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A Tale of Two Investors: Exploring Differences in Trading Behavior around Macroeconomic Announcements

A study of institutional and retail investors in the US market

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Abstract

We study whether the trading behaviour of institutional and retail investors differs on the days surrounding key macroeconomic announcements, and the impact of this difference on equity premiums earned. Through analysis of trading data from the 50 largest US companies between January 2017 and October 2022, we find a significant difference of 2.11 pp in order imbalances two days prior to announcements. Further, we find a significant difference of 2.06 pp in the equity premiums earned by institutions and retail investors on the day after announcements. We attribute these differences to the higher risk appetite of institutional investors and the slower reaction times and higher attention-sensitivity of retail investors.

Keywords – Behavioural finance, trading, macroeconomic announcements, retail- and institutional investors

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1 Introduction

The number of retail investors in the stock market has increased drastically over the last few years due to recent technological innovations (Welch, 2022). Yet, both popular media and financial literature often emphasise the apparent contrasting attributes of the two investors, with retail investors typically portrayed as uninformed and less resourceful, causing their trading behaviour to deviate substantially from their institutional counterpart (see for instance Barber and Odean (2000)).

In this paper, we study the differences between the two investors by identifying deviations in their trading behaviour in the days surrounding the release of key macroeconomic figures. We limit our scope to macroeconomic announcements days due to two main reasons. First, the dates of macroeconomic announcements are publicly available months in advance and expectations are routinely published by professional forecasters[1] prior to the announcements. We thus limit the issue of information asymmetries to that of abilities to utilise publicly available information, causing any observed trading differences in the period around the announcements to stem from other factors, such as deviations in expertise or risk preferences. Second, market returns on days with macroeconomic announcements constitute a significant part of the annual market return. For instance, Savor and Wilson (2013) find that the market-wide average excess return is 10.3 bp higher – and more than 60% of the annual equity risk premium is earned – on announcement days. Consequently, suboptimal trading around macroeconomic announcement days could have large implications for investors' annual performance in the stock market. We analyse this issue by including the intraday returns earned by each investor to evaluate who captures the majority of the announcement day equity premium.

There are several reasons to expect differences in the trading behaviour of institutional and retail investors in the days surrounding macroeconomic announcements. Barber and Odean (2008) find that retail investors are net buyers of shares subsequent to the release of company-specific news – irrespective of the content being good or bad – suggesting that retail investors are attention-traders. In contrast, institutional trading is less affected by news releases. Moreover, the investors respond differently to company

[1]Including economists, analysts, and investment banks.

earnings signals; whereas institutions are net buyers (sellers) subsequent to good (bad) news, retail investors are net buyers regardless of the content (Lee, 1992). Nofsinger (2001) examines trading behaviour in response to macroeconomic announcements, arguing that while the two investors trade in the same direction, institutions (retail investors) respond more heavily to bad (good) news. Additional evidence points to institutions positioning themselves before various announcements according to their own expectations. For instance, Henry et al. (2017) find that institutions are net sellers of shares before dividend reduction announcements, while Davis et al. (2021) find that institutions are net buyers of the targets prior to takeover announcements. Contrarily, retail investors do not exhibit such pre-announcement positioning. Last, the trading behaviour of both retail and institutional investors is found to be abnormal in the days after pre-scheduled company-specific announcements, with retail investors being the most uniform in their trading (see for instance Duong et al. (2016)).

We do not find any abnormal difference in order imbalances on announcement days, indicating that both parties are trading normally. However, the difference is abnormal by 2.11 pp two days prior to announcements, driven by abnormal institutional buying of 1.11 pp – consistent with previous findings of institutional pre-announcement positioning (Davis et al., 2021). Further, we find that institutions increase their purchases of shares relative to retail investors when the risk[2] in the market is higher, suggesting a higher risk appetite among institutions. We suggest risk preferences as an explanation for the observed difference in trading behaviour before announcements, consistent with previous findings by e.g., Lee (1992). Finally, we argue that risk-averse retail investors delay purchases of shares until after the announcement of macroeconomic news when the risk is lower, substantiated by our finding of retail investors being abnormal net buyers of shares by 0.27 pp two days after announcements.

Next, we find that announcement days do not have any significant impact on the difference in equity premiums earned by institutional and retail investors. However, the difference is abnormal subsequent to announcements; institutions outperform retail investors by 2.06 pp on the first day after announcements, primarily caused by retail investors selling shares at relatively low prices. The finding indicates that retail investors react slowly to news, consistent with previous findings by e.g., Barber and Odean (2008).

[2]Measured by the CBOE Volatility Index (VIX).

We base our analysis on three methodological main parts: data collection, separation of institutional and retail trades, and model creation. First, we utilise Trade and Quote (TAQ) data containing extensive information on all transactions to derive information regarding trading behaviour. We narrow down the selection of shares to the 50 largest US companies, effectively constituting a representative benchmark for all trading in the US market. The sample period spans from January 2017 through October 2022 – a period characterised by a surge in retail investor activity (Welch, 2022). Our macroeconomic announcements include CPI, non-farm payrolls and GDP, for which the announcement dates have been retrieved from various US government statistical bureaus.

Second, we implement a method developed by Boehmer et al. (2021) to identify the retail transactions in the TAQ data: Due to US regulations, retail investors can receive fractional price improvements on each trade, whereas institutions cannot, implying that all transactions with fractional penny prices are traded by retail investors. Specifically, the direction of the price improvement categorises the retail trades' as either buy or sell transactions; prices fractionally below a round penny are identified as sell orders, and vice versa for buy orders. Accordingly, we assume the remaining trades to be conducted by institutions. The institutional trades are categorised as buy or sell orders by implementing the "tick test", whereby trades are classified depending on the transaction price relative to the preceding transaction (Lee and Ready, 1991).

Last, to analyse the trading behaviour of institutions and retail investors, we first create daily order imbalance variables to indicate whether each investor is a net buyer or seller of a particular share on a given day. Next, we construct an order imbalance difference variable by subtracting the retail order imbalance from the institutional order imbalance, in which we aim to capture any deviations in the trading behaviour of the investors. To measure the equity premiums earned by each investor on a given day, we create a proxy for intraday returns, emphasising the deviation between the investor's buy or sell VWAP and the closing price. Next, we estimate multiple linear regression models to measure the impact in the days surrounding macroeconomic announcements on (1) the difference in order imbalances, and (2) the difference in equity premiums. To control for any unobserved effects and coherently ensure validity in our estimations, we include a set of fixed effects. For instance, day-of-the-week fixed effects are included to avoid

any 'weekend effects' skewing our results. Last, we segment our models to analyse the underlying dynamics driving the observed effects.

This paper contributes to existing literature in two main ways. First, contrary to previous papers, we include an entire five-day period surrounding the announcements to capture any differences in the investors' trading behaviour before and after, as well as on the announcement day itself. With this inclusion, we observe that institutions exhibit an abnormal buying of shares prior to announcements to position themselves, consistent with previous findings by e.g., Davis et al. (2021). Moreover, we observe abnormal institutional trading on announcement days in our analysis of the announcements on an aggregate level. In contrast, Nofsinger (2001) finds abnormal trading behaviour among both institutions and retail investors in response to announcements categorised as either good and bad. Second, we provide an understanding of the practical implications of institutional and retail investors' trading behaviour through inclusion of an intraday equity premium variable. While several studies have examined the trading behaviour of the two investors in response to the same announcements (see for instance Nofsinger (2001) or Barber and Odean (2008)), none of them have analysed whether the deviations in trading behaviour have any practical implications – namely if one party outperforms the other.

2 Hypothesis Development

2.1 Background

Recent technological innovations have contributed to a significant increase in the number of retail investors actively participating in the financial market (Welch, 2022). The previously prominent information asymmetry between professional and retail investors has diminished through more accessible information and better research tools, converging the decision basis of the two investors (Welch, 2022). Further, the emergence of online trading platforms such as Robinhood in the US and Nordnet in the Nordics has made participation in the financial market significantly less costly and time-consuming for retail investors. Following retail investors' large-scale entry in the stock market, popular media has often emphasized the contrasting attributes of institutional and retail investors, with the latter portrayed as an uninformed and vulnerable party being exploited by profit-seeking institutions. Additionally, previous literature has identified significant differences in the trading behaviour and performance of institutional and retail investors, with retail investors notably underperforming relevant benchmarks (see for instance Barber and Odean (2000)).

To examine the implication of increased retail investor presence in the market on the dynamic between the two investors, we first analyse their trading behaviour on selected days surrounding macroeconomic announcements. Thereby, we measure whether the investors prepare and respond differently to the same news releases. Next, we analyse differences in intraday trading returns to determine which party captures the announcement day equity premium.

2.2 The Importance of Macroeconomic Announcement Days

The connection between macroeconomic risk and asset return is a central focus in finance due to its market-wide impact. The fact that macroeconomic figures are released on pre-scheduled dates substantiates the announcements' relevance through two main factors. First, as investors know that market-impacting information will be revealed on the

announcement days, it allows for pre-announcement positioning in the market. Second, as investors are ignorant of the news content pre-announcement, we are able to fully isolate the sources of any potential deviations in trading behaviour.

