.026027 (0.225)	-0.377000 (0.140)	-0.004071* (0.062)	-8741.997310 (0.275)	0.019227* (0.071)
Constant	-0.000135 (0.797)	-0.000146 (0.784)	0.000657 (0.211)	0.000802 (0.123)	-0.058110 (0.537)	-0.089300* (0.054)	-0.018985 (0.751)	-0.297458 (0.718)	0.001380 (0.788)	-1.74036e+05*** (0.000)	-0.002938 (0.901)
Observations	3,027	3,027	3,027	3,027	3,027	3,027	3,027	3,027	3,027	3,027	3,027
R-squared	0.005	0.005	0.007	0.006	0.008	0.016	0.008	0.004	0.007	0.044	0.014

**Table 7: Effect of Securities Account Reports (15 months after first distribution, reactors)**

This table displays the results for the difference-in-difference analysis from July 2013 to end of January 2015 (15 months) for investors who trade within five days after the distribution of the reports. The columns (1) to (5) measure changes in portfolio performance, columns (6) and (7) changes in diversification, and columns (8) and (9) measure changes in trading behavior. The *p*-values from using clustered standard errors are displayed in parentheses, with \*\*\*, \*\*, and \* denoting significance at the 1%, 5%, and 10% levels, respectively.

Variables	Return / Performance					Diversification		Trading		Investment	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
	Return	Net- Return	Alpha (gross) (1-factor)	Alpha (gross) (4-factor)	Sharpe Ratio	Unsys. var. (4-factor)	HHI	Fees	Turnover	Size of portfolio	Risky share
Report	0.000405* (0.078)	0.000430* (0.064)	0.000271* (0.078)	0.000328* (0.060)	0.042451* (0.073)	-0.016578** (0.043)	-0.024498** (0.019)	-0.141319 (0.423)	-0.002916*** (0.006)	-1325.599081 (0.828)	-0.010079* (0.056)
Age	-0.000045 (0.242)	-0.000045 (0.245)	-0.000028 (0.266)	-0.000030 (0.312)	-0.003210 (0.446)	-0.001905 (0.250)	0.000876 (0.703)	0.022473 (0.341)	0.000035 (0.846)	517.026191 (0.501)	0.002900** (0.020)
Age^2	0.000000 (0.215)	0.000000 (0.220)	0.000000 (0.327)	0.000000 (0.336)	0.000025 (0.523)	0.000004 (0.791)	-0.000018 (0.406)	-0.000177 (0.469)	-0.000000 (0.801)	-4.233574 (0.629)	-0.000024** (0.048)
Gender	-0.000155 (0.300)	-0.000143 (0.360)	-0.000167 (0.202)	-0.000202 (0.127)	-0.019558 (0.294)	-0.001284 (0.931)	-0.008791 (0.645)	-0.512555 (0.125)	0.000847 (0.724)	11718.477147 (0.570)	-0.001075 (0.907)
Risk-class (WpHG)	-0.000040 (0.506)	-0.000045 (0.466)	-0.000125** (0.016)	-0.000112** (0.038)	-0.008205 (0.276)	0.016531*** (0.003)	-0.004111 (0.585)	0.154918 (0.237)	0.000455 (0.568)	3,591.730076 (0.345)	0.003921 (0.237)
Number of portfolios	0.000090 (0.204)	0.000094 (0.188)	0.000071 (0.139)	0.000078 (0.150)	0.008742 (0.297)	0.001923 (0.612)	-0.003881 (0.306)	-0.097808 (0.136)	-0.000344 (0.414)	9,106.733110 (0.194)	-0.003727 (0.336)
Ln(portfolio size)	0.000069 (0.446)	0.000070 (0.444)	0.000056 (0.361)	0.000048 (0.494)	0.013557 (0.229)	0.005915*** (0.009)	0.003545 (0.404)	-0.007112 (0.924)	-0.000398 (0.265)	19813.936508*** (0.000)	-0.009048** (0.013)
Job dummy1	-0.000690 (0.216)	-0.000708 (0.210)	-0.000534 (0.130)	-0.000636 (0.120)	-0.092032 (0.104)	-0.023713 (0.225)	-0.006183 (0.815)	-0.186763 (0.673)	-0.003701 (0.213)	-2607.113695 (0.872)	0.011771 (0.374)
Job dummy2	0.000087 (0.740)	0.000084 (0.749)	0.000144 (0.570)	0.000102 (0.686)	0.024725 (0.517)	-0.007010 (0.750)	0.018138 (0.577)	-0.339919 (0.358)	-0.008731*** (0.007)	-6531.345975 (0.551)	0.012791 (0.427)
Job dummy3	-0.000012 (0.945)	-0.000032 (0.851)	-0.000006 (0.967)	-0.000030 (0.841)	-0.000287 (0.989)	-0.013655 (0.447)	-0.008381 (0.740)	-0.490456 (0.121)	-0.004622* (0.086)	-1679.905349 (0.868)	0.009871 (0.432)
Job dummy4	-0.000155 (0.404)	-0.000176 (0.340)	-0.000219 (0.171)	-0.000226 (0.154)	-0.042549* (0.075)	-0.007400 (0.701)	0.020234 (0.442)	-0.531617* (0.098)	-0.005750** (0.035)	-1.31667e+04 (0.191)	0.020851 (0.118)
Constant	0.000153 (0.759)	0.000161 (0.748)	0.000986* (0.061)	0.001107** (0.038)	-0.048776 (0.599)	-0.100733* (0.070)	0.026813 (0.727)	0.038173 (0.971)	0.008257 (0.146)	-2.26070e+05*** (0.001)	-0.005401 (0.849)
Observations	2,318	2,318	2,318	2,318	2,318	2,318	2,318	2,318	2,318	2,318	2,318
R-squared	0.005	0.005	0.007	0.006	0.008	0.017	0.007	0.004	0.009	0.051	0.021

