

Trading Behavior of Style and Multi-Style Investors

Douglas W. Blackburn
Fordham University

William N. Goetzmann
Yale University

Andrey D. Ukhov
Cornell University

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ABSTRACT

We investigate whether investors tend to form expectations about different categories of assets in a consistent, similar fashion, or whether an investor would apply different models for forming expectations depending on the classification or characteristics of the assets. We investigate the trading behavior of investors who specialize in value assets, investors who specialize in growth assets, and investors who trade both value and growth. We find important systematic differences in trading tendencies. Growth investors tend to follow a momentum buying and contrarian selling strategy and tend to rely on short term return signals while value investors follow a contrarian buying and momentum selling strategy and tend to rely on longer-term return signals. Surprisingly, multi-style investors, those who trade both value and growth, use different strategies depending on the style of asset being traded. When trading growth, the multi-style investor uses a momentum buy and contrarian sell strategy. However, when trading value, the multi-style investor uses a contrarian buy and momentum sell strategy. Hence, the multi-style investor trades like both the value and the growth style-investors. Investors adopt different trading strategies depending on the characteristics of asset being traded.

JEL classification: D8, D9, E2, G2, D1

Keywords: Individual Investor, Trading Behavior, Momentum, Contrarian

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ABSTRACT

We investigate whether investors tend to form expectations about different categories of assets in a consistent, similar fashion, or whether an investor would apply different models for forming expectations depending on the classification or characteristics of the assets. We investigate the trading behavior of investors who specialize in value assets, investors who specialize in growth assets, and investors who trade both value and growth. We find important systematic differences in trading tendencies. Growth investors tend to follow a momentum buying and contrarian selling strategy and tend to rely on short term return signals while value investors follow a contrarian buying and momentum selling strategy and tend to rely on longer-term return signals. Surprisingly, multi-style investors, those who trade both value and growth, use different strategies depending on the style of asset being traded. When trading growth, the multi-style investor uses a momentum buy and contrarian sell strategy. However, when trading value, the multi-style investor uses a contrarian buy and momentum sell strategy. Hence, the multi-style investor trades like both the value and the growth style-investors. Investors adopt different trading strategies depending on the characteristics of asset being traded.

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A key question in financial economics is what determines patterns—rational or irrational—in trading behavior. Systematic patterns in investor trading are particularly important because of the question of whether speculative trading can accumulate and impact asset price dynamics.¹ Given the importance of investor trading, it is essential to understand why investors trade.

The fundamental question examined in this paper is whether individuals display a consistent "trait" that can be captured—across different situations—as an investor characteristic in a utility formulation framework as is commonly done with an agent's aversion to risk. The alternative is that propensity to trade is situation dependent allowing the evaluation of risky prospects to vary with context.²

To categorize how an individual's characteristics and inherent risk attitudes affect trading, researchers have examined the roles of several attributes such as risk aversion, age, and gender.³ In addition to the inherent, personality-trait component, risk taking and trading may be related to situational factors. Important determinants of buy and sell transactions are related to the assets themselves and not to the investors trading them. Past returns, reference price effects, the size of the holding period capital gain or loss, tax-loss selling, and asset volatility all are determinants of trading. Odean (1998) and Grinblatt and Keloharju (2001) using individual account data that allows analysis about how investors

¹ Goetzmann and Massa (2002, 2003); DeLong, Shleifer, Summers, and Waldman (1990). For a recent model where trading activity of (irrational) individual investors can affect market prices see Hirshleifer, Subrahmanyam, and Titman (2006). For studies of individual investors trading in stocks see Odean (1998, 1999), Barber and Odean (2001, 2002). Grinblatt and Keloharju (2001), and Kaniel, Saar and Titman (2008).

² A general discussion of context-dependent financial decision making is contained in Slovic (1972), Shiller (1998), and Trimpop (1994).

³ For example, in a well-known study, Barber and Odean (2001) find that men trade more than women. See also Deaves, Luders, and Luo (2009) for a discussion of gender, overconfidence, and trading. Many papers focus on the connection between investor-level attributes and investor trading, including Dorn and Huberman (2005), Christiansen et. al. (2008), and Feng and Seasholes (2005).

trade in individual stocks both find evidence that trade decisions about individual securities depend on past individual security price paths.

We contribute to bridging the gap between the personality-trait and the situation-dependent views on trading in several ways. In the prior literature on investor trading behavior an important latent assumption is maintained that it is highly unlikely for an investor to display different trading strategies across different types of investments. Very little is known, however, whether a given investor would tend to form expectations about different categories of assets in a consistent, similar fashion, or whether an investor would apply different models for forming expectations depending on the classification or characteristics of the assets. In this paper, we study how asset characteristics affect the trading behavior of individual investors. To do this, we investigate the trading behavior of three types of investors: those who trade only value assets (value investors), investors who trade only growth assets (growth investors), and investors who trade both growth and value assets (multi-style investors).⁴

We make three contributions in this paper. First, we analyze trading decisions at an individual level with respect to investments of different, clearly defined, characteristics – growth and value investments. Using individual trade data, we demonstrate that investors who specialize in different classes of assets (growth or value funds) tend to follow different trading rules. Value investors tend to be contrarian buyers (buying after price declines), while growth investors tend to be momentum buyers (buying after price increases). Second, unlike previous studies on investor classification, we consider many different

⁴ It is important to point out that our study is based on data on trading mutual funds and not individual stocks. This provides several important advantages. First, we (as researchers) do not need to categorize assets into value and growth categories, and therefore do not suffer from our criteria being *ad hoc* or different from the criteria employed by the market participants. Value and growth mutual funds are categorized, named, and marketed as such by the mutual fund family that provided the data. Second, investors in our data set who trade both value and growth funds trade *exactly the same* assets as value-only and growth-only investors. For example, their information sets contain the same past performance information.

trading signals in order to allow for differences in horizon across individuals. We find that individuals who specialize in growth securities tend to use short-term return signals while value investors tend to use longer-term signals. Different investors exhibit differences not only in *how* they respond to a return signal (momentum or contrarian), but they are also different in the *type of signal* to which they respond. This result is new to the literature.

Third, having established that growth-only and value-only investors display differences in their propensities to trade, we study individual investors who trade both value and growth securities. Surprisingly, multi-style investors use different strategies depending on the asset being traded. We find the existence of a significantly large group of investors who trade growth using the same strategy as the growth style-investors and trade value using the same strategy as the value style-investors. This suggests that the trading style of an individual is not necessarily an internally determined characteristic but instead is influenced by the characteristics of the investment. Investors appear to adopt different trading strategies depending on the characteristics of the asset being traded. Our results are consistent with mental accounting (Thaler 1980). Multi-style investors behave as if they have categorized their investments into growth and value accounts. Each account is then treated independently and differently.

Our tests are centered on classifying individual investors according to their trading strategy. We classify each individual investor as a momentum or contrarian trader according to their trading history (Goetzmann and Massa 2002).⁵ Each trade made by an individual is classified as momentum or contrarian relative to a specified return signal. We compare the total number of trades consistent with a particular strategy to a binomial

⁵ Positive feedback traders (momentum investors) react by purchasing when prices rise and selling when prices fall. Negative feedback traders (contrarian investors) are characterized in exactly the opposite fashion. They buy after a drop in prices and sell after a rise.

distribution to determine whether the individual is trading randomly or is following a particular strategy. Conducting the test in this fashion allows us to make statements regarding the existence of individuals following a particular strategy. Classification at the individual investor level makes it possible to identify groups of investors who display intragroup homogeneity and to identify intergroup heterogeneity regarding their trading strategies.

We further advance the previous research by considering ten different return signals extending from a one-day return signal to a one-year return signal. Each individual investor is classified as momentum, contrarian, or undetermined using each of the ten return signals. Then, for each individual we determine which trading signal best describes their trading strategy by comparing statistical significance across return signals. Grouping individual growth and value investors according to their “best” return signal allows us to make comparisons of signal horizons between the two groups of investors.

This study is related to the research on attitudes toward risk. Many attempts have been made in the decisions-under-uncertainty literature to understand the underlying factors in risk taking.⁶ *Personality theories*, which are largely based on biological trait models, focus on characteristics or traits of the individual, such as age or gender.⁷ *Situation-dependent theories* have attempted to identify or clarify situational processes and moderating variables. Mental accounting and loss aversion are examples of such theories.⁸ Whereas personality theories argue that individuals make decisions because of their own internal characteristics, the situation-dependent theories argue that individuals make

⁶ See an excellent review in Trimpop (1994).

⁷ The first of the modern personality theories was developed by Pavlov (1927/1960). In canonical asset pricing theories investors are characterized by agent-specific attributes (such as risk preferences) and investors treat all assets in the investment opportunity set similarly (see, for example, Bossaerts and Plott (2004) and Feldman (2002)).

