Who Drove and Burst the Tech Bubble?

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Abstract

From 1997 to March 2000, as technology stocks rose more than five-fold, institutions bought more new technology supply than individuals. Among institutions, hedge funds were the most aggressive investors, but independent investment advisors and mutual funds (net of flows) actively invested the most capital in the technology sector. The technology stock reversal in March 2000 was accompanied by a broad sell-off from institutional investors but accelerated buying by individuals, particularly discount brokerage clients. Overall, our evidence is most consistent with the bubble model of Abreu and Brunnermeier (2003) where rational arbitrageurs fail to trade against bubbles until a coordinated selling effort occurs.

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Perceived bubbles, such as the "tech bubble" and the more recent credit and real estate bubbles, pose challenges to efficient market theories and are not well understood. The stock market run-up in the mid to late 1990s was the greatest in the last 140 years of U.S. history in terms of both price appreciation and market-wide valuation multiples.[1] While theoretical models explaining bubbles are plentiful, there is little rigorous empirical work uncovering the complex economic forces responsible for rapid price increases that subsequently collapse. The financial press commonly touted the view that individual investors were largely responsible for the tech bubble.[2] This paper directly examines the relative roles of individual and institutional trading during the rise and fall of technology stocks.

Theoretical modeling of investor interactions has developed along three general paths in the extensive bubble literature.[3] The first path, or rational markets view (e.g., Friedman (1953) and Fama (1965)), recognizes that some agents may trade irrationally but contends that such trading will not significantly affect prices, since sophisticated traders (arbitrageurs) quickly trade against irrational agents to eliminate deviations from economic values. The second path invokes frictions. Theories that allow for frictions such as short-sale restrictions (Miller (1977), Harrison and Kreps (1978), and Scheinkman and Xiong (2003)), noise trader risk (DeLong *et al.* (1990a)), or capital constraints coupled with delegated portfolio management (Shleifer and Vishny (1997)), argue that sophisticated traders may not be able to eliminate a bubble, and prices can be driven by noise traders.

The third and more unconventional path predicts that rational speculators may actually help drive a bubble. Speculators may initiate or contribute to price movements with the expectation that positive-feedback traders purchase those securities later at even higher prices (DeLong *et al* (1990b)). Arbitrageurs, knowing that the market is overvalued, maximize profits by riding the bubble (Abreu and Brunnermeier (2002, 2003)) and because of capital constraints, the bubble only bursts when there is a coordinated selling effort among arbitrageurs.

In our empirical analysis, we relate the trading behavior of institutional (sophisticated) investors and individuals (noise traders) to the literature along several dimensions. First, we find that both institutions and individuals are net technology buyers during the market run-up but institutions are the largest buyers. During the run-up period from January 2, 1997 to March 27, 2000, institutions made 63.6% of active technology purchases while individuals account for the remainder (19.4% via mutual fund flows and 17.0% directly). Even if we are extremely conservative and exclude all purchases from technology-oriented mutual funds (3.6%) and hedge funds (3.7%), institutions still account for 56.3% of total technology purchases. Among institutions, our sample of 688 hedge fund firms are the most aggressive investors (consistent with Brunnermeier and Nagel (2004)), but the larger set of independent investment advisors and mutual funds (net of flows) actively invest more capital into the technology sector.

Second, we investigate trading patterns around the market peak. If the crash was due to a shift in noise trader sentiment (DeLong *et al.* (1990a)), then we expect individual investors to drive the peak and subsequent crash. In contrast, the coordination mechanism of Abreu and Brunnermeier (2002, 2003) suggests that institutional investors drive the fall. We construct a unique database of daily trading activity for institutional and individual investor groups that allows us to focus on short-term trading. Consistent with Abreu and Brunnermeier, we find that institutional investors (except derivatives traders) begin pulling capital out of the market in mid-March 2000, while individuals, more strongly discount brokerage clients, accelerate their purchases. We also examine individual stock peaks and find that institutions actively buy until the day before the peak and then rapidly pull out while various individual investor groups continue to increase their holdings. Consistent with Schultz (2008) we find little evidence that new supply of shares through lockup expirations drives price reversals in March 2000 or around individual stock peaks as argued by Ofek and Richardson (2003), Hong, Scheinkman, and Xiong (2006), and Xiong and Yu (2009).

Third, we examine whether institutions trade in the same direction as future fundamentals. For large stocks, pre-peak institutional buying is negatively related to post-peak stock returns. Additionally, institutions are net buyers for six clearly overpriced internet carve-outs identified by Lamont and Thaler

(2003), further evidence that institutions under some circumstances buy in the face of poor economic fundamentals. Lastly, since institutional trading in the same direction as price movements could be a mechanical result of institutions responding more quickly to news on fundamentals, we examine short-term institutional trading patterns around news releases and find that the positive relation between institutional trading and price movements also persists on no-news days and weeks, suggesting the institutional trading pattern is not simply due to their faster response to news.

Our paper is also related to the larger literature that documents the relation between trading by investor groups and stock returns at the cross-sectional (Grinblatt and Keloharju (2000)) or market level (Choe, Kho, and Stulz (1999)).[4] Brunnermeier and Nagel (2004) find that hedge fund firms generally took larger positions in stocks with high price-to-sales ratios during the 1998-2000 Nasdaq run-up. As Brunnermeier and Nagel note, their 53 hedge fund firm sample alone (owning only 0.30% of the aggregate market) is not likely to move market prices. We find that our larger sample of 688 hedge fund firms together with other institutional investors drive the technology run-up and crash.

Although we interpret investor interactions as representing supply and demand forces that influence prices, one might alternatively view this exercise simply as an interesting comparison of investor groups who bought and sold during the rise and fall of technology stocks. We find the former interpretation reasonable in light of growing empirical evidence that institutional demand can affect security prices at short-term (Kraus and Stoll (1972), Scholes (1972), and Shleifer (1986)) and longer-term (Coval and Stafford (2007), Cohen, Diether, and Malloy (2007), and Frazzini and Lamont (2008)) frequencies.[5] We consider institutional and individual purchases as discretionary in the sense that investors (other than index funds) are not obligated to purchase new equity issues. Mechanical purchases of index, technology, and sector funds account for just 3.6% of total technology purchases, suggesting that institutional buying is largely an active practice.

The outline of our paper is as follows. Section I briefly describes the multitude of databases we use. Section II analyzes the aggregate trading in technology stocks by various investor groups and

Section III examines investor trading around the market and individual security peaks. Section IV examines whether institutions move prices in the direction of longer-run fundamentals. Our conclusions follow.

I. Data

This paper uses several sources of data: proprietary Nasdaq trading data, Thomson Financial for 13f institutional holdings, N-30D mutual fund holdings, and insider trading data, CRSP for mutual fund asset values and returns, weekly mutual fund flows from AMG Data Services, Factiva for news articles, SDC and EDGAR for lockup expirations, Datastream and SDC for float data, and SDC for events that affect the supply of technology stocks such as IPOs, SEOs, mergers and acquisitions, and repurchases.

A. Sample

Our sample consists of Nasdaq technology firms (with 3-digit SIC code 737, which stands for computer programming, data processing, and other computer-related services) with ordinary common shares (i.e., CRSP share code equals 10 or 11), trading during the run-up and collapse of Nasdaq stock market from 1997 to 2002.[6] We define the run-up as the period from January 2, 1997 to March 27, 2000.[7] Over this sample period, an average of 517 Nasdaq technology stocks trade each day. More details are in Internet Appendix A.

B. Quarterly Holdings of Institutions, Insiders, and Individuals

For intermediate and long-term analysis, we obtain data on quarterly institutional holdings from Thomson Financial 13f database (correcting for various issues as described in Internet Appendix B). In addition to the five 13f institution categories (banks, insurance companies, mutual funds, independent investment advisors, and all others), we identify 688 hedge fund firms in the 13f database with valid data over our sample period predominantly through the use of firms from LionShares and Griffin and Xu (2009). As discussed in Brunnermeier and Nagel (2004), hedge fund firms often operate multiple hedge funds under the same 13f filing.

To study the trading activity of non-institutional investors, we further classify non-institutional shares into insider and individual holdings. We obtain data from SDC on closely held shares for IPOs issued between 1994 and 2002 and adjust insider holdings over time using subsequent insider trades reported by Thomson Financial insider trading data. For firms with IPOs before 1994, we obtain closely held shares from Datastream and adjust through time again using the Thomson Financial insider trading data. We then calculate quarterly individual holdings as the residual shares not held by insiders or 13f institutions. Numerous additional details regarding holdings are provided in Appendix A.

C. Nasdaq Trading Data

We use proprietary data from Nasdaq clearing records that include the date, time, ticker symbol, trade size, and price of each transaction for each stock. The data also include additional identifying fields about the parties involved in each trade—fields that allow us to assign trading volume to various investor groups. First, each trade is linked to the parties on both sides of the trade. Second, information is provided as to whether the parties are trading for their own account (as a market maker) or are simply handling a trade for a client (agency trading). Third, each trade identifies the buyer and seller. In our analysis, we focus on client trades only. More details are provided in Internet Appendix C.

We directly classify more than 500 brokerage houses through company web pages, news media, the NASD website, and conversations with Nasdaq officials. We confirm these classifications by examining average trade size and re-examine classifications where appropriate. Using this information, we assign trading volume to nine categories: four individual investor groups (general individual, individual full service, individual discount, and individual day trading), four institutional investor groups (institutional, largest investment banks, 21 hedge funds, and derivatives traders), and one "mixed" group that handles both individual and institutional order flow.[8]

Table I shows several descriptors of trading activity for various investor groups during the Nasdaq run-up. In Panel A, we present percentages of share volume, dollar trading volume, and number of trades accounted for by each group, and average trade size for each group in technology stocks.

Institutional traders and mixed-client brokers dominate trading volume. The fraction of daily trading volume accounted for by individual and institutional investor groups did not change markedly over the sample period (see Internet Appendix Figure IA.1). Viewed in isolation, this finding would hardly hint at the dramatic price changes that occurred during this time frame.

[Insert Table I about here]

The average trade size varies between 413 and 615 shares for individual investor groups. Conversely, the average trade for institutional clients exceeds 1,600 shares, and the average trade size for the largest investment bank clients is approximately 2,700 shares. The average trades executed through hedge fund, derivatives, and mixed-client brokers range from 693 to 853 shares—all between the individual and institutional averages.

We explore the trading behavior of investor groups by focusing on daily trading imbalances. For each stock, we compute daily trading imbalances by an investor group as the difference between buy and sell volumes for the investor group, scaled by that day's shares outstanding to present a measure of net buying activity relative to the total number of shares. For technology sector level analysis, we compute value-weighted aggregate imbalances across stocks in the technology index to relate with the value-weighted returns. Unclassified trades and omitted market maker trades result in aggregate imbalances being only approximately equal to zero.

We compare quarterly imbalances for institutional and mixed investor groups calculated from our Nasdaq data to quarterly changes in institutional ownership computed using Thomson Financial 13f data. Panel B of Table I presents correlations among these variables during the 1997-2002 period. The average cross-sectional correlation between aggregate institutional imbalances from Nasdaq data and changes in 13f institutional holdings is 0.27. By institutional ownership quartile, correlations are near zero for lowest institutional ownership stocks but increase monotonically to 0.38 for the highest quartile. The mapping between 13f and Nasdaq data is tightest in stocks that comprise the bulk of market capitalization, an important link since we are interested in the economic forces behind the increase in market capitalization of technology stocks. The mixed imbalances have strong negative correlations with institutional imbalances, indicating that individual trading drives mixed imbalances.[9]

Following Boehmer and Kelley (2009), we obtain an average cross-sectional correlation of 0.72 between Nasdaq and 13f institutional turnover. This number compares favorably to their correlation of 0.44 calculated with NYSE and 13f data. We also benchmark our data to Campbell, Ramadorai, and Schwartz (2009) and find that our data yields a much stronger relation with 13f data in the largest two size quintiles which comprise the bulk of market capitalization (see details in Appendix B).

D. Flows for Mutual Funds and 13f Institutions

We construct mutual fund flows data to separate discretionary mutual fund trades from flow-induced trades. We match CRSP mutual fund returns and total net assets with Thomson Financial N-30D mutual fund holdings using Mutual Fund Links provided by Wharton Research Data Services (WRDS). We first follow the literature to calculate fund flows using CRSP fund returns and assets, and then infer flow-induced trading for our merged mutual fund sample and 13f mutual fund families. We also estimate flows for 13f data using quarterly stock returns and holdings. Subsequently, we obtain weekly flows for technology mutual funds and aggressive growth funds from AMG Data Services (who monitor 69% and 65% of technology and aggressive growth fund assets, respectively, during our sample period) and extrapolate these flows to the technology sector as well. Details about the merged mutual fund sample and our methodologies to compute flow-induced trading and identify index, sector, and technology mutual funds are in Internet Appendices D through G.

E. News Articles

To study how investor reactions to news may influence trading behavior, we manually search the Factiva database and obtain all news articles on firms in the technology sector from January 1, 1997 to December 31, 2002. We follow Tetlock, Saar-Tsechansky, and Macskassy (2008) to collect news articles and carefully account for name changes, mergers, etc., with details provided in Internet Appendix H.

F. SDC Events

We obtain from SDC various events that affect the supply of shares including IPOs, SEOs, share repurchases, and mergers and acquisitions. Internet Appendix I provides details on our approach to compute the components of supply. To study the effect of lockup expirations, we obtain IPO and SEO lockup expiration dates and number of shares subject to lockup agreement from SDC. We manually search prospectuses through the EDGAR database to confirm the expiration dates and fill in missing data on expiration dates and number of shares subject to lockup.

II. Which Investor Groups Bought the Technology Sector?

In this section we examine portfolio weights of individuals and various types of institutions in the technology sector as well as the evolution of demand and supply from a long-run perspective.

A. Technology Weights

We start by analyzing the portfolio weights in technology stocks for institutions and individuals during the 1997-2002 period. Panel A of Figure 1 shows that the technology sector (excluding Microsoft) comprised 1.8% of institutional holdings in March 1997, increasing to 6.4% by March 31, 2000. Similarly, technology weights of individuals (net of insiders) increased from 1.0% to 4.3% over the same period.

[Insert Figure 1 about here]

Panel B of Figure 1 shows portfolio weights for six different types of institutional investors. Hedge funds have the largest exposure to technology stocks and are the most aggressive buyers during the run-up. They decrease their technology exposure through the first two quarters of 1999 followed by aggressive purchases during the second half of 1999. Interestingly, this finding of a failed "attack on the bubble" in early 1999 is nearly identical to Brunnermeier and Nagel (2004) even though our hedge fund sample has thirteen times (688 vs. 53) as many hedge fund firms. Mutual funds and independent investment advisors have the next largest exposures to technology sector during the run-up, with banks and insurance companies exposed the least.

B. Passive, Active, and Flow-Induced Changes in Holdings

Technology holdings of an investor group could increase either because: a) previously held technology positions increased in value, b) net flows were received and invested in the technology sector, or c) the investor group actively increased holdings in technology stocks. To isolate the passive change in holdings, we calculate the quarter-end buy-and-hold value of beginning-of-quarter technology positions. Specifically, we calculate passive holdings for an investor group for quarter q as follows:

$$Passive_q = \sum_i Holdings_{i,q-1} \times (1 + R_{i,q}) \tag{1}$$

where $Holdings_{i,q-1}$ is total dollar value of holdings in technology stock *i* for the investor group at the end of quarter *q-1* and $R_{i,q}$ is buy-and-hold return on stock *i* over quarter *q*.

We then calculate net active buying as quarter-end technology ownership minus passive holdings and net buying induced by mutual fund flows:

$$Net\ Active\ Buying_q = \sum_i Holdings_{i,q} - Passive_q - NBFlows_q^{13f} \tag{2}$$

where $Net\ Active\ Buying_q$ is total net active buying for the technology sector during quarter q and $NBFlows_q^{13f}$ is dollar value of flow-induced net buying for 13f mutual fund families.

Although we take great care to calculate individual holdings, we believe individual ownership at the IPO date may be overstated because standard databases do not fully capture the extent of insider holdings.[10] For this reason, we mainly focus on technology stocks that exist at both the start and end of a quarter. Therefore, technology IPOs are excluded from the analysis in the IPO quarter, but included thereafter. Panel A of Figure 2 shows cumulative change in demand (net active buying) for technology stocks during the 1997-2002 period. Individuals are heavy buyers in 1997 and during the first half of 1999. Conversely, from June 1999 to March 2000 institutions are the main technology buyers. Over the entire run-up period from January 1997 to March 2000, institutions account for 63.6% of technology purchases, mutual fund flows 19.4%, and direct individual purchases 17.0%. Figure 1 also shows that the technology index had lost most of its gains (-72.9%) from March 31, 2000 to March 31, 2001. During this one-year period there were additional purchases worth $74.6 (233.6 – 159.0) billion, out of which only 36.4% is due to institutions, 49.0% individuals directly, and 14.6% individuals through mutual fund flows.[11]

[Insert Figure 2 about here]

Panel B of Figure 2 presents cumulative change in demand for technology stocks for the six 13f institution types. On a value-weighted basis, independent investment advisors and mutual funds (net of flows) are responsible for the largest movements of capital into the technology sector followed by hedge funds and banks. Although hedge funds have the most aggressive technology weights as shown in Figure 1, they only account for 6.2% of technology market capitalization at the peak. Furthermore, technology-oriented hedge funds (257 out of a total of 688 hedge fund firms) only account for 37% of total hedge fund buying during the run-up even with the broadest selection criteria, suggesting that hedge fund buying was not limited to a subset of hedge funds (see Internet Appendix Figure IA.3). Interestingly, independent investment advisors buy large amounts during the two quarters following the March 2000 peak and account for most of the increase in institutional holdings after the peak.

We find that cumulative net buying induced by mutual fund flows up to March 31, 2000 is 4.2% of the technology sector market capitalization (see Internet Appendix Figure IA.4), less than the 7.2% figure for cumulative net active buying by mutual funds after flows. As an alternative check on mutual fund flows, we use AMG weekly flow data which account for 69% (65%) of total assets of all technology (aggressive growth) mutual funds on average during our sample period. We then calculate net buying induced by technology fund flows and aggressive growth fund flows by assuming that AMG flows are representative of the sector as a whole. At the end of March 2000, AMG flows account for an increase in ownership of 2.0% of the technology sector which is 52% lower than the 4.2% increase for flow-induced trading of 13f mutual fund families. These results are consistent with the fact that AMG flows cover the sectors most heavily invested in technology stocks, while flow-induced net buying of 13f mutual fund families covers a broader set of mutual funds.

Index funds raise an interesting issue. If a fund simply invests in a value-weighted index of stocks then the value of its technology holdings will change with movements in market values with no rebalancing needed. As money flows into index funds, we capture these flows using the methodology as previously discussed. However, if funds are initially underinvested in a group of stocks that grew more than others, or if the fund manager does not fully index, fund managers will tinker with technology weights. Additionally, fund managers who invest in technology in proportion to its market capitalization may be forced to invest further in technology stocks if these stocks become a larger part of the market index through new supply being issued. To measure the extent of indexing, we identify all funds which contain keywords that indicate they may be an index, sector, or technology fund. We find that these funds represent 8.58% of mutual fund technology holdings for our sample in March 1997 and 24.21% by March 2000. We estimate that net active demand for this sample is $5.78 billion for our base sample (as shown in Internet Appendix Figure IA.5), or 5.7% of the $101.13 billion in total institutional demand from 1997 to March 2000. Hence, if one assumes that all of this index buying was non-discretionary and forced by index funds having to purchase technology shares because of new supply being issued, then this would reduce the net active institutional buying to 60.0% instead of the 63.6% in Panel A of Figure 2. How to treat this buying is not straightforward since it is not possible to ascertain the reason why index and sector funds increase their technology weighting. Internet Appendix Figure IA.6 further shows that after excluding technology-oriented mutual funds and hedge funds with the broadest definition, the remaining institutions still account for 56.3% of technology purchases. Although these adjustments tend to reduce the effect of institutional buying, even conservatively assuming all demand from technology-oriented mutual funds and hedge funds is non-discretionary does not alter our inferences.

C. Supply of Shares

Strong demand can be accompanied by an increase in price and/or supply. It is important to note that our measure of change in demand (or net active buying) accounts for price changes. Hence by construction change in supply will equal change in demand. We examine the possible sources of change in supply including IPOs, SEOs, delistings, insider sales, share repurchases, and stock payments during merger and acquisition activities. Figure 3 shows that the supply of technology shares drifts upward over time as IPOs, stock payments for mergers and acquisitions, and insider sales easily outpace decreases due to technology stock delistings. Overall, out of the $224.5 billion increase in the net supply of technology shares until March 31, 2000, 33.4% is due to IPOs, 17.0% due to insider sales, and 18.4% due to stock payments. In the year following the peak (up until March 31, 2001), out of the additional $82.8 (307.3 – 224.5) billion in capital that came to market, 30.3% is from other changes in shares outstanding such as executive stock compensation while selling by insiders accounts for 15.2% and IPOs another 13.6%.

[Insert Figure 3 about here]

D. Technology versus Non-Technology Sectors

We now explore whether the trading activity in the technology sector is substantially different than for non-technology stocks. From January 1997 to March 2000, while the technology sector grew by $159 billion in new capital (not held by insiders), approximately $1,060 billion in new capital came into non-technology stocks. This is perhaps not surprising considering that even at its peak the technology sector (excluding Microsoft) was only 6.8% of CRSP market capitalization.

In Table II, we examine if the patterns of individual and institutional trading differ between technology and non-technology stocks. We further divide stocks into two groups of market capitalization within technology and non-technology sectors. We compare the trading of technology and non-technology in the year prior to the technology peak where the much of the market run-up occurred. We first focus on large stocks that represent over 99% of the total market capitalization. Consistent with our previous findings in Figure 2, Panel A of Table II shows that institutions are the larger buyer (as a percentage of market capitalization) in large technology stocks in the year prior to the peak, with institutions purchasing 6.7% as compared to 3.7% for individuals. For non-technology stocks however, individuals purchased 2.5% as compared to 1.5% for institutions. Stated differently; the institutional net buying in technology stocks in the year prior to the peak is 1.8 times that of individuals but institutional net buying in non-technology stocks is only 60% of that of individuals. Panel A also presents simple changes in ownership and the level of ownership which lead to similar inferences. When we examine small stocks we see that here individuals dominate the buying in technology and non-technology stocks. These patterns are interesting in that individuals are probably the marginal buyers in these smaller stocks, but less important for discerning where the majority of market value dislocation is from. Panel B further presents net active buying across institution types. We find that for large stocks, all types of institutional investors are more aggressive in technology than they are in non-technology stocks except for insurance companies and possibly mutual funds.

[Insert Table II about here]

We compare the demand for technology and non-technology stocks over the period from January 1997 to March 2000 in Panel A of Figure 4. While institutions account for 63.6% of technology purchases up to the market peak, they only account for 31.0% ($328.9 billion/$1,060.4 billion) of non-technology purchases during this same period.[12] The fact that institutions account for a significantly higher percentage of technology demand than non-technology demand indicates that the aggressive purchases of technology shares is a discretional decision made by institutional investors.

[Insert Figure 4 about here]

Panel B of Figure 4 plots the composition of total demand from April 2000 to March 2001 when most of the market value was lost. In the post-peak period, individuals account for majority of technology purchases while institutions account for majority of non-technology purchases. This sharp contrast to the pre-peak period suggests that individuals have bad timing, which we examine more thoroughly in the next section.

III. Trading around the Technology Sector and Individual Security Peaks

To distinguish between predictions of bubble theories regarding the burst of the tech bubble, we further examine institutional and individual trading around the March 2000 technology peak as well as individual stock peaks.

A. Technology Peak

Using Nasdaq clearing data we obtain a high frequency view of whether institutional or individual investors pulled capital out around the technology sector peak. Panel A of Figure 5 provides a detailed look at value-weighted imbalances for the technology sector from February through April 2000, with imbalances cumulated from the beginning of January 2000. The value-weighted technology index excluding Microsoft peaks on March 9 but loses only 8.5% as of March 27, the peak of the broader Nasdaq index. In contrast, from March 27 to April 28, 2000 the cumulative return on the technology index is -31.6%.

[Insert Figure 5 about here]

Imbalances of general institutions peaked on March 7. Between March 8 and the end of April, general institutions, largest I-banks, and hedge fund clients sold 0.87% of the technology sector market capitalization, or 1.34% of the technology sector float. Conversely, all individual investor groups other than the individual full service group, most dramatically discount brokerage clients, were net buyers throughout March and April 2000 as prices fell precipitously. Our earlier result in Figure 2 Panel B indicates that institutional selling from March 31, 2000 to June 30, 2000 primarily came from mutual funds and hedge funds.

Panel B of Figure 5 shows almost no outflows from mutual funds over this period according to AMG flow data, suggesting that institutional investors actively pulled out of the technology sector rather than responding to flows. Panel B also shows that the magnitudes of insider sales and lockup expirations are slowly decreasing around the market peak. The number and dollar value of lockup expirations rise dramatically as early as August 1999, long before the bubble burst in March 2000 (see Internet Appendix

Figure IA.9). Unlike investor demand patterns, these results show no drastic shift in supply that can account for the burst of the bubble. Consistent with non-binding supply constraints, Battalio and Schultz (2006) show that investors could have shorted stocks synthetically with options in early 2000 but Lakonishok, Lee, Pearson, and Poteshman (2007) find that sophisticated investors generally did not practice this strategy.

B. Trading around Individual Stock Peaks

We examine trading patterns around individual stock peaks from January 1997 to December 2000 in the same spirit as Brunnermeier and Nagel's (2004) examination of quarterly hedge fund trading activity. Figure 6 reports equal-weighted cross-sectional averages of cumulative imbalances for investor groups for the two months surrounding individual peaks. In the month before the peak, general institutions buy slightly more than 0.35% of shares outstanding.[13] Conversely, derivatives traders are small net sellers prior to the peak. Purchases by general individual and discount brokerage clients increase markedly the day before and the day of the peak. These groups continue buying after the peak—in dramatic contrast to widespread institutional selling of close to 0.37% for all institutional groups during the twenty one trading days following the peak. Full-service brokerage clients also buy as prices fall, albeit to a lesser degree.

[Insert Figure 6 about here]

In supplemental results (Panel C of Internet Appendix Figure IA.10), we extend the window on each side of the peak to sixty trading days and find extremely strong institutional buying before the peak from day -60 to day -1 and institutional selling after the peak continuing until day +60. We also examine trading patterns by firm size quartiles (see Internet Appendix Figure IA.11). For the smallest firms, individuals (mostly discount brokerage customers) are entirely responsible for driving up prices. However, institutional buying prior to peaks is stronger in the largest three size quartiles. In the largest two quartiles, institutions are the main buyers in the run-up and they start pulling out on the day of (quartile 3) or the day after the peak (top quartile). These results highlight the importance of individuals in small stocks and institutions in large stocks which account for most of the market capitalization of the technology sector.

We further explore institutional trading patterns using 13f institutional holdings data. This approach provides a long-term view of trading at quarterly frequency. Panel A of Figure 7 plots the average cumulative net buying and flow-adjusted net active buying for institutions in the eight quarters surrounding individual peaks. Aggregate institutional buying coincides with individual peaks. After the peak, institutions sell at a slower rate than they buy during the run-up. Panel B of Figure 7 displays cumulative net active buying (net of flows) by institution type around individual peaks. Although all institution types are net buyers before the peak, independent investment advisors lead all groups in magnitude, increasing holdings by more than 3% in the four quarters before the peak.