**Table 8: Effect of Securities Account Reports (15 months after first distribution, high fees)**

This table displays the results for the difference-in-difference analysis from July 2013 to end of January 2015 (15 months) for investors who have above median fees for the twelve months prior to 31 July 2013. The columns (1) to (5) measure changes in portfolio performance, columns (6) and (7) changes in diversification, and columns (8) and (9) measure changes in trading behavior. The  $p$ -values from using clustered standard errors are displayed in parentheses, with \*\*\*, \*\*, and \* denoting significance at the 1%, 5%, and 10% levels, respectively.

Variables	Return / Performance					Diversification		Trading		Investment	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
	Return	Net- Return	Alpha (gross) (1-factor)	Alpha (gross) (4-factor)	Sharpe Ratio	Unsys. var. (4-factor)	HHI	Fees	Turnover	Size of portfolio	Risky share
Report	0.000386* (0.066)	0.000416* (0.050)	0.000293** (0.040)	0.000349** (0.032)	0.049583** (0.033)	-0.018257** (0.017)	-0.016832* (0.076)	-0.066475 (0.629)	-0.002138** (0.017)	2,420.359695 (0.691)	-0.002273 (0.626)
Age	-0.000028 (0.430)	-0.000028 (0.423)	-0.000020 (0.386)	-0.000024 (0.374)	-0.003151 (0.418)	-0.001305 (0.387)	0.001561 (0.419)	0.010245 (0.630)	0.000098 (0.527)	-46.200317 (0.949)	0.001090 (0.258)
Age^2	0.000000 (0.574)	0.000000 (0.575)	0.000000 (0.623)	0.000000 (0.561)	0.000015 (0.694)	0.000000 (0.997)	-0.000027 (0.157)	0.000008 (0.972)	-0.000001 (0.505)	2.073862 (0.809)	-0.000008 (0.380)
Gender	-0.000267* (0.091)	-0.000268 (0.115)	-0.000239* (0.081)	-0.000281** (0.042)	-0.046847* (0.097)	-0.000938 (0.949)	-0.012227 (0.503)	-0.447797 (0.161)	0.001792 (0.459)	8,018.559980 (0.699)	-0.001491 (0.869)
Risk-class (WpHG)	-0.000079 (0.181)	-0.000085 (0.152)	-0.000139*** (0.006)	-0.000128** (0.015)	-0.011493 (0.133)	0.013488*** (0.010)	-0.001176 (0.854)	0.115456* (0.082)	0.000288 (0.628)	3,106.248950 (0.352)	0.002225 (0.433)
Number of portfolios	0.000143** (0.039)	0.000147** (0.035)	0.000103** (0.030)	0.000115** (0.032)	0.014448* (0.091)	0.003255 (0.370)	-0.001532 (0.662)	-0.144452*** (0.008)	-0.000486 (0.200)	8,799.996143 (0.193)	-0.002452 (0.500)
Ln(portfolio size)	0.000089 (0.266)	0.000098 (0.222)	0.000069 (0.196)	0.000067 (0.276)	0.015222 (0.110)	0.005444*** (0.008)	0.004486 (0.229)	0.005507 (0.923)	-0.000238 (0.442)	17410.595450*** (0.000)	-0.005701* (0.074)
Job dummy1	-0.000757 (0.118)	-0.000784 (0.110)	-0.000525* (0.092)	-0.000636* (0.077)	-0.084084 (0.105)	-0.011673 (0.522)	0.021730 (0.358)	0.036695 (0.920)	-0.001904 (0.461)	-6407.807273 (0.674)	0.013210 (0.277)
Job dummy2	-0.000313 (0.286)	-0.000346 (0.243)	-0.000331 (0.213)	-0.000354 (0.190)	-0.090856 (0.136)	-0.005406 (0.795)	0.027313 (0.365)	-0.086897 (0.796)	-0.006418* (0.064)	-9288.129022 (0.358)	0.004103 (0.784)
Job dummy3	-0.000088 (0.598)	-0.000107 (0.526)	-0.000075 (0.608)	-0.000099 (0.502)	-0.003414 (0.869)	-0.005839 (0.727)	0.011293 (0.611)	-0.333501 (0.233)	-0.002928 (0.221)	-1603.405055 (0.869)	0.011987 (0.316)
Job dummy4	-0.000090 (0.632)	-0.000116 (0.539)	-0.000113 (0.474)	-0.000106 (0.511)	-0.017012 (0.466)	-0.001890 (0.916)	0.045387* (0.051)	-0.396889 (0.161)	-0.003315 (0.177)	-1.11748e+04 (0.248)	0.023361* (0.062)
Constant	0.000040 (0.934)	0.000007 (0.989)	0.000872* (0.070)	0.001013** (0.037)	-0.015523 (0.853)	-0.104176** (0.042)	-0.035400 (0.569)	0.064234 (0.939)	0.003152 (0.473)	-1.86565e+05*** (0.001)	0.008015 (0.757)
Observations	2,554	2,554	2,554	2,554	2,554	2,554	2,554	2,554	2,554	2,554	2,554
R-squared	0.006	0.007	0.008	0.008	0.010	0.014	0.008	0.007	0.006	0.047	0.011

