# Sustainability and Private Wealth Investment Flows

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**Abstract**

In this paper we examine the sustainability preferences of wealthy private investors and the effect of sustainability ratings on their asset allocation decisions. Using a large proprietary dataset of a private bank with monthly investment holdings of European private wealth investors, we document significantly larger investment flows into assets with a high sustainability rating compared to those with a low sustainability rating. We further find that investors react to changes in sustainability ratings of their portfolio assets by rebalancing their portfolios towards assets with higher sustainability ratings. Exploiting a quasi-natural experiment and an event study design our study documents a plausibly causal relationship between private investors' investment flows and firms' sustainability ratings.

**Keywords:** Investor behavior, household finance, sustainability, sustainable investing, ESG, private wealth, private banking, investment management

**JEL Codes:** G11, G14, G15, G29, G41, G50

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# 1 Introduction

There is a large body of literature in household finance that documents retail investors' investment choices and portfolio allocations. For example, many households do not seem to participate in financial markets or hold highly concentrated portfolios (Blume and Friend, 1975; Guiso et al., 2002; Polkovnichenko, 2005; Calvet et al., 2007), seem to exhibit a preference for local securities (French and Poterba, 1991; Huberman, 2001) and make mistakes that lead to sub-optimal investment decisions (e.g., inertia, overconfidence and disposition effect) (Agnew et al., 2003; Barber and Odean, 2000, 2001; Calvet et al., 2009b). The literature is vast, yet surprisingly little is known about private investors' preferences and asset allocation decisions with respect to the environmental and social impact of their portfolio assets.

An emerging literature in financial economics examines the investment preferences and policies of *institutional* investors with respect to sustainability (or environmental, social and governance (ESG)) issues and their impact on investment performance. This is motivated by anecdotal evidence of a rapid rise in so-called sustainable investment funds that screen companies based on environmental, social and governance metrics and of an increasing number of investors that have signed up to the Principles of Responsible Investments (PRI) pledging to consider sustainability information in all their investment decisions.[1] Survey evidence also suggests that institutional investors are paying increasing attention to the sustainability footprint of their portfolio companies motivated by the rising demand from their clients and asset owners (Amel-Zadeh and Serafeim, 2018).

The academic evidence on institutional investors' attitudes towards sustainability suggests that professional asset managers increasingly prefer more sustainable firms (Gibson and Krueger, 2018; Dyck et al., 2019), increasingly engage with portfolio companies on sustainability issues (Dimson et al., 2018; He et al., 2019), and consider sustainability information, particularly those related to climate change, important to their investment

[1] See for example '*Record sums deployed into sustainable investment funds*', Financial Times, 20 January 2020 (https://on.ft.com/3alNunf, last accessed 22 Feburary 2020). As of 2019 the PRI counted more than 2,300 asset managers and asset owners with a total of $86 trillion in assets under management among their signatories (https://www.unpri.org/pri/about-the-pri, last accessed 22 February 2020).



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decisions (Amel-Zadeh and Serafeim, 2018; Krueger et al., 2020). Examining holdings data of institutional investors from 13F filings with the SEC, Gibson and Krueger (2018), for example, report an increase in the environmental sustainability of institutional equity portfolios since 2002. The study further finds that long-horizon investors and those that have experienced natural disasters close to their headquarters have stronger sustainability preferences as revealed by their investment holdings.

In this paper we examine the sustainability preferences of wealthy private investors and the effect of sustainability ratings on asset allocation decisions. The study of wealthy investors among households is important as they have a disproportionately larger impact on equilibrium asset demand and returns than the average household. Wealthy households hold a large fraction of the net wealth of a country even though they make up a small fraction of the population and are more likely to hold a larger portfolio share in risky assets. These households are also more likely to be more financially sophisticated (Gentry and Hubbard, 2004; Campbell, 2006).

Few studies examine the investment behaviour of wealthy households largely due to limited data access. King and Leape (1998) estimate the wealth elasticities from survey data of U.S. households for various assets and liabilities and find that an increase in wealth increases the propensity of holding larger fractions of wealth in equities and bonds. Prior research also investigates the trading behaviour of customers to (discount) brokerage houses (Schlarbaum et al., 1978; Odean, 1998, 1999; Barber and Odean, 2000) or derives share ownership and trading behaviour for an entire population from national central registers and tax offices such as in Nordic countries (Grinblatt and Keloharju, 2000, 2001; Campbell, 2006; Calvet et al., 2009b). Even though these studies do not focus on wealthy individuals, their empirical findings point to several investment habits of wealthy individuals.

Wealthy investors tend to have higher capital market participation rates (Van Rooij et al., 2011), hold more diversified portfolios (Goetzmann and Kumar, 2008), rebalance more often (Calvet et al., 2009a), are less likely to be contrarian (Grinblatt and Keloharju, 2000), and are less likely to make costly mistakes (Calvet et al., 2009b). Despite



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these known investment habits of wealthy private investors, less is known about the particular investment choices of these individuals within their equity and bond portfolios. Specifically, we know little about whether private investors consider nonfinancial factors when making purchasing or selling decisions and whether they change their investment behaviour when provided with investment advice that includes information about the environmental and social impact of their portfolio investments. Given the above mentioned trend among institutional investors who increasingly consider sustainability criteria in their investment decisions, in this paper we investigate whether wealthy retail investors consider sustainability information in their investment portfolio choices.

To study the investment choices of wealthy households we obtained access to a proprietary dataset of investment holdings of European private wealth investors at ABN AMRO private bank. ABN AMRO is the third largest private bank in Europe with more than 100,000 clients and almost €200 billion in assets under management. The dataset allows us to observe monthly investment holdings on the individual asset level from January 2016 to December 2019 by investor type (aggregated from the individual investor-level for privacy reasons) and by country of residence for the bank's four main European markets, the Netherlands, Germany, Belgium and France. The data allows us to observe asset allocations and investment flows within and across asset classes for a large panel of securities.

For our empirical tests we exploit three particular features of the dataset. First, we are able to distinguish between individuals who receive investment advice ('advisory clients') and investors who use the bank solely for execution of their portfolio trades ('execution-only clients'). Specifically, we will exploit the fact that investors in the advisory group receive periodic reports about their investment portfolios that include information about the sustainability characteristics of the underlying assets, while the investors in the execution-only group do not.[2]

Secondly, we are able to observe cross-country variation in the reporting of the sustainability characteristics of investors' portfolios. Specifically, investors in the Netherlands

[2]Both investor groups have continuous access to online reporting tools of their portfolios, however.



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and Belgium receive sustainability information on a quarterly basis, while investors in Germany receive the information with a semi-annual frequency. In contrast, investors in France do not receive any reporting on the sustainability characteristics of their investment assets. That is, we are able to assess the effects of the reporting of sustainability information on investment decisions by using investor behaviour in France as a natural benchmark.

Thirdly, and more importantly, we are able to exploit an exogenous change in the availability of sustainability ratings for the underlying assets in investors' portfolios after the bank changed its sustainability ratings provider. The change in provider increased the number of assets in clients' portfolios for which sustainability ratings became available. This quasi-natural experiment allows us to observe whether and how the investors in our sample change their portfolio composition after learning about the sustainability ratings of their portfolio assets and the wider universe of assets available to them. As we observe a group of assets for which sustainability ratings have always been available and assets for which ratings only became available after the change in provider, any portfolio rebalancing due to the exogenous shock to the availability of ratings for some asset can plausibly be interpreted as causal.

Our findings are as follows. In the cross-section of our investor sample, we document significantly larger investment flows into (and holdings of) assets with a high sustainability rating compared to those with low sustainability rating. The difference is economically large at 15% of the average monthly investment flow. In absolute terms, we document about €4.4 million per month in incremental investment flows into assets with high sustainability ratings compared to those with low sustainability ratings. Over the course of our sample period from January 2016 to December 2019 this results in about €210 million incrementally allocated to assets with high sustainability ratings by the retail investors in our sample. We further find this difference in flows to be larger for equities than for bonds and to predominantly stem from allocation decisions of investors that receive advice, and hence more readily receive information about the sustainability ratings of their assets, compared to investors that use the bank solely for execution purposes. That is, the



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incremental investment flows are likely attributable to the higher sustainability ratings observed by investors in the advisory client group.

Furthermore, using a quasi-natural experiment of an exogenous change to the availability of sustainability ratings in a difference-in-difference setting, we find a significant increase in investment flows into assets that are 'treated' with a sustainability rating and have a high rating and significant decreases in investment flows in those treated assets with a low sustainability rating. Specifically, we find a 50% increase in investment flows into assets with a high sustainability rating after investors are confronted with the rating. In contrast, we find a significant decrease in investment flows into assets with a newly reported low sustainability rating. The difference in investment flows between high and low rated assets is economically large at about €45 million per month. The reduced flows into assets with low sustainability rating are statistically stronger and more robust suggesting that retail investors are particularly concerned with avoiding seemingly unsustainable firms.

Lastly, we show that investors in the advisory client group react to *changes* in sustainability ratings by rebalancing their portfolios towards higher rated assets, but only in those countries in which the bank includes sustainability information for their portfolio assets with the periodic investment reports and thus informs investors about the change in rating. Overall, thus, our study provides systematic evidence that private investors consider sustainability information in their investment decisions and make economically meaningful allocations towards assets with higher sustainability ratings.

In addition to the literature on household finance discussed above, our study contributes to the emerging literature on the sustainability preferences of investors (Amel-Zadeh and Serafeim, 2018; Gibson and Krueger, 2018; Krueger et al., 2020) by documenting that wealthy retail investors factor sustainability information into their investment decisions. Moreover, using a novel dataset of private wealth investment holdings we provide empirical evidence on a plausibly causal effect of sustainability ratings on investment flows. As such our study also contributes to the literature on mutual fund flows and the effect of fund ratings (Del Guercio and Tkac, 2008; Ammann et al., 2019).



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The remainder of the paper is structured as follows. Section 2 describes the data and the setting. Section 3 outlines the research design and Section 4 present the empirical results. The study concludes with Section 5.

# 2 Data and Summary Statistics

## 2.1 Background

Our data sample consists of investment holdings of European private wealth investors and is obtained from ABN AMRO private bank. It contains anonymised monthly investment account holdings of ABN AMRO's private banking clients from January 2016 to December 2019. ABN AMRO is the third largest private bank in Europe by assets under management (€195 billion as of Q4 2019)[3], with more than 100,000 private clients across the Netherlands, France, Germany, and Belgium as well as other countries outside of Europe. We focus our investigation on private investors in the Netherlands, France, Germany, and Belgium. This investor group comprises of private individuals with investable wealth of more than EUR 500,000 in the Netherlands (more than EUR 1,000,000 outside of the Netherlands) and includes small institutions such as pensions funds, foundations and family offices (ABN AMRO, 2018). The sample therefore allows us to gain insights into the investment preferences and behaviour of a large number of European private wealth investors. We are particularly interested in the revealed sustainability preferences of wealthy private investors by examining their investment flows with respect to the level and the changes in the sustainability ratings of their underlying asset holdings. In doing so, we exploit (exogenous) variation in how ABN AMRO reports and communicates sustainability ratings to these clients from January 2016 to December 2019.

## 2.2 Description of the Investor Sample

The private clients in our sample belong to the *advisory* and *execution-only* mandates of the bank. While in both mandates clients manage their own investment portfolios, advi-

[3]ABN AMRO Quarterly Report Q4, 2019, p.13



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sory clients manage their portfolios with the assistance of an advisor from the bank. The bank's mandate for advisory clients is limited to providing (non-independent) investment advice, and it is not able to manage the clients' assets without their explicit instructions. Under the advisory mandate, clients in all four countries can opt for different intensities of contact with the bank, ranging from low to high and from standardised to customised. In addition, in the Netherlands clients in the advisory group can opt for advice that is specifically geared towards sustainable investing. This specific concept of 'Sustainable Advice' is investment advice aimed at choosing investments based on the bank's sustainability criteria.

All advisory clients in all countries (with the exception of France) regularly receive a report on their investment portfolio that contains financial information about their investments as well as the ABN AMRO sustainability rating of the issuers of the stock or bond in their portfolios. In France, clients also receive financial updates, but no information regarding sustainability ratings. The reporting frequency of the sustainability ratings also varies by country, from quarterly in the Netherlands and Belgium to half-yearly in Germany. However, clients in all countries have continuous access to their portfolio details online. Sustainability ratings are reported on a scale from one to five, with one being a poor sustainability rating and five being an excellent rating. Changes of the sustainability ratings are not separately highlighted in the client reporting, but advisory clients might receive a call from their advisors when the sustainability ratings of assets in their portfolio change.[4] Clients in the Dutch 'Sustainable Advice' concept will always be called when the sustainability score of one of their holdings falls to poor (equal to a sustainability rating of 1).

Execution-only clients do not have an advisor, but instead have access to an execution platform for their desired transactions. That is, the execution-only mandate relates to investment services that target the execution of investment transactions, where no investment advice or portfolio management is provided by the bank. Clients in execution-only do not receive periodic reporting, but have access to their portfolio details online on de-

[4]This will especially be the case when the clients have signalled to their advisor their preferences for sustainable investments.



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mand including the sustainability ratings of their holdings (again with the exception of clients in France).

While for data protection and privacy reasons we do not have details of individual client holdings (i.e. client-level data), we have details about the money amount held at the end of the month in a specific asset by client type and country of residence. The asset pool comprises of equities and bonds of individual issuers, including sovereign, quasi-sovereign or supranational entities and financial and non-financial corporates. The initial dataset starts with an average monthly asset pool of €121 billion. After removing observations that do not have sustainability ratings over the entire sample period and those for which we do not have returns, the remaining asset pool is about €35.5 billion on average per month. We then remove holdings of clients that are not part of the advisory or execution-only mandates.[5]

Table 1, describes the sample. Overall the sample consists of an average monthly asset pool worth approx. €28.1 billion over the sample period 2016-2019 and contains 270,979 asset-month observations. Table 1, Panel A shows the number of observations, number of assets and average holding for equities and Panel B the equivalent for bonds. The table shows that investors' holdings of equities exceed that of bonds. The average total monthly exposure that investors in our sample have to equities is approximately €26 billion (last column), whereas it is €2 billion to bonds. Investors that are part of the execution-only client group have portfolios larger than those of investors of the advisory client group. The average total monthly holdings for execution-only clients is approximately €20 billion, whereas it is only €8 billion for advisory clients. Investment holdings of both groups have grown over time partly due to the price appreciation of the assets and partly due to the addition of new asset under management. Our sample is unevenly distributed by country, with the Netherlands representing the largest client group making up 68% of the sample, followed by Germany (with 23% on average), France (with 5.5% on average), and Belgium (with 3.5% on average).

Insert Table 1 here.

[5] The bank also maintains a *discretionary* mandate that mostly comprises of mutual fund holdings.



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## 2.3 Sustainability Ratings

Throughout our sample period, ABN AMRO presents sustainability ratings to clients based on two different methodologies. Prior to December 2018, the bank presents an in-house measure, which is based on raw sustainability scores provided by Sustainalytics, a sustainability research and ratings provider. Starting in December 2018, the bank is basing its sustainability rating on sustainability ratings provided by Morningstar. Even though the two ratings providers likely use different methodologies for their ratings, the relative interpretation of the sustainability ratings remains the same in the sense that a rating of 1 captures the worst companies while a rating of 5 corresponds to the best companies in terms of their sustainability performance.[6]

The sustainability ratings prior to December 2018 are calculated based on three different components. The first component is the ESG bucket (ratings 1 to 5), which is determined by the Sustainalytics ESG score of a company relative to its industry group. The second component is the Controversy bucket (ratings 0 to 5 from low to high), which is determined based on the Sustainalytics Controversy scores. The third component is the availability of corporate policies in various sectors that the bank deems 'high risk' sectors, and is essentially used to downgrade ratings in case certain policies are not available. The sustainability ratings are computed by starting with the ESG bucket and subtracting one in case policies are not available. The final score is adjusted by subtracting one for Controversy category 3, subtracting two for Controversy category 4, and by assigning a sustainability rating of one for Controversy category 5, where one is the lower bound for the rating overall.