[Insert Figure 7 about here]

Coval and Stafford (2007) and Frazzini and Lamont (2008) demonstrate that investor flows can cause predictable mutual fund trading in individual stocks. We directly examine the flow-induced net buying for each institution type around individual stock peaks in Panel C. The impact of flows is relatively small in all institution types except for mutual funds where the flow-induced change in holdings during the four quarters prior to the peak represents 1.72% of the firm's market capitalization. In comparison, the total net buying of mutual funds including flows is 3.63% for the same period, so flows represent slightly less than half of the buying pressure from mutual funds. Panel C also shows that individuals investing directly in these stocks are actually net sellers in the two quarters prior to the peak but are net buyers following the peak. In total, individual investors (through flows and direct investment) are net buyers of 1.41% of event firm's market capitalization in the four quarters prior to the peak compared to 8.78% for institutions (net of flows).

Since quarterly 13f data limits inferences on the exact timing of institutional trading patterns around our 580 stock peaks, we examine the subset of 95 peaks that occur within five trading days of the end of a quarter (coinciding with 13f report dates). As shown in Panel D of Figure 7, institutional net active buying coincides with price peaks, consistent with Nasdaq trading data (Figure 6). This pattern is most prevalent for mutual funds, investment advisors, and hedge funds. Hedge funds and investment advisors are the most aggressive sellers in the quarter after the peak.

Panel E examines the change in the supply of shares due to insider selling, SEOs, stock payments to acquire interests in other companies, etc. Although the supply of shares generally increases over time, it appears that stock peaks coincide with acceleration in insider selling and stock payments for acquisitions. The increase in supply through insider selling and stock payments continues after the peak as well.[14]

Shares locked up at issuance do not effectively increase the supply of shares until the lockup expires. Panel F examines the timing of IPO and SEO lockup expirations relative to individual stock peaks. In contrast to the lockup explanation of Ofek and Richardson (2003) but consistent with Schultz (2008), we find that lockup expirations do not generally coincide with individual stock peaks. For example, 40% of lockups expire more than three months before the peak and another 29% more than three months after the peak. Likewise, the values of lockup expirations, expressed as a percentage of market capitalization of the event firm, show no discernible patterns around individual stock peaks.[15]

IV. Bubble or Fundamental Mechanics?

Our evidence can be interpreted as institutions either facilitating mispricing or believing rationally in future growth prospects in the technology sector. To help distinguish between these possibilities, we first examine whether institutional and individual net active buying during the run-up is related to post-peak stock price movements. Additionally, we examine whether institutional trading moves prices toward or away from fair value for a sample of six carve-outs that Lamont and Thaler (2003) associate with clear overpricing. Lastly, we examine whether institutions were just trading with fundamental values reflected in stock-specific news or reacting to their own signals.

A. Pre-Peak Institutional and Individual Trading and Post-Peak Returns

We first investigate whether institutional buying prior to March 31, 2000 is indicative of relatively greater future stock returns (as a proxy for future fundamentals). Because our previous findings in Table II show that buying patterns differ dramatically with firm size, we focus on firms in the top 25% of CRSP market capitalization but later examine results for the next largest quartile. The largest 25% firms represent 95.8% of total market capitalization of CRSP as of March 31, 2000. Next, we assign sample firms into terciles according to the difference between one-year institutional buying (excluding flows) and one-year individual buying prior to March 31, 2000.

As an alternative and continuous measure of 'bubbly' stocks we first report the price-to-sales (P/S) ratios, as proposed by Brunnermeier and Nagel (2004). Table III shows that compared to stocks bought heavily by individuals, stocks bought heavily by institutions have higher P/S ratios at the market peak, and they experience higher returns in the year prior to the peak. More importantly, Table III further shows that stocks heavily bought by institutions experience much more negative one- and two-year returns from the market peak of March 31, 2000 than those heavily bought by individual investors.[16] When we examine P/S adjusted returns for stocks heavily bought by institutions, we find that majority of the negative returns in the post-peak periods can be explained by the high P/S ratios (the 'bubbly' nature) of these firms. However, there is weak evidence of negative P/S adjusted returns in the two-year period after the market peak.

[Insert Table III about here]

We further estimate cross-sectional regressions of one-, two-, and three-year buy-and-hold stock returns after March 31, 2000 on institutional and individual buying in the year prior to March 31, 2000 for the top 25% and 50% CRSP stocks in terms of market capitalization. Panel A of Table IV shows that both institutional buying (excluding flows) and individual buying (including flows) during the run-up are significantly negatively related to post-peak returns.[17] Coefficients for the two groups are nearly identical with more explanatory power for institutional buying particularly in the top 25 percentile of market capitalization. Panel B further tests whether the net active buying by institutions in excess of individual buying is negatively related to future returns. Institutional buying relative to individual buying is a negative predictor of future returns in the top 25% of firms but not significantly so in the top 50%. The fact that institutional buying leads to larger post-peak reversals than individual buying for the largest 25% stocks which account for most of the CRSP market capitalization, suggests that institutions moved stock markets in what was clearly the wrong direction.[18]

[Insert Table IV about here]

B. Do Institutions Ever Trade in the Direction of Clear Mispricing?

For more evidence on whether institutions rationally respond to fundamental information or fuel prices that they know to be artificially high, we analyze the six equity carve-outs identified by Lamont and Thaler (2003) to be clearly overpriced.[19] In these cases the market value of the parent firm's ownership in the carve-out exceeds the market value of the parent firm for a considerable amount of time, with the parent firm clearly intending to enforce the carve-out. We examine net buying of investor groups in the 60 days prior to the day when the clear overpricing is corrected. Figure 8 shows that institutions buy on average 1.5% of the market value (2.9% of float) of these overpriced carve-outs from day -60 to day -12 before they start selling. Conversely, derivatives traders sell about 1.0% from day -30 to day 0. Trading of the four individual groups is close to zero except for discount traders, the least sophisticated individual group, who buy 0.45% from day -36 to day 0. Interestingly, in the last twelve days while institutions are aggressively selling the carve-outs, discount traders (and individuals in aggregate) continue to purchase and lose from their trades. Though limited to only six firms, these results are consistent with institutions fueling prices that they should know to be artificially high.

[Insert Figure 8 about here]

C. Were Institutions Simply Following the News?

While our results are supportive of institutional trading moving up prices of technology stocks, one may argue that positive relation between institutional trading and price movements is due to the fact that the financial press drove stock prices and institutions simply reacted to information in the news more quickly than individuals. To test whether the relation between institutional trading and prices is driven by institutions reacting to news articles, we examine trading activity on days with news and no news separately. In the similar spirit as Section IV.A, we focus on the largest 50% of technology stocks which account for over 98.6% of technology market capitalization. On each day t, we assign stocks to portfolios according to whether there are any news articles about the firm in the top ten newswires during the [t-3, t] window and whether their returns in excess of the technology index return are negative or positive.

Panel A of Table V shows that for days with or immediately following news articles, individual general group and day traders trade in the same direction as stock returns but discount brokerage clients trade in the opposite direction. Institutions and largest I-banks, on the other hand, trade in the same direction as returns. For days with no news there is a slightly weaker pattern of institutions and largest I-banks moving with returns, suggesting that responding to news explains only part of institutional trading. Panel B further shows that the four individual groups in aggregate trade against lagged returns for both news days and no-news days, while the four institutional groups trade with lagged returns for both news days and no-news days. We also examine the weekly frequency (see Internet Appendix Table IA.V) with no discernible difference between weeks with and without news. Institutions move in the same direction as contemporaneous weekly returns, while individuals move in the opposite direction.

[Insert Table V about here]

Panel C of Table V presents, across the largest 50% of technology stocks, daily, weekly, and monthly Fama-MacBeth cross-sectional regressions of individual stock returns on trading imbalances for eight investor groups during the run-up period. We standardize returns and imbalances in each cross-section. The standardization measures how closely returns and imbalances move together but does not take into account the price impact a large investor group would have relative to a small group. At the daily frequency, institutions exhibit the strongest positive relation with stock returns, where a one standard deviation change in institutional trading is accompanied by a 0.18 standard deviation (or 1.43%) increase in stock returns. At the weekly and monthly frequency, institutional trading continues to be strongly correlated with returns. We then estimate daily and weekly regressions interacting news dummies with investor imbalances. Consistent with the sorting results in Panel A, the last two columns show that the positive relation between institutional trading and returns remains strong on no-news days.[20]

Overall, the daily and weekly evidence at the cross-sectional level indicates that institutions move with returns. This pattern is prevalent on both news and no-news days and thus inconsistent with the conjecture that institutions are simply reacting to fundamentals in the news.

V. Conclusion

This paper examines the trading behavior of individual and institutional investors during the spectacular rise and fall of the technology sector from January 1997 to December 2002. From January 1997 to March 2000, both institutions and individuals actively purchase technology shares with institutional buying exceeding the sum of direct and indirect (through mutual funds) individual purchases. During March 2000 institutional investors quickly pulled capital out of the market, while individual investors continued to buy. Institutional investors also drive the run-up of individual technology stocks, particularly in large stocks. Individuals, in contrast, purchase large amounts following individual stock peaks and during the year following the market peak in March 2000. Cross-sectional patterns for individual stock peaks are generally consistent with institutions moving with and following returns in all but the smallest stocks. In contrast to the explanation that institutions drove prices higher with a rational but mistaken belief in future growth opportunities, we find that institutions trade in the direction of clear mispricing in a small sample of equity carve-outs.

Our results directly contrast a world where sophisticated investors consistently move against mispricing, a central building block of market efficiency. Nor does the evidence support bubble models where individuals move prices while smart money (institutions) passively stands aside. We also find evidence inconsistent with share supply restrictions and lockups being the sole cause of the bubble. Overall our evidence suggests that the most sophisticated market participants actively purchased technology stocks during the run-up and quickly reversed course in March 2000, driving the collapse—a finding consistent with Abreu and Brunnermeier (2003). Individual investors actively bought during both the run-up and particularly the collapse, highlighting their relatively unsophisticated behavior in the stock market. Future research should further explore the stabilizing and destabilizing roles that sophisticated investors play in capital markets.

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Appendix

A. Quarterly Holdings of Institutions, Insiders, and Individuals

We construct a comprehensive panel data of insider holdings using three different approaches: 1) SDC Approach: we obtain data from SDC on shares offered (including the overallotment option) for IPOs issued between 1994 and 2002. We define closely held shares on the IPO date as the difference between CRSP shares outstanding and shares offered in the IPO. We then update the shares held by insiders after the IPO date using insider trading data from Thomson Financial. We delete duplicate insider trades for a given firm-date with the same shares held, shares traded, transaction price, and transaction type to avoid double counting a trade reported redundantly by insiders who jointly own the shares transacted. 2) Datastream Approach: we obtain annual data on closely held shares from Datastream, and compute the shares held by insiders between two reports by updating the figure from the previous report using insider trading data from Thomson Financial. For IPOs, Datastream closely held shares are only available some time after the IPO date, so we backfill from the first report to the IPO date using Thomson Financial insider trading data as well. 3) Form 3 Approach: officers and directors, and any beneficial owners of more than 10% of a class of the company's stock must initially file a Form 3 statement of ownership with the SEC. We define closely held shares on the IPO date as the sum of all Form 3 holdings filed by officers and directors for the window [-365, +10], where day 0 is the IPO date. We update post-IPO closely held shares using Thomson Financial insider trading.

Insiders and institutions can overlap. For example, a venture capital firm can be both a 13f institution and an insider. If that venture capital firm sells 5% of a firm's shares during a quarter to individuals, this trade is likely captured by both Thomson Financial insider trading data and 13f institutional holdings data, resulting in 10% individual buying (since individual ownership is one minus institutional and insider ownership). To avoid this double counting, we screen to exclude institutional trades from Thomson Financial insider trading data. We construct the list of institutional trades within the insider trading data as follows. We first exclude a trade if the insider is a top executive, director, etc. Within the remaining trades we identify institutional trades based on whether the insider's name contains key words that indicate an institution.[21] Further, we manually screen the remaining names to identify institutions whose names do not contain a key word (for example, Morgan Stanley). If the trade is from a trust or a foundation, we classify it as an institutional trade if the name can be matched to a 13f institution.

Overlaps in holdings of insiders and institutions could occur due to initial IPO allocations as well. We identify potential overlaps when aggregate institutional and insider ownership (after excluding institutional insider trades) exceeds 100% of shares outstanding.[22] For these cases, we take the maximum quarterly overage across the sample period and subtract it from IPO closely held shares. For a small number of firms where this adjustment makes IPO closely held shares negative, we use the Datastream approach discussed above.

We then compile insider holdings using the SDC approach for 68% of the technology sample and the Datastream approach for the rest.[23] We calculate quarterly individual holdings as 100% minus the sum of 13f institutional holdings and insider holdings. For the analysis involving insiders and individual investors, we exclude firms with missing insider data and firm-quarters where combined ownership exceeds 100% in either the current or previous quarter.[24] The sub-sample with complete insider holdings (and therefore individual holdings) contains 91% of firm-quarters.

One issue is that we might underestimate insider ownership and therefore overestimate individual ownership for IPOs. For example, Aggarwal, Prabhala, and Puri (2002) find that only 27.2% of IPO shares are allocated to individual investors between May 1997 and June 1998. However, we find that at the end of the IPO quarter, individuals receive 62.5% of shares allocated in technology IPOs (72.8% for all IPOs). There are two potential reasons for the underestimation of insider ownership at the time of the IPO. First, some IPOs either have no valid SDC data or their SDC data are replaced with Datastream data due to the reasons described above. For 54 of our 406 IPOs we use Datastream data which potentially understates IPO insider ownership. According to Datastream, average closely held shares for these IPOs is 43.97% on IPO date and 46.09% at the end of IPO quarter. Since average institutional ownership is 11.41%, individual ownership equals 42.50% (100% – 46.09% – 11.41%) or 75.6% of float at the end of the IPO quarter, significantly higher than both the literature (Aggarwal, Prabhala, and Puri (2002)) and the corresponding percentage from our SDC sample.

Second, our adjustment for overlapping ownership might also understate insider ownership and therefore overstate individual ownership of IPOs. Before adjustment the average closely held shares for 352 IPOs with SDC data is 72.41% on the IPO date and 72.81% at the end of the IPO quarter. As a result, individual ownership is 12.27% at the end of the IPO quarter, accounting for only 45.1% of the float. However, after we subtract overlapping ownership between institutions and insiders (i.e., the maximum amount by which their combined ownership exceeds 100%) from IPO closely held shares, the average closely held shares at the end of the IPO quarter becomes 63.84% while individual ownership is 21.24%, accounting for 58.7% of float, which is also significantly higher than what the literature has documented.

Due to the concern of overestimating IPO individual ownership, for our major tests we use the sample containing technology stocks that exist at both the beginning and end of a quarter (excluding technology IPOs from the analysis in the IPO quarter). We use the full sample for robustness checks.

B. Investor-Type Classifications for Nasdaq Trading Data

We identify the largest 100 Nasdaq market makers each year from 1997 to 2002 and the top 500 market makers from October 1999 to September 2002, according to trading volume. These efforts result in a set of 619 unique market makers handling 98.2% of Nasdaq volume over our sample period. We classify each utilizing company web pages, news media, conversations with Nasdaq officials, information gathered from the NASD website, and other reliable sources of public information. In many cases classifications are verified through several sources. We classify the remaining smaller market participants according to average market maker trade size. Firms with average trade sizes of less than 500 are classified as individual general, those with average trade sizes between 500 and 1000 are classified as mixed, and those with average trade sizes above 1000 are classified as institutional. We also adjust our classifications for mergers on the effective merger date, so that each market maker in the sample is accurately classified on each day.

We describe our nine categories and provide sample firms for each category below:

- Individual General – Brokers in this category focus on retail services to individuals and offer some mixture of at least two of full-service, discount, or daytrading brokerage services (e.g. Mayer and Schweitzer, Datek Securities, Ameritrade, J.B. Oxford and Co. and Big J Securities).
- Individual Full Service – This category consists of brokers that primarily provide full-service brokerage to individuals (e.g. Wedbush Morgan Securities, H&R Block Financial Advisors, A.G. Edwards & Sons, and CIBC Wood Gundy Securities).
- Individual Discount – Brokers in this category primarily provide discount brokerage services to individuals (e.g. Charles Schwab, TD Waterhouse, Brown & Co. Securities, and Scottrade).
- Individual Day Trading – Brokers found in this category specialize in providing daytrading services to active individual traders. (e.g. Momentum Securities, Assent, Heartland Securities, Landmark Securities, and Broadway Trading).
- Institutional – This category consists primarily of firms that broker only for institutional clients. We classify firms that offer individual brokerage exclusively to high net worth individuals and institutional brokers as institutional brokers (e.g. UBS Warburg, J.P. Morgan Chase, Credit Suisse First Boston, NDB Capital Markets and Robertson Stephens). Also included in the institutional category are strictly proprietary trading firms (e.g. Swift Trade and Domestic Securities).
- Largest I-banks – This classification consists of three of the largest investment banks in our sample, the largest participants in the business of prime brokerage for hedge funds, accounting for approximately 60% of that market.

- Hedge Fund – This category consists of 21 registered market participants whose primary trading activity is on behalf of hedge funds or families of hedge funds (e.g. Nova Fund, Sierra Trading Group, Ramius Securities, Peters Securities, and Millenco). Given that these hedge funds have their own market making desks, it is likely that they engage in high frequency trading strategies.
- Derivatives – This category consists of firms who specialize in the trading of options, futures and other derivative financial instruments (e.g. Timber Hill, First Options of Chicago, Susquehanna Capital Group, Lit America, and Hull Trading).
- Mixed – This category consists of brokers who conduct a large number of trades on behalf of both individuals and institutions (e.g. Citigroup, Deutsche Bank Alex Brown, Herzog Heine Geduld, Merrill Lynch, National Financial Services, and Paine Webber Jackson Curtis).

In addition to the comparison with Boehmer and Kelley (2009) mentioned in the text (at the end of Section I.C), we compare the mapping between our Nasdaq data and 13f data to that of Campbell, Ramadorai, and Schwartz (2009). They infer daily institutional trading activity from the Trade and Quote (TAQ) database by estimating regressions for each size quintile for the 1993-2000 period and report adjusted R^2s of 0.123, 0.100, 0.142, 0.133, and 0.142, respectively. For comparison, we estimate a similar regression model except that we replace the TAQ variables with our institutional flows and our institutional flows interacted with lagged 13f holdings. The adjusted R^2s are 0.038, 0.107, 0.137, 0.210, and 0.226 from the smallest to the largest quintile. We obtain much higher adjusted R^2s for the largest two quintiles which comprise the bulk of market capitalization.

Footnotes

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[1] Using data from 1871 to 2000, Shiller (2000) shows that in real terms the 1992-2000 S&P 500 price run-up is even larger than the 1920s run-up and the January 2000 P/E multiple (using the prior ten-year earnings) of 44 exceeds the September 1929 P/E ratio of 33.

[2] "Economists and market experts say (individual) investors … not the so-called 'smart money' on Wall Street – are the reasons behind the greatest bull market in history" (Smart (1999)). See also Hamilton (1998) and Dugan (1999).

[3] Brunnermeier (2001, 2008) evaluates bubble models and LeRoy (2004) discusses empirical bubble connections. We use the term "bubble" in the spirit of Kindleberger (1978) as "an upward price movement over an extended range that then implodes."Although Ofek and Richardson (2002) provide compelling evidence that price levels were too high to be explained by reasonable expectations of future cash flows, our paper does not directly relate to this debate.

[4] Grinblatt, Titman, and Wermers (1995), Grinblatt and Keloharju (2001), Griffin, Harris, and Topaloglu (2003), Kaniel, Saar, and Titman (2008), Barber and Odean (2008), and Linnainmaa (2010), among others, examine investor trading with respect to past individual stock returns. At the market level, Shapira and Venezia (2007), Lipson and Puckett (2010), Boyer and Zheng (2009), and Cohen (2003) examine trading activity.

[5] Grinblatt and Han (2005), Han and Wang (2007), Andrade, Chang, and Seasholes (2008), Lou (2010), and Greenwood and Nagel (2009) provide evidence that non-informative demand can cause price dislocations. Chordia, Roll, and Subrahmanyam (2002) note that it is more intuitive to think of aggregate prices as driven by the 'inventory paradigm' (supply and demand) rather than asymmetric information.

[6] For our value-weighted results, we exclude Microsoft because Microsoft's market capitalization is 44.9% (on average, ranging between 21.6% and 58.3%) of the technology sector during our sample period. Including Microsoft generally makes patterns more volatile, but inferences are similar.

[7] Our value-weighted technology index (excluding Microsoft) actually peaked on March 9, 2000 at 5.71 times its value on January 1, 1997, or 5.60 times if we further exclude the IPO quarters to be consistent with our analysis of institutional and individual demand.

[8] Institutional brokerage houses with private wealth management businesses are counted as institutional. We refer to trades by "institutions" although a more accurate but cumbersome classification would be trades "executed through brokerage houses dealing primarily with institutions". We provide details of investor-type classifications in Appendix B.

[9] In Internet Appendix Table IA.I we examine correlations among imbalances for the nine investor groups.

[10] We find that individuals receive 62.5% of shares allocated in technology IPOs (72.8% for all IPOs) which is far above the 27.2% in Aggarwal, Prabhala and Puri (2002) with proprietary SEC allocation data. Since, insider ownership at the IPO quarter is likely understated (and individual holdings overstated) we measure insider ownership several ways (see Appendix A) but ultimately think it is best to exclude stocks in the quarter of issuance. Griffin, Harris, and Topaloglu (2007) find that institutions are the dominant driver behind the high 'dot-com' IPO pricing through the laddering activity.

[11] In Internet Appendix Figure IA.2, we include IPOs and delistings in the calculations. Under this approach, individuals play a slightly greater role but institutions (net of flows) are still the largest buyers with 55.7% of technology purchases during the run-up, even though our lack of complete allocation data likely overestimates individual purchases.

[12] We further document the time-series of demand for non-technology stocks in Internet Appendix Figure IA.7. Due to the large number of non-technology stocks, we also repeat the tests by excluding all stocks in the highest quartile of price-to-sales ratios, a measure of 'bubbly' stocks proposed by Brunnermeier and Nagel (2004), to address the concern that non-technology stocks might contain some hidden 'new economy' stocks. In this more restrictive "old economy" sample, we find (in Internet Appendix Figure IA.8) that during the run-up period institutions buy 46.4% of non-technology stocks while individuals buy the remaining 53.6% (directly or through mutual fund flows).

[13] In Panels A and B of Internet Appendix Figure IA.10, we find similar results using imbalances adjusted for firm size and turnover.

[14] Although individual stock peaks cluster in March 2000 (151 peaks in March 2000 versus 429 peaks in other months), these results are robust to excluding March 2000 peaks (see Internet Appendix Figures IA.12 and IA.13).

[15] In Internet Appendix Figure IA.14, we also examine imbalances in the 60 trading days before and after lockup expirations. Institutions begin selling 49 (7) trading days before IPO (SEO) lockup expirations. In contrast, individuals consistently buy during this window.

[16] In Internet Appendix Tables IA.II and IA.III, we repeat the tests using change in ownership, an alternative measure to net active buying, and with the second highest quartile of CRSP firms in terms of market capitalization, respectively, and find similar patterns with few statistically significant differences.

[17] A caveat of this regression design is that the residuals can be cross-sectionally correlated due to the potential co-movements of post-peak stock prices, leading to inflated t-statistics which should be treated with caution.

[18] In Internet Appendix Table IA.IV, we estimate regressions of post-peak returns on one or two-year pre-peak institutional net active buying, flow-induced net buying, and individual net buying simultaneously. All three components are negatively related to future returns with institutions and flows generally having the largest coefficients.

[19] We thank Ravi Jagannathan for this suggestion.

[20] We also perform the news analysis with alternative samples of technology firms including the full sample, top 25% largest firms, bottom 50% smallest firms, with alternative news measures, and with panel regression techniques (see Internet Appendix Tables IA.VI through IA.IX and Figure IA.15) with similar results, consistent with Bhattacharya et al. (2009) who conclude that the media was not a significant factor for internet stocks.

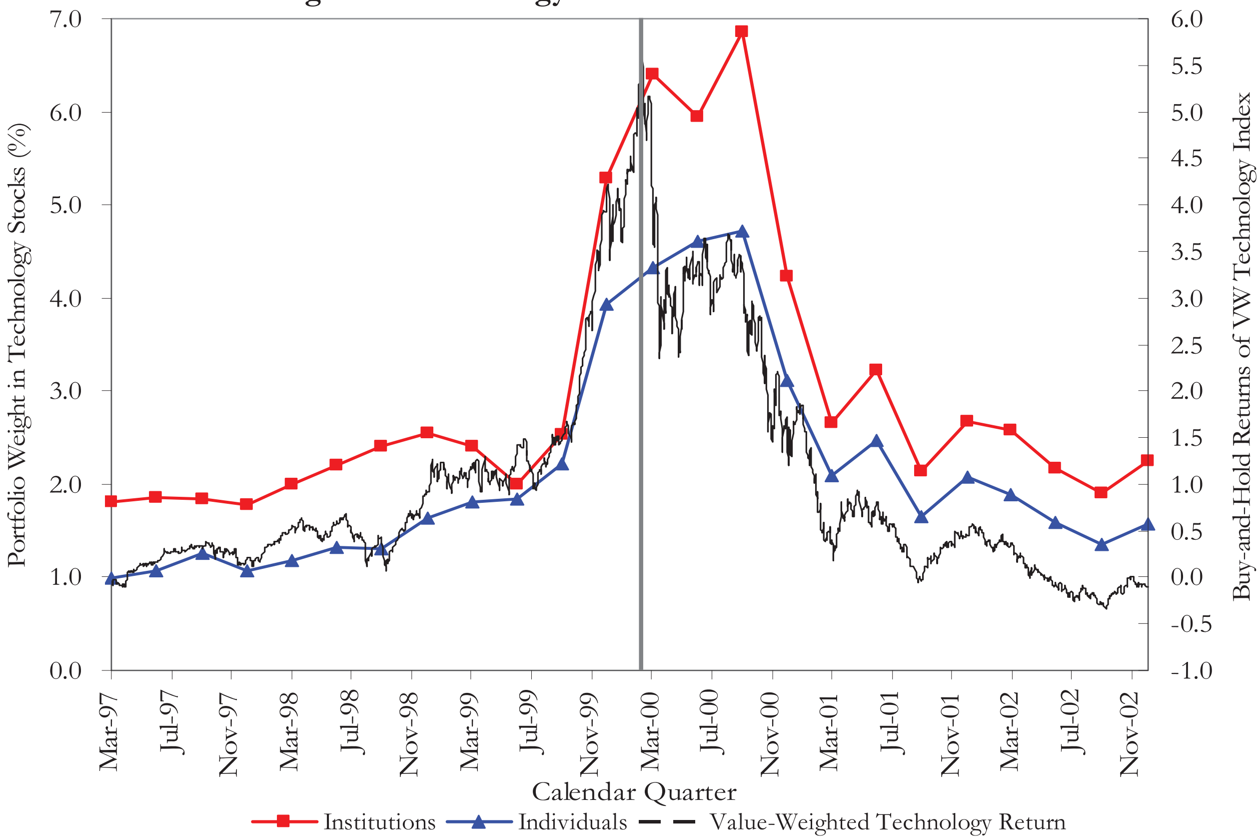
[21] The keywords include the following: 'bank', 'venture', 'capital', 'investment', 'inv ', 'invt ', 'invs ', ' lp', ' l p', 'insurance', ' ins ', 'associate', ' assoc', 'pension', 'advisor', 'holding', 'hlds', 'management', 'mgmt', 'mgt', 'fund', 'property', 'buyout', 'financ', ' fin ', 'institution', 'equity', and 'partners'.

