NBER WORKING PAPER SERIES

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Working Paper 25567
http://www.nber.org/papers/w25567

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
February 2019

We thank David Laibson, George Loewenstein and Brigitte Madrian for very helpful comments and suggestions, together with seminar participants at the Network for Integrated Behavioural Science Annual Workshop 2018, University of Glasgow, University of Bristol and Queen Mary University of London. This work was supported by Economic and Social Research Council grants ES/K002201/1, ES/N018192/1, ES/P008976/1, and Leverhulme grant RP2012-V-022. Sakaguchi acknowledges a Ph.D. studentship funding from Economic and Social Research Council with award reference 1499648. The views expressed herein are those of the authors and do not necessarily reflect the views of the National Bureau of Economic Research.

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NBER Working Paper No. 25567
February 2019
JEL No. D14,D53,D91,G02,G11,G12

ABSTRACT

Individual investors buying multiple stocks on the same day often use a naïve diversification 1/N heuristic, dividing purchase value equally across stocks. Yet very few investors maintain a 1/N portfolio allocation. Instead, investors appear to narrowly frame their buy-day decision independently of their portfolio, applying the 1/N heuristic only for new purchases. The use of this heuristic decreases, but does not disappear, as financial stakes and investor trading experience increase. These findings indicate that the simple heuristics individual investors use in practice depart further from rationality than is often assumed even in behavioral models of investment decisions.

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1 Introduction

When faced with financial decisions, people often turn to simple rules to guide their choices. Examples include setting saving to be a constant fraction of income, or choosing a mortgage contract that keeps monthly repayments at a target value. Such heuristics are sometimes very imperfect approximations to optimal behavior, or even quasi-rationally optimal behavior. So, to develop realistic models of individual behavior, and to inform policy design, it is important to understand these heuristics.

We here investigate how investors approach a very fundamental financial choice: how to allocate funds for investment across multiple stocks. Portfolio theory offers standard recommendations for how to diversify optimally across stocks (Markowitz 1952), but individual investors deviate substantially from what theory recommends (Goetzmann and Kumar 2008).[1]

One of the major explanations that have been proposed to explain this failure is narrow framing, which is the tendency to make choices in isolation rather than making an integrated overall decision (Gilovich and Griffin 2010). Proposed consequences of narrow framing include limited stock market participation, portfolio under-diversification, and the equity premium puzzle (Barberis, Huang, and Thaler 2006; Barberis and Huang 2008).

Our focus is on a different aspect of narrow framing that has received much less attention—one that is not about the overestimation of the incremental risk of increasing the holdings of an asset in a portfolio (nor of excessive loss aversion toward such changes). Our focus is instead on neglect of something simpler—the sheer current holdings of different assets when buying new assets.

We first show that when investors buy stocks, they often group several trades together on the same day, and split their investments evenly using the $1/N$ heuristic. This raises the question of whether, when making a purchase, investors seek to bring their overall portfolios into balance, or whether they apply $1/N$ only to their new purchases. If

[1] Investors typically hold only a few stocks and exhibit biases such as over-trading (Barber and Odean 2000), sensitivity to gains compared with losses (Odean 1998) and rank effects (Hartzmark 2015). For a review of the literature on the behavior of individual investors see Barber and Odean (2013). Hirshleifer (2015) and Barberis (2018) review approaches based on investor psychology to trading and asset prices.

they frame narrowly upon their new purchases, such a heuristic could potentially push their overall holdings *further* from a $1/N$ balance. We find that investors do indeed use $1/N$ as a buying heuristic, not as a portfolio balancing heuristic.

This indicates that investors act *very* narrowly, naïvely diversifying among what they buy, not what they hold. Investors appear to be considering only the stocks they are buying on the day, making diversification choices only within the set of stocks they buy, instead of making choices over their entire portfolio. We call this behavior *Naïve Buying Diversification* (NBD).

These findings mark a departure from the approach of many existing behavioral finance models. In many such existing psychology-based models of investment choices, even though investors do not behave rationally, they are trying to optimize an overall portfolio in order to achieve an attractive probability distribution of consumption (Barberis and Huang 2001; Daniel, Hirshleifer, and Subrahmanyam 2001; Grinblatt and Han 2005; Li and Yang 2013; Barberis, Mukherjee, and Wang 2016).

Our evidence indicates that investors fall far short of this standard of quasi-rationality. Investors do not even seem to be trying to assess security or portfolio risk, nor to diversify or bring balance to their overall portfolios—only to bring value-invested balance to purchase events on a day-by-day basis. Trading based on equalizing trade values rather than estimating risks seems even farther from rational than the narrow framing of investors who, in the above-mentioned models of narrow framing, overestimate the risks of certain potential portfolio changes.

The main contribution of this paper is to show that investors engage in NBD but not *Naive Portfolio Diversification* (NPD). That is, many investors split their *buys* according to the $1/N$ heuristic, but very few investors allocate buy amounts so as to achieve $1/N$ portfolio shares—hence NBD but not NPD.

Our tests build on previous studies that provide evidence that is potentially consistent with either NBD or NPD. Benartzi and Thaler (2001) and Huberman and Jiang (2006) find that a large share of company employees use a $1/N$ asset allocation to build retirement savings portfolios, via setting their personal regular contribution rates. However,

in the Benartzi and Thaler (2001) and Huberman and Jiang (2006) testing context it is very hard to distinguish between NBD and NPD, for two closely-related reasons. First, it involves choices of continuing contribution rates rather than one-time transactions, which very strongly links specific purchase transactions weights to overall portfolio weights. This is especially the case given very strong evidence of inertia in retirement investing (Madrian and Shea 2001). Second, the fact that the investor is choosing a contribution rate may act as a prime for considering the effects of the choice on the overall portfolio. In contrast with these studies, our tests focus on a sample of discrete trades by individual investors, so that there is a clear distinction between buy-transaction weights and portfolio weights. So a key innovation of our study is to perform tests that sharply distinguish NBD and NPD.

The data we use are provided by a mainstream brokerage platform and covers a large sample of individual investors building portfolios containing common stocks. We examine the allocation decisions of over $50,000$ investors on $260,000$ buy-days on which investors purchase multiple stocks. Multiple-stock buy-days are important, with 31% of the total amount invested in our sample accounted for by multiple-stock buy-day purchases. On approximately one-third of all multiple-stock buy-days investors adopt a NBD heuristic for splitting the funds that they invest, approximately equalizing the value invested in each stock bought on the buy-day.

NBD does not vary by age or gender. NBD might be explained by models learning and rational inattention, as in the rational inattention approach of Sims (2003). If individual investors face fixed costs of calculating the investment share of each stock in an optimal portfolio (such as time or psychic costs of calculations), then use of NBD would decrease as economic stakes increase. Alternatively, if investors learn portfolio strategies, then use of NBD would decrease with trading experience.

Our findings provide only a degree of support for an explanation of NBD based upon learning and rational inattention. Consistent with learning, NBD declines with investor experience (measured by account age and frequency of trading). Consistent with rational inattention, NBD declines with financial stakes (measured by investment size and variance

in returns on individual stocks bought).[2] However, NBD is not eliminated even at high levels of investor experience or as the financial stakes of the decisions increase: it is used by investors on more than 20% of buy-days even at the top of the distributions of the variables by which we measure learning and rational inattention.

The cleanest context for distinguishing between NBD and NPD is when an investor tops up existing positions in N stocks. For example, an investor holding positions in stocks A and B who, on a buy-day, buys additional units of stock A and stock B. This investor could decide split the new invested funds 50:50 across A and B (i.e., NBD), or split the new funds such that at the end-of-day the ratio of the total market value in A and B is 50:50 (i.e., NPD), or make some other allocation. We find that NBD is overwhelmingly more likely than NPD. When the analysis is extended to all trades on all buy-days, we find that only very few investors trade to a NPD heuristic. This evidence indicates that $1/N$ splitting is almost exclusively a buy-day effect.

There is a normative literature that provides evidence that NPD performs well in practice (DeMiguel, Garlappi, and Uppal 2009). However, as we have stated, we show that only very few investors in our sample follow the NPD heuristic. Investors' portfolio allocation strategies appear in some way disconnected with their buying allocation strategies.[3]

We propose that investors prefer NBD because it simplifies the buying decision problem. The way in which investors implement NBD suggests a strong preference for simplicity. Specifically, many investors choose the denominator and numerator of the $1/N$ calculation to make the division problem simple. When $N = 3$, the distribution of total investment amounts is dominated by round number multiples of 3, with heaping at £3,000, £6,000, £9,000, £15,000 and £30,000. When $N = 4$, the distribution shows heaping at £4,000, £8,000, £20,000 and £40,000. These patterns suggest a strong preference for

[2] Also, we find no evidence of day-of-the-week or month-of-the-year differences in the use of NBD. This indicates that NBD is not made more likely by Friday-induced inattention (market reactions to earnings announcements are on average more sluggish on Friday afternoons (DellaVigna and Pollet 2009).)

[3] The net effect of many buy-days and movements in stock prices is to create portfolios away from the $1/N$ allocation, with resulting portfolio allocations appearing as if the result of a more complex portfolio allocation rule. Unless one looks at individual buy-days, the use of the $1/N$ heuristic for buying is hidden in the resulting portfolio positions, in part due to the aggregation over many trades and in part due to movements in the prices of the stocks within the investor's portfolio.

simplicity in the math of investing.

Overall, these results suggest that the behavior of individual investors is far from optimal. However, the investors in our sample are purchasing multiple stocks and *de facto* achieving some degree of diversification their portfolios, albeit in a crude manner. Naïve diversification may be an improvement on no diversification at all; many studies find most investors hold under-diversified portfolios (Barber and Odean 2013). Nevertheless, our results indicate that investors apply the naïve diversification strategy in an extremely narrow way.

2 Data

2.1 Brokerage Account Data

We use data from Barclays Wealth, a large mainstream UK based broker. The data consist of transaction histories of 182, 569 accounts held with the broker between April 2014 and June 2016. The panel data are unbalanced, with accounts opening during the period. Dropping accounts with no activity during the data period, we define the baseline sample as 118,169 accounts that have at least one buy transaction within the data period. The data include stock identification numbers (Stock Exchange Daily Official List (SEDOL) numbers, a list of security identifiers used in the United Kingdom and Ireland for clearing purposes), transaction dates, transaction types (e.g., buy, sell), transaction quantities, and transaction prices. We use SEDOL numbers to match in additional data on individual stock product and performance information via Datastream.

2.2 Sample

Our interest lies in how individuals choose to allocate funds invested on buy-days involving purchases of multiple stocks. We define a "multiple-stock buy-day" as a day on which the investor makes a purchase of two or more common stocks (denominated in GBP), via either opening a position in new stocks or adding additional stock to an existing position.[4]

[4] We restrict to buy events involving the choice of an investment amount on the part of the investor on the buy day. Hence we exclude, for example, automatic dividend reinvestments.

Our analysis focuses on two samples. First is a sample of all accounts in which we see at least one multiple-stock buy-day. The sample includes accounts already open at the beginning of our data period and also new accounts which open within the data period. This sample restriction provides 52,866 accounts (44.7% of accounts in the baseline sample) and 261,585 multiple-stock buy-days (17.4% of buy-days in the baseline sample). Multiple-stock buy days account for 30.8% of the total amount invested over the data period.

Second, from the first sample we draw a sub-sample that includes all new accounts which are opened within the data period. For this sub–sample of new accounts we have richer data, in that we observe the complete portfolio position of the account from opening date onwards, including for accounts that are transferred in from another broker service. This allows us to accurately calculate returns on individual holdings. This sample restriction provides 8,982 accounts (43.1% of new accounts in the baseline sample) and 25,507 multiple-stock buy-days (16.3% of buy-days in the baseline sample of new accounts).

Approximately 68% of multiple-stock buy days involve purchases of two stocks. Figure A1 shows a bar chart of the number of stock bought on multiple-stock buy-days. Summary statistics for the sample of all accounts and new accounts with at least one multiple-stock buy-day are shown in Table A1 and Table A2. Among the all accounts sample 70.4% of account holders are male. The average age of the account is four years. Account holders make on average 1.8 trades per month, with an average investment amount of over £16,500 on a multiple-stock buy-day (median value is close to £7,000). Among the sample of new accounts, for which we have additional information, Table A2 shows that investor portfolios are worth on average £61,000, with an average investment amount on a multiple-stock buy-day of £11,500. Portfolios contain on average 8 individual stocks and on average investors engage in of 1.5 trades per month.

The low number of individual stocks we see investors in our sample holding in their portfolios is consistent with existing studies that document a lack of diversification among individual investors in the individual stock component of the portfolio (Goetzmann and Kumar 2008; Barber and Odean 2013). Purchases of diversified investment products, such

as mutual funds or exchange traded funds (ETF) are rare in the sample—fewer than 6% of purchases are of mutual funds or ETFs. In addition, while the benefits of diversification increase with the variance in market prices, Figure A2 shows that among the sample of all buy-days (including single-stock buy days), the average number of stocks purchased per day does not depend on market volatility and does not vary over the sample period.

3 Naïve Buying Diversification on Multiple-Stock Buy-Days

We first examine whether investors engage in Naïve Buying Diversification. We begin by showing allocations across purchased stocks on multiple-stock buy-days. We calculate the percentage of the total buy-day investment (in pounds sterling and net of fees) that is allocated to each stock.[5] Choosing one of the N stocks at random to be "Stock A", Figure 1 plots the proportion of the buy-day investment allocated to Stock A among all N-stock buy-days in the sample, with panels showing different values of N. The width of each bin is 0.01.[6]

Strikingly, Figure 1 shows large heaping in the frequencies of portfolio weights around $1/N$. In Panel A, 29.7% of two-stock buy-days involve allocations of monies invested on the day in the 49-51 interval. This suggests that, as seen in Panel A many, trades are made with allocations that are close to 50:50 and may be using that heuristic to guide their allocation choices. In Panels C-D we also see heaping around $1/N$. On 3-stock buy-days, people often spend one third of their money on each stock. On 4-stock buy-days, people often spend one quarter on their money on each stock. And so on.

When measuring NBD, we should not restrict the definition to a precise $1/N$ allocation of funds across N stocks. This is because the indivisibility of individual stocks implies that investors could not in all cases make precise NBD allocations (even if they wanted to). Given the total amount invested and the prices of individual stocks, investors may only be able to achieve an allocation close to $1/N$. As with most investment platforms,

[5] Fees are low as a proportion of the average amount invested. Hence our results are not sensitive to the inclusion of fees in the allocation calculations.

[6] We focus on allocation to one randomly chosen stock to avoid the dependence of observations that naturally arises because the sum of weights across stocks must be equal to one.

on the Barclays platform investors can input a money amount they would like to invest in stock and the platform calculates the maximum number of shares (in integers) at the time-limited quoted price (in local currency) that can be purchased with that money amount at the market price.[7]

We therefore present bandwidth measures of NBD. Table 1 reports the proportion of multiple-stock buy-days on which a buy-day investment of £P is split such that the money value of stock purchases are divided in the intervals £$P/N \times (1 \pm X)$ where X takes values of $0.02, 0.05$ and 0.1 in Panels A–C. This range of values of X allow for the indivisibility of individual stocks. In the two-stock case, these intervals translate to a proportion of the total buy-day investment invested in Stock A of 49-51 (Panel A), 47.5-52.5 (Panel B) and 45-55 (Panel C). We report 95% bootstrapped confidence intervals clustered by accounts.

The estimates in Table 1 show that, for two-stock buy-days, allocations fall in the NBD interval in between one quarter and one half of cases, depending on bandwidth. As the number of stocks purchased on the multiple stock buy-day increases, the proportion of allocations falling within the range decreases, illustrated in Figure A3. This will be in part due to a mechanical effect, as the indivisibility of individual stocks resulting in $1/N$ allocations being less likely as the number of stocks purchased rises. Across all buy-days involving multiple-stock purchases, 49.6% CI[49.2%, 50.0%] of investors exhibit at least one buy-day on which they make an allocation in the interval £$P/N \times (1 \pm X)$ with $X = 0.02$.

Our findings raise the question of whether NBD has a mechanical source. For example, if the investment platform uses an interface in which a NBD allocation is presented as an on-screen default, this might lead investors to accept a NBD allocation. However, the platform used by the brokerage did not automatically default, or suggest, equal money investments across multiple stocks. Investors were required to key in their

[7] For example, consider the case that an investor intends to invest £$1,000$ to buy two stocks, called Stocks A and B, and that a price of Stock A is £4.50 per unit and a price of Stock B is £100.50 per unit. Were the investor to aim for NBD the precise stock split generating an equal money cost split would be: Stock A = £500/£4.50 = 111.11 units, Stock B £500/£100.50 = 4.96 units. Purchases of common stock must be made in non-divisible single units. Due to this non-divisibility, the investor cannot invest £500 for each stock and so might instead decide to buy 111 shares of Stock A with a cost of $111 \times$ £4.50 = £499.50 and to buy shares of Stock B with a cost of $5 \times$ £100.50 = £502.50. Thus, the allocation of the investment to Stock A is £499.50 ÷ (£499.50 + £502.50) = .498 and that to Stock B is .502.

investment amount for each stock separately and each transaction required a separate multiple-screen journey, with no default allocation or recommended allocation shown on screen or in investment guidance.[8]

4 Exploring the Sources of NBD

We now examine whether use of the NBD heuristic varies across investor types. We also examine whether use of the NBD heuristic is consistent with models of learning and rational inattention.

4.1 Investor Types: Gender and Age

There is evidence that US males tend to trade more actively and aggressively than women (Barber and Odean 2001; Choi et al. 2002; Agnew, Balduzzi, and Sundén 2003; Dorn and Huberman 2005; Mitchell et al. 2006). Consistent with this, we might also expect that men tend to be more confident in choosing portfolio weights. But, alternatively, they might tend more to heuristic thinking, being more likely to follow a gut instinct of choosing $1/N$. To test between these possibilities, we examine gender subsamples.

Figure 2 Panel A shows the bootstrapped estimate of the proportion of two-stock buy-days on which the investment is split within the 49%–51% interval by gender.[9] The plot shows that the proportions of $1/N$ buy-day allocations are very similar across men and women. Figure A4 shows the similarity in histogram plots for men and women separately, with no notable differences in the distributional characteristics of the buy-day allocation by gender. Table 2 shows summary statistics for the proportion of two-stock buy-days on which the investor uses NBD by investor characteristics.

Previous research has also found that age is associated with lower investment

[8] A video showing the Barclays Stockbroking user interface and screen display journey involved in making a purchase can be viewed at `https://www.youtube.com/watch?v=AsV-pve696M`. The video shows that the buy / sell screen display journey shows only information about the stocks to be purchased / sold and does not allow for multiple purchase or sale events in a way that would encourage NBD, or show portfolio information (such as illustration of portfolio positions before or after a purchase / sale) on the same screen.

[9] We use this interval to identify NBD throughout this section of the paper. Results are not sensitive to widening this interval.

performance, possibly due to age related declines in cognitive abilities (Korniotis and Kumar 2013). Declining cognitive ability might lead older investors to turn to the simple NBD heuristic. Figure 2 Panel B shows the proportion of $1/N$ buy days by decade of birth. Very few investors in the sample were born before the 1930s or after the 1990s (the investor age distribution is shown in Figure A5). The plot illustrates a similar propensity to engage in NBD across investors by age. Figure A6 shows the similarity in histogram plots for investors by each decade of birth.

4.2 Do Investors Learn to Avoid Naïve Buying Diversification?

Previous research offers mixed evidence as to whether investor behavior improves with experience. For example, studies have found that investors learn to avoid the disposition effect as they gain more trading experience (Feng and Seasholes 2005 Seru, Shumway, and Stoffman 2010;); while in the case of investing in Initial Public Offerings, investors appear to learn to make more mistakes (Kaustia and Knupfer 2008; Chiang et al. 2011). There is evidence that individuals learn from previous experience when using financial products (Agarwal et al. 2008; Ater and Landsman 2013; Miravete and Palacios-Huerta 2014). While a $1/N$ buy-day allocation might be a naïve action of a new investor, with experience investors may gain information and feedback that causes them to refine their allocations.

Figure 3 Panel A shows the proportion of NBD buy days across quartiles of the distribution of account tenure. Measured in months from account opening, the quartile threshold values are 25%: 24 months; 50%: 60 months and 75%: 109 months. Figure 3 shows shows that the propensity to engage in NBD falls with tenure, though the magnitude of the reduction is small.[10] Table 2 Panel C provides summary statistics. The proportion of buy-days on which the investor uses NBD falls from 31% in the bottom quartile to 27% in the top quartile.

An alternative measure of experience is the frequency with which investors trade, which we measure as the number of trades executed per month. This measure includes all

[10] Figure A7 illustrates histogram plots by tenure. Figure A8 illustrates histogram plots by trading frequency. Table 2 Panel C provides summary statistics.

buy and sell trades, whether involving single stock or multiple stocks. A large number of studies have examined the relationship between this measure of trading frequency and performance, typically finding that frequent trading tends to result in lower returns (Barber and Odean 2001). Figure 3 Panel B shows the proportion of NBD buy-days across quartiles of trading frequency. The quartile threshold values of trades per month are 25% : 1.1 trades, 50% : 3.1 trades; 75% : 10.2 trades. As can be seen from the figure, the most frequent traders are much less likely to choose NBD, possibly because some of these individuals are day-traders who very regularly adjust their positions and follow more sophisticated trading strategies. Among the top quartile sub-sample, 19% of multiple stock buy-days are NBD compared with 36% in the bottom quartile.

4.3 Limited Attention

Theoretical models have suggested that limited investor attention affects trading and asset prices (Hirshleifer and Teoh 2003; Peng and Xiong 2006; Hirshleifer, Lim, and Teoh 2011). A considerable body of empirical research finds evidence consistent with attention effects in asset markets.[11] Models of rational inattention explain quasi-rational behaviors as arising due to opportunity costs in allocating attention, as in Sims (2003). Recent studies present mixed evidence as to whether individuals behave in a way that is consistent with rational inattention (DellaVigna 2009; Chetty et al. 2014; Taubinsky and Rees-Jones 2017; Gathergood et al. 2018).

In our setting, if investors face fixed costs of calculating the investment share of each stock in a optimal portfolio (such as time or psychic costs of portfolio calculations), then for investment choices with low economic stakes, investors might optimally choose the simple naïve diversification heuristic. In models with fixed optimization costs, it is worth paying the optimization cost (e.g. time cost) only when stakes are sufficiently high. Also, investors may be inattentive to their investment choices when distractions are present (as in Hirshleifer, Lim, and Teoh 2011). This is a feature that DellaVigna and Pollet (2009) refer to as behavioral inattention, who provide evidence of reduced market reaction to

[11] Examples include DellaVigna and Pollet 2009, Hirshleifer, Lim, and Teoh 2009, Hou, Peng, and Xiong 2009, Cohen, Diether, and Malloy 2013 and Huang 2015.

earnings announcements made on Fridays. We find no evidence of variation in the use of NBD by day of the week or month of the year.[12]

4.3.1 Scale of Investment

To test whether use of the NBD heuristic is consistent with limited attention, we first examine the relationship between NBD and the financial stakes of the investment decision.