⁸ See Thaler (1980, 1985), Thaler and Johnson (1990), Barberis and Huang (2001), and Haigh and List (2005) and references therein.

decisions based on the characteristics of the external situation. Both approaches have largely studied cross-sectional samples within a between-subject design. Longitudinal, or within-subject studies, are scarce. In sum, while personality theories and situation dependent theories are both valid and important sub-factors in the concept of risk, the evidence linking the two has been elusive. We bring new data to the debate.

This is not the first paper to study trading patterns of investors. Stock trading by individual investors has been studied by several authors: Odean (1998, 1999), Barber and Odean (2000, 2001, 2002), Grinblatt and Keloharju (2001), Lee and Kumar (2006), and Kaniel, Saar and Titman (2008). It has been documented that investors use past returns to make trading decisions. Using daily mutual fund trades Goetzmann and Massa (2002) find that some investors in an S&P 500 index fund follow a momentum strategy while others follow a contrarian trading strategy. Odean (1998) and Grinblatt and Keloharju (2001) find evidence of the disposition effect⁹ – investors hold on to their poor performing stocks but sell stocks exhibiting past high returns. Kaniel, Saar, and Titman (2008) report that past returns influence investors' buying and selling decisions for stocks. Lee and Kumar (2006) argue that the trading behavior of retail investors focused in particular segments or styles contribute to observed pricing anomalies. The unique feature of our study is the comparative analysis of how individual investors trade across styles.

The paper proceeds as follows. Section I describes our data. The description of methodology and results describing the trading behavior of style investors are provided in Section II. The analysis of multi-style trading behavior is listed in section III. Concluding remarks follow in Section IV.

⁹ See Shefrin and Statman (1985)

I. Data

This study employs a unique data set containing anonymous individual account activity provided by a large mutual fund complex at the time.¹⁰ The daily data include all trades made by clients, identified by a unique account number, for different mutual funds from 1997-1999¹¹. The data consists of daily activity records for all accounts that existed or were formed in the three-year sample period. All individual identifying characteristics of these accounts were removed by the data provider. From the different mutual funds available to us, we identify six mutual funds that describe themselves as being growth oriented and five funds that describe themselves as being value oriented.

The data identifies the account as being held by an individual, a broker, a trust, a corporation, or retirement account (both 401k and IRA). Since we are interested in the timing decisions of investors, we remove all trades associated with retirement investing. Retirement funds are usually invested according to a predetermined schedule (bi-weekly or monthly) and therefore do not reflect the timing decisions of the investor.

Table I provides statistics regarding our sample of growth and value funds. We categorize the data into four groups: the value trades made by value investors, the growth trades of growth investors, the value trades of multi-style investors (who hold both value and growth funds), and the growth trades of multi-style investors. We first notice the popularity of growth investing during our sample period. There are more growth investors than both value investors and multi-style investors. Growth investors trade more often in our sample trading an average of 4.4 times. Value investors, on the other hand, trade on average only 3.07. Investors trading both growth and value also exhibit interesting trading

¹⁰ No identifying characteristics of the account were given to researchers, keeping accounts anonymous.

¹¹ Most of the mutual funds sell various classes of shares (i.e. Class A, Class B, etc.). We include all share classes in the study.

behavior. These investors trade growth over three times as much as they trade value (9.83 growth trades per investor versus 3.11 value trades per investor). However, trading is highly skewed with many account holders trading only once during our sample period.

Overall, evidence in Table I suggests differences in the way growth funds and value funds are traded. Growth funds, whether traded by growth investors or multi-style investors, are more frequently traded than value funds. We investigate the differences in trading behavior more rigorously in the next sections.

II. Growth Traders versus Value Traders

A. Identification of Momentum and Contrarian Investors

We use individual account activity to classify investors according to their pattern of share purchases and redemptions. For each growth investor and value investor, we classify each trade as being a momentum purchase, contrarian purchase, momentum sell or contrarian sell. This classification is conditional on a predetermined past return signal. All purchases that occur on the day after observing a positive (negative) return signal are considered momentum buys (contrarian buys). Likewise, all sells that occur on the day after observing a negative (positive) return signal are considered momentum sells (contrarian sells). Positive feedback traders (momentum investors) react by purchasing when prices rise and selling when prices fall. Negative feedback traders (contrarian investors) are characterized in exactly the opposite fashion. They buy after a drop in prices and sell after a rise.

An individual investor is then classified as a momentum buyer, contrarian buyer, momentum seller, contrarian seller, or undetermined depending on the number of trades the individual agent made that were consistent with the strategy. We classify the investor

as a momentum buyer if the number of purchases occurring on days following a positive return signal is significantly greater than that expected assuming a random distribution of trades. The same method is used to determine contrarian buyers, momentum sellers and contrarian sellers. Those that do not fit into one of the trading strategies are classified as undefined. Following Goetzmann and Massa (2002), we use a binomial distribution to determine whether the number of trades following a particular strategy is greater than expected if the investor traded randomly. The probability is determined using

$$P(X > x) = 1 - \sum_{y=0}^{x-1} \binom{n}{y} p^y (1-p)^{n-y}$$

where n is the total number of buys (or sells), x is the number of buys (sells) consistent with a particular strategy, and p is the probability of observing a positive return. To determine the probability, we use returns over the eight-year period 1992-1999. The probability of a positive return signal is equal to the ratio of observed positive returns over total number of days.

To classify an investor, the individual must not only trade consistently, but more fundamentally, he must trade. As seen in Table 1, the median number of trades is one for both growth investors and value investors. Such investors are unclassifiable. To eliminate some noise in our analysis we consider only those investors who trade (either buy or sell) at least four times in our sample. We are left with 834 value investors, 12,884 growth investors, and 2,197 multi-style investors.¹²

There are many instances of individual agents making multiple growth or value trades within the same day thus multiplying the reaction to a single signal. This can have

¹² For comparison, Goetzmann and Massa (2002) work with approximately 91,000 individual accounts in S&P 500 index fund over the period 1997-1998; Barber and Odean (2002) analyze 1,607 investors who switched from phone-based to online trading during the 1990s.

the affect of falsely associating the agent to a particular trading strategy. To eliminate this possibility, we aggregate all trades (both buys and sells) made by the same investor within the same style on the same day to a single trade.

We classify investors using ten different past return signals. This is one of the important contributions of this paper. While past studies focus on the previous day's return as the signal to classify momentum and contrarian trading behavior, it is important to investigate other return histories. It is *a priori* unclear how far back investors look to determine their trading strategies. Many trading strategies (moving average strategies, for example) use days or months of past return data to signal when trade. Further, past research has shown that returns exhibit positive serial correlation over short horizons and negative serial correlation over longer horizons (Jegadeesh and Titman (1993)). We, therefore, calculate past return signals using $(P_{t-1} - P_{t-1-j})/P_{t-j}$ for $j = 1, 5, 10, 20, 40, 60, 90, 120, 180$ and 250 days. We choose the intervals to correspond to one day, a calendar week (5 trading days), a calendar month (20 trading days), and a quarter, among others. We use the notation *j-day* to distinguish the various past return windows. Using these return signals, which range from the previous day's return to the previous year's return, we let the data tell us which signals are important.¹³

B. Classification Results

The results of the classification are provided in Tables II and III. Table II Panels A and B show the classification of value buyers and growth buyers. Similar to Goetzmann and Massa (2002), we use five categories: strong momentum, weak momentum, undefined,

¹³ Studying trades in and out of mutual funds is particularly interesting because there is no immediate opposing trade. When an investor buys a stock, another must sell. If we use the previous day's return as a trading signal, then every momentum trade must be matched with a contrarian trade. Mutual funds are different. An investor may move in and out of the mutual fund without the need of an immediate opposing trade.

weak contrarian and strong contrarian. Strong and weak investors are defined by statistical significance where strong momentum and strong contrarian investors have p-values less than 10%, and weak momentum and weak contrarian investors have p-values between 10% and 50%. An investor is considered undefined if the p-value is greater than 50% for both the momentum and contrarian strategies. Such investors either did not trade in a consistent way or did not trade a sufficient number of times.

We first observe that both momentum and contrarian investing strategies are used by groups of value and growth investors. From the 1-day return signal, 1.94% of value investors and 5.35% of growth investors are classified as strong momentum buyers while 5.67% of value traders and 4.59% of growth investors are classified as strong contrarian buyers. For this signal, we are unable to classify 52% of the value investors and 58.5% of the growth investors. These results are comparable to the findings of Goetzmann and Massa (2002) who study investors in an S&P 500 index fund. Goetzmann and Massa find that 1.08% of all buyers are strong momentum traders while 2.36% are strong contrarian investors. They are unable to classify 68% of all investors. The method performs well in our setting. For all return signals we are able to classify at least as well. In nine out the twenty cases in Table II we classify more than 50% of all investors.