[22] For a small number of firm-quarters where insider holdings are negative or above 100%, we use the most recent insider holdings between zero and 100%.

[23] The majority of the firms that we apply the Datastream approach are those with IPOs prior to 1994. We use the Form 3 approach for four technology firms missing both SDC and Datastream data.

[24] Since we already make adjustments for SDC firms with combined ownership above 100%, these cases of combined ownership exceeding 100% are firms from Datastream.

Panel A: Portfolio Weights in Technology Stocks: Institutions and Individuals



Panel B: Portfolio Weights in Technology Stocks: 13f Institution Types

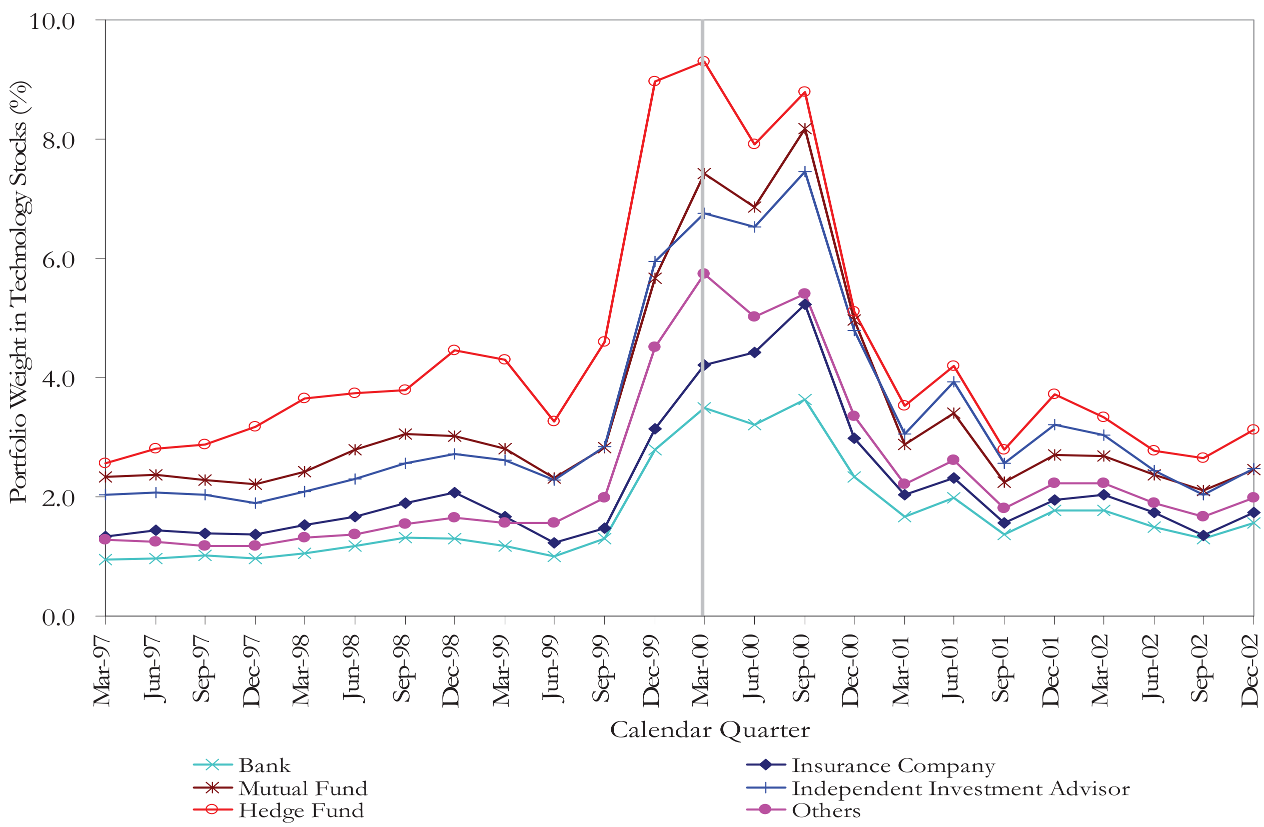
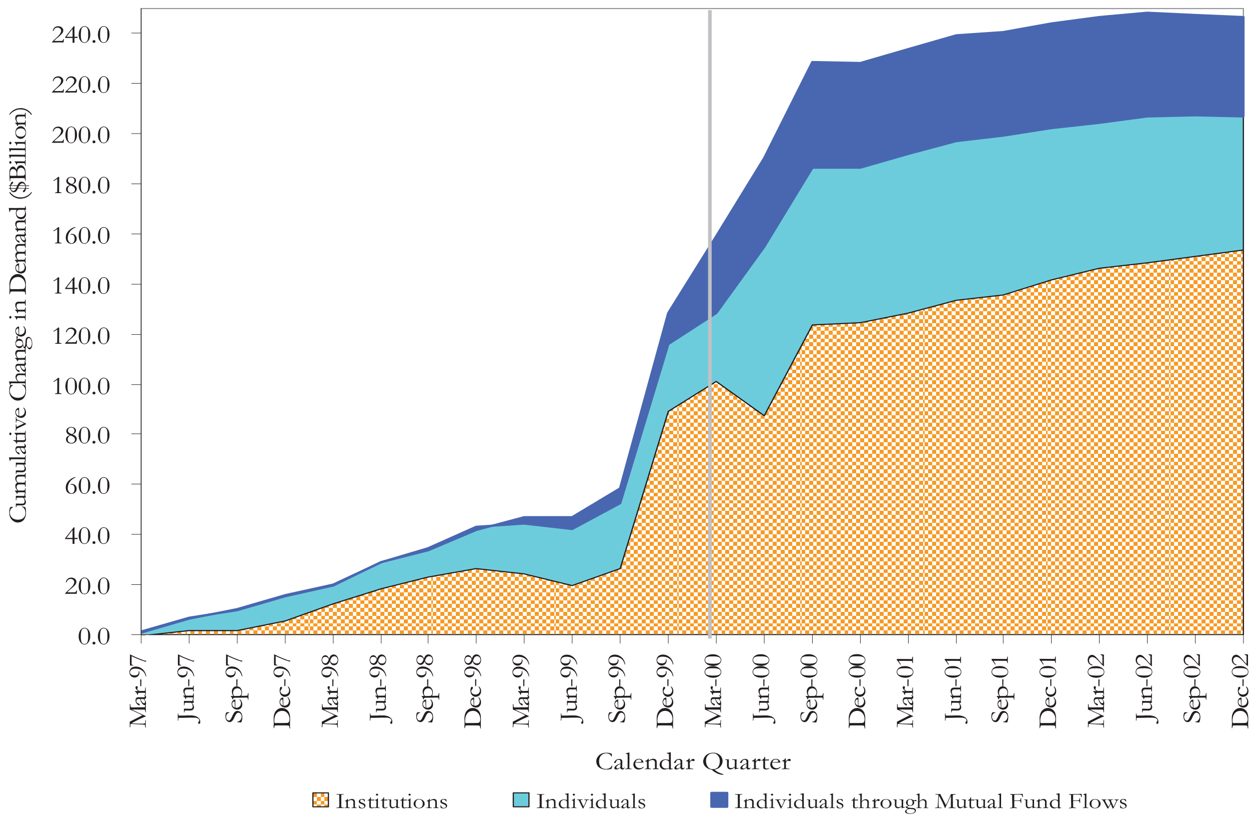


Figure 1. Portfolio Weights in Technology Stocks. This figure plots portfolio weights in Nasdaq technology stocks (3-digit SIC code=737 with ordinary common shares, excluding Microsoft) for various investor groups during the 1997-2002 period. Panel A plots portfolio weights at the end of each quarter for institutions and individuals (net of insiders), where portfolio weight is the percentage of total dollar holdings accounted for by technology stocks for an investor group. Panel B plots portfolio weights in technology stocks for the six 13f institution categories.

Panel A: Cumulative Change in Demand for Technology Stocks: Institutions and Individuals



Panel B: Cumulative Change in Demand for Technology Stocks: 13f Institution Types

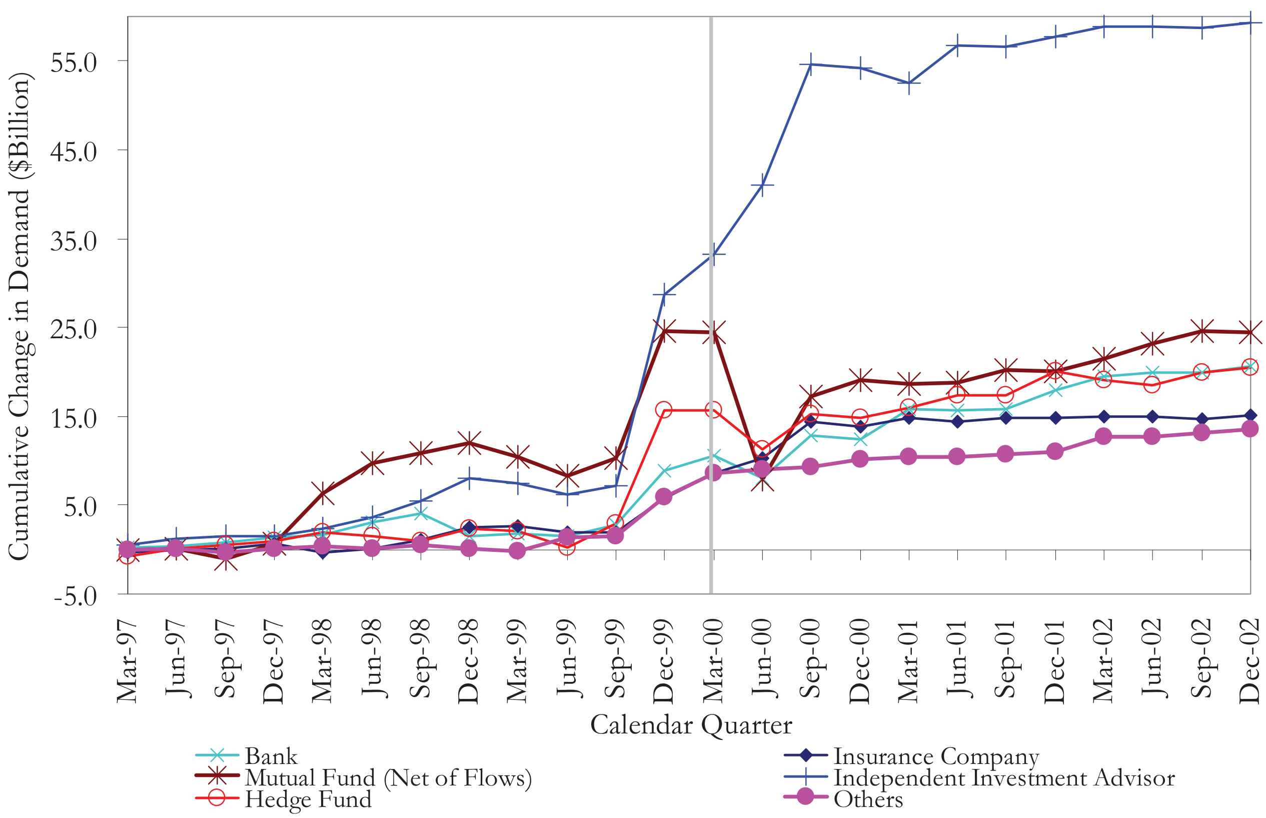


Figure 2. Cumulative Change in Demand for Technology Stocks. We calculate quarterly changes in demand for Nasdaq technology stocks (3-digit SIC code=737 with ordinary common shares, excluding Microsoft) during the 1997-2002 period. We require a firm to be in the technology sector at both the beginning and the end of the quarter to be included in the sample. Quarterly change in demand for an investor group is the difference between end-of-quarter technology holdings and buy-and-hold value of beginning-of-quarter technology holdings. The individual group is net of insiders. We further isolate the change in demand induced by mutual fund flows from change in demand by institutions. Change in demand induced by mutual fund flows is calculated by applying mutual fund flows for merged CRSP-Thomson Financial sample to 13f mutual fund families. We describe the details of our approach in Internet Appendix E. Panel A plots cumulative changes in demand for institutions and individuals, and demand induced by mutual fund flows. Panel B plots cumulative changes for the six 13f institution types, where the change by mutual funds is net of flows.

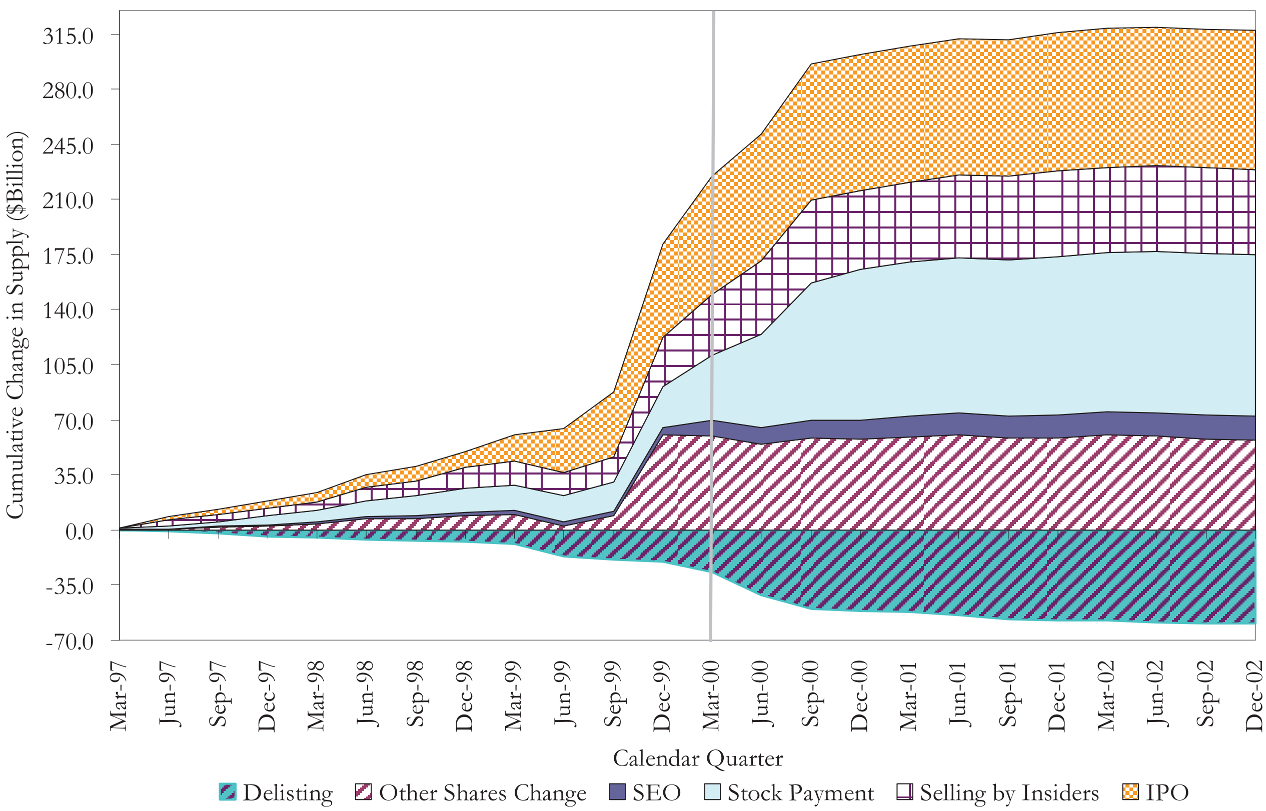
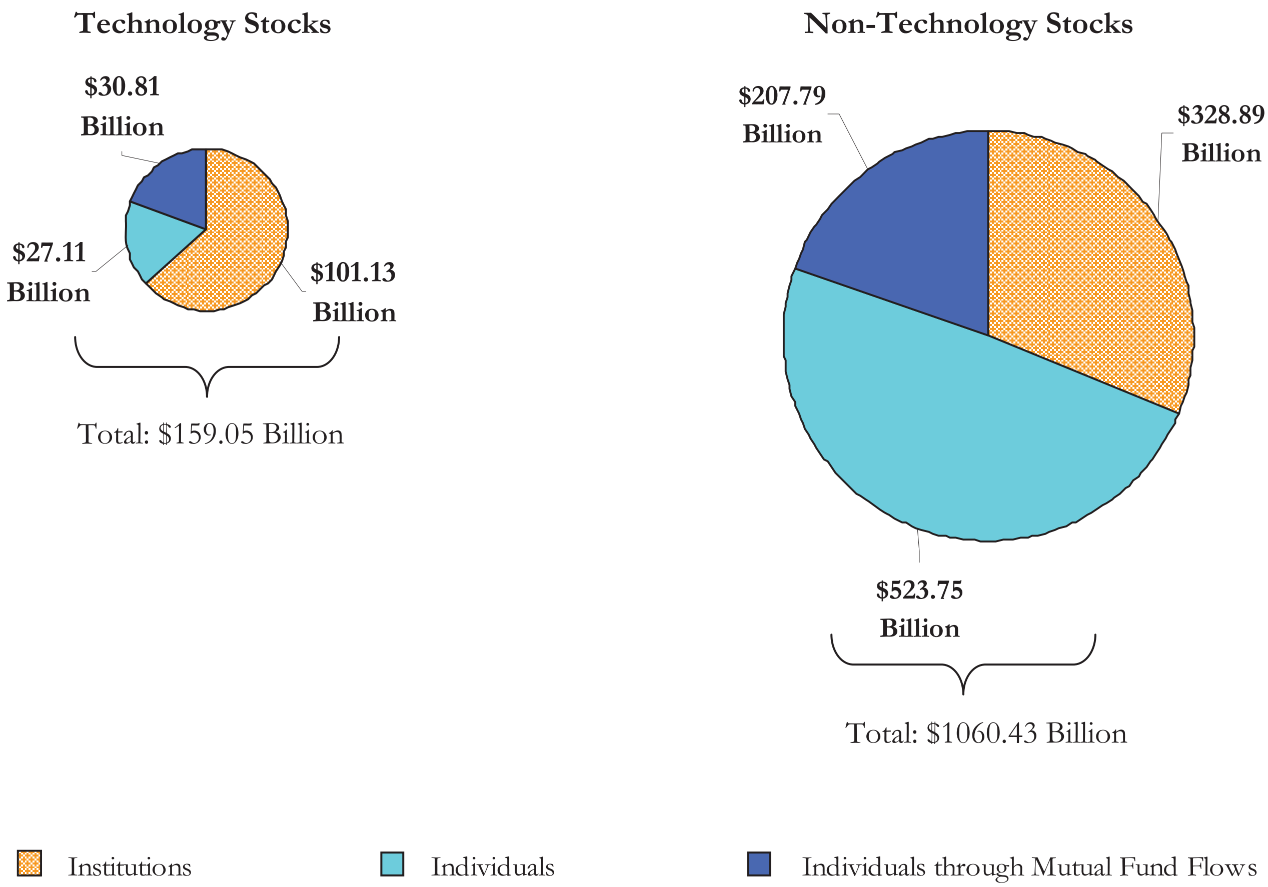


Figure 3. Cumulative Change in Supply of Technology Stocks. We calculate quarterly changes in supply of Nasdaq technology stocks (3-digit SIC code=737 with ordinary common shares, excluding Microsoft) during the 1997-2002 period. In each quarter, we calculate quarterly changes in dollar supply of technology sector due to: 1) delistings; 2) IPOs; 3) SEOs; 4) Insider selling; 5) technology firms using stock payment to acquire interests in another firm; and 6) other shares changes, which are changes in shares outstanding of technology firms due to reasons other than SEOs and stock payments. We incorporate share repurchases into other shares changes because the amount of repurchases is very small. We describe the details of calculation in Internet Appendix I. We then plot the cumulative changes in quarterly supply measured in billion dollars.

Panel A: Cumulative Change in Demand from January 1, 1997 to March 31, 2000



Panel B: Cumulative Change in Demand from April 1, 2000 to March 31, 2001

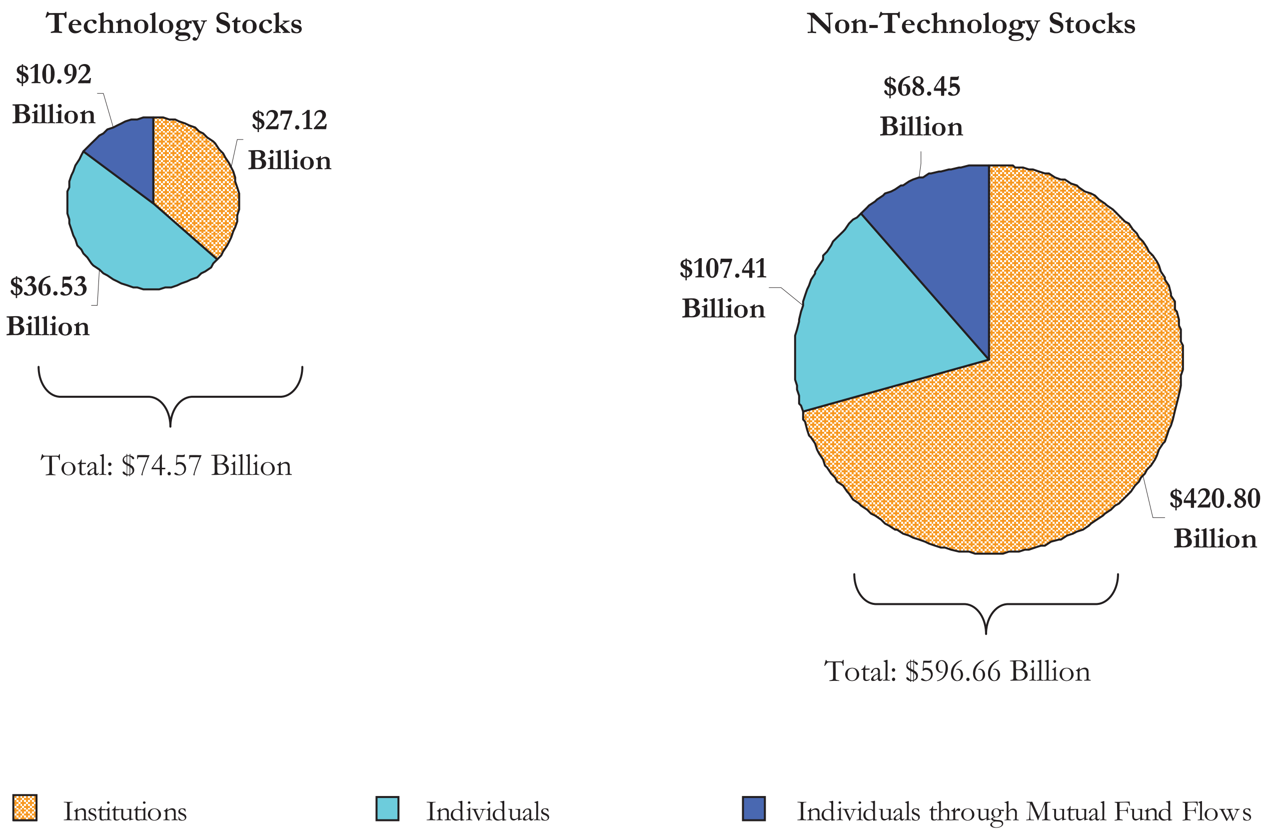
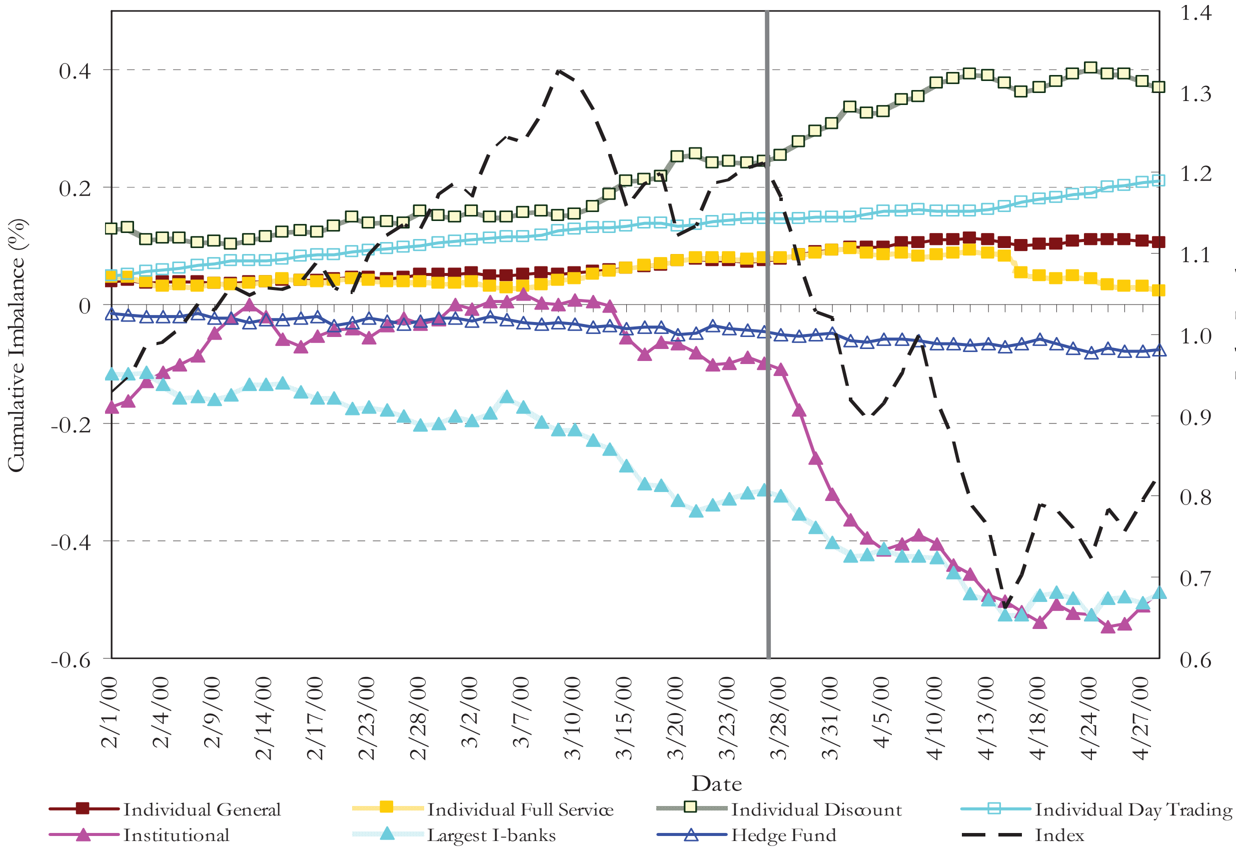


Figure 4. Cumulative Change in Demand for Technology and Non-Technology Stocks. In Panel A, we first calculate quarterly changes in demand from January 1997 to March 2000 for technology stocks (3-digit SIC code=737 and exchange code=3, excluding Microsoft) and non-technology stocks (3-digit SIC code≠737 or exchange code≠3) with ordinary common shares. We require a firm to be in the technology (non-technology) sector at both the beginning and the end of the quarter to be included in the technology (non-technology) sample. Quarterly change in demand for technology (non-technology) stocks by an investor group is the difference between end-of-quarter technology (non-technology) holdings and buy-and-hold value of beginning-of-quarter technology (non-technology) holdings. The individual group is net of insiders. We further isolate the change in demand induced by mutual fund flows from change in demand by institutions. Change in demand induced by mutual fund flows is calculated by applying mutual fund flows for merged CRSP-Thomson Financial sample to 13f mutual fund families. We describe the details of our approach in Internet Appendix E. We then sum up the quarterly changes in demand from January 1997 to March 2000. Panel B plots the corresponding changes in demand from April 2000 to March 2001.