Savor and Wilson (2013) find that asset prices behave significantly different on days with key macroeconomic figures scheduled for release compared to other trading days. Using a sample of US shares, Savor and Wilson find that market returns are significantly higher on days with news announcements regarding the consumer price index (CPI), producer price index (PPI), employment (non-farm payrolls), or Federal Open Market Committee (FOMC) decisions. Specifically, the average excess return on the stock market is 11.4 bp on announcement days relative to 1.1 bp on other days. Moreover, Savor and Wilson estimate that more than 60% of the cumulative annual equity risk premium is earned on announcement days, although constituting only 13% of their sample period.

We build on the findings by Savor and Wilson (2013) and research whether the trading behaviour of institutional and retail investors deviate in the period surrounding macroeconomic announcement days. As announcement day returns constitute a large share of the cumulative yearly return, these days should be particularly important for investors. Any observed differences in the trading behaviour of institutions and retail investors around announcements indicate that the premium on these days is unequally distributed across market participants. Whether these behavioural differences exist and resultantly who gains on it by capturing the announcement day equity premiums is particularly interesting. We examine these issues by comparing the order imbalances and the obtained premiums of the respective investors in the days surrounding macroeconomic announcements.

2.3 Differences in Trading Behaviour of Institutional and Retail Investors

There is considerable evidence that the level of investor sophistication impacts trading decisions both on days with announcements and in the surrounding days (see for instance Barber and Odean (2008)). Lee (1992) finds evidence of directional differences in the trading behaviour of institutional and retail investors in response to company earnings

signals. For institutions, good (bad) news triggers intense buying (selling) imbalances, while retail investors are net buyers regardless of the news categorisation. Further, Lee (1992) argues that the difference in trading behaviour is driven by different risk preferences; retail investors – being risk-averse – delay share purchases until after announcements when the risk of ownership is lower. Similarly, Barber and Odean (2008) find that retail investors are net buyers subsequent to all company-specific news – irrespective of the content – suggesting they are attention-traders. In contrast, institutional trading is less affected by the release of news.

Henry et al. (2017) observe that institutions are net sellers of dividend reduction firms in the pre-announcement period. They argue that institutional investors are exploiting their advantage in both expertise and information-gathering to position themselves in the market prior to news releases. Comparably, Davis et al. (2021) find evidence of institutions actively buying takeover targets before the acquisition announcement, even when controlling for potential information leakages through prime brokers. Consistent with Henry et al. (2017), Davis et al. (2021) argue that institutions are better informed than retail investors and exploit this advantage to earn abnormal profits through buying targets before announcements. To our knowledge, there is no evidence of retail investors collectively positioning themselves in the market prior to news releases in a comparable way, thereby constituting another evident trading difference between the investors.

Studying the trading behaviour of institutions and retail investors in the days after pre-scheduled company-specific announcements, Duong et al. (2016) find abnormal retail buying subsequent to news releases, with institutional investors following their normal trading patterns. Similar to Lee (1992), Duong et al. (2016) argue that risk-averse retail investors are minimizing their risk exposure by delaying share purchases until the risk associated with the announcement has vanished.

Only a limited number of studies have examined the trading behaviour of institutions and retail investors around macroeconomic announcements. First, Nofsinger (2001) finds that both institutional and retail investors buy (sell) large firms in response to good (bad) macroeconomic news. While both investors buy abnormally on days with good macroeconomic news, retail investors have significantly higher buy rates. Similarly, institutional investors sell significantly more on days with bad news. Note, however, that

the effect is only present for large firms[3] (Nofsinger, 2001). Second, Ikizlerli et al. (2019) identify similar differences in the trading behaviour of different investors subsequent to macroeconomic announcements in a study of the Korean stock market. On days with bad inflation announcements, retail investors are net buyers while institutions are net sellers. Likewise, retail investors are net sellers on days with bad GDP news, with institutional investors trading in the opposite direction (Ikizlerli et al., 2019).

In light of the above findings, we expect to observe several differences in the trading behaviour of institutions and retail investors around the macroeconomic announcements. First, we expect institutions to position themselves in the market in the days prior to the announcements. Specifically, we expect institutions to buy abnormally due to the positive average market return on announcement days. Second, we expect trading abnormalities on the announcement days. However, we have no directional prediction, as the findings of previous literature are divided. Last, we expect retail investors to be abnormal net buyers of shares in the days after the announcements.

2.4 Differences in Performance of Institutional and Retail Investors

Lee (1992) finds that retail investors react more slowly to earnings announcements than institutions, potentially implicating their trading profits with share prices quickly absorbing new information. Moreover, Barber and Odean (2000) find that retail investors significantly underperform relevant benchmarks. In a study of the Shanghai Stock Exchange, Seasholes and Wu (2000) find evidence for a small group of institutional investors profiting at the expense of retail investors by anticipating their reaction to company-specific news.

Considering the above findings on the investors' relative performances, we expect to observe differences in the parties' earned premiums around macroeconomic announcements. In particular, we hypothesise that institutional investors outperform retail investors. Given the findings of retail investors reacting slowly to announcements (Lee, 1992), we expect any difference to be caused primarily by institutions trading at more favourable prices.

[3]Defined as those in the largest market capitalization quintile.

3 Data

3.1 Data

We obtain Trade and Quote (TAQ) data from Wharton Research Data Services (WRDS) containing all transactions in the 50 largest US-listed companies[4]. We limit our sample to these companies to only include well-known and transparent companies likely to attract significant attention from both institutional and retail investors. The larger companies are also expected to have higher and more stable trading volumes, benefiting our analysis by increasing variable robustness. Further, this delimitation should be the best suited to capture any effects, as Nofsinger (2001) finds that the trading differences between the investors subsequent to macroeconomic announcements are present only in larger companies. We define the sample period between January 2017 and October 2022 – totalling 1,466 trading days – to cover a period where the retail investor activity in the market has increased.

Our macroeconomic announcement days cover the same period; the first announcement being on 6 January 2017 and the last on 27 October 2022. We include announcements on inflation, employment and GDP as they are the three most used lagging indicators of the economy by investors (IG, 2022). Notably, we have excluded minutes from the Federal Open Market Committee's meetings, as interest rate decisions are affected by the other indicators (Gardner et al., 2022). We use the core consumer price index (CPI) for inflation and non-farm payrolls for employment, both of which are released monthly. We use the preliminary estimate for GDP which is released quarterly. We collect announcement dates for inflation and employment numbers from the US Bureau of Labor Statistics website (http://bls.gov), and gross domestic product (GDP) announcement dates from the US Bureau of Economic Analysis website (http://bea.gov). In total, our data sample contains 163 announcement dates: 70 of which are inflation, 70 employment and 23 GDP. Every announcement in the sample is released at 8:30 am EST – one hour before the opening of the core trading session. Table 3.1 displays the distribution of the macroeconomic announcements by category and weekday.

[4]Measured by market capitalization as of October 2022 – see Appendix for a complete list of the companies

Table 3.1: Overview of Macroeconomic Announcements

	Total	Monday	Tuesday	Wednesday	Thursday	Friday
All announcements	163	0	13	31	29	90
CPI	70	0	13	29	15	13
Employment	70	0	0	0	1	69
GDP	23	0	0	2	13	8

Table 3.1 illustrates the distribution of our macroeconomic announcements. The vertical axis highlights the different types of macroeconomic announcements included in the sample: CPI, employment and GDP, while the horizontal axis shows the distribution of announcements on weekdays.

3.2 Variables

To analyse the differences between the two investors, we split our TAQ data into institutional and retail transactions. We implicitly assume that a market maker is the counterparty in every transaction by labelling a single transaction as either a retail or an institutional trade. Moreover, we identify the retail transactions in the TAQ data by utilising a method developed by Boehmer et al. (2021): Due to regulatory restrictions in the US, retail order flow can receive price improvement on transactions, measured in small fractions of a cent per share. Institutional order flow, on the contrary, cannot receive this fractional penny price improvement (Barardehi et al., 2022). This observation is used to identify marketable price-improved transactions in the TAQ data; all trades executed at share prices with fractional pennies are labelled as retail transactions. Due to the nature of price improvement, transactions with prices slightly below the round penny are identified as retail buy, while transactions with prices slightly above the round penny are identified as retail sell. Specifically, denoting the transaction price in share i at time t as $P_{i,t}$ we compute the fraction of a penny associated with the transaction price as $Z_{i,t} = 100 * mod(P_{it},\ 0.01)$. We classify trades where $Z_{i,t}$ is in the interval (0, 0.4) as retail sell transactions, while $Z_{i,t}$ in the interval (0.6, 1) is labelled as retail buy transactions (Boehmer et al., 2021). Transactions at the round penny ($Z_{i,t} = 0$) or near the half-penny ($0.4 \leq Z_{i,t} \leq 0.6$)[5] are identified as institutional transactions.