Over all return signals, value investors tend to be more contrarian in their purchases while growth investors tend to be more momentum oriented in their purchases. This can be seen in Panel C of Table II where we report the results of the Mantel-Haenzel test. We compute the average investor type for both growth and value investors. All contrarian investors (both strong and weak) receive a score of -1, momentum investors (both strong and weak) a score of +1, and unclassified investors a score of 0. The average of the scores over all investors in each style is a number between -1 and +1. Positive values indicate that

on average the investors follow a momentum buying strategy while negative values indicate that on average the investors follow a contrarian buying strategy. Using the Mantel-Haenszel chi-square statistic, we test whether the average growth investor type is the same as the average value investor type. Results indicate a clear difference in trading strategy that is dependent on the style of the security being purchased. These results are robust to the choice of scoring system.

The average growth investor follows a momentum strategy for all return signals. Although at shorter horizons (up to prior 10 trading days) contrarian behavior has a strong presence among growth investors, we identify more investors as following a momentum strategy at all other signals. More growth investors are classified as momentum traders as the signal length increases. Figure 1 clearly illustrates this. Over 50% of growth investors are classified as either weak or strong momentum buyers using the 250-day return signal, which corresponds to the return over the past calendar year. Growth investors respond to long-term past positive performance when timing their purchases. That is, over 50% of all growth investors in our sample buy the previous year's winners. For growth investors momentum tendencies prevails over contrarian for all signals.

Value investors are different. As Figure 1 and Table II show, value buyers are contrarian investors for the 1-day to 120-day return signals. Beyond this, the average becomes positive indicating a switch in average trading style. For the shorter return signals (1-day to 120-day), value buyers are on average contrarian investors, but for long return signals (180-day to 250-day), value buyers on average follow a momentum strategy. This result indicates that value investors trade as momentum investors only when there is long-term positive performance but are more likely to follow a contrarian strategy otherwise. The greatest number of contrarian investors is found using the 90-day return

signal. A total of 45% of value investors are contrarian (36% classified as strong contrarian and 9% are classified as weak.) This is compared to the 10% who are classified as momentum buyers. However, for the 250-day return signal, less than 9% are classified as contrarian and nearly 49% are classified as momentum.

The large number of momentum investors at the 250-day signal is surprising. It would indeed be curious if an investor is classified as contrarian at a shorter horizon signal and then as a momentum investor at a longer horizon signal. To better understand the effect of the signal horizon on our classification, we follow changes in classification of each individual value investors with respect to different return signals. Tracking classification at the level of an individual investor uncovers the following. As the signal length increases, value investors once considered contrarian are reclassified as undefined using the long-term signal and those investors who were undefined using the shorter signals are reclassified as momentum using the longer signals. We find only a few individuals who switch directly from contrarian to momentum.¹⁴ This is an important finding in that it suggests that investors use different signal lengths to determine when to trade. Studies that have focused on only one return signal miss this dimension of investor heterogeneity. We investigate this more in the next section.

The differences between value and growth investors are also evident from Figure 3. The figure shows the distribution of trading strategies for various past return signals. Two patterns emerge from the figure when the distribution for value investors (top left graph) is compared with the distribution for growth investors (top right). First, compared with growth investors, value investors exhibit a stronger tendency for contrarian purchases at any past signal horizon. For a given return signal, there are more contrarian buyers among

¹⁴ The results are not reported for brevity and are available from the authors upon request.

value investors, and there are more momentum buyers among growth investors. Second, the figures illustrate the importance of the signal horizon. The distribution of contrarian and momentum traders changes with the signal horizon. Momentum purchases dominate at the longer horizon.

Not only are growth and value traders different in their buying behavior, they are also different in their selling behavior. Table III shows the classification of value and growth sell strategies. There are growth and value sellers who follow a contrarian strategy (sell when past returns are positive) and there are investors who follow a momentum strategy (sell when past returns are negative). Using the 1-day return signal, 7.69% of value investors and 1.82% of growth investors are classified as strong momentum sellers and 2.56% of value traders and 3.25% of growth investors are classified as strong contrarian sellers. We are unable to classify 51% of the value investors and 58% of the growth investors. This is a slightly better overall classification than Goetzmann and Massa (2002). Goetzmann and Massa find 0.11% of investors are momentum sellers, 0.27% are contrarian sellers, and 87% are unclassified for investors in S&P 500 index fund.

Table III – Panel C and Figure 2 provide the average growth and value investor types. Similar to the buy scoring system, all momentum sellers are given a score of +1, all undefined investors receive a score of 0, and all contrarian sellers are given a score of -1. A positive value implies that on average the investors are momentum traders, while a negative average implies that on average investors are contrarian. The numbers of growth momentum and growth contrarian investors are nearly equal for the 1-day to 40-day return signals. However, on average, growth investors are contrarian sellers for the longer signals. The highest average (in absolute value) is found using the 120-day return signal.

Nearly 40% of growth sellers are classified as contrarian using this signal compared to only 2.5% classified as momentum. Growth investors tend to sell when markets rise. This is consistent with the disposition effect that describes the investor behavior of holding losers and selling winners.¹⁵ This is true for all of the longer return signals.

Value investors behave differently. Value investors are momentum sellers for the 1-day through 120-day signals and then they behave as contrarian sellers for 180-day and 250-day return signals. The Mantel-Haenszel chi-square statistics show that the average growth investor and the average value investor are significantly different. More so than growth sellers, value investors sell when they observe falling returns.

At longer horizons, value investors, like growth investors, are prone to sell last year's winners. We classify the largest number of momentum sellers using the 90-day return signal. Fifty-five percent of value sellers are classified as either weak or strong momentum. For the 250-day return signal, 60% of the value sellers are classified as either weak or strong contrarian.

Figure 4 illustrates the difference between the value investors (upper left graph) and growth investors (upper right). The figure shows the distribution of different investor types for various past return signals. The figure also shows the importance of the length of the return signal.

The tests above are based on classifying individuals according to their trading strategy. Our results indicate important differences between value and growth investors in regard to trading strategies. We find existence of both momentum and contrarian investing by both growth and value investors. Overall, growth investors tend to follow a momentum buy and contrarian sell strategy. The single return signal that classifies the most growth

¹⁵ See Odean (1998), Locke and Mann (2005), Frazzini (2006), Statman, Thorley and Vorkink (2006), and Goetzmann and Massa (2008) and references therein for discussions regarding the disposition effect.

investors (as either strong momentum or strong contrarian) is the 250-day signal. Value investors tend to follow a contrarian buy and momentum sell strategy. The return signal that classifies the most value investors is the 90-day return signal.

C. Classification Results: Return Signal

In the previous analysis we discussed several possible signal horizons and studied the differences between value and growth traders for each horizon. We found that some agents were able to be classified using short-term signals while other agents could only be classified using the long-term signals indicating that agents have different horizons. We now advance our analysis by classifying each agent by the signal most likely being used to make investment decisions. This is an important issue. Different investors exhibit differences not only in *how* they respond to a return signal (momentum or contrarian), but they are also different in the *type of signal* to which they respond. In this section we double sort all agents first by trading strategy and then by trading signal. This is the first study to classify individual investors according to signal horizon.

To study the potential differences between value and growth investors with respect to signal length, we proceed as follows. For each investor in the dataset we determine the signal length (1-day, 5-day, etc.) that results in the highest p-value in the binomial classification method. The investors are still classified as momentum or contrarian (or unclassified), but now for each investor we determine the signal length with the greatest statistical support.

Results are provided in Table IV for investor buying behavior. This table lists the percent of all value investors (Panel A) and all growth investors (Panel B) according to the

trading strategy and trading signal that best describes their past trading behavior. Whereas in Tables II and III, each investor is evaluated using each trading signal so that the column sum always equals 100%, in Table IV, each investor appears only once – at the best trading strategy and best trading signal.

Consistent with our previous results, momentum buying dominates contrarian buying for growth investors while for value investors the contrarian buying strategy dominates the momentum strategy. In the aggregate, 66.18% of growth investors follow the momentum strategy (38.15% are classified as strong momentum). Only 24.39% of growth investors are contrarian investors (8.97% are strong contrarian). Value investors exhibit tendency toward contrarian buying: 54.91% of value investors are classified as contrarian in their purchases (41.72% as strong contrarian). Only 23.98% of value investors are momentum investors in their purchases (17.51% are strong momentum).