The sustainability ratings after December 2018 based on the Morningstar methodology are calculated using only two of the components above. Similar to the ratings prior to December 2018, the first component corresponds to the asset-level ESG rating produced by Sustainalytics and the second refers to the Sustainalytics controversy scores. That is, the two methodologies use Sustainalytics scores as their inputs, but in different ways, leading to different distributions of sustainability ratings. We provide details of the derivation

[6] We discuss the ratings methodology in more detail in Appendix A.



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of the sustainability ratings from the Sustainalytics scores under both methodologies in Appendix A.

An additional effect of the change in methodology is that it increases the universe of assets with available sustainability ratings. This is because the universe of the Morningstar sustainability ratings is much broader than its ABN AMRO equivalent. The ABN AMRO rating scheme prior to December 2018 only covers equities from the MSCI World Index (approx. 1600 stocks) and bonds for which sustainability information is available in the Sustainalytics database (approx. 800 bonds). The asset universe considered by Morningstar is much broader for equities (approx. 2700 stocks) as well as bonds (approx. 3100 bonds). We exploit this shock to the availability of sustainability ratings for assets after December 2018 in a difference-in-difference setting, in which assets with newly provided sustainability ratings are the treatment group. Those that already had ratings before and those that do not have ratings are used as the control group.

The switch to the Morningstar ratings did not change how the bank communicates the sustainability ratings to clients. Advisory clients receive the sustainability ratings via paper copies and/or e-mails and are also able to see them online with their portfolio details at all times. Clients that have signalled that they are interested in the sustainability ratings will be advised of changes by their advisors. This is especially the case for clients in the Dutch 'Sustainable Advice' concept mentioned above. Execution-only clients only have access to the digital version of the sustainability ratings by logging into their personal investment accounts. That is, execution-only clients have to actively seek the rating information by themselves, which likely affects their attention to these scores and their potential response to the ratings and ratings changes.

Table 2 reports the average sustainability rating by asset class in Panel A, by client type in Panel B and by country of residence in Panel C. The difference in the average sustainability ratings between the groups in all three categories is statistically significant. The table shows that the average sustainability rating for equities is lower than for bonds. Advisory clients tend to hold assets with a slightly higher average sustainability rating than execution-only clients. This may be attributed to the fact that investors in the



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advisory client group hold 90% of their assets in equities on average, whereas the holdings of investors in the execution-only group are made up of 98% equities.

Panel C in the table shows that average sustainability ratings also differ across countries. Clients in the Netherlands hold assets with the lowest sustainability ratings and clients in France with the highest ratings. The variation in average sustainability ratings across countries could be due to variations in cultural attitudes toward sustainability or due to the industry compositions of the assets in the portfolios of investors in each country. As sustainability ratings are correlated with sector membership and sector memberships of listed companies vary across countries, it is possible that investors are naturally overweight specific sectors if they have a tendency to invest in 'home' assets. In supplementary results in the Internet Appendix (Table IA-2) we confirm such a home bias in investors' portfolios.

Insert Table 2 here.

Table 3 reports the average monthly client holdings, average monthly returns, Jensen's Alphas and reward-to-risk ratios for assets ranked by sustainability rating and for equities and bonds separately. We use some of these variables as control variables in our empirical analyses. The first columns for equities as well as bonds show that client holdings increase with sustainability rating suggesting that private investors systematically invest in more sustainable assets. The difference between the holdings in assets with the highest and lowest sustainability rating is statistically significant at less than the 1% confidence level. The difference is about €7.5 million (t-stat.=10.56) for equities and €0.35 million (t-stat.=11.17) for bonds on average. Furthermore, even though the average monthly returns tend to decrease as the sustainability rating increases, the difference between sustainability ratings of 5 and 1 is only significant for bonds at about -10 basis points (t-stat.=-3.45). This suggests that, on average, monthly returns are higher for assets with low sustainability ratings compared to high sustainability ratings. Similar results are found when using risk-adjusted returns or Jensen's Alphas. The alphas are computed with respect to the MSCI World Index as a market proxy for equities, and the Barclays



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Global Aggregate Bond Index for Bonds. The parameters for the calculation of Jensen's alphas are estimated using 12 months return data. The differences in alphas between high and low sustainable equities and bonds, although statistically significant, are economically very small at -0.3 basis points (t-stat.=-1.79) for equities and at -0.02 basis points (t-stat.=-2.74) for bonds. The reward-to-risk ratios (i.e., returns divided by their standard deviation) are on the whole slightly higher for higher rated assets.

Insert Table 3 here.

# 3 Methodology and Research Design

## 3.1 Investment Flows

The variable of interest we examine to measure changes in portfolio holdings is the monthly net asset flow, which has been frequently used in the mutual fund literature (e.g. (Sirri and Tufano, 1998; Barber et al., 2005; Cooper et al., 2005; Bollen, 2007; Del Guercio and Tkac, 2008). Flows are defined as

$$\text{FLOW}_{i,t} = \frac{\text{TNE}_{i,t} - \text{TNE}_{i,t-1} * (1 + R_{i,t})}{\text{TNE}_{i,t-1}}, \tag{1}$$

where $\text{TNE}_{i,t}$ corresponds to the total net holding of asset $i$ at the end of month $t$, and $R_{i,t}$ is the return of asset $i$ during that month. This measure reflects the percentage growth of investors' holdings of the asset in excess of the growth that would have occurred if no new investments had flowed in and all dividends had been reinvested. As the return measure we use the monthly total returns of each asset reported in Bloomberg. To prevent extreme outliers from driving the results, we winsorize the net flows at the 0.5 percent and 99.5 percent levels.

Prior research on fund flows has identified various financial performance and sustainability characteristics that investors consider in their asset allocation decisions. Del Guercio and Tkac (2008) study the effect of Morningstar ratings on mutual fund flows and find



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that several financial performance variables, including raw returns, one-factor alpha and the Sharpe ratio are strongly correlated with new asset flows. There is also some evidence that mutual fund flows are sensitive to Morningstar sustainability ratings (Ammann et al., 2019). In contrast to prior research, we investigate to what extent private investors respond to company-specific sustainability ratings in their private investment portfolios.

## 3.2 Panel Regressions

We first examine the cross-sectional variation in changes in investors' portfolio holdings. We estimate panel regressions of investment flows on sustainability ratings and various financial determinants of investment flows. Specifically, we regress net asset flows on four indicator variables capturing the sustainability categories one, two, four and five with assets having a sustainability rating of three being the benchmark category. This allows us to capture cross-sectional differences between average investment flows into assets with a low and high sustainability rating.

The regression equation includes variables that have been shown to be important predictors of flows in the mutual fund literature (e.g., Sirri and Tufano, 1998; Bollen, 2007; Del Guercio and Tkac, 2008). In particular, it includes controls for the current popularity of an asset's investment class (i.e. equity or bond), recent developments in the asset's raw and risk-adjusted financial performance, as well as the asset's long-term overall performance record. It is important to include financial performance measures such as the asset's raw return and risk-adjusted performance at time $t-1$, since they occur contemporaneously with the sustainability rating changes, yet may independently influence asset flows. The squared change in Jensen's alpha is included to account for a possible convex relation between asset flows and recent financial performance, which has been widely documented in the mutual fund literature (e.g., Sirri and Tufano, 1998). Furthermore, the lagged asset flow variable, corresponds to an infinitely distributed lag model containing the full performance history of the asset, and thus accounts for its effect on asset flow. Del Guercio and Tkac (2008) and Ammann et al. (2019) show that the model predicts fund flows reasonably well.



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For each asset, we compute the flows into assets for the different types of clients (i.e. advisory and execution-only clients) and for the different countries where these clients are located (i.e. the Netherlands, France, Germany, Belgium or elsewhere). That is, for the panel analysis, the unit of observation is net investment flow into asset $i$ by client type $c$ at time $t$.

We estimate the following regression equation:

$$F^c_{i,t} = \zeta + \beta_1 \text{RET}^i_{t-1} + \beta_2 \Delta\alpha^i_{t-1} + \beta_3 (\Delta\alpha^i_{t-1})^2 + \beta_4 F^c_{i,t-1} + \beta_5 RATING_{s=1} + \beta_6 RATING_{s=2} + \beta_7 RATING_{s=4} + \beta_8 RATING_{s=5} + \gamma_i + \delta_t + \epsilon^c_{i,t}, \quad (2)$$

where $F^c_{i,t}$ corresponds to the flow as defined in equation (1) and varies per asset type, client type and country.[7] $\text{RET}^i_{t-1}$ denotes asset $i$'s monthly return at $t-1$, $\Delta\alpha^i_{t-1}$ is the change in asset $i$'s Jensen's alpha from month $t-2$ to $t-1$, and $F^c_{i,t}$ is the net flow to asset $i$ at month $t-1$. Our variables of interest are the dummy variables $RATING_s$ for the sustainability ratings 1, 2, 4 and 5, where the omitted category are assets with a sustainability rating of 3. The equation further includes different combinations of industry, asset or country fixed effects ($\gamma_i$) and year-month fixed effects ($\delta_t$).[8]

## 3.3 Difference-in-Difference Regressions

To strengthen the identification of the effect of sustainability ratings on investment flows we exploit a quasi-natural experiment afforded to us by changes in how ABN AMRO reports sustainability ratings to their clients. As discussed in the previous section, in December 2018 the bank switched from providing clients with in-house sustainability ratings based on Sustainalytics provided scores to Morningstar sustainability ratings. With this switch the ratings coverage expanded providing sustainability ratings for a much larger set of firms than before. The change in ratings provider thus exogenously increases the universe of firms in private client portfolios for which sustainability ratings became available. We exploit this shock to the availability of sustainability ratings in

[7] In robustness tests we also use absolute instead of relative flows as dependent variable. Our results remain unchanged.

[8] In additional tests tabulated in the Internet Appendix we run the same regressions using asset holdings as dependent variable



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a difference-in-difference setting. Specifically, we exploit the fact that there are assets in investors' portfolios that did not have their sustainability ratings reported by ABN AMRO before December 2018 and for which the bank now initiated the reporting (treated assets), and a group of assets that always had the ratings reported or stopped having their ratings reported after the transition to Morningstar (control assets). We are thus able to compare investment flows into the treated assets after the treatment (adoption of Morningstar rating) with the investment flows into the control assets over the same period. Specifically, we are able to establish whether subsequently client investment flows are higher into those assets with a *high* newly reported sustainability rating and whether they are lower in *low* newly rated assets compared to newly rated assets with a medium rating relative to assets of the control group in the same ratings categories.

We thus run a difference-in-difference regression with a triple interaction to move closer to a causal interpretation of whether the presentation of sustainability ratings to private investor clients has increased flows into those firms that have high ratings versus those that have low ratings. That is, we estimate the following regression equation:

$$\begin{aligned} F^c_{i,t} = {} & \zeta + \beta_1 POST + \beta_2 TREAT + \beta_3 HIGH\_ESG + \beta_4 LOW\_ESG + \beta_5 POST \\ & \times TREAT + \beta_6 POST \times HIGH\_ESG + \beta_7 POST \times LOW\_ESG \\ & + \beta_8 TREAT \times HIGH\_ESG + \beta_9 TREAT \times LOW\_ESG + \beta_{10} POST \\ & \times TREAT \times HIGH\_ESG + \beta_{11} POST \times TREAT \times LOW\_ESG \\ & + \delta_i + \epsilon^c_{i,t}, \end{aligned} \tag{3}$$

where the $POST$ dummy is 1 after the switching date, and 0 before, and $TREAT$ is 1 if asset $i$ has sustainability ratings under either the ABN AMRO or the Morningstar measure (but not both). Thus $POST \times TREAT$ represents those firms that did not have a rating before but report a Morningstar sustainability rating after December 2018. The $HIGH\_ESG$ indicator equals 1 for assets with a sustainability rating exceeding three, and zero otherwise. Similarly, the $LOW\_ESG$ indicator equals 1 when the sustainability rating of asset $i$ is smaller than three, and zero otherwise. The excluded category is a sustainability rating of three. As the breadth of the Morningstar sustainability coverage might be correlated with industry membership, the regression equation further includes industry or asset-fixed effects ($\delta_i$).



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### 3.4 Event Study

As a third test to establish whether private investors react to sustainability ratings we run an event study around asset-months with ratings changes. The event study aims to measure the effect of a sustainability rating change on net asset flows in the months following the rating change.

Similar to a conventional event study on stock returns, an event study on asset flows aims to isolate the incremental asset flow due to a rating change by parsimoniously removing the influence of all variables other than the change in sustainability rating from raw asset flows. We use the event study methodology as proposed by Del Guercio and Tkac (2008), who examined the effect of Morningstar's Star ratings changes on mutual fund flows. To compute normal asset flow, we can estimate a time-series benchmark regression for each individual asset $i$, i.e.

$$F_t^i = \gamma^i + \beta_1 \text{RET}_{t-1}^i + \beta_2 \Delta\alpha_{t-1}^i + \beta_3 (\Delta\alpha_{t-1}^i)^2 + \beta_4 SF_t^i + \beta_5 F_{t-1}^i + \epsilon_t^i, \tag{4}$$

where we use the same control variables as in the panel regression given in equation (2).

In the event study, we define the event date ($t = 0$) as the end of the month during which the sustainability rating change occurs as the ratings are are updated at the end of each month. The alphas in equation (4) are calculated based on the prior twelve months. Furthermore, the coefficients of the benchmark model are estimated based on twelve months of data, ending one month before time 0 (i.e., event months -24 to -1).

The abnormal flows for asset $i$ in each month $t$ around the time of the event date can be computed by taking the estimated benchmark model parameters into the event window, i.e.

$$\text{AF}_t^i = F_t^i - \left( \hat{\gamma}^i + \hat{\beta}_1 \text{RET}_{t-1}^i + \hat{\beta}_2 \Delta\alpha_{t-1}^i + \hat{\beta}_3 (\Delta\alpha_{t-1}^i)^2 + \hat{\beta}_4 SF_t^i + \hat{\beta}_5 F_{t-1}^i \right). \tag{5}$$

That is, the abnormal flow to asset $i$ at month $t$, $\text{AF}_t^i$, equals the actual realized asset flow $F_t^i$ minus the expected asset flow based on the estimated coefficients. In addition to the explanatory variables discussed above, the expected asset flow estimation includes a



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term for the average abnormal flow to asset $i$ ($\hat{\gamma}^i$), which aims to capture asset-specific predictors of flow that are constant over time and not included in the asset-wise time-series regressions.

Similar to Del Guercio and Tkac (2008), we define events by grouping assets according to their pre-change sustainability rating. Events thus correspond to one-notch sustainability rating changes, and we assess the relative flow reaction measured to each event for statistical significance accordingly. For our main tests, we report cumulative abnormal flow statistics over the event window $t = [1; 6]$. We do not include event month 0, as the sustainability ratings are published at the end of the month. We test multiple event horizons as the impact of a sustainability rating change on investment flows may persist over multiple months. That is, we account for delayed investment flow reactions expecting that private investors make investment decisions over different time intervals and may take time to act upon a sustainability ratings change.

In order to assess the statistical significance of the abnormal flow estimates, we derive test statistics for abnormal flows following the methodology in Dodd and Warner (1983). Specifically, we consider the standardized abnormal flows, which are computed by standardizing the abnormal flow estimates for all assets within the event period with the root mean squared error (RMSE) based on the corresponding multivariate regression. Dodd and Warner (1983) show that standardizing the relative abnormal flows involves assigning higher weights to assets with higher accuracy in their estimates. For the purpose of examining the temporal aspect of rating changes, which is the main focus of our study, we analyze the cumulative standardized abnormal flows (CSAF). The CSAF are computed by summing the standardized abnormal flows for each asset individually over the total event window and dividing by the square root of the number of months used in the computation.