The financial stakes of the investment allocation choice can be defined in two main dimensions—the difference in returns between the stocks bought and the total value of the buy-day investment. When mean returns and risks differ more across stocks, optimal allocations tend to differ more from NBD. We explore how NBD buy-days relate to the difference in past returns, or the difference in future returns, between the two stocks purchased on the two-stock buy-day. We use the simple difference in gross returns over the previous 3 months, excluding dividend payments, capital gain taxes, or trading fees. We then separate the sample into quartiles by the difference in returns.[13]

Figure 5 Panels A and B show the proportion of $1/N$ buy days for past returns. The proportion of buy-days with NBD declines with the difference in past returns and is notably lower in the top quartile sub-sample compared with the third quartile. Summary statistics in Table 3 Panel C show that 24% of buy-days in the top quartile are NBD, compared with 33% in the bottom quartile. A similar pattern in seen in Panel B for future returns. Summary statistics in Table 3 Panel C show that 25% of buy-days in the top quartile are NBD compared with 32% in the bottom quartile.[14]

Panels C and D of Figure 5 illustrate the relationship between NBD behavior and the total value of the individual's portfolio with the brokerage (Panel C) and the

[12] Figure 4 Panel A shows the fraction of NBD buy-days for each day of the week. Figure A9 shows the distribution of trades by day of the week and Figure A11 shows the distribution of trades by month of the year. Figure A10 confirms that the histogram plots are very similar for each day of the week. Figure 4 Panel B shows the fraction of NBD buy-days for each month of the year. Figure A12 confirms that the histogram plots are very similar for each month of the year. Table 3 Panel A reports supporting summary statistics.

[13] It is possible that investors might be more likely to use NBD when stocks have similar characteristics, such as being from firms in the same industry. However, Figure A15 shows that this is not the case. Panel A shows that investors are as likely to engage in NBD when buying two stocks from firms in the same industry as they are when buying two stocks from firms in different industries.

[14] Figure A13 and Figure A14 show the histogram plots in each quartile, confirming the drop in the central mass at the top quartile sub-samples.

amount invested on the day (Panel D). Panel C illustrates that individuals with high value portfolios are less likely to adopt a NBD heuristic. Figure A17 shows histograms which confirm this pattern.[15]

The total amount invested on the day is the simple sum of the two-stock purchases. Figure 5 Panel D illustrates the proportion of buy-days with NBD across quartile subsamples. Among the sample the median investment amount on the day is £5,200. Figure 5 Panel D shows the proportion of buy-days exhibiting NBD falls as the investment amount increases. Summary statistics in Table 4 Panel A show that at the top quartile 24% of buy-days in involve a $1/N$ buy-day allocation, compared with 35% in the bottom quartile. However, Panel D also illustrates a non-monotonic relationship, with the proportion increasing between the second and third quartiles, before falling at the fourth quartile.[16]

Later, we show that this pattern arises due to investors making joint decisions over their investment amount on the day and the number of stocks purchased. This results in high value investment amounts (e.g. at higher round number multiples of 2 such as £10,000 and £20,000) being more popular among investors using NBD compared with lower value investment amounts.

4.3.2 Portfolio Size and Trading Activity

In a limited attention setting there may be a one-time fixed cost of adopting a decision making strategy (e.g., learning how to use an online portfolio optimizer). The returns from adopting a decision making strategy are higher as portfolio activity and trading activity increase. Hence, use of NBD will fall with portfolio activity and trading activity.

We explore how NBD varies with portfolio activity and stocks held. Figure 6 Panel A shows the proportion of NBD buy-days by whether the investor holds existing positions in their portfolio and Panel B by whether the investor also makes a sale on the buy-day.

[15] This analysis is only feasible for new accounts, as we can only build complete portfolios from transaction data for new accounts, as old accounts have a composition which is not seen by us at the beginning our of data period. We replicate our main result among new accounts in Figure A16, which shows that approximately 34% of two-stock buy-days are made in the 49%–51% interval among the sample of new accounts.

[16] Figure A18 shows the histogram plots and confirms this non-monotonic pattern, which is attributable to less bunching at the centre of the distribution in the second quartile.

The panels show the proportion of NBD buy-days is lower with existing positions held (31% compared with 39%) and with sales on the day (22% compared with 35%).

Finally, we explore the relationship between NBD behavior and the number of stocks in the individual investor's portfolio. It is well documented that individual investors tend to hold only a few stocks as direct holdings in their portfolios (Barber and Odean 2013). In our data the cut points for quartiles of the number of stocks held are 25%: 3, 50%: 5 and 75%: 9. Figure 6 Panel C illustrates the proportion of NBD buy-days by whether the individual holds existing stocks within the portfolio and Panel C shows the proportion of NBD buy-days by number of stocks held. There is no decline in the proportion of NBD buy-days with the number of stocks held, Figure A19 confirms this pattern in the histogram illustrations.

Overall, these results suggest that the use of the NBD heuristic decreases both with investor experience and as the incentives to allocate attention increase. Nevertheless, among top quartile of buy-days by financial characteristics (including portfolio value, number of stocks in the portfolio and differences in returns across stocks) the proportion of investments made with NBD is consistently above 20%. Hence NBD is only modestly sensitive to the economic stakes of investing.

4.4 Taking Stock of NBD Behavior

To explore the relative importance of the multiple possible sources of NBD behavior, we estimate cross-section multivariate regression models. Of course, these estimates do not establish causality. In the probit model the dependent variable is a dummy variable indicating whether the two-stock buy-day allocation is NBD, again using the $£P/N \times (1 \pm 0.02)$ interval to define an approximate NBD. The model is estimated on the sample of all multiple-stock buy-days from the new accounts sample.

Results are shown in Table 5. Model 1 includes investor gender dummies, decade of birth dummies, day of the week dummies and month of the year dummies, plus an intercept term. Consistent with the unconditional relationships shown above, none of the coefficients returned in the regression are statistically significantly different from zero.

Model 2 adds dummies for account tenure quartiles and a continuous measure of the average number of trades per month. The coefficient on the average number of trades per day is negative and statistically significant. Model 3 adds the additional variables. Results show the likelihood of a NBD declines with the number of stocks bought on the day, the range in future returns of stocks in the portfolio, whether the investor holds an existing position in their position and whether a sale is made on the same day.

5 Naïve Buying Diversification or Naïve Portfolio Diversification?

A key contribution of our paper is to determine whether investors engage in naïve portfolio diversification (targeting equal weights in the portfolio) or naïve buying diversification (targeting equal weights in a given purchase). This distinction has important welfare consequences. As a target portfolio-balancing heuristic, NPD arguably performs well for investors in practice. From a normative perspective, DeMiguel, Garlappi, and Uppal (2009) compare the performance of NPD against 14 alternative models and find that none is consistently better than NPD in achieving a Sharpe ratio, certainty-equivalent return or turnover. In contrast, NBD can produce very poorly diversified portfolios, and is therefore hard to rationalize as even an approximately optimal investment strategy.

5.1 Evidence from Top-Up Buy Days

The cleanest setting in which to distinguish between NBD and NPD is when investors top-up multiple stocks already held in their portfolio. We examine whether they split the top-up investment $1/N$ across new funds invested (i.e., NBD), or instead top up such that the portfolio is balanced $1/N$ as a result of the trade (i.e., NPD).

First we show results for top-up buy-days involving two stocks. Panel A of Figure 7 shows the proportion of the buy-day investment allocated to (randomly chosen) Stock A. The right-side figure shows the market value of Stock A over the total end-of-day portfolio value (of holdings of Stocks A and B). There is clear heaping around $1/N$ in the left-side figure, which is absent in the right-side figure. Hence in this sample we see NBD, not NPD,

on top-up buy-days.

Investors mail fail to achieve NPD simply because the level of total investment on the buy-day is not large enough to bring their portfolio into balance. In that case, an investor could only achieve NPD if they increased the total amount invested on the buy-day, or reduced their holdings of one position. In Panel B of Figure 7 we restrict the sample to top-up buy-days on which the investor could achieve NPD, given the total buy-day investment amount, without requiring any sell activity. Again, there is clear heaping around $1/N$ in the left-side figure, which is absent in the right-side figure.

Next we extend our analysis to all top-up buy-days involve multiple stocks. Results are shown in Table 6, which presents a breakdown of the starting positions, buying allocations, and ending positions of all buy-day episodes with at least two existing positions in the portfolio. In each panel the rows summarize eight mutually exclusive scenarios for account positions at the start of the day and activity during the day.

The first four rows in each panel show accounts which begin the buy-day with NPD (2.2% of observations). Of these, 1.1% engage in NBD and 1.1% engage is non-NBD. At the day end, in 0.5% of cases the portfolio is balanced by NPD in 1.9% of cases the portfolio is not balanced by NPD. The bottom four rows in each panel show accounts which begin the buy-day away from NPD (97.8% of observations). Of these, in 28.5% of cases investors use NBD and 69.2% of cases they choose some other allocation. In only 0.2% of cases is the portfolio position at the end of the day NPD. Panels B and C show similar results. Table 7 shows the proportion of buy-days resulting in NPD in the restricted sample. Across all multiple-stock buy-days in the restricted sample, only 2% result in NPD.

5.2 Evidence from All Buy-Days

To see whether there is a more general tendency towards NBD versus NPD among investors, we extend the analysis to all multiple-stock buy-days (including those involving investors opening of new positions). Figure 8 splits the sample across panels by number of positions in the investor's existing portfolios at the beginning of the buy-day. Within each panel the horizontal axis denotes the number of stocks bought on the day. The red bars and

whiskers illustrate 95% confidence intervals for the proportion of buy-days within the cell that show NBD. The blue bars and whiskers illustrate 95% confidence intervals for the proportion of buy-days that show NPD.

Strikingly, NBD is consistently high on buy-days in which, at the beginning of the day, there are multiple stocks in the portfolio. In contrast, NPD is rare across all combinations of existing positions and numbers of stocks bought on the day (with the exception of empty accounts with no existing positions at the beginning of the day for which, by construction, NBD = NPD). Table 8 and Table 9 report the mean values and bootstrapped 95% confidence interval bounds within each cell. This analysis makes clear that NPD is extremely rare, whether investors are topping-up their portfolios or adding new positions.

6 $1/N$ Selling

Investors could employ a Naïve Selling Diversification (NSD) heuristic when selling multiple stocks. However, if NBD is due to narrow framing, then NSD might be less likely, as when making selling decisions investors are confronted with information on their portfolio. Previous research suggests investor selling behavior is related to the framing of the portfolio, including the well-known disposition effect (Barber and Odean 2013) and rank effects (Hartzmark 2015). By these heuristics, investors tend to pick out stocks from the distribution within their portfolio. Indeed, in our data the vast majority of sell-days involve single stocks. We observe 1,108,080 sell-days, among which 84% are sell-days involving single-stock sales. The majority of sell trades are liquidating sales (62%) with the remainder partial sales.[17]

6.1 $1/N$ Selling on Multiple-Stock Sell Days

In additional analysis in the appendix, Figure A20 illustrates the proportion of selling proceeds from a randomly chosen stock, Stock A, on a two-stock sell-day. The peak at $1/N$ accounts for approximately 13% of sell-days in the 49% – 51% interval. Table A3

[17] Another category is short-selling, which is uncommon in our data, affecting only 7% of sell-trades.

summarizes the proportion of sell-days by number of stocks sold on the sell-day. In total only 11% of all multiple-stock sell-days involve investors choosing NSD. Overall, NSD accounts for fewer than 1.5% of all sell-days in the data.

6.2 Selling to Achieve $1/N$ Portfolios

Alternatively, investors might sell positions such that they achieve NPD. Again, this might be more likely than NPD when buying because selling stocks necessarily involves looking at the values of existing positions. Table A4 shows the percentage of sell-days that result in NPD by combinations of the number of existing positions in the portfolio at the start of the day, number of positions sold (either partially or fully liquidated) and number of resulting positions. Results show that NSD is a very rare outcome.[18]

7 Do Investors Jointly Choose Investment Amounts and N?

A possible motivation for using the NDB heuristic is that it simplifies the decision problem. If so, we would expect that investors who use the NBD heuristic would implement it in a simple way. To investigate this, we analyze how investors choose total amount to invest on the day and N stocks. We find that they choose these in order to make the division calculation simpler, say choosing to invest approximately £15,000 in three stocks or £10,000 in two stocks. This is consistent with NBD investors having a preference for simplicity.

In Figure 9 we plot the investment amount on multiple-stock buy-days on which individuals split their purchases $1/N$, for different value of N. The striking feature of the plot is the heaping of investment amounts around simple round-number multiples of N. Beginning at Panel A with $N = 2$, one observes heaping at values of £1,000, £2,000, £4,000, £10,000 and £20,000. By contrast, in Panel B with $N = 3$ we see investment amounts dominated by numbers which are simple multiples of 3, £1,500, £3,000, £6,000, £9.000, £15,000

[18] When we restrict the sample to sell-days on which the investor can achieve NSD without requiring any purchases of stocks, we find that NSD is achieved on only 7.2% of sell-days (see Table A5). When we restrict the sample to days with both buy and sell trades on which the investor can achieve NSD by reallocating the total sales and total investment on the day without requiring any additional purchase or sale, we find that NSD is achieved on only 1.6% of sell-days (see Table A6).

and £30,000.

We further see this patterns when $N = 4$ and when $N = 5$. In Panel C, showing $N = 4$, we see heaping at £2,000, £4,000, £8,000, £10,000, £12,000, £20,000, and £40,000. In Panel D, showing $N = 5$, we see heaping at at £2,500, £5,000, £10,000, £25,000 and £50,000. It is further striking that the modal investment bin is £2,000 when $N = 2$, £3,000 when $N = 3$, £4,000 when $N = 4$ and £5,000 when $N = 5$.

One outcome of this behavior is to give rise to near-identical distributions of investment amounts *per stock* across multiple-stock buy-days involving 2 – 5 stocks. This is illustrated in Figure A21. The distribution of investment amount per stock across 5-stock buys days appears near-identical to that across 2-stock buy-days. Hence the total amount invested on the buy-day rising monotonically with the number of stocks bought, while the average amount invested in each stock remains constant, illustrated in Figure A22.[19] An interpretation of these results is that investors are not only utilizing $1/N$ as a simple heuristic for allocating across N stocks, but that they are choosing a total investment amount to be allocated such that $1/N$ becomes a simple calculation.[20]

8 Conclusion

We investigate how investors go about approaching a common financial choice: allocating invested funds across multiple stocks bought on the same day. Previous research on retirement saving fund allocation has proposed that investors use a $1/N$ heuristic, but has not disentangled whether individuals use $1/N$ as a rule for dividing the amount invested across funds, or as a target portfolio allocation. We disentangle these, showing that a

[19] While the average amount invested in each stock remains constant with the number of stocks in the sample, this is not true at the investor level. Restricting to the sample of investors who make at least one multiple-stock buy-trade and one single-stock buy-trade within the sample period, only 2.3% of investors spend approximately the same amount on every trade (allowing a 10% bandwidth to define approximate in this case). Hence NBD does not arise simply due to investors always investing the same amount of funds in every trade and sometimes buying multiple stocks on the same day.

[20] An example of a compelling pattern pointing in this direction is the observation that investors tend to buy 2 not 3 stocks with a spend of £2,000, 3 not 2 stocks with a spend of £3,000, but then often 2 not 3 stocks with a spend of £4,000, suggesting that the total sum of money available for investment may be determining the number of stocks purchased in a very non-monotonic way. As discussed earlier on, the non-divisibility of individual stock implies that investors at the point of buying will only approximate NBD, as we saw earlier. Of course, we do not have experimental or natural sources of exogenous variation in either the total investment amount or N within or across investors.

common approach among investors is to simplify this problem by applying a $1/N$ heuristic to their buy-day purchases, approximately equalizing the money amount invested across several stocks, a behavior which we term *Naïve Buying Diversification* (NBD).

The propensity to use the NBD heuristic decreases with investor experience and financial stakes, consistent with models of learning and attention allocation. Nevertheless, even when investor experience is high and financial stakes are large, the proportion of investments made with NBD is above 20%. Hence NBD is only modestly sensitive to the economic stakes of investing.

Use of the NBD heuristic has the result of creating portfolio shares for individual stocks that do not closely approach equalizing weights in the investor's overall portfolio (Naïve Portfolio Diversification). This behavior is consistent with narrow framing, whereby investors appear to approach the buy–day task of allocating funds across stocks in a isolation from their existing portfolio positions. Investors may use the NBD heuristic due to a preference for simplicity. Consistent with this, investors implement NBD in a simple way, appearing to choose both margins in order to make the $1/N$ task mathematically simple.

Our findings indicate that investors act very narrowly, appearing to be concerned with bringing value-invested balance to purchase events on a day-by-day basis and not concerned with the resulting portfolio weights. This suggests that behavioral models of investment decisions should incorporate this type form of narrow framing, and that more empirical and theoretical work would be valuable to increase our understanding of why investors behave this way.

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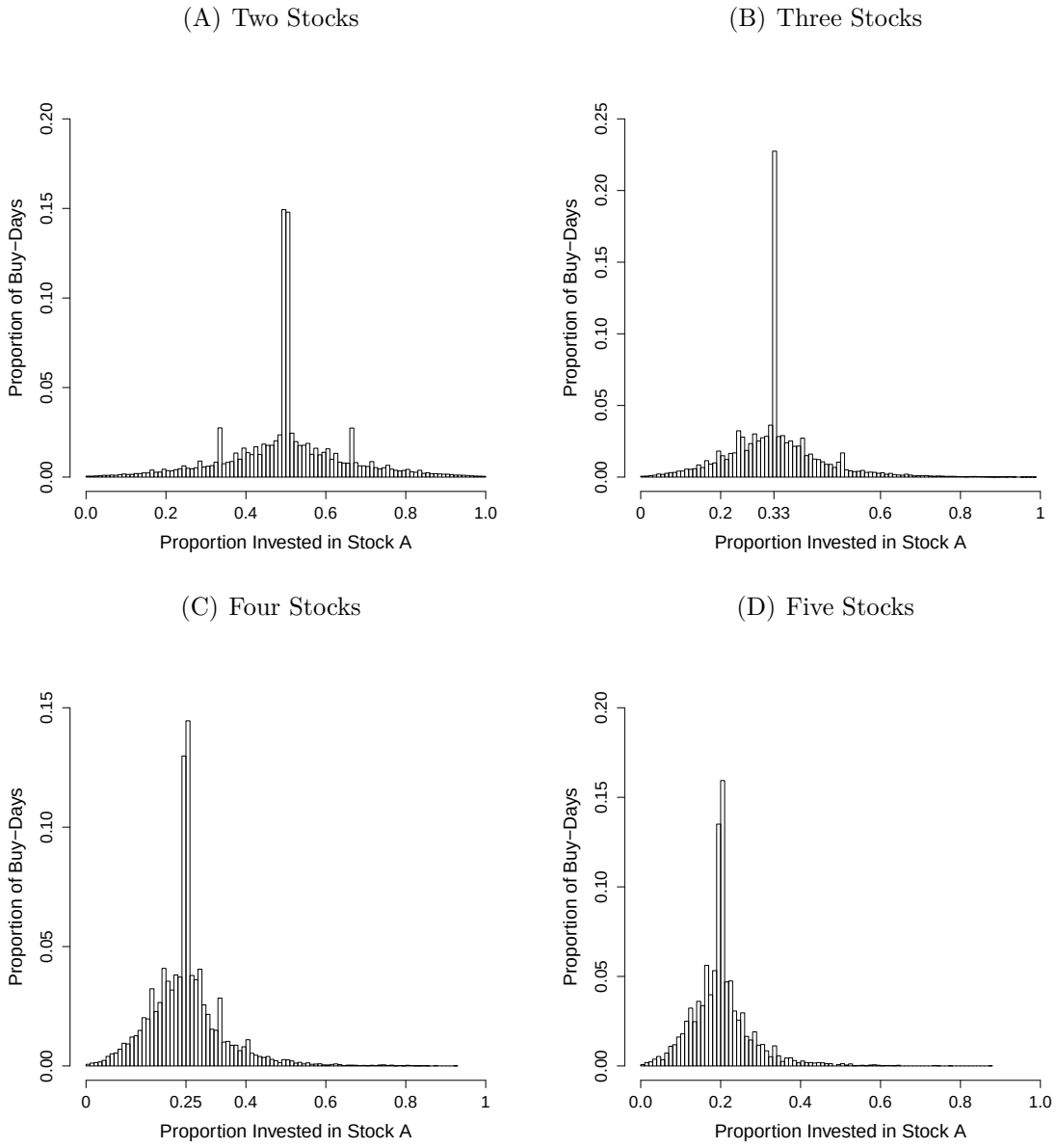
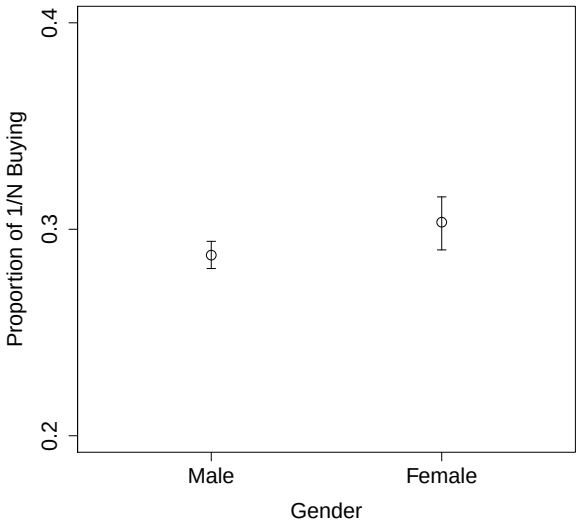
Figure 1: Proportion of Buy-Day Investment Allocated to Each Stock on Multiple-Stock Buy-Days



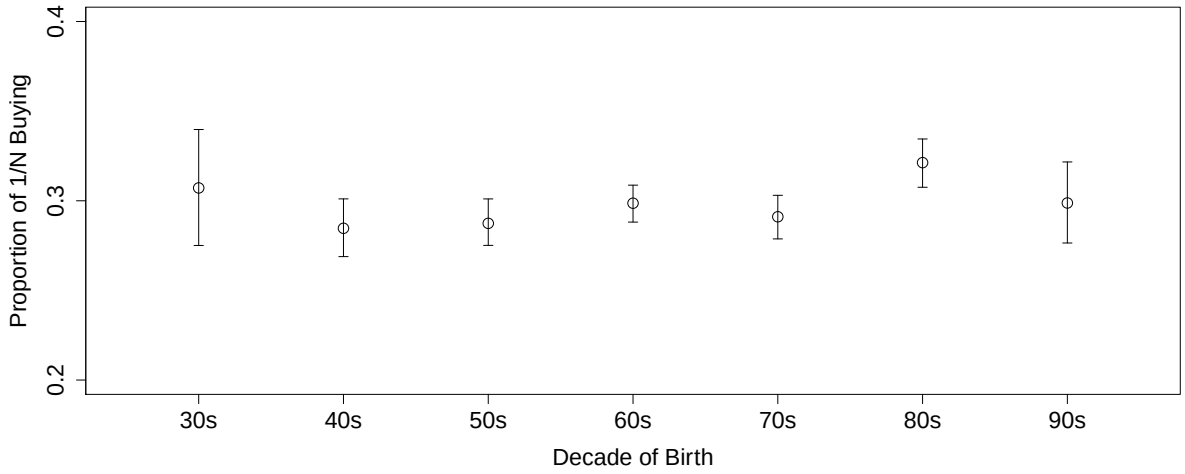
Note: Figure shows a histogram of the proportion of the total buy-day investment (in pounds) which is invested in Stock A, where Stock A is a randomly chosen stock from the group of stocks purchased. Bin width is 0.01. Sample is restricted to multiple-stock buy-days. See Section 2 for details on the sample construction.