**Table 9: Effect of Securities Account Reports (15 months after first distribution, information overload)**

This table displays the results for the difference-in-difference analysis from July 2013 to end of January 2015 (15 months) for investors who have a financial literacy score over 3. The columns (1) to (5) measure changes in portfolio performance, columns (6) and (7) changes in diversification, and columns (8) and (9) measure changes in trading behavior. The  $p$ -values from using clustered standard errors are displayed in parentheses, with \*\*\*, \*\*, and \* denoting significance at the 1%, 5%, and 10% levels, respectively.

Variables	Return / Performance					Diversification		Trading		Investment	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
	Return	Net- Return	Alpha (gross) (1-factor)	Alpha (gross) (4-factor)	Sharpe Ratio	Unsys. var. (4-factor)	HHI	Fees	Turnover	Size of portfolio	Risky share
Report	0.000386* (0.066)	0.000416* (0.050)	0.000293** (0.040)	0.000349** (0.032)	0.049583** (0.033)	-0.018257** (0.018)	-0.016832* (0.081)	-0.066475 (0.633)	-0.002138** (0.020)	2,420.359695 (0.693)	-0.002273 (0.640)
Age	-0.000028 (0.431)	-0.000028 (0.424)	-0.000020 (0.388)	-0.000024 (0.376)	-0.003151 (0.419)	-0.001305 (0.389)	0.001561 (0.422)	0.010245 (0.633)	0.000098 (0.530)	-46.200317 (0.949)	0.001090 (0.308)
Age^2	0.000000 (0.575)	0.000000 (0.576)	0.000000 (0.625)	0.000000 (0.562)	0.000015 (0.695)	0.000000 (0.997)	-0.000027 (0.162)	0.000008 (0.972)	-0.000001 (0.509)	2.073862 (0.809)	-0.000008 (0.444)
Gender	-0.000267 (0.107)	-0.000268 (0.131)	-0.000239* (0.094)	-0.000281* (0.051)	-0.046847 (0.107)	-0.000938 (0.949)	-0.012227 (0.501)	-0.447797 (0.162)	0.001792 (0.511)	8,018.559980 (0.704)	-0.001491 (0.870)
Risk-class (WpHG)	-0.000079 (0.184)	-0.000085 (0.154)	-0.000139*** (0.006)	-0.000128** (0.015)	-0.011493 (0.134)	0.013488** (0.010)	-0.001176 (0.855)	0.115456* (0.085)	0.000288 (0.632)	3,106.248950 (0.347)	0.002225 (0.444)
Number of portfolios	0.000143** (0.043)	0.000147** (0.039)	0.000103** (0.035)	0.000115** (0.036)	0.014448* (0.099)	0.003255 (0.413)	-0.001532 (0.692)	-0.144452*** (0.007)	-0.000486 (0.206)	8,799.996143 (0.198)	-0.002452 (0.507)
Ln(portfolio size)	0.000089 (0.266)	0.000098 (0.222)	0.000069 (0.197)	0.000067 (0.276)	0.015222 (0.110)	0.005444*** (0.009)	0.004486 (0.226)	0.005507 (0.924)	-0.000238 (0.440)	17410.595450*** (0.000)	-0.005701* (0.077)
Job dummy1	-0.000757 (0.119)	-0.000784 (0.111)	-0.000525* (0.095)	-0.000636* (0.078)	-0.084084 (0.107)	-0.011673 (0.519)	0.021730 (0.360)	0.036695 (0.921)	-0.001904 (0.462)	-6407.807273 (0.675)	0.013210 (0.278)
Job dummy2	-0.000313 (0.291)	-0.000346 (0.249)	-0.000331 (0.219)	-0.000354 (0.194)	-0.090856 (0.137)	-0.005406 (0.794)	0.027313 (0.366)	-0.086897 (0.797)	-0.006418* (0.085)	-9288.129022 (0.359)	0.004103 (0.784)
Job dummy3	-0.000088 (0.608)	-0.000107 (0.537)	-0.000075 (0.620)	-0.000099 (0.512)	-0.003414 (0.872)	-0.005839 (0.722)	0.011293 (0.611)	-0.333501 (0.234)	-0.002928 (0.223)	-1603.405055 (0.869)	0.011987 (0.316)
Job dummy4	-0.000090 (0.640)	-0.000116 (0.548)	-0.000113 (0.487)	-0.000106 (0.520)	-0.017012 (0.474)	-0.001890 (0.915)	0.045387* (0.052)	-0.396889 (0.162)	-0.003315 (0.179)	-1.11748e+04 (0.254)	0.023361* (0.066)
Constant	0.000040 (0.934)	0.000007 (0.989)	0.000872* (0.071)	0.001013** (0.038)	-0.015523 (0.853)	-0.104176** (0.043)	-0.035400 (0.570)	0.064234 (0.939)	0.003152 (0.475)	-1.86565e+05*** (0.001)	0.008015 (0.757)
Observations	2,554	2,554	2,554	2,554	2,554	2,554	2,554	2,554	2,554	2,554	2,554
R-squared	0.006	0.007	0.008	0.008	0.010	0.014	0.008	0.007	0.006	0.047	0.011

**Table 10: Effect of Securities Account Reports (15 months after first distribution, different report designs)**

This table displays the results for the difference-in-difference analysis from July 2013 to end of January 2015 (15 months). As we want to include all report design, we leave out the constant. Report design number 1 serves as the base group. The columns (1) to (5) measure changes in portfolio performance, columns (6) and (7) changes in diversification, and columns (8) and (9) measure changes in trading behavior. The *p*-values from using clustered standard errors are displayed in parentheses, with \*\*\*, \*\*, and \* denoting significance at the 1%, 5%, and 10% levels, respectively.