We then adopt the cross-sectional test developed by Boehmer et al. (1991) to derive unbiased estimates. The test divides the CSAF by their contemporaneous standard errors at each point in time. Using this approach accounts for possible changes in the variance of the CSAF in the event window in relation to the time window used for estimation. For



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instance, the Boehmer et al. (1991) $t$-statistics will be adjusted downwards in case the volatility in the event period is higher than in the estimation period. This cross-sectional technique facilitates producing robust results by incorporating the event-induced variance. Boehmer et al. (1991) argues that ignoring the contemporaneous event-variance would often lead to a rejection of the null-hypothesis of zero average cumulative abnormal flow, even when it is true.

In a second step, we continue with examining the effect of ratings changes on the CSAF in a cross-sectional regression setting. Specifically, we regress the CSAF over the six month window on an indicator variable representing a sustainability ratings change, on indicators for the different countries (using France as the omitted category) and their interaction effects as well as on the same control variables as in the panel regressions above. That is, we estimate the following regression equation:

$$\begin{aligned} CSAF^i_{(+1,+6)} = &\ \zeta + \beta_1 UP + \beta_2 NL + \beta_3 BE + \beta_4 GE + \beta_5 UP \times NL \\ &+ \beta_6 UP \times BE + \beta_7 UP \times GE + \beta_8 Controls^i_t + \gamma_i + \delta_t + \epsilon^i_t, \end{aligned} \tag{6}$$

where $UP$ represents an indicator equal to one for sustainability ratings upgrades and zero for downgrades and $NL$, $BE$ and $GE$ are indicator variables for the respective countries, Netherlands, Belgium and Germany with the omitted category representing France. $\gamma_i$ represents industry or client-type fixed effects and $\delta_t$ are event-month or year-month fixed effects. We run the regressions over the entire sample and separately by asset and client type. Standard errors are clustered by asset and time.

# 4 Empirical Results

We begin our tests examining average flows across sustainability ratings over the entire sample period distinguishing between client types and asset classes. Table 4 presents the result of these univariate comparisons. The first set of columns in the table shows the investment flows for both client groups for all assets and separately for equities and bonds ranked from the lowest sustainability rating (1) to the highest (5). The table shows somewhat higher net flows into higher rated assets compared to lower rated assets. The



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difference in flows between assets with sustainability rating 1 and 5 is only statistically significant for equities, however, and much larger for the advisory client group compared to the execution-only group (which shows no statistical differences in flows for either equities or bonds). The univariate results are consistent with the fact that advisory clients receive regular reporting on their portfolios which includes information about the sustainability ratings of their holdings. They are therefore more likely to consider this information in their asset allocation decisions. These univariate results, however, do not allow us to establish a causal link between sustainability ratings and investment flows. We therefore investigate the determinants of investment flows in multivariate settings next.

Insert Table 4 here.

## 4.1 Panel Regression Results

In this section we report the panel regression results of the estimations of equation 2. Table 5 summarises the results. Our variables of interest are the ratings indicator variables $RATING_{s\in\{1,2,4,5\}}$ that are equal to one if the asset is in the respective sustainability ratings category in that month, and zero otherwise. The indicator variables capture the differences in average monthly investment flows into assets with poor and strong sustainability performance compared to assets with medium sustainability, i.e., those in the middle sustainability category of three. The regressions also control for known predictors of investment flows discussed in the prior literature such as the prior month return and change in alpha as well as prior month flows. The table is divided into three panels. Panel A reports the results for the entire sample, Panel B reports the results by asset type, and Panel C by client type.

The columns in each panel show the coefficients and t-statistics for the ratings indicator variables of interest omitting coefficients for the control variables. Each column shows the results using different fixed effects and standard error clustering as depicted at the bottom of the table. For example, as the sustainability ratings in our sample are highly



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sector dependent (being comprised of a combination of sustainability scores and controversy ratings) we control for industry fixed effects and also allow these to vary over time interacting them with year-month fixed effects. The estimations in column (3) further use fixed effects on the asset-level clustering errors by country and column (4) adds country fixed effects clustering errors by industry.

The results in column (1) in Panel A show that the flows into assets in the ratings category two and four are significantly lower by 29 and 23 basis points (t-stat. = -2.49 and -2.19), respectively, compared to flows into assets with the middle rating, while the flows into assets with a sustainability rating of five are significantly larger by 22 basis points (t-stat. = 1.97). Based on unconditional average monthly flows of 3.3%, a 50 basis point difference is an economically significant increase of 0.5/3.3 = 15% in average flows.[9] In absolute Euro terms average monthly flows into assets with sustainability ratings are about €873 million (3.3% x €26.45 billion average holdings). That is, the 50 basis point difference in flows between assets with a rating of two and assets with a rating of five translates to about €4.4 million higher monthly flows into the assets with the higher sustainability rating. Over the course of our sample period of 48 months this equates to 48 × €4.4 million = €210 million higher net investment flows into assets with the highest sustainability rating by private wealth investors between January 2016 and December 2019.

The results in column (2) controlling for industry × year-month fixed effects are similar showing that flows into assets in the ratings category two are lower by 41 basis points (t-stat. = -4.75), while flows into asset in the ratings category five are higher by 30 basis points (t-stat. = 2.56) compared to assets with a rating of three. Once we include asset fixed effects in columns (3) and (4) the results for the higher ratings weaken, but remain similar for the lower rated assets which might suggest higher variation in ratings changes at the lower end of the ratings spectrum. Overall, the results suggest significantly lower investment flows into assets with low sustainability ratings and somewhat higher flows into assets with the highest sustainability rating.[10]

[9] We tabulate unconditional summary statistics in Table IA-1 in the Internet Appendix
[10] In additional panel regressions tabulated in the Internet Appendix Table IA-3 we repeat the estimations



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Panel B in Table 5 confirms that the main results hold for equities and bonds. The coefficient signs on the indicator variables largely mirror the results of the entire sample, although the magnitudes are higher for equities than bonds. Column (1) shows that equity flows into assets with a rating of two are lower by about 44 basis points (t-stat. = -4.49), while they are higher by about 40 basis points (t-stat. = 2.84) into assets with a rating of five. In comparison, bond flows are lower by 22 basis points (t-stat. = - 6.41) into assets with a rating of two and higher by 32 basis points (t-stat. = 2.60) into assets with a rating of five (column (3)). Again the results weaken for flows into assets with higher rating once we control for asset fixed effects.

The results in Panel C reveal that the relatively higher investment flows into assets with a sustainability rating of five are driven by advisory clients, while the relatively lower flows into assets with a rating lower than three are also attributable to execution-only clients. The coefficient on the ratings category five for advisory clients is 57 basis points and highly statistically significant (t-stat.=6.40) with industry × year-month fixed effects and remains significant at 82 basis points (t-stat.=2.17) when controlling for asset and year-month fixed effects. The coefficients on the ratings category two are -20 and -37 basis points (t-stat.=-2.10 and -3.02), respectively. Based on average monthly flows of 3.3%, the latter difference of 119 basis points between flows into high versus low rated assets results is an economically significant increase of 1.19/3.3 = 36% in average flows. In absolute Euro terms this difference in flows between assets with a rating of two and assets with a rating of five translates to about €10.4 million higher monthly flows into the assets with the higher sustainability rating by advisory clients. Execution-only clients, on the other hand, while appearing to avoid the very lowest rated assets, do not seem to discriminate between sustainability ratings three to five.

Insert Table 5 here.

Overall, the results in this section indicate that there are significant cross-sectional differences in monthly investment flows between assets with high sustainability ratings

above using asset holdings as dependent variable instead of flows. We find monotonically increasing holdings with increasing sustainability ratings corroborating that retail investors prefer higher rated assets



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and assets with low ratings and that these differences are mainly evident in equity flows and predominantly come from advisory clients. Even though we control in the regressions for a variety of variables known to affect investment flows as well as for possible industry, firm and time effects, we cannot fully eliminate the possibility in this cross-sectional setting that the results might be driven by unobserved varying omitted firm characteristics that are correlated with the sustainability rating and private investors' investment flows. To more confidently allow for a causal interpretation of the results we therefore exploit, in the next section, a quasi-natural experiment that induces exogenous variation in the availability of sustainability ratings for our sample assets. In addition, we examine changes in investment flows after sustainability ratings changes in an event study setting to isolate the effect of sustainability ratings on investment flows.

## 4.2 Difference-in-Difference Regression Results

This subsection presents the results of the difference-in-difference regressions. As discussed in more detail in the previous section, a change in methodology of how ABN AMRO reports sustainability ratings to their clients in December 2018 provides us with a quasi-natural experiment that introduces an (exogenous) shock to the breadth of firms in private investors' portfolios for which sustainability ratings are available. Specifically, we exploit this shock to the availability of sustainability ratings by estimating a difference-in-difference regression with a triple interaction, in which firms in investors' portfolios that did not have their sustainability ratings reported by ABN AMRO before December 2018 are the treatment firms and those that always had the ratings reported (so saw no change in their reporting) or ceased to have their ratings reported are the control group. The triple interaction includes a term for high and low sustainability ratings (compared to the omitted category with a sustainability rating of three) and thus will pick up whether flows into firms with high sustainability ratings are higher compared to flows into firms with low sustainability ratings after these ratings become visible to clients relative to a control group of firms with the same sustainability ratings. This set-up therefore allows us to more confidently rely on a causal interpretation of our results whether the reporting



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of sustainability ratings increased flows into assets with a high sustainability rating.

Table 6 shows the estimation results of equation 3. The first three columns report results over the entire cross-section of the sample and the next pairs of columns show the results by asset class (equity and bonds) and client type (advisory and execution-only). Our coefficients of interest are the coefficients on the triple differences. In particular, the coefficients on $TREAT \times POST \times HIGH\_ESG$ ($TREAT \times POST \times LOW\_ESG$) capture the relative investment flows into assets with high (low) sustainability rating for assets that did not have their rating reported before December 2018 relative to similarly rated assets that did have a rating reported before. For ease of exposition the table does not display the coefficients of the main effects and control variables.

The results in the column (1) show a significantly positive coefficient of 0.016 (t-stat.=1.98) on the triple difference estimator $TREAT \times POST \times HIGH\_ESG$ and a significantly negative coefficient of -0.026 (t-stat.=-2.39) on $TREAT \times POST \times LOW\_ESG$ suggesting investment flows into the treated assets are significantly higher when their sustainability ratings are high and significantly lower when their sustainability ratings are low relative to the control group. More specifically, treatment assets on average experience a 1.6% higher monthly investment flow (a 50% increase in flow or approx. €13.6 million) after the treatment compared to control firms with the same ratings after December 2018. In contrast, treatment assets with a low sustainability rating experience a 2.6% lower investment inflow (approx. €22.1 million) after the treatment compared to the respective control group with low sustainability rating. Thus, we find an economically significant 4.2% (or approx. €45 million) difference in monthly flows between high and low rated assets relative to the control group after December 2018. This difference results in a more than €500 million increase in investment flows into assets with a high sustainability rating compared to assets with a low sustainability rating over the subsequent twelve months at this private bank in 2019.

The results weaken somewhat for flows into $HIGH\_ESG$ assets, but remain robust for $LOW\_ESG$ assets once we control for country and asset differences (Columns (2) and (3)). The coefficients on the triple interaction $TREAT \times POST \times LOW\_ESG$ are



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-0.028 (t-stat. = -2.67 and -2.28, respectively).

For the untabulated coefficients in column (1), we find significantly negative coefficients on $TREAT$ (-0.006, t-stat.=-3.44) and $POST \times TREAT$ (-0.011, t-stat.=-1.83) suggesting that average flows into the treatment assets with a sustainability rating of three are lower before the treatment (i.e., the reporting of their sustainability ratings) compared to the control group as well as after. Flows are also relatively lower compared to the control group before the reporting of sustainability ratings for those assets that have a low sustainability after the reporting is introduced (as evident from a negative coefficient on $TREAT \times LOW\_ESG$).

When distinguishing between equities and bonds the results in columns (4) and (5) reveal that only the triple interaction on assets with low sustainability are statistically significantly negative and larger for bonds than for equities. That is, the coefficients on the interaction effect for equities are -0.027 and -0.026 (t-stat.=-2.93 and -2.55, respectively) and the effects for bonds are -0.047 (t-stats.=-1.80) and -0.049 (t-stat.=-1.71), for the regressions with industry and asset fixed effects, respectively. This suggests that investment flows are significantly lower for assets with low sustainability rating after those ratings are reported compared to the control group. The coefficients on the interaction with high sustainability rating are statistically not significant.

Lastly, we find significant differences in the investment flows of advisory compared to execution-only clients. For the advisory client group the coefficients on the triple interaction $TREAT \times POST \times HIGH\_ESG$ are weakly significantly positive at 1.6% and 1.5% (t-stat.=1.68) and the coefficients on the interaction $TREAT \times POST \times LOW\_ESG$ are significantly negative at -1.6% and -1.5% (t-stat.=-3.58 and -3.24, respectively). In contrast, for execution-only clients the coefficients on the interaction $TREAT \times POST \times HIGH\_ESG$ are statistically insignificant, but the coefficients on $TREAT \times POST \times LOW\_ESG$ are statistically significantly negative and higher in magnitude at -4.6% and -4.3% (t-stat.=-3.20 and -2.99, respectively). The results suggests that advisory clients have relatively higher flows into assets with high sustainability rating while execution-only clients seem to have relatively lower flows into assets with low



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sustainability rating compared to the control group. These results are consistent with our results of the panel regression in the previous subsection and possibly due to the active advice given to advisory clients by the bank compared to the execution-only group. Clients' advisors are more likely to discuss and show their clients these sustainability scores and make portfolio allocation recommendations accordingly.

Insert Table 6 here.

Overall, the findings in this section show that private wealth (i.e., retail) investment flows are significantly higher in assets with high sustainability ratings and significantly lower in assets with low sustainability ratings and that investment flows follow these ratings once the ratings become available to investors. The evidence suggests that sustainability ratings are important drivers of investment decisions of retail investors moving investment flows towards (seemingly) more sustainable assets and away from (seemingly) unsustainable assets.

## 4.3 Event Study Results

To provide further evidence on whether sustainability ratings affect retail investors' investment decisions, we examine, in this subsection, their reaction to changes in sustainability ratings. Specifically, we employ an event study to investigate whether investors reduce their exposure to assets that experience a downgrade in rating and increase their exposure to assets that experience an upgrade.

One concern is that sustainability ratings are 'sticky', i.e., that ratings changes are rare. We thus begin by summarising the frequency of ratings changes in Table 7. The table contains the frequency count, i.e. the number of times, that sustainability ratings have changed each month relative to the previous month. Table 7, Panel A shows that in our sample we observe 3,688 ratings changes for equities and 2,628 ratings changes for bonds. The vast majority is made up of one-notch changes for both equities (89.2% of the total) and for bonds (87.3% of the total), whereas larger than one-notch changes are



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extremely rare. We therefore concentrate our analysis on one-notch rating changes in the event study.

Panel B shows the distribution of sustainability ratings changes by ratings level. The changes are fairly evenly distributed over the five sustainability rating categories for both equities and bonds and over upgrades and downgrades. For equities, we observe slightly more frequent upgrades at higher sustainability levels and more frequent downgrades at lower levels. For example, the first column for equities shows that there are 624 ratings upgrades from a rating of three to four and 498 upgrades from four to five. The second column shows that there are 425 downgrades from a rating of three to two and 289 downgrades from a rating of two to one. Ratings changes for bonds observe a similar distribution.

Insert Table 7 here.

We next estimate average cumulative standardized abnormal flows (CSAF) over the six months following these ratings changes and examine upgrades and downgrades separately. Standardized abnormal flows at time $t$ are defined as the actual net flow minus the expected flow standardized by the standard error of the estimation as described in Dodd and Warner (1983). To calculate the expected asset flow, we estimate the coefficients of a benchmark model for each asset individually over an estimation window of 24 months (t = [-24; -1] ). The CSAF are then computed for each asset by summing the standardized abnormal flows over the event period. We discuss the estimation procedure and benchmark model in more detail above in section 3.4.