Figure 2: Naïve Buying Diversification by Gender and Age
Two-Stock Buy-Days

(A) Gender



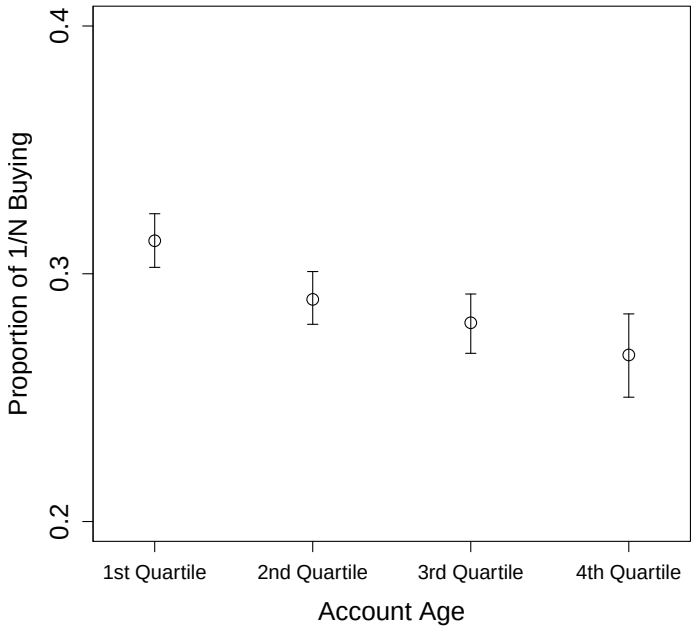
(B) Decade of Birth



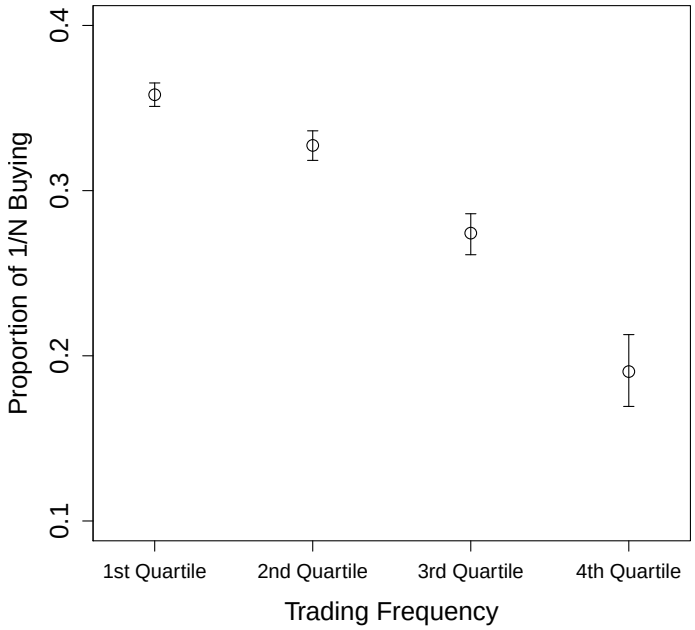
Note: Figure shows proportion of all two-stock buy-days on which the buy-day investments are split equally (in pounds) across the two stocks. Equal is defined in the range 49% to 51%. Sample is restricted to two-stock buy-days. See Section 2 for details on the sample construction. 95% confidence intervals illustrated in error bars.

Figure 3: Naïve Buying Diversification by Account Age and Trading Frequency
Two-Stock Buy-Days

(A) Account Tenure



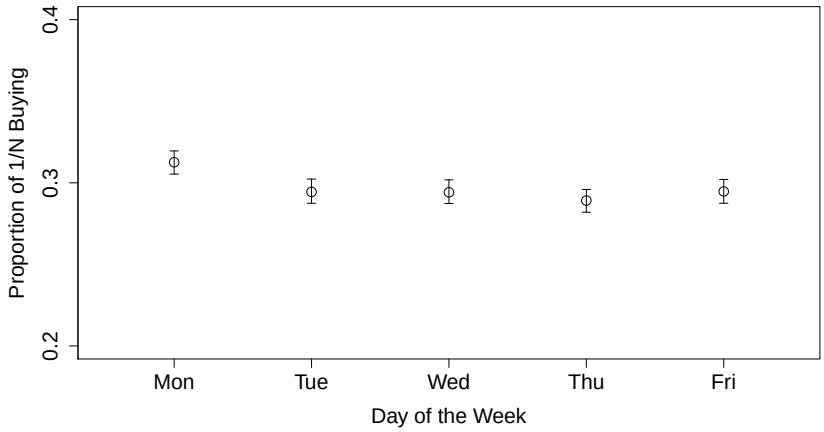
(B) Trading Frequency



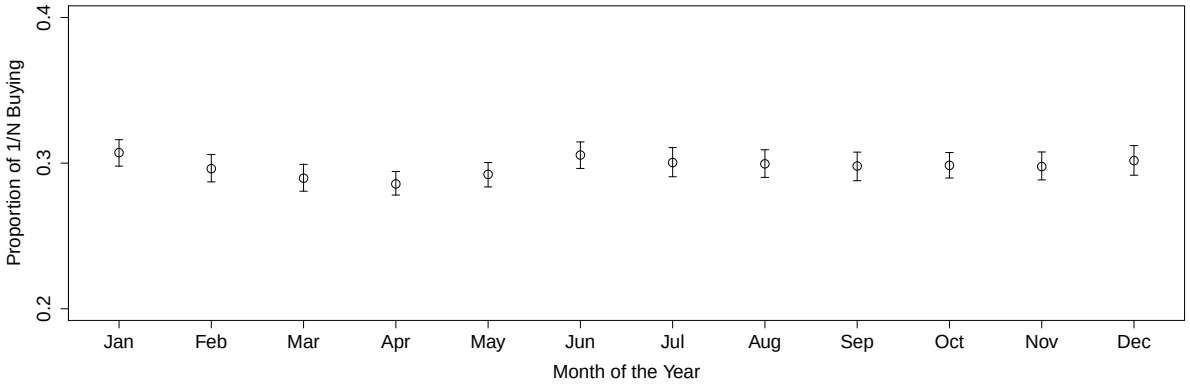
Note: Figure shows proportion of all two-stock buy-days on which the buy-day investments are split equally (in pounds) across the two stocks. Equal is defined in the range 49% to 51%. Sample is restricted to two-stock buy-days. See Section 2 for details on the sample construction. 95% confidence intervals illustrated in error bars.

Figure 4: Naïve Buying Diversification by Day and Month
Two-Stock Buy-Days

(A) Day of the Week



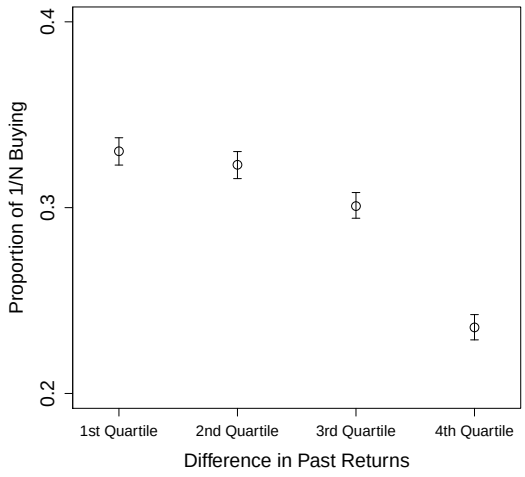
(B) Month of the Year



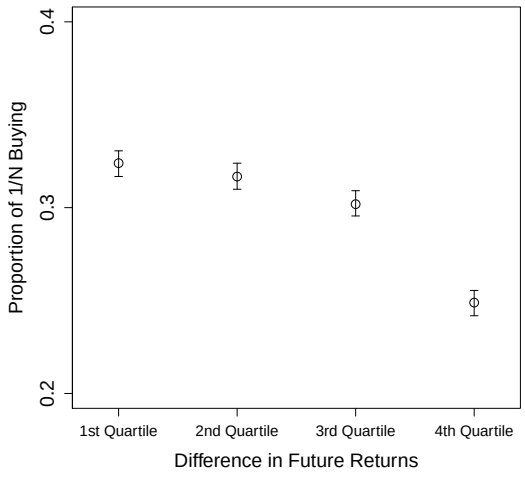
Note: Figure shows proportion of all two-stock buy-days on which the buy-day investments are split equally (in pounds) across the two stocks. Sample is restricted to two-stock buy-days. See Section 2 for details on the sample construction. Equal is defined in the range 49% to 51%. 95% confidence intervals illustrated in error bars.

Figure 5: Naïve Buying Diversification by Portfolio Value and Investment Amount
Two-Stock Buy-Days

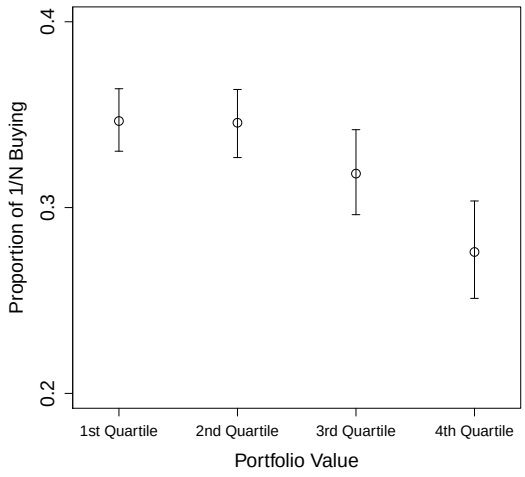
(A) Past 3 Month Returns



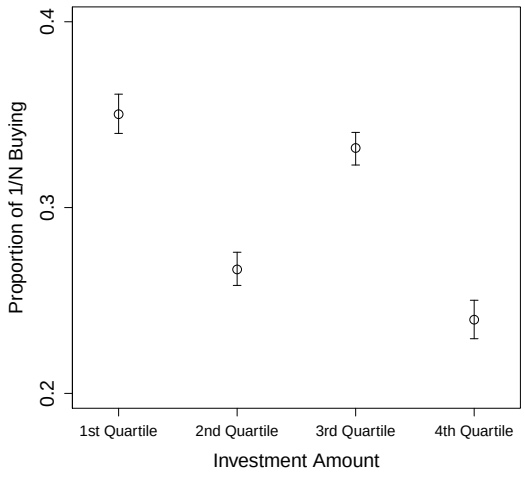
(B) Next 3 Month Returns



(C) Portfolio Value



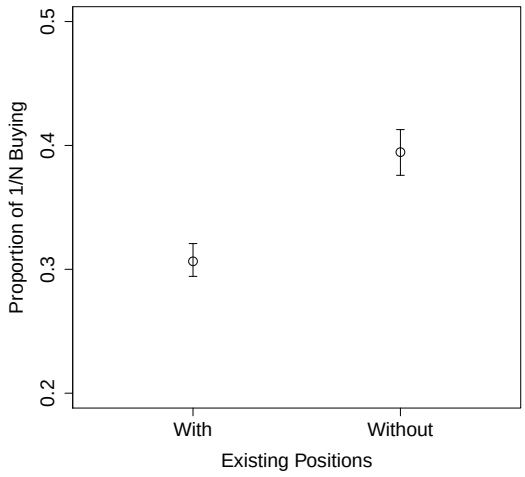
(D) Investment Amount on the Day



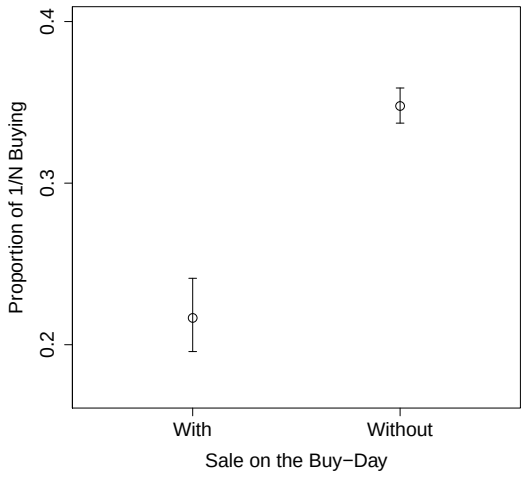
Note: Figure shows proportion of all two-stock buy-days on which the buy-day investments are split equally (in pounds) across the two stocks. Equal is defined in the range 49% to 51%. Sample is restricted to two-stock buy-days. See Section 2 for details on the sample construction. 95% confidence intervals illustrated in error bars. The quartile threshold values are: Panel A 25% : 5.5% , 50% : 12.4% and 75% : 25.3%; Panel B 25% : 5.5%, 50% : 12.2% and 75% : 23.7%; Panel C 25% : £5,860; 50% : £15,630; and 75% : £41,690; Panel D 25% : £1,910; 50% : £3,990 and 75% : £9,760.

Figure 6: Naïve Buying Diversification by Existing Positions and Sales
Two-Stock Buy-Days

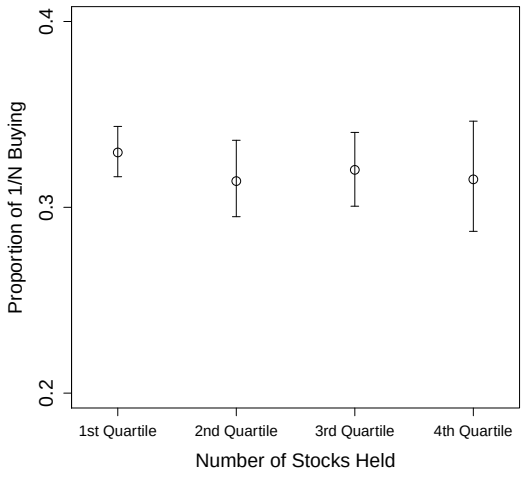
(A) Existing Position Held



(B) Sale on the Day



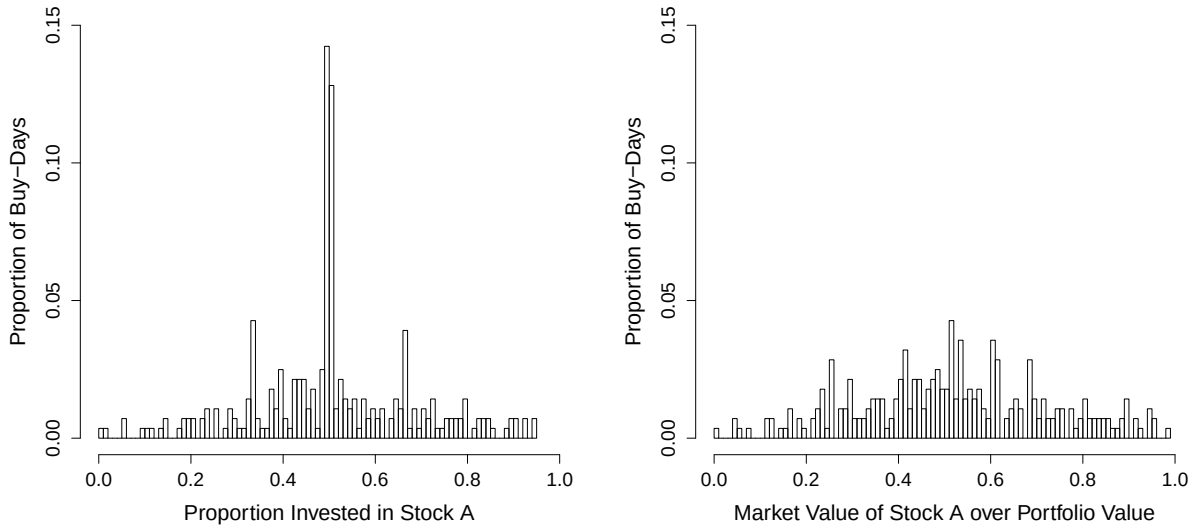
(C) Number of Stocks Held



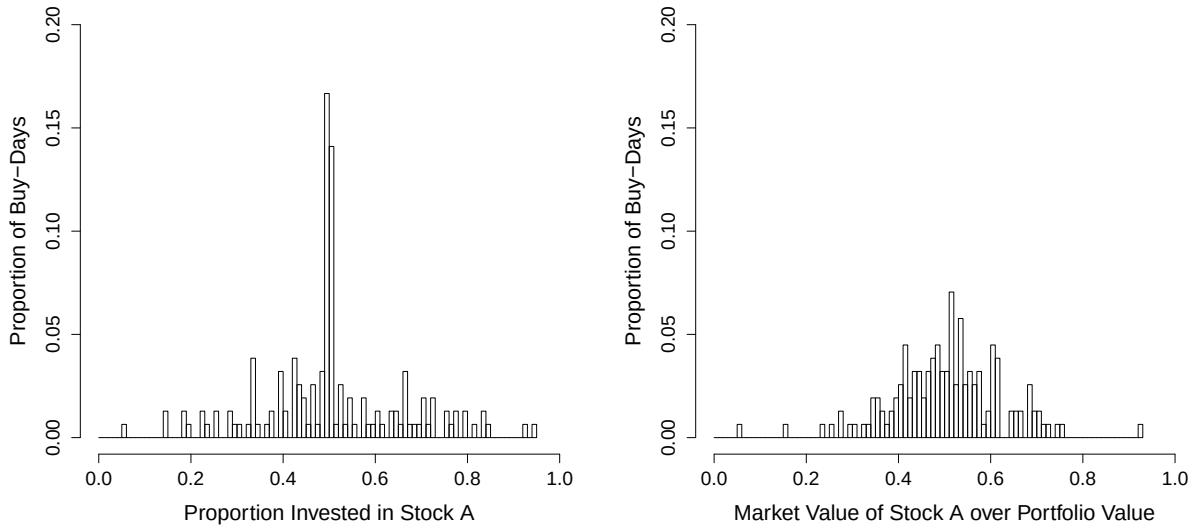
Note: Figure shows proportion of all two-stock buy-ays on which the buy-day investments are split equally (in pounds) across the two stocks. Equal is defined in the range 49% to 51%. Sample is restricted to two-stock buy-days in the new accounts data. See Section 2 for details on the sample construction. 95% confidence intervals illustrated in error bars.