[5]Transactions executed near the half-penny are identified as institutional transactions because regulations allow midpoint trades for institutions, i.e., trades at the midpoint between the best bid and best ask. As the quoted spread is typically 1 cent per share, many institutional transactions are reported at half-penny prices (Boehmer et al., 2021).

Next, we use a method described by Lee and Ready (1991) – known as the "Tick test" – to identify institutional buy and sell transactions. The method infers the direction of a transaction by comparing the transaction price to the preceding trade, and classifies every transaction into one of four categories: uptick, zero-uptick, downtick, or zero-downtick. A transaction is labelled as an uptick (downtick) if the price is higher (lower) than the price of the previous transaction. If the price is equal to the price of the preceding transaction (zero-tick), we look at the direction of the last price change: Zero-ticks with previous uptick price changes are classified as zero-upticks, whereas zero-ticks with previous downtick price change is categorised as zero-downticks. Finally, we identify upticks and zero-upticks as buy transactions, and downticks and zero-downticks as sell transactions (Lee and Ready, 1991).

To measure the directions in which institutional retail and investors are trading, we compute their respective daily order imbalances for each share i. More precisely, we calculate daily retail order imbalances (ROIB) and daily institutional order imbalances (IOIB) as:

$$IOIB_{i,t} = \frac{Institutional\ buy\ volume_{i,t} - Institutional\ sell\ volume_{i,t}}{Institutional\ buy\ volume_{i,t} + Institutional\ sell\ volume_{i,t}} \tag{3.1}$$

$$ROIB_{i,t} = \frac{Retail\ buy\ volume_{i,t} - Retail\ sell\ volume_{i,t}}{Retail\ buy\ volume_{i,t} + Retail\ sell\ volume_{i,t}} \tag{3.2}$$

A positive order imbalance implies that the respective investors are net buyers of a particular share i on a given day t. Conversely, a negative imbalance indicates net selling. Each order imbalance is mechanically bound between -1 and 1, with the lower and upper limits indicating that every transaction is a sell and a buy, respectively. Further, the size of the order imbalance is interpreted the easiest by computing % buy of all transactions $= 0.50 + \frac{Order\ imbalance}{2}$; an order imbalance of 0.1 is interpreted as 55% of the transactions being buys on the given date[6]. Finally, we compute the difference in order imbalances (DOIB) as a measure of the relative trading behaviour of institutional and retail investors in share i at day t:

$$DOIB_{i,t} = IOIB_{i,t} - ROIB_{i,t} \tag{3.3}$$

[6]Similarly, an order imbalance of -0.2 is interpreted as $0.5 + \frac{-0.2}{2} = 0.50 - 0.10 = 0.40$ of the transactions being buys on the given date.

A positive difference in order imbalances is interpreted as institutional investors having relatively higher percentages of buying transactions on a given day. Contrarily, a negative difference in order imbalances implies that retail investors buy relatively more. Variations in the difference in order imbalances could be caused by changes in either order imbalance. An abnormally positive difference in order imbalances is not necessarily caused by abnormal institutional net buying; it could be driven by abnormal selling amongst retail investors, or a combination of the two.

To determine the distribution of the announcement day equity premium across investors, we create a proxy by estimating the intraday profit. First, we calculate the daily volume-weighted average buy price (VWABP) and volume-weighted average sell price (VWASP) for each investor in share i at date t:

$$Institutional\ VWABP_{i,t} = \frac{Institutional\ buy\ turnover_{i,t}}{Institutional\ buy\ volume_{i,t}} \tag{3.4}$$

$$Institutional\ VWASP_{i,t} = \frac{Institutional\ sell\ turnover_{i,t}}{Institutional\ sell\ volume_{i,t}} \tag{3.5}$$

$$Retail\ VWABP_{i,t} = \frac{Retail\ buy\ turnover_{i,t}}{Retail\ buy\ volume_{i,t}} \tag{3.6}$$

$$Retail\ VWASP_{i,t} = \frac{Retail\ sell\ turnover_{i,t}}{Retail\ sell\ volume_{i,t}} \tag{3.7}$$

Next, we utilise daily closing prices from Refinitiv for each share in the sample. The choice of price measure is primarily motivated by the inherent simplicity it entails; through the use of closing prices we implicitly assume investors (1) earn by holding their purchases at volume-weighted buy prices until the end of the day, and (2) earn by selling at volume-weighted selling prices higher than the potential value of their holdings at the market close. We create a proxy for the daily premium from buy and sell transactions for each investor k in share i at date t:

$$Buy\ premium_{i,t,k} = \frac{Closing\ price_{i,t} - VWABP_{i,t,k}}{Closing\ price_{i,t}} \cdot \frac{Buy\ volume_{i,t,k}}{Total\ volume_{i,t,k}} \tag{3.8}$$

$$Sell\ premium_{i,t,k} = \frac{VWASP_{i,t,k} - Closing\ price_{i,t}}{Closing\ price_{i,t}} \cdot \frac{Sell\ volume_{i,t,k}}{Total\ volume_{i,t,k}} \tag{3.9}$$

Moreover, we define our premium proxy as the sum of the buy and sell premium:

$$Premium_{i,t} = Buy\ premium_{i,t} + Sell\ premium_{i,t} \tag{3.10}$$

The measure is effectively a weighted average of the relative buy and sell profit and constitute the equity premium earned on any given day. Notably, we ignore any movements in investors' shareholdings as a part of the earned premium, as we are unable to trace both previous and future holdings. The measure is not aimed at displaying the actual returns for any one individual or institutional investor, but rather the "average" investor on aggregate. Further, the aggregate profit or loss is neglected by focusing exclusively on intraday returns. Hence, the actual performance of the investors could deviate substantially from the intraday return on a given day. We compute the difference in the earned premium of institutional and retail investors on a given day as:

$$Diff.\ in\ equity\ premiums_{i,t} = Institutional\ premium_{i,t} - Retail\ premium_{i,t} \tag{3.11}$$

3.3 Summary Statistics

Table 3.2 displays summary statistics for our main variables. Moreover, Figure 3.1 graphically illustrates the development of the investors' respective order imbalances. The figure exhibits a pattern of volatile institutional order imbalances, with retail order imbalances remaining relatively stable in comparison. Additionally, retail investors have a higher average order imbalance than institutions – illustrated by the dotted lines.

Table 3.2: Summary Statistics

	Mean	Median	Std.dev.	Min	Max	No.obs.
Institutional OIB	-2.171	-2.680	25.996	-93.253	94.703	74,766
Retail OIB	0.260	0.149	17.133	-100.000	100.000	74,766
Institutional EP	0.185	-0.176	23.586	-66.497	84.333	74,766
Retail EP	-0.709	-0.028	10.782	-36.338	29.357	74,766

Table 3.2 presents summary statistics for our main variables: Institutional Order Imbalance, Retail Order Imbalance, Institutional Equity Premium, and Retail Equity Premium. The variables are expressed as percentage points.