Figure 1 shows the CSAF in event time over the six months after the sustainability ratings change. The graph shows an increase in standardised abnormal flows into assets that experience a sustainability ratings upgrade while there seems to be no particular trend in flows of assets that experience a downgrade. This trend in abnormal flows seems to be more pronounced for bonds compared to equities.

Insert Figure 1 here.



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Table 8 reports the CSAF and t-statistics over the 6 months post-ratings change showing upgrades and downgrades in two separate columns for the entire sample, and then by client group and by asset class. The results for the entire sample confirm the significantly increasing abnormal flows over the six month period after ratings upgrades depicted in Figure 1. All CSAF from month three onward are highly statistically significant. For example, the CSAF for month one to six are significantly positive at 0.36 (t-stat.=2.72) for ratings upgrades. The CSAF for ratings downgrades, on the other hand, are not significantly different from zero over any event window.

Consistent with the results in the previous section, the significantly positive CSAF after ratings upgrades are largely driven by flows from the advisory client group. For this client group, the CSAF over all event windows are significantly positive for upgrades. Specifically, the CSAF over two and four and five months are large in magnitude at 0.46, 0.41 and 0.40 (t-stats.=3.59, 1.84, and 3.14), respectively. The CSAF after ratings downgrades, albeit being mostly negative, are not statistically different from zero. In contrast, execution-only clients do not seem to react to changes in the sustainability ratings of their holdings. We only observe small positive CSAF for upgrades, one of which is marginally significant, for this client group.

Insert Table 8 here.

Examining the CSAF by asset class reveals that the significantly positive CSAF after ratings upgrades are mostly observable for bonds rather than equities. Although ratings upgrades seem to elicit positive abnormal flows into equities, these are largely not statistically significant with the exception of the CSAF over four months post-upgrade (coefficient = 0.29, t-stats=1.98). Bond flows, on the other hand, are significantly positive over all event windows after ratings upgrades. For example, the CSAF over five and six months post-upgrade are 0.41 and 0.34 (t=stats.=3.28 and 3.36), respectively. Again, also for bonds we do not find any statistically significant negative reaction to sustainability ratings downgrades.

Table 9 further breaks down the event study results by country of residence of the clients. As discussed above, variation exists in if and how frequently clients receive reports



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about the sustainability ratings of the assets in their portfolios. In the Netherlands and Belgium sustainability ratings are reported quarterly and most likely also discussed by the advisors in client calls. In Germany the reports are produced semi-annually and in France sustainability ratings are not reported to advisory clients during our sample period. If client flows are responsive to the visibility of sustainability ratings we expect investors in the Netherlands and Belgium to respond more strongly and more timely to changes in these ratings and investors in France to be least likely to respond. The results in Table 9 confirm our expectations.

Panel A shows the event study results for investors in the Netherlands. The CSAF are significantly positive for sustainability ratings upgrades particularly within the advisory client group, but also weakly so for the execution-only group. For example, the CSAF over the six months post-ratings upgrade are 0.14 (t-stat.=3.08) for advisory clients and 0.07 (t-stat.=1.80) for execution-only clients. The CSAF are not statistically different from zero for either group after ratings downgrades.

The effects are similar albeit somewhat stronger for investors in Belgium compared to the Netherlands as reported in Panel B. Overall, the coefficient magnitudes are larger suggesting that Belgian investors respond more strongly to sustainability ratings upgrades. For example, the CSAF over the six months post-ratings upgrade are 0.20 (t-stat.=3.42) for advisory clients and 0.19 (t-stat.=3.09) for execution-only clients. The CSAF are not statistically different from zero for either group after ratings downgrades.

In contrast to the effects reported above, and consistent with our expectations, the results are weaker for investors in Germany and insignificant for investors in France. Consistent with a less timely (i.e., quarterly) reporting periodicity, the CSAF for German investors are only (weakly) significantly positive over three (coefficient=0.08, t-stat.=1.83) and six months (coefficient=0.09, t-stat.=2.10) after ratings upgrades. In France, investors are not actively confronted with the sustainability ratings and consequently we do not find any significant reactions to ratings changes.[11]

[11]In the Internet Appendix we report further robustness tests breaking down the ratings changes by ratings category in Table IA-4 and using an absolute flow measure instead of a relative flow measure in Table IA-5.



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Insert Table 9 here.

We investigate the event study results further in cross-sectional regressions estimating equation 6. Table 10 summarises the results. Panel A shows the results for the entire sample, Panel B shows the results by asset type and Panel C by client type. For ease of exposition the table only shows the coefficients on the interaction effect of the ratings upgrade and country dummies. The control variables are the same as in the previous regressions. The regression results confirms the results of the univariate tests. Panel A shows significantly higher 6-month CSAF by clients in the Netherlands and Belgium compared to Germany and France after sustainability ratings upgrades. For example, the coefficients on the interaction effects $UP \times NL$ and $UP \times BE$ in column (1) are statistically significantly positive at 9.4% and 16% (t-stat.=2.58 and 3.44), respectively. The coefficients have similar magnitudes in columns (2)-(4), albeit are somewhat weaker statistically, when including client-type and even-month fixed effects.

Panels B further reveals that the results are mainly due to equity flows from investors in the Netherlands and Belgium and that the significant bond flows reported in the univariate analysis are driven by German investors. That is, German investors seem to react to sustainability ratings upgrades with relatively larger flows into bonds, but no significant flows into equities while the reverse seems to be true for Dutch and Belgian investors. The results reported in Panel C further confirm that only the advisory client group exhibits significantly positive CSAF.

Insert Table 10 here.

Overall, the results in this section suggest that one-notch sustainability ratings upgrades elicit significantly positive abnormal flows particularly by advisory clients and specifically by investors in countries that receive regular reporting of the ratings. That is, the elasticities to positive ratings changes are larger in countries, in which clients actively receive updates about the sustainability ratings and are possibly made aware of the ratings changes by their investment advisors.



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# 5 Conclusion

In this paper we examine the sustainability preferences of wealthy individual investors and the effect of sustainability ratings (changes) on their asset allocation decisions. We do so by examining a proprietary dataset of investment holdings of European private wealth investors at ABN AMRO Private Bank, the third largest private bank in Europe. The dataset allows us to observe monthly investment holdings on the individual asset level from January 2016 to December 2019 by investor type and by country of residence for the bank's four main European markets, the Netherlands, Germany, Belgium and France.

We exploit three particular features of the dataset. First, we are able to distinguish between individuals who receive investment advice, and with it information about the sustainability ratings of their investment portfolio, and investors who use the bank solely for execution purposes. Secondly, we are able to observe cross-country variation in the reporting of the sustainability characteristics of investors portfolios. Thirdly, we exploit a quasi-natural experiment, that affords us with an exogenous change in the availability of sustainability ratings for the underlying assets in investors' portfolios.

Our main results —using a difference-in-difference design in the quasi-natural experimental setting —show significantly larger investment flows into assets with a high sustainability rating compared to those with low sustainability rating. Furthermore, using an event study design, we find that investors who regularly receive information about the sustainability ratings of their portfolio assets, react to changes in these ratings by rebalancing their portfolios towards assets with higher sustainability rating. Our findings thus point to a plausibly causal relationship between private investors' investment flows and firms' sustainability ratings.

This study is among the first to document that sustainability ratings affect wealthy retail investors' asset allocations and how private investment flows are diverted from assets with low sustainability ratings to assets with high sustainability ratings in both equities and bonds. Our study thus contributes to the emerging literature on investor attitudes towards sustainability and more generally to the literature in household finance that examines retail investors' investment choices.



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**Table 1:** Sample Descriptive Statistics

This table reports the number of observations, number of assets and average holdings per year and by investor type (table headings) for our sample countries (table rows) for equities (Panel A) and bonds (Panel B). Advisory clients are abbreviated by Adv., and Exec. corresponds to execution-only clients. The statistics by country are reported as proportion of total in each of the first rows of each panel.

| | 2016 | | 2017 | | 2018 | | 2019 | | Total |
|---|---|---|---|---|---|---|---|---|---|
| | Adv. | Exec. | Adv. | Exec. | Adv. | Exec. | Adv. | Exec. | |
| Panel A: Equities | | | | | | | | | |
| Observations | 22,641 | 17,265 | 28,571 | 20,980 | 27,913 | 23,776 | 27,904 | 33,180 | 202,230 |
| Unique equities | 957 | 935 | 980 | 1004 | 1012 | 1104 | 1733 | 2190 | 1445 |
| Average holding (€ bn) | 6.54 | 10.27 | 7.80 | 15.32 | 6.68 | 23.28 | 7.45 | 29.62 | 26.45 |
| **Netherlands** | | | | | | | | | |
| Observations (%) | 33.3 | 50.0 | 32.8 | 45.1 | 34.1 | 43.4 | 35.8 | 47.0 | 40.9 |
| Unique equities | 754 | 864 | 782 | 962 | 792 | 1058 | 1141 | 1881 | 1259 |
| Average holding (%) | 63.1 | 88.6 | 59.4 | 76.0 | 57.0 | 58.6 | 56.4 | 62.0 | 66.1 |
| **Germany** | | | | | | | | | |
| Observations (%) | 29.5 | 0.0 | 29.0 | 10.4 | 30.3 | 14.2 | 36.1 | 10.6 | 20.4 |
| Unique equities | 667 | 0 | 691 | 268 | 704 | 282 | 1118 | 391 | 792 |
| Average holding (%) | 28.0 | 0.0 | 30.9 | 15.7 | 30.8 | 18.9 | 27.7 | 23.7 | 24.8 |
| **Belgium** | | | | | | | | | |
| Observations (%) | 17.4 | 28.8 | 18.4 | 25.6 | 19.7 | 22.1 | 19.5 | 21.6 | 20.9 |
| Unique equities | 394 | 498 | 439 | 482 | 458 | 478 | 606 | 794 | 676 |
| Average holding (%) | 5.3 | 3.4 | 6.4 | 2.5 | 7.4 | 1.5 | 7.7 | 1.5 | 3.3 |
| **France** | | | | | | | | | |
| Observations (%) | 9.2 | 20.0 | 10.5 | 18.0 | 11.3 | 20.8 | 7.9 | 19.2 | 12.7 |
| Unique equities | 208 | 346 | 250 | 315 | 263 | 531 | 303 | 708 | 433 |
| Average holding(%) | 1.3 | 7.7 | 1.6 | 5.7 | 2.0 | 2.6 | 2.6 | 10.9 | 5.3 |
| Panel B: Bonds | | | | | | | | | |
| Observations | 6,629 | 2,073 | 8,809 | 2,540 | 8,461 | 3,224 | 24,842 | 11,299 | 68,749 |
| Unique Bonds | 404 | 179 | 461 | 190 | 505 | 232 | 2216 | 1078 | 943 |
| Average holding (€ bn) | 0.58 | 0.12 | 0.68 | 0.16 | 0.63 | 0.41 | 2.26 | 1.61 | 1.52 |
| **Netherlands** | | | | | | | | | |
| Observations (%) | 38.8 | 71.2 | 40.7 | 77.8 | 33.0 | 48.9 | 28.9 | 54.1 | 40.1 |
| Unique Bonds | 257 | 147 | 299 | 165 | 280 | 158 | 795 | 674 | 522 |
| Average holding (%) | 52.4 | 89.2 | 58.2 | 91.8 | 41.4 | 91.0 | 36.4 | 43.3 | 46.6 |
| **Germany** | | | | | | | | | |
| Observations (%) | 41.2 | 0.0 | 42.4 | 6.2 | 45.6 | 15.1 | 52.4 | 9.2 | 36.8 |
| Unique Bonds | 274 | 0 | 311 | 53 | 322 | 41 | 1440 | 115 | 550 |
| Average holding(%) | 43.7 | 0.0 | 38.5 | 1.8 | 46.0 | 2.4 | 58.8 | 1.4 | 32.9 |
| **Belgium** | | | | | | | | | |
| Observations (%) | 13.0 | 25.9 | 12.0 | 14.2 | 12.6 | 15.2 | 18.5 | 24.1 | 17.2 |
| Unique Bonds | 86 | 54 | 88 | 30 | 89 | 41 | 573 | 338 | 234 |
| Average holding (%) | 2.4 | 6.3 | 2.1 | 5.4 | 2.7 | 3.4 | 4.5 | 4.7 | 3.9 |
| **France** | | | | | | | | | |
| Observations (%) | 4.3 | 2.9 | 0.6 | 1.5 | 0.7 | 11.2 | 0.5 | 13.3 | 3.3 |
| Unique Bonds | 4 | 6 | 4 | 5 | 5 | 91 | 16 | 167 | 50 |
| Average holding (%) | 2.1 | 4.4 | 0.3 | 1.0 | 0.7 | 3.7 | 0.2 | 46.3 | 17.2 |



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**Table 2:** Average Sustainability Ratings

This table reports average sustainability ratings by asset class (Panel A), client types (Panel B), and country (Panel C). The first column reports the average sustainability rating, and the remaining columns report Welch's $t$-statistics corresponding to the average difference in sustainability rating between the row and column sample. In order to create this table, ABN AMRO sustainability ratings were mapped to the Morningstar rating scheme (see Appendix A for the details on the ratings methodologies).

| Panel A: Investment Classes | | | | | |
|---|---|---|---|---|---|
| | Average | Equities | Bonds | | |
| Equities | 3.68 | | | | |
| Bonds | 4.07 | $-51.13^{***}$ | | | |
| **Panel B: Client types** | | | | | |
| | Average | Advisory | Execution Only | | |
| Advisory | 3.86 | | | | |
| Execution Only | 3.78 | $-13.54^{***}$ | | | |
| **Panel C: Countries** | | | | | |
| | Average | Netherlands | Germany | France | Belgium |
| Netherlands | 3.83 | | | | |
| Germany | 3.87 | $7.23^{***}$ | | | |
| France | 3.95 | $14.12^{***}$ | $8.07^{***}$ | | |
| Belgium | 3.91 | $10.28^{***}$ | $3.82^{***}$ | $-4.17^{***}$ | |

**Table 3:** Average Holdings by Sustainability Rating

This table reports the average monthly holdings, returns (%), Jensen's Alpha (%) and the reward-risk ratio (RRR) for all five sustainability ratings. Robust $t$-statistics assessing the 5 minus 1 difference are reported in the last row. *, **, *** denotes significance at the 10%, 5% and 1% level, respectively.

| | Equity | | | | Bonds | | | |
|---|---|---|---|---|---|---|---|---|
| Rating | Holdings (€m) | Ret. (%) | Alpha (%) | RRR | Holdings (€m) | Ret. (%) | Alpha (%) | RRR |
| 1 | 2.05 | 0.97 | 0.0047 | 0.105 | 0.72 | 0.19 | -0.0010 | 0.099 |
| 2 | 7.75 | 0.93 | 0.0028 | 0.108 | 0.78 | -0.074 | -0.00087 | -0.050 |
| 3 | 2.79 | 0.90 | 0.0085 | 0.113 | 0.80 | 0.09 | -0.0097 | 0.034 |
| 4 | 8.12 | 0.81 | 0.0081 | 0.089 | 1.11 | 0.22 | -0.0011 | 0.140 |
| 5 | 9.50 | 0.94 | 0.0018 | 0.108 | 1.07 | 0.09 | -0.0012 | 0.0034 |
| 5 min 1 | 7.45 | -0.03 | -0.0029 | 0.003 | 0.35 | -0.10 | -0.00020 | -0.096 |
| $t$-stat | $10.56^{***}$ | -0.53 | $-1.79^{*}$ | - | $11.17^{***}$ | $-3.45^{***}$ | $-2.74^{***}$ | - |



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**Table 4:** Average Flow by Sustainability Rating

This table reports the average relative investment flow to assets for different sustainability rating levels by client types and asset class (in %) as defined in equation 1. Robust $t$-statistics assessing the 5 minus 1 difference are reported in the last row. *, **, *** denotes significance at the 10%, 5% and 1% level, respectively.

| | All Clients | | | Advisory | | | Execution-Only | | |
|---|---|---|---|---|---|---|---|---|---|
| Rating | All Assets | Equity | Bond | All Assets | Equity | Bond | All Assets | Equity | Bond |
| 1 | 3.49 | 3.75 | 1.97 | 3.11 | 3.41 | 1.88 | 4.02 | 4.18 | 2.27 |
| 2 | 3.02 | 3.50 | 1.26 | 2.43 | 2.92 | 1.12 | 3.89 | 4.20 | 1.72 |
| 3 | 3.72 | 4.30 | 1.65 | 3.17 | 3.82 | 1.51 | 4.47 | 4.85 | 2.03 |
| 4 | 3.20 | 3.91 | 1.38 | 2.63 | 3.40 | 1.22 | 3.97 | 4.47 | 1.81 |
| 5 | 3.60 | 4.77 | 2.03 | 3.39 | 4.62 | 2.14 | 3.89 | 4.72 | 1.77 |
| 5 min 1 | 0.11 | 1.01*** | 0.051 | 0.27 | 1.22** | 0.26 | -0.13 | 0.54 | -0.50 |
| $t$-stat | 0.38 | 2.75 | 0.12 | 0.79 | 2.48 | 0.52 | 0.27 | 1.34 | -0.67 |

**Table 5:** Panel Regression Results

This table reports the regression results for the estimation of equation (2). Panel A present the results for entire sample, Panel B reports the results by asset type (equities versus bonds) and Panel C by client type (advisory versus execution-only). Coefficients on the control variables are omitted. The $t$ statistics are based on clustered standard errors as reported at the bottom of the table and are given in parentheses. *, **, *** denotes significance at the 10%, 5% and 1% level, respectively.