Figure 7: Naïve Buying Diversification vs. Naïve Portfolio Diversification
Investors Topping-Up Two-Stock Portfolios

(A) Whole Sample

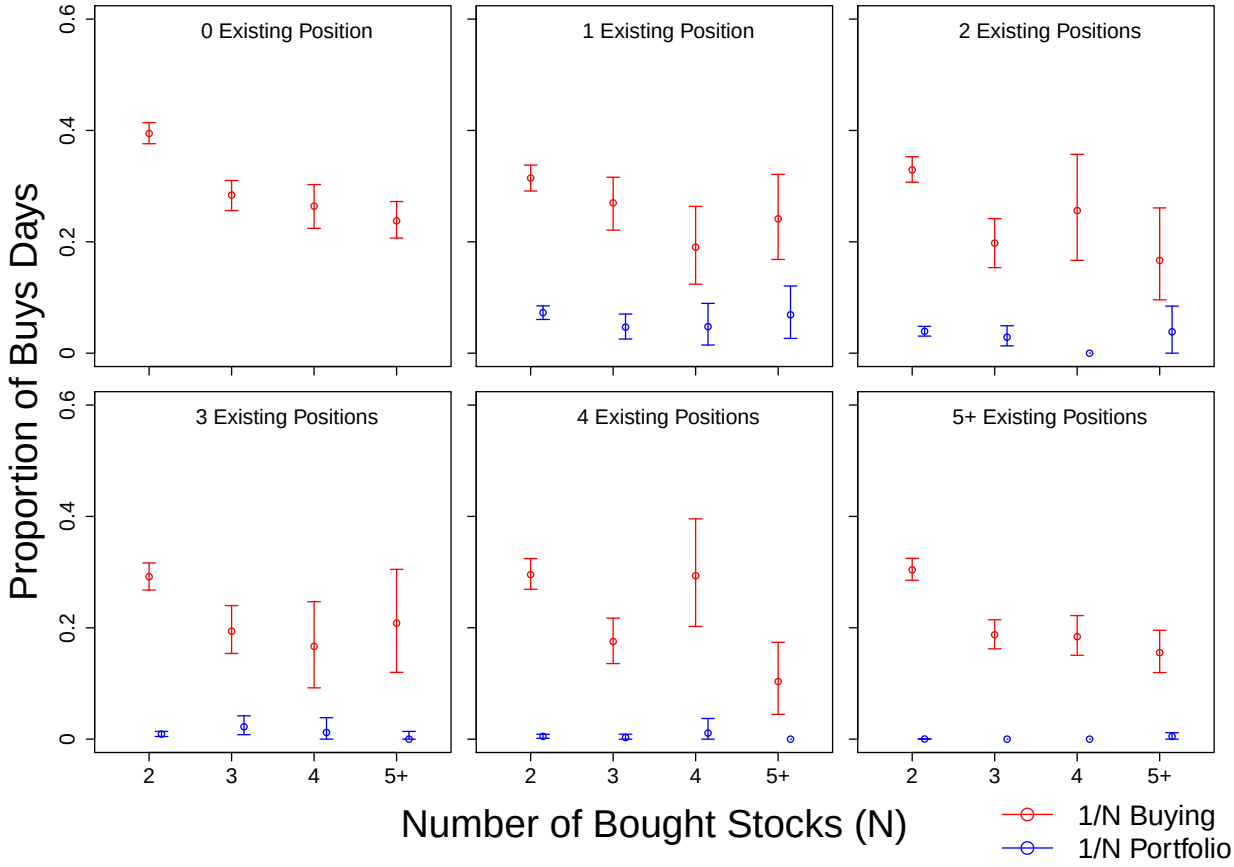


(B) Restricted Sample



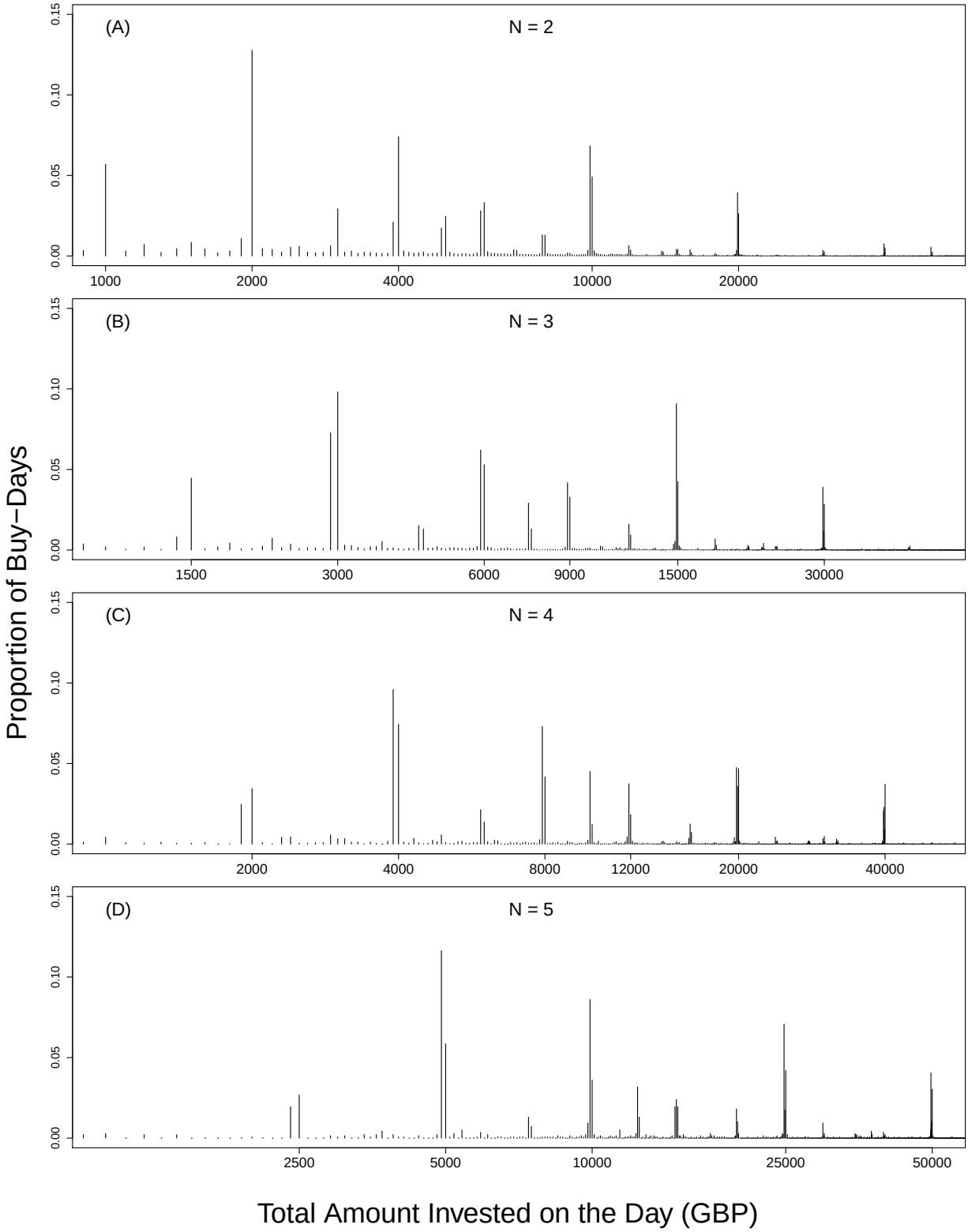
Note: Panel A figure shows a histogram of the proportion of the total buy-day investment (in pounds) invested in Stock A, where Stock A is a randomly chosen stock from the pair of stocks purchased. Bin width is 0.01. Panel B shows a histogram of the proportion of the end of day investment in the portfolio that is allocated to Stock A, where Stock A is a randomly chosen stock from the pair of stocks purchased. Sample is restricted to two-stock buy-days in the sample of new accounts. See Section 2 for details on the sample construction. Bin width is 0.01.

Figure 8: Naïve Buying Diversification vs. Naïve Portfolio Diversification
All Buy-Days



Note: Plots illustrate the proportion of buy-days on which multiple-stock purchases as split across stocks $1/N$ (in red) and on which the end of day portfolio positions are split $1/N$ (in blue). Separate panels for number of existing positions within the portfolio at the start of the day, with number of stocks purchased on the day shown on the x-axis of each panel. Sample is restricted to multiple-stock buy-days in the new accounts data. See Section 2 for details on the sample construction.

Figure 9: Distribution of Total Buy-Day Investment (in £) by Number of Stocks Bought



Note: Panels illustrate the distribution (density) of monies invested on the buy-day (in pounds) for multiple-stock buy-days involving 2 – 5 stocks. Sample is restricted to multiple-stock buy-days. See Section 2 for details on the sample construction.

Table 1: $1/N$ Allocations on Multiple-Stock Buy-Days

(a) Panel A: ($£P/N \times (1 \pm 0.02)$)

Stocks	1/N Buying (%)	LL	UL	Buy-days
2	29.7	29.1	30.3	177193
3	20.3	19.4	21.1	48896
4	18.6	17.6	19.7	17672
5	17.5	16.0	19.0	7925
6+	15.2	13.1	17.3	9899
All	26.3	25.6	26.9	261585

(b) Panel B: ($£P/N \times (1 \pm 0.05)$)

Stocks	1/N Buying (%)	LL	UL	Buy-days
2	36.5	36.0	37.1	177193
3	23.3	22.4	24.2	48896
4	20.9	19.7	22.1	17672
5	20.1	18.6	21.7	7925
6+	18.0	15.3	20.6	9899
All	31.8	31.1	32.5	261585

(c) Panel C: ($£P/N \times (1 \pm 0.05)$)

Stocks	1/N Buying (%)	LL	UL	Buy-days
2	45.6	45.1	46.2	177193
3	27.8	26.8	28.7	48896
4	23.9	22.6	25.2	17672
5	22.4	20.7	24.0	7925
6+	20.0	17.2	22.8	9899
All	39.1	38.4	39.9	261585

Note: Table shows summary data for multiple-stock buy-days. Each row reports the percentage of buy-days involving N stocks in which the proportion invested in each stock falls within the $1/N$ range, for differing ranges. See Section 3 for details. Lower limit and upper limit values of 95% confidence intervals from bootstrap mean estimates are reported in LL and UL columns. Sample is restricted to multiple-stock buy-days. See Section 2 for details on the sample construction.

Table 2: Naïve Buying Diversification by Investor Characteristics

(a) Gender

Gender	Male	Female
% of Sample	83.29	16.71
Proportion of $1/N$	0.29	0.30
95% CI	[0.28, 0.29]	[0.29, 0.32]

(b) Decade of Birth

Decade of Birth	30s	40s	50s	60s
% of Sample	3.81	15.57	24.14	28.76
Proportion $1/N$	0.31	0.28	0.29	0.30
95% CI	[0.28, 0.34]	[0.27, 0.30]	[0.27, 0.30]	[0.29, 0.31]

Decade of Birth	70s	80s	90s	2000-
% of Sample	16.32	8.63	2.17	0.14
Proportion $1/N$	0.29	0.32	0.30	0.32
95% CI	[0.28, 0.30]	[0.31, 0.34]	[0.28, 0.32]	[0.26, 0.40]

(c) Account Age

	Quartiles			
Age in Months	Q1	Q2	Q3	Q4
Quartile Mean	9.94	41.84	83.67	134.26
Proportion $1/N$	0.31	0.29	0.28	0.27
95% CI	[0.30, 0.32]	[0.28, 0.30]	[0.27, 0.29]	[0.25, 0.28]

(d) Trading Frequency

	Quartiles			
Trades Per Month	Q1	Q2	Q3	Q4
Quartile Mean	0.56	1.93	5.78	35.07
Proportion $1/N$	0.36	0.33	0.27	0.19
95% CI	[0.35, 0.36]	[0.32, 0.34]	[0.26, 0.29]	[0.17, 0.21]

Note: Table shows summary data the proportion of two-stock buy-days within the $1/N$ range. See Section 3 for details. Sample is restricted to multiple-stock buy-days. See Section 2 for details on the sample construction.

Table 3: Naïve Buying Diversification by Trading Characteristics I

(a) Day of the Week

Day of the Week	Mon	Tue	Wed	Thu	Fri
% of Sample	20.76	20.35	19.40	19.45	20.04
Proportion $1/N$	0.31	0.29	0.29	0.29	0.29
95% CI	[0.31, 0.32]	[0.29, 0.30]	[0.29, 0.30]	[0.28, 0.30]	[0.29, 0.30]

(b) Month of the Year

Month	Jan	Feb	Mar	Apr	May	Jun
% of Sample	9.48	8.70	9.57	10.58	9.68	7.61
Proportion $1/N$	0.31	0.30	0.29	0.29	0.29	0.31
95% CI	[0.30, 0.32]	[0.29, 0.31]	[0.28, 0.30]	[0.28, 0.29]	[0.28, 0.30]	[0.30, 0.32]

Month	Jul	Aug	Sep	Oct	Nov	Dec
% of Sample	7.53	7.53	7.62	8.14	7.40	6.16
Proportion $1/N$	0.30	0.30	0.30	0.30	0.30	0.30
95% CI	[0.29, 0.31]	[0.29, 0.31]	[0.29, 0.31]	[0.29, 0.31]	[0.29, 0.31]	[0.29, 0.31]

(c) Difference in Past 3 Month Gross Returns

	Quartile			
Difference in Past 3 Month Returns (%)	Q1	Q2	Q3	Q4
Quartile Mean	0.03	0.09	0.18	0.83
Proportion $1/N$	0.33	0.32	0.30	0.24
95% CI	[0.32, 0.34]	[0.32, 0.33]	[0.29, 0.31]	[0.23, 0.24]

(d) Difference in Next 3 Month Gross Returns

	Quartile			
Difference in Next 3 Month Returns (%)	Q1	Q2	Q3	Q4
Quartile Mean	0.03	0.09	0.17	0.48
Proportion $1/N$	0.32	0.32	0.30	0.25
95% CI	[0.32, 0.33]	[0.31, 0.32]	[0.29, 0.31]	[0.24, 0.26]

Note: Table shows summary data the proportion of two-stock buy-days within the $1/N$ range. See Section 3 for details. Sample is restricted to multiple-stock buy-days. See Section 2 for details on the sample construction.

Table 4: Naïve Buying Diversification by Trading Characteristics II

(a) Portfolio Value (£)

	Quartile			
Portfolio Value (£)	Q1	Q2	Q3	Q4
Quartile Mean	2,566.81	10,326.33	25,908.63	168,976.48
Proportion $1/N$	0.35	0.35	0.32	0.28
95% CI	[0.33, 0.36]	[0.33, 0.36]	[0.30, 0.34]	[0.25, 0.30]

(b) Investment Value (£)

	Quartile			
Investment Value (£)	Q1	Q2	Q3	Q4
Quartile Mean	1,441.06	4,035.69	8,489.37	34,723.43
Proportion $1/N$	0.35	0.27	0.33	0.24
95% CI	[0.34, 0.36]	[0.26, 0.28]	[0.32, 0.34]	[0.23, 0.25]

(c) Holds Existing Position(s)

Existing Position Held	With	Without
% of Sample	82.76	17.24
Proportion $1/N$	0.31	0.39
95% CI	[0.29, 0.32]	[0.38, 0.41]

(d) Number of Stocks Held

	Quartile			
Number of Stocks Held	Q1	Q2	Q3	Q4
Quartile Mean	2.35	4.44	7.22	17.90
Proportion $1/N$	0.33	0.31	0.32	0.32
95% CI	[0.32, 0.34]	[0.29, 0.33]	[0.30, 0.34]	[0.29, 0.35]

(e) Same Day Sale

Sale on the Day	With	Without
% of Sample	20.22	79.78
Proportion $1/N$	0.22	0.35
95% CI	[0.19, 0.24]	[0.34, 0.36]

Note: Table shows summary data the proportion of two-stock buy-days within the $1/N$ range. See Section 3 for details. Sample is restricted to multiple-stock buy-days. See Section 2 for details on the sample construction.

Table 5: Probit Regression Marginal Effects: $1/N$ Buying on Two-Stock Buy-Days

	Model 1	Model 2	Model 3
(intercept)	-0.110	-0.111	0.007
	[-0.321,0.095]	[-0.311,0.104]	[-0.185,0.212]
Decade of Birth 1930s	-0.069	-0.066	-0.082
	[-0.275,0.160]	[-0.302,0.151]	[-0.290,0.132]
Decade of Birth 1940s	-0.090	-0.071	-0.083
	[-0.310,0.117]	[-0.285,0.123]	[-0.279,0.111]
Decade of Birth 1950s	-0.059	-0.039	-0.054
	[-0.260,0.159]	[-0.247,0.150]	[-0.235,0.140]
Decade of Birth 1960s	-0.069	-0.034	-0.047
	[-0.277,0.143]	[-0.242,0.168]	[-0.226,0.148]
Decade of Birth 1970s	-0.069	-0.049	-0.058
	[-0.288,0.135]	[-0.260,0.146]	[-0.251,0.139]
Decade of Birth 1980s	-0.077	-0.056	-0.065
	[-0.290,0.135]	[-0.262,0.142]	[-0.250,0.129]
Decade of Birth 1990s	-0.061	-0.058	-0.069
	[-0.262,0.154]	[-0.283,0.139]	[-0.258,0.133]
Decade of Birth 2000s	-0.092	0.054	0.027
	[-0.339,0.185]	[-0.210,0.268]	[-0.214,0.249]
Male	-0.009	0.003	0.003
	[-0.046,0.029]	[-0.033,0.041]	[-0.034,0.040]
Feb	-0.023	-0.021	-0.026
	[-0.070,0.025]	[-0.067,0.027]	[-0.073,0.025]
Mar	-0.007	-0.009	-0.012
	[-0.059,0.039]	[-0.058,0.035]	[-0.060,0.037]
Apr	-0.020	-0.022	-0.025
	[-0.068,0.026]	[-0.073,0.024]	[-0.069,0.025]
May	-0.020	-0.024	-0.030
	[-0.072,0.031]	[-0.071,0.032]	[-0.082,0.024]
Jun	-0.027	-0.031	-0.032
	[-0.079,0.026]	[-0.085,0.014]	[-0.080,0.023]
Jul	-0.009	-0.015	-0.018
	[-0.062,0.043]	[-0.067,0.035]	[-0.067,0.036]
Aug	-0.025	-0.024	-0.027
	[-0.079,0.025]	[-0.075,0.020]	[-0.076,0.023]
Sep	0.011	0.010	0.008
	[-0.040,0.063]	[-0.040,0.064]	[-0.042,0.058]
Oct	-0.013	-0.018	-0.020
	[-0.062,0.037]	[-0.068,0.031]	[-0.071,0.027]
Nov	0.004	0.001	0.002
	[-0.051,0.054]	[-0.054,0.052]	[-0.052,0.058]
Dec	-0.017	-0.019	-0.018
	[-0.071,0.034]	[-0.072,0.035]	[-0.073,0.036]
Monday	0.003	0.001	0.004
	[-0.032,0.038]	[-0.032,0.034]	[-0.029,0.035]
Tuesday	-0.011	-0.007	-0.005
	[-0.046,0.023]	[-0.043,0.025]	[-0.040,0.030]
Wednesday	-0.011	-0.009	-0.008
	[-0.047,0.024]	[-0.042,0.025]	[-0.045,0.027]
Thursday	-0.008	-0.007	-0.006
	[-0.041,0.026]	[-0.040,0.025]	[-0.038,0.030]
	...	...	...
	...	...	...
	...	...	...

Table 5 Continued...

	Model 1	Model 2		Model 3	
	...	...		...	
	...	...		...	
	...	...		...	
Account Tenure 2nd Quartile		0.009		0.018	
		[-0.023,0.042]		[-0.019,0.052]	
Account Tenure 3rd Quartile		-0.004		0.007	
		[-0.036,0.032]		[-0.030,0.043]	
Account Tenure 4th Quartile		-0.014		-0.003	
		[-0.049,0.026]		[-0.043,0.036]	
Ave Num of Trades Per Month		-0.006	***	-0.005	**
		[-0.010,-0.004]		[-0.008,-0.003]	
Portfolio Value (x 10000)				-0.001	
				[-0.003,0.000]	
Num of Stocks in the Portfolio				0.004	*
				[0.000,0.006]	
Inv Amount on the Day (x 10000)				0.002	
				[-0.004,0.007]	
N (Num of Bought Stocks)				-0.019	**
				[-0.033,-0.007]	
Range in Past 60-Days Returns				-0.005	
				[-0.027,0.002]	
Range in Next 60-Days Returns				-0.088	**
				[-0.147,-0.037]	
Existing Position Dummy				-0.055	**
				[-0.087,-0.016]	
Same-Day Sale Dummy				-0.076	***
				[-0.108,-0.042]	
Log-Likelihood	-37102.11	-35497.87		-34750.81	

Note: Table reports marginal effects from probit regression model estimates. Dependent variable is a 1/0 dummy indicating whether the buy-day investment falls within the $1/N$ range, defined as $£P/N \times (1 \pm 0.02)$. Covariates are account characteristics. Sample is restricted to multiple-stock buy-days in the new accounts data. See Section 2 for details on the sample construction. * denotes statistical significance at the 5% level, ** at the 1% level and *** at the 0.1% level.

Table 6: Starting and Ending Portfolio Positions on Multiple-Stock Buy-Days

Panel (A) ($£P/N \times (1 \pm 0.02)$)

1/N Existing Positions	1/N Buying	1/N Resulting Positions	Proportion of Buy-Days	LL	UL
Yes	Yes	Yes	0.5	0.4	0.7
Yes	Yes	No	0.6	0.4	0.7
Yes	No	Yes	0.0	0.0	0.0
Yes	No	No	1.1	0.9	1.3
No	Yes	Yes	0.1	0.0	0.1
No	Yes	No	28.5	27.3	29.8
No	No	Yes	0.1	0.0	0.1
No	No	No	69.2	67.8	70.4

Panel (B) ($£P/N \times (1 \pm 0.05)$)

1/N Existing Positions	1/N Buying	1/N Resulting Positions	Proportion of Buy-Days	LL	UL
Yes	Yes	Yes	1.5	1.3	1.7
Yes	Yes	No	1.3	1.1	1.5
Yes	No	Yes	0.1	0.0	0.1
Yes	No	No	1.9	1.6	2.1
No	Yes	Yes	0.1	0.1	0.2
No	Yes	No	32.7	31.5	34.0
No	No	Yes	0.2	0.1	0.3
No	No	No	62.2	60.9	63.5

Panel (C) ($£P/N \times (1 \pm 0.1)$)

1/N Existing Positions	1/N Buying	1/N Resulting Positions	Proportion of Buy-Days	LL	UL
Yes	Yes	Yes	2.7	2.4	3.1
Yes	Yes	No	2.2	2.0	2.5
Yes	No	Yes	0.2	0.1	0.2
Yes	No	No	2.7	2.4	3.0
No	Yes	Yes	0.2	0.2	0.3
No	Yes	No	37.2	36.0	38.3
No	No	Yes	0.3	0.2	0.4
No	No	No	54.5	53.3	55.8

Note: Table shows summary data for multiple-stock buy days. Each row reports the percentage of buy-days by combinations of existing positions at the beginning of the day, buying split, and resulting positions in the $1/N$ range, for differing ranges. Lower limit and upper limit values of 95% confidence intervals from bootstrap mean estimate reported in LL and UL columns. Sample is restricted to multiple-stock buy-days in the new accounts data. See Section 2 for details on the sample construction.

Table 7: Naïve Portfolio Diversification, Restricted Sample Buy-Days

N	1/N Portfolios (%)	LL	UL	Buy-days
2	3.5	2.9	4.3	2622
3	1.4	1.0	1.9	2549
4	0.8	0.3	1.3	1052
5	1.1	0.2	2.3	467
6+	0.0	0.0	0.0	482
All	2.0	1.6	2.3	7172

Note: Table shows summary data for multiple-stock buy days. Each row reports the percentage of buy-days resulting positions in the $1/N$ range, for different number of stocks in the portfolio. Lower limit and upper limit values of 95% confidence intervals from bootstrap mean estimate reported in LL and UL columns. Sample is restricted to multiple-stock buy-days in the new accounts data. See Section 2 for details on the sample construction.

Table 8: Naïve Portfolio Diversification By N Stocks Purchased and N Positions
All Buy-Days

	Single Stock Purchase	2 Stock Purchase	3 Stock Purchase	4 Stock Purchase	5 Sstock Purchase	6+ Sstock Purchase
0 Existing Position	NA	36.5	24.9	22.4	25.0	14.1
		[34.8,38.3]	[22.0,27.5]	[19.0,25.8]	[19.5,30.6]	[10.6,17.8]
1 Existing Position	8.6	7.3	4.7	4.8	10.0	4.5
	[8.1, 9.2]	[6.0, 8.5]	[2.6, 7.1]	[1.6, 8.7]	[2.3,18.9]	[0.0,10.5]
2 Existing Positions	2.3	3.9	2.9	0.0	2.8	4.8
	[2.0, 2.5]	[3.0, 5.0]	[1.2, 4.5]	[0.0, 0.0]	[0.0, 9.7]	[0.0,11.9]
3 Existing Positions	0.6	0.9	2.2	1.2	0.0	0.0
	[0.5, 0.7]	[0.5, 1.4]	[0.8, 4.0]	[0.0, 3.8]	[0.0, 0.0]	[0.0, 0.0]
4 Existing Positions	0.3	0.5	0.3	1.1	0.0	0.0
	[0.2, 0.4]	[0.2, 0.9]	[0.0, 0.9]	[0.0, 3.6]	[0.0, 0.0]	[0.0, 0.0]
5 Existing Positions	0.1	0.2	0.0	0.0	8.1	0.0
	[0.0, 0.1]	[0.0, 0.4]	[0.0, 0.0]	[0.0, 0.0]	[0.0,18.8]	[0.0, 0.0]
6+ Existing Positions	0.0	0.0	0.0	0.0	0.0	0.3
	[0.0, 0.0]	[0.0, 0.0]	[0.0, 0.0]	[0.0, 0.0]	[0.0, 0.0]	[0.0, 0.8]

Note: Table shows data for all buy-days. Each cell reports the percentage of buy-days which end in $1/N$ allocations by number of existing positions at the start of the buy-day and number stocks purchased on the day. Cell [0,1] empty as it takes a value of 100% by construction. Values in square brackets report lower limit and upper limit values of 95% confidence intervals from bootstrap mean estimate. Sample is restricted to multiple-stock buy-days in the new accounts data. See Section 2 for details on the sample construction.