Panel A: Cumulative Imbalances around the Market Peak



Panel B: Lockup Expirations, Insider Trading, and Flows around the Market Peak

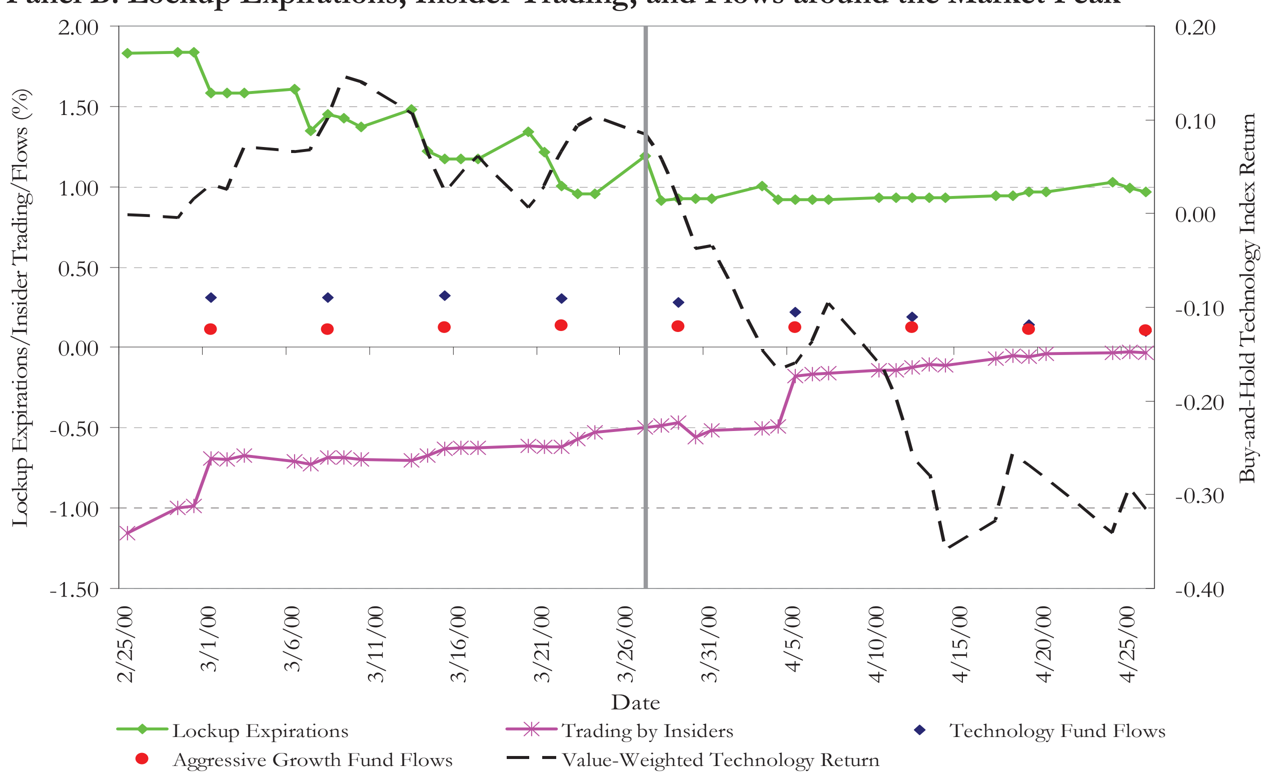


Figure 5. Cumulative Imbalances, Lockup Expirations, Insider Trading, and Mutual Fund Flows around the Market Peak. Panel A plots the index level and cumulative imbalances for various investor groups for value-weighted technology sector from February 1, 2000 to April 28, 2000. Daily imbalance is the difference between the buy and sell volumes expressed as a percentage of shares outstanding. The technology sector is comprised of all Nasdaq stocks with ordinary common shares and 3-digit SIC code 737, excluding Microsoft. We start cumulating imbalances and index levels on January 3, 2000. Panel B plots lockup expirations, insider trading, technology mutual fund flows, and aggressive growth fund flows around March 27, 2000. Daily lockup expirations are total dollar value of expiring lockup shares on that day divided by total market value of technology sector. Daily insider trading is total dollar value of insider net buying (buys minus sells) on that day divided by total market value of technology stocks. We convert weekly AMG flows of technology funds and aggressive growth funds into flow-induced buying of technology stocks as percentages of total market value of technology sector. We describe the details in Internet Appendix G. Lockup expirations, insider trading, and flows are presented as the sum for the past thirty-day window.

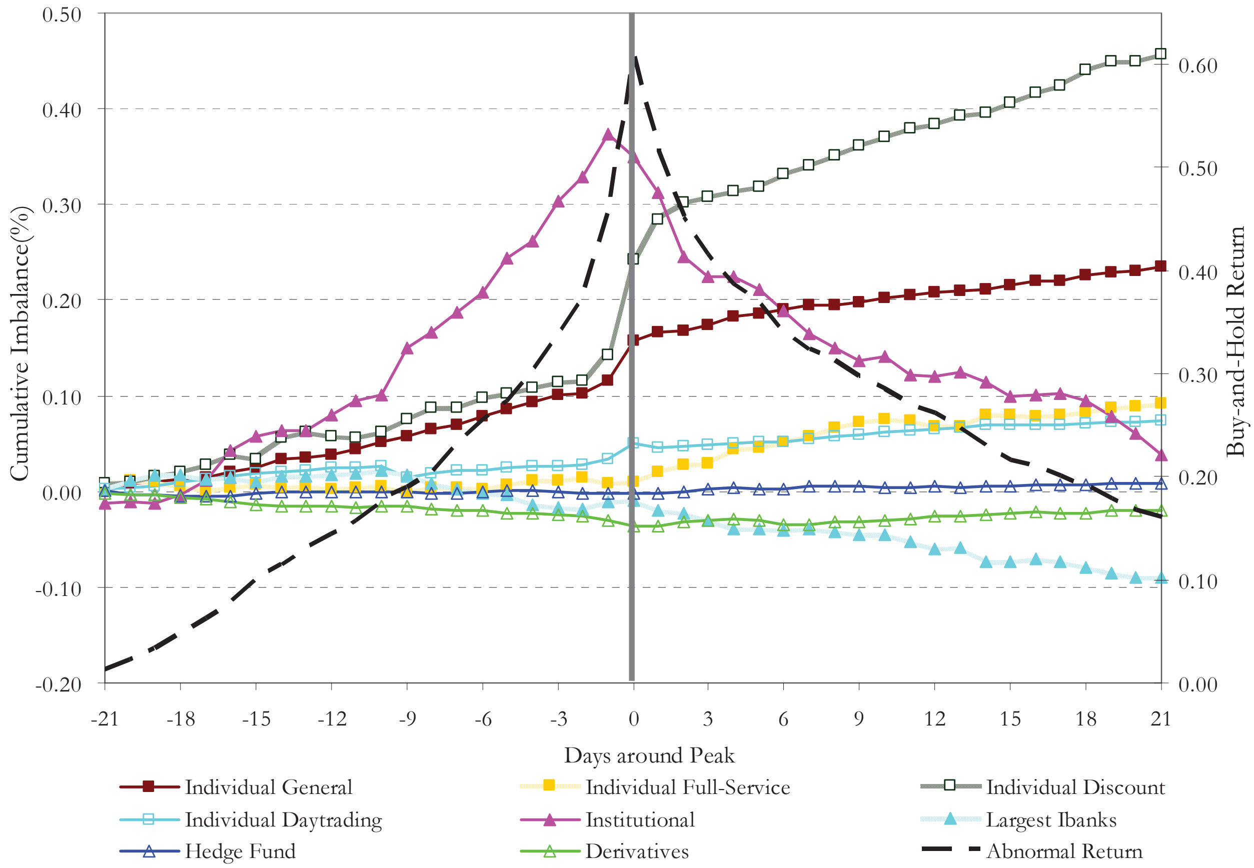
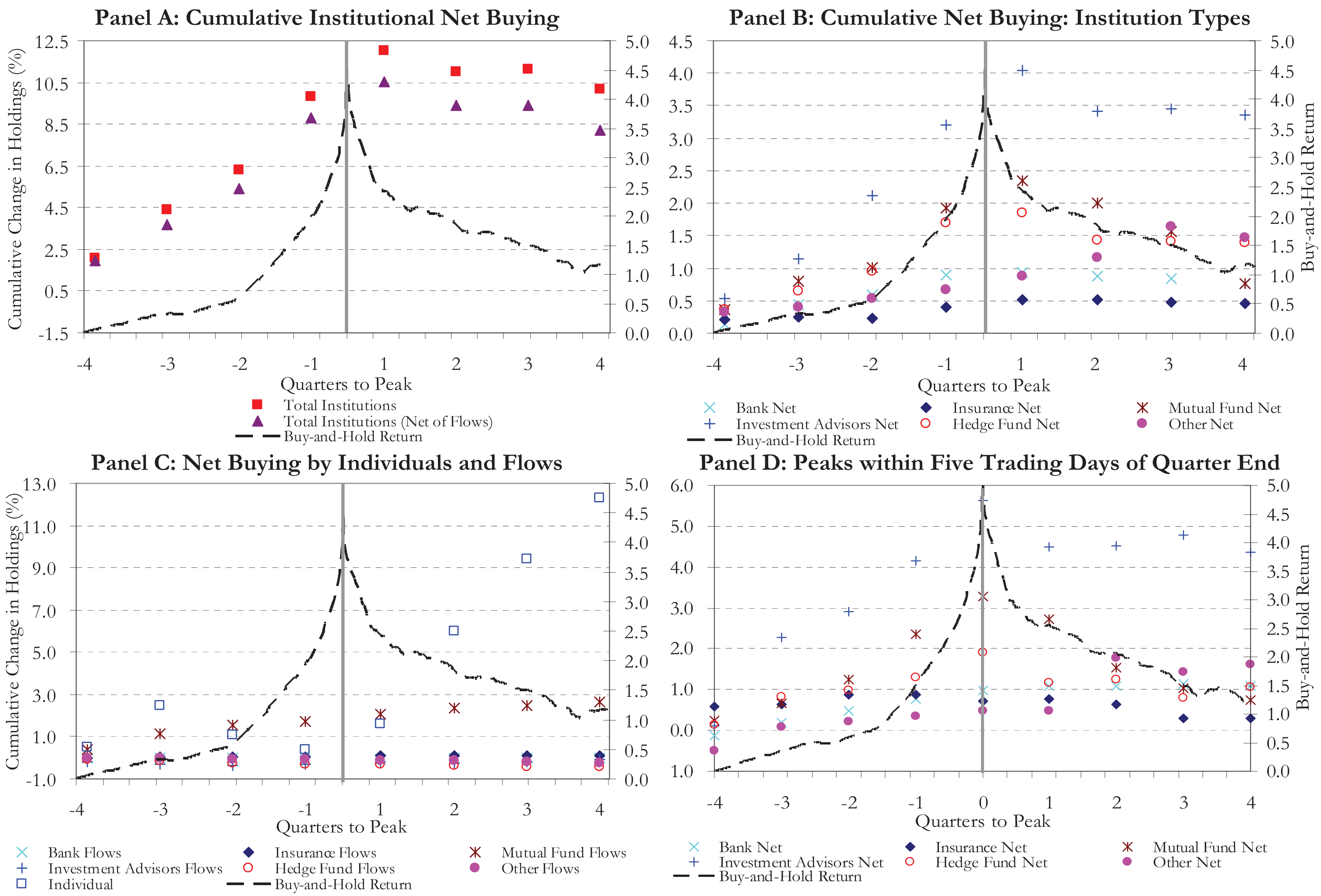
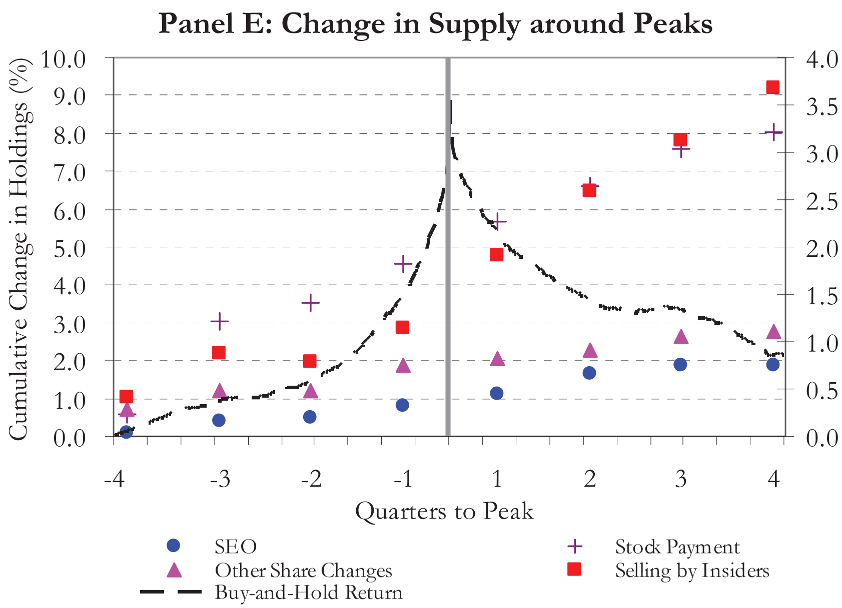


Figure 6. Cumulative Imbalances around Individual Stock Peaks: [-21, 21] Window. For all Nasdaq stocks with ordinary common shares and 3-digit SIC code 737 at some point from January 1997 to December 2000, we identify the individual peaks during the same period. In case of a tie, we choose the first peak. Then, we eliminate stocks for which the peak is within the first or last 21 days of trading or the 3-digit SIC code is different from 737 at the time of the peak. This gives us 580 technology stock peaks. When two stocks peak on the same day, we take the equal-weighted average of the two observations to avoid clustering. This gives us 279 different peak days. This figure plots the cross-sectional averages of the buy-and-hold return and cumulative imbalances for various investor groups for 43 trading days surrounding individual peaks. Daily imbalance is the difference between the buy and sell volumes expressed as a percentage of shares outstanding.


Panel A: Cumulative Institutional Net Buying
Cumulative Change in Holdings (%)
Quarters to Peak
Total Institutions
Total Institutions (Net of Flows)
Buy-and-Hold Return
Panel B: Cumulative Net Buying: Institution Types
Buy-and-Hold Return
Quarters to Peak
Bank Net
Investment Advisors Net
Insurance Net
Hedge Fund Net
Mutual Fund Net
Other Net
Buy-and-Hold Return
Panel C: Net Buying by Individuals and Flows
Cumulative Change in Holdings (%)
Quarters to Peak
Bank Flows
Investment Advisors Flows
Individual
Insurance Flows
Hedge Fund Flows
Buy-and-Hold Return
Mutual Fund Flows
Other Flows
Panel D: Peaks within Five Trading Days of Quarter End
Buy-and-Hold Return
Quarters to Peak
Bank Net
Investment Advisors Net
Buy-and-Hold Return
Insurance Net
Hedge Fund Net
Mutual Fund Net
Other Net



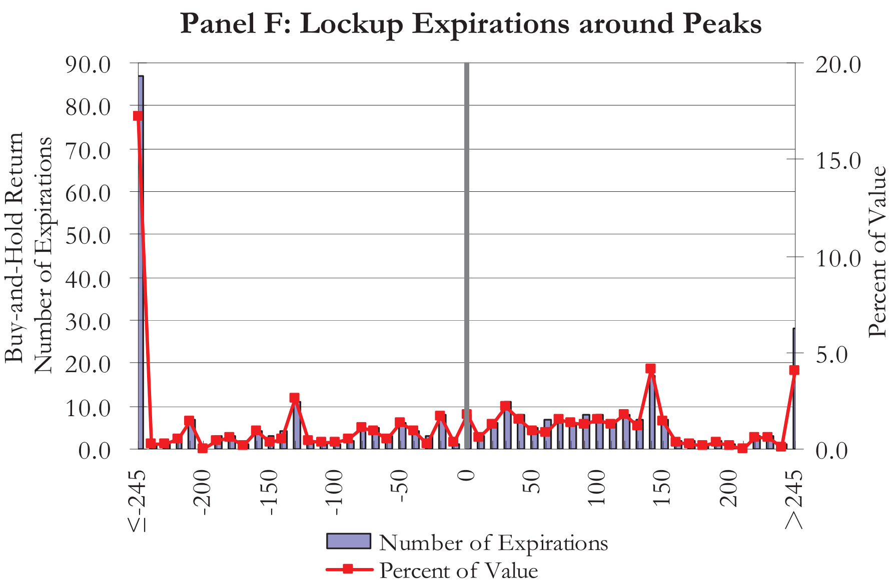
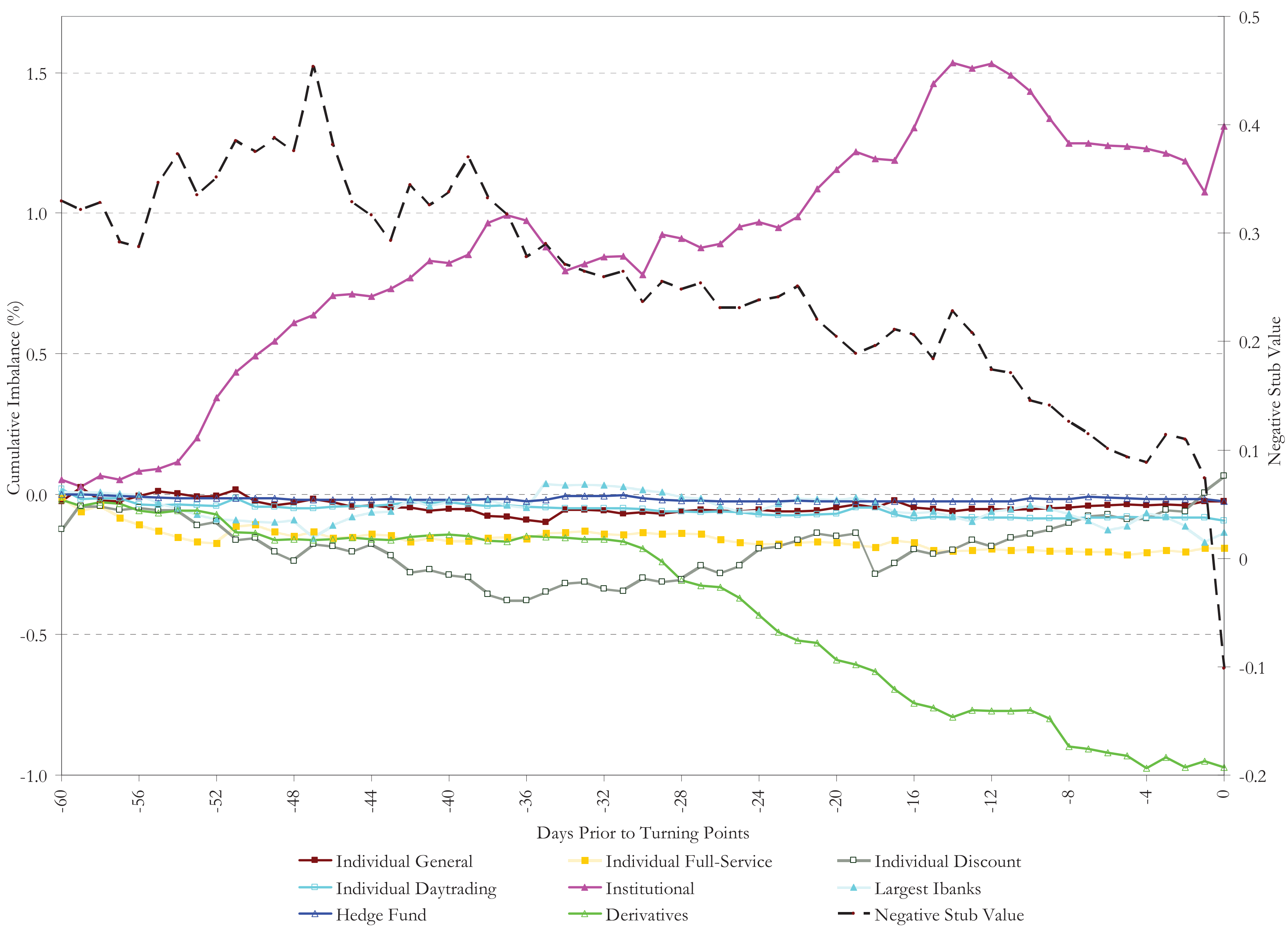


Figure 7. Demand and Supply around Individual Stock Peaks. We analyze demand and supply around individual peaks for Nasdaq technology stocks (3-digit SIC code=737 with ordinary common shares, excluding Microsoft) during the period from January 1997 to December 2000. There are 580 technology stock peaks (279 different event days) during this period. When stocks peak in the same quarter, we take the equal-weighted average of the observations. Panel A plots cross-sectional averages of the buy-and-hold return and cumulative net buying for aggregate 13f institutions during the eight quarters surrounding individual peaks. Quarterly institutional net buying for a stock is calculated as the difference between end-of-quarter institutional holdings and buy-and-hold value of beginning-of-quarter holdings, expressed as a percentage of the stock's market capitalization at the end of quarter. 'Total Institutions' is cumulative net buying and 'Total Institutions (Net of Flows)' is cumulative net buying minus net buying induced by flows (net active buying). Calculations of flow-induced net buying for mutual funds and other 13f institution types are described in Internet Appendices B and F. Quarter 1 marks the end of the quarter containing the peak, which is on average 33 trading days after the peak for our sample. Quarter -1 marks the end of the quarter prior to peak. Panel B plots the cumulative net active buying excluding flows for the six 13f institution types. Panel C plots the cumulative net buying induced by flows and by individuals directly. Individual net buying is calculated with the similar approach as institutional net buying by using individual ownership (net of insiders). Panel D plots the cumulative institutional net active buying around 95 price peaks that occur within five trading days ([-5, 5] window) from the end of a quarter, where quarter 0 refers to the end of the quarter that coincides with the individual price peak. Panel E plots the cumulative change in supply of shares around individual price peaks due to SEOs, insider selling, stock payments for mergers and acquisitions, and other changes in shares outstanding. Panel F plots the lockup expirations relative to price peaks for the 333 technology firms that have both individual peaks and lockup expirations during the 1997-2002 period. Number of lockup expirations at t refers to the total number of IPO and SEO lockup expirations during the ten day window of (t-5, t+5]. Day 0 refers to the day of the peak. For the amount of lockup expirations at t, we first sum up for each firm the value of expiring shares during the window (t-5, t+5] as a percentage of the firm's market capitalization. We then average the amount across event firms.



Cumulative Imbalance (%)
1.5
1.0
0.5
0.0
-0.5
-1.0
Negative Stub Value
0.5
0.4
0.3
0.2
0.1
0
-0.1
-0.2
-60
-56
-52
-48
-44
-40
-36
-32
-28
-24
-20
-16
-12
-8
-4
0
Days Prior to Turning Points
Individual General
Individual Full-Service
Individual Discount
Individual Daytrading
Institutional
Largest Ibanks
Hedge Fund
Derivatives
Negative Stub Value

Figure 8. Cumulative Imbalances in Overpriced Carve-Outs. This figure plots simple averages of cumulative imbalances for the six overpriced carve-outs (UBID, Retek, PFSWeb, Xpedior, Palm, and Stratos Lightwave) studied in Lamont and Thaler (2003) during the 60-day window prior to the date on which overpricing is corrected. Negative stub value for a carve-out calculated as follows:

$$NStub_{it} = \frac{Own_{it} - ME_{it}}{ME_{it}}$$

where $NStub_{it}$ is negative stub value for carve-out *i* on day t. Own_{it} is dollar value of parent firm's ownership of carve-out *i* of day t, and ME_{it} is parent firm's market capitalization of t. Our negative stub value is Lamont and Thaler's stub times minus one – we flip the sign of their stub value so that a positive stub value indicates an overpriced carve-out. Day 0 is the date on which stub value becomes negative (when clear overpricing is corrected). Daily imbalance is the difference between the buy and sell volumes expressed as a percentage of shares outstanding. Total Individual is the sum of individual general, individual full service, individual discount, and individual day trading groups. The patterns for these four individual groups are similar. Total Institution is the sum of institutional, largest I-banks, hedge fund, and derivatives groups. Hedge fund imbalances are close to zero for these carve-outs.

Table I
Distribution of Trades by Investor Groups and Correlations between Nasdaq and 13f Imbalances

Panel A reports the percentages of share volume, dollar value of trading ($ Volume), and number of trades that can be attributed to each of the nine investor groups, and the average trade size for each group for the technology sector from January 2, 1997 to March 27, 2000. The technology sector is comprised of all Nasdaq stocks with ordinary common shares (CRSP share codes 10 or 11) and 3-digit SIC code 737, which stands for computer programming, data processing, and other computer-related services. Microsoft is excluded. A detailed description of the method used for classifying the investor groups is in Appendix B. All figures are based on client trading only. Panel B reports the correlations among quarterly imbalances for aggregate institutional (sum of institutional, largest I-banks, hedge fund, and derivatives) and mixed investor groups calculated from Nasdaq data and quarterly changes in institutional ownership computed using the Thomson Financial 13f data for the technology sample during the 1997-2002 period. Quarterly imbalance for institutional (mixed) investor group is the difference between the institutional (mixed) buy and sell volumes for that quarter scaled by the total number of shares outstanding at the beginning of the quarter. Quarterly change in institutional ownership from Thomson Financial 13f data is the quarterly change in holdings as a fraction of the total number of shares outstanding at the beginning of the quarter. Any firm-quarter for which there was a stock split in the previous, current or next quarter is dropped from the sample. Results are provided for the full sample and 13f institutional ownership quartiles. We first compute cross-sectional correlations for each quarter and then average across time. T-statistics are reported in parentheses.

Panel A: Volume, Number of Trades, and Trade Size for Investor Groups

	% Share Volume	**% $ Volume**	**% # of Trades**	**Avg. Trade Size**
Individual General	3.92	3.66	7.00	479
Individual Full Service	3.45	2.86	4.80	615
Individual Discount	10.52	10.22	19.14	471
Individual Day Trading	5.04	8.03	10.46	413
Institutional	27.16	25.08	14.46	1,610
Largest I-banks	9.62	10.63	3.06	2,692
Hedge Fund	0.64	0.78	0.79	695
Derivatives	1.86	2.50	2.29	693
Mixed	37.80	36.24	37.98	853

Panel B: Correlations between Quarterly Institutional and Mixed Imbalances from Nasdaq and Quarterly Changes in 13f Institutional Holdings

			13f Institutional Ownership			
	Full Sample		**Low**	**2**	**3**	**High**
	Nasd Inst.	Mixed	Nasd Inst.	Nasd Inst.	Nasd Inst.	Nasd Inst.
13f Inst.	0.27	-0.02	0.03	0.21	0.29	0.38
	(14.92)	(-1.03)	(1.43)	(6.75)	(8.46)	(13.28)
Mixed	-0.45		-0.40	-0.49	-0.45	-0.47
	(-15.49)		(-8.87)	(-13.93)	(-13.05)	(-15.52)

Table II
Firm Characteristics and Investor Trading for Technology and Non-Technology Stocks of March 2000

We first assign all CRSP stocks with ordinary common shares (CRSP share codes 10 or 11) into technology sector (3-digit SIC code=737, exchange code=3, excluding Microsoft) non-technology sector (3-digit SIC code≠737 or exchange code≠3). We further assign stocks within technology and non-technology sectors into two portfolios according to market capitalization as of March 31, 2000. Panel A reports value-weighted averages of firm characteristics and institutional and individual (net of insiders) trading for each portfolio. Returns are value-weighted buy-and-hold returns, where weights are market capitalizations at the beginning of the return measurement periods. For net active buying of a firm, we first take the difference between end-of-quarter holdings and buy-and-hold value of beginning-of-quarter holdings. We further subtract net buying induced by mutual fund flows (calculation described in Internet Appendix E) to obtain net active buying. For individuals, we set flow-induced net buying to zero. We sum up quarterly net active buying for the four quarters from April 1, 1999 to March 31, 2000 for each firm, and divide by the firm's market capitalization of March 31, 2000. We then calculate value-weighted net active buying, where the weights are market capitalizations of March 31, 2000. Change in ownership is the difference between ownerships at the end of March 2000 and March 1999. Ownership for an investor group is defined as share holdings divided by total shares outstanding. Individual ownership is net of insiders. Ownerships and changes in ownerships are weighted by market capitalizations of March 31, 2000. We also report the percentage of total market capitalization of our sample accounted for by each portfolio. Panel B further reports value-weighted net active buying by different institution types.