Variables	Return / Performance					Diversification		Trading		Investment	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
	Return	Net- Return	Alpha (gross) (1-factor)	Alpha (gross) (4-factor)	Sharpe Ratio	Unsys. var. (4-factor)	HHI	Fees	Turnover	Size of portfolio	Risky share
Report 1	0.000189 (0.344)	0.000222 (0.271)	0.000130 (0.425)	0.000165 (0.354)	0.029945 (0.210)	-0.024908** (0.028)	-0.019123 (0.139)	-0.359388** (0.028)	-0.003597*** (0.000)	-952.422951 (0.913)	-0.013843** (0.011)
Report 2	0.000387* (0.062)	0.000427** (0.043)	0.000296* (0.058)	0.000340** (0.041)	0.052153** (0.037)	-0.013632 (0.218)	-0.026660* (0.068)	-0.233670 (0.154)	-0.003675*** (0.004)	-7927.336512 (0.262)	-0.016306* (0.052)
Report 3	0.000309 (0.156)	0.000315 (0.152)	0.000250 (0.135)	0.000299* (0.099)	0.036313 (0.174)	-0.036006*** (0.002)	-0.032328** (0.028)	-0.066834 (0.792)	-0.000393 (0.801)	-2048.513599 (0.869)	-0.003584 (0.708)
Report 4	0.000498* (0.071)	0.000545* (0.052)	0.000338 (0.135)	0.000409* (0.075)	0.044512 (0.267)	-0.009947 (0.370)	-0.008666 (0.554)	-0.135622 (0.443)	-0.003806** (0.010)	6,974.139384 (0.305)	0.000437 (0.946)
Age	-0.000029 (0.314)	-0.000030 (0.311)	-0.000005 (0.789)	-0.000006 (0.791)	-0.002729 (0.401)	-0.003393*** (0.003)	0.001265 (0.407)	0.013523 (0.461)	0.000122 (0.366)	-2660.306731*** (0.003)	0.002625** (0.024)
Age^2	0.000000 (0.308)	0.000000 (0.314)	0.000000 (0.997)	0.000000 (0.934)	0.000017 (0.590)	0.000020* (0.082)	-0.000023 (0.114)	-0.000087 (0.652)	-0.000002 (0.243)	27.218490*** (0.002)	-0.000024** (0.040)
Gender	-0.000204 (0.169)	-0.000208 (0.180)	-0.000140 (0.286)	-0.000171 (0.193)	-0.042545* (0.080)	-0.007969 (0.532)	-0.007002 (0.662)	-0.317419 (0.224)	0.001305 (0.546)	-2494.372931 (0.881)	-0.001187 (0.876)
Risk-class (WpHG)	-0.000085 (0.153)	-0.000092 (0.126)	-0.000115** (0.036)	-0.000091* (0.092)	-0.017968* (0.071)	0.008604** (0.032)	-0.003394 (0.534)	0.135716 (0.112)	0.000669 (0.162)	-7874.908949** (0.011)	0.001459 (0.583)
Number of portfolios	0.000105* (0.091)	0.000110* (0.080)	0.000079* (0.072)	0.000086* (0.078)	0.012155 (0.122)	0.002033 (0.598)	-0.002768 (0.473)	-0.102158* (0.060)	-0.000377 (0.300)	9,340.545262 (0.126)	-0.001926 (0.567)
Ln(portfolio size)	0.000089 (0.223)	0.000094 (0.201)	0.000096* (0.063)	0.000091 (0.114)	0.016415* (0.076)	0.004685** (0.012)	0.004629 (0.146)	0.000933 (0.985)	-0.000023 (0.938)	12995.625463*** (0.000)	-0.007072** (0.011)