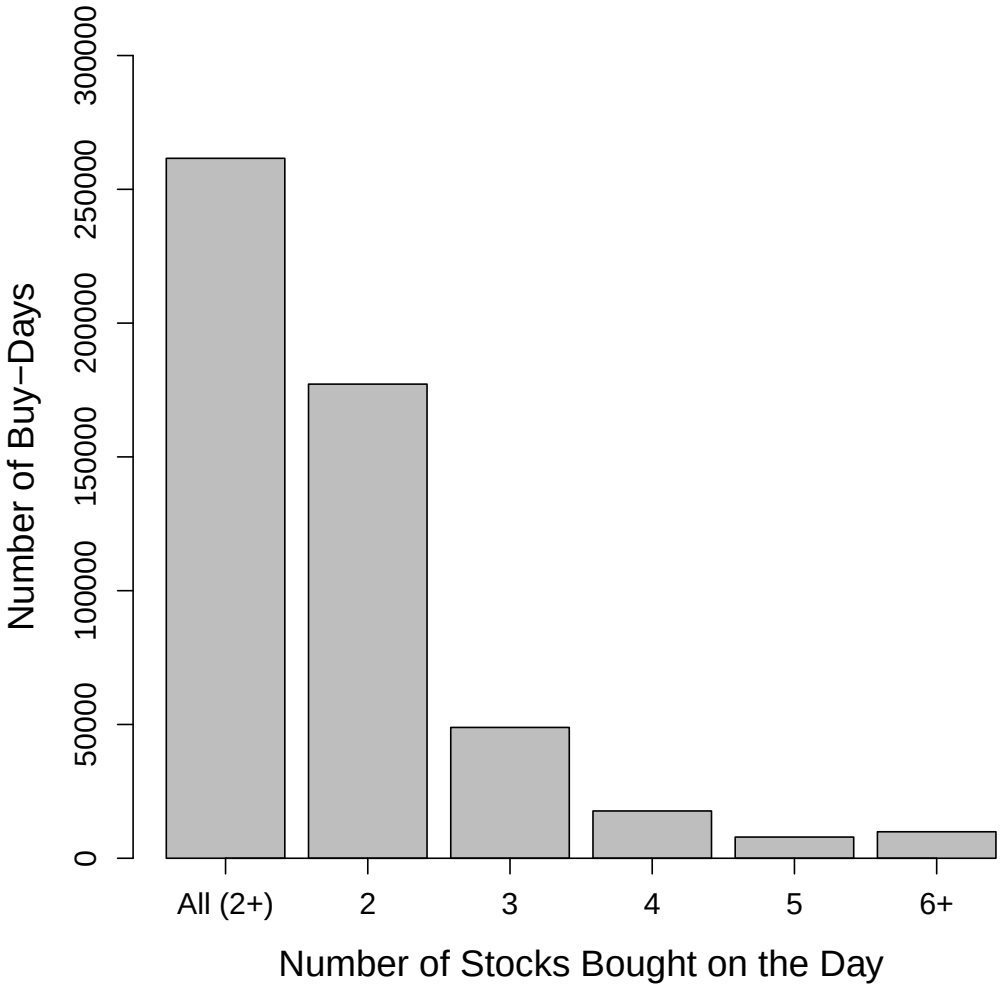
Table 9: Naïve Buying Diversification By N Stocks Purchased and N Positions
All Buy-Days

	2 Stock Purchase	3 Stock Purchase	4 Stock Purchase	5 Sstock Purchase	6+ Sstock Purchase
0 Existing Position	39.5	28.4	26.4	29.9	19.4
	[37.7,41.4]	[25.7,31.3]	[22.8,30.5]	[24.3,35.5]	[15.5,23.6]
1 Existing Position	31.5	27.0	19.0	30.0	19.7
	[29.4,33.7]	[22.6,31.7]	[12.5,26.6]	[17.5,42.2]	[10.3,29.4]
2 Existing Positions	32.9	19.8	25.6	19.4	14.3
	[30.6,35.0]	[15.9,24.1]	[16.5,34.9]	[7.1,34.1]	[4.8,25.6]
3 Existing Positions	29.2	19.4	16.7	20.6	21.1
	[26.9,31.6]	[15.4,23.5]	[9.0,24.4]	[8.3,35.0]	[8.3,34.1]
4 Existing Positions	29.5	17.5	29.3	12.2	7.9
	[26.7,32.4]	[13.6,21.8]	[20.8,38.9]	[4.2,23.4]	[0.0,17.6]
5 Existing Positions	30.6	17.8	20.9	35.1	17.2
	[27.6,33.8]	[13.4,22.5]	[13.3,29.5]	[16.7,53.1]	[5.3,33.3]
6+ Existing Positions	30.4	18.9	18.0	15.2	13.9
	[28.2,32.6]	[16.1,21.6]	[14.4,21.7]	[11.4,19.4]	[9.2,19.1]

Note: Table shows data for all buy-days. Each cell reports the percentage of buy-days on which the investor splits the buy-day investment $1/N$, by number of existing positions at the start of the buy-day and number stocks purchased on the day. Values in square brackets report lower limit and upper limit values of 95% confidence intervals from bootstrap mean estimate.

Appendix

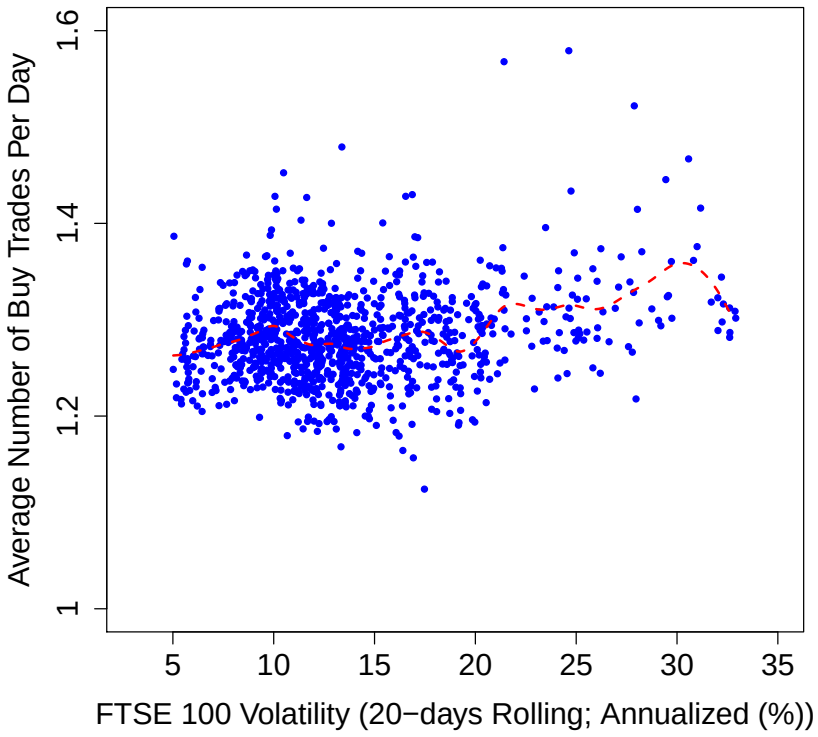
Figure A1: Number of Stocks Bought on Multiple-Stock Buy-Days



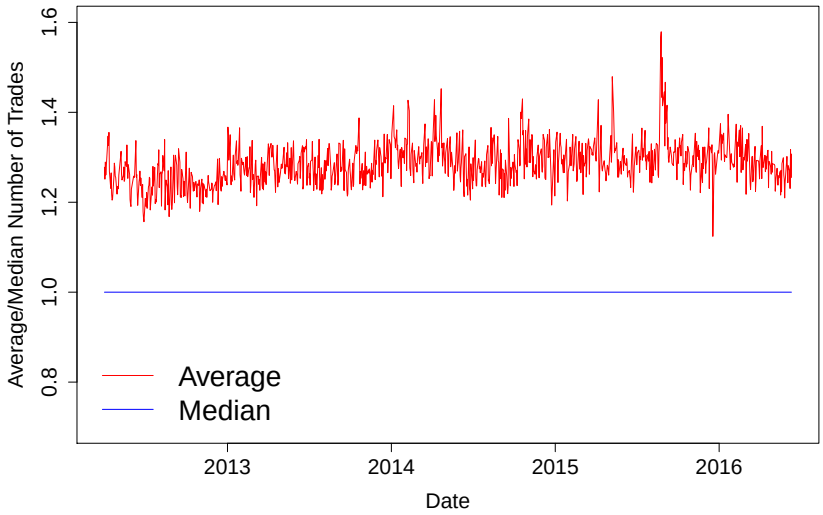
Note: Sample comprises all multiple-stock buy-days. Right-most column includes all multiple-stock buy-days on which 6 or more stocks were purchased.

Figure A2: Number of Stocks Bought and Market Volatility

(A) Market Volatility and Mean Stocks Purchased

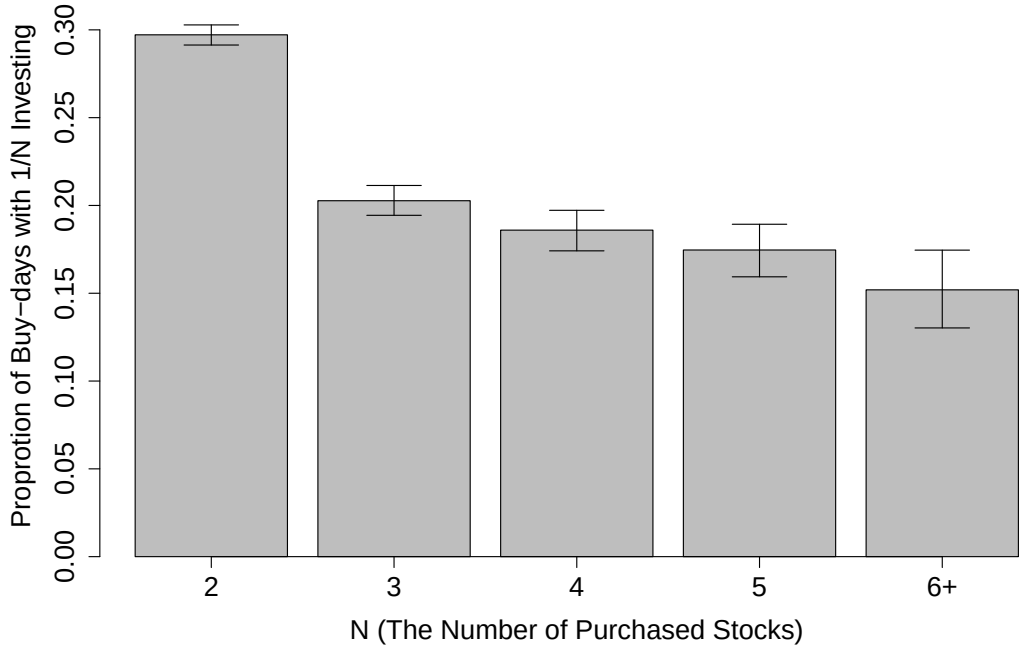


(B) Mean Stocks Purchased by Calendar Days



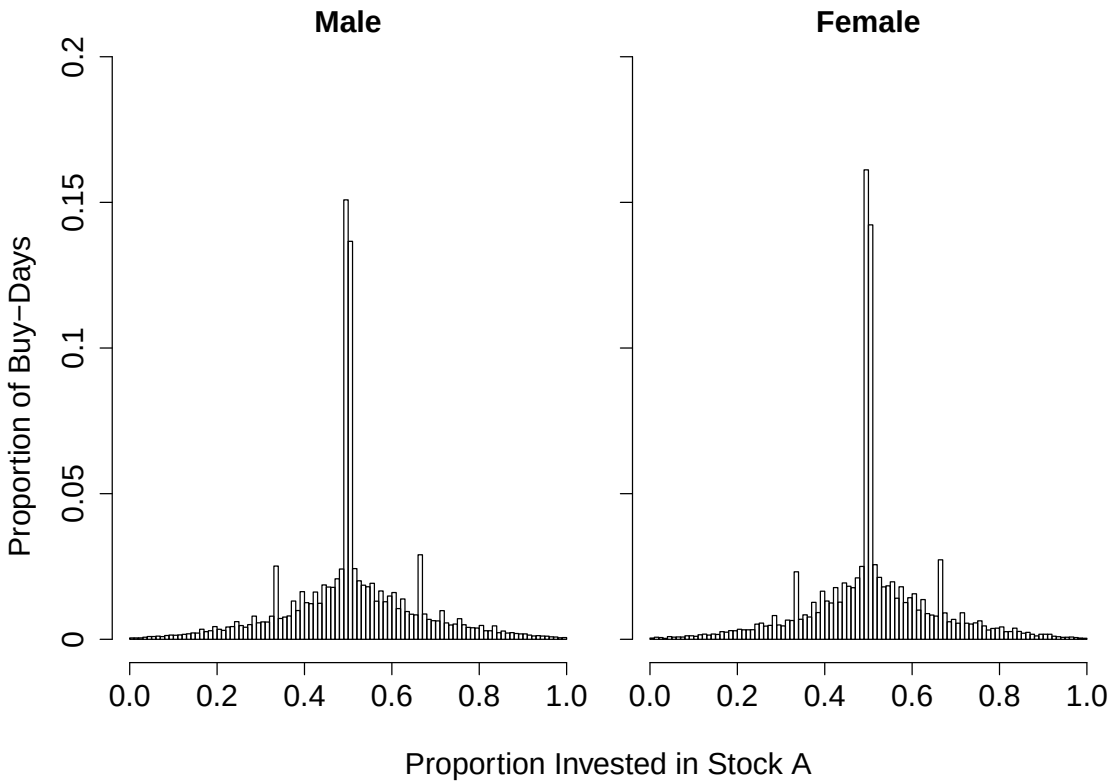
Note: Panel A shows the correlation between the average number of buy trades per day (among accounts making at least one buy trade on the day) and the volatility of the FTSE 100. Panel B shows the average and median number of buy trades per day (among accounts making at least one buy trade on the day) by calendar date of the sample period. Sample comprises all buy-days (including both single-stock and multiple-stock buy-days).

Figure A3: Proportion of Buy-Days with $1/N$ Buying by Number of Stocks Purchased



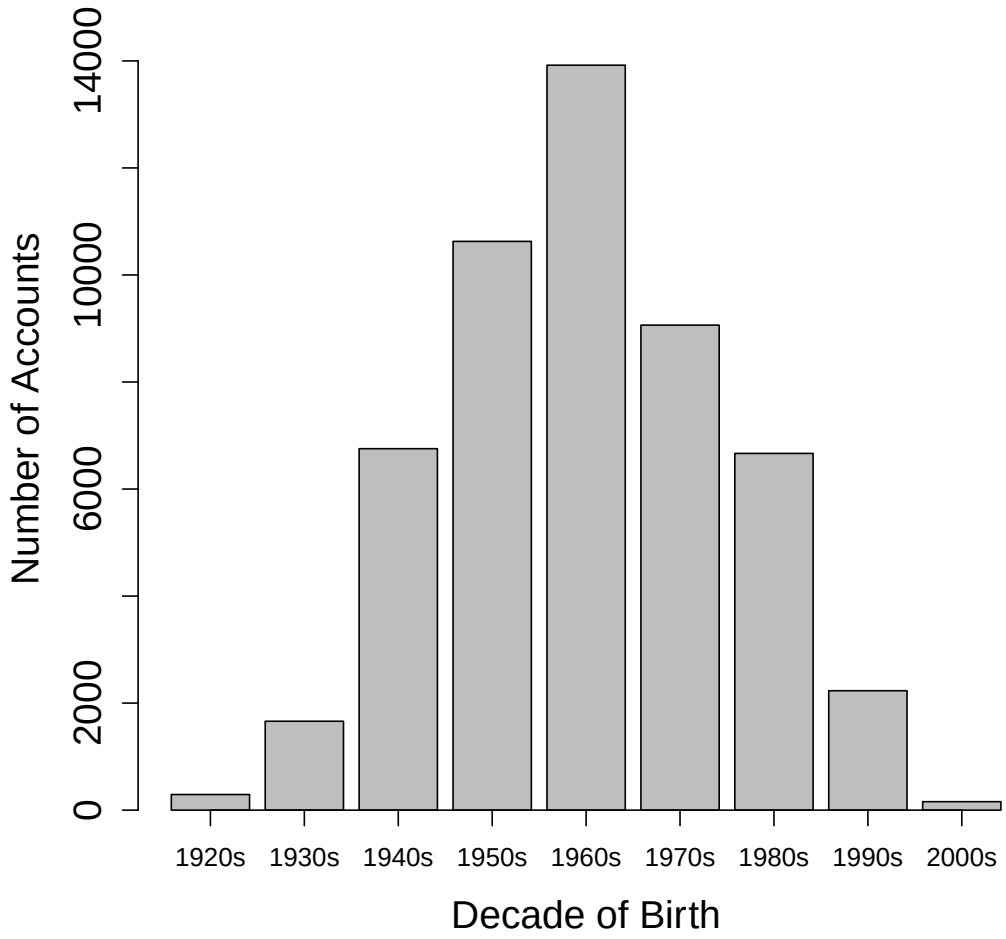
Note: Bar heights illustrate the proportion of all N-stock buy-days on which buy-day investments are split equally (in pound values) across the N stocks purchased. Equal is defined in the range 49% to 51%. Sample comprises all buy-days on which investors buy two or more stocks. 95% confidence intervals illustrated in error bars.

Figure A4: Proportion of Two-Stock Buy-Day Investment in Stock A by Gender



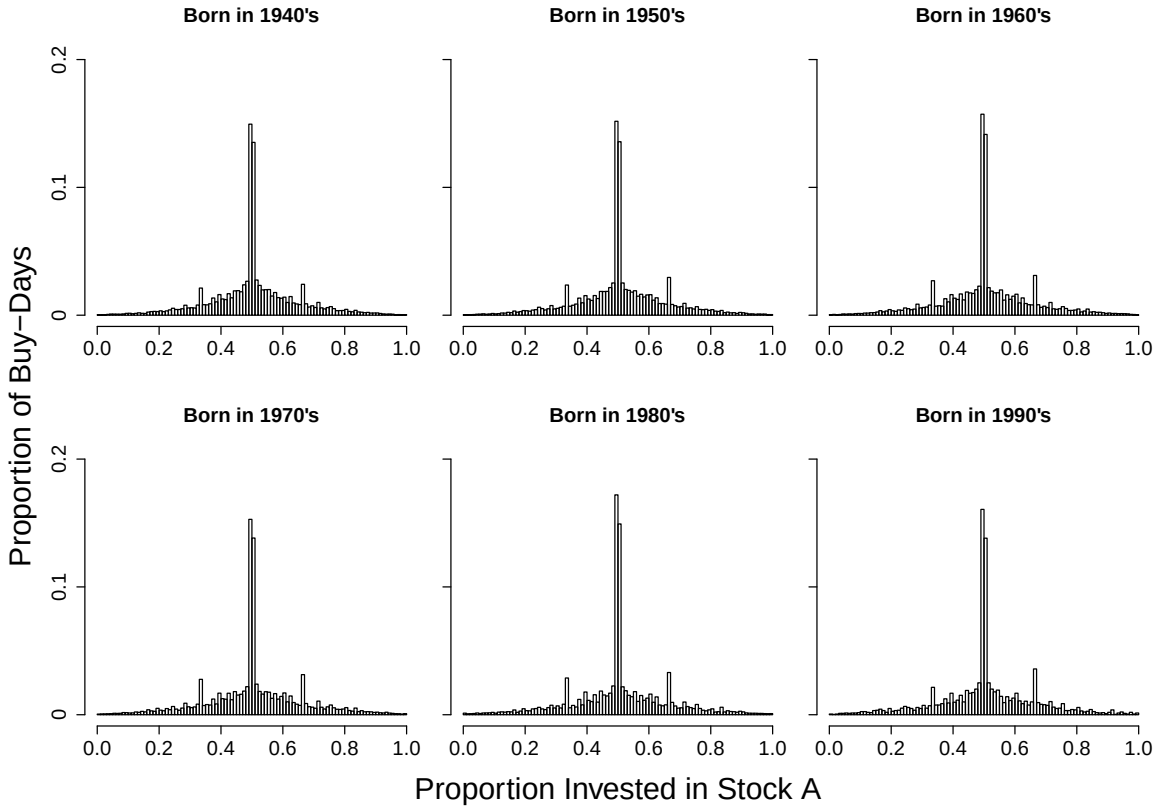
Note: Figures show histograms of the proportion of the total buy-day investment (in pounds) which is invested in Stock A, where Stock A is a randomly chosen stock from the pair of stocks purchased. Sample comprises all buy-days on which investors buy exactly two stocks. Bin width is 0.01.