We find interesting differences in signal horizon between growth and value investors. Comparing the percent of growth and value investors at each signal, we find that a greater percentage of growth investors use signals 1-day through 40-day and 250-day while a greater percentage of value investors use mid-horizon signals of 60-day through 180-day. For example, we classify 12.90% of all growth investors and 5.16% of value investors as using the 1-day return signal. However, 19.19% of value investors but only 7.56% of growth investors appear to follow the 120-day signal.

Another way to compare signal horizons across the two groups of style investors is to compare short-term signals to long-term signals. Let the short-term signals be the 1-day through 60-day signals and long-term signal as the 90-day through 250-day signals. We find that 51.40% of all growth investors and 28.44% of all value investors rely on short-term signals. On the other hand, 39.15% of growth investors and 50.49% of value

investors follow the long-term signal. Growth investors tend to respond to short-term information as compared to value investors who rely on longer-term signals.

Consider now selling behavior as described in Table V. Overall, we are able to categorize fewer investors according to their redemptions as compared to their purchases. Investors in our sample bought more than sold. For growth investors, contrarian selling is more strongly present than momentum selling. In the aggregate, 25.6% of growth investors are contrarian (9.6% strong contrarian), and 24.4% are momentum sellers (3.7% are strong momentum). Value investors exhibit tendencies toward momentum selling: 41.1% of value investors are classified as momentum in their sales (25.4% as strong momentum). Only 13.6% of value investors are contrarian sellers (7.8% strong contrarian). This is consistent with our previous results.

Similarly to the differences in buying behavior, growth and value investors also use different signal horizons to determine when to sell. Over all trading signals, the largest percentage of growth investors (10.9%) are best described as using the 1-day trading signal. In contrast, the largest percentage of value investors (12.59%) appear to use the 120-day signal. This suggests that value investors rely on longer-term signals than growth investors in their selling behavior, just as they do in their buys.

The tendency for growth investors to rely on shorter-term signals and value investors to rely on long-term signals is even more evident when aggregating over all short-term signals (1-day through 60-day) and all long-term signals (90-day through 250-day). We are able to classify 50.03% of all growth investors as momentum or contrarian. Of these, 40.3% of all growth investors are best described as using the short-term signals, while only 9.7% of all growth investors appear to use the long term signals. Value

investors rely on longer-term signals. We classify 55.2% of all value investors. Of these, 21.1% use short-term signals, and 34.1% follow the long term signal.

Overall, we find that not only do growth and value investors exhibit differences in the way they respond to return signals (momentum vs. contrarian behavior), but we also find differences in the type of signal that growth and value investors respond to. Growth investors respond to short-term signals more so than to longer-term signals, and value investors display the opposite tendency.

III. Multi-Style Investors – Consistency in Trading Strategies

Having established systematic differences between growth investors and value investors, we make another step in the study of investor trading behavior. In this section we consider investors who trade in both growth and value styles (multi-style investors). By comparing multi-style investors with value-only and growth-only groups we study whether a propensity to trade in a certain way resides with an investor, such as age, gender and risk aversion, or whether it is affected by situational factors, such as the type of asset being traded.

Propensity to trade in a certain fashion – momentum or contrarian – may be a characteristic of an individual investor. In much the same way it is assumed that an individual has a particular aversion to risk, an investor may be naturally prone to trade different assets according to a consistent trading rule. An investor may behave as a contrarian investor and may show this characteristic when investing across different assets. An investor who trades consistently across all assets may follow either a momentum or a contrarian strategy. This is a feature of the prior literature on investor trading behavior where an important latent assumption is maintained that it is highly unlikely for an investor

to display different trading strategies across different types of investments. In such a setting, it is not likely for an individual to be a momentum investor for certain assets and a contrarian investor with a different set of assets.

A number of authors, for example, Barberis, Shleifer, and Vishny (1998), Daniel, Hirshleifer, and Subrahmanyam (1998), and Hong and Stein (1999) present behavioral models that are based on the idea that investors are prone to behavioral heuristics and have inherent biases in the way they interpret information (Tversky and Kahneman (1974)). For example, investors may apply "representative heuristic" which may lead them to mistakenly conclude that firms realizing extraordinary earnings growth will continue to experience similar extraordinary growth in the future (Barberis, Shleifer, and Vishny (1998)).¹⁶ This approach to forming beliefs will affect all stocks in the investors' opportunity set.

In our setting, the personality factor implies that an individual who trades both value and growth will exhibit the same propensity to trade in both value and growth holdings. A momentum investor will be expected to display momentum trading in both value and growth trades. A contrarian investor will use contrarian strategies in both styles.

There is an important alternative, however. In addition to an invariant, inherent personality-trait component, risk taking may be related to situational factors. Tversky and Kahneman (1981, 1984) and Thaler (1985) show that different situations, referred to as "situational frames," can cause the dependence of preferences on the formulation of decision problems. When asset characteristics themselves play a role in how investors trade them, the same investor can exhibit different trading patterns depending on the characteristics of the assets.

¹⁶ *Representative heuristic* is the tendency of individuals to identify an uncertain event, or a sample, by the degree to which it is similar to the parent population (Tversky and Kahneman, 1974).

It has been argued that asset characteristics contribute to how investors make decisions. For example, investors frequently classify assets into categories (or, styles) and then express their demand for risky assets at the levels of these categories (Barberis and Shleifer (2003)). The approach that investors take to form expectations about the performance of different categories (styles) may depend on a chosen style. Characteristic of the asset—or *perceived* characteristics—can potentially alter the way in which investors think about that asset.

A commonly used classification into value and growth assets can also result in dependence of trading strategies on the type of asset. As an example, if an asset is classified by an investor as a *value* asset, after a price drop (when the asset becomes “cheaper”), it may be perceived that the asset’s “value” characteristic has been enhanced by the lower price. Alternatively, if an asset is considered to be a *growth* asset, after a price increase (and thus after an observed growth), the asset’s “growth” trait may be perceived as being stronger.

Very little is known whether a given investor would tend to form expectations about different categories of assets in a consistent, similar fashion, or whether an investor would apply different models for forming expectations depending on the classification or characteristics of the assets. Understanding context dependent investment decision making is important. Different situational frames and expectations, as well as different personalities, may very well interact to produce the sometimes opposite behaviors shown by the same person in objectively similar situations. Using the sample of individual investors who trade both growth and value, we test to see whether the investors use the same trading strategy across styles or whether they apply different strategies to different styles.

A. Classification Analysis

We classify all multi-style investors as momentum, undefined, or contrarian according to their value trades and then classify all investors according to their growth trades. Each investor falls into one of nine categories based on their value classification and their growth classification (momentum, unclassified or contrarian for value trades times the same three categories for their growth trades).

Figure 3 illustrates the distribution of multi-style investor types for buys. Figure 4 shows the distribution for sells. These figures allow us to clearly compare the distribution of trading behavior of the multi-style investors' value trades (lower left) with the distribution of behavior of the value-only investors' trades (upper left). We can also compare the multi-style investors' trades of growth funds (lower right) with the distribution of behavior of growth-only investors (upper right).

The figures illustrate two important findings. First, multi-style investors trade differently across their value and growth holdings. Second, the figures show striking similarities between the way multi-style investors trade their value holdings and the way value-only investors trade; and between the way multi-style investors trade their growth holdings and the way growth-only investors trade. Multi-style investors trade their growth holdings in a similar way as the growth-only investors, but trade like the value-only investors in their value trades. This is true for both purchases and redemptions.

We proceed with a more formal analysis of these tendencies. To conduct statistical tests we select and study those agents who are classified as a momentum or contrarian investor in both the value dimension and the growth dimension. We find the existence of investors who are momentum traders in value and in growth, contrarian traders in value and in growth, momentum traders in value but contrarian in growth, and contrarian traders

in value but momentum in growth. Hence, we find a group of investors who consistently use a single strategy, and we find a collection of investors who use different strategies depending on the style of the traded security. This is evidence supporting both the personality theory and the situation-dependent theory. We adopt the convenient notation “Strategy G / Strategy V” where Strategy G refers to the strategy used when trading growth and Strategy V refers to the strategy used when trading value.

Results are listed in Table VI. Panel A describes the classification of purchases and Panel B describes the classification of redemptions. With respect to the buys (Panel A), we can judge the consistency of investors trading by comparing investors labeled as Mom/Mom or Contr/Contr to the investors who are labeled as Contr/Mom and Mom/Contr. By observation, we notice that consistency is challenged by the existence of Contr/Mom and Mom/Contr investors. For the short term return signals, 1-day through 60-day, the majority of investors are classified as Contr/Contr and Mom/Contr. For longer term return signals, 90-day through 250-day, the majority of investors are classified as Mom/Mom and Mom/Contr. For short term signals, investors seem to follow a contrarian strategy with their value trades but use both momentum and contrarian strategies with their growth trades. For long term signals, investors follow a momentum strategy with their growth trades but use both momentum and contrarian strategies with their value trades. Only a very small percentage of investors follow the Contr/Mom strategy—growth contrarian and value momentum buyer. The overall pattern is surprising. This table shows that a large proportion of individual agents trade differently across asset classes – momentum in growth but contrarian in value. These investors trade like the growth only investors in their growth trades but trade like the value only investors with their value trades.