Job dummy1	-0.000673 (0.113)	-0.000694 (0.107)	-0.000507* (0.070)	-0.000573* (0.071)	-0.089452* (0.057)	-0.019637 (0.246)	0.001628 (0.940)	-0.183143 (0.596)	-0.002996 (0.202)	-1.10226e+04 (0.387)	0.006698 (0.520)
Job dummy2	-0.000198 (0.442)	-0.000223 (0.391)	-0.000121 (0.629)	-0.000147 (0.556)	-0.058102 (0.295)	-0.017382 (0.362)	0.005008 (0.855)	-0.193302 (0.512)	-0.006369** (0.045)	-1.86561e+04** (0.038)	-0.002435 (0.865)
Job dummy3	-0.000119 (0.431)	-0.000136 (0.370)	-0.000069 (0.609)	-0.000074 (0.580)	-0.013772 (0.490)	-0.016944 (0.264)	-0.006485 (0.749)	-0.395293 (0.120)	-0.003702* (0.082)	-1.22840e+04 (0.115)	0.005716 (0.568)
Job dummy4	-0.000286 (0.175)	-0.000305 (0.148)	-0.000272 (0.158)	-0.000245 (0.196)	-0.055849* (0.083)	-0.010761 (0.504)	0.023782 (0.260)	-0.406760 (0.116)	-0.003987* (0.062)	-2.34585e+04*** (0.007)	0.018147* (0.080)
Observations	3,027	3,027	3,027	3,027	3,027	3,027	3,027	3,027	3,027	3,027	3,027
R-squared	0.012	0.012	0.007	0.007	0.019	0.062	0.011	0.011	0.012	0.059	0.015



## Appendix

### A.1 Detailed motivation for different report designs

In non-dynamic settings Atkins et al. (2002) and Glenzer et al. (2014) show, that learning from tabular feedback is greater than from graphical representations. Atkins et al. (2002), however, also show that, in dynamic decision environments, graphical displays lead to better performance from feedback, which is desirable in the context of this experiment. Legge et al. (1989) show that information is best extracted from graphs. Furthermore, Vekiri (2002) proposes the visualization of information so that it requires only a minimum of cognitive processing, thereby limiting investors' information costs. Furthermore, a graphical display can offer access to information for less numerate readers, who cannot as easily extract it from mere numerical information, as Keller et al. (2009) show for risk perception with the example of a risk ladder. Goldstein et al. (2008) also argue that graphical representations help investors choose between alternative probability distributions. In the context of risk communication, Chua et al. (2006), Kaufmann et al. (2013), and Glenzer et al. (2014) find that people tend toward the more risky option when confronted with graphic displays instead of numerical information. Therefore, for a reporting of performance, risk and diversification it seems advisable to combine graphical illustrations and labels containing the numerical values, which would have been displayed in a table otherwise to foster information extraction of investors.