Panel A: Entire Sample

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| $\text{RATING}_{s=1}$ | -0.0011 | -0.0013 | $-0.0043^{***}$ | -0.0043 |
| | (-0.77) | (-0.74) | (2.61) | (-1.43) |
| $\text{RATING}_{s=2}$ | $-0.0029^{**}$ | $-0.0041^{***}$ | $-0.0040^{***}$ | $-0.0041^{**}$ |
| | (-2.48 ) | (-4.75) | (-2.60) | (-2.31) |
| $\text{RATING}_{s=4}$ | $-0.0023^{**}$ | $-0.0020$ | -0.0019 | $-0.0019$ |
| | (-2.19) | (-1.28) | (-0.89) | (-1.11) |
| $\text{RATING}_{s=5}$ | $0.0022^{**}$ | $0.0030^{***}$ | 0.0041 | $0.0041^{*}$ |
| | (1.97) | (2.56) | (1.48) | (1.82) |
| Controls | ✓ | ✓ | ✓ | ✓ |
| $R^2$ | 0.010 | 0.014 | 0.005 | 0.005 |
| Observations | 173,834 | 173,834 | 173,834 | 173,834 |
| Year-month FE | ✓ | | ✓ | ✓ |
| Industry FE | ✓ | | | |
| Year-month × Industry FE | | ✓ | | |
| Asset FE | | | ✓ | ✓ |
| Country FE | | | | ✓ |
| SE Cluster | Robust | Country | Country | Industry |



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Table 5 - *continued*

| Panel B: by Asset types | | | | |
|---|---|---|---|---|
| | Equities | | Bonds | |
| | (1) | (2) | (3) | (4) |
| $\text{RATING}_{s=1}$ | -0.0018 | $-0.0030$ | -0.0005 | $-0.011^{**}$ |
| | (-0.94) | (-1.38) | (-0.29) | (-2.50) |
| $\text{RATING}_{s=2}$ | $-0.0044^{***}$ | $-0.0040^{***}$ | $-0.0022^{***}$ | $-0.0036^{***}$ |
| | (-4.49) | (-4.33) | (-6.41) | (-6.82) |
| $\text{RATING}_{s=4}$ | -0.0018 | -0.0019 | -0.0012 | -0.0030 |
| | (-1.28) | (-0.73) | (-1.61) | (-0.72) |
| $\text{RATING}_{s=5}$ | $0.0040^{***}$ | 0.0047 | $0.0032^{***}$ | 0.0004 |
| | (2.84) | (1.39) | (2.60) | (0.88) |
| Controls | ✓ | ✓ | ✓ | ✓ |
| $R^2$ | 0.011 | 0.013 | 0.008 | 0.017 |
| Observations | 133,054 | 133,054 | 40,780 | 40,780 |
| Year-month FE | | ✓ | | ✓ |
| Year-month × Industry FE | ✓ | | ✓ | |
| Asset FE | | ✓ | | ✓ |
| SE Cluster | Country | Country | Country | Country |

| Panel C: by Client types | | | | |
|---|---|---|---|---|
| | Advisory | | Execution Only | |
| | (1) | (2) | (3) | (4) |
| $\text{RATING}_{s=1}$ | -0.0004 | -0.0019 | $-0.0022^{*}$ | $-0.0061^{*}$ |
| | (-0.22) | (-1.09) | (-1.68) | (-1.85) |
| $\text{RATING}_{s=2}$ | $-0.0020^{**}$ | $-0.0037^{***}$ | $-0.0056^{***}$ | $-0.0035$ |
| | (-2.10) | (-3.02) | (-5.96) | (-1.28) |
| $\text{RATING}_{s=4}$ | -0.0016 | -0.0011 | $-0.0025^{**}$ | $-0.035^{*}$ |
| | (-1.54) | (-0.48) | (-1.99) | (-1.73) |
| $\text{RATING}_{s=5}$ | $0.0057^{***}$ | $0.0082^{**}$ | -0.0010 | -0.0013 |
| | (6.40) | (2.17) | (-0.65) | (-0.48) |
| Controls | ✓ | ✓ | ✓ | ✓ |
| $R^2$ | 0.009 | 0.003 | 0.028 | 0.026 |
| Observations | 102,508 | 102,508 | 71,326 | 71,326 |
| Year-month FE | | ✓ | | ✓ |
| Year-month × Industry FE | ✓ | | ✓ | |
| Asset FE | | ✓ | | ✓ |
| SE Cluster | Country | Country | Country | Country |



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**Table 6:** Difference-in-Difference Regressions

This table reports the regression results for the estimations of equation (3). The columns present the results for entire sample, equities, bonds, advisory clients, and execution-only clients. We present different combinations of fixed effects and clustered standard errors. *, **, *** indicate significance at the 10 %, 5 %, and 1% levels, respectively.

| | Entire Sample | | | Asset Type | | | | Client Type | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | Equity | | Bond | | Advisory | | Execution Only | |
| | | | | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) |
| Treat * Post * High_ESG | $0.016^{**}$ | 0.016 | 0.0052 | 0.0068 | 0.0071 | 0.0003 | -0.0006 | $0.016^{*}$ | $0.015^{*}$ | 0.0093 | -0.0002 |
| | (1.98) | (0.95) | (0.85) | (0.80) | (0.77) | (0.98) | (-0.05) | (1.68) | (1.68) | (0.01) | (-0.01) |
| Treat * Post * Low_ESG | $-0.026^{**}$ | $-0.028^{***}$ | $-0.028^{**}$ | $-0.027^{***}$ | $-0.026^{**}$ | $-0.047^{*}$ | $-0.049^{*}$ | $-0.016^{***}$ | $-0.015^{***}$ | $-0.046^{***}$ | $-0.043^{***}$ |
| | (-2.39) | (-2.67) | (-2.28) | (-2.93) | (-2.55) | (-1.80) | (-1.71) | (-3.58) | (-3.24) | (3.20) | (-2.99) |
| Controls | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Industry FE | ✓ | ✓ | | ✓ | | ✓ | | ✓ | | ✓ | |
| Asset FE | | | ✓ | | ✓ | | ✓ | | ✓ | | ✓ |
| SE Cluster | Robust | Country | Country | Country | Country | Country | Country | Country | Country | Country | Country |
| $R^2$ | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.002 | 0.002 | 0.003 | 0.003 | 0.003 | 0.003 |
| Observations | 392,192 | 392,192 | 392,192 | 234,320 | 234,320 | 157,872 | 157,872 | 235,929 | 235,929 | 156,263 | 156,263 |



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**Table 7:** Sustainability Ratings Changes

This table reports the frequency count of asset-months with sustainability ratings changes relative to the previous month over the period January 2016 to December 2019. The frequency count is separately reported for equities and bonds, and the sustainability rating changes are divided into one-notch ratings upgrades, and one-notch rating downgrades as well as ratings changes greater than one-notch.

Panel A: Sustainability ratings changes

| | Equities | Bonds |
|---|---|---|
| Total ratings changes | 3688 | 2628 |
| One-notch changes | 3291 | 2295 |
| Upgrades greater than one-notch | 347 | 278 |
| Downgrades greater than one-notch | 50 | 55 |

Panel B: One-notch up and downgrades

| | Equity | | Bond | |
|---|---|---|---|---|
| Sustainability rating after Change | One-notch rating upgrade | One-notch rating downgrade | One-notch rating upgrade | One-notch rating downgrade |
| 1 | N/A | 289 | N/A | 162 |
| 2 | 289 | 425 | 166 | 224 |
| 3 | 541 | 372 | 242 | 295 |
| 4 | 624 | 253 | 333 | 375 |
| 5 | 498 | N/A | 498 | N/A |



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**Table 8:** Cumulative Standardized Abnormal Flows

This table reports the average cumulative standardized abnormal asset flows $CSAF_t$ following up and down sustainability rating changes. Standardized abnormal asset flows at time $t$ are defined as the actual flow minus the expected flow standardized by the forecast standard error, as described in Dodd and Warner (1983). To calculate the expected asset flow, we estimate the coefficients of the benchmark model for each asset individually over an estimation window of 24 months (t = [-24; -1] ). The $CSAF$ are computed for each asset by summing the standardized abnormal flows over the event period. The table reports results for the entire sample, and by client type and asset class. *, **, *** indicate significance at the 10%, 5%, and 1% level, respectively.

| | Entire Sample | | | | Advisory | | | | Execution-Only | | | | Equity | | | | Bond | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Event | UP | | DOWN | | UP | | DOWN | | UP | | DOWN | | UP | | DOWN | | UP | | DOWN | |
| month | $\overline{\text{CSAF}}_t$ | $t$-value | $\overline{\text{CSAF}}_t$ | $t$-value | $\overline{\text{CSAF}}_t$ | $t$-value | $\overline{\text{CSAF}}_t$ | $t$-value | $\overline{\text{CSAF}}_t$ | $t$-value | $\overline{\text{CSAF}}_t$ | $t$-value | $\overline{\text{CSAF}}_t$ | $t$-value | $\overline{\text{CSAF}}_t$ | $t$-value | $\overline{\text{CSAF}}_t$ | $t$-value | $\overline{\text{CSAF}}_t$ | $t$-value |
| 1 | 0.04 | (1.24) | 0.02 | (0.18) | 0.15** | (2.04) | 0.04 | (0.86) | 0.02 | (0.36) | 0.02 | (0.68) | 0.07 | (0.30) | -0.01 | (-0.30) | 0.28** | (1.97) | 0.08 | (1.05) |
| 2 | 0.11* | (1.74) | -0.03 | (-0.64) | 0.46*** | (3.59) | -0.03 | (-0.07) | 0.05 | (1.25) | 0.04 | (1.32) | 0.12 | (0.99) | -0.15 | (-0.97) | 0.28* | (1.75) | 0.01 | (0.27) |
| 3 | 0.32*** | (2.78) | -0.04 | (-0.69) | 0.39* | (1.75) | -0.04 | (-0.26) | 0.09 | (0.62) | 0.14 | (0.21) | 0.14 | (1.45) | -0.01 | (-0.80) | 0.29*** | (3.61) | -0.02 | (-0.09) |
| 4 | 0.42*** | (2.87) | 0.03 | (0.32) | 0.41* | (1.84) | -0.01 | (-0.09) | 0.13 | (1.16) | -0.16 | (-0.72) | 0.29** | (1.98) | 0.03 | (0.07) | 0.34*** | (3.86) | 0.03 | (0.47) |
| 5 | 0.33*** | (2.99) | 0.03 | (0.69) | 0.40*** | (3.14) | -0.03 | (-0.17) | 0.13* | (1.66) | 0.00 | (-1.12) | 0.04 | (0.62) | 0.02 | (0.12) | 0.41*** | (3.28) | 0.06 | (0.73) |
| 6 | 0.36*** | (2.72) | -0.02 | (-0.22) | 0.26* | (1.76) | 0.01 | (0.01) | 0.06 | (0.61) | -0.02 | (-0.16) | 0.11 | (1.15) | -0.09 | (-0.26) | 0.34*** | (3.36) | 0.02 | (0.21) |



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**Table 9:** Cumulative Standardized Abnormal Flows by Country

This table reports the average cumulative standardized abnormal asset flows $CSAF_t$ following up and down sustainability rating changes by country. Standardized abnormal asset flows at time $t$ are defined as the actual flow minus the expected flow standardized by the forecast standard error, as described in Dodd and Warner (1983). To calculate the expected asset flow, we estimate the coefficients of the benchmark model for each asset individually over an estimation window of 24 months (t = [-24; -1] ). The $CSAF$ are computed for each asset by summing the standardized abnormal flows over the event period. The table reports results by client type and country where Panel A reports results for the Netherlands, Panel B for Belgium, Panel C for Germany and Panel D for France. *, **, *** indicate significance at the 10%, 5%, and 1% level, respectively.

| | Advisory | | | | Execution-Only | | | |
|---|---|---|---|---|---|---|---|---|
| Event | UP | | DOWN | | UP | | DOWN | |
| month | $\overline{\text{CSAF}}_t$ | $t$-stat | $\overline{\text{CSAF}}_t$ | $t$-stat | $\overline{\text{CSAF}}_t$ | $t$-stat | $\overline{\text{CSAF}}_t$ | $t$-stat |
| | Panel A: Netherlands | | | | | | | |
| 1 | 0.08* | (1.88) | 0.03 | (0.39) | 0.05 | (1.36) | 0.07 | (1.57) |
| 2 | 0.13*** | (3.09) | 0.02 | (0.33) | 0.08** | (1.97) | -0.02 | (-0.23) |
| 3 | 0.17*** | (4.03) | 0.04 | (0.56) | 0.07* | (1.68) | 0.03 | (0.41) |
| 4 | 0.12*** | (2.90) | 0.05 | (0.82) | 0.08* | (1.92) | 0.02 | (0.32) |
| 5 | 0.13*** | (3.08) | 0.05 | (0.74) | 0.07* | (1.84) | 0.01 | (0.16) |
| 6 | 0.14*** | (3.08) | 0.05 | (0.70) | 0.07* | (1.80) | 0.02 | (0.31) |
| | Panel B: Belgium | | | | | | | |
| 1 | 0.13** | (2.24) | 0.01 | (0.07) | 0.04 | (0.68) | -0.04 | (-0.38) |
| 2 | 0.21*** | (3.68) | -0.07 | (-0.72) | 0.10 | (1.63) | -0.05 | (-0.45) |
| 3 | 0.23*** | (3.91) | 0.03 | (0.28) | 0.10* | (1.70) | 0.04 | (0.42) |
| 4 | 0.24*** | (4.15) | 0.09 | (0.99) | 0.11* | (1.77) | 0.02 | (0.21) |
| 5 | 0.23*** | (3.99) | 0.09 | (0.96) | 0.19*** | (3.08) | 0.05 | (0.46) |
| 6 | 0.20*** | (3.42) | 0.11 | (1.09) | 0.19*** | (3.09) | 0.13 | (1.21) |
| | Panel C: Germany | | | | | | | |
| 1 | 0.04 | (0.92) | -0.07 | (-1.11) | 0.03 | (0.19) | -0.01 | (-0.07) |
| 2 | 0.04 | (1.02) | 0.03 | (0.47) | −0.01 | (-0.06) | 0.03 | (0.25) |
| 3 | 0.08* | (1.83) | -0.02 | (-0.37) | −0.08 | (-0.63) | 0.05 | (0.36) |
| 4 | 0.06 | (1.30) | -0.07 | (-1.02) | −0.08 | (-0.62) | 0.05 | (0.40) |
| 5 | −0.03 | (-0.81) | -0.03 | (-0.45) | −0.01 | (-0.11) | 0.12 | (0.87) |
| 6 | 0.09** | (2.10) | -0.01 | (-0.07) | −0.02 | (-0.12) | 0.10 | (0.74) |
| | Panel D: France | | | | | | | |
| 1 | −0.07 | (-0.86) | 0.01 | (0.06) | 0.07 | (0.29) | 0.04 | (0.19) |
| 2 | −0.02 | (-0.27) | 0.04 | (0.28) | 0.04 | (0.19) | 0.03 | (0.15) |
| 3 | 0.01 | (0.07) | 0.10 | (0.71) | 0.10 | (0.44) | 0.08 | (0.38) |
| 4 | 0.05 | (0.57) | 0.15 | (1.01) | 0.10 | (0.43) | 0.08 | (0.38) |
| 5 | 0.09 | (0.99) | 0.16 | (1.09) | 0.10 | (0.45) | 0.08 | (0.37) |
| 6 | 0.07 | (0.75) | 0.14 | (1.00) | 0.10 | (0.44) | 0.08 | (0.38) |



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**Table 10:** Cumulative Standardized Abnormal Flows Cross-sectional Regression

This table reports the regression results for the estimation of equation 6. Panel A reports results for the entire sample, Panel B by asset type, and Panel C by client type. We present different combinations of fixed effects and clustered standard errors. Control coefficients are omitted. The $t$ statistics are given in parentheses. *, **, *** denotes significance at the 10%, 5% and 1% level, respectively.