We determine the degree of consistency of trading across asset classes using two tests. We first calculate Cohen's kappa coefficient to describe the level of consistency.¹⁷ The kappa coefficient is a statistical measure of consistency (or agreement) and describes the difference in the amount of agreement beyond that expected by chance. If there is complete agreement (all investors are Mom/Mom or Contr/Contr), then kappa will equal one. Values of zero or less than zero indicate no agreement. As a rule of thumb, values of kappa above 0.4 are generally considered moderate agreement and values above 0.8 as excellent (almost perfect) agreement.¹⁸ The provided test determines if kappa is equal to zero – no consistency in trading strategies across asset classes.

The second statistic used is the log odds ratio test.¹⁹ This ratio compares the number of individuals that trade consistently to those who trade inconsistently. The value ranges from zero to infinity with zero indicating no agreement and infinity indicating complete agreement. As with the kappa coefficient, we test if the log odds ratio is equal to zero indicating no consistency in trading strategies across asset classes.

For buying behavior, we can conclude that there is little agreement between the strategies each individual uses with their growth trades and the strategies the same investor uses with their value trades. Using both statistics we reject the hypothesis that there is no agreement in trading strategies across asset classes for short term signals, but for many of

¹⁷ Kappa is defined as $\kappa = (\Pi_o - \Pi_e) / (1 - \Pi_e)$, where $\Pi_o = \sum \pi_{ii}$ is the observed agreement and $\Pi_e = \sum \pi_{i+} \pi_{+i}$ is the expected agreement. The value π_{ij} is the probability of an individual being classified in the i, j -th category.

¹⁸ Cohen (1960) and Fleiss (1981).

¹⁹ The log odds ratio is defined as $\log(OR) = \log\left(\frac{n_{m/m}n_{c/c}}{n_{m/c}n_{c/m}}\right)$ where n_{ij} is the number of individuals classified as i/j . The log ratio is normally distributed with mean of zero and variance of $\text{var}(OR) = \frac{1}{n_{m/m}} + \frac{1}{n_{m/c}} + \frac{1}{n_{c/m}} + \frac{1}{n_{c/c}}$.

the long-term signals we are not able to reject the hypothesis of no consistency. Statistically speaking, there exists some consistency in trading with the short-term signals but there is no consistency with the long-term signals. Even when we do find some consistency in trading strategies across asset classes, the degree of consistency is small. Both kappa and the log odds ratio are small. Only in one case is kappa above 0.4 – for the 250-day signal. A large proportion of categorized investors tend to react to past returns differently in their buys into value than their buys into growth.

Similar differences in behavior can be seen in the selling patterns (Table VI Panel B). We mostly observe kappas below 0.2 and the log odds ratio values are small, indicating no agreement. But, we do observe two larger kappas. Kappa is 0.57 for the return signal 40-day and is 0.63 for the signal of 250-day. There is an overall tendency for investors to act as contrarian sellers at the horizon of one year, 250-day. With the exception of these two cases, 30% or more of the investors trade in an inconsistent way. As in the buy case, though we do reject the hypothesis of no consistency, the degree of consistency is low.

Table VI Panel B shows that the most likely strategy combination is Mom/Mom for return signals 1-day through 60-day. Over these same signals, the second most likely combination of strategies is the Contr/Mom. For the longer term signals, we see the dominant strategy switching to Contr/Contr while there still remains a very large proportion of investors who trade Contr/Mom – as large as 56% of the population. These results align themselves very closely with the results found for the investors who specialize in only one asset class.

As a final test, we show that there are significantly more growth trades of multi-style investors classified as momentum than there are value trades classified as momentum,

and there are significantly more value trades classified as contrarian than there are growth trades classified as contrarian. To test this, we use McNemar's Test.²⁰ The test is applied to a 2x2 contingency table, where the columns are Growth Momentum and Growth Contrarian, and the rows are Value Momentum and Value Contrarian. The cells contain the number of investors in each category. Statistical significance means that the inconsistent (off-diagonal) investors are not equal. This indicates that we find more of one type of investor than we do of the other.

As seen in Table VI, Panel A, we reject the equality for all but one case. We find significantly more contrarian value buyers than contrarian growth buyers, and we find significantly more momentum growth buyers than momentum value buyers. Multi-style investors who trade differently in their growth and value funds tend to be contrarian value and momentum growth buyers. These are the same tendencies as we find for growth-only and value-only investors. This statistical test confirms the patterns reported in Figure 3.

Our findings for selling behavior (Table VI, Panel B) are the same. We strongly reject equality in all but two cases. There are significantly more contrarian growth-momentum value sellers than momentum growth-contrarian value sellers. This result again reinforces the finding that investors who trade growth tend to follow a momentum buying and contrarian selling strategy while investors who trade value tend to follow a contrarian buying and momentum selling strategy. Here, too, multi-style investors who

²⁰ McNemar's test determines if we classify the same number of momentum growth investors as we find momentum value investors *and* if we classify the same number of contrarian growth investors as we classify contrarian value investors. Hence, we are comparing

$$\begin{aligned} \text{Mom|Mom} + \text{Mom|Contra} &= \text{Mom|Mom} + \text{Contra|Mom} \\ \text{Contra|Contra} + \text{Contra|Mom} &= \text{Contra|Contra} + \text{Mom|Contra} \end{aligned}$$

The test above is the same as comparing the size of the off-diagonal cells (due to canceling like terms). McNemar statistic is computed as: $Q = (\text{Mom|Contra} - \text{Contra|Mom})^2 / (\text{Mom|Contra} + \text{Contra|Mom})$ where Q follows a chi-squared distribution. Statistical rejection implies that there is a significantly larger group of buyers who are Mom|Contr compared to Contr|Mom, and there is a significantly larger group of sellers who are Contr|Mom compared to Mom|Contr.

trade differently in their growth and value funds tend to behave similarly to growth-only investors in their growth trades, and similarly to value-only investors in their value trades. This statistical test confirms the patterns reported in Figure 4.

A significant number of investors do not follow the same trading rules between asset classes. For multi-style investors who fall in this category, we find that they tend to trade their growth funds similarly to growth-only investors, and they tend to trade their value funds in a fashion similar to value-only investors.

IV. Conclusion

Investors use patterns in prices to determine when to buy and sell financial securities. It has been previously shown that some investors follow a contrarian strategy while other investors follow a momentum strategy. However, it is important to understand to what extent trading is driven by a given investor's predisposition to trade in a certain way, and to what extent trading strategies depend on the assets being traded.

In this paper we study the investing strategies of three distinct groups of investors: those who specialize in growth securities, those who specialize in value securities, and those who trade both growth and value securities. We find significant differences in how these three groups trade. Value investors tend to buy after prices fall, and sell as prices decline. Growth investors tend to buy after price increases and sell after observing positive returns. Further, we show that growth investors tend to rely on short-term signals while value investors follow longer-term signals. Value and growth investors exhibit significant differences in how they approach the buying and selling of securities.

After establishing trading patterns of growth investors and value investors, we study investors who trade in both value and growth. The multi-style investors in our

sample exhibit different trading behavior depending on the style of the traded security. The multi-style investors trade growth like the growth only investors, and they trade value like the value only investors.

This paper adds to the literature describing how investors trade. In the prior literature on investor trading behavior, it has been subtly assumed that investors are initially endowed with a preferred trading strategy. Our results indicate that the choice of trading strategy may depend in a significant way on the characteristics of the security being traded. The same individual chooses a momentum strategy when trading growth assets but chooses a contrarian strategy when trading value assets.

Collectively, our results call to attention the importance of asset characteristics and investment environment as determinants of trading behavior. Broadly consistent with mental accounting, our results suggest, whether rational or irrational, that investors have identified the popular asset styles of value and growth as being different and thus worthy of differential treatment.