However, there is large variety of graphical representations available to choose from. Lipkus and Hollands (1999) propose the use of line graphs to illustrate trends, a suggestion that can be used to display return data over time. Furthermore, simple bar graphs are not suitable to illustrate proportions of change (Hollands and Spence 1992), since the significance of potential changes is difficult to assess. Creating reference points, however, might serve as a remedy in this case. For example, showing bar charts of trading costs may not be useful until the total portfolio value or the current year's return is also provided as a reference point. When it comes to estimating the importance of different components, it is advisable to spare the viewer the cognitive summation and make the processing of the message as easy as possible (Hollands and Spence 1998). For part-to-whole relations, as for example when showing a risk decomposition, divided (stacked) bar graphs and/or pie charts, are presumably the best means of representation, since the diagram itself serves as reference for 100% (Tan and Benbasat 1993).

Besides, personalizing information as much as possible, as was shown for displays of insurance plans (Kling et al. 2008) supports information extraction and processing by individual investors. Presumably superior to outcome feedback is calibration feedback for increasing decision quality. A form of calibration feedback would be displaying the performance of a reference group, since (enhanced) calibration feedback has been shown to reduce e.g. overconfidence (Duflo and Saez 2002; Sieck and Arkes 2005; Ryvkin et al. 2012). Therefore, the inclusion of peers as a reference group to direct behavior is sensible, provided that the peers are perceived as such. The focus should thereby always be on

behavior that can be observed, not on components that are not observed (Thaler and Sunstein 2003). This calibration feedback should be provided in the form of a market benchmark or a clearly described peer group.

Finally, the question how often to provide feedback to investors. From research on single stock trading we know that attention drives investment. Trading increases when stocks are in the news (Dharet al. 2004; Barber and Odean 2008; Engelberg and Parson 2011) or exhibit a high trading volume or abnormal returns (Barber and Odean 2008). Additionally, Barber and Odean (2008) show that attention determines the choice set regarding the stock purchases of private investors. Sirri and Tufano (1998) find that increased marketing efforts foster mutual fund inflows, since they lower investor search costs. Therefore, to help investors make better decisions, securities account reportings may bring investment to the attention of investors. Gerhardt and Meyer (2013), analyzing portfolio reports that are distributed only once, provide evidence that reports only create attention, which is, trading activity. With this in mind, too frequent feedback can cause high trading costs that ultimately reduce net profit. Furthermore, Thaler et al. (1997) show that too frequent feedback may increase myopic loss aversion and therefore keep investors from holding riskier assets. On the other hand, Langer and Weber (2008) reason that frequent feedback is appreciated by investors if they want to engage in long-term investment strategies in which temporary losses are likely to be outweighed by long-term gains. Against this background, it seems reasonable to produce the securities account reports on a monthly basis, since investors will still remember their trading activities over this horizon and feedback can therefore be seen as such. At the same time, a monthly frequency limits the potential of inducing overtrading.

## **A.2 Process of decision making on definitive report designs**

Based on these considerations we developed more than 50 different graphical displays for risk, return, and diversification. They were discussed in four focus groups within the faculty and then, in a second stage, with two focus groups of subjects outside the finance or academic area. In preparation of the focus groups,<sup>13</sup> the graphical displays were then populated using identical underlying data from a random investor.

In each of the focus groups, participants were divided into two groups of three to five people. Within the groups participants had to discuss all graphical displays and to then select three displays, which fit on one page for their final reports. Focus groups participants were then asked to summarize what conclusions they drew from the resulting reports. These focus groups gave preference to straightforward graphical displays with numerical labels at relevant places. In a second step, we then

---

<sup>13</sup> Focus groups are prevalently used in social science to discover subjects' hidden needs by bringing them together for an interactive discussion session on a predefined topic, supporting quantitative analyses with qualitative experience reports. Initially known predominantly in marketing research, finance research, as reported by Merton (1987), has drawn on further insights gained from this technique early on. For an overview of how to conduct a focus group and major aspects to consider, see Asbury (1995).

gave preference to those displays from which focus group participants seemed to draw conclusions from that were commensurate with normative ideas of portfolio management. Finally, participants voiced a strong preference for a short and comprehensive overview of their current investment situation. Therefore, the final format of all the securities account reports is limited to one page. Focus groups were unanimous of whether they preferred outcome to calibration feedback or vice versa and they were also debating whether textual summary (executive summary) of information at the very top is desirable, so that we finally decided to define three new reporting designs. In addition, we define a fourth reporting design, which is consistent with the design used by Gerhardt and Meyer (2013). In contrast to their setup, our reporting covers an investment period of 12 months instead of one month. As they show that, their design only creates attention, but does not have any directional influence on investor behavior this report design can also be seen as the reference measurement in this experiment.