Figure 3.1: Order Imbalances

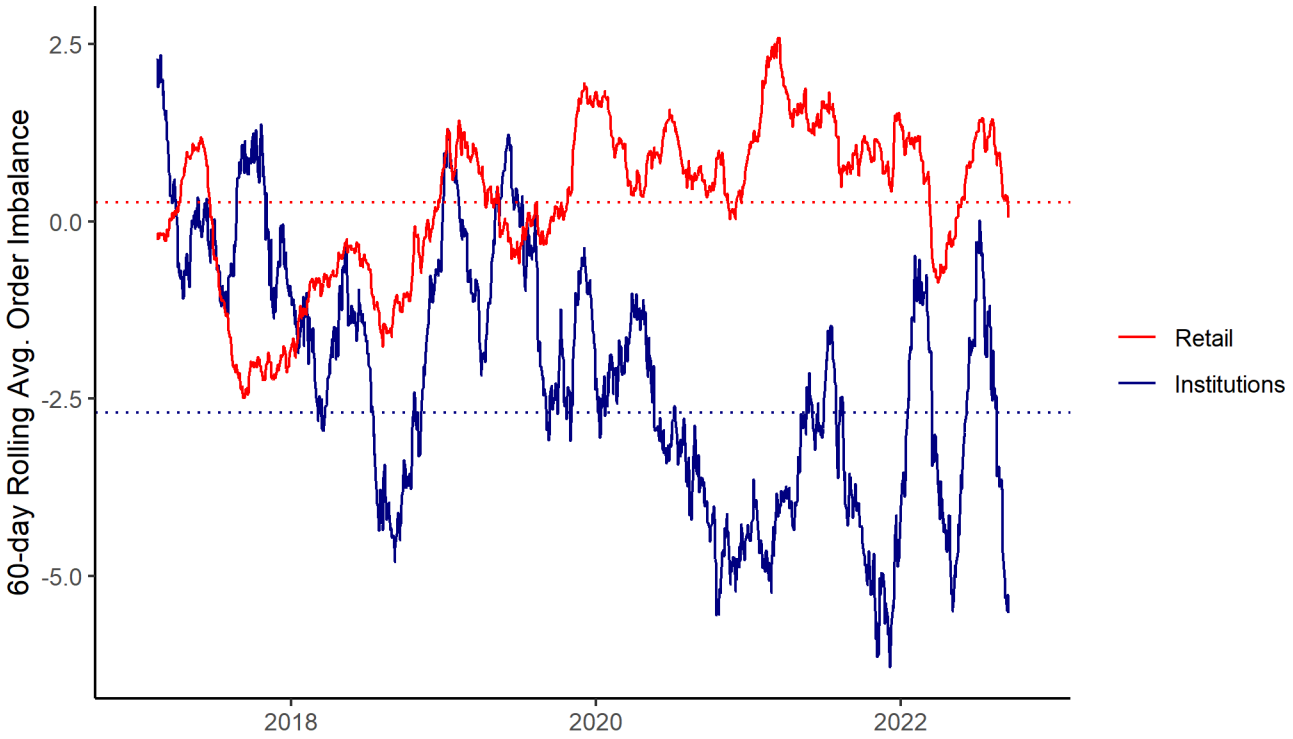

Figure 3.1 illustrates the development of the daily average order imbalances of institutional and retail investors. We use a 60-day rolling average to enhance the readability of the data.

4 Analysis

4.1 Methodology

To analyse the relative trading behaviour of institutional and retail investors around announcement days, we estimate a multiple linear regression (MLR) with the difference in order imbalances as the dependent variable. We include three main independent dummy variables: (1) the two-day period before an announcement; (2) the announcement day; and (3) the two-day period after the announcement. First, the dummy for the two-day period prior to an announcement indicates whether an observation occurs one or two days before an announcement. Second, the announcement day dummy indicates whether a given day has macroeconomic figures scheduled for release. Third, the dummy for the two-day period subsequent to an announcement indicates whether an observation occurs one or two days after an announcement. We limit our scope to the two days before an announcement as we expect any institutional pre-announcement positioning to occur close to the announcement days, aiming to minimise unnecessary risk exposure. Similarly, we only include the two days after an announcement as we expect any delayed retail trading to occur within this period. Further, the market return in the previous days is found to impact the trading behaviour of both institutions and retail investors on a given day (Badrinath and Wahal, 2002). Hence, we include one-day and two-day lagged returns for all shares in the sample to control for any sentiments affecting the order imbalances.

As our observations consist of data on 53 entities over close to six years, we define our main data frame as panel data, measuring all variables daily for all shares. Next, we include various fixed effects to avoid the occurrence of omitted variable bias in our model. Initially, we account for share-specific variations with company-fixed effects. This inclusion is motivated by our aim of measuring market-wide differences in trading behaviour between the two parties; company-fixed effects remove any noise associated with potential constant variations within the entities. We include year- and month-fixed effects to account for constant variations in order imbalance differences on a yearly and monthly basis. Examples of such effects include the January effect, which causes abnormalities in retail investors' trading behaviour in January relative to the remaining months of the year (Ritter, 1988). We limit our analysis to the impact on trading behaviour around announcement days

and therefore aim to avoid any periodically varying differences potentially skewing our findings. Last, French (1980) argues for the existence of systematic trading patterns of institutions and retail investors relating to the weekday, with returns on Mondays deviating significantly from the other weekdays. Similarly, Lakonishok and Maberly (1990) argues for the effect of weekdays on trading behaviour, with individuals exhibiting abnormally high trading volumes on Mondays, of which the majority of the trades are sell transactions. To account for such weekday-specific variations occurring, we include weekday-fixed effects.

Additionally, we cluster standard errors by date to ensure heteroskedasticity-robustness. Thus we allow for arbitrary correlation in trading imbalances across shares on any given trading day. Else, we assume standard errors across dates to be uncorrelated, thereby fulfilling the second fixed effects assumption. The dependent variable being observed on a market-wide scale – causing variance mainly across trading days rather than shares – constitutes our motivation for assuming dates' standard errors to be uncorrelated. Equation 4.1 summarises our main regression model.

$$\begin{aligned} DOIB_t = \beta_1 ADAY_{t-2,t-1} + \beta_2 ADAY_t + \beta_3 ADAY_{t+1,t+2} + \\ \beta_4 DRET_{t-2} + \beta_5 DRET_{t-1} + u_t \end{aligned} \tag{4.1}$$

4.2 Trading Behaviour around Announcement Days

4.2.1 Differences in Trading Behaviour

Table 4.1 illustrates the impact on the difference in order imbalances around macroeconomic announcement days. The coefficient on the two-day period before an announcement is significant at the 10% level in Model (3), indicating an abnormal difference in order imbalances of 0.96 pp. Moreover, the coefficient being positive implies that institutions are increasing their market exposure relative to retail investors in the period before announcement days – consistent with our hypothesis of institutional investors positioning themselves in the market. Notably, the coefficient is not significant in Model (1) and Model (2) – in which the weekday fixed effects are not included – indicating that the difference in the order imbalances follows a systematic day-of-the-week pattern (see for instance Lakonishok and Maberly (1990)). The abnormal difference in order imbalances could be caused by either abnormal institutional buying, abnormal retail selling, or a combination of the two. To investigate our hypothesis regarding pre-announcement institutional positioning, we conduct a more in-depth analysis in Section 4.2.2.

Next, the coefficient on announcement days is positive and statistically significant at the 1% level in Models (1) and (2), implying an abnormal deviation of 2.01 pp in the investors' trading behaviour on these days. However, when including weekday-fixed effects in Model (3), the coefficient is no longer significant. This impact substantiates the findings of French (1980) and Lakonishok and Maberly (1990), with proof of systematic day-of-the-week trading patterns among institutional and retail investors. We delve deeper into this issue in Section 4.2.2.1.

The coefficient on the two-day period after announcements variable is not significant in any of the models, indicating normality in the difference between the institutional and retail order imbalances. Note, however, that if both investors' order imbalances were to deviate proportionally in the same direction, the difference could be normal although both imbalances are abnormal upon individual examination. To highlight the trading behaviour of each investor, we analyse the order imbalances separately in Section 4.2.2.

Table 4.1: The Impact of Announcement Days on Differences between Institutional and Retail Order Imbalances

	Difference in Order Imbalances		
	(1)	(2)	(3)
Announcement Day (t-2,t-1)	0.4151	0.4082	**0.9553***
	(0.5004)	(0.4992)	(0.4988)
Announcement Day	**1.986*****	**2.010*****	1.105
	(0.6742)	(0.6670)	(0.6943)
Announcement Day (t+1,t+2)	-0.0817	-0.0858	-0.2083
	(0.5335)	(0.5313)	(0.5364)
Daily Return (t-1)	-0.1825	-0.1771	-0.1474
	(0.1165)	(0.1154)	(0.1147)
Daily Return (t-2)	**0.2807****	**0.2858****	**0.3034****
	(0.1296)	(0.1294)	(0.1283)
Company fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Month fixed effects		Yes	Yes
Weekday fixed effects			Yes
Observations	74,062	74,062	74,062
R^2	0.01425	0.01482	0.01684
Within R^2	0.00104	0.00105	0.00080

Clustered (Date) standard-errors in parentheses
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

Table 4.1 portrays how the difference between the order imbalances of institutional and retail investors is impacted around macroeconomic announcement days. *Announcement Days* are those trading days when US CPI-, GDP-, and non-farm payroll figures are scheduled for release. *Announcement* $Day_{t-2,t-1}$ is the two-day period prior to an announcement, and *Announcement* $Day_{t+1,t+2}$ is the two-day period after an announcement. The sample covers the period from January 2017 through October 2022. Order imbalances are computed for each investor by dividing their respective daily buy and sell volume by their total daily volume, yielding values in the interval [-1, 1].