Figure A5: Distribution of Investor Decade of Birth



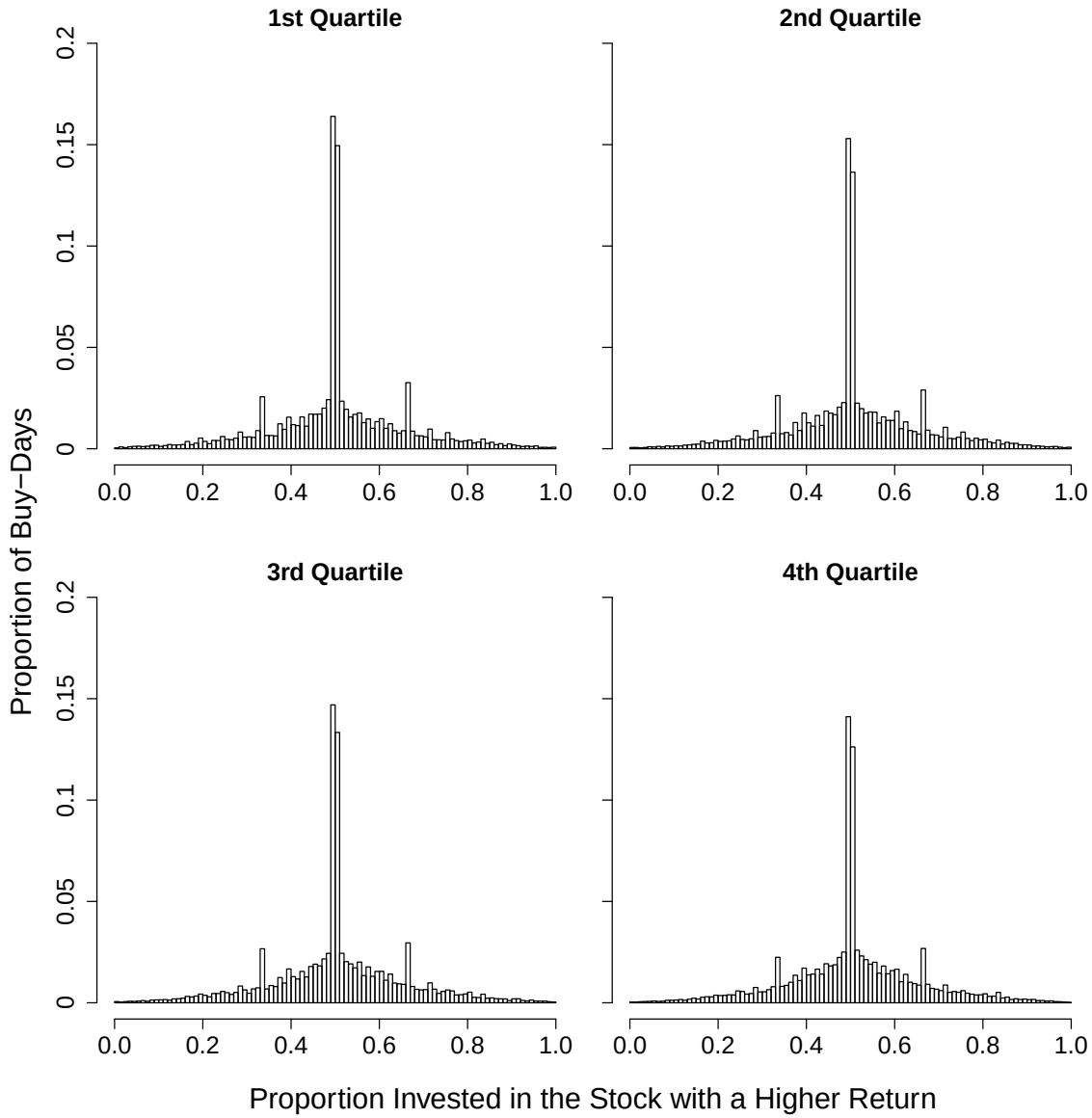
Note: Figure shows a histogram (frequency) of two-stock buy-days by decade of birth of the investor.

Figure A6: Proportion of Two-Stock Buy-Day Investment in Stock A by Age of Investor



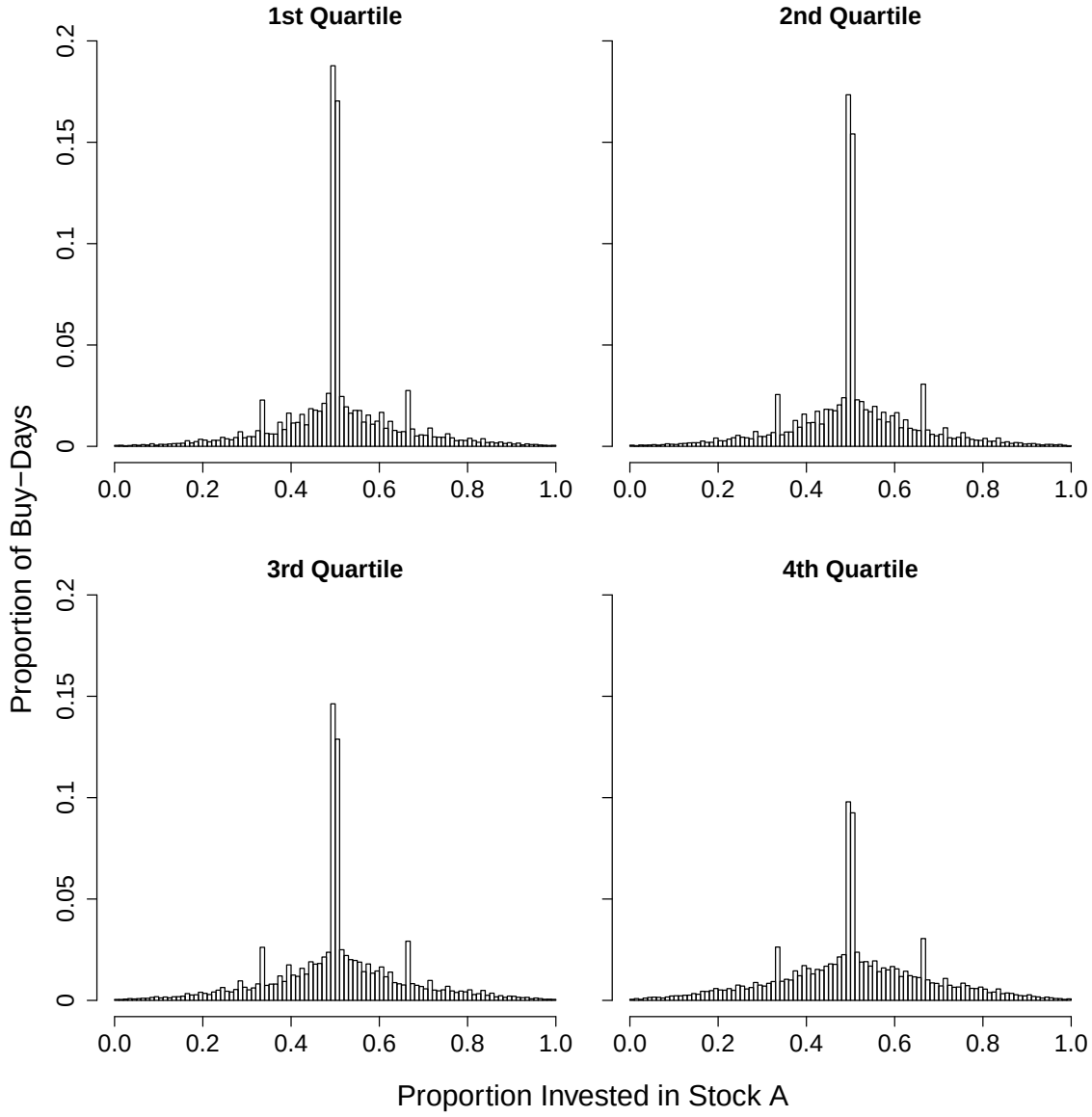
Note: Figures show histograms of the proportion of the total buy-day investment (in pounds) which is invested in Stock A, where Stock A is a randomly chosen stock from the pair of stocks purchased. Sample comprises all buy-days on which investors buy exactly two stocks. Bin width is 0.01.

Figure A7: Proportion of Two-Stock Buy-Day Investment in Stock A by Account Tenure



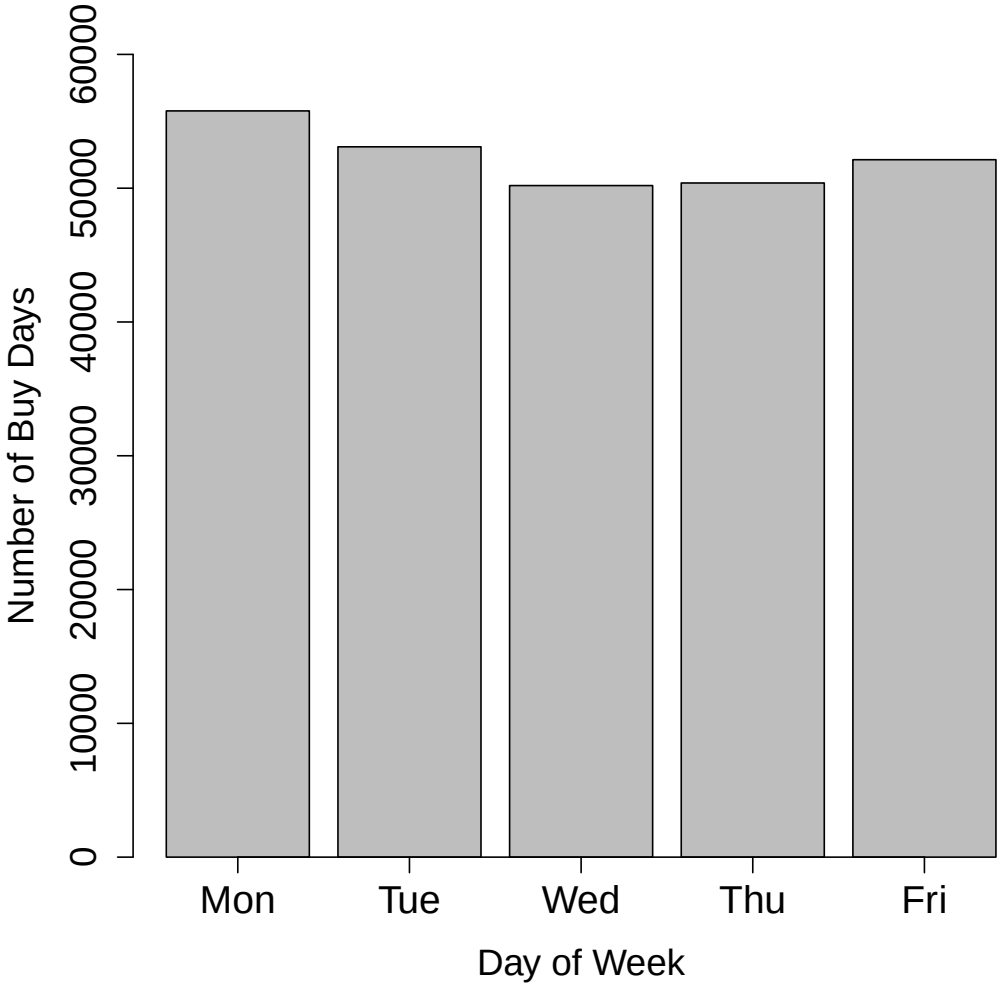
Note: Figures show histograms of the proportion of the total buy-day investment (in pounds) which is invested in Stock A, where Stock A is a randomly chosen stock from the pair of stocks purchased. Sample comprises all buy-days on which investors buy exactly two stocks. Bin width is 0.01.

Figure A8: Proportion of Two-Stock Buy-Day Investment in Stock A by Trading Frequency



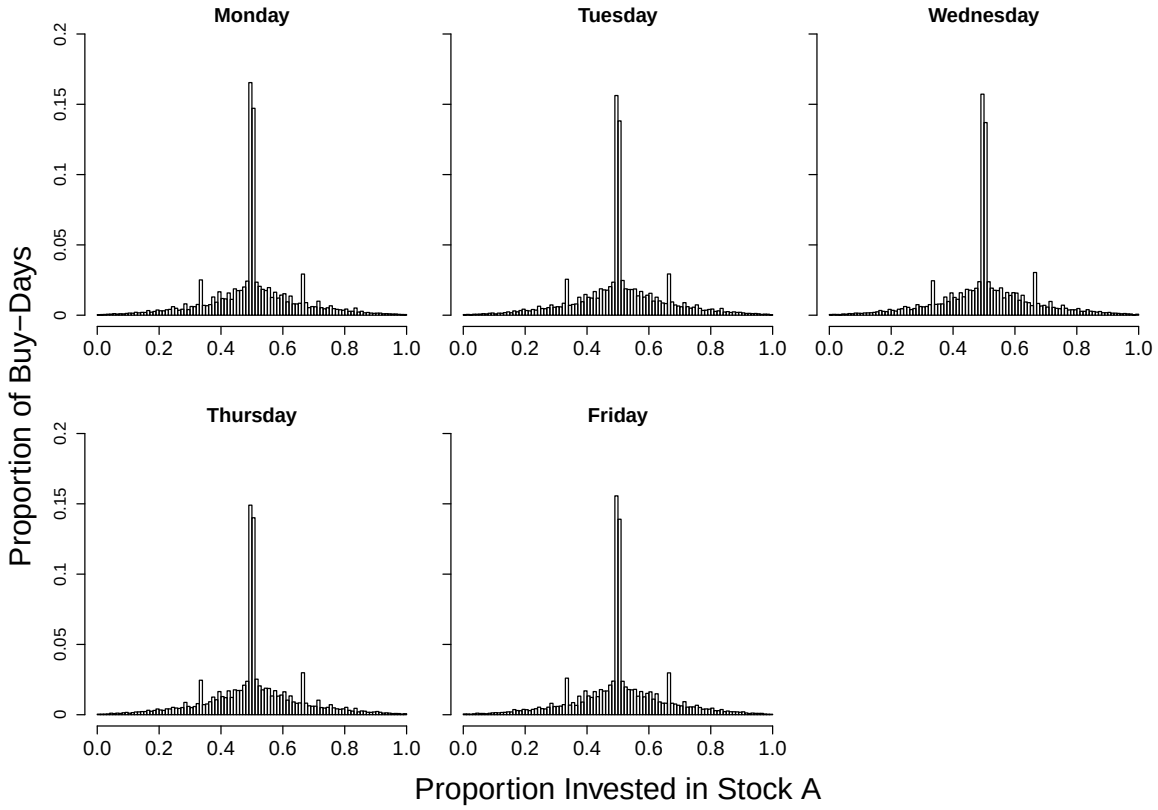
Note: Figures show histograms of the proportion of the total buy-day investment (in pounds) which is invested in Stock A, where Stock A is a randomly chosen stock from the pair of stocks purchased. Sample comprises all buy-days on which investors buy exactly two stocks. Bin width is 0.01.

Figure A9: Distribution of Investment Day of Week



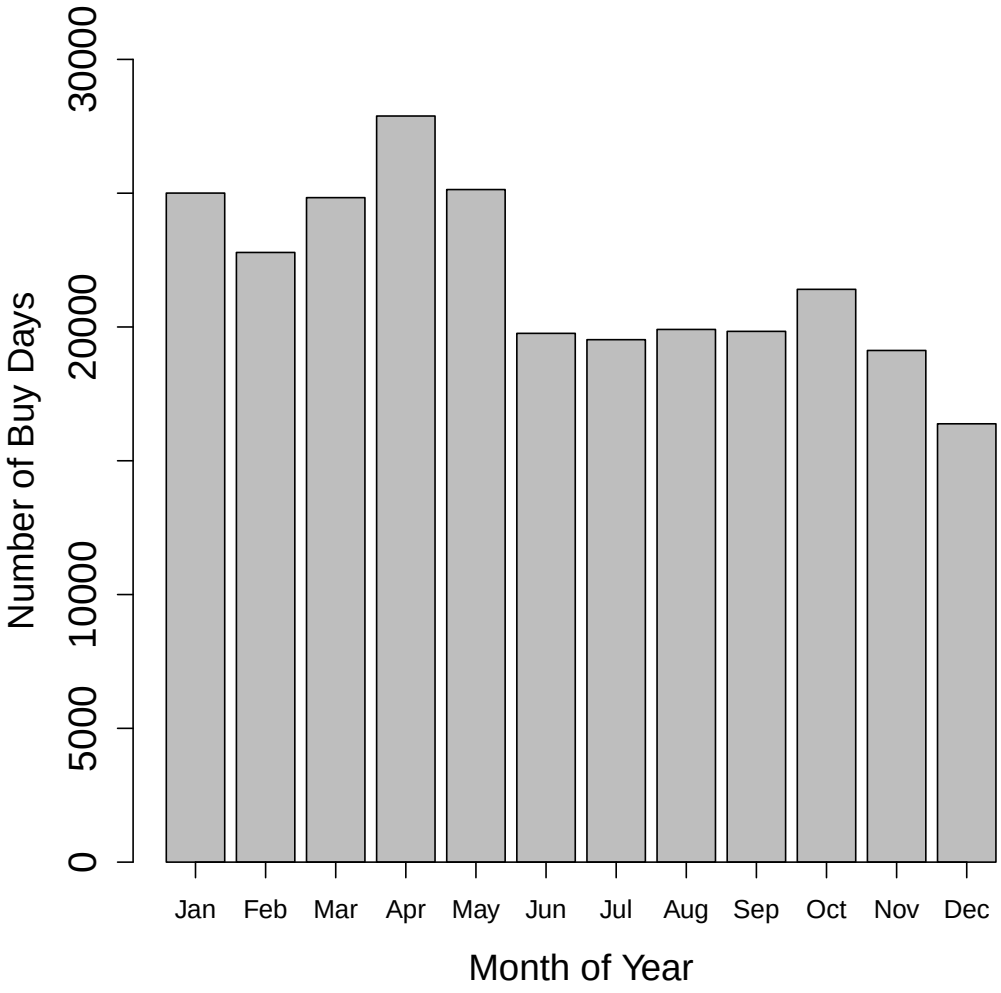
Note: Figure shows a histogram (frequency) of two-stock buy-days by day of the week.

Figure A10: Proportion of Two-Stock Buy-Day Monies Invested in Stock A by Day



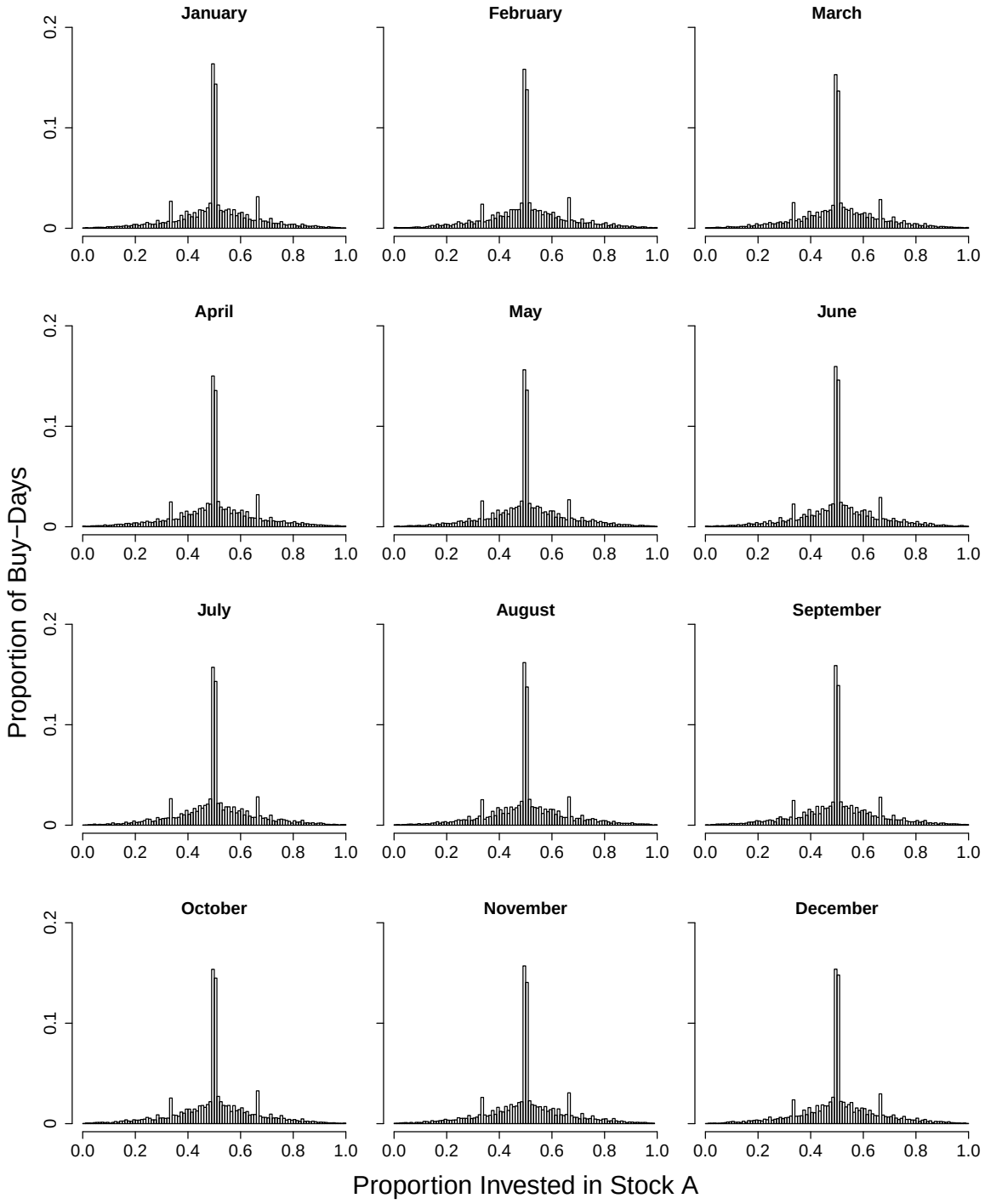
Note: Figures show histograms of the proportion of the total buy-day investment (in pounds) which is invested in Stock A, where Stock A is a randomly chosen stock from the pair of stocks purchased. Sample comprises all buy-days on which investors buy exactly two stocks. Bin width is 0.01.