Panel A: Value-Weighted Returns and Trading

	Tech		Non-Tech		Tech – Non-Tech			
	Small	Large	Small	Large	Small	t-stat	Large	t-stat
Market Cap.								
Fraction of CRSP ME Mar.00	0.001	0.067	0.008	0.924				
Net Active Buying								
Institutional Apr.99-Mar.00	0.020	0.067	-0.015	0.015	0.035	(2.16)	0.052	(2.17)
Individual Apr.99-Mar.00	0.097	0.037	0.026	0.025	0.071	(3.19)	0.012	(0.43)
Change in Ownership								
Institutional Apr.99-Mar.00	0.002	0.054	-0.013	0.002	0.016	(1.58)	0.052	(2.92)
Individual Apr.99-Mar.00	0.035	0.008	0.014	0.013	0.020	(1.44)	-0.005	(-0.20)
Ownership								
Institutional Mar.00	0.182	0.488	0.199	0.543	-0.017	(-0.74)	-0.055	(-0.29)
Individual Mar.00	0.456	0.231	0.463	0.374	-0.007	(-0.20)	-0.143	(-0.88)

Panel B: Value-Weighted Buying by Institution Type: April 1, 1999 to March 31, 2000

Net Active Buying								
Banks	0.006	0.009	-0.004	0.001	0.011	(2.20)	0.008	(2.96)
Insurance. Companies	-0.002	0.006	-0.005	0.001	0.003	(0.95)	0.005	(1.44)
Mutual Funds	-0.003	0.013	-0.002	0.005	-0.001	(-0.17)	0.008	(1.72)
Indep. Investment Advisors	0.008	0.019	-0.004	0.001	0.012	(1.66)	0.019	(2.55)
Hedge Funds	0.005	0.013	-0.002	0.005	0.006	(0.92)	0.008	(2.17)

Table III

Firm Characteristics Sorted on the Difference between Institutional and Individual Trading Up to March 2000: Top 25% CRSP Firms according to Market Capitalization

The sample contains CRSP stocks with ordinary common shares (CRSP share codes 10 or 11) that are in the top quartile of CRSP according to market capitalization on March 31, 2000. We first assign sample firms into terciles according to the difference between institutional net active buying and individual net active buying. For net active buying of a stock, we first take the difference between end-of-quarter holdings and buy-and-hold value of beginning-of-quarter holdings, divided by end-of-quarter market capitalization. We further subtract net buying induced by mutual fund flows (calculation described in Internet Appendix E) to obtain net active buying. We set flow-induced net buying to zero for individual investors. We then sum up quarterly net active buying for the four quarters from April 1, 1999 to March 31, 2000. We report simple averages of price-to-sales ratios as of March 31, 2000, buy-and-hold returns, and P/S adjusted returns for each portfolio. Price-to-sales ratio is price per share for March 31, 2000 divided by sales per share for most current fiscal year end which is at least six months before March 31, 2000. P/S adjusted return is the individual firm return minus the average return for the firm's P/S quartile on March 31, 2000. We also report the percentage of total market capitalization of CRSP sample accounted for by each portfolio.

	Characteristics Mar.00		**Buy-and-Hold Returns**			**P/S Adj. Returns**	
	Fraction CRSP ME	**P/S Ratios**	**Apr.99-Mar.00**	**Apr.00-Mar.01**	**Apr.00-Dec.02**	**Apr.00-Mar.01**	**Apr.00-Dec.02**
Institutional Buying	0.126	2.064	2.359	-0.171	-0.254	0.048	-0.055
Medium	0.381	1.353	0.540	0.043	0.019	0.149	0.041
Individual Buying	0.451	1.517	0.675	-0.017	-0.026	0.119	0.036
Inst. Buying – Indiv. Buying		0.548	1.685	-0.154	-0.228	-0.072	-0.091
t-statistics		(5.21)	(7.46)	(-4.00)	(-4.54)	(-2.14)	(-2.12)

Table IV

Cross-Sectional Regressions of Post-Peak Returns on Pre-Peak Investor Trading

This table presents cross-sectional univariate regressions of post-peak returns on pre-peak investor trading for CRSP stocks with ordinary common shares (CRSP share codes 10 or 11). The samples include firms in the top 50% and 25% of the CRSP sample according to market capitalization on March 31, 2000. The dependent variables are buy-and-hold returns from April 1, 2000 to March 31, 2001, March 31, 2002, and December 31, 2002, respectively. In Panel A, the independent variables are institutional trading or individual trading from April 1, 1999 to March 31, 2000, respectively. We first calculate net buying for institutions and individuals by taking the difference between end-of-quarter holdings and buy-and-hold value of beginning-of-quarter holdings, divided by end-of-quarter market capitalization. We then subtract (add) net buying induced by mutual fund flows (calculation described in Internet Appendix E) to construct quarterly institutional (individual) trading and sum up over the four quarters from April 1, 1999 to March 31, 2000. In Panel B, the independent variables are institutional trading (excluding flows) in excess of individual trading (including flows) from April 1, 1999 to March 31, 2000. We standardize all variables in the cross-section and estimate with intercepts which are not displayed for brevity. T-statistics computed with White robust errors are in parentheses.

Panel A: Regressions of Post-Peak Returns on One-Year Pre-Peak Trading by Institutions or Individuals

	Top 50% Market Cap.			**Top 25% Market Cap.**		
	Return (Apr.00-Mar.01)	**Return (Apr.00-Mar.02)**	**Return (Apr.00-Dec.02)**	**Return (Apr.00-Mar.01)**	**Return (Apr.00-Mar.02)**	**Return (Apr.00-Dec.02)**
Institutional (Excl. Flows)	-0.13	-0.12	-0.12	-0.20	-0.16	-0.15
	(-3.47)	(-3.55)	(-3.65)	(-8.16)	(-8.23)	(-7.65)
Adj. R^2	0.026	0.030	0.031	0.074	0.073	0.068
Individual (Incl. Flows)	-0.13	-0.11	-0.10	-0.18	-0.16	-0.15
	(-2.32)	(-2.40)	(-2.49)	(-4.53)	(-5.19)	(-5.03)
Adj. R^2	0.015	0.014	0.013	0.021	0.025	0.022

Panel B: Regressions of Post-Peak Returns on One-Year Pre-Peak 'Institutional Trading – Individual Trading'

Institutional - Individual	-0.02	-0.03	-0.03	-0.10	-0.07	-0.08
	(-0.88)	(-1.59)	(-1.89)	(-3.23)	(-3.06)	(-3.27)
Adj. R^2	0.000	0.001	0.001	0.010	0.009	0.010

Table V
News Articles and Investor Imbalances: Large Technology Firms

The sample contains firms in the top 50% of Nasdaq technology sector (3-digit SIC code=737 with ordinary common shares) according to market capitalization from January 2, 1997 to March 27, 2000. In Panel A, on each day t we assign stocks to portfolios according to whether their contemporaneous returns in excess of technology index return are negative or positive and whether there are any news articles about the firm during the [t-3, t] window. We use news articles from the top ten newswires. We calculate equal-weighted average daily imbalance for each portfolio and investor group and then report the time-series means. Daily imbalance is the difference between the buy and sell volumes expressed as 1/100 of a percentage of shares outstanding. We adjust daily imbalances for firm size by subtracting the average imbalance for the firm's size quartile in the technology sector. *Total Individual* is the sum of individual general, individual full service, individual discount, and individual day trading groups. *Total Institution* is the sum of institutional, largest I-banks, hedge fund, and derivatives groups. Panel B is similar to Panel A, but assigns stocks to portfolios according to excess returns for the previous day. T-statistics are calculated for the differences between positive-return and negative-return portfolios. Significance at the 1% and 5% levels are denoted by ** and *, respectively. Panel C presents time-series averages of coefficients, number of observations, and adjusted R^2s for cross-sectional regressions estimated each day (week, month) from January 2, 1997 to March 27, 2000. The dependent variables are daily (weekly, monthly) returns and the independent variables are contemporaneous daily (weekly, monthly) imbalances and their interactions with news dummies. Weekly or monthly imbalance is the sum of daily imbalances over the week (Thursday open to Wednesday close) or month. Weekly (monthly) returns are buy-and-hold returns over the week (month). For daily cross-sectional regression on day t, news dummy equals one for a firm if there are any news articles about the firm in the top ten newswires during the [t-3, t] window. For weekly (monthly) cross-sectional regressions, news dummy equals one for a firm if there are any news articles about the firm in the top ten newswires during the week (month). We standardize dependent and independent variables in each cross-section except for news dummies and estimate with intercepts which are not displayed for brevity. T-statistics computed using Newey-West standard errors with five lags are reported in parentheses.

Panel A: Imbalances Sorted on Contemporaneous Firm Returns

	No News			News			News – No News
	Neg. Ret.	Pos. Ret.	Diff.	Neg. Ret.	Pos. Ret.	Diff.	Diff.
Indiv. General	-0.21	0.21	0.42**	-0.11	0.39	0.50**	0.08*
Indiv. Full Service	0.06	-0.13	-0.19**	0.19	-0.13	-0.33**	-0.14*
Indiv. Discount	0.55	-0.95	-1.50**	0.99	-0.62	-1.62**	-0.12
Indiv. Day Trading	-0.23	0.29	0.52**	-0.25	0.42	0.67**	0.15**
Institutional	-1.66	2.13	3.79**	-2.15	2.24	4.39**	0.60*
Largest I-banks	-0.49	0.48	0.97**	-0.76	0.88	1.63**	0.67**
Hedge Fund	0.06	-0.10	-0.16**	0.11	-0.04	-0.15**	0.01
Derivatives	0.17	-0.16	-0.32**	0.14	-0.30	-0.45**	-0.12**
Total Individual	0.17	-0.58	-0.75**	0.83	0.05	-0.78**	-0.03
Total Institution	-1.92	2.36	4.27**	-2.66	2.77	5.43**	1.15**

Panel B: Imbalances Sorted on Lagged Firm Returns

Total Individual	0.11	-0.52	-0.63**	0.73	0.13	-0.61**	-0.02
Total Institution	-0.61	0.95	1.56**	-0.75	0.51	1.26**	0.30

Panel C: Fama-MacBeth Regressions of Returns on Contemporaneous Imbalances

	Daily	Weekly	Monthly	Daily	Weekly
Indiv. General	0.15	0.09	0.01	0.14	0.08
	(12.24)	(3.23)	(0.37)	(11.30)	(2.44)
Indiv. Full Service	0.01	0.01	0.01	0.02	0.02
	(2.00)	(1.31)	(1.03)	(3.83)	(1.58)
Indiv. Discount	-0.13	-0.12	-0.18	-0.14	-0.14
	(-15.65)	(-5.66)	(-6.18)	(-16.04)	(-6.54)
Indiv. Day Trading		0.18	0.12		0.19
		(6.92)	(3.94)		(6.79)
Institutional	0.18	0.19	0.18	0.18	0.20
	(29.10)	(11.80)	(7.38)	(28.94)	(11.48)
Largest I-banks	0.08	0.08	0.07	0.07	0.09
	(21.81)	(8.31)	(5.19)	(20.64)	(8.49)
Hedge Fund		-0.07	-0.01		-0.09
		(-7.66)	(-0.64)		(-6.87)
Mixed	0.13	0.11	0.11	0.14	0.13
	(25.50)	(10.21)	(4.77)	(29.23)	(10.39)
D_{News} x *Indiv. General*				0.12	0.01
				(3.57)	(0.45)
D_{News} x *Indiv. Full Service*				0.39	-0.03
				(0.83)	(-1.25)
D_{News} x *Indiv. Discount*				-0.11	0.02
				(-1.11)	(0.80)
D_{News} x *Indiv. Day Trading*					0.00
					(0.22)
D_{News} x *Institutional*				0.01	0.01
				(0.17)	(0.57)
D_{News} x *Largest I-banks*				-0.07	-0.01
				(-0.91)	(-0.57)
D_{News} x *Hedge Fund*					0.00
					(0.16)
D_{News} x *Mixed*				0.05	-0.01
				(3.24)	(-0.78)
Avg. N	244.8	244.4	257.7	244.8	244.4
Adj. R^2	0.185	0.231	0.194	0.233	0.265

Internet Appendix to "Who Drove and Burst the Tech Bubble?"*

This appendix includes supplemental data facts, analyses, tables, and figures. Sections A to I provide supplemental details on data construction and measures used in the published paper. Section J presents supplemental analyses on the relations between investor imbalances and stock returns at the cross-sectional and market level. Figures IA.1 to IA.15 and Tables IA.I to IA.IX are discussed but not reported in detail in the published paper. Figures IB.1 and IB.2 and Tables IB.I and IB.II are discussed in the Internet Appendix. Figures IB.3 to IB.13 and Tables IB.III to IB.IX, for interested readers, are supplemental results not mentioned in the paper or the Internet Appendix.

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A. Composition of the Technology Sector for Quarterly Analysis

We apply the following sample selection criteria for our quarterly analyses using the full sample of Nasdaq technology firms: 1) We include IPOs issued during quarter q in the sample. When we calculate net buying for IPO quarter q, we set initial holdings to zero. 2) For a firm delisted during quarter q, we set its quarter-end holdings to zero when we calculate net buying for quarter q. We further match delistings with M&A data from SDC to identify cases where non-technology firms take over technology firms in quarter q. For those cases, we multiply their passive holdings (calculation described in Section II.B) of quarter q by 1 minus the percentage of stock payment. This avoids counting the non-tech stock payment as active selling of technology firms. 3) Typically, each quarter fewer than five firms enter and exit the technology sector because of changes in SIC codes, exchange listing, or share codes. However, in September 2000, 91 (40) firms enter (exit) the sector, mostly due to changing SIC codes. For firms entering (exiting) during quarter q due to these changes, we include holdings data for both quarters q-1 and q to avoid spurious net buying changes driven by changes in the composition of the sector. For some tests we only include firms that are in the technology sector at both the quarter-beginning and the quarter-end. This sample therefore excludes IPOs, delistings, and firms moving into and out of the technology sector over a quarter.

B. Thomson Financial 13f Institutional Holdings Data

We correct Thomson Financial 13f institutional holdings data as follows: 1) We identify stock splits for which Thomson Financial incorrectly changes shares outstanding in quarter q even though the split occurs in quarter q+1 by comparing shares outstanding from Thomson Financial and CRSP. When deviations greater than 15% exist, we examine 13f holdings for consistency. When both Thomson shares outstanding and 13f holdings are inflated, we assume consistency within Thomson and that the percentage ownership is not affected.[1] When only Thomson shares outstanding are inflated (0.3% of observations), we use CRSP shares outstanding. 2) If an institution reports holdings in quarters q-1 and q+1, but not in quarter q (3.3% of observations), we backfill positions in quarter q using shares held and change in shares reported in quarter q+1. 3) Many institutions are improperly classified into the "others" group in 1998 and beyond. For example, in the first quarter of 1999, the number of independent investment advisors drops from 1159 to 183, while "others" jumps from 242 to 1125. We therefore ignore institution type changes in 1998 and beyond if the new institution type is listed as "others". For hedge funds our primary means of identification is a grouping from LionShares with the addition of 306 firms from Griffin and Xu (2009).[2]

C. Nasdaq Trading Data

In the Nasdaq trading data, each side of the trade is classified as to whether the market maker is trading for its own account (as a principal) or handling a trade for a brokerage client (as an agent). The data includes both trades reported "to the tape" and unreported Nasdaq clearing records. We check for consistency between the reported and unreported records when assigning whether a market maker acted as a principal or an agent for each leg of the trade. We exclude unclassified trades that are inconsistently reported in any leg of the routing report. Additionally, we use unreported records to trace ECN and regional exchange trades back to the originating broker, where possible. For example, if a client at brokerage A buys through an ECN and meets a client from brokerage B, then the trade can be matched as a brokerage A (client buy) to brokerage B (client sell) trade. Unfortunately, we are unable to match parties in some ECN and regional exchange trades, likely because the data did not include complete details related to clearing (based on investigating unmatched ECN trades and consulting with Nasdaq officials). For technology stocks, there are 5.51% client-to-client, 57.62% client-to-market maker, 9.38% market maker-to-market maker, 18.65% unmatched ECN, and 8.84% unclassified trades in terms of value. In our analysis, we focus on client trades and only use client-to-client and client-to-market maker trades.

Excluding unmatched ECN trades will not affect the overall trading imbalance of a group unless that particular group systematically uses ECNs for either buying or selling stocks. It is reasonable to assume that no group routes orders on only one side of the market to ECNs, but we also check for robustness by including unmatched ECN and regional exchange trades in the analysis. This approach barely altered our findings on institutional trading. In addition, for eight of the nine investor groups, imbalances measured with or without unmatched ECN and regional exchange trades are highly correlated (above 0.75) with the exception of day traders, consistent with the propensity of day traders to utilize ECNs. However, when we exclude unmatched ECN trades, we find that day traders trade with short-term momentum (consistent with Battalio, Hatch, and Jennings (1997) and Harris and Schultz (1998)) suggesting our dataset is reasonably representative of day trader positions as well.

D. Merged Mutual Fund Sample

We obtain Thomson Financial N-30D data on fund number, investment objective, report date, CUSIP, shares held, and change in shares since last report. We include stocks with ordinary common shares (CRSP share codes 10 or 11) listed on NYSE, Amex or Nasdaq. We delete 8.35% of observations for which the difference between shares held for the current report and shares held for the previous report is not equal to change in shares since last report after controlling for stock splits using CRSP split factors. We refer to the remaining observations as the mutual fund holdings data. For 98.24% of observations in the mutual fund holdings data, the report date is the same as the end of the month. For the remaining 1.76%, we assume the report date was at the end of the current month if the mutual fund reported after mid-month and at the end of the previous month otherwise.

We obtain monthly data on returns and total net asset values from CRSP Mutual Funds database and match to mutual fund holdings using Mutual Fund Links. We require that data on mutual fund returns and assets are available for all classes of the fund for all months between the previous and current report. Based on the dollar value of holdings, the intersection of N-30D holdings and CRSP returns and assets data is 54.64% of mutual fund holdings data. We then take the subset of funds that report at consecutive quarter ends so that the timing of our mutual fund data matches quarterly 13f institutional holdings data, leaving our final sample at 22.58% of mutual fund holdings data. We extrapolate the flows for this subset to the aggregate 13f mutual fund sector as we discuss below. Using the whole intersection (54.64%) for robustness yields proportionally lower flow estimates.[3]

To identify index, sector, and technology funds, we use the Standard and Poor's detailed objective name, style name, and specialist name, ICDI's fund objective code, Wiesenberger objective code, and both CRSP Mutual Funds and Thomson Financial N-30D fund names. We identify a mutual fund as an index fund if the Standard and Poor's specialist name includes the keyword 'index', or the fund name from CRSP Mutual Funds includes one of the keywords 'index', 'indx', 'idx', 'dow 30', '100', '500', or 'russell 2000', or the Thomson Financial N-30D fund name includes one of the keywords 'index' or 'indx'. We identify sector funds and technology funds in a similar manner and describe details in the header of Figure IA.5.

E. Applying Mutual Fund Flows to 13f Mutual Fund Families

We calculate total flow-induced trading for our merged mutual fund sample and project to aggregate 13f mutual fund families for both technology sector-level and cross-sectional analysis.[4] We first calculate flow ratio for mutual fund j for quarter q as:

$$FlowRatio_{j,q} = \frac{TNA_{j,q}}{TNA_{j,q-1} \times (1 + R_{j,q})} \qquad \text{(IA.1)}$$

where $TNA_{j,q}$ is end-of-quarter total net asset value and $R_{j,q}$ is return during the quarter.

For each firm i, we calculate quarterly aggregate flow-induced net buying for the merged mutual fund sample using the following formula:

$$NBFlows_{i,q}^{Merged} = \frac{\sum_j (Shares_{i,j,q-1} \times FlowRatio_{j,q}) - \sum_j Shares_{i,j,q-1}}{Shrout_{i,q}} \qquad \text{(IA.2)}$$

where $Shares_{i,j,q-1}$ is end-of-quarter shares held and $Shrout_{i,q}$ is end-of-quarter total shares outstanding.

We then compute aggregate flow-induced net buying for the technology sector for our merged mutual fund sample in quarter q, $NBFlows_{q}^{Merged}$, as the value-weighted average of $NBFlows_{i,q}^{Merged}$, where weights are market capitalizations at the end of quarter q. Then we calculate aggregate flow-induced net buying for the technology sector for 13f mutual fund families as follows:

$$NBFlows_{q}^{13f} = NBFlows_{q}^{Merged} \times \frac{Holdings_{q}^{13f}}{Holdings_{q}^{Merged}} \quad \text{(IA.3)}$$

where $Holdings_{q}^{13f}$ and $Holdings_{q}^{Merged}$ are end-of-quarter total dollar value of holdings in the technology sector for 13f mutual fund families and the merged mutual fund sample, respectively. For demand analysis in dollar values (Figure 2), we further convert $NBFlows_{q}^{13f}$ into a dollar amount by multiplying by total market capitalization of the technology sector at the end of quarter q.

This approach projects the impact of flows for merged mutual fund sample to 13f mutual fund families based on the ratio of technology holdings of 13f fund families and merged fund sample. For example, for any quarter q if aggregate flow-induced net buying of the merged mutual fund sample is 0.2% of market capitalization of the technology sector, and if the holdings in the technology sector of 13f mutual fund families is five times that of the merged mutual fund sample, then our approach will calculate flow-induced net buying of 13f mutual fund families as 1%.

For event studies around individual stock peaks (Figure 7), we calculate flow-induced net buying for event firms in the same way except that: 1) For each event quarter q, we calculate $NBFlows_{q}^{Merged}$ as the simple average of the flow-induced buying of each event firm i, $NBFlows_{i,q}^{Merged}$; 2) in equation (5) we use the ratio of total dollar holdings in event firms rather than total dollar holdings in the technology sector.

For cross-sectional analysis (Table II) we calculate flow-induced net buying for individual firms in the same way except that we convert flow-induced net buying of the merged mutual fund sample for firm i, $NBFlows_{i,q}^{Merged}$, to 13f mutual fund families using the ratio of total dollar holdings in firm i at the beginning of quarter q. We winsorize flow-induced net buying of individual firms at the 99.9% cutoff point to eliminate a small number of outliers.

F. Flows for 13f Institution Types Other Than Mutual Funds

We estimate flows into 13f institutions other than mutual funds using quarterly holdings and stock returns, first calculating the flow ratio for 13f institution k in quarter q using the following formula:

$$FlowRatio_{k,q} = \frac{\sum_i Holdings_{i,k,q}}{\sum_i (Holdings_{i,k,q-1} \times (1 + R_{i,q}))} \quad \text{(IA.4)}$$

where $Holdings_{i,k,q}$ is the end-of-quarter dollar value of holdings in stock i for 13f institution k and $R_{i,q}$ is the buy-and-hold return on stock i during quarter q. To control for outliers we winsorize flow ratios at the 5th and 95th percentiles.[5] We then decompose quarterly net buying of 13f institution k in stock i over quarter q into flow-induced net buying $NBFlows_{i,k,q}$ and net active buying $NetActiveBuying_{i,k,q}$:

$$NBFlows_{i,k,q} = \frac{Holdings_{i,k,q-1} \times (1 + R_{i,q}) \times (FlowRatio_{k,q} - 1)}{MV_{i,q}} \quad \text{(IA.5)}$$

$$NetActiveBuying_{i,k,q} = \frac{Holdings_{i,k,q} - (Holdings_{i,k,q-1} \times (1 + R_{i,q}) \times FlowRatio_{k,q})}{MV_{i,q}} \quad \text{(IA.6)}$$

where $MV_{i,q}$ is market capitalization of stock i at the end of quarter q.

We recognize that these flows will be noisy if the manager trades during the quarter or switches money between stock and non-stock sectors. We find that these flows are small (see Figure IB.1). Hence, unless otherwise stated, we set flow-induced net buying to zero for institution types other than mutual funds.

G. Flow-Induced Net Buying for AMG Technology and Aggressive Growth Funds

We obtain aggregate weekly dollar flows and asset values for technology and aggressive growth mutual funds from AMG Data Services. During the 1997-2002 period, AMG technology (aggressive growth) funds account for 69% (65%) of total assets of technology (aggressive growth) funds on average. We calculate flow-induced net buying for AMG funds using the following three steps: First, we calculate portfolio weights in technology stocks for technology and aggressive growth funds in the Thomson Financial N-30D database. We identify technology funds as funds with 'internet' or 'tech' (but not 'biotech') in their names and aggressive growth funds as those that are classified by Thomson as aggressive growth funds. We then compute portfolio weights in the technology sector for aggregate technology (aggressive growth) funds in each quarter. Second, we calculate flow-induced net buying of the technology sector for AMG funds assuming that managers distribute flows proportionally to the current portfolio. Specifically, we calculate weekly flow-induced net buying for technology (aggressive growth) funds as the product of total dollar flows of AMG technology (aggressive growth) funds and technology sector portfolio weights for technology (aggressive growth) funds at the beginning of the current quarter. Third, we generalize AMG results to all technology (aggressive growth) funds assuming that non-AMG technology (aggressive growth) funds trade like AMG funds and divide weekly flow-induced net buying of technology (aggressive growth) funds by 0.69 (0.65) to express net buying as a percentage of total market capitalization of the technology sector.

H. News Articles on Technology Stocks

We manually search the Factiva database and obtain all news articles on firms in the technology sector from January 1, 1997 to December 31, 2002. Following Tetlock, Saar-Tsechansky, and Macskassy (2008), we require that each story contain at least 50 words and mention the firm's name at least once within the first 25 words and at least twice within the full article. We account for name changes, mergers, etc. using the Factiva company name search function. We perform tests using news articles from top ten newswires which account for 94% of news with time stamps. The top ten newswires are Business Wire, PR Newswire, Dow Jones News Service, Reuters News, Federal Filings Newswires, Professional

Investor Report, Dow Jones Business News, Select Federal Filings Newswires, Associated Press Newswires, and Dow Jones Online News. We include news articles from all sources for robustness tests.