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Table I
Descriptive Statistics

Investors are placed into three groups: growth investors who trade only growth, value investors who trade only value, multi-style investors (growth *and* value investors) who trade both growth and value. No. of Accounts is the number of different investors who make at least one buy or sell trade. No. of Transactions is the total number of buy and sell trades of all investors. This value is then subdivided into number of purchases and number of sales. Transactions per account is the average number of trades made by each investor account. Trade size per account and Dollar Trade are measures of trade size. The former is the average number of shares traded by each investor, and the latter is the average dollar value of the trade by each investor.

| | | Growth Investors | Value Investors | Multi-Style Investors | |
|---------------------------------------|-----------|-------------------------|------------------------|------------------------------|--------------|
| | | Growth Trades | Value Trades | Growth Trades | Value Trades |
| No. of Accounts | | 76,775 | 6,705 | 3,978 | 3,978 |
| No. of Transactions | Total | 340,809 | 20,598 | 39,123 | 12,400 |
| | Purchases | 251,414 | 13,101 | 29,154 | 6,007 |
| | Sales | 89,395 | 7,497 | 9,969 | 6,393 |
| Transactions per account | Mean | 4.44 | 3.07 | 9.83 | 3.11 |
| | Median | 1.00 | 1.00 | 3.00 | 1.00 |
| | St. Dev | 11.98 | 9.20 | 86.06 | 9.63 |
| | | | | | |
| Trade Size per account (in shares) | Mean | 720.97 | 610.60 | 697.41 | 522.83 |
| | Median | 209.68 | 216.03 | 150.93 | 142.76 |
| | St. Dev | 3968.92 | 3347.22 | 4422.04 | 2918.98 |
| Dollar Trade per account (\$) | Mean | 10,390.33 | 13,063.75 | 10,126.22 | 9943.71 |
| | Median | 3102.25 | 4780.00 | 2445.67 | 2668.02 |
| | St. Dev | 54,044.14 | 72,227.95 | 55,832.01 | 52,407.45 |

Table III
Trading Classification for Sells

We classify value investors and growth investors as being momentum sellers, contrarian sellers and undefined for various past return signals. To be included, investors must trade only Value (Panel A) or only Growth (Panel B) and the must have traded at least four times. The values in the table are the percent of investors who fit the classification. Panel C gives the average investor type for each signal. We give a value of +1 to momentum traders, -1 to contrarian traders and 0 to undefined investors. The average, therefore, describes whether the style investors lean to one type of trading strategy – positive value indicates that the average investor is momentum and negative value indicates that the average investor is contrarian. The Mantel-Haenszel chi-square statistic tests if the average value investor is equal to the average growth investor.

| Panel A: Value Trader Sells | | | | | | | | | | | |
|--|----------------------|------------------|-------------------|-------------------|-------------------|-------------------|--------------------|--------------------|--------------------|----------------|-------------------|
| | Signal | 1-day | 5-day | 10-day | 20-day | 40-day | 60-day | 90-day | 120-day | 180-day | 250-day |
| Str. Contr. | $\alpha < 0.1$ | 2.56 | 1.50 | 1.07 | 2.56 | 0.85 | 1.28 | 0.85 | 1.28 | 8.12 | 13.03 |
| Wk. Contr. | $0.5 > \alpha > 0.1$ | 13.46 | 12.39 | 9.62 | 10.68 | 17.74 | 10.90 | 4.49 | 6.41 | 33.97 | 47.65 |
| | Undefined | 51.07 | 54.06 | 48.72 | 60.26 | 59.62 | 56.62 | 40.38 | 49.36 | 40.60 | 34.83 |
| Wk. Mom. | $0.5 > \alpha > 0.1$ | 25.21 | 24.57 | 29.70 | 21.15 | 15.38 | 19.02 | 19.66 | 17.52 | 12.39 | 4.27 |
| Str. Mom. | $\alpha < 0.1$ | 7.69 | 7.48 | 10.90 | 5.34 | 6.41 | 12.18 | 34.62 | 25.43 | 4.91 | 0.21 |
| Panel B: Growth Trader Sells | | | | | | | | | | | |
| | Signal | 1-day | 5-day | 10-day | 20-day | 40-day | 60-day | 90-day | 120-day | 180-day | 250-day |
| Str. Contr. | $\alpha < 0.1$ | 3.25 | 3.23 | 2.00 | 3.78 | 4.93 | 5.47 | 8.41 | 9.35 | 11.69 | 11.77 |
| Wk. Contr. | $0.5 > \alpha > 0.1$ | 15.77 | 17.75 | 18.33 | 23.11 | 16.13 | 21.42 | 28.56 | 30.38 | 23.93 | 23.80 |
| | Undefined | 55.88 | 55.18 | 58.07 | 57.85 | 67.04 | 65.20 | 59.15 | 57.81 | 64.34 | 64.39 |
| Wk. Mom. | $0.5 > \alpha > 0.1$ | 23.29 | 21.72 | 20.00 | 14.21 | 9.85 | 6.62 | 3.46 | 2.23 | 0.04 | 0.04 |
| Str. Mom. | $\alpha < 0.1$ | 1.82 | 2.11 | 1.60 | 1.05 | 2.05 | 1.29 | 0.42 | 0.22 | 0.00 | 0.00 |
| Panel C: Comparison of Growth and Value Investors | | | | | | | | | | | |
| Value | Average | 0.169 | 0.182 | 0.299 | 0.132 | 0.032 | 0.190 | 0.489 | -0.353 | -0.248 | -0.562 |
| Growth | Average | 0.061 | 0.028 | 0.013 | -0.116 | -0.091 | -0.190 | -0.331 | -0.373 | -0.356 | -0.355 |
| Mantel Haenszel | Chi-Sq p-value | 11.98 (0.001) | 23.06 (0.0001) | 85.97 (0.0001) | 65.75 (0.0001) | 18.91 (0.0001) | 173.22 (0.0001) | 669.20 (0.0001) | 538.81 (0.0001) | 4.03 (0.04) | 92.61 (0.0001) |

Table IV
Investor Classification by Signal Horizon

We classify all investors as strong contrarian, weak contrarian, undefined, weak momentum, and strong momentum using the methods described in Tables II and III according to their buying history. We then classify each investor according to the return signal that best describes their trading - the return signal that minimized the p-value of the binomial distribution. Values in the table are percentages of the total population.

| Panel A: Value Trader Buys | | | | | | | | | | | |
|-----------------------------------|---------|-------|-------|--------|--------|--------|--------|--------|---------|---------|---------|
| | Row Sum | 1-day | 5-day | 10-day | 20-day | 40-day | 60-day | 90-day | 120-day | 180-day | 250-day |
| Str. Contr. | 41.73 | 1.80 | 1.32 | 2.52 | 1.68 | 0.84 | 5.28 | 8.39 | 17.27 | 2.52 | 0.12 |
| Wk. Contr. | 13.19 | 2.16 | 0.96 | 1.56 | 1.80 | 0.72 | 1.44 | 0.84 | 1.68 | 0.84 | 1.20 |
| Undefined | 21.10 | | | | | | | | | | |
| Wk. Mom. | 6.47 | 1.08 | 2.04 | 0.36 | 0.60 | 0.60 | 0.12 | 0.24 | 0.00 | 0.84 | 0.60 |
| Str. Mom. | 17.51 | 0.12 | 0.72 | 0.12 | 0.00 | 0.12 | 0.48 | 1.92 | 0.24 | 1.68 | 12.11 |
| Column Sum | 100.00 | 5.16 | 5.04 | 4.56 | 4.08 | 2.28 | 7.32 | 11.39 | 19.19 | 5.88 | 14.03 |

| Panel B: Growth Trader Buys | | | | | | | | | | | |
|------------------------------------|---------|-------|-------|--------|--------|--------|--------|--------|---------|---------|---------|
| | Row Sum | 1-day | 5-day | 10-day | 20-day | 40-day | 60-day | 90-day | 120-day | 180-day | 250-day |
| Str. Contr. | 8.97 | 2.34 | 1.70 | 1.20 | 1.14 | 1.53 | 0.63 | 0.30 | 0.14 | 0.00 | 0.00 |
| Wk. Contr. | 15.41 | 3.71 | 2.33 | 2.42 | 2.67 | 1.58 | 1.19 | 0.75 | 0.63 | 0.02 | 0.12 |
| Undefined | 9.44 | | | | | | | | | | |
| Wk. Mom. | 28.03 | 4.11 | 4.18 | 3.70 | 2.90 | 2.58 | 2.34 | 2.65 | 1.68 | 0.01 | 3.88 |
| Str. Mom. | 38.15 | 2.74 | 1.63 | 0.89 | 1.48 | 1.18 | 1.25 | 4.25 | 5.11 | 0.31 | 19.30 |
| Column Sum | 100.00 | 12.90 | 9.84 | 8.21 | 8.19 | 6.87 | 5.41 | 7.95 | 7.56 | 0.34 | 23.3 |

Table V
Investor Classification by Signal Horizon

We classify all investors as strong contrarian, weak contrarian, undefined, weak momentum, and strong momentum using the methods described in Tables II and III according to their selling history. We then classify each investor according to the return signal that best describes their trading - the return signal that minimized the p-value of the binomial distribution. Values in the table are percentages of the total population.