Figure A11: Distribution of Investment Month of Year



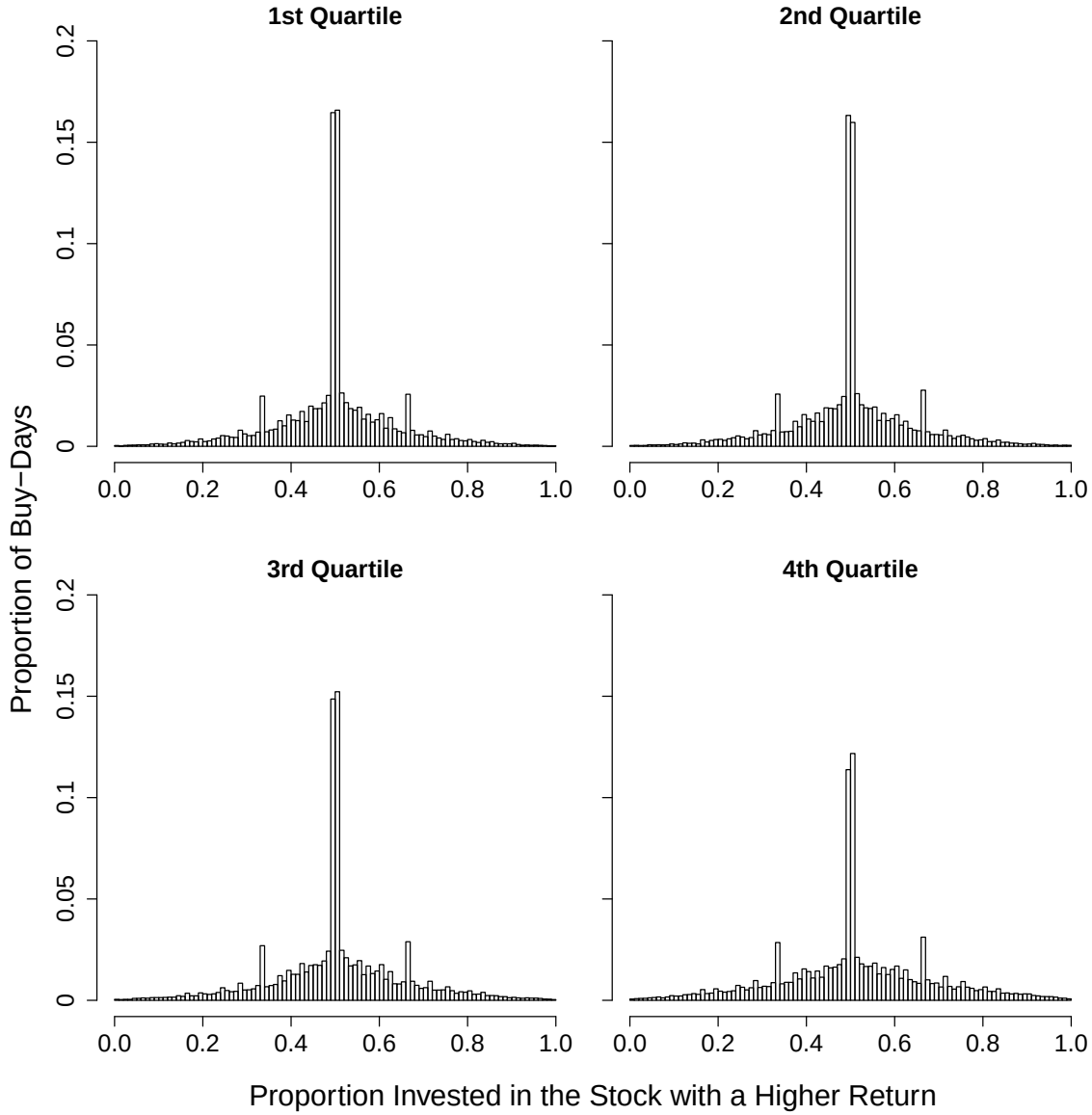
Note: Figure shows a histogram (frequency) of two-stock buy-days by month of the year.

Figure A12: Proportion of Two-Stock Buy-Day Monies Invested in Stock A by Month



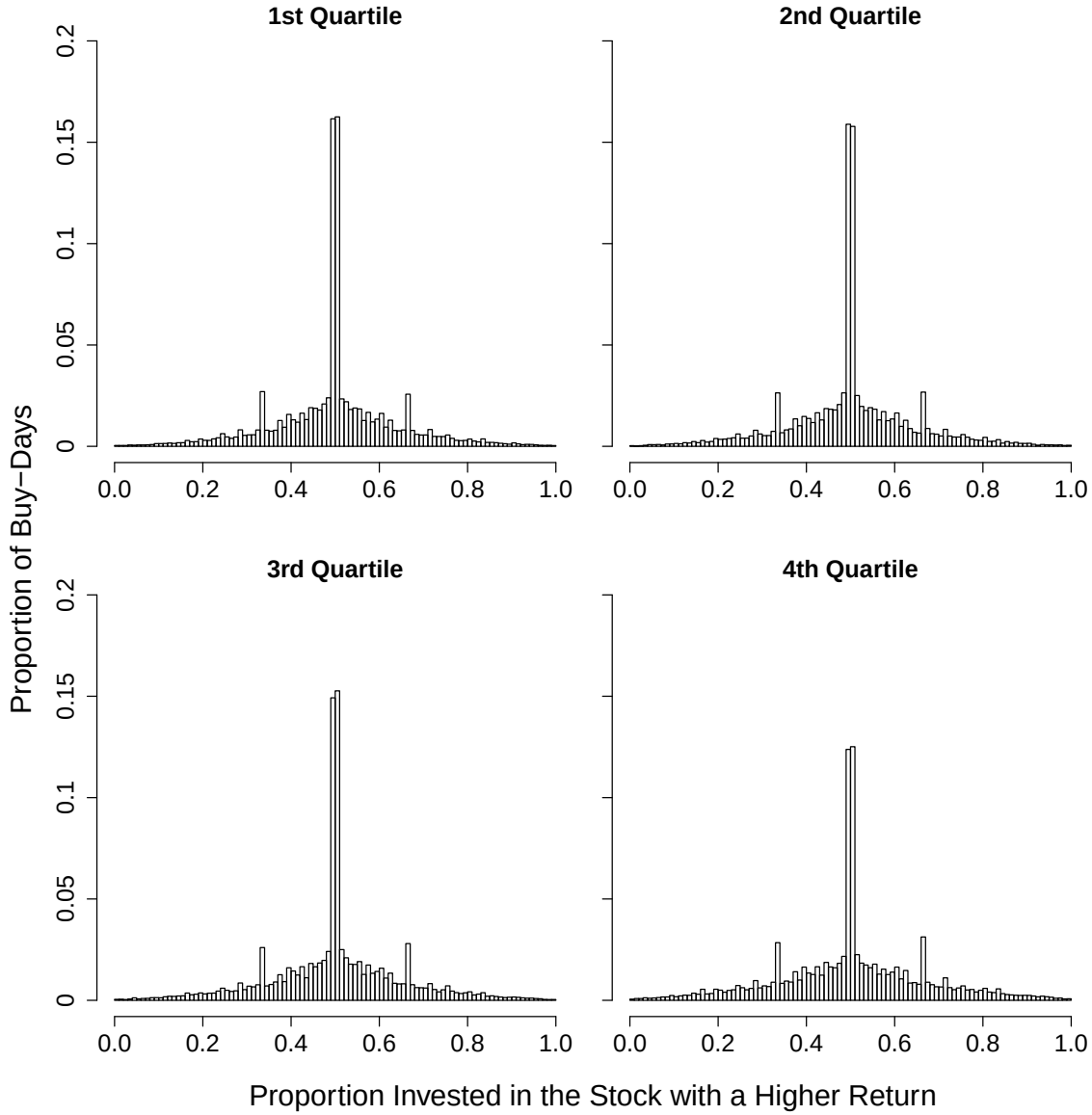
Note: Figures show histograms of the proportion of the total buy-day investment (in pounds) which is invested in Stock A, where Stock A is a randomly chosen stock from the pair of stocks purchased. Sample comprises all buy-days on which investors buy exactly two stocks. Bin width is 0.01.

Figure A13: Proportion of Two-Stock Buy-Day Monies Invested in Stock A by Difference in Past 3 Month Stock Returns



Note: Figures show histograms of the proportion of the total buy-day investment (in pounds) which is invested in Stock A, where Stock A is the stock from the pair of stocks purchased which has the higher gross returns over the previous 3 month period. Sample comprises all buy-days on which investors buy exactly two stocks. Bin width is 0.01.

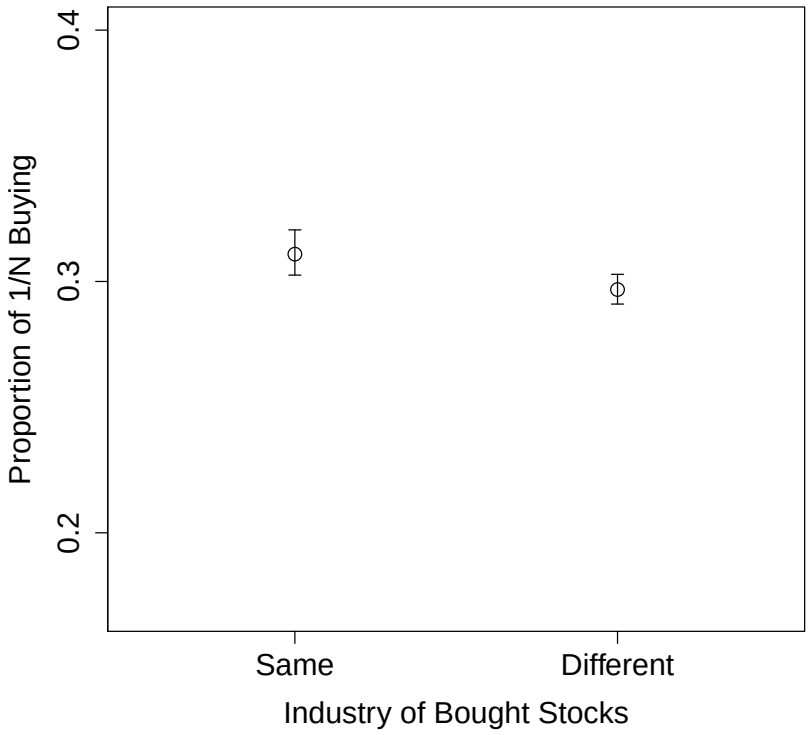
Figure A14: Proportion of Two-Stock Buy-Day Monies Invested in Stock A by Difference in Next 3 Month Stock Returns



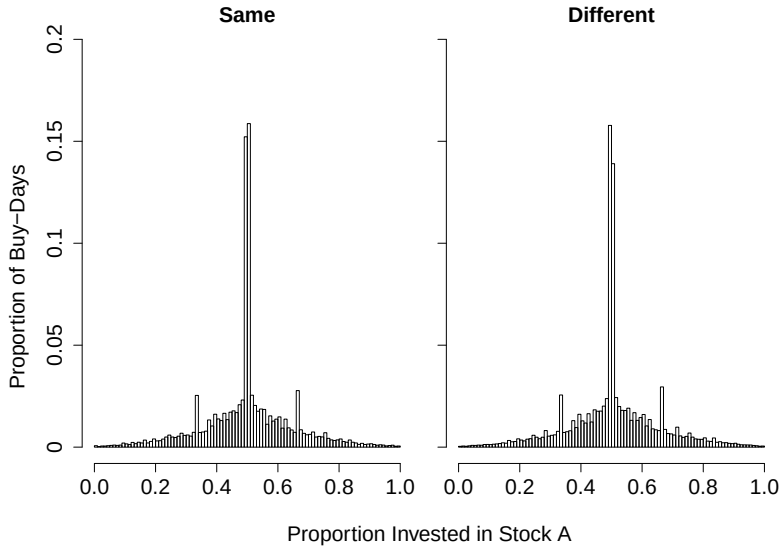
Note: Figures show histograms of the proportion of the total buy-day investment (in pounds) which is invested in Stock A, where Stock A is the stock from the pair of stocks purchased which has the higher gross returns over the next 3 month period. Sample comprises all buy-days on which investors buy exactly two stocks. Bin width is 0.01.

Figure A15: Naïve Buying Diversification by Two-Stock Buy-Days With Same Industry Stock Purchases and Different Industry Stock Purchases

(A) Proportion NBD

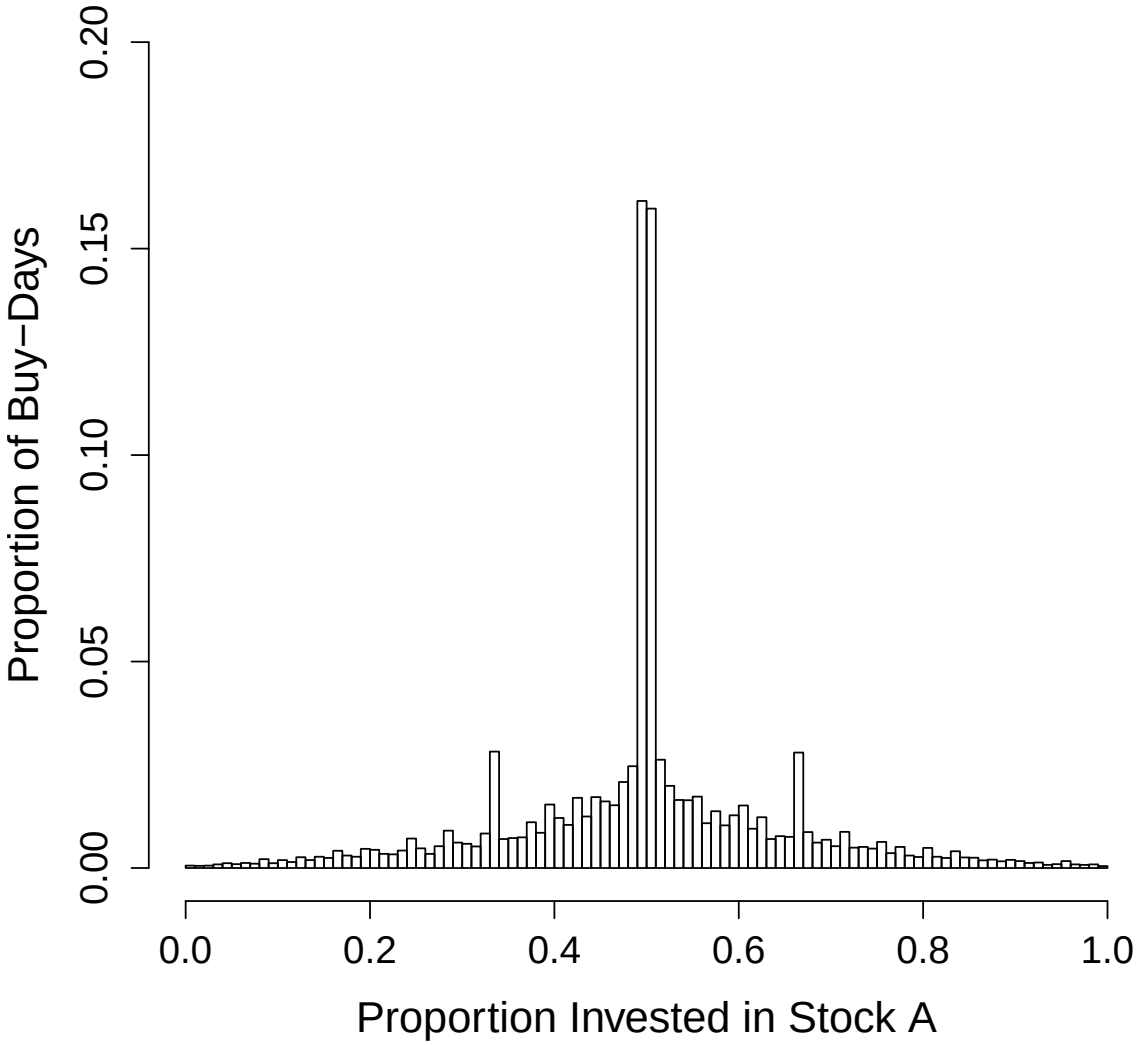


(B) Proportion of Two-Stock Buy-Day Investment in Stock A



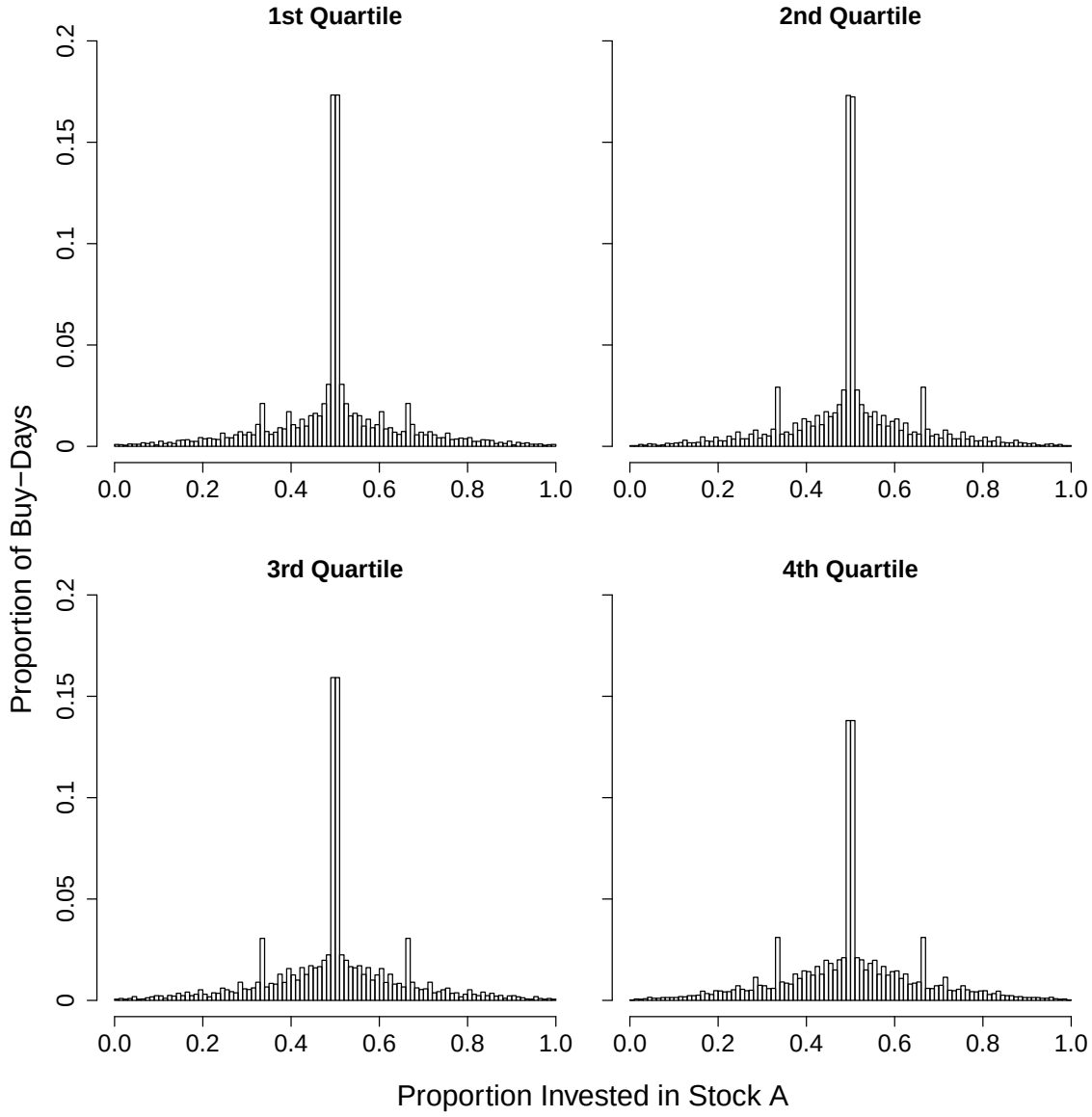
Note: Panel a shows proportion of all two-stock buy-days on which the buy-day investments are split equally (in pounds) across the two stocks by whether the two stocks are in the same, or different, industries. Panel B shows histograms of the proportion of the total buy-day investment (in pounds) which is invested in Stock A, where Stock A is a randomly chosen stock from the pair of stocks bought on the day. Sample comprises all buy-days on which investors buy exactly two stocks. Bin width is 0.01.

Figure A16: Proportion of Two-Stock Buy-Day Investment in Stock A Among New Accounts



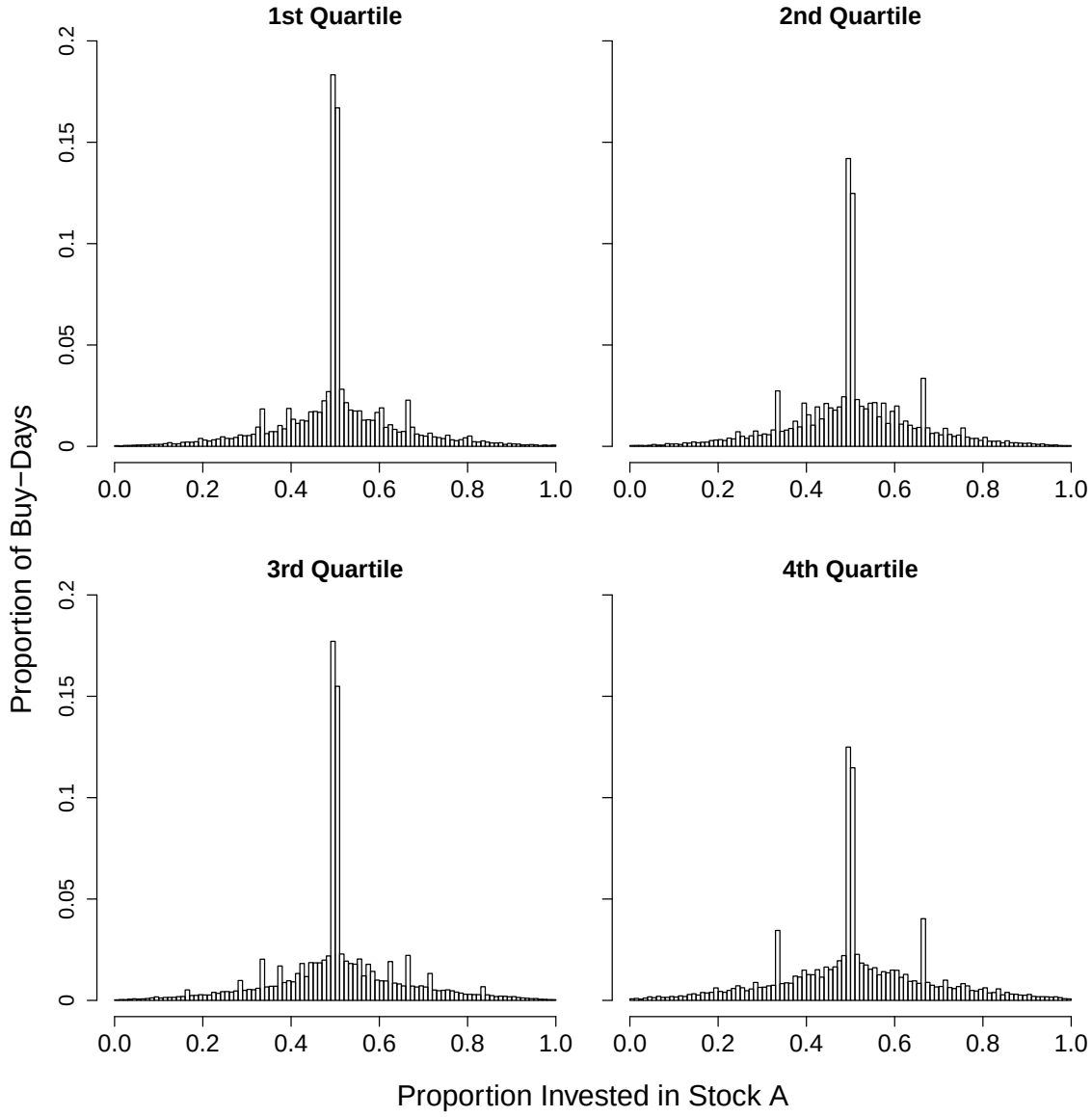
Note: Figures show histograms of the proportion of the total buy-day investment (in pounds) which is invested in Stock A, where Stock A is a randomly chosen stock from the pair of stocks purchased. Sample comprises all buy-days on which investors buy exactly two stocks in new accounts. Bin width is 0.01.