I. Components of Supply

We calculate quarterly changes in the supply of technology shares as follows: 1) IPOs: For technology IPOs issued during a quarter, the change in supply is calculated as the total market capitalization of IPO firms at the end of the quarter (excluding insider ownership). 2) Delistings: For technology firms delisted during a quarter, we first calculate delisting value as the product of the firm's market capitalization at the beginning of the quarter (excluding insider ownership) and buy-and-hold returns from the beginning of the quarter to the delisting date. We incorporate delisting returns into the delisting value following Shumway (1997) and assign -30% to a missing delisting return if the delisting is performance related. We then calculate the change in supply as the total value of all technology delistings over the quarter. 3) Trading by insiders: For every existing technology firm, we calculate the dollar value of insider trading as the product of change in shares held by insiders over the quarter (adjusted for stock splits) and quarter-end stock price. Then, we calculate the change in supply as the sum of the dollar value of insider trading for all technology firms. Insider selling is reported as a positive change in supply and insider buying is reported as a negative change in supply. 4) Changes in shares outstanding for existing firms: For every existing technology firm, we first calculate the dollar change as the product of change in shares outstanding over the quarter (adjusted for stock splits) and quarter-end stock price. Then, we calculate the change in supply as the sum of dollar changes for all technology firms. We further classify this category into four sub-groups using SDC data: i) share repurchases, ii) technology firms using stock payments to acquire interests in other firms, iii) SEOs, and iv) other share changes.

We use the following procedures to match CRSP changes in shares outstanding with the four sub-groups:

Step 1: We first obtain SDC data on repurchases and match with negative shares changes. For each repurchase, we take all the negative shares changes from CRSP in the 90-day window from repurchase day and calculate for each negative share change the percentage deviation from SDC value or shares of repurchase. When both SDC repurchase value and shares are available, we calculate deviations from both and count the smaller one. We then match repurchase with the negative shares change that has the smallest deviation. If a repurchase is followed by another repurchase of the same firm within 90 days, we use the time window between the repurchase and the next repurchase day. We matched 27 repurchases with shares changes.

Step 2: We then obtain SDC data on technology SEOs and mergers (or acquiring interests) that involve stock payments from a technology firm. The latter group includes acquiring major interests with disclosed value and minor interests where acquirers are technology firms. We calculate the amount of stock payments using SDC deal values and percentage of stock payments. When an acquirer conducts more than one merger on the same day, we sum up values of stock payments. We then match 122 SEOs and 606 (603 acquiring major interests and 3 acquiring minor interests) stock payments with positive shares changes in the 90-day post-event window using the same approach as matching repurchases.

Step 3: We obtain mergers from SDC with undisclosed deal values. Since their deal values and therefore the amount of stock payments are not available, we match them with CRSP share changes that are not matched with events in step 1 and 2. Specifically, for each event we take all the positive shares changes that are unmatched with SEO or stock payments in the 90-day post-event window. If the biggest percentage change in shares is above 5% then we match it to the merger with undisclosed value. We match 78 undisclosed mergers with shares changes, which are relatively smaller deals than those with disclosed values. For robustness, we also repeat the tests by dropping undisclosed mergers, and the results are very similar.

The category of 'other share changes' includes all other changes in shares outstanding that are not matched with SDC events. There are a large numbers of these changes but the magnitudes are small (the median change is 0.4% of shares outstanding, and the 75th percentile is 1.5%), which is consistent with insiders exercising options over the bubble period. We lump repurchases with 'other share changes' for brevity because repurchases are rare over this period.

J. Investor Imbalances and Stock Returns: Cross-Sectional and Market Level Evidence

This section presents our analyses on which investor groups move with and follow prices both in the cross-section and at the technology sector level, predominantly at short-term frequencies, during the run-up period.

J.1. Cross-Sectional Evidence

In addition to the cross-sectional analyses regarding news articles by sorting and regressions, we also examine investor trading in the cross-section by sorting on contemporaneous and past returns.

The sorting approach allows for asymmetric behavior in response to up and down price moves and an examination of the magnitude of trading. During the run-up period from January 1997 to March 27, 2000 we examine average investor imbalances in technology stocks sorted by contemporaneous and lagged daily stock returns. In Panel A of Table IB.I, we report daily trading imbalances, by market capitalization quartile, for the nine investor groups for stocks with negative and positive contemporaneous returns in excess of technology index return.

For small stocks, all individual investor groups trade in the same direction as contemporaneous returns. Likewise, institutions buy contemporaneous winners and sell contemporaneous losers in the smallest size quartile, with this pattern strengthening with an increase in market capitalization. In the largest size quartile, for stocks with positive returns, for instance, the net buying of four institutional groups totals 2.55 one hundredths of a percent of shares outstanding or 1.86% of daily trading volume. In contrast, institutional groups in aggregate sell 2.31 one hundredths of a percent for stocks with negative returns, which accounts for 2.04% of daily trading volume.[6]

Interesting differences emerge among individual investors for large firms, with day traders and the individual general group trading in the same direction as returns while individual discount and full-service brokerage clients trade in the opposite direction. This net selling pattern is consistent with trades motivated by the disposition effect (Grinblatt and Keloharju (2001)), individual investors utilizing passive limit orders that are executed when prices move quickly (Linnainmaa (2010)), and individuals supplying liquidity (Kaniel, Saar, and Titman (2008)). Among institutional groups, hedge funds and derivatives traders also provide liquidity in large winners but the three largest I-banks (where most of the hedge fund order flow is cleared) move strongly with contemporaneous returns.

Panel B of Table IB.I shows that individuals chase past returns in the smallest two size quartiles. For the largest two quartiles individuals become contrarians to past returns, whereas institutions chase past stock price movements. The magnitude of chasing past returns is much smaller than the contemporaneous relation.

Panel C presents investor imbalances across contemporaneous excess returns at the weekly level. Institutions move with contemporaneous returns, especially in large stocks. In contrast, individuals move with contemporaneous returns in the smallest size quartile but move against contemporaneous returns in the two largest size quartiles. Panel D further shows that investor responses to lagged returns at the weekly level are consistent with daily patterns. In the top two size quartiles, institutions chase the previous week's returns while individuals are contrarians.[7]

J.2. Technology Sector-Level Evidence

Market or sector-level trading patterns could differ significantly from cross-sectional trading patterns. For example, if institutions or individuals shuffle investments across technology stocks while keeping total technology investments fixed, one would see little relation between cross-sectional and aggregate technology trading patterns. Therefore, we further analyze investor trading at the aggregate technology sector level.

We first use sorts to examine the contemporaneous and lagged relation between technology index movements and aggregate investor trading at the daily and weekly frequencies. We divide all trading days during the run-up period into four groups—those with index returns below negative 2.5%, above 2.5%, and two intermediate return intervals. Panel A of Figure IB.2 shows daily aggregate imbalances across contemporaneous value-weighted technology returns. Institutions, largest I-banks, hedge funds, day traders, and mixed brokerage clients exhibit strong positive relations with contemporaneous technology returns. However, the magnitudes of these relations vary considerably. Hedge fund imbalances are noticeably smaller than others because of their generally smaller trading volume. The largest I-bank clients sell with the greatest intensity on down days. In contrast, aggregate net buying of discount brokerage clients and to a lesser extent full service investors are negatively related with technology index returns. Panel A also presents weekly net trading activity sorted on contemporaneous weekly returns. Similar to daily analysis, institutions and the largest I-bank clients move with contemporaneous index returns while discount brokerage clients move against index returns.

Panel B of Figure IB.2 presents aggregate imbalances sorted on lagged daily and weekly index returns. For all investor groups except general institutions, daily net buying activity conditioned on lagged index return is less pronounced than that conditioned on contemporaneous returns. Individuals generally buy slightly more in response to lagged negative returns.[8] Institutions, the largest I-bank clients, and, to a much lesser extent, the mixed group respond positively to lagged daily technology index returns. At the weekly level, however, institutions are contrarians with respect to previous week's returns.

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Footnotes

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[1] Thomson reports change in shares held ('CHANGE' variable) for quarter q calculated as the difference between holdings for quarters q and q-1 adjusting for stock splits. By matching quarterly changes with quarterly holdings, we infer (and adjust for) erroneously inflated quarterly holdings due to stock splits that actually occurred in a later quarter.

[2] We thank Christian Tiu for compiling an additional sample of hedge fund firms using predominantly FactSet's LionShares but also a few firms indentified by Stephanie Sikes through ADV forms.

[3] We repeat our major test in Figure 2 using all funds with holdings and flow data and find that total flow-induced trading from January 1997 to March 2000 is 80.62% of the flow-induced trading using the sample in Figure 2. To include funds that do not report at consecutive quarter ends, one must make additional assumptions about how holdings change through time. In this case, we assume that flow-induced net buying and net active buying between two reports are evenly spread over the period. Since we project fund flows to 13f fund families reporting on a quarterly basis, we believe the results using the merged mutual fund sample are more accurate and report those in the paper.

[4] The dollar value of holdings for our merged mutual fund sample is 22.65% of 13f mutual fund families (manager type=3).

[5] Since 13f data include stock holdings only, outliers can occur if an institution moves funds from non-stock investments into stocks or vice versa.

[6] Market makers offset these net imbalances out of their inventory. Client imbalances are slightly positive due to unmatched and inconsistently reported trades as discussed in Internet Appendix C.

[7] We also examine imbalances for contemporaneous or lagged firm returns above positive 2.5% and below negative 2.5% (see Table IB.II) and find similar results.

[8] Similarly, Dhar and Goetzmann (2006) find that in 1999 and 2000 individual investors are largely contrarian. Shiller (2000) documents that in 1999, 56% (19%) of U.S. individual investors thought that a one-day drop of three percent would be followed by an increase (decrease) in prices – a big change in opinion from 35% (34%) in 1989.

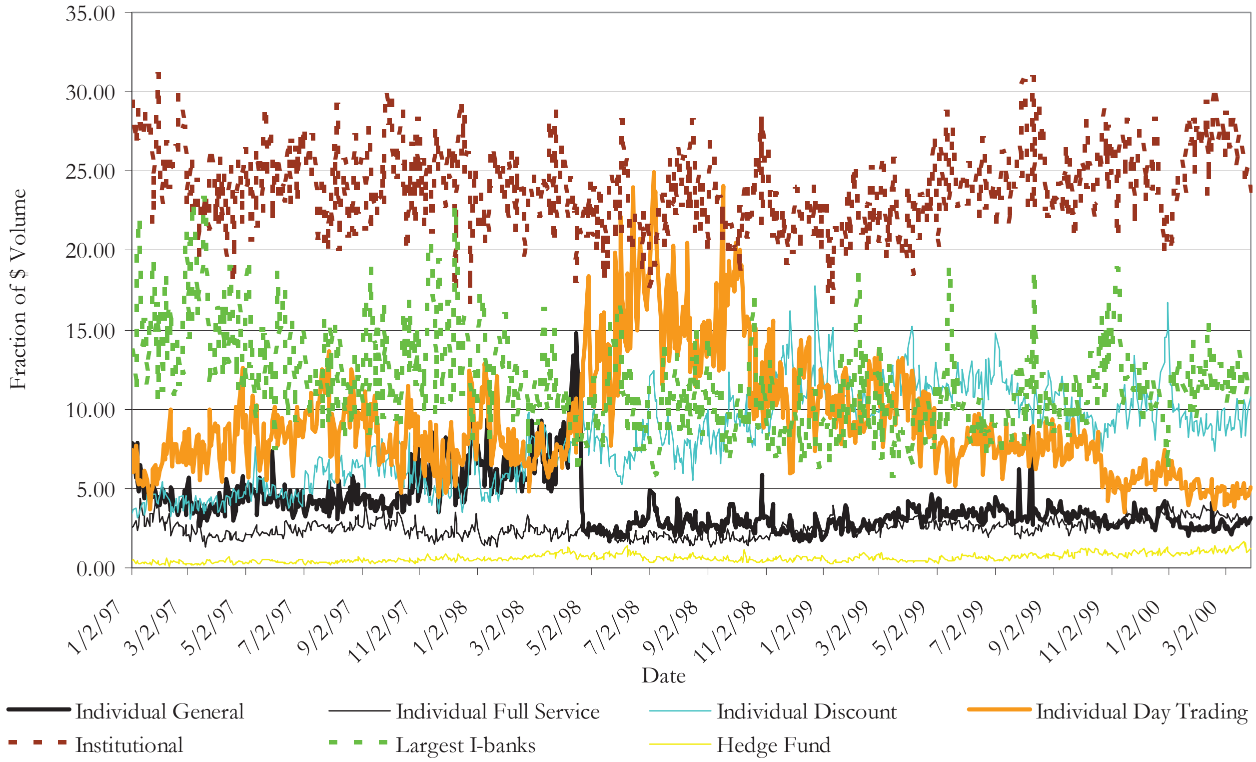


Figure IA.1. Investor Trading Volume. This figure plots the fraction of total dollar value of trading ($ volume) for the technology sector that can be attributed to various investor groups for the period from January 2, 1997 to March 27, 2000. The technology sector is comprised of all Nasdaq stocks with ordinary common shares (CRSP share codes 10 or 11) and 3-digit SIC code 737, which stands for computer programming, data processing, and other computer-related services. A detailed description of the method used for classifying the investor groups is in Appendix B.

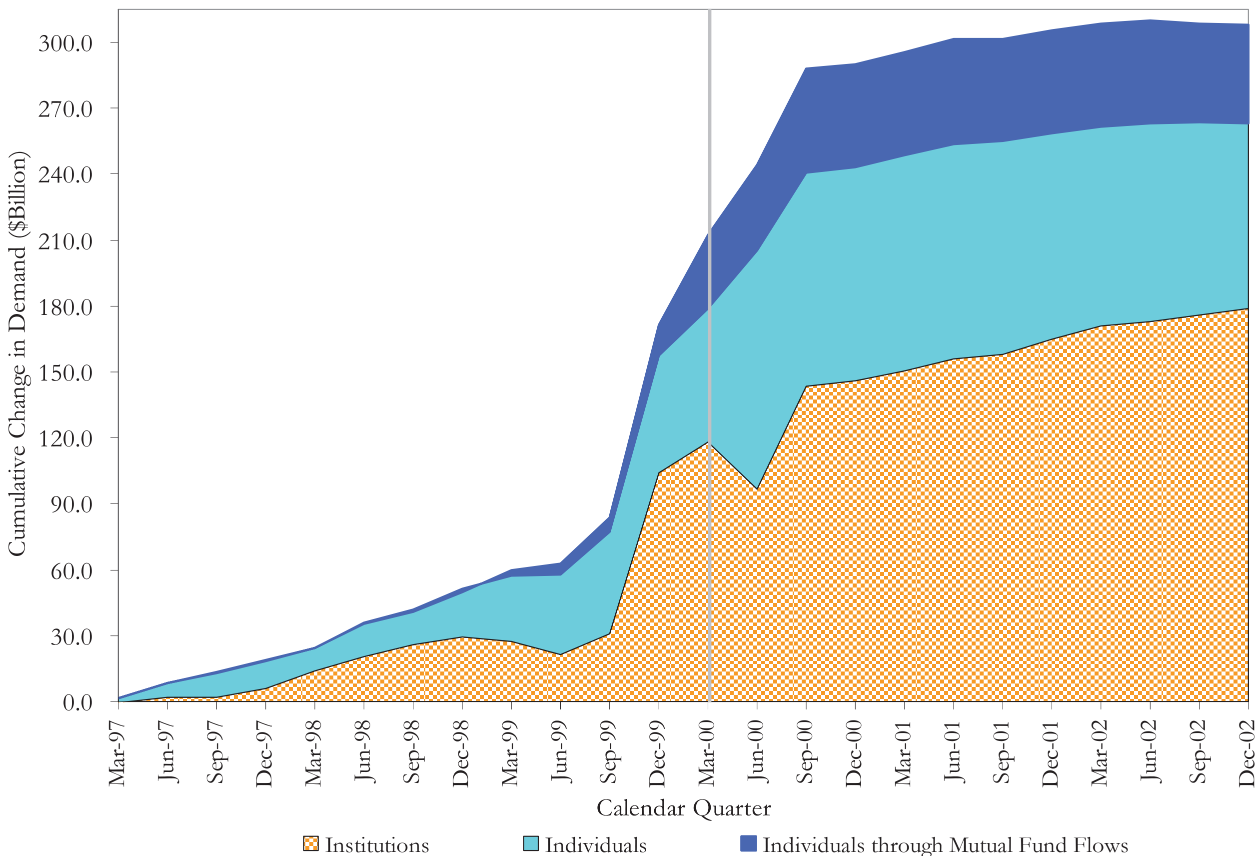


Figure IA.2. Cumulative Change in Demand for Technology Stocks: Including IPOs and Delistings. We calculate quarterly changes in demand for Nasdaq technology stocks (3-digit SIC code=737 with ordinary common shares, excluding Microsoft) during the 1997-2002 period. To calculate quarterly change in demand (net active buying) for an investor group, we first take the difference between end-of-quarter technology holdings and buy-and-hold value of beginning-of-quarter technology holdings. The individual group is net of insiders. We then isolate the change in demand induced by mutual fund flows from change in demand by institutions. Change in demand induced by mutual fund flows is calculated by applying mutual fund flows for merged CRSP-Thomson Financial sample to 13f mutual fund families. We set beginning-of-quarter holdings equal to zero for an IPO issued during the quarter. We set buy-and-hold value of beginning-of-quarter holdings equal to the product of beginning-of-quarter holdings and quarterly return until the delisting day (including delisting returns) for a delisting during the quarter. We describe the details of our approach in Internet Appendices A and E.

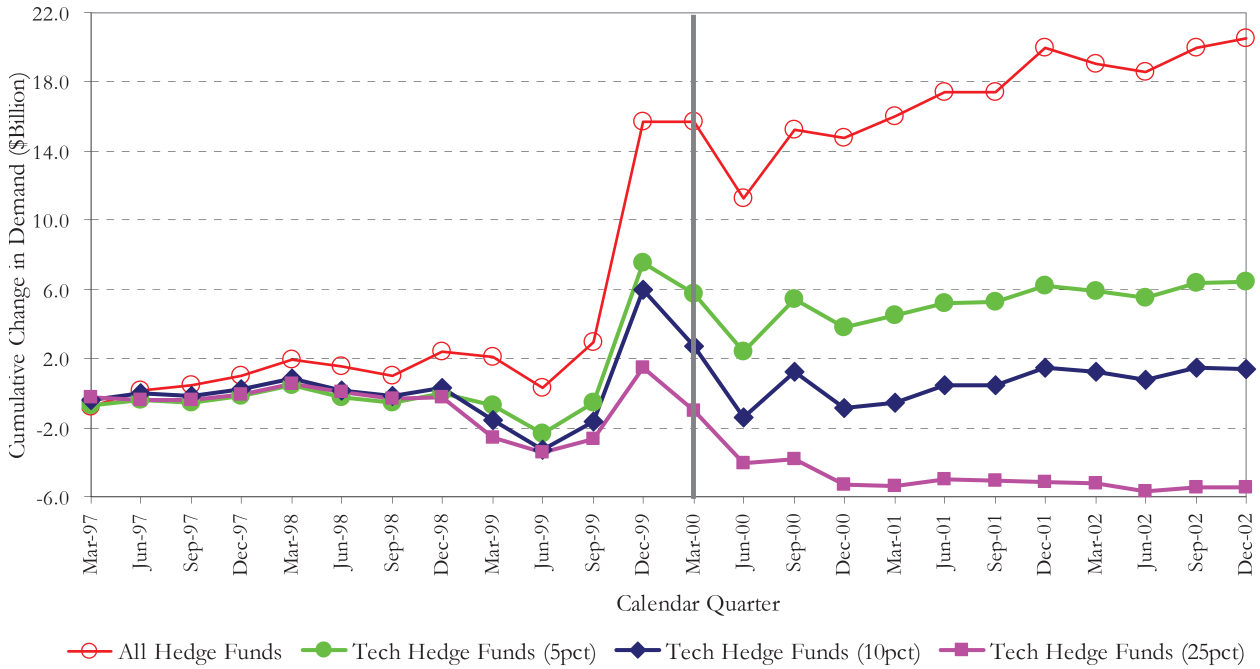


Figure IA.3. Cumulative Change in Demand for Technology Stocks: Technology Hedge Funds. We calculate quarterly changes in demand by technology hedge funds for Nasdaq technology stocks (3-digit SIC code=737 with ordinary common shares, excluding Microsoft) during the 1997-2002 period. We require a firm to be in the technology sector at both the beginning and the end of the quarter to be included in the sample. Quarterly change in demand is the difference between end-of-quarter technology holdings and buy-and-hold value of beginning-of-quarter technology holdings. We identify 257 technology hedge funds whose portfolio weights in technology stocks for the first quarter of 1997 (or the first quarter in 13f sample for a new fund) are higher than the 5th percentile of the corresponding weights for technology mutual funds (Internet Appendix G describes how we identify technology mutual funds). For robustness, we also identify 210 and 94 technology hedge funds using 10th and 25th percentile cutoffs. We also plot cumulative change in demand for the whole hedge fund sample for comparison.

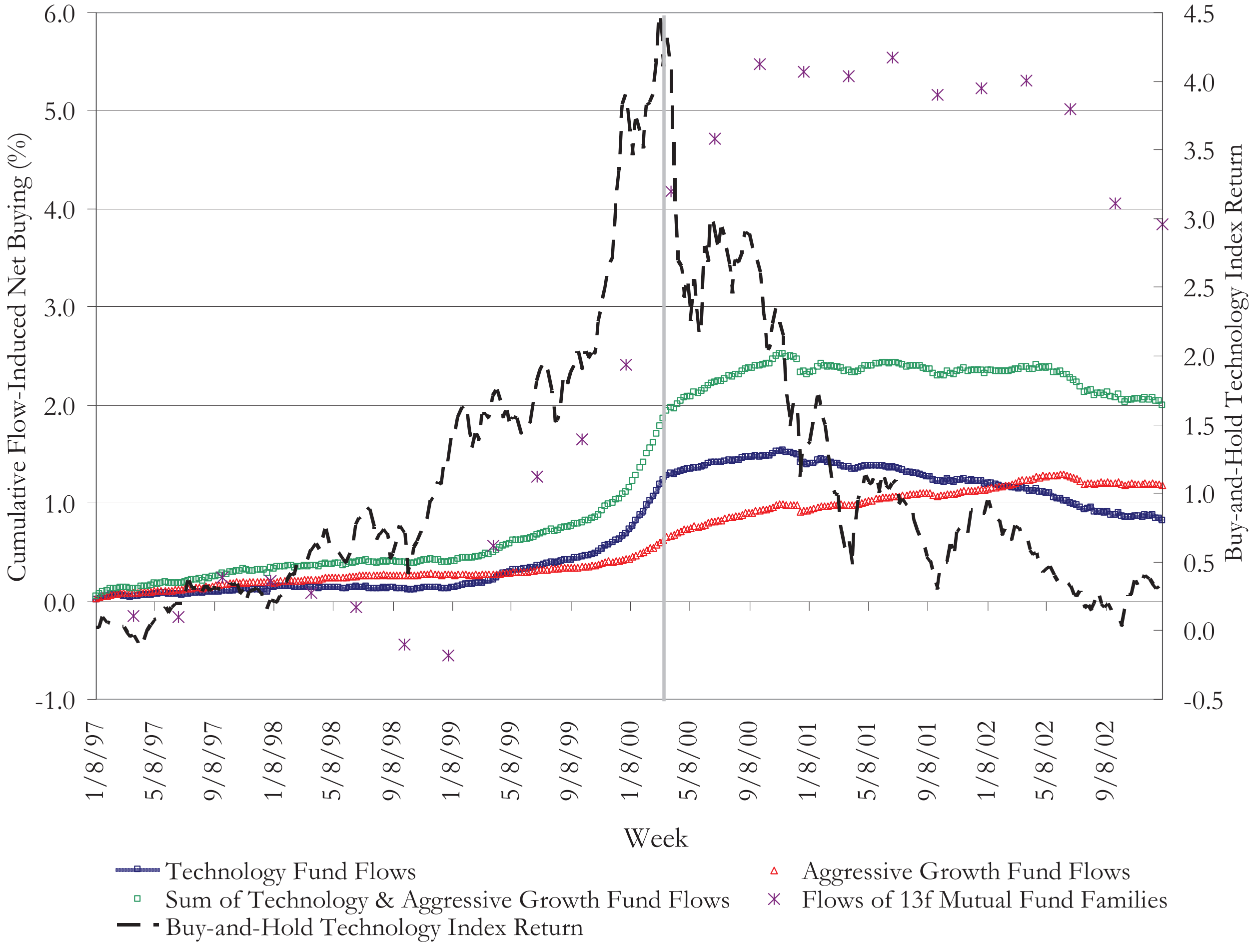


Figure IA.4. Cumulative Net Buying Induced by Mutual Fund Flows. This figure plots cumulative net buying induced by flows of 13f mutual fund families, AMG technology mutual funds (which represent 69% of technology fund assets), and AMG aggressive growth funds (which represent 65% of aggressive growth fund assets) for Nasdaq technology stocks (3-digit SIC code=737 with ordinary common shares, excluding Microsoft) during the 1997-2002 period. We calculate quarterly net buying induced by flows of 13f mutual fund families, and weekly net buying induced by flows of AMG technology and aggressive growth funds. Quarterly (weekly) flow-induced net buying is expressed as a percentage of total market capitalization of the technology sector at the end of the quarter (week). We then plot cumulative net buying during the 1997-2002 period. The details of our calculation of flow-induced net buying are described in Internet Appendices E and G.