4.2.2 Institutional and Retail Investors' Trading Behaviour

To examine the abnormalities in the difference between institutional and retail order imbalances surrounding announcement days found in Section 4.2.1, we run three similar regressions with a larger emphasis on the individual days surrounding announcements. In particular, the following regressions split the two-day period before and after announcements into individual days. Thus we construct models with five main independent dummy variables, indicating whether a given day is (1) two days prior to an announcement, (2) the day prior to an announcement, (3) an announcement day, (4) the day after an announcement, or (5) two days after an announcement. The control variables are equal to the previous model, and we include weekday fixed effects in all models to control for any day-of-the-week effect impacting the model estimates. To highlight the impact on both the difference in order imbalances and the individual order imbalances of the investors, we run the regressions with three different dependent variables: Model (1) uses the difference between the order imbalances (DOIB), while Models (2) and (3) uses the institutional order imbalance (IOIB) and the retail order imbalance (ROIB), respectively. Equations 4.2, 4.3 and 4.4 summarise the regression models.

$$\begin{aligned} DOIB_t = \beta_1 ADAY_{t-2} + \beta_2 ADAY_{t-1} + \beta_3 ADAY_t + \beta_4 ADAY_{t+1} + \beta_5 ADAY_{t+2} + \\ \beta_6 DRET_{t-2} + \beta_7 DRET_{t-1} + u_t \end{aligned} \tag{4.2}$$

$$\begin{aligned} IOIB_t = \beta_1 ADAY_{t-2} + \beta_2 ADAY_{t-1} + \beta_3 ADAY_t + \beta_4 ADAY_{t+1} + \beta_5 ADAY_{t+2} + \\ \beta_6 DRET_{t-2} + \beta_7 DRET_{t-1} + u_t \end{aligned} \tag{4.3}$$

$$\begin{aligned} ROIB_t = \beta_1 ADAY_{t-2} + \beta_2 ADAY_{t-1} + \beta_3 ADAY_t + \beta_4 ADAY_{t+1} + \beta_5 ADAY_{t+2} + \\ \beta_6 DRET_{t-2} + \beta_7 DRET_{t-1} + u_t \end{aligned} \tag{4.4}$$

Table 4.2 illustrates the impact on the difference in order imbalances, and the institutional and retail order imbalances in the five days surrounding macroeconomic announcements. Consistent with our findings in Section 4.2.1, the difference in order imbalances is positive and significant at the 1% level two days prior to announcements. Further, the institutional

order imbalance is positive and significant on these days, while the retail order imbalance is not. We do not find any abnormalities on the day prior to announcements. We thus conclude that the abnormal difference in trading imbalances observed in the two-day period prior to announcements in Section 4.2.1 is caused by unusual institutional trading two days prior to announcements. Specifically, the institutional order imbalance is abnormal by 2.21 pp, indicating a 1.11 pp higher relative buy volume than normal. The finding is consistent with our hypothesis of institutions increasing their shareholdings – and consequently their market exposure – prior to macroeconomic announcements.

The coefficients on announcement days and the first day after announcements are not significant in any of the models. Hence, we reject the hypothesis of either abnormal institutional or retail trading. The finding contrasts Nofsinger (2001), who observes abnormal trading behaviour by both investors on macroeconomic announcement days. Note, however, that we analyse the macroeconomic announcements on an aggregate level, while Nofsinger (2001) categorise the announcements into either good or bad news.

Next, the coefficient on retail order imbalance two days after announcements is abnormal by 0.53 pp and significant at the 10% level. This constitutes evidence of abnormal retail buying, with a 0.25 pp higher buy volume than normal. As argued by Lee (1992), the observation could be caused by retail investors minimising their market exposure before macroeconomic announcements due to their higher risk-aversion; pre-announcement selling could be dispersed and less detectable, while post-announcement buying is far more concentrated and thus observable. Moreover, retail investors could delay share purchases until after macroeconomic announcements when the market risk has decreased. An alternative explanation provided by Lee (1992) is that retail investors simply react slowly to announcements.

Table 4.2: The Impact of Announcement Days on Differences, Institutional and Retail Order Imbalances

	DOIB (1)	IOIB (2)	ROIB (3)
Announcement Day (t-2)	**2.110*****	**2.213*****	0.1047
	(0.6405)	(0.6125)	(0.2696)
Announcement Day (t-1)	0.0150	0.1248	0.1017
	(0.6263)	(0.5849)	(0.2394)
Announcement Day	1.034	1.054	0.0241
	(0.6984)	(0.6646)	(0.2476)
Announcement Day (t+1)	-0.4188	-0.2063	0.2124
	(0.6886)	(0.6516)	(0.2471)
Announcement Day (t+2)	0.1083	0.6444	**0.5289****
	(0.6746)	(0.6508)	(0.2428)
Daily Return (t-1)	-0.1334	-0.1011	0.0313
	(0.1144)	(0.1064)	(0.0457)
Daily Return (t-2)	**0.2965****	**0.3019****	0.0070
	(0.1270)	(0.1199)	(0.0440)
Company fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Month fixed effects	Yes	Yes	Yes
Weekday fixed effects	Yes	Yes	Yes
Observations	74,062	74,107	74,062
R^2	0.01722	0.01276	0.03359
Within R^2	0.00119	0.00180	0.00015

Clustered (Date) standard-errors in parentheses
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

Table 4.2 presents the impact on the difference in order imbalances (DOIB), the institutional order imbalance (IOIB), and the retail order imbalance (ROIB) in the five days surrounding macroeconomic announcements.

4.2.2.1 Fridays Distorting the Model Results

Including weekday fixed effects in our models evidently affects both the size and statistical significance of several coefficients. The majority of the announcement days in our sample are on Fridays, suggesting any not-controlled-for 'weekend effects' might skew our coefficients. Illustratively, French (1980) and Keim and Stambaugh (1984) find that returns on Mondays deviate highly from the remaining weekdays, while Lakonishok and Maberly (1990) find that retail investors increase both trading volume and net selling positions on Mondays. Moreover, Chordia et al. (2001) find a significant decrease in trading activity and liquidity on Fridays. Practically, this entails both returns and retail trading behaviour on Mondays deviate highly from Fridays, on which 55% of all announcements take place.

To better understand this dynamic's impact on our model, we compare two equal models with different sample selections in Table 4.3. In Model (1) we utilise the full sample, whereas Fridays are excluded in Model (2). The effect of excluding Fridays is evident: First, the coefficient on the day two days prior to the announcement increases by 0.51 pp, implying institutions are more heavily tilted towards buying than previously. Second, the coefficient on announcement days is no longer statistically significant, meaning that announcement days do not have a significant impact on the difference in order imbalances on Monday through Thursday. The inclusion of weekday fixed effects thus appears to mainly impact our model through the adjustment of trading abnormalities on Fridays relative to the remaining days.

Table 4.3: The Impact of Excluding Fridays from our Data Sample on the Observed Announcement Day Effect

	Difference in Order Imbalances	
	(1)	(2)
	Full Sample	Ex. Friday
Announcement Day (t-2)	**1.628*****	**2.137*****
	(0.6243)	(0.6469)
Announcement Day (t-1)	-0.5141	0.1281
	(0.6139)	(0.6237)
Announcement Day	**1.910*****	0.9823
	(0.6717)	(0.8325)
Announcement Day (t+1)	-0.4658	-0.2683
	(0.6802)	(0.7354)
Announcement Day (t+2)	0.2651	-0.2760
	(0.6732)	(0.7092)
Daily Return (t-1)	-0.1653	-0.1426
	(0.1152)	(0.1187)
Daily Return (t-2)	**0.2793****	0.2016
	(0.1284)	(0.1361)
Company fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
Month fixed effects	Yes	Yes
Observations	74,062	59,233
R^2	0.01522	0.01564
Within R^2	0.00146	0.00112

Clustered (Date) standard-errors in parentheses
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

Table 4.3 illustrates the impact of excluding Fridays from our data sample on the difference in order imbalances around announcement days. Model (1) is with the full sample, while all Fridays are excluded from the sample in Model (2).

4.2.3 Robustness of Estimates

To ensure robustness in our estimate of abnormal institutional buying two days prior to announcements in Section 4.2.2, we test the probability of the coefficient size stemming from pure randomness. That is, we aim to assure that the order imbalances of institutions and retail investors are expected to be normal two days prior to a random sample date. Practically, we randomly assign 163[7] dates within our sample as placebo-announcement

[7]Equivalent to the number of actual announcement days in our sample.

dates. We do not specify any particular distribution of announcement dates across weekdays in the placebo sample, meaning that the weekday distribution of the placebo announcements could deviate from the actual sample. Further, we estimate a similar regression to Model (1) in Table 4.2 and extract the coefficient on the two days prior to placebo-announcements variable. The process is repeated 10,000 times to ensure normally distributed coefficients.

Figure 4.1 illustrates the coefficient derived from Model (1) in Table 4.2 in comparison to the simulated placebo coefficients. The simulated placebo coefficients create a bell curve with a mean of zero in the histogram, indicating that the coefficient on two days prior to announcements is not statistically different from zero under random sampling. Further, the actual coefficient – as illustrated by the dotted blue line – lies to the far right of the histogram, indicating that the size of the coefficient is highly unlikely to be observed under random sampling. The robustness test substantiates our findings; our observed abnormalities in trading behaviour two days prior to macroeconomic announcements are likely to stem directly from the figures releases.