Panel A: Entire Sample

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| UP * NL | 0.094*** | 0.10*** | 0.094* | 0.10* |
| | (2.58) | (2.76) | (1.69) | (1.74) |
| UP * GE | 0.079 | 0.083 | 0.079 | 0.083 |
| | (1.52) | (1.58) | (0.99) | (1.03) |
| UP * BE | 0.16*** | 0.17*** | 0.16** | 0.17** |
| | (3.44) | (3.58) | (2.24) | (2.27) |
| Controls | ✓ | ✓ | ✓ | ✓ |
| $R^2$ | 0.010 | 0.010 | 0.010 | 0.010 |
| Observations | 20,100 | 20,100 | 20,100 | 20,100 |
| Industry FE | ✓ | ✓ | ✓ | ✓ |
| Client-type FE | | ✓ | | ✓ |
| Event-month FE | | | ✓ | ✓ |
| SE Cluster | Asset and Event-month | Asset and Event-month | Year-month | Year-month |

Panel B: by Asset types

| | Equity | | Bond | |
|---|---|---|---|---|
| | (2) | (3) | (2) | (3) |
| UP * NL | 0.12*** | 0.12** | -0.14 | -0.14 |
| | (3.33) | (2.13) | (-0.58) | (-0.19) |
| UP * GE | 0.09 | 0.09 | 0.15*** | 0.15** |
| | (0.59) | (1.08) | (3.09) | (1.98) |
| UP * BE | 0.16*** | 0.16** | -0.03 | -0.03 |
| | (3.31) | (2.07) | (-0.11) | (-0.04) |
| Controls | ✓ | ✓ | ✓ | ✓ |
| $R^2$ | 0.016 | 0.019 | 0.022 | 0.022 |
| Observations | 17,274 | 17,274 | 2,826 | 2,826 |
| Industry FE | ✓ | ✓ | ✓ | ✓ |
| Client-type FE | ✓ | | ✓ | |
| Event-month FE | | ✓ | | ✓ |
| SE Cluster | Asset and Event-month | Year-month | Asset and Event-month | Year-month |

Panel C: by Client types

| | Advisory | | Execution Only | |
|---|---|---|---|---|
| | (2) | (3) | (2) | (3) |
| UP * NL | 0.13** | 0.13 | 0.035 | 0.035 |
| | (2.45) | (1.60) | (0.60) | (0.16) |
| UP * GE | 0.10 | 0.10 | -0.09 | -0.09 |
| | (1.56) | (1.03) | (-1.37) | (-0.50) |
| UP * BE | 0.17*** | 0.17* | 0.10 | 0.10 |
| | (2.61) | (1.75) | (1.35) | (0.47) |
| Controls | ✓ | ✓ | ✓ | ✓ |
| $R^2$ | 0.013 | 0.013 | 0.028 | 0.028 |
| Observations | 12,270 | 12,270 | 7,830 | 7,830 |
| Industry FE | ✓ | ✓ | ✓ | ✓ |
| Client-type FE | | | | |
| Event-month FE | | ✓ | | ✓ |
| SE Cluster | Asset and Event-month | Year-month | Asset and Event-month | Year-month |



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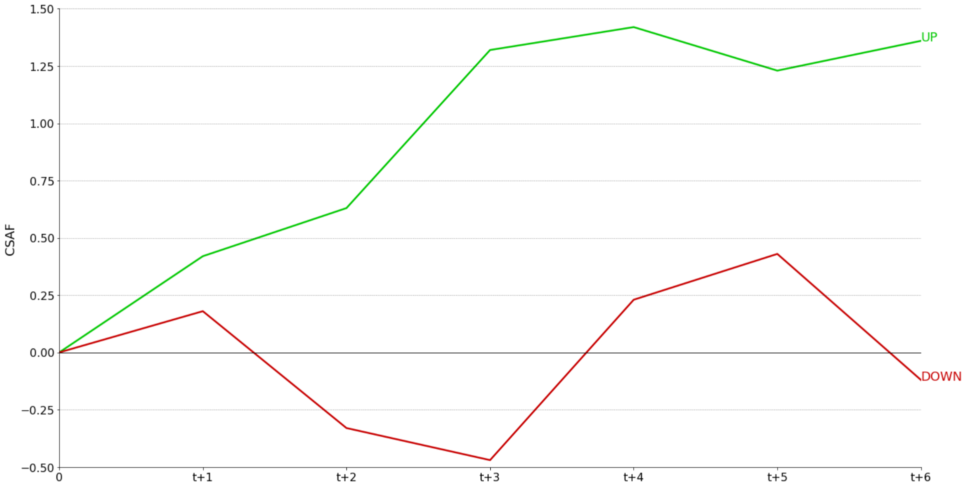
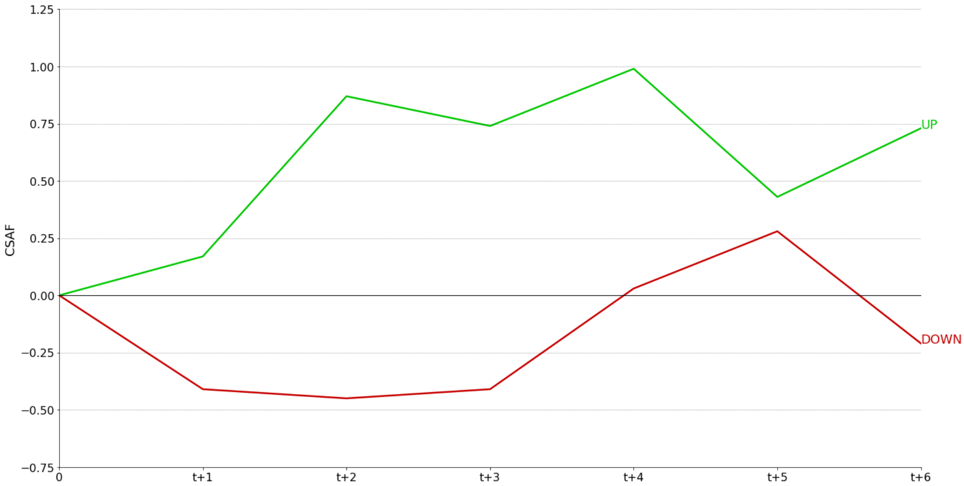
**Figure 1:** Average Cumulative Standardized Abnormal Flows

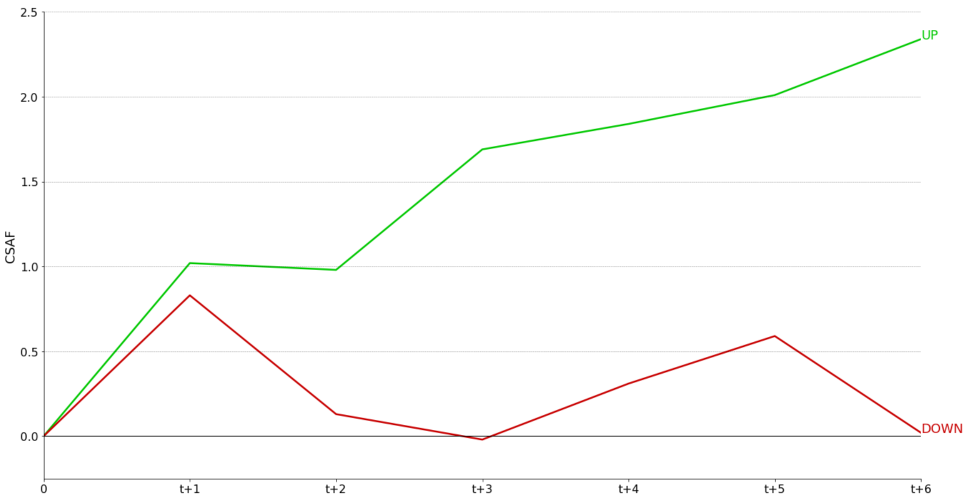
This figure shows the average cumulative standardized abnormal flows over the six months following the sustainability ratings changes (up versus down) for all assets in (a), equity only in (b), and bonds only in (c).




**(a)** All assets




**(b)** Equity




**(c)** Bond



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# A Appendix: Sustainability Rating Methodologies

As discussed in section 2.3, ABN AMRO clients are presented sustainability ratings based on two different methodologies during the sample period: the ABN AMRO and the Morningstar methodology. Both methodologies use the Sustainalytics ESG and Controversy scores as input, but use them in different ways. These two metrics constitute the starting point in the computation of sustainability ratings. In this section, we will first outline how the sustainability ratings are calculated under the ABN AMRO methodology. Next, we describe how the sustainability ratings are calculated under the Morningstar measure.

## A.1 ABN AMRO Methodology

The first two components needed to determine the ABN AMRO Sustainability ratings are the ESG and Controversy ratings. The ESG ratings (from 1 to 5) are computed based on the ESG score of a company in the Sustainalytics database relative to other companies in the same Industry Group. Furthermore, for each type of controversy, the controversy category is derived from the Sustainalytics controversy score. The table below sets the correspondence between the quantiles of the distribution of ESG scores within Industry group and the ESG Rating, as well as the definition of the Controversy rating versus the controversy score.

**Table A1:** Definition ABN AMRO ESG and Controversy ratings

| Percentile Range | ESG Rating |
|---|---|
| $0\% \leq \text{Pct} < 7\%$ | 1 |
| $7\% \leq \text{Pct} < 31\%$ | 2 |
| $31\% \leq \text{Pct} < 69$ | 3 |
| $69\% \leq \text{Pct} < 93\%$ | 4 |
| $93\% \leq \text{Pct} \leq 100\%$ | 5 |

| Controversy Score | Controversy Category |
|---|---|
| $99 < \text{CScore} \leq 100$ | 0 |
| $80 < \text{CScore} \leq 99$ | 1 |
| $50 < \text{CScore} \leq 80$ | 2 |
| $20 < \text{CScore} \leq 50$ | 3 |
| $0 < \text{CScore} < \leq 20$ | 4 |
| $\text{CScore} = 0$ | 5 |

The third part in the computation of the sustainability rating is the policy component, which refers to the availability and quality of policies of companies in high risk sectors, and is characterized by a flag which is equal to zero if all required policies are available and to one otherwise. Policies in high risk sectors that are required by the bank are a Bribery & Corruption Policy, a Freedom of Association Policy, Social Supplier Standards, and an Environmental Policy.

Based on the three components (i.e. ESG, Controversy and Policy), the ABN AMRO sustainability ratings are calculated as follows

1. Start with the ESG rating.



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2. Subtract one if policies in risk sectors are not available.
3. Subtract one for controversy category 3, subtract two for controversy category 4, assign sustainability rating of one for controversy category 5.
4. Require the resulting sustainability rating to be $\geq$1.

## A.2 Morningstar Methodology

The sustainability ratings under the Morningstar measure are also calculated based on Sustainalytics ESG and Controversy scores. To make the Sustainalytics ESG scores comparable across peer groups, Morningstar first normalizes the scores of each peer group using the following transformation

$$Z_{peer} = \frac{ESG - \mu_{peer}}{\sigma_{peer}}, \tag{7}$$

where $ESG$ corresponds to the Sustainalytics ESG score, $\mu_{peer}$ is the peer group mean of the ESG score, and $\sigma_{peer}$ the peer group standard deviation of the ESG scores. Next, Morningstar normalizes the z-scores such that they are on a 0-100 scale with a mean of 50, i.e.

$$ESGNormalized = 50 + (Z_{peer} * 10) \tag{8}$$

Morningstar further uses the Sustainalytics controversy scores, which are converted to controversy categories (from 0 to 5) in the same way as given in Table A1. To calculate sustainability ratings, Morningstar rescales the controversy ratings by creating a controversy deduction as given in Table A2. Next, it naturally follows that the sustainability score is calculated as

$$Sustainability\ score = ESGNormalized - Controversy\ Deduction. \tag{9}$$

**Table A2:** Controversy Deduction

| Controversy rating | Controversy Deduction |
|---|---|
| 0 | 0 |
| 1 | 0.2 |
| 2 | 4 |
| 3 | 10 |
| 4 | 16 |
| 5 | 20 |

In order to calculate the Morningstar Sustainability ratings (from 1-5), the Morningstar historical sustainability score is calculated as a weighted average of the trailing 12



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months sustainability scores. Specifically, the historical sustainability score is computed as

$$Historical\ Sustainability\ score = \frac{\sum_{t=1}^{12}(12-t) * Portfolio\_Sustainability_t}{\sum_{t=1}^{12} t}, \quad (10)$$

which results in recent ratings being weighted more heavily than distant ratings.

Based on the Morningstar Historical Sustainability Score, companies are assigned absolute category ranks and percent ranks within their Morningstar Global Categories. The exact rating distribution is summarized in Table A3 below.