### **A.3 Detailed description of individual report designs**

The “baseline” report adopted from Gerhardt and Meyer (2013) starts with a one-line tabular summary of the present account value, the account value 12 month ago, the development of the account value and volatility over the last 12 months in percentage points, gains or losses in euros, and the portfolio’s current risk category on a scale from one to 10. This overview is followed by further graphical representations in Sections I to III: In the left half of Section I, a mu–sigma diagram displays investor performance, as well as nine benchmark indices<sup>14</sup>; on the right, a bar chart shows the trading activity in number of transactions by month over the last year. Below that, in Section II, a line graph displaying the return development, in Euros, of the respective portfolio over the last 12 months is shown. Finally, in Section III, the month-end balances over the last 13 month-ends of the securities accounts are displayed in a bar graph. For an actual example, refer to figure A.1 (reporting design 1).

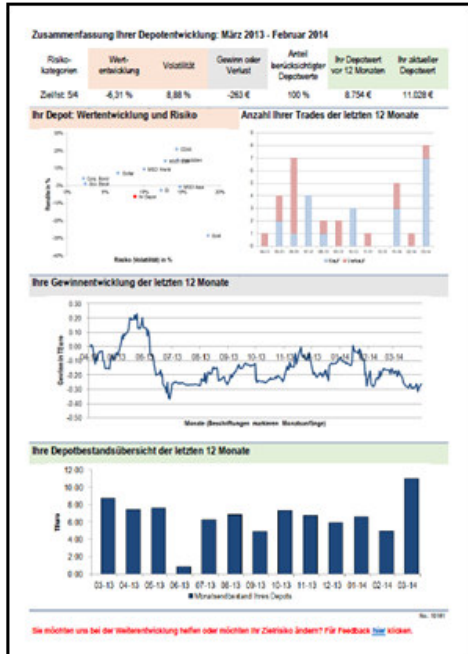
---

<sup>14</sup> The benchmark indices are chosen to reflect the development of the stock, bond, commodity and/or foreign exchange markets. For stock markets, we include the MSCI World, the CDAX for the German market, the MSCI USA for the US market, the MSCI Asia for Asian markets. For all equity benchmarks, we use total return indices. Bond markets are tracked using JPM GBI Global all maturities, the IBOXX Euro Corporate all maturity index. We also use total return indices for the bond indices. To track commodity markets we use the Gold Bullion LBMA, and OPEC Oil back price. For foreign exchange exposure we also include the Datastream US-\$ to Euro exchange rate.

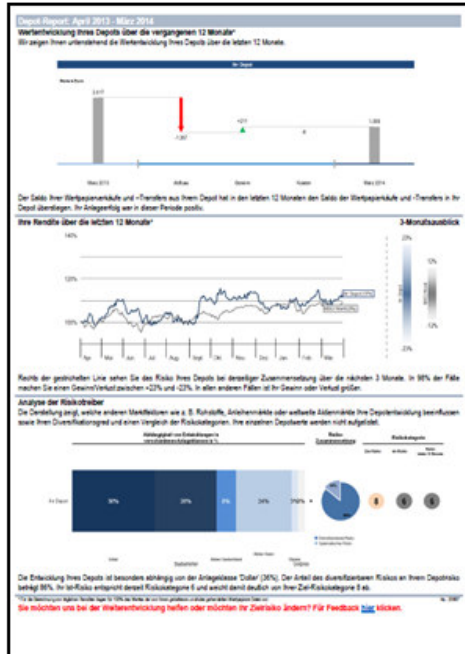
# Figure A.1: Examples for the Four Different Securities Account Report Designs

Reporting Design Number 1 (“baseline”) is based on Meyer and Gerhardt (2013). Reporting Designs Numbers 2 to 4 build on each other with Number 2 (“no peer”) showing information for the investors securities account only, Number 3 (“peer”) shows information of a peer group with the same risk level, while Number 4 (“executive summary”) starts with a written summary at the top of the page.