Figure 4.1: Order Imbalance Model Robustness

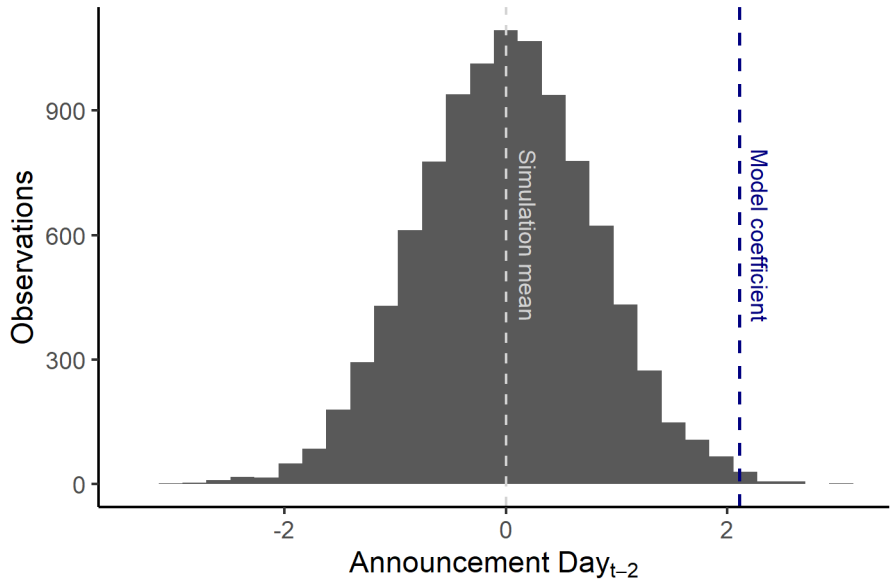

Figure 4.1 illustrates our coefficient on $AnnouncementDay_{t-2}$ from Model (1) in Table 4.2 overlayed on the histogram derived from running 10,000 simulations of the same model with randomly assigned placebo-announcement days.

4.2.4 Causes of Differences in Order Imbalances Two Days prior to Announcements

The large difference in the order imbalances of institutions and retail investors two days prior to macroeconomic announcements observed in Section 4.2.2 indicates abnormal buying among institutions as part of a positioning strategy. In contrast, retail investors exhibit no such abnormal trading behaviour prior to announcements. Previous literature points at two main causes of deviating trading behaviour of retail investors and institutions, namely risk tolerance (see for instance Barber and Odean (2000)) and expertise (see for instance Hendershott et al. (2015)). We test for the impact of both causes on the difference in order imbalances to examine whether they explain the observed difference in pre-announcement trading.

4.2.4.1 Risk Preferences as an Explanation For Deviating Trading Behaviour

The theory that investor's risk preferences influence their trading decisions is well-established in financial economics; a higher risk tolerance leads to more speculative investments, all else equal (Berk and Demarzo, 2019). Lee (1992) suggests risk aversion among retail investors as a reason for observed differences in trading behaviour subsequent to earnings announcements, based on observing retail investors selling shares pre-announcements to reduce risk and re-buy after announcements. Hence, if institutions have a higher risk tolerance than retail investors, this could explain the differences in their trading behaviour before announcements when the risk is higher.

To analyse the impact of risk on the trading behaviour of institutions and retail investors, we first estimate a regression with the difference in order imbalances as the dependent variable and a proxy for the risk in the market as the independent variable. We use the Chicago Board Options Exchanges Volatility Index (henceforth the VIX) as a proxy for daily market risk due to the index being a widely used risk measure among market participants (CBOE, 2022). We use the same data sample as in previous regressions, but we exclude the control variables as we are only examining the general correlation between the VIX and the difference in institutional and retail order imbalances.

Table 4.4 illustrates the impact of changes in the VIX on the difference in the trading

imbalances. In Model (1) – where the regression is run on the full sample – the VIX coefficient is positive and significant at the 1% level, indicating that the difference in trading imbalances increases with higher risk. Hence, on days with higher risk, institutions increase their net buying position relative to retail investors. Excluding the two days prior to announcements in our sample in Model (2), we find the same effect. However, when we only consider the days two days before announcements in Model (3), the coefficient is not statistically significant. We interpret this as the risk not having an abnormal impact on the difference in order imbalances.

Table 4.4: The Impact of Risk on Difference in Order Imbalances

	Difference in Order Imbalances		
Announcement Day (t-2)	Full sample	0	1
	(1)	(2)	(3)
VIX	**0.1101*****	**0.1165*****	0.1226
	(0.0397)	(0.0428)	(0.1189)
Company fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Month fixed effects	Yes	Yes	Yes
Weekday fixed effects	Yes	Yes	Yes
Observations	74,162	63,127	11,035
R^2	0.01647	0.01626	0.02780
Within R^2	0.00042	0.00048	0.00038

Clustered (Date) standard-errors in parentheses
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

Table 4.4 illustrates the impact of changes in risk, measured by the VIX, on the difference between the trading imbalances of institutions and retail investors.

To highlight the impact of changes in the market risk on the trading behaviour of institutions and retail investors, we estimate two similar regressions in 4.5 with the institutional and retail order imbalances as dependent variables. The VIX coefficient for institutions is positive and significant at the 5% level, indicating that institutions are buying abnormally with increased market risk. Contrarily, the VIX coefficient for retail investors is not statistically different from zero, and we cannot conclude that changes in market risk affect the trading behaviour of retail investors. The finding is consistent with previous literature suggesting that institutions are less risk averse, and could thus explain

the observed difference in trading behaviour prior to macroeconomic announcements when the risk is higher (Du and Hu, 2015). Consistent with Lee (1992), we find that institutional investors demonstrate a higher risk appetite by increasing their order imbalances on days with higher risk. This attribute could cause the abnormalities we are observing in trading behaviour around macroeconomic announcements.

Table 4.5: The Impact of Risk on Institutional and Retail Order Imbalances

	Institutional Order Imbalance (1)	Retail Order Imbalance (2)
VIX	**0.0922****	-0.0179
	(0.0370)	(0.0162)
Company fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
Month fixed effects	Yes	Yes
Weekday fixed effects	Yes	Yes
Observations	74,207	74,162
R^2	0.01140	0.03346
Within R^2	0.00042	3.67×10^{-5}

Clustered (Date) standard-errors in parentheses
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

Table 4.5 presents the impact of changes in risk, measured by the VIX, on the institutional and retail order imbalances.

4.2.4.2 Expertise as an Explanation For Deviating Trading Behaviour

Institutional investors are often portrayed as better informed than retail investors, caused by either unique access to information or superior abilities to utilise publicly available information. For instance, Hendershott et al. (2015) identify institutions' superior information gathering and processing skills as key drivers behind observed trading differences between institutional and retail investors. Further, Henry et al. (2017) argues that institutions earn profits by exploiting their advantage in both expertise and information gathering to position themselves in the market prior to company-specific news releases.

To analyse whether the level of expertise impacts the trading behaviour of institutions and retail investors, we examine if the difference in order imbalances two days prior to

CPI announcements[8] correlates with the difference in their expectations. We retrieve expectations of retail investors before CPI announcements from Michigan Consumer Services, and institutional expectations from Refinitiv. Next, we utilise these expectations to construct a measure of information asymmetry or expertise:

$$CPI\ Expectations\ Deviation = Institutional\ Expectation - Retail\ Expectation \quad (4.5)$$

We hypothesise that institutional investors are better informed and more skilled, in line with previous findings of e.g., Hendershott et al. (2015). If our hypothesis is true, institutional expectations should be relatively closely aligned with the actual announcement data. As institutional expectations are published in advance and thus known to retail investors, retail expectations should take on similar values. Higher deviations from institutional expectations suggest that retail investors are unanimous in their estimates, serving as a potential source of more uniform trading and thus more extreme order imbalances. As such, we expect to observe a larger difference in pre-announcement trading imbalances when the deviation in expectations before an announcement is larger. To test this hypothesis, we regress the difference in order imbalances two days prior to CPI announcements with the expectations deviation variable. The data sample in the model excludes all days not being two days prior to CPI announcements, resulting in a substantially lower number of observations compared to previous models.

Table 4.6 displays the impact of deviations in the expectations of institutions and retail investors before CPI announcements on the difference in order imbalances two days prior to the announcements. The coefficient on the deviation in pre-announcement expectations is not statistically significant – thus we do not find any support for the level of informedness impacting the trading behaviour of the two investors. Interestingly, the lack of impact on investor trading differences contrasts previous findings of e.g., Hendershott et al. (2015) and Henry et al. (2017). Whereby previous literature suggests institutions are able to exploit superior information gathering and utilisation, our findings suggest that deviating expectations – arising from either different information basis or better utilisation – is not explanatory.

[8]We look exclusively on CPI announcements as it the only of the announcement types in our sample where retail expectations are publicly available

Table 4.6: The Impact of Deviating CPI Expectations on Differences between Institutional and Retail Order Imbalances

	Difference in Order Imbalances (1)
CPI Expectations Deviation	-2.197
	(3.891)
Company fixed effects	Yes
Year fixed effects	Yes
Month fixed effects	Yes
Weekday fixed effects	Yes
Observations	3,394
R^2	0.04371
Within R^2	0.00041

Clustered (Date) standard-errors in parentheses
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

Table 4.6 presents the impact of expertise, measured by deviating CPI expectations of institutions and retail investors prior to CPI announcements, on the difference between their order imbalances. The data set consists of the 70 CPI announcement dates from the full sample.