| Panel A: Value Trader Sells | | | | | | | | | | | |
|------------------------------------|---------|-------|-------|--------|--------|--------|--------|--------|---------|---------|---------|
| | Row Sum | 1-day | 5-day | 10-day | 20-day | 40-day | 60-day | 90-day | 120-day | 180-day | 250-day |
| Str. Contr. | 7.79 | 0.84 | 0.48 | 0.24 | 0.24 | 0.00 | 0.24 | 0.24 | 0.12 | 1.08 | 4.32 |
| Wk. Contr. | 5.76 | 0.84 | 1.32 | 0.48 | 0.60 | 0.96 | 0.60 | 0.12 | 0.12 | 0.36 | 0.36 |
| Undefined | 44.84 | | | | | | | | | | |
| Wk. Mom. | 16.19 | 0.96 | 0.84 | 2.52 | 1.08 | 0.36 | 1.32 | 1.92 | 3.24 | 2.52 | 1.44 |
| Str. Mom. | 25.42 | 1.32 | 1.20 | 1.80 | 0.96 | 0.72 | 1.20 | 8.39 | 9.11 | 0.60 | 0.12 |
| Column Sum | 100.00 | 3.96 | 3.84 | 5.04 | 2.88 | 2.04 | 3.36 | 10.67 | 12.59 | 4.56 | 6.24 |

| Panel B: Growth Trader Sells | | | | | | | | | | | |
|-------------------------------------|---------|-------|-------|--------|--------|--------|--------|--------|---------|---------|---------|
| | Row Sum | 1-day | 5-day | 10-day | 20-day | 40-day | 60-day | 90-day | 120-day | 180-day | 250-day |
| Str. Contr. | 9.62 | 1.29 | 0.74 | 0.34 | 0.64 | 0.56 | 0.61 | 1.11 | 0.90 | 0.02 | 3.42 |
| Wk. Contr. | 15.93 | 4.75 | 3.25 | 2.10 | 1.76 | 1.36 | 1.20 | 0.68 | 0.39 | 0.01 | 0.45 |
| Undefined | 49.98 | | | | | | | | | | |
| Wk. Mom. | 20.80 | 4.32 | 2.56 | 3.76 | 2.96 | 2.77 | 1.90 | 1.21 | 1.27 | 0.04 | 0.00 |
| Str. Mom. | 3.67 | 0.57 | 0.70 | 0.61 | 0.33 | 0.76 | 0.47 | 0.15 | 0.08 | 0.00 | 0.00 |
| Column Sum | 100.00 | 10.93 | 7.25 | 6.81 | 5.69 | 5.45 | 4.18 | 3.14 | 2.64 | 0.07 | 3.87 |

Panel B: Sells

| Gro/Val | 1-day | 5-day | 10-day | 20-day | 40-day | 60-day | 90-day | 120-day | 180-day | 250-day |
|----------------|---------|---------|----------|---------|---------|---------|----------|----------|---------|---------|
| Mom/Mom | 64.22 | 54.60 | 47.60 | 49.38 | 73.42 | 36.54 | 17.65 | 13.51 | 5.26 | 6.67 |
| Contr/Mom | 16.06 | 21.84 | 35.60 | 21.88 | 12.66 | 32.69 | 55.88 | 51.35 | 36.84 | 3.33 |
| Mom/Contr | 13.76 | 13.79 | 12.80 | 15.00 | 1.27 | 1.92 | 1.47 | 1.35 | 2.63 | 3.33 |
| Contr/Contr | 5.96 | 9.77 | 4.00 | 13.75 | 12.66 | 28.85 | 25.00 | 33.78 | 55.26 | 86.67 |
| Log Odds Ratio | 0.24 | 0.25 | -0.38 | 0.32 | 1.76 | 1.22 | 0.73 | 0.82 | 0.48 | 1.72 |
| <i>p-value</i> | (0.266) | (0.252) | (0.835) | (0.189) | (0.055) | (0.130) | (0.250) | (0.224) | (0.354) | (0.141) |
| Kappa | 0.098 | 0.115 | -0.123 | 0.160 | 0.567 | 0.364 | 0.111 | 0.128 | 0.090 | 0.630 |
| <i>p-value</i> | (0.108) | (0.088) | (0.015) | (0.032) | (0.000) | (0.001) | (0.081) | (0.046) | (0.379) | (0.020) |
| McNemar | 0.38 | 3.16 | 26.85 | 2.05 | 7.36 | 14.22 | 35.10 | 35.10 | 11.27 | 0.00 |
| <i>p-value</i> | (0.540) | (0.083) | (0.0001) | (0.156) | (0.013) | (0.001) | (0.0001) | (0.0001) | (0.003) | (1.00) |

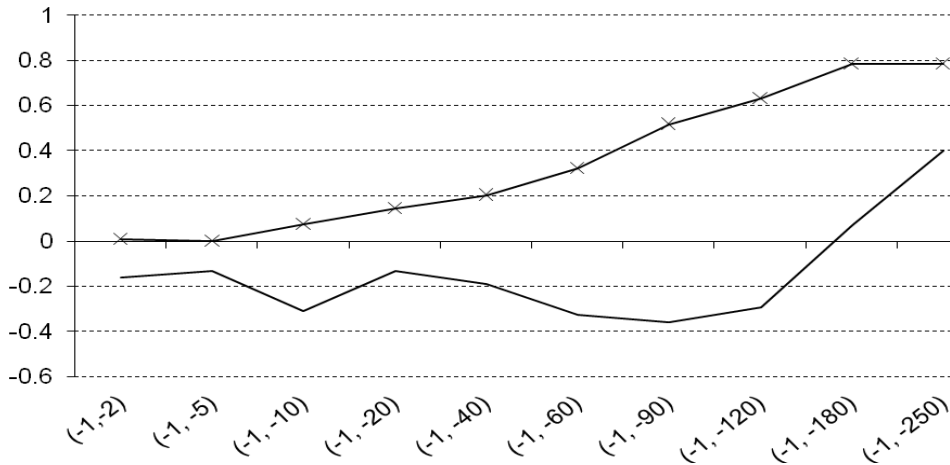


Figure 1: Average Investor Type – Purchases

Value investors (solid line) and growth investors (line with x) are classified as contrarian or momentum traders according to the purchasing behavior. Contrarian investors are given a value of -1 and momentum investors are given a value of +1. The figure plots the average investor type for growth and value style investors for ten different return signals. Positive value indicates that the average investor is momentum and negative value indicates that the average investor is contrarian.

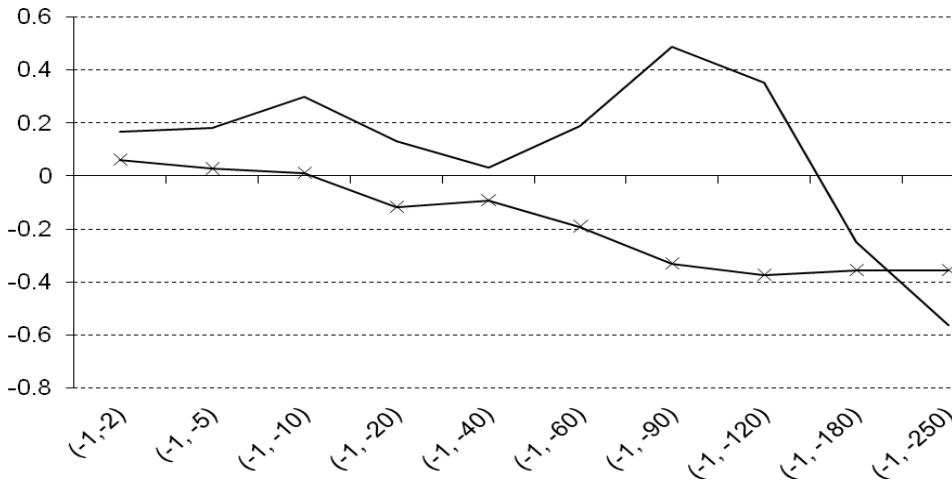


Figure 2: Average Investor Type – Sells

Value investors (solid line) and growth investors (line with x) are classified as contrarian or momentum traders according to their selling behavior. Contrarian investors are given a value of -1 and momentum investors are given a value of +1. The figure plots the average investor type for growth and value style investors for ten different return signals. Positive value indicates that the average investor is momentum and negative value indicates that the average investor is contrarian.