**Table A3:** Definition Morningstar Sustainability rating

| Percentile Range Historical Sustainability Score | Sustainability Rating |
|---|---|
| 90% $<$ Pct $\leq$ 100 | 5 |
| 67.5% $<$ Pct $\leq$ 90% | 4 |
| 32.5% $<$ Pct $\leq$ 67.5 | 3 |
| 10% $<$ Pct $\leq$ 32.5% | 2 |
| 0% $\leq$ Pct $\leq$ 10% | 1 |



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# Internet Appendix to
# Sustainability and Private Wealth Investment Flows

April 15, 2020

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**Table IA-1:** Summary Statistics

This table reports summary statistics for variables used in the panel regressions.

| | Mean | Std. Dev. | 25th Percentile | Median | 75th Percentile |
|---|---|---|---|---|---|
| Flow | 3.31% | 0.022 | -0.0032 | 0.016 | 3.09 |
| Return | 0.89% | 57.51 | -2.06 | 0.13 | 3.92 |
| Delta Alpha | -0.00036 | 0.011 | -0.0038 | -0.000018 | 0.0034 |
| Delta Alpha Squared | 0.011 | 3.93 | $5.81e^{-7}$ | $1.26\ e^{-5}$ | $6.87\ e^{-5}$ |
| $\text{RATING}_{s=1}$ | 0.10 | 0.30 | 0.00 | 0.00 | 0.00 |
| $\text{RATING}_{s=2}$ | 0.17 | 0.38 | 0.00 | 0.00 | 0.00 |
| $\text{RATING}_{s=4}$ | 0.25 | 0.44 | 0.00 | 0.00 | 1.00 |
| $\text{RATING}_{s=5}$ | 0.21 | 0.41 | 0.00 | 0.00 | 0.00 |

**Table IA-2:** Country Exposure by Investor Country of Residence

This table reports the portfolio country composition (in %) by country of residence of the investors in the sample.

| | Dutch Investors | | German Investors | | French Investors | | Belgian Investors | |
|---|---|---|---|---|---|---|---|---|
| Ranking | Country | Exp. | Country | Exp. | Country | Exp. | Country | Exp. |
| 1 | NL | 0.71 | GE | 0.67 | FR | 0.68 | US | 0.24 |
| 2 | US | 0.11 | CH | 0.15 | CH | 0.11 | NL | 0.20 |
| 3 | GB | 0.05 | US | 0.08 | US | 0.09 | FR | 0.17 |
| 4 | CH | 0.04 | XS | 0.02 | XS | 0.08 | CH | 0.08 |
| 5 | GE | 0.02 | FR | 0.02 | GE | 0.03 | BE | 0.06 |



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**Table IA-3:** Asset Holdings Panel Regression

This table reports the regression results for the estimation the following equation:

$$\begin{aligned} Holding^{c}_{i,t} = \zeta + \beta_1 \mathrm{RET}^{i}_{t-1} + \beta_2 \Delta\alpha^{i}_{t-1} + \beta_3 (\Delta\alpha^{i}_{t-1})^2 + \beta_4 RATING_{s=1} \\ + \beta_5 RATING_{s=2} + \beta_6 RATING_{s=4} + \beta_7 RATING_{s=5} + \epsilon^{c}_{i,t}, \end{aligned} \tag{11}$$

where the dependent variable is $Holding^{c}_{i,t}$, which corresponds to the holding in asset $i$. The $t$ statistics are given in parentheses. *, **, *** denotes significance at the 10%, 5% and 1% level, respectively.

| Panel A: Entire Sample | | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| $\mathrm{RATING}_{s=1}$ | -2.06e$^{6***}$ | -9.33e$^{5**}$ | -2.45e$^{5}$ | -3.11e$^{5}$ |
| | (-6.74) | (-2.12) | (-0.48) | (-0.62) |
| $\mathrm{RATING}_{s=2}$ | 2.63e$^{6***}$ | 3.46e$^{6*}$ | 3.63e$^{6}$ | 3.64e^6 |
| | (3.55) | (1.76) | (1.46) | (1.48) |
| $\mathrm{RATING}_{s=4}$ | 4.39e$^{6***}$ | 4.99e$^{6*}$ | 5.38e$^{6**}$ | 5.22e$^{6**}$ |
| | (8.20) | (1.92) | (2.12) | (2.15) |
| $\mathrm{RATING}_{s=5}$ | 5.86e$^{6***}$ | 5.42e$^{6**}$ | 6.29e$^{6***}$ | 6.02e$^{6***}$ |
| | (9.66) | (2.30) | (2.70) | (2.78) |
| Controls | ✓ | ✓ | ✓ | ✓ |
| $R^2$ | 0.007 | 0.005 | 0.002 | 0.001 |
| Observations | 173,834 | | | |
| Year-month FE | ✓ | | ✓ | |
| Industry FE | ✓ | | | |
| Year-month × Industry FE | | ✓ | | |
| Country FE | | | ✓ | |
| Year-month × Country FE | | | | ✓ |
| SE Cluster | Robust | Country | Industry | Industry |



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Table IA-3 - *continued*

| Panel B: by Asset types | | | | |
|---|---|---|---|---|
| | Equity | | Bond | |
| | (2) | (4) | (2) | (4) |
| $RATING_{s=1}$ | $-1.56e^{6**}$ | $-4.46e^{5}$ | $-6.55e^{4}$ | $3.74e^{4}$ |
| | (-2.40) | (-0.73) | (-1.43) | (0.27) |
| $RATING_{s=2}$ | $4.53e^{6*}$ | $4.66e^{6}$ | $-4.59e^{4}$ | $-4.14e^{4}$ |
| | (1.67) | (1.41) | (-0.67) | (-0.42) |
| $RATING_{s=4}$ | $6.44e^{6*}$ | $6.65e^{6**}$ | $5.16e^{5}$ | $5.93e^{5**}$ |
| | (1.85) | (2.14) | (1.50) | (2.33) |
| $RATING_{s=5}$ | $8.97e^{6**}$ | $8.92e^{6***}$ | $3.64e^{5*}$ | $5.71e^{5***}$ |
| | (2.04) | (2.82) | (1.85) | (2.71) |
| Controls | ✓ | ✓ | ✓ | ✓ |
| $R^2$ | 0.005 | 0.002 | 0.005 | 0.029 |
| Observations | 133,054 | | 40,780 | |
| Year-month × Industry FE | ✓ | | ✓ | |
| Year-month × Country FE | | ✓ | | ✓ |
| SE Cluster | Country | Industry | Country | Industry |

| Panel C: by Client types | | | | |
|---|---|---|---|---|
| | Advisory | | Execution Only | |
| | (2) | (4) | (2) | (4) |
| $RATING_{s=1}$ | $2.28e^{5}$ | $3.12e^{5}$ | $-2.88e^{6**}$ | $-1.89e^{6}$ |
| | (1.27) | (0.72) | (-2.36) | (-1.49) |
| $RATING_{s=2}$ | $9.52e^{5}$ | $1.08e^{6}$ | $7.39e^{6}$ | $7.44e^{6}$ |
| | (1.49) | (1.39) | (0.95) | (1.29) |
| $RATING_{s=4}$ | $1.03e^{6**}$ | $1.03e^{6***}$ | $1.06e^{7**}$ | $1.11e^{7**}$ |
| | (2.22) | (2.84) | (2.06) | (2.01) |
| $RATING_{s=5}$ | $1.49e^{6***}$ | $1.75e^{6***}$ | $1.11e^{7**}$ | $1.20e^{7**}$ |
| | (2.76) | (3.35) | (2.32) | (2.36) |
| Controls | ✓ | ✓ | ✓ | ✓ |
| $R^2$ | 0.004 | 0.011 | 0.002 | 0.002 |
| Observations | 102,508 | | 71,326 | |
| Year-month × Industry FE | ✓ | | ✓ | |
| Year-month × Country FE | | ✓ | | ✓ |
| SE Cluster | Country | Industry | Country | Industry |



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**Table IA-4:** Cumulative Standardized Abnormal Flows by Sustainability Ratings Change

This table reports the average cumulative standardized abnormal asset flows $CSAF_t$ following up and down sustainability rating changes by ratings category for one-notch changes. Standardized abnormal asset flows at time $t$ are defined as the actual flow minus the expected flow standardized by the forecast standard error, as described in Dodd and Warner (1983). To calculate the expected asset flow, we estimate the coefficients of the benchmark model for each asset individually over an estimation window of 24 months (t = [-24; -1] ). The $CSAF$ are computed for each asset by summing the standardized abnormal flows over the event period. Results for the entire sample are reported in Panel A, for advisory clients in Panel B, for execution-only clients in Panel C, for equities in Panel D, and for bonds in Panel E. *, **, *** indicate significance at the 10 %, 5 %, and 1% levels, respectively.

| Event | From 1 to 2 | | From 2 to 3 | | From 3 to 4 | | From 4 to 5 | | From 5 to 4 | | From 4 to 3 | | From 3 to 2 | | From 2 to 1 | | UP | | DOWN | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| month | $\overline{\text{CSAF}}_t$ | $t$-value | $\overline{\text{CSAF}}_t$ | $t$-value | $\overline{\text{CSAF}}_t$ | $t$-value | $\overline{\text{CSAF}}_t$ | $t$-value | $\overline{\text{CSAF}}_t$ | $t$-value | $\overline{\text{CSAF}}_t$ | $t$-value | $\overline{\text{CSAF}}_t$ | $t$-value | $\overline{\text{CSAF}}_t$ | $t$-value | $\overline{\text{CSAF}}_t$ | $t$-value | $\overline{\text{CSAF}}_t$ | $t$-value |
| | Panel A: Entire sample | | | | | | | | | | | | | | | | | | | |
| 1 | 0.04 | (0.39) | 0.09 | (0.34) | 0.03 | (0.15) | 0.04 | (1.47) | 0.08 | (1.08) | -0.04 | (-0.46) | 0.03 | (0.17) | -0.07 | (-0.14) | 0.04 | (1.24) | 0.02 | (0.18) |
| 2 | 0.03 | (0.31) | 0.09* | (1.74) | -0.03 | (-0.23) | 0.18* | (1.66) | 0.03 | (0.35) | -0.04 | (-1.46) | 0.02 | (0.42) | -0.06 | (-0.41) | 0.11* | (1.74) | -0.03 | (-0.64) |
| 3 | 0.04 | (0.91) | 0.45*** | (3.16) | -0.04 | (-0.82) | 0.34*** | (3.05) | 0.01 | (0.17) | -0.06 | (-1.22) | 0.05 | (0.01) | -0.09 | (-0.19) | 0.32*** | (2.78) | -0.04 | (-0.69) |
| 4 | 0.07 | (1.46) | 0.42*** | (3.54) | -0.01 | (-0.16) | 0.37*** | (3.65) | 0.06 | (0.19) | -0.03 | (-0.97) | 0.04 | (0.95) | 0.03 | (0.77) | 0.42*** | (2.87) | 0.03 | (0.32) |
| 5 | 0.02 | (0.31) | 0.29*** | (2.83) | 0.04 | (1.52) | 0.08 | (1.16) | -0.07 | (-0.32) | -0.01 | (-0.35) | 0.07 | (1.46) | 0.03 | (0.15) | 0.33*** | (2.72) | 0.03 | (-0.22) |
| 6 | 0.04 | (0.54) | 0.22** | (2.15) | 0.28** | (2.20) | 0.32** | (2.46) | -0.12 | (-0.38) | -0.04 | (-0.55) | 0.06 | (0.51) | -0.03 | (-0.01) | 0.36*** | (2.72) | -0.02 | (-0.22) |
| | Panel B: Advisory Clients | | | | | | | | | | | | | | | | | | | |
| 1 | 0.12 | (0.28) | 0.04 | (1.21) | 0.03 | (0.45) | 0.30* | (1.87) | -0.07 | (-0.33) | 0.04 | (1.42) | 0.03 | (0.49) | 0.06 | (0.04) | 0.15** | (2.04) | 0.04 | (0.86) |
| 2 | 0.05 | (0.26) | 0.06 | (0.29) | 0.07 | (0.31) | 0.31*** | (4.03) | -0.03 | (-0.13) | -0.04 | (-0.14) | 0.02 | (0.20) | -0.02 | (-0.04) | 0.46*** | (3.59) | -0.03 | (-0.07) |
| 3 | -0.02 | (-0.17) | 0.02 | (0.99) | 0.04 | (0.88) | 0.32 | (1.38) | -0.03 | (-0.35) | 0.02 | (0.30) | 0.02 | (0.15) | -0.07 | (-0.44) | 0.39* | (1.75) | -0.04 | (-0.26) |
| 4 | -0.03 | (-0.04) | 0.03 | (1.11) | 0.02 | (0.25) | 0.33* | (1.94) | -0.08 | (-0.34) | -0.04 | (-0.16) | -0.05 | (-0.15) | 0.02 | (0.24) | 0.41* | (1.84) | -0.01 | (-0.09) |
| 5 | 0.03 | (0.56) | 0.33** | (2.05) | 0.03 | (1.35) | 0.39*** | (3.64) | -0.04 | (-0.51) | -0.05 | (-0.12) | 0.02 | (0.47) | -0.03 | (-0.28) | 0.40*** | (3.14) | -0.03 | (-0.17) |
| 6 | 0.03 | (0.08) | 0.04 | (0.62) | 0.02 | (0.59) | 0.14** | (2.29) | -0.08 | (-0.59) | 0.03 | (0.05) | 0.05 | (0.98) | -0.02 | (-0.54) | 0.26* | (1.76) | 0.01 | (0.01) |



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Table IA-4 - *continued*

| Event | From 1 to 2 | | From 2 to 3 | | From 3 to 4 | | From 4 to 5 | | From 5 to 4 | | From 4 to 3 | | From 3 to 2 | | From 2 to 1 | | UP | | DOWN | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| month | $\overline{\text{CSAF}}_t$ | $t$-stat | $\overline{\text{CSAF}}_t$ | $t$-stat | $\overline{\text{CSAF}}_t$ | $t$-stat | $\overline{\text{CSAF}}_t$ | $t$-stat | $\overline{\text{CSAF}}_t$ | $t$-stat | $\overline{\text{CSAF}}_t$ | $t$-stat | $\overline{\text{CSAF}}_t$ | $t$-stat | $\overline{\text{CSAF}}_t$ | $t$-stat | $\overline{\text{CSAF}}_t$ | $t$-stat | $\overline{\text{CSAF}}_t$ | $t$-stat |
| | Panel C: Execution-Only Clients | | | | | | | | | | | | | | | | | | | |
| 1 | 0.01 | (0.03) | 0.13* | (1.80) | -0.04 | (-0.08) | -0.01 | (-0.68) | 0.02 | (0.61) | 0.03 | (0.14) | 0.04 | (0.43) | 0.03 | (0.17) | 0.02 | (0.36) | 0.02 | (0.68) |
| 2 | -0.01 | (-0.05) | 0.23** | (2.50) | 0.01 | (0.15) | 0.05 | (0.09) | 0.04 | (0.99) | 0.03 | (0.13) | 0.04 | (0.71) | 0.02 | (0.88) | 0.05 | (1.25) | 0.04 | (1.32) |
| 3 | 0.06 | (0.24) | 0.03 | (0.62) | -0.06 | (-0.53) | 0.04 | (0.96) | -0.04 | (-0.18) | 0.12 | (0.98) | 0.05 | (1.00) | -0.12 | (-1.61) | 0.09 | (0.62) | 0.14 | (0.21) |
| 4 | -0.12 | (-0.24) | 0.05 | (0.48) | 0.06 | (1.07) | 0.07 | (0.67) | -0.06 | (-0.59) | 0.18 | (0.64) | -0.09 | (-0.21) | -0.08 | (-1.42) | 0.13 | (1.16) | -0.16 | (-0.72) |
| 5 | -0.11 | (-0.92) | 0.39* | (1.91) | 0.23* | (1.77) | 0.04 | (0.38) | 0.08 | (0.34) | 0.06 | (0.65) | -0.08 | (-0.37) | -0.08 | (-1.29) | 0.13* | (1.66) | 0.00 | (-1.21) |
| 6 | -0.09 | (-0.94) | 0.08 | (0.60) | 0.05 | (0.98) | 0.08 | (0.08) | 0.07 | (0.76) | 0.12 | (0.02) | 0.08 | (0.52) | −0.26* | (-1.73) | 0.06 | (0.61) | -0.02 | (-0.16) |
| | Panel D: Equity | | | | | | | | | | | | | | | | | | | |
| 1 | 0.01 | (0.33) | 0.05 | (0.19) | 0.08 | (0.34) | -0.03 | (-0.16) | 0.05 | (0.28) | -0.01 | (-0.66) | -0.01 | (0.04) | -0.02 | (-0.09) | 0.07 | (0.30) | -0.01 | (-0.30) |
| 2 | 0.02 | (0.42) | 0.28** | (2.11) | -0.03 | (-0.08) | -0.01 | (-0.13) | 0.03 | (0.16) | -0.04 | (-1.27) | -0.02 | (-0.41) | -0.01 | (-0.27) | 0.12 | (0.99) | -0.15 | (-0.97) |
| 3 | 0.11 | (1.05) | 0.22** | (2.14) | 0.12 | (0.05) | 0.03 | (0.16) | -0.11 | (-0.27) | -0.05 | (-0.87) | -0.04 | (-0.42) | 0.03 | (0.07) | 0.14 | (1.45) | -0.01 | (-0.80) |
| 4 | 0.09 | (1.58) | 0.32** | (2.24) | 0.02 | (0.38) | 0.04 | (0.36) | 0.02 | (0.09) | -0.05 | (-0.59) | -0.02 | (-0.14) | 0.04 | (0.91) | 0.29** | (1.98) | 0.03 | (0.07) |
| 5 | 0.02 | (0.29) | 0.58 | 1.16 | 0.01 | (0.04) | -0.05 | (-0.08) | -0.03 | (-0.17) | 0.01 | (0.02) | 0.01 | (0.10) | 0.03 | (0.26) | 0.04 | (0.62) | 0.02 | (0.12) |
| 6 | 0.04 | (0.57) | 0.18* | (1.70) | 0.05 | (0.37) | -0.03 | (-0.09) | -0.04 | (-0.31) | -0.03 | (-0.28) | 0.04 | (0.16) | -0.03 | (-0.11) | 0.11 | (1.15) | -0.09 | (-0.26) |
| | Panel E: Bond | | | | | | | | | | | | | | | | | | | |
| 1 | 0.04 | (0.23) | 0.01 | (0.37) | -0.04 | (-0.33) | 0.42*** | (2.84) | 0.08 | (1.21) | 0.04 | (0.16) | 0.06 | (0.44) | -0.08 | (-0.13) | 0.28** | (1.97) | 0.08 | (1.05) |
| 2 | -0.05 | (-0.13) | -0.09 | (-0.22) | -0.07 | (-0.34) | 0.45*** | (3.06) | 0.02 | (0.33) | -0.02 | (-0.73) | 0.17 | (1.61) | -0.11 | (-0.30) | 0.28* | (1.75) | 0.01 | (0.27) |
| 3 | -0.01 | (-0.02) | 0.32*** | (2.69) | -0.08 | (-1.02) | 0.54*** | (4.13) | 0.03 | (0.54) | -0.05 | (-0.88) | 0.02 | (0.74) | -0.03 | (-0.57) | 0.29*** | (3.61) | -0.02 | (-0.09) |
| 4 | 0.04 | (0.09) | 0.53*** | (3.27) | -0.06 | (-1.12) | 0.43*** | (3.24) | 0.04 | (0.19) | -0.55 | (-0.87) | 0.03 | (1.02) | -0.08 | (-0.12) | 0.34*** | (3.86) | 0.03 | (0.73) |
| 5 | 0.09 | (0.12) | 0.34*** | (3.74) | 0.12* | (1.71) | 0.28** | (2.21) | -0.03 | (-0.31) | -0.05 | (-0.72) | 0.04 | (0.73) | -0.28 | (-0.19) | 0.41*** | (3.28) | 0.06 | (0.73) |
| 6 | 0.02 | (0.03) | 0.08 | (1.39) | 0.33** | (2.37) | 0.43*** | (3.71) | -0.08 | (-0.23) | -0.03 | (-0.65) | 0.04 | (0.71) | 0.01 | (0.20) | 0.34*** | (3.36) | 0.02 | (0.21) |