4.3 Announcement Day Equity Premiums

To determine the practical implications of the provenly deviating trading behaviour in Section 4.2.2, we expand our analysis by including impacts on the relative returns earned by the investors. Savor and Wilson (2013) argue for the importance of days with announcements of macroeconomic news relative to regular trading days, with excess returns being significantly higher than on days without such announcements. Moreover, Savor and Wilson (2013) finds that the majority of the cumulative annual equity risk premium is earned on announcement days. Therefore, we conduct a more thorough examination of the actual difference in intraday equity premiums earned by institutions and retail investors to determine which of the investors are performing better.

We utilise a very similar model to the one used in the analysis of trading imbalances, with identical independent variables and fixed effects. An important difference, however, is the dependent variable now being the difference in equity premiums variable defined in Section 3.2. In effect, this variable enables us to determine the intraday equity premiums earned by the respective investors; any proven significance in our main independent variable would point towards announcement periods affecting the difference in equity premiums. That is, one of the investors would consistently outperform the other days surrounding announcements compared to regular trading days. Practically, a positive coefficient is interpreted as the institutional investors being relatively better off. Contrarily, a negative coefficient suggests retail investors perform superior to their institutional counterparts. Equation 4.6 summarises our equity premium model:

$$\begin{aligned} DEP_t = \beta_1 ADAY_{t-2} + \beta_2 ADAY_{t-1} + \beta_3 ADAY_t + \beta_4 ADAY_{t+1} + \beta_5 ADAY_{t+2} + \\ \beta_6 DRET_{t-2} + \beta_7 DRET_{t-1} + u_t \end{aligned} \tag{4.6}$$

4.3.1 Differences in Intraday Equity Premiums Earned

Table 4.7 illustrates the impact on the difference in intraday equity premiums in the days surrounding macroeconomic announcements. The coefficients on the two days prior to announcements and the announcement day itself are not statistically significant, meaning that these days do not have any abnormal impact on the difference in intraday equity premiums earned. Interestingly, however, the coefficient on the first day after announcement days is significant at the 1% level, implying abnormalities in the equity premium difference. The coefficient is positive and thus suggests institutional investors outperform retail investors these days. Specifically, institutions earn 2.06 pp higher intraday returns relative to retail investors on the day subsequent to the release of macroeconomic news than on regular trading days. This result may be caused either by abnormally high intraday returns by institutional investors, abnormally low intraday returns by retail investors, or both. We fragment our analysis additionally in Sections **??** and 4.3.2.1 to determine which of the former options are true.

Table 4.7: The Impact of Announcement Days on the Difference in Intraday Equity Premiums Earned

	Difference in Equity Premiums		
	(1)	(2)	(3)
Announcement Day (t-2)	-0.2748	-0.2364	-0.4219
	(0.8155)	(0.7958)	(0.8087)
Announcement Day (t-1)	-0.4625	-0.4518	-0.3591
	(0.7862)	(0.7638)	(0.8074)
Announcement Day	0.2810	0.2922	0.4309
	(0.7564)	(0.7361)	(0.7632)
Announcement Day (t+1)	**1.817****	**1.863****	**2.055*****
	(0.7679)	(0.7547)	(0.7747)
Announcement Day (t+2)	0.1299	0.1004	-0.1289
	(0.7765)	(0.7451)	(0.7523)
Daily Return (t-1)	-7.646	-4.229	-5.003
	(15.52)	(14.97)	(14.94)
Daily Return (t-2)	**-38.61*****	**-35.35****	**-35.65****
	(14.65)	(14.35)	(14.52)
Company fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Month fixed effects		Yes	Yes
Weekday fixed effects			Yes
Observations	73,843	73,843	73,843
R^2	0.06899	0.06962	0.06965
Within R^2	0.00014	0.00013	0.00014

Clustered (Date) standard-errors in parentheses
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

Table 4.7 presents the impacts of announcement days, days two days before and after announcement days, and two-day lagged returns on the difference in intraday equity premiums between institutional- and retail investors. Intraday equity premiums are defined as the weighted sum of buy- and sell premiums. These are computed by dividing the difference between VWAP (closing price) and closing price (VWAP) by the closing price, yielding the sell (buy) premium.

4.3.2 Investor Premiums Causing Differences

Table 4.8 displays the results of a similar regression model to Table 4.7, however with the dependent variable now being institutional- and retail investors' respective intraday equity premiums. Equations 4.7 and 4.8 summarise the models:

$$IEP_t = \beta_1 ADAY_{t-2} + \beta_2 ADAY_{t-1} + \beta_3 ADAY_t + \beta_4 ADAY_{t+1} + \beta_5 ADAY_{t+2} + \beta_6 DRET_{t-2} + \beta_7 DRET_{t-1} + u_t \tag{4.7}$$

$$REP_t = \beta_1 ADAY_{t-2} + \beta_2 ADAY_{t-1} + \beta_3 ADAY_t + \beta_4 ADAY_{t+1} + \beta_5 ADAY_{t+2} + \beta_6 DRET_{t-2} + \beta_7 DRET_{t-1} + u_t \tag{4.8}$$

The table nuances our analysis through two main findings. First, the coefficient on announcement days in Model (1) is positive and statistically significant at the 5% level, highlighting the impact of announcement days on the intraday equity premium earned by institutions. That is, institutions are expected to obtain 0.79 pp higher returns on announcement days compared to regular trading days. In comparison, the non-statistically significant coefficient on announcement days in Model (2) suggests retail investors neither earn nor lose significantly more or less than is expected on regular trading days.

Second, the coefficient on the day subsequent to announcement days for retail investors is negative and statistically significant at the 5% level. Practically, the coefficient suggests that retail investors earn abnormally low returns one day after announcement days – 1.78 pp less than their regular intraday return. This result coincides with the abnormal premium difference found in Table 4.7, indicating that the difference is driven mainly by abnormally negative returns among retail investors and less by abnormally high returns among institutional investors.

Table 4.8: The Impact of Announcement Days on Intraday Equity Premiums Earned by Institutional and Retail Investors

	Institutional Equity Premium (1)	Retail Equity Premium (2)
Announcement Day (t-2)	0.0079	0.5211
	(0.3718)	(0.7655)
Announcement Day (t-1)	0.2439	0.8321
	(0.3503)	(0.7953)
Announcement Day	**0.7915****	0.1696
	(0.3443)	(0.7351)
Announcement Day (t+1)	0.3757	**-1.782****
	(0.3564)	(0.7562)
Announcement Day (t+2)	-0.0369	-0.0101
	(0.3540)	(0.7301)
Daily Return (t-1)	-4.581	2.926
	(6.540)	(14.14)
Daily Return (t-2)	-4.837	**29.77****
	(6.865)	(13.76)
Company fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
Month fixed effects	Yes	Yes
Weekday fixed effects	Yes	Yes
Observations	74,107	73,843
R^2	0.00256	0.07475
Within R^2	7.03×10^{-5}	0.00012

Clustered (Date) standard-errors in parentheses
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

Table 4.8 presents the impacts of announcement days, the two days before and after announcement days, and two-day lagged returns on the intraday equity premiums of institutional and retail investors.

4.3.2.1 Underlying Dynamics Driving Returns

Table 4.9 provides deeper insight into the drivers of the respective parties' earned and lost equity premiums. Both investors' premiums are divided into buy- and sell premiums presented in Section 3.2, enabling analysis of the behavioural dynamics driving their respective premium outcomes. Equations 4.9, 4.10, 4.11 and 4.12 summarise the models:

$$IBP_t = \beta_1 ADAY_{t-2} + \beta_2 ADAY_{t-1} + \beta_3 ADAY_t + \beta_4 ADAY_{t+1} + \beta_5 ADAY_{t+2} + \beta_6 DRET_{t-2} + \beta_7 DRET_{t-1} + u_t \tag{4.9}$$

$$ISP_t = \beta_1 ADAY_{t-2} + \beta_2 ADAY_{t-1} + \beta_3 ADAY_t + \beta_4 ADAY_{t+1} + \beta_5 ADAY_{t+2} + \beta_6 DRET_{t-2} + \beta_7 DRET_{t-1} + u_t \tag{4.10}$$

$$RBP_t = \beta_1 ADAY_{t-2} + \beta_2 ADAY_{t-1} + \beta_3 ADAY_t + \beta_4 ADAY_{t+1} + \beta_5 ADAY_{t+2} + \beta_6 DRET_{t-2} + \beta_7 DRET_{t-1} + u_t \tag{4.11}$$

$$RSP_t = \beta_1 ADAY_{t-2} + \beta_2 ADAY_{t-1} + \beta_3 ADAY_t + \beta_4 ADAY_{t+1} + \beta_5 ADAY_{t+2} + \beta_6 DRET_{t-2} + \beta_7 DRET_{t-1} + u_t \tag{4.12}$$

The table provides several explanatory dynamics. First, the positive and significant coefficients on the announcement day variable in Models (1) and (2) imply that institutional investors earn abnormal premiums through both buying at prices lower than the closing price and selling at prices higher than the closing price. Second, the negative and significant coefficient on the day after the announcement day in Model (4) implies that retail investors lose abnormally by selling at prices lower than the closing price.