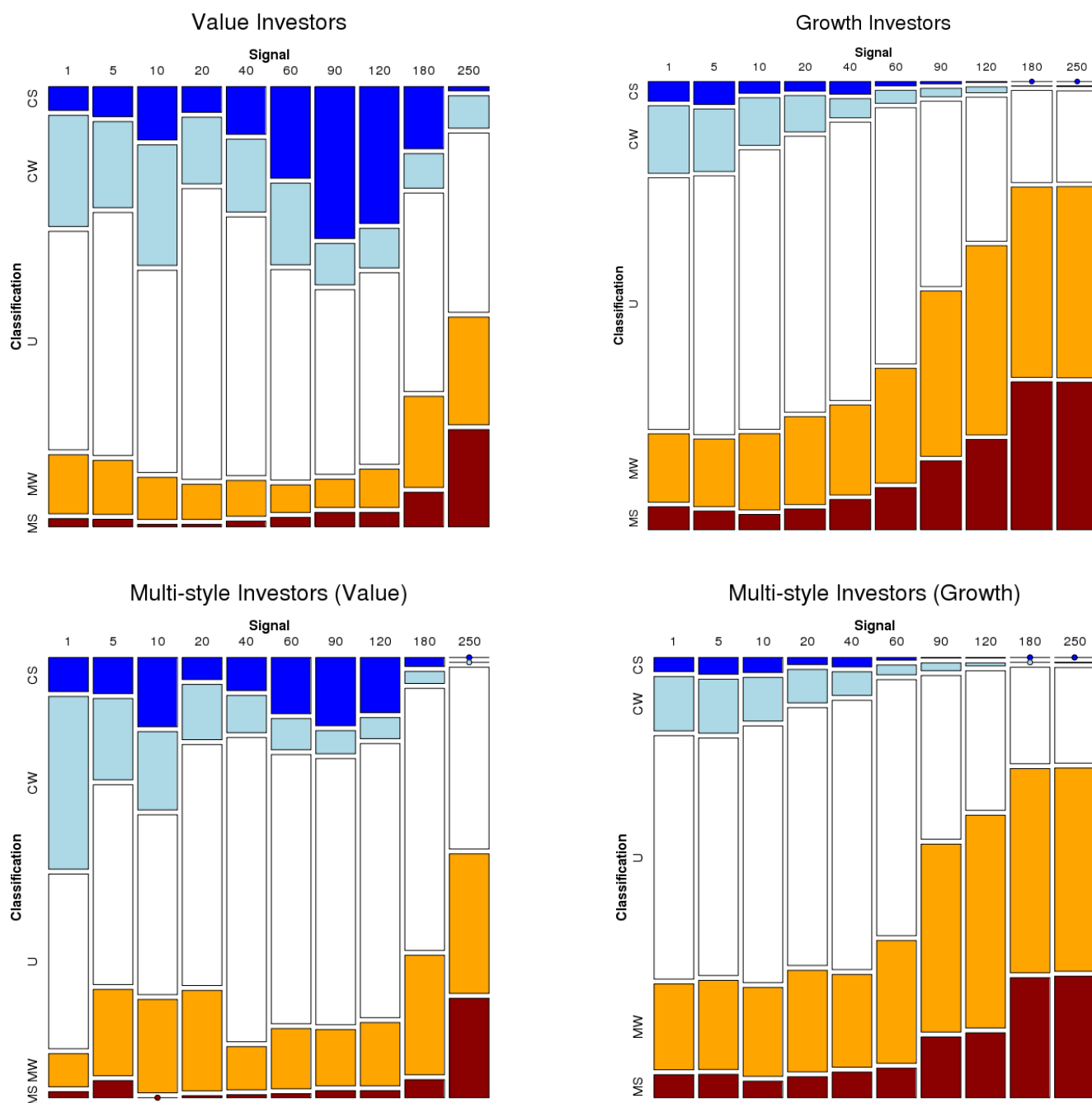


Figure 3. Investor Types and Return Signal – Buys.

The chart in each panel shows the distribution of different investors for various past return signals. We classify value investors, growth investors, multi-style investors who trade in value and in growth funds as being momentum buyers, contrarian buyers and undefined. The categories on the X-axis correspond to the different length of the prior return signal, from the return over the previous one day (1), five trading days (5)—a week, through the return over the previous 250 trading days (250) corresponding to a calendar year. The Y-axis is the proportion of investors classified into one of the five categories (from bottom to the top): Momentum Strong (MS), Momentum Weak (MW), Unclassified (U), Contrarian Weak (CW), and Contrarian Strong (CS).

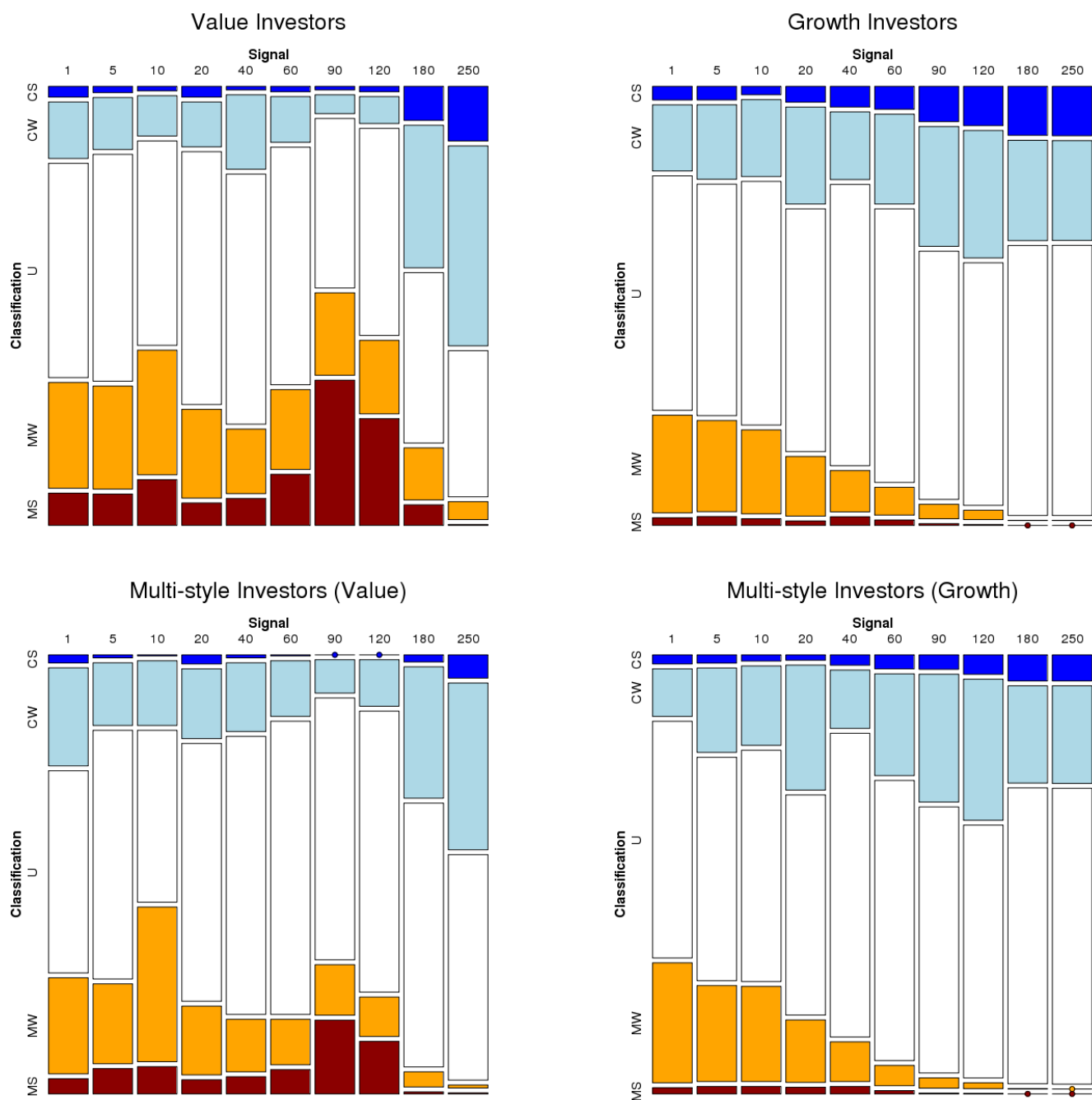


Figure 4. Investor Types and Return Signal – Sells.

The chart in each panel shows the distribution of different investors for various past return signals. We classify value investors, growth investors, multi-style investors who trade in value and in growth funds as being momentum sellers, contrarian sellers and undefined. The categories on the X-axis correspond to the different length of the prior return signal, from the return over the previous one day (1), five trading days (5)—a week, through the return over the previous 250 trading days (250) corresponding to a calendar year. The Y-axis is the proportion of investors classified into one of the five categories (from bottom to the top): Momentum Strong (MS), Momentum Weak (MW), Unclassified (U), Contrarian Weak (CW), and Contrarian Strong (CS).