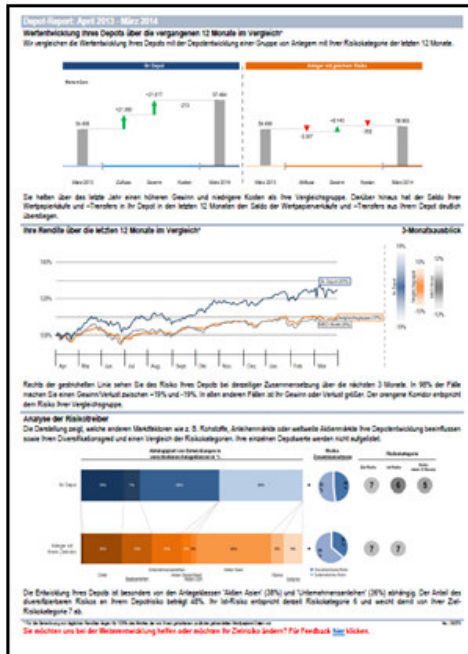
## Reporting Design Number 1



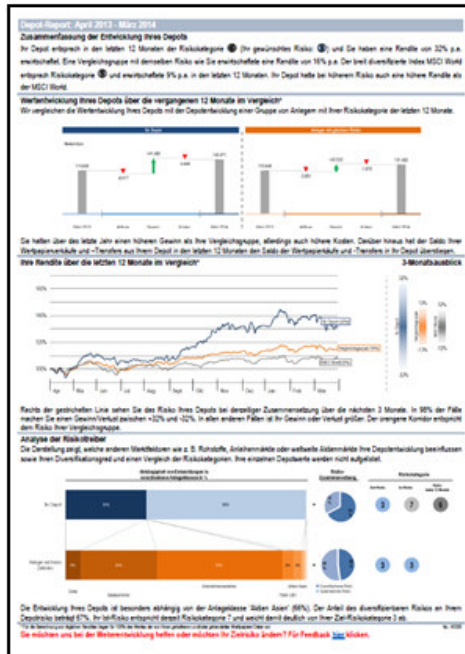
## Reporting Design Number 2



## Reporting Design Number 3



## Reporting Design Number 4



Examples of the four reports are provided in Figure A.1. The first one (“peer”) of the newly designed reports was set up as an outcome feedback design. It displays the information of the preceding twelve months. The report starts with a graphical display of the change in portfolio value over the last 12 months in Section I: A waterfall graph displays how the value of additional investments or disinvestments, gains and losses, as well as the Euro amount of costs of trading contribute to the securities account value at the end of the reporting period. The single stacks are labeled with the absolute Euro values they represent and are connected with dotted lines to denote the starting levels of the next stack. This graph is followed by a line graph displaying the indexed percentage returns of the securities account and of the MSCI All Country World Index, leading to a fan graph displaying the volatility outlook over the next three months, together comprising Section II. Calculations for the volatility outlook use on the portfolio composition as of the closing date and those for the MSCI All Country World Index are based on the index’s development during the last 12 months. Lastly, in Section III, feature a factor analysis (Sharpe 1992). It is visualized using a divided bar graph, which displays the nine international indices on which the current portfolio composition loads. To the right a pie chart shows the share of systematic and unsystematic risk when the portfolio is compared to the MSCI All Country World Index, and an overview of the current risk class, the risk class over the last 12 months, and the stated target risk class is displayed in this risk management part.

The third design is based on the second one, but incorporates additional calibration feedback. While the same graphical elements are employed, they are extended and contrasted with the information of a reference group. The peer information is thereby derived from the total sample of investors of the brokerage whose portfolio volatility over the preceding twelve months was in a range of +/- two percentage points of the one of the investor at hand. To facilitate differentiation between the investor’s own account information and peer information, different color schemes are applied to the two sets of information throughout the report. Thus, right to the waterfall graph displayed in Section I, as described above, a second waterfall displaying the same information for a peer group of investors is introduced. For better comparison, this peer information is indexed to the starting value of the investor’s securities account value at the beginning of the observation period. Similarly, in the return graph, the indexed percentage portfolio development of the peer group with the same risk level for the last 12 months is added to the line graph, with the fan graph being extended by the risk outlook of the peer group currently exhibiting the same level of portfolio risk. In Section III the results from the style analysis are compared to those of a peer group with the same target risk to illustrate the difference in the current risk decomposition (asset allocation). Additionally, the unsystematic risk share of the investor’s portfolio is contrasted with that of the peer group. Finally, the report closes with an overview and comparison of the current risk class, the risk class over the last 12 months, as well as the stated target risk class.

The fourth report design adds a written summary information section at the top of the page, with the rest of the report remaining unchanged compared to the third design. This summary is four lines long and condenses the central investment information of the graphical displays below it, namely, the exhibited and targeted risk for the last 12 months with the return achieved, the return of the peer group with the same

incurred risk and return achieved; and the risk and return of the MSCI All Country World Index.