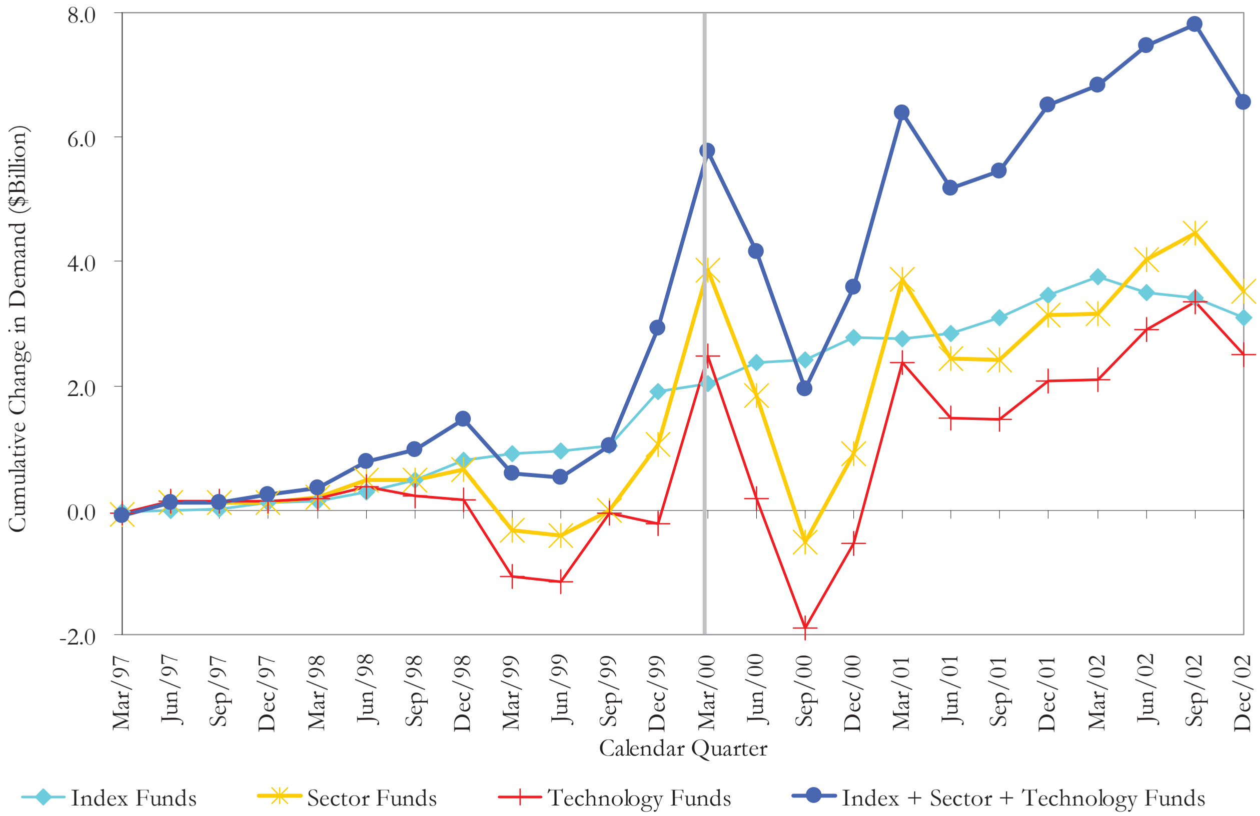


Figure IA.5. Cumulative Change in Demand for Technology Stocks: Index Mutual Funds, Sector Mutual Funds, and Technology Mutual Funds. We calculate quarterly changes in demand for Nasdaq technology stocks (3-digit SIC code=737 with ordinary common shares, excluding Microsoft) for index mutual funds, sector mutual funds, and technology mutual funds during the 1997-2002 period. We require a firm to be in the technology sector at both the beginning and the end of the quarter to be included in the sample. Quarterly change in demand is the difference between end-of-quarter technology holdings and buy-and-hold value of beginning-of-quarter technology holdings. We further subtract demand induced by fund flows. Internet Appendix E describes how we calculate flow-induced demand. To identify index, sector, and technology funds, we use the Standard and Poor's detailed objective name, Standard and Poor's style name, Standard and Poor's specialist name, ICDI's fund objective code, Wiesenberger objective code, and fund name variables from the CRSP Mutual Funds database and fund names from Thomson Financial N-30D data. We identify a mutual fund as an index fund if the Standard and Poor's specialist name variable includes the keyword 'index', or the fund name from the CRSP Mutual Funds database includes one of the keywords 'index', 'indx', 'idx', 'dow 30', '100', '500', or 'russell 2000', or the fund name from Thomson Financial N-30D data includes one of the keywords 'index' or 'indx'. We identify a mutual fund as a sector fund if the Standard and Poor's detailed objective name variable equals 'Equity USA Misc Sectors', or the Standard and Poor's style name variable equals 'Equity Sector', or the Standard and Poor's specialist name variable equals 'Miscellaneous Sector', or the ICDI's fund objective code variable equals 'SF' (sector funds). We identify a mutual fund as a technology fund if the Standard and Poor's detailed objective name variable equals 'Equity USA Technology', or the Standard and Poor's style name variable equals 'Equity Information Technology Sector' or 'Equity Telecommunications Sector', or the Standard and Poor's specialist name variable equals 'Index ArcaEx Tech 100', 'Index GSTI Composite', 'Index MSCI US IM Info Tech', 'Index MSCI US IM Telecom Svcs', 'Index NYSE Arca Tech 100', 'Index PSE Technology 100', 'Information Technology', 'Internet', 'TMT', 'TMT (Technology Media & Telecom)', 'Technology', or 'Telecommunications', or the Wiesenberger objective code variable equals 'TCH' (technology sector), or the fund name from the CRSP Mutual Funds database includes one of the keywords 'internet', 'technology', or 'telecom' but not 'biotech', or the fund name from Thomson Financial N-30D data includes the keywords 'internet' or 'tech' but neither 'bio tech' nor 'biotech'. Since the dollar value of holdings in our merged mutual fund sample is 22.58% of mutual fund holdings in Thomson Financial N-30D data (more details provided in Internet Appendix D), we further divide the demand for each fund type by 22.58% assuming our merged fund sample is representative of the mutual fund universe. We also plot total cumulative change in demand by index, sector, and technology funds.

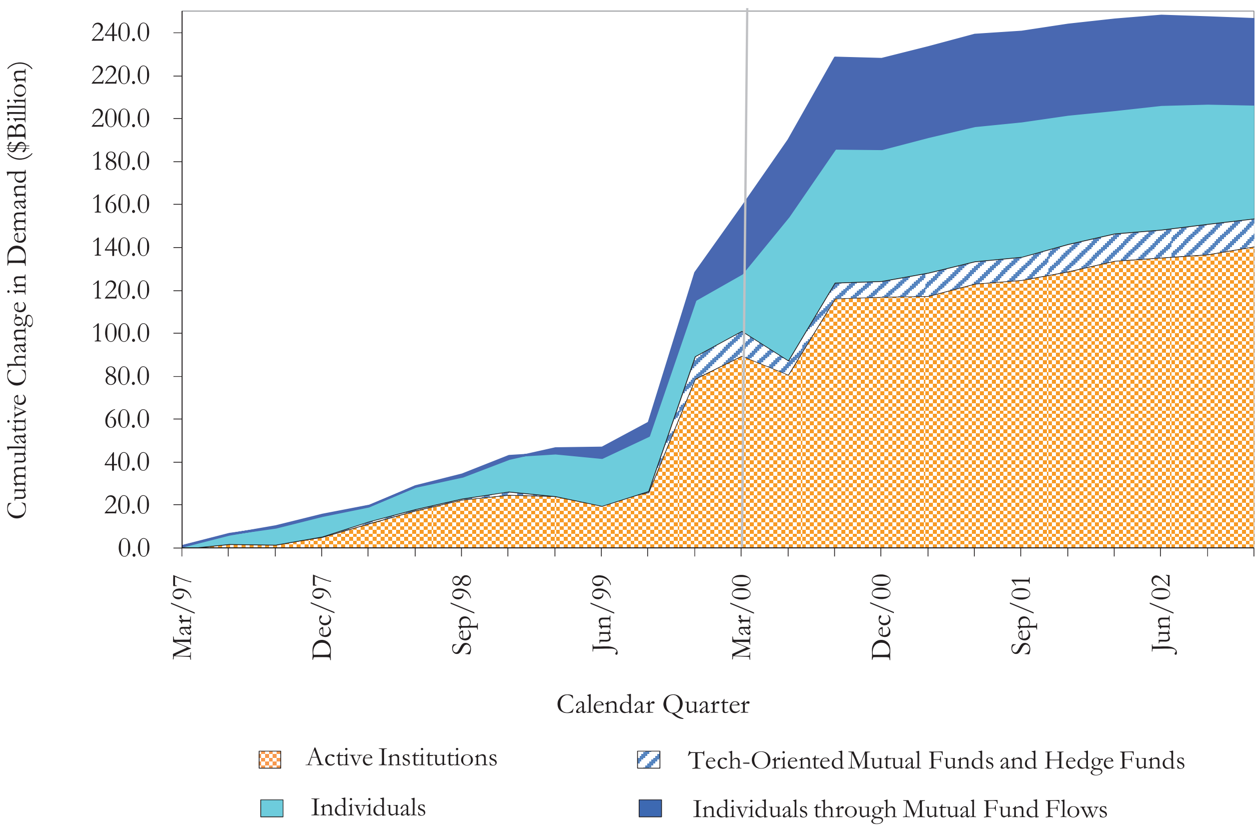


Figure IA.6. Cumulative Change in Demand for Technology Stocks: Examining Technology-Oriented Institutions and Active Institutions Separately. We calculate quarterly changes in demand for Nasdaq technology stocks (3-digit SIC code=737 with ordinary common shares, excluding Microsoft) during the 1997-2002 period. We require a firm to be in the technology sector at both the beginning and the end of the quarter to be included in the sample. Quarterly change in demand for an investor group is the difference between end-of-quarter technology holdings and buy-and-hold value of beginning-of-quarter technology holdings. The individual group is net of insiders. We further isolate the change in demand induced by mutual fund flows from change in demand by technology-oriented mutual funds and hedge funds and change in demand by active institutions. Change in demand induced by mutual fund flows is calculated by applying mutual fund flows for merged CRSP-Thomson Financial sample to 13f mutual fund families. We describe the details of our approach in Internet Appendix E. Technology-oriented mutual funds comprise index, sector, and technology funds. To identify such funds, we use the Standard and Poor's detailed objective name, Standard and Poor's style name, Standard and Poor's specialist name, ICDI's fund objective code, Wiesenberger objective code, and fund name variables from the CRSP Mutual Funds database and fund names from Thomson Financial N-30D data. We identify a mutual fund as an index fund if the Standard and Poor's specialist name variable includes the keyword 'index', or the fund name from the CRSP Mutual Funds database includes one of the keywords 'index', 'indx', 'idx', 'dow 30', '100', '500', or 'russell 2000', or the fund name from Thomson Financial N-30D data includes one of the keywords 'index' or 'indx'. We identify a mutual fund as a sector fund if the Standard and Poor's detailed objective name variable equals 'Equity USA Misc Sectors', or the Standard and Poor's style name variable equals 'Equity Sector', or the Standard and Poor's specialist name variable equals 'Miscellaneous Sector', or the ICDI's fund objective code variable equals 'SF' (sector funds). We identify a mutual fund as a technology fund if the Standard and Poor's detailed objective name variable equals 'Equity USA Technology', or the Standard and Poor's style name variable equals 'Equity Information Technology Sector' or 'Equity Telecommunications Sector', or the Standard and Poor's specialist name variable equals 'Index ArcaEx Tech 100', 'Index GSTI Composite', 'Index MSCI US IM Info Tech', 'Index MSCI US IM Telecom Svcs', 'Index NYSE Arca Tech 100', 'Index PSE Technology 100', 'Information Technology', 'Internet', 'TMT', 'TMT (Technology Media & Telecom)', 'Technology', or 'Telecommunications', or the Wiesenberger objective code variable equals 'TCH' (technology sector), or the fund name from the CRSP Mutual Funds database includes one of the keywords 'internet', 'technology', or 'telecom' but not 'biotech', or the fund name from Thomson Financial N-30D data includes the keywords 'internet' or 'tech' but neither 'bio tech' nor 'biotech'. Since the dollar value of holdings in our merged mutual fund sample is 22.58% of mutual fund holdings in Thomson Financial N-30D data (more details provided in Internet Appendix D), we further divide the demand for each fund type by 22.58% assuming our merged fund sample is representative of the mutual fund universe. We identify 257 technology hedge funds whose portfolio weights in technology stocks for the first quarter of 1997 (or the first quarter in 13f sample for a new fund) are higher than the 5th percentile of the corresponding weights for technology mutual funds. We plot cumulative changes in demand for technology-oriented mutual funds and hedge funds, active institutions, and individuals, and demand induced by mutual fund flows. Active institutions include all institutions other than technology-oriented mutual funds and hedge funds.

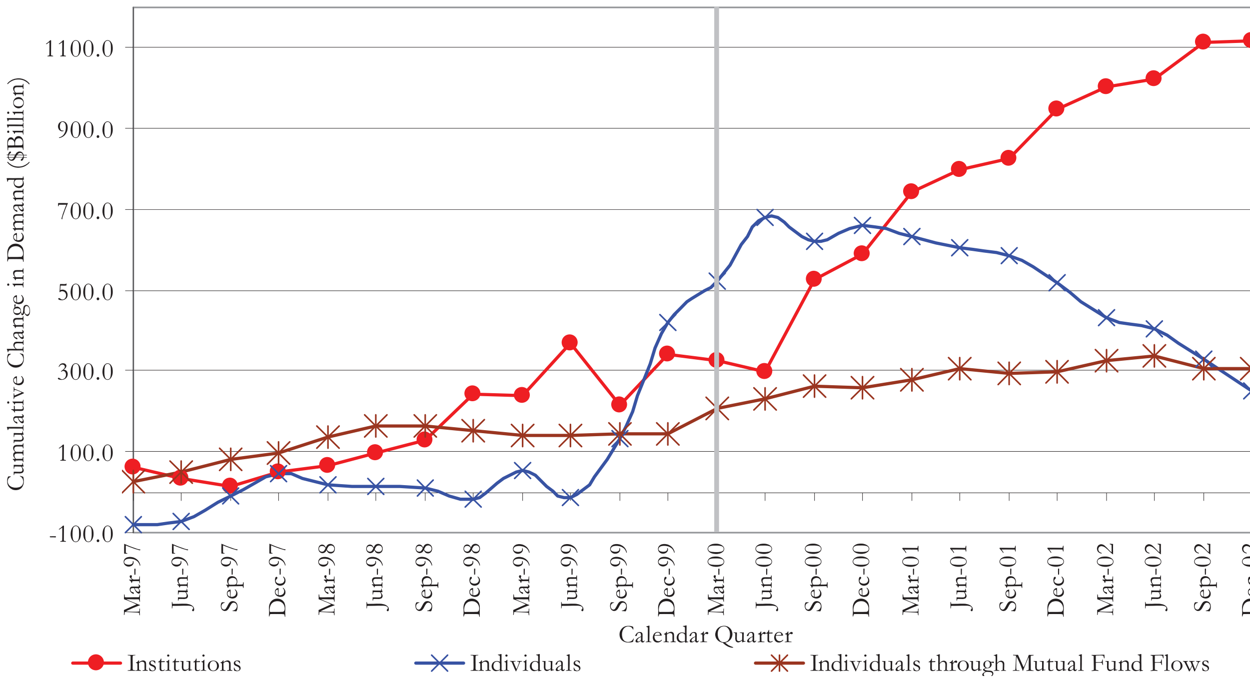
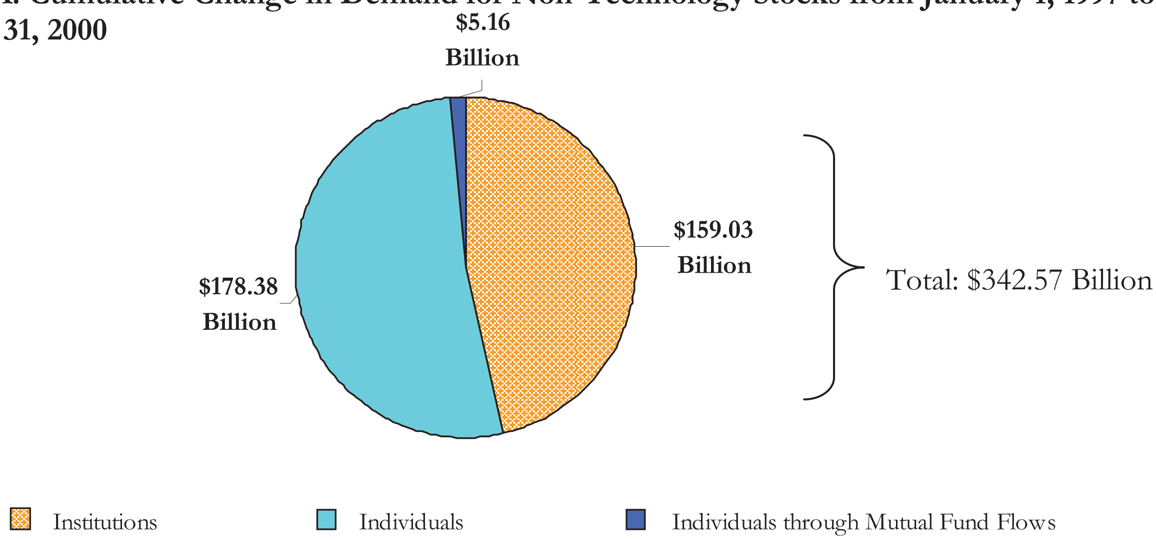


Figure IA.7. Cumulative Change in Demand for Non-Technology Stocks. We calculate quarterly changes in demand for non-technology stocks (3-digit SIC code≠737 or exchange code≠3) with ordinary common shares during the 1997-2002 period. We require a firm to be a non-technology stock at both the beginning and the end of the quarter to be included in the sample. Quarterly change in demand for an investor group is the difference between end-of-quarter non-technology holdings and buy-and-hold value of beginning-of-quarter non-technology holdings. The individual group is net of insiders. We further isolate the change in demand induced by mutual fund flows from change in demand by institutions. Change in demand induced by mutual fund flows is calculated by applying mutual fund flows for merged CRSP-Thomson Financial sample to 13f mutual fund families. We describe the details of our approach in Internet Appendix E.

Panel A: Cumulative Change in Demand for Non-Technology Stocks from January 1, 1997 to March 31, 2000



Panel B: Cumulative Change in Demand for Non-Technology Stocks from April 1, 2000 to March 31, 2001

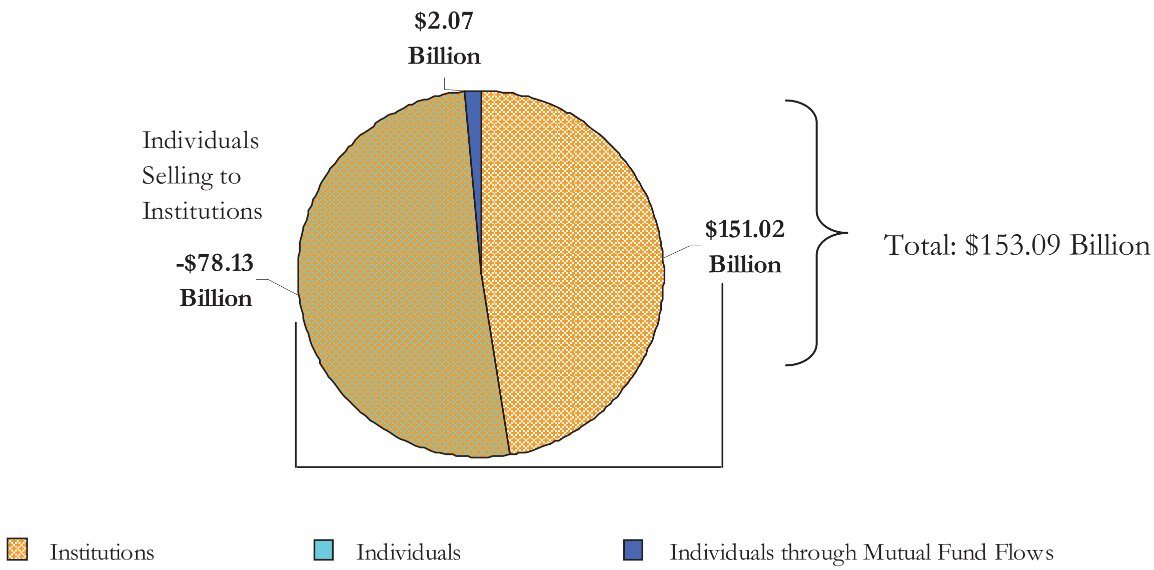


Figure IA.8. Cumulative Change in Demand for Non-Technology Stocks: Excluding Stocks with High P/S Ratios. In Panel A, we first calculate quarterly changes in demand from January 1997 to March 2000 for non-technology stocks (3-digit SIC code≠737 or exchange code≠3) with ordinary common shares. We require a firm to be in the non-technology sector at both the beginning and the end of the quarter to be included in the sample. We exclude stocks that are in the top quartile according to price-to-sales ratio as of March 31, 2000. Price-to-sales ratio as of March 31, 2000 is price per share for March 31, 2000 divided by sales per share for most current fiscal year end which is at least six months before March 31, 2000. Quarterly change in demand for non-technology stocks by an investor group is the difference between end-of-quarter non-technology holdings and buy-and-hold value of beginning-of-quarter non-technology holdings. The individual group is net of insiders. We further isolate the change in demand induced by mutual fund flows from change in demand by institutions. Change in demand induced by mutual fund flows is calculated by applying mutual fund flows for merged CRSP-Thomson Financial sample to 13f mutual fund families. We describe the details of our approach in Internet Appendix E. We then sum up the quarterly changes in demand from January 1997 to March 2000. Panel B plots the corresponding changes in demand from April 2000 to March 2001.

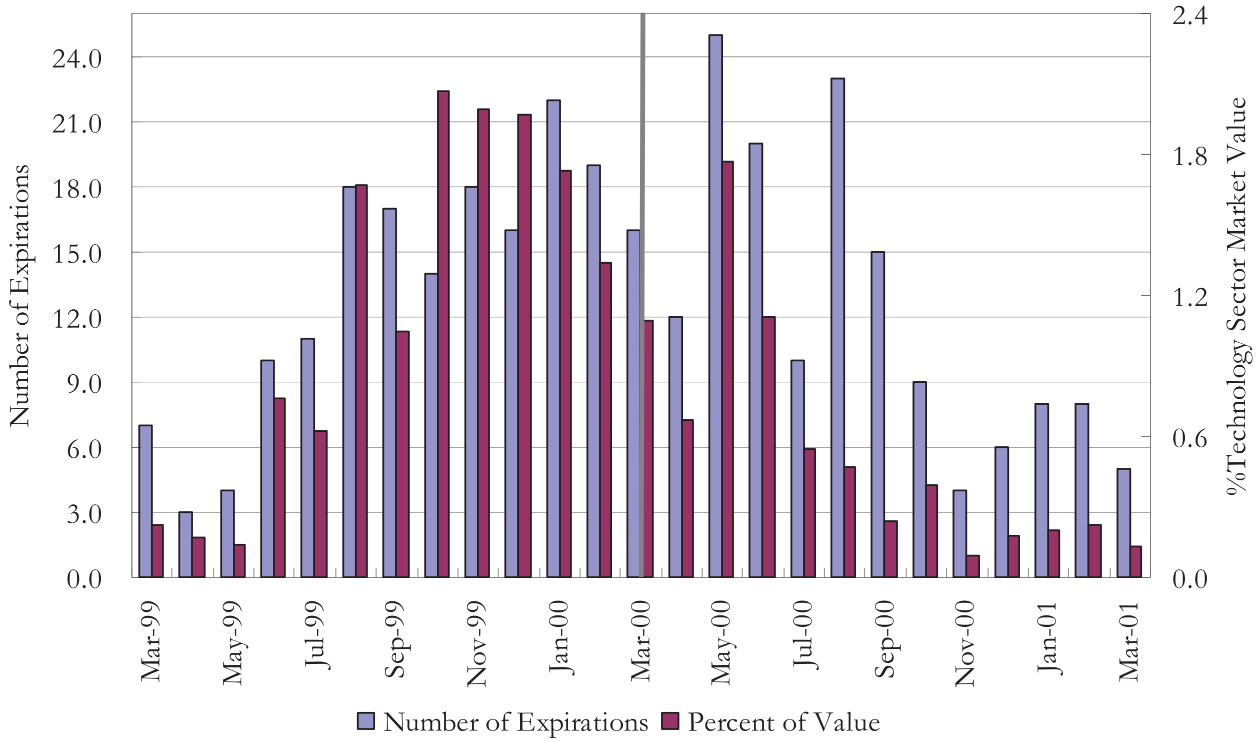
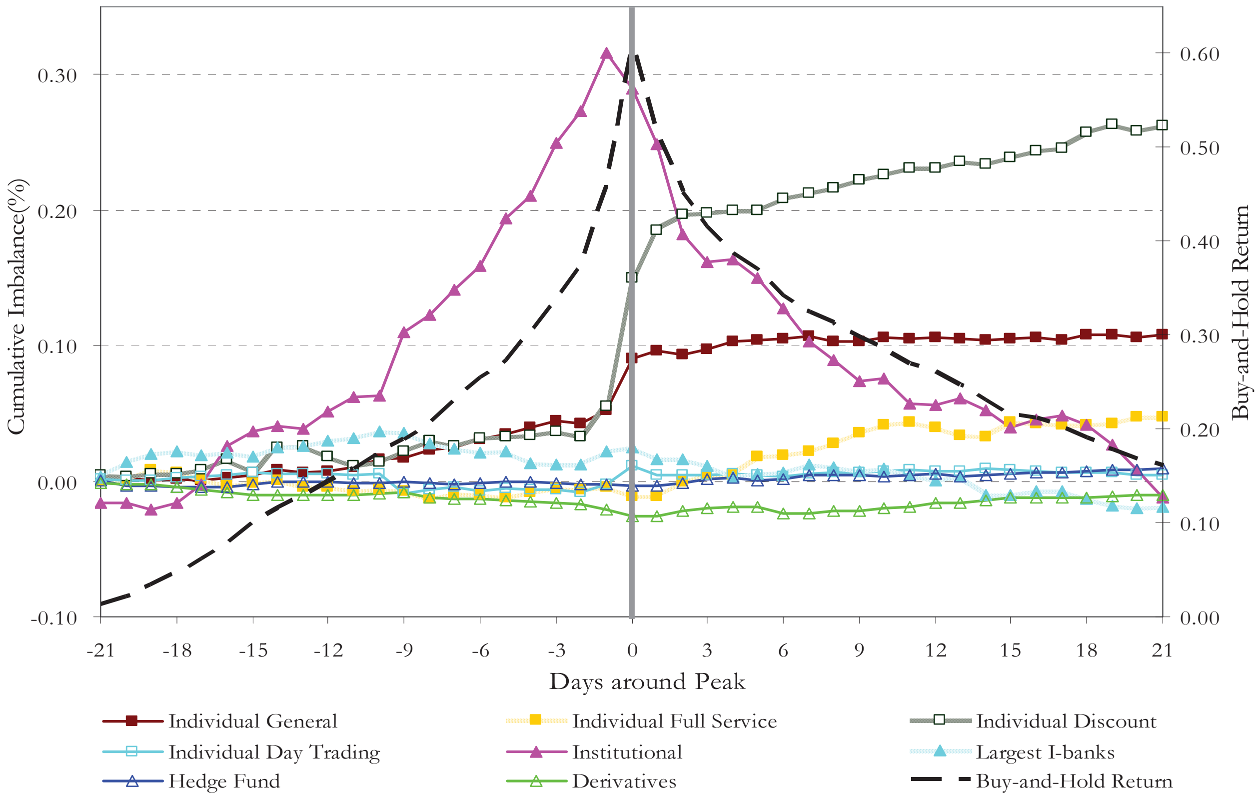
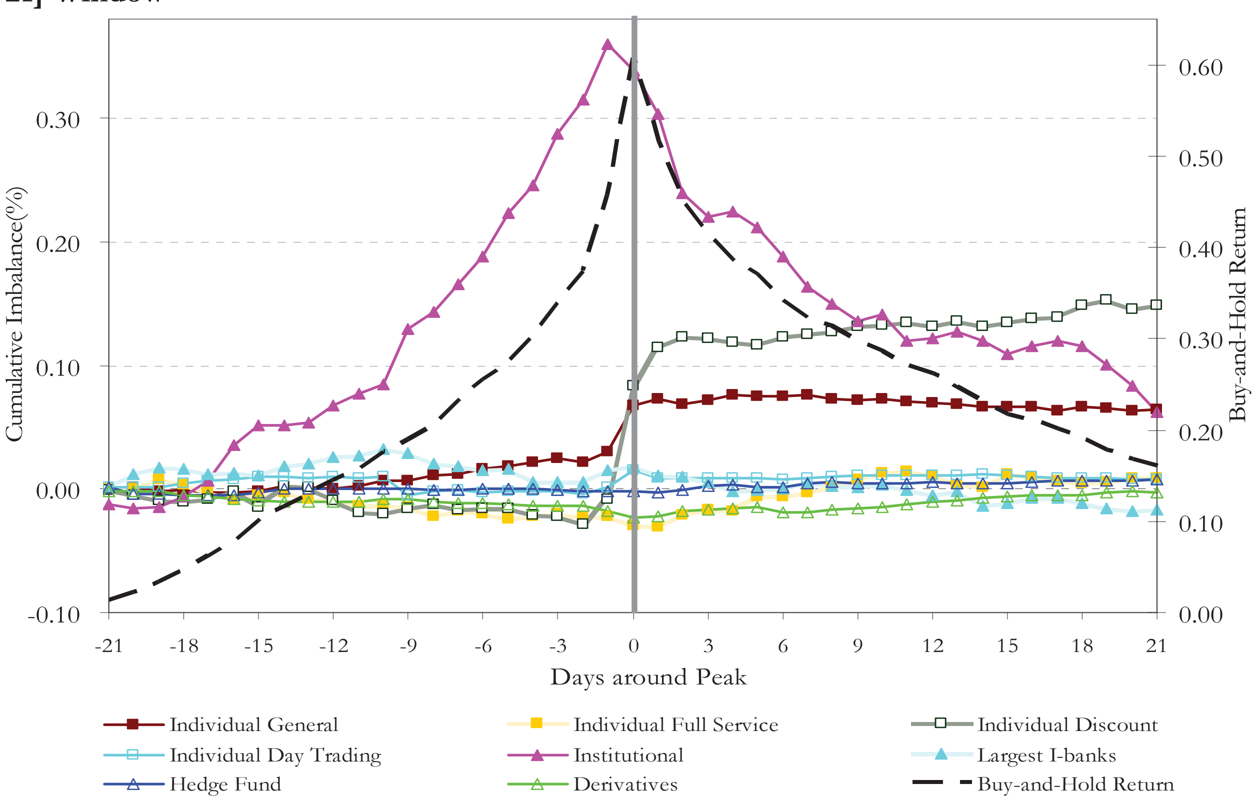


Figure IA.9. Lockup Expirations around the Market Peak. We collect data from SDC on IPO and SEO lockup expirations for Nasdaq technology stocks (3-digit SIC code=737 with ordinary common shares) during the 1997-2002 period. We manually search prospectuses through the EDGAR database to confirm the expiration dates and fill in missing data on expiration dates and number of shares subject to lockup. We drop issues with multiple lockup expiration dates or with an offer price less than $5. We plot the total number of IPO and SEO lockup expirations each month during the two-year window around the market peak in March 2000. We also calculate the total daily value of expiring IPO and SEO lockup shares expressed as a percentage of total market capitalization of the technology sector. We then plot the sum of daily values for each month during the two-year window around the market peak.