Figure A17: Proportion of Two-Stock Buy-Day Monies Invested in Stock A by Portfolio Value, New Accounts Only



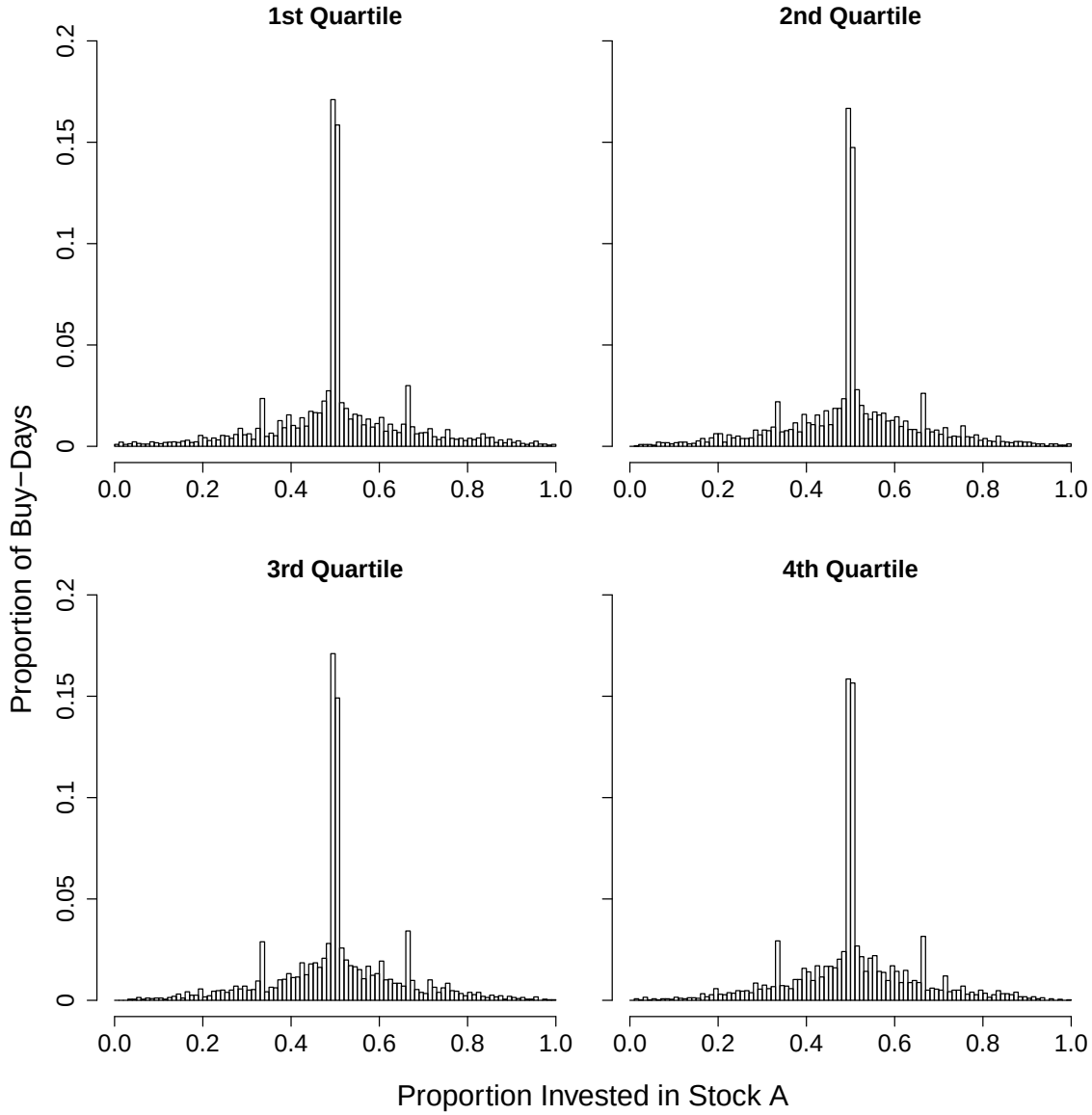
Note: Figures show histograms of the proportion of the total buy-day investment (in pounds) which is invested in Stock A, where Stock A is a randomly chosen stock from the pair of stocks purchased. Sample comprises all buy-days on which investors buy exactly two stocks. Bin width is 0.01.

Figure A18: Proportion of Two-Stock Buy-Day Monies Invested in Stock A by Investment Amount on the Day



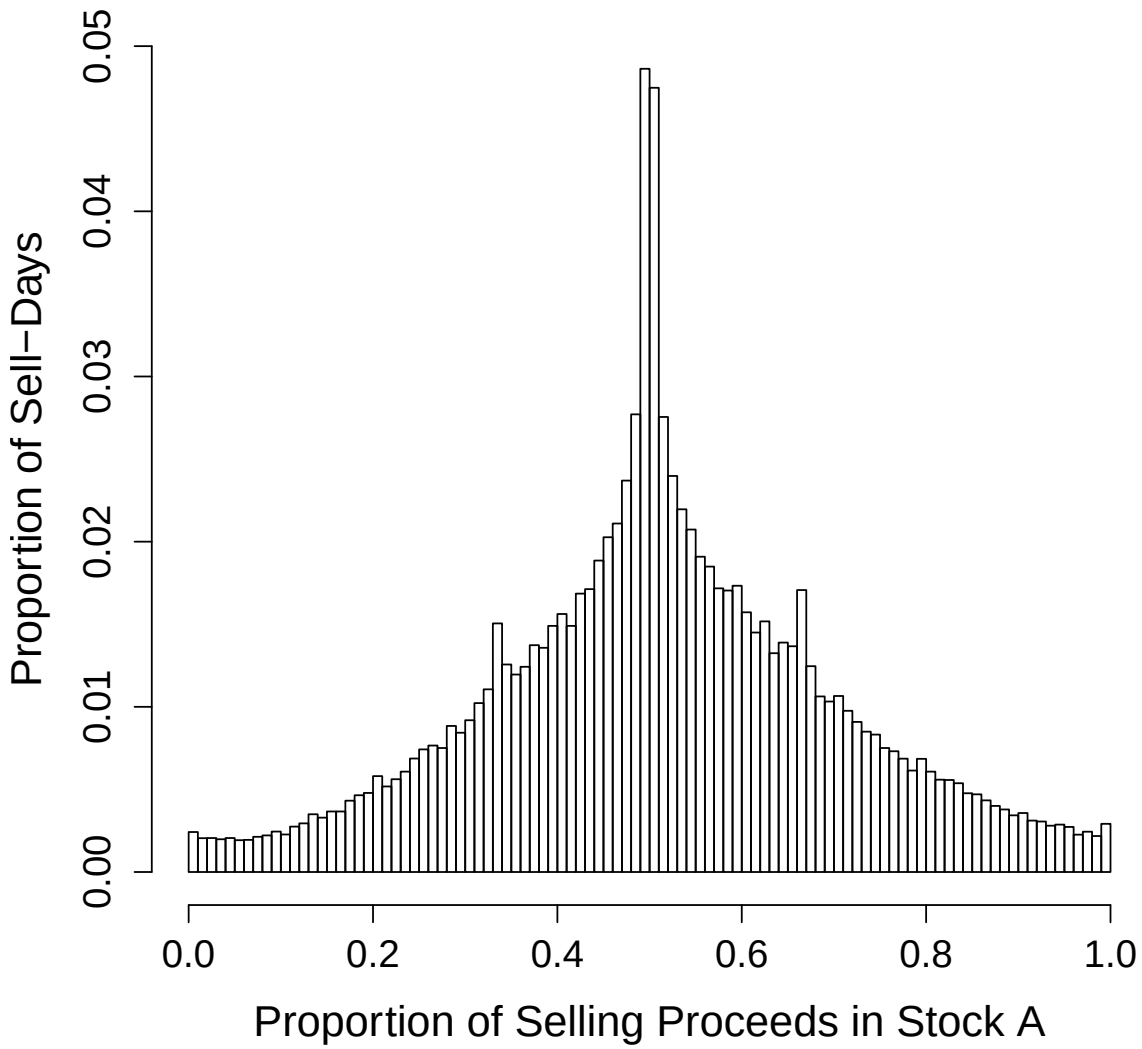
Note: Figures show histograms of the proportion of the total buy-day investment (in pounds) which is invested in Stock A, where Stock A is a randomly chosen stock from the pair of stocks purchased. Sample comprises all buy-days on which investors buy exactly two stocks. Bin width is 0.01.

Figure A19: Proportion of Two-Stock Buy-Day Monies Invested in Stock A by Number of Stocks in Portfolio, New Accounts Only



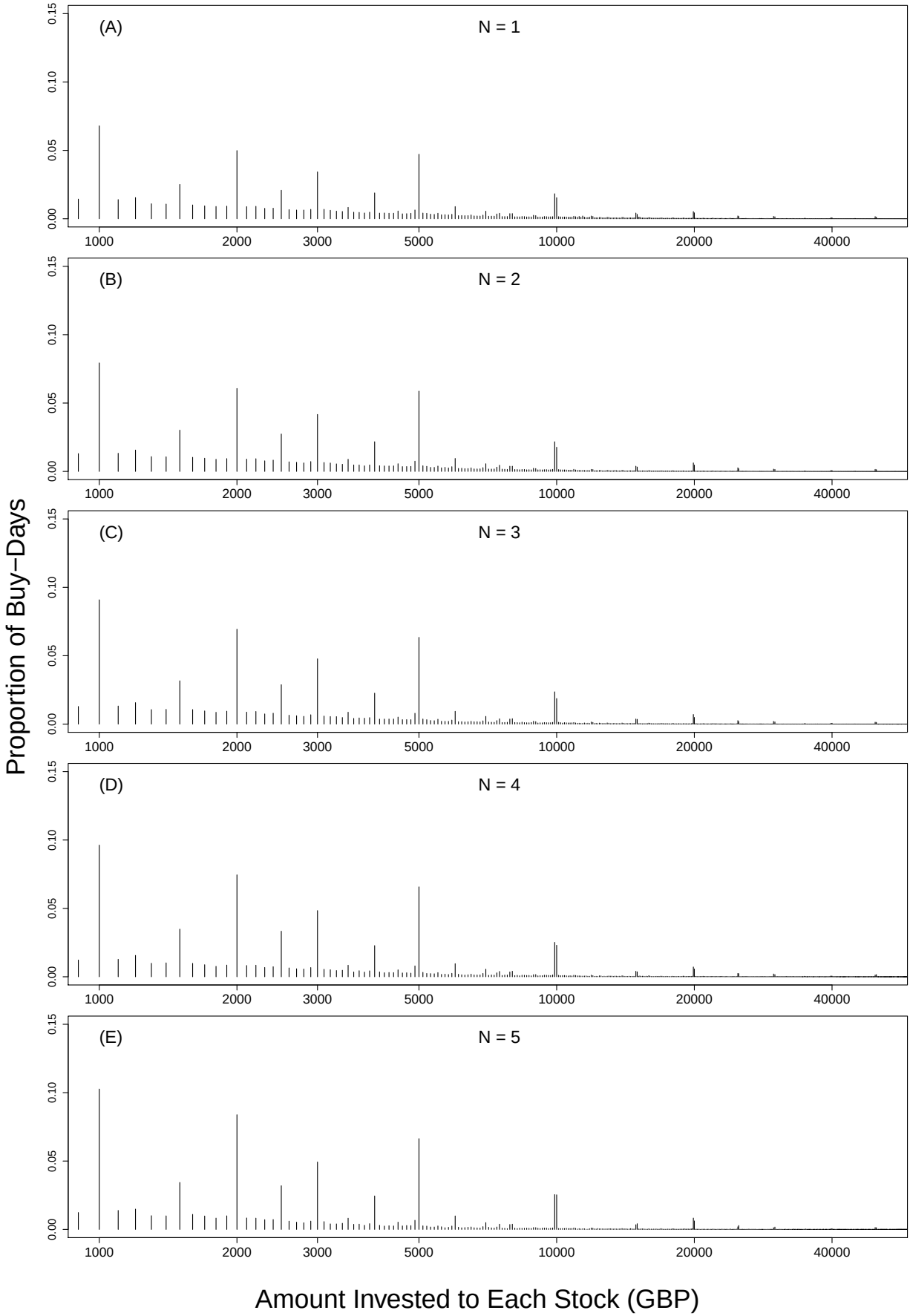
Note: Figures show histograms of the proportion of the total buy-day investment (in pounds) which is invested in Stock A, where Stock A is a randomly chosen stock from the pair of stocks purchased. Sample comprises all buy-days on which investors buy exactly two stocks. Bin width is 0.01.

Figure A20: Proportion of Sell-Day Monies From Sale of Random Stock A, All Two-Stock Sell-Days



Note: Figures show histograms of the proportion of the total sell-day dis-investment (in pounds) which is sold out of Stock A, where Stock A is a randomly chosen stock from the pair of stocks sold. Bin width is 0.01.

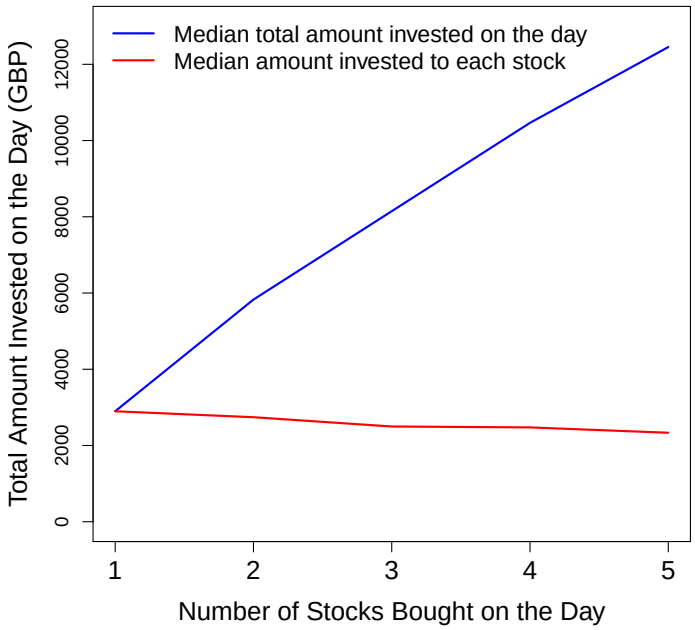
Figure A21: Distribution of Total Buy-Day Investment (in £) Divided by Number of Stocks Bought on the Buy-Day



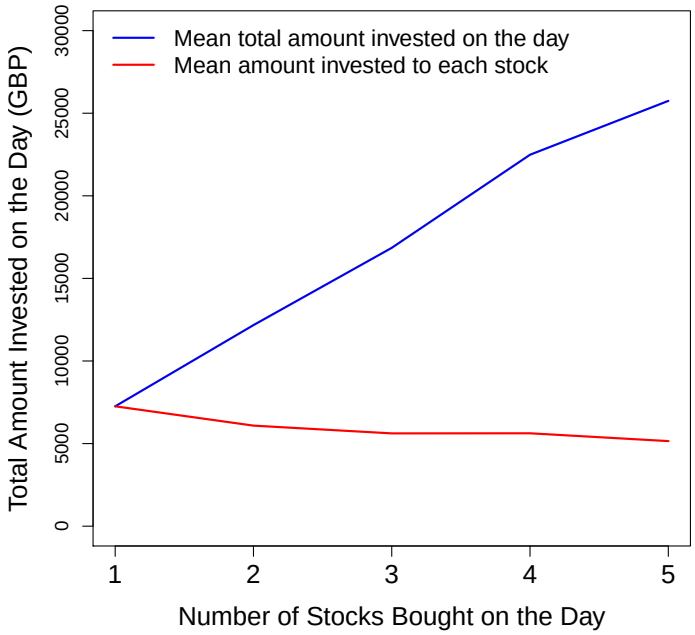
Note: Panels illustrate the distribution (density) of funds invested on the buy-day (in pounds) divded by the number of stocks purchased for all buy-days involving $1-5$ stocks.

Figure A22: Total Buy-Day Investment Amounts By Number Of Stocks Bought

(A) Median Buy-Day Allocation



(B) Mean End of Day Portfolio Allocation



Note: Panel A figure shows line plots of the median total amount invested on the day by number of stocks bought on the day. Panel B figure shows line plots for the mean total amount invested on the day by number of stocks bought on the day.

Table A1: Summary Statistics for All Multiple-Stock Buy-Days

Panel (A)

	Mean	SD	25th percentile	Median	75th percentile
Account Tenure	49.06	45.66	11.07	34.97	77.30
Investment Amount on the Day	16,480.36	50,154.36	2,995.49	7,005.23	15,040.20
Range of Past 60-days Returns	0.27	1.04	0.07	0.15	0.29
Range of Next 60-days Returns	0.22	0.25	0.07	0.15	0.28

Panel (B)

	Male	Female	Unknown
Number of Accounts	37,421	9,805	5,640

Panel (C)

	Mean	SD	25th percentile	Median	75th percentile
Ave. Num. of Trades per Month	1.82	5.50	0.36	0.74	1.60

Note: Table reports summary statistics for sample of multiple-stock buy-days. Unit of data is a single buy-day. Account tenure is number of months since account openig. Range of Past / Next 60–day returns is the difference (in percent) in simple gross returns between stocks purchased on the buy-day.

Table A2: Summary Statistics for New Account Multiple-Stock Buy-Days

Panel (A)

Statistics	Mean	SD	25th percentile	Median	75th percentile
Account Tenure	11.16	11.02	1.77	7.77	17.80
Investment Amount on the Day	11,457.93	28,872.36	2,001.93	4,998.35	10,914.70
Portfolio Value	60,567.92	187,747.84	6,577.45	17,328.90	46,971.01
Num. of Stocks in the Portfolio	8.29	9.10	3.00	5.00	10.00
Range of Past 60-days Returns	0.32	1.57	0.07	0.16	0.31
Range of Next 60-days Returns	0.24	0.28	0.08	0.16	0.30

Panel (B)

	Male	Female	Unknown
Number of Accounts	7,483	1,474	25

Panel (C)

	Mean	SD	25th percentile	Median	75th percentile
Ave. Num. of Trades per Month	1.49	3.82	0.32	0.66	1.43

Note: Table reports summary statistics for sample of multiple-stock buy-days among the new accounts sample only. Unit of data is a single buy-day. Account tenure is number of months since account opening. Range of Past / Next 60–day returns is the difference (in percent) in simple gross returns between stocks purchased on the buy-day.

Table A3: Proportion of Sell-Days on Which Investor Splits Sales $1/N$, Sell-Days with N = 2 – 6+

Panel (A) ($£P/N \times (1 \pm 0.02)$)

N (Num. sold Stocks)	Prop. 1/N Selling (%)	LL	UL	Num. Sell-Days
2	12.6	10.5	15.4	1673
3	5.9	2.0	11.9	269
4	3.4	0.0	8.9	88
5	5.4	0.0	14.8	37
6+	0.0	0.0	0.0	46
All	11.0	8.9	13.6	2113

Note: Table shows summary data for multiple-stock sell-days. Each row reports the percentage of sell-days involving N stocks in which the proportion invested in each stock falls within the $1/N$ range, for differing ranges. Lower limit and upper limit values of 95% confidence intervals from bootstrap mean estimate reported in LL and UL columns.

Table A4: Proportion of Sell-Days on Which Investors Achieve $1/N$ Portfolios

Existing Positions	Sold Stocks	Resulting Positions	1/N Resulting Portfolios (%)	Num. Sell-Days
2	1	2	2.91	2746
2	2	2	4.90	102
3	1	2	5.36	4947
3	1	3	0.19	1563
3	2	2	2.82	142
3	2	3	0.00	75
3	3	2	14.29	14
3	3	3	0.00	14
4	1	3	0.63	3644
4	1	4	0.00	1106
4	2	2	9.73	442
4	2	3	0.00	105
4	2	4	0.00	86
4	3	2	5.56	18
4	3	3	0.00	16
4	3	4	0.00	10
4	4	2	0.00	3
4	4	3	0.00	5
4	4	4	0.00	12
5	1	4	0.11	2631
5	1	5	0.00	855
5	2	3	1.59	314
5	2	4	0.00	68
5	2	5	0.00	56
5	3	2	4.44	90
5	3	3	0.00	15
5	3	4	0.00	5
5	3	5	0.00	14
5	4	2	0.00	4
5	4	3	0.00	2
5	4	4	0.00	1
5	4	5	0.00	1
5	5	2	0.00	2
6+	1	5	0.05	2089
6+	1	6+	0.02	12126
6+	2	4	1.13	265
6+	2	5	0.00	271
6+	2	6+	0.00	1689
6+	3	3	1.39	72
6+	3	4	0.00	64
6+	3	5	0.00	62
6+	3	6+	0.00	493
6+	4	2	6.67	30
6+	4	3	0.00	29
6+	4	4	0.00	31
6+	4	5	3.70	27
6+	4	6+	0.00	198
6+	5	2	5.88	17
6+	5	3	0.00	13
6+	5	4	0.00	14
6+	5	5	0.00	12
6+	5	6+	0.00	110
6+	6+	2	8.00	25
6+	6+	3	6.67	15
6+	6+	4	0.00	12
6+	6+	5	0.00	18
6+	6+	6+	0.00	117

Note: Table shows summary data for multiple-stock sell-days.

Table A5: Proportion of Sell-Days with NPD by Number of Stocks, Feasible NPD Sample

N	1/N Portfolios (%)	LL	UL	Buy-days
2	10.2	9.1	11.2	3004
3	2.6	1.5	3.8	1006
4	1.4	0.3	2.5	370
5	1.1	0.0	2.8	183
6+	1.1	0.0	2.8	176
All	7.2	6.5	7.9	4739

Note: Table shows summary data for multiple-stock sell-days. Each row reports the percentage of sell-days resulting positions in the $1/N$ range, for different number of stocks in the portfolio. Lower limit and upper limit values of 95% confidence intervals from bootstrap mean estimate reported in LL and UL columns. Sample is restricted to multiple-stock sell-days in the new accounts data. See Section 2 for details on the sample construction.

Table A6: Proportion of Buy-and-Sell Days with NPD by Number of Stocks, Feasible NPD Sample

N	1/N Portfolio (%)	LL	UL	Buy-days
2	17.4	13.5	21.5	357
3	3.0	1.6	4.5	498
4	0.0	0.0	0.0	513
5	0.5	0.0	1.3	400
6+	0.0	0.0	0.1	3167
All	1.6	1.2	2.1	4935

Note: Table shows summary data for days on which investors make both multiple-stock buy trades and sell trades. Each row reports the percentage of days resulting positions in the $1/N$ range, for different number of stocks in the portfolio. Lower limit and upper limit values of 95% confidence intervals from bootstrap mean estimate reported in LL and UL columns. Sample is restricted to days on which investors make both multiple-stock buy trades and sell trade in the new accounts data. See Section 2 for details on the sample construction.