Our findings are aligned with Barber and Odean (2008), who suggest that retail traders are attention-traders typically trading subsequent to news announcements. Barber and Odean (2008) argues that this dynamic is caused by institutions' superior resources allowing them to spend more time on research and thus being less affected by news. Explaining the delayed buying timing of retail investors, Lee (1992) finds that retail investors typically

react more slowly than institutional investors to news announcements. Considering how quickly new information is absorbed into share prices, the slow response time subsequent to announcements could be a factor causing them to trade at unfavourable prices and thereby lose equity premium.

Table 4.9: The Impact of Announcement Days on Intraday Buy- and Sell Premiums Earned by Both Investors

	IBP (1)	ISP (2)	RBP (3)	RSP (4)
Announcement Day (t-2)	0.0301	-0.0222	-0.4448	-0.1253
	(0.1890)	(0.2053)	(0.5056)	(0.4581)
Announcement Day (t-1)	0.1439	0.0999	-0.0270	0.4112
	(0.1824)	(0.1918)	(0.5143)	(0.4914)
Announcement Day	**0.4222****	**0.3693***	-0.0183	-0.0707
	(0.1716)	(0.1961)	(0.4881)	(0.4605)
Announcement Day (t+1)	0.2222	0.1535	-0.4068	**-1.237*****
	(0.1826)	(0.1950)	(0.4652)	(0.4535)
Announcement Day (t+2)	0.0425	-0.0794	-0.2420	**-0.7404***
	(0.1826)	(0.1914)	(0.4916)	(0.4138)
Daily Return (t-1)	-1.255	-3.327	1.041	-0.6096
	(3.306)	(3.808)	(8.801)	(8.526)
Daily Return (t-2)	-0.9923	-3.845	9.668	**17.53****
	(3.519)	(3.853)	(8.913)	(8.346)
Company fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Month fixed effects	Yes	Yes	Yes	Yes
Weekday fixed effects	Yes	Yes	Yes	Yes
Observations	74,107	74,107	74,011	73,894
R^2	0.94179	0.94525	0.80066	0.76391
Within R^2	4.12×10^{-5}	4.35×10^{-5}	2.02×10^{-5}	0.00015

Clustered (Date) standard-errors in parentheses
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

Table 4.9 presents the impacts of announcement days, the two days before and after announcement days, and two-day lagged returns on the intraday equity buy- and sell premiums of institutional- and retail investors. The models convey (1) Institutional Buy Premium, (2) Institutional Sell Premium, (3) Retail Buy Premium, and (4) Retail Sell Premium.

4.3.3 Robustness of Estimates

To ensure validity in our equity premium models, we run a robustness test on the coefficient of the day after announcements, equivalent to that conducted in Section 4.2.3. Figure 4.2 compares the coefficient derived from Model (3) in table 4.7 to coefficients derived from repeated regressions using random sampling of placebo-announcement days. Visually, our coefficient lies on the far right-hand side of the histogram. This implies that our coefficient size is very improbable to be randomly observed, thus confirming the robustness of our estimate.

Figure 4.2: Equity Premium Model Robustness

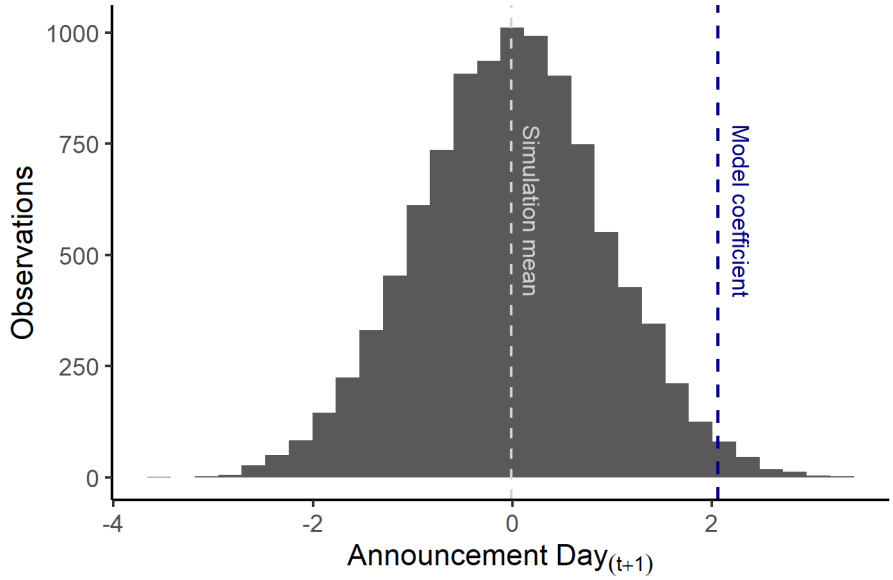

Figure 4.2 illustrates our coefficient on $AnnouncementDay_{t+1}$ overlayed on the histogram derived from running 10,000 simulations of the same model with randomly assigned placebo-announcement days.

5 Conclusion

Numerous papers have analysed differences in investors' trading behaviour surrounding various announcements, while others have emphasised the market-wide impacts of specific pre-scheduled macroeconomic announcements through abnormal return analysis. However, few have combined the analyses as we do to increase the understanding of the trading behaviour of presumably more knowledgeable institutions, and retail investors around key macroeconomic announcements. Practically, we examine the trading behaviour of institutions and retail investors in the days surrounding pre-scheduled US macroeconomic announcements on inflation, employment and GDP. By extending our analysis to intraday equity premium earnings, the practical impacts of the dynamics are uncovered. In doing so, we aim to nuance the understanding of the connection between investors' trading behaviour and returns.

Two main findings arise from our study. First, the respective order imbalances of institutional and retail investors exhibit no significant differences on announcement days. However, the difference in order imbalances is abnormal by 2.11 pp two days prior to announcements, implying that institutions increase their holdings relative to retail investors. We find that the abnormal difference observed is caused by abnormal institutional buying of 2.21 pp two days prior to pre-scheduled announcements, significant at the 1% level. We suggest a higher risk appetite among institutions as an explanation for the abnormal buying, consistent with previous findings by e.g., Lee (1992).

Second, we find the difference in intraday equity premiums one day subsequent to announcement days to be positive and statistically significant at the 1% level. The coefficient implies that institutions abnormally outperform retail investors by 2.06 pp. Segmented analysis proves that although institutions earn 0.79 pp abnormal premiums on announcement days, retail investors' substantial abnormal losses of 1.78 pp the day after announcements constitute the main driver for the premium difference. Specifically, the retail losses are mainly caused by an abnormal selling premium loss of 1.24 pp, indicating that retail investors sell at prices lower than the closing price of the given day. We mainly attribute the observed dynamics to the fact that retail investors are more likely to be attention-traders with fewer resources and slower reaction times, causing them to sell on

days following market-affecting announcements (Barber and Odean, 2008; Lee, 1992).

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Appendix

Table .1: Sample Companies

	Company	Ticker		Company	Ticker
1	Apple	AAPL	27	PepsiCo	PEP
2	Microsoft	MSFT	28	Costco Wholesale	COST
3	Alphabet Inc Class A	GOOGL	29	Thermo Fisher Scientific	TMO
4	Alphabet Inc Class C	GOOG	30	McDonald's	MCD
5	Amazon	AMZN	31	Broadcom	AVGO
6	Tesla	TSLA	32	Walt Disney	DIS
7	Berkshire Hathaway Class B	BRKB	33	Accenture	ACN
8	Berkshire Hathaway Class A	BRKA	34	Cisco Systems	CSCO
9	UnitedHealth Group	UNH	35	Danaher	DHR
10	Johnson & Johnson	JNJ	36	Wells Fargo & Co	WFC
11	Exxon Mobil	XOM	37	Abbott Laboratories	ABT
12	Visa	V	38	Salesforce	CRM
13	Walmart	WMT	39	Bristol-Myers Squibb	BMY
14	JPMorgan Chase & Co	JPM	40	Verizon Communications	VZ
15	Chevron	CVX	41	Nextera Energy	NEE
16	Eli Lilly and Co	LLY	42	Adobe	ADBE
17	Nvidia	NVDA	43	Linde	LIN
18	Procter & Gamble	PG	44	United Parcel Service	UPS
19	Mastercard	MA	45	Texas Instruments	TXN
20	Home Depot	HD	46	Nike	NKE
21	Bank of America	BAC	47	Comcast Corp	CMCSA
22	Abbvie	ABBV	48	Qualcomm	QCOM
23	Meta Platforms	META	49	Union Pacific	UNP
24	Coca-Cola	KO	50	Advanced Micro Devices	AMD
25	Pfizer	PFE	51	Netflix	NFLX
26	Merck & Co	MRK			