Panel A: Cumulative Size-Adjusted Imbalances around Individual Stock Peaks: [-21, 21] Window



Panel B: Cumulative Turnover-Adjusted Imbalances around Individual Stock Peaks: [-21, 21] Window



Panel C: Cumulative Imbalances around Individual Stock Peaks: [-60, 60] Window

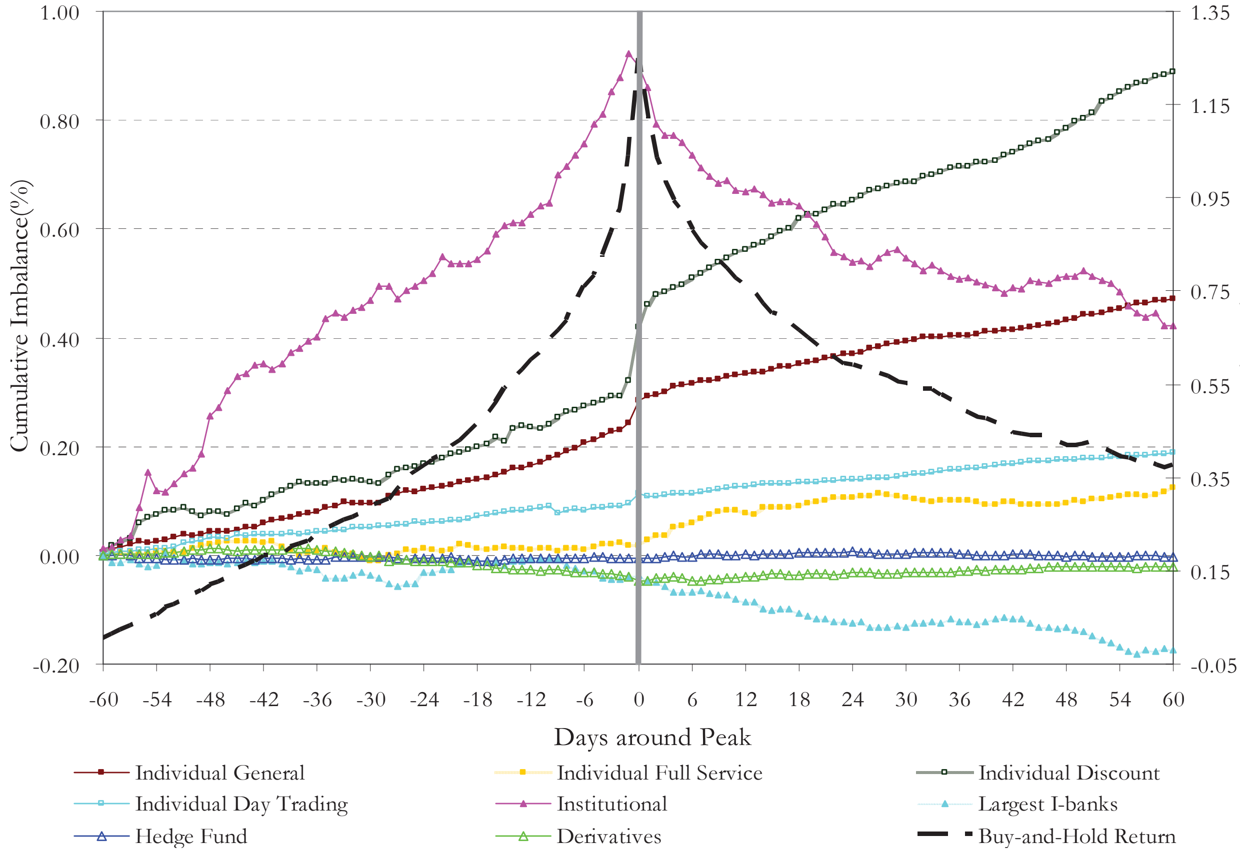


Figure IA.10. Cumulative Imbalances around Individual Stock Peaks: Size- and Turnover-Adjusted Imbalances and [-60, 60] Window. For all Nasdaq stocks with ordinary common shares and 3-digit SIC code 737 at some point from January 1997 to December 2000, we identify the individual peaks during the same period. In case of a tie, we choose the first peak. Then, we eliminate stocks for which the peak is within the first or last 21 days of trading or the 3-digit SIC code is different from 737 at the time of the peak. When two stocks peak on the same day, we take the equal-weighted average of the two observations to avoid clustering. This gives us 279 different peak days. We plot the cross-sectional averages of the buy-and-hold return and cumulative imbalances for various investor groups around individual peaks. Panel A plots cumulative size-adjusted imbalances in the [-21, 21] window surrounding individual peaks. Daily imbalance is the difference between the buy and sell volumes expressed as a percentage of shares outstanding. We adjust daily imbalances for firm size by subtracting the average imbalance for the firm's size quartile in the technology sector. Panel B plots cumulative turnover-adjusted imbalances in the [-21, 21] window surrounding individual peaks. We adjust daily imbalances for turnover by subtracting the average imbalance for the firm's historical turnover quartile in the technology sector. Historical turnover for a stock is sum of daily turnover of the stock in the past twenty trading days. Panel C plots cumulative imbalances in the [-60, 60] window surrounding individual peaks.

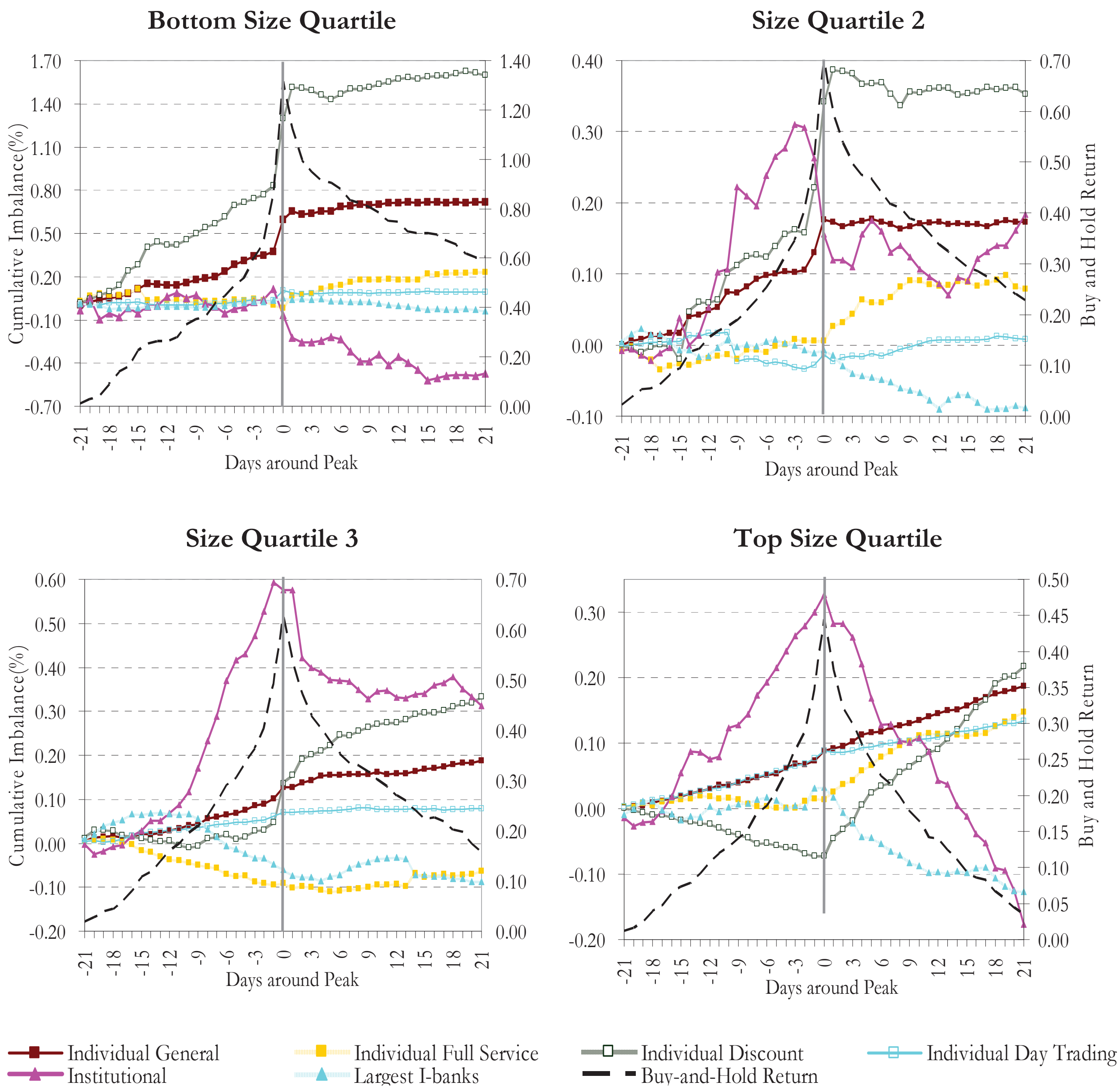


Figure IA.11. Cumulative Imbalances around Individual Stock Peaks: Groups of Firm Size. For all Nasdaq stocks with ordinary common shares and 3-digit SIC code 737 at some point from January 1997 to December 2000, we identify the individual peaks during the same period. In case of a tie, we choose the first peak. Then, we eliminate stocks for which the peak is within the first or last 21 days of trading or the 3-digit SIC code is different from 737 at the time of the peak. We then assign individual peaks into quartiles based on market capitalization. When two stocks in the same size quartile peak on the same day, we take the equal-weighted average of the two observations to avoid clustering. This figure plots the cross-sectional averages of the buy-and-hold return and cumulative imbalances for various investor groups for 43 trading days surrounding individual peaks for each size quartile. Daily imbalance is the difference between the buy and sell volumes expressed as a percentage of shares outstanding.

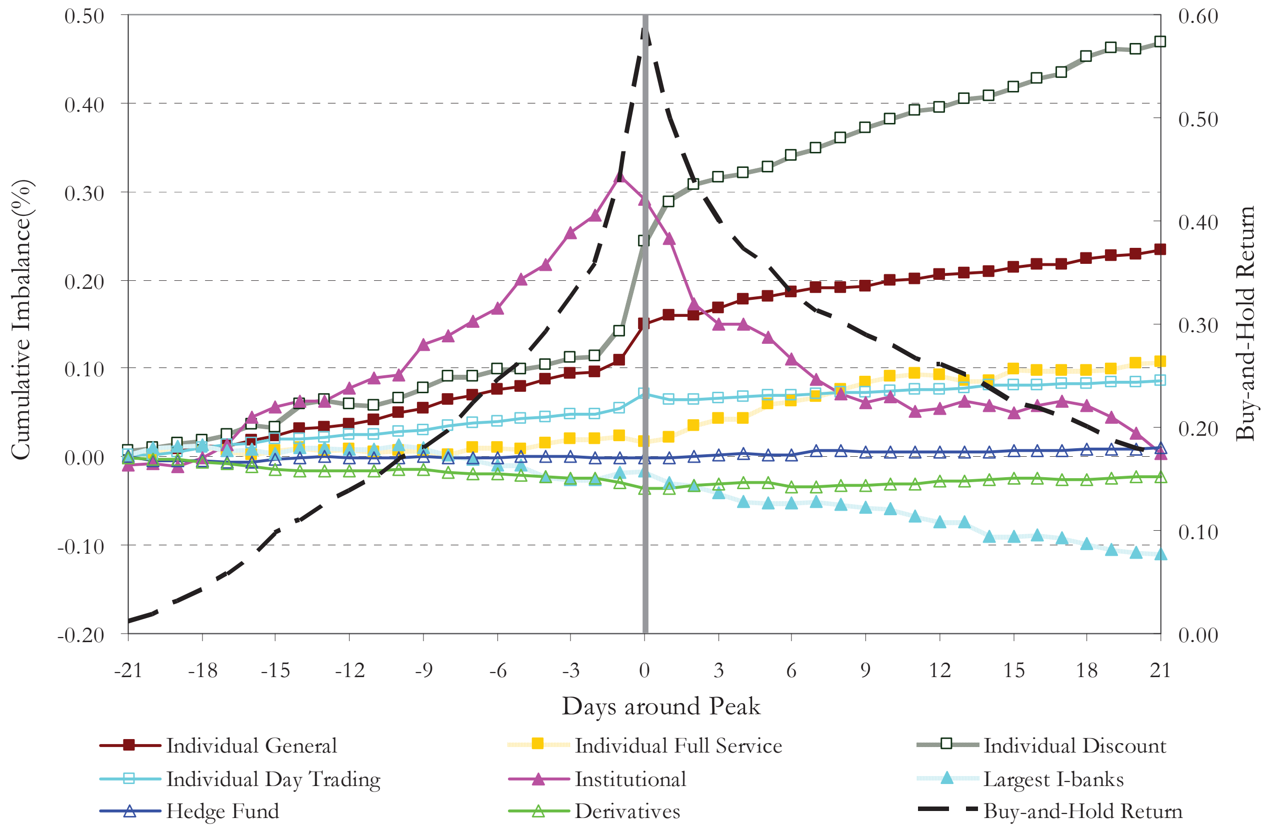
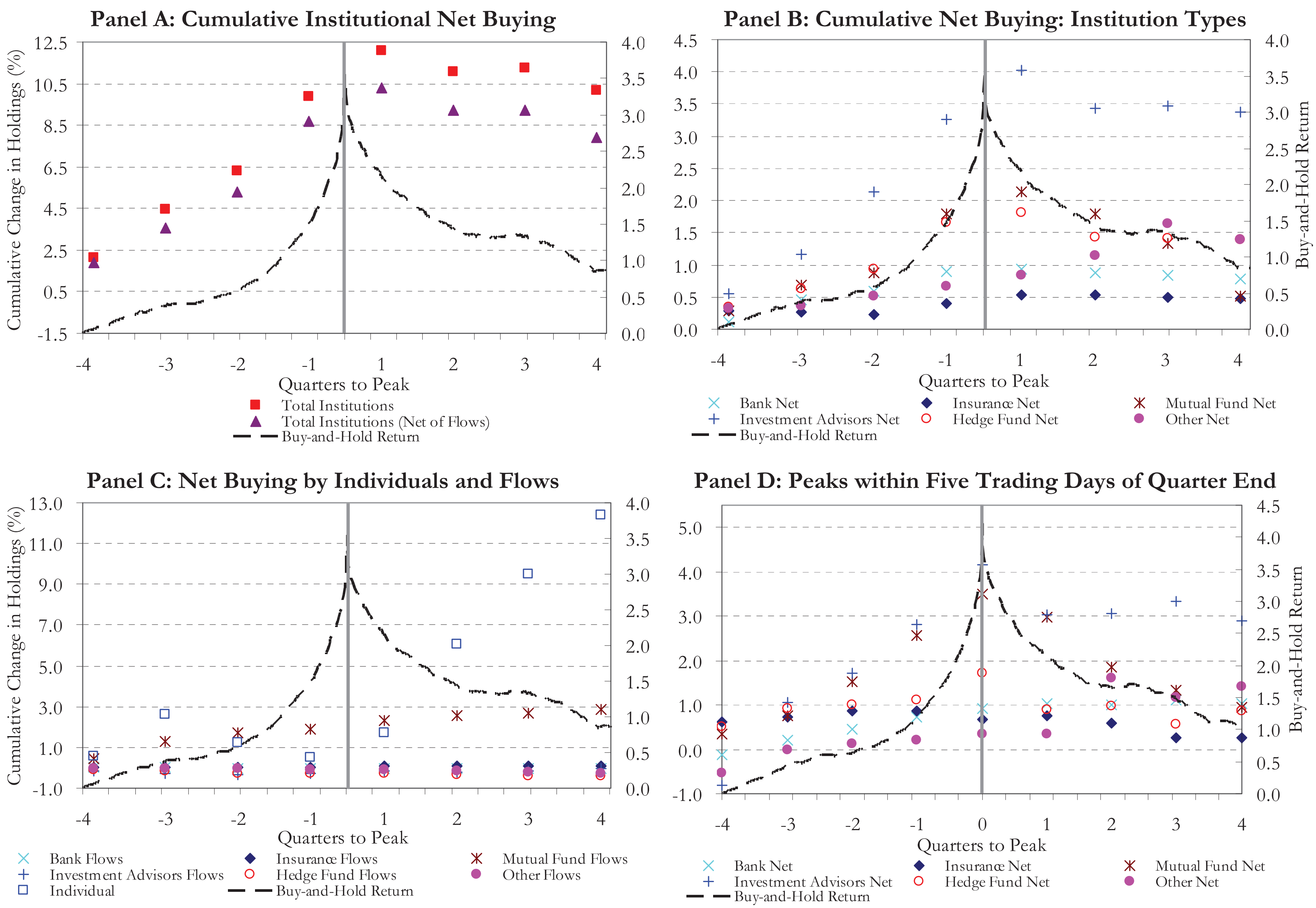
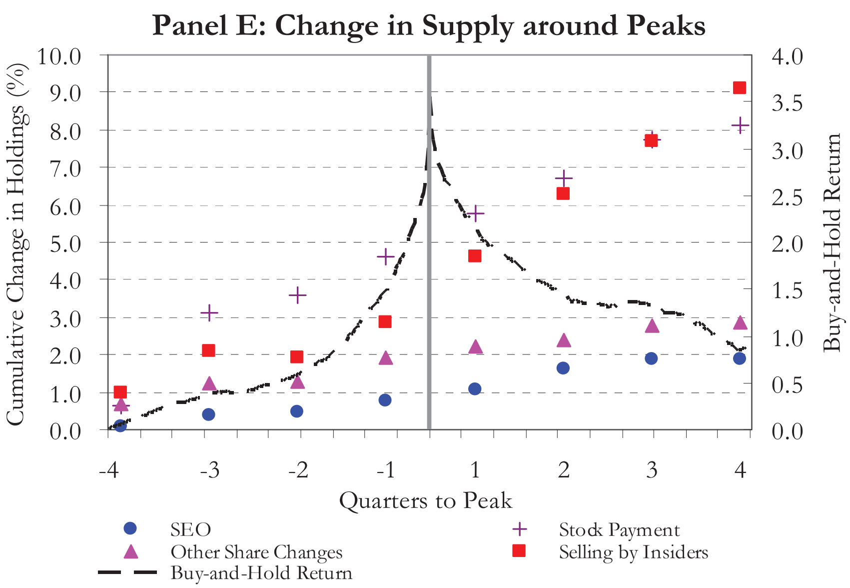


Figure IA.12. Cumulative Imbalances around Individual Stock Peaks: [-21, 21] Window; Excluding Peaks in March 2000. For all Nasdaq stocks with ordinary common shares and 3-digit SIC code 737 at some point from January 1997 to December 2000, we identify the individual peaks during the same period. In case of a tie, we choose the first peak. Then, we eliminate stocks for which the peak is within the first or last 21 days of trading or the 3-digit SIC code is different from 737 at the time of the peak. We also eliminate stocks with peaks in March 2000 to avoid clustering. We are left with 429 stocks. When two stocks peak on the same day, we take the equal-weighted average of the two observations to avoid clustering. This gives us 258 different peak days. This figure plots the cross-sectional averages of the buy-and-hold return and cumulative imbalances for various investor groups for 43 trading days surrounding individual peaks. Daily imbalance is the difference between the buy and sell volumes expressed as a percentage of shares outstanding.


Panel A: Cumulative Institutional Net Buying
Cumulative Change in Holdings (%)
Quarters to Peak
Total Institutions
Total Institutions (Net of Flows)
Buy-and-Hold Return
Panel B: Cumulative Net Buying: Institution Types
Buy-and-Hold Return
Quarters to Peak
Bank Net
Investment Advisors Net
Buy-and-Hold Return
Insurance Net
Hedge Fund Net
Mutual Fund Net
Other Net
Panel C: Net Buying by Individuals and Flows
Cumulative Change in Holdings (%)
Quarters to Peak
Bank Flows
Investment Advisors Flows
Individual
Insurance Flows
Hedge Fund Flows
Buy-and-Hold Return
Mutual Fund Flows
Other Flows
Panel D: Peaks within Five Trading Days of Quarter End
Buy-and-Hold Return
Quarters to Peak
Bank Net
Investment Advisors Net
Buy-and-Hold Return
Insurance Net
Hedge Fund Net
Mutual Fund Net
Other Net



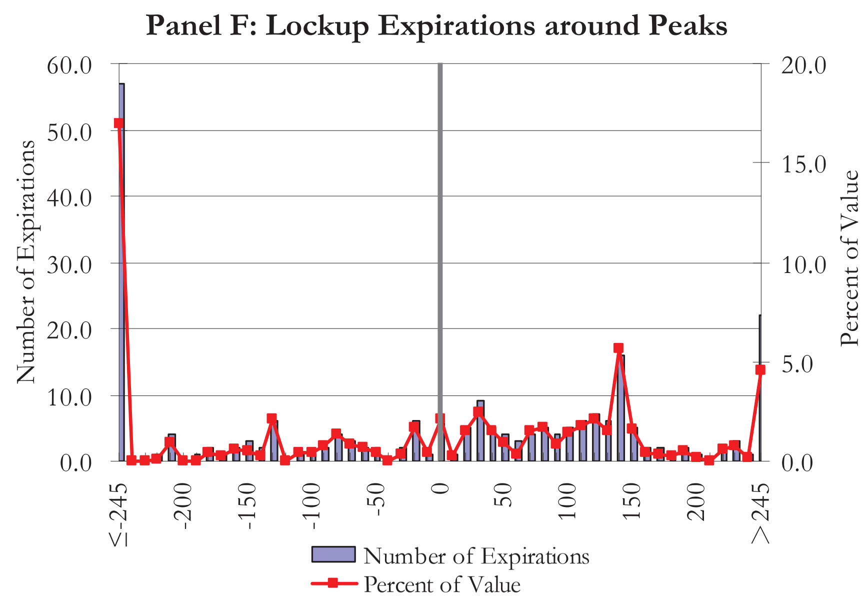
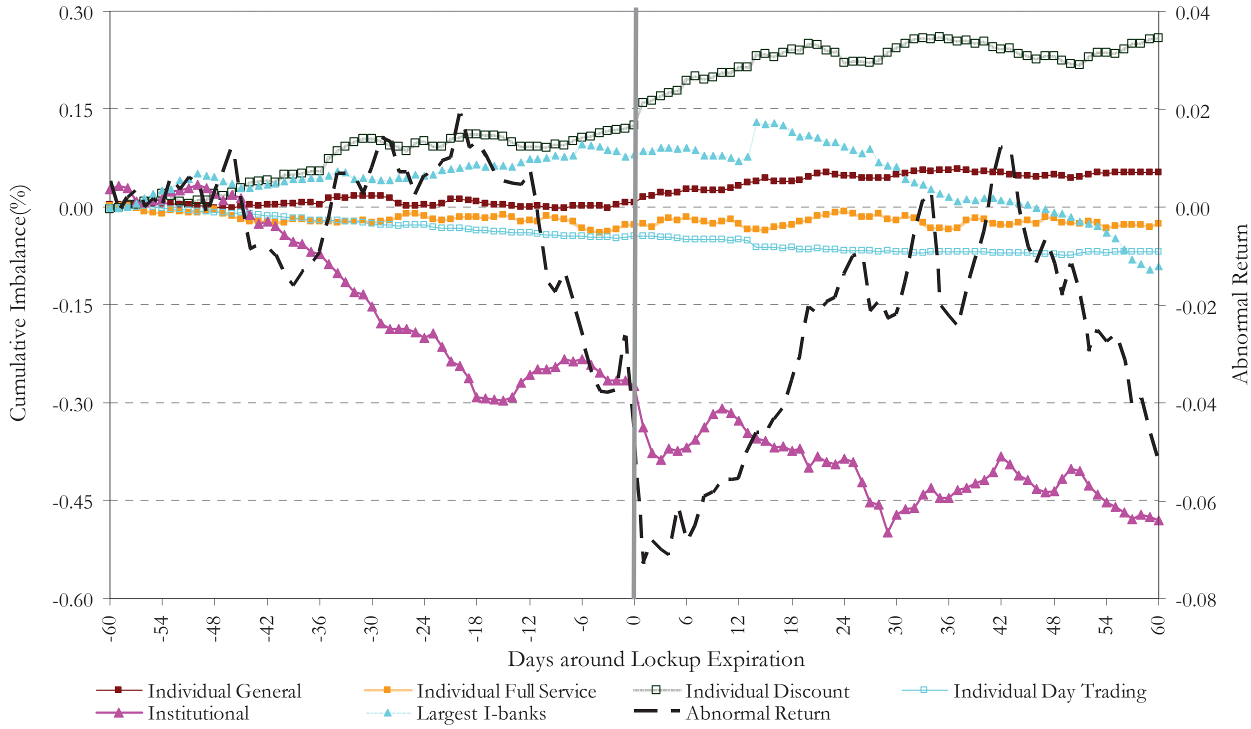


Figure IA.13. Demand and Supply around Individual Stock Peaks: Excluding Peaks in March 2000. We analyze demand and supply around individual peaks for Nasdaq technology stocks (3-digit SIC code=737 with ordinary common shares, excluding Microsoft) during the period from January 1997 to December 2000 (excluding March 2000 to avoid clustering). There are 429 technology stock peaks (258 different event days) during this period. When stocks peak in the same quarter, we take the equal-weighted average of the observations. Panel A plots cross-sectional averages of the buy-and-hold return and cumulative net buying for aggregate 13f institutions during the eight quarters surrounding individual peaks. Quarterly institutional net buying for a stock is calculated as the difference between end-of-quarter institutional holdings and buy-and-hold value of beginning-of-quarter holdings, expressed as a percentage of the stock's market capitalization at the end