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**Table IA-5:** Cumulative Standardized Abnormal Flows by Sustainability Ratings Change: Absolute Flow Measure

This table reports the average cumulative standardized abnormal asset flows $CSAF_t$ following up and down sustainability rating changes by ratings category for one-notch changes. Standardized abnormal asset flows at time $t$ are defined as the actual flow minus the expected flow standardized by the forecast standard error, as described in Dodd and Warner (1983). To calculate the expected asset flow, we estimate the coefficients of the benchmark model for each asset individually over an estimation window of 24 months (t = [-24; -1] ). The $CSAF$ are computed for each asset by summing the standardized abnormal flows over the event period. Results for the entire sample are reported in Panel A, for advisory clients in Panel B, for execution-only clients in Panel C, for equities in Panel D, and for bonds in Panel E. The results in this table are based on the absolute flow measure used by Del Guercio and Tkac (2008). *, **, *** indicate significance at the 10 %, 5 %, and 1% levels, respectively.

| Event | From 1 to 2 | | From 2 to 3 | | From 3 to 4 | | From 4 to 5 | | From 5 to 4 | | From 4 to 3 | | From 3 to 2 | | From 2 to 1 | | UP | | DOWN | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| month | $\overline{\text{CSAF}}_t$ | $t$-value | $\overline{\text{CSAF}}_t$ | $t$-value | $\overline{\text{CSAF}}_t$ | $t$-value | $\overline{\text{CSAF}}_t$ | $t$-value | $\overline{\text{CSAF}}_t$ | $t$-value | $\overline{\text{CSAF}}_t$ | $t$-value | $\overline{\text{CSAF}}_t$ | $t$-value | $\overline{\text{CSAF}}_t$ | $t$-value | $\overline{\text{CSAF}}_t$ | $t$-value | $\overline{\text{CSAF}}_t$ | $t$-value |
| | Panel A: Entire sample | | | | | | | | | | | | | | | | | | | |
| 1 | -0.03 | (-0.28) | 0.20*** | (2.75) | 0.02 | (0.32) | 0.06 | (1.02) | -0.01 | (-0.05) | -0.01 | (-0.04) | 0.09 | (0.76) | 0.00 | (0.01) | 0.06** | (1.98) | 0.02 | (0.31) |
| 2 | -0.02 | (-0.19) | 0.08 | (1.13) | 0.02 | (0.36) | 0.12** | (2.17) | -0.02 | (-0.18) | -0.04 | (-0.40) | -0.02 | (-0.21) | -0.05 | (-0.38) | 0.06** | (1.97) | -0.03 | (-0.58) |
| 3 | -0.02 | (-0.16) | 0.10 | (1.43) | 0.02 | (0.31) | 0.07 | (1.34) | -0.01 | (-0.04) | -0.02 | (-0.27) | -0.05 | (-0.41) | -0.04 | (-0.35) | 0.05 | (1.59) | -0.03 | (-0.51) |
| 4 | -0.01 | (-0.01) | 0.16** | (2.26) | 0.03 | (0.60) | 0.06 | (1.14) | -0.01 | (-0.13) | -0.03 | (-0.30) | -0.03 | (-0.31) | -0.04 | (-0.32) | 0.07** | (2.06) | -0.03 | (-0.52) |
| 5 | -0.02 | (-0.21) | 0.13* | (1.82) | 0.03 | (0.49) | 0.07 | (1.23) | -0.02 | (-0.20) | -0.08 | (-0.89) | 0.02 | (0.15) | -0.02 | (-0.18) | 0.06* | (1.80) | -0.03 | (-0.61) |
| 6 | -0.01 | (-0.08) | 0.13* | (1.85) | 0.02 | (0.34) | 0.11** | (1.99) | -0.02 | (-0.20) | -0.08 | (-0.92) | 0.03 | (0.23) | -0.02 | (-0.15) | 0.07** | (2.21) | -0.03 | (-0.58) |
| | Panel B: Advisory Clients | | | | | | | | | | | | | | | | | | | |
| 1 | -0.04 | (-0.26) | 0.13 | (1.33) | 0.04 | (0.56) | 0.04 | (0.65) | -0.01 | (-0.12) | 0.01 | (0.08) | 0.05 | (0.78) | 0.02 | (0.18) | 0.05 | (1.24) | 0.02 | (0.41) |
| 2 | -0.06 | (-0.39) | 0.09 | (0.92) | 0.05 | (0.74) | 0.07 | (1.03) | 0.05 | (0.37) | -0.01 | (-0.03) | 0.04 | (0.95) | 0.04 | (0.31) | 0.06 | (1.37) | 0.04 | (0.75) |
| 3 | -0.09 | (-0.56) | 0.08 | (0.79) | 0.05 | (0.72) | 0.14** | (2.19) | 0.06 | (0.44) | -0.02 | (-0.16) | 0.06 | (0.62) | 0.05 | (0.35) | 0.08* | (1.88) | 0.03 | (0.57) |
| 4 | -0.06 | (-0.36) | 0.13 | (1.27) | 0.03 | (0.36) | 0.15** | (2.31) | 0.05 | (0.39) | -0.02 | (-0.18) | 0.05 | (0.83) | 0.01 | (0.10) | 0.09** | (2.12) | 0.03 | (0.52) |
| 5 | -0.10 | (-0.68) | 0.06 | (0.61) | 0.06 | (0.74) | 0.17** | (2.52) | 0.05 | (0.39) | 0.04 | (0.30) | 0.05 | (0.90) | 0.01 | (0.01) | 0.09** | (2.11) | 0.05 | (0.80) |
| 6 | -0.05 | (-0.31) | 0.06 | (0.61) | 0.11 | (1.45) | 0.22*** | (3.25) | 0.05 | (0.42) | -0.01 | (-0.06) | 0.06 | (0.87) | -0.21 | (-1.25) | 0.13*** | (3.08) | 0.01 | (0.08) |



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Table IA-5 - *continued*

| Event | From 1 to 2 | | From 2 to 3 | | From 3 to 4 | | From 4 to 5 | | From 5 to 4 | | From 4 to 3 | | From 3 to 2 | | From 2 to 1 | | UP | | DOWN | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| month | $\overline{CSAF}_t$ | $t$-stat | $\overline{CSAF}_t$ | $t$-stat | $\overline{CSAF}_t$ | $t$-stat | $\overline{CSAF}_t$ | $t$-stat | $\overline{CSAF}_t$ | $t$-stat | $\overline{CSAF}_t$ | $t$-stat | $\overline{CSAF}_t$ | $t$-stat | $\overline{CSAF}_t$ | $t$-stat | $\overline{CSAF}_t$ | $t$-stat | $\overline{CSAF}_t$ | $t$-stat |
| | Panel C: Execution-Only Clients | | | | | | | | | | | | | | | | | | | |
| 1 | 0.01 | (0.06) | 0.08 | (0.85) | 0.02 | (0.33) | 0.04 | (0.52) | 0.01 | (0.05) | 0.02 | (0.20) | 0.09 | (0.92) | 0.11 | (1.01) | 0.04 | (0.90) | 0.06 | (1.01) |
| 2 | 0.05 | (0.37) | 0.04 | (0.42) | 0.02 | (0.31) | 0.06 | (0.83) | 0.02 | (0.14) | 0.03 | (0.27) | 0.10 | (0.72) | -0.10 | (-0.67) | 0.04 | (0.97) | 0.02 | (0.25) |
| 3 | 0.09 | (0.61) | 0.02 | (0.19) | 0.06 | (0.80) | -0.03 | (-0.39) | 0.05 | (0.42) | 0.03 | (0.24) | 0.05 | (0.32) | -0.09 | (-0.62) | 0.02 | (0.51) | 0.02 | (0.23) |
| 4 | 0.09 | (0.65) | -0.13 | (-1.02) | 0.04 | (0.53) | -0.02 | (-0.25) | -0.01 | (-0.02) | -0.04 | (-0.33) | 0.09 | (1.00) | -0.10 | (-0.64) | -0.01 | (-0.23) | -0.01 | (-0.01) |
| 5 | 0.06 | (0.45) | -0.09 | (-1.42) | 0.03 | (0.42) | 0.02 | (0.27) | -0.01 | (-0.03) | 0.01 | (0.09) | -0.01 | (-0.03) | -0.13 | (-1.02) | -0.01 | (-0.13) | -0.03 | (-0.44) |
| 6 | 0.08 | (0.55) | 0.10 | (0.53) | 0.02 | (0.27) | 0.03 | (0.58) | 0.01 | (0.11) | 0.11 | (0.91) | 0.02 | (0.17) | -0.14 | (-1.13) | 0.05 | (1.13) | 0.01 | (0.13) |
| | Panel D: Equity | | | | | | | | | | | | | | | | | | | |
| 1 | -0.01 | (-0.05) | 0.27*** | (3.11) | 0.02 | (0.25) | 0.07 | (1.01) | 0.06 | (0.5) | -0.01 | (-0.02) | 0.10 | (0.45) | -0.01 | (-0.01) | 0.08** | (2.16) | 0.03 | (0.44) |
| 2 | 0.02 | (0.07) | 0.13 | (1.47) | 0.03 | (0.54) | 0.09 | (1.36) | 0.02 | (0.19) | -0.02 | (-0.23) | 0.05 | (0.53) | -0.05 | (-0.38) | 0.07* | (1.81) | 0.01 | (0.04) |
| 3 | 0.01 | (0.08) | 0.12 | (1.51) | 0.03 | (0.52) | 0.07 | (1.06) | 0.02 | (0.19) | -0.03 | (-0.26) | 0.08 | (0.66) | -0.04 | (-0.34) | 0.06* | (1.66) | 0.01 | (0.11) |
| 4 | 0.03 | (0.26) | 0.16** | (2.06) | 0.05 | (0.89) | 0.02 | (0.35) | 0.02 | (0.19) | -0.04 | (-0.32) | 0.07 | (0.55) | -0.04 | (-0.33) | 0.07* | (1.77) | 0.00 | (0.02) |
| 5 | 0.02 | (0.16) | 0.15* | (1.88) | 0.05 | (0.76) | 0.03 | (0.45) | 0.01 | (0.08) | -0.02 | (-0.23) | 0.04 | (0.43) | -0.02 | (-0.18) | 0.06* | (1.65) | 0.02 | (0.35) |
| 6 | 0.02 | (0.15) | 0.15** | (1.90) | 0.04 | (0.59) | 0.04 | (0.59) | 0.01 | (0.08) | -0.03 | (-0.25) | 0.08 | (0.69) | -0.02 | (-0.14) | 0.06* | (1.67) | 0.02 | (0.35) |
| | Panel E: Bond | | | | | | | | | | | | | | | | | | | |
| 1 | -0.17 | (-0.58) | 0.14 | (0.89) | 0.03 | (0.19) | 0.11 | (1.11) | -0.10 | (-0.69) | -0.01 | (-0.04) | 0.09 | (0.57) | 0.01 | (0.04) | 0.07 | (1.15) | 0.02 | (0.23) |
| 2 | -0.18 | (-0.63) | 0.16 | (1.04) | -0.04 | (-0.33) | 0.25*** | (2.62) | -0.08 | (-0.53) | -0.07 | (-0.40) | -0.01 | (-0.04) | -0.01 | (-0.05) | 0.13* | (1.92) | -0.06 | (-0.59) |
| 3 | -0.17 | (-0.59) | 0.24 | (1.57) | -0.05 | (-0.41) | 0.15 | (1.59) | -0.05 | (-0.32) | -0.02 | (-0.09) | 0.00 | (0.00) | -0.03 | (-0.08) | 0.15 | (1.41) | -0.02 | (-0.29) |
| 4 | -0.17 | (-0.60) | 0.35** | (2.26) | -0.06 | (-0.47) | 0.22** | (2.29) | -0.06 | (-0.44) | -0.01 | (-0.06) | 0.02 | (0.41) | -0.01 | (-0.03) | 0.09** | (2.16) | -0.08 | (-0.16) |
| 5 | -0.26 | (-0.89) | 0.27* | (1.73) | -0.06 | (-0.50) | 0.22** | (2.30) | -0.06 | (-0.42) | -0.24 | (-1.34) | 0.08 | (0.35) | -0.01 | (-0.02) | 0.12* | (1.86) | -0.08 | (-0.87) |
| 6 | -0.16 | (-0.56) | 0.27* | (1.76) | -0.05 | (-0.40) | 0.33*** | (3.44) | -0.05 | (-0.41) | -0.25 | (-1.38) | 0.12 | (0.54) | -0.02 | (-0.05) | 0.19*** | (2.77) | -0.08 | (-0.81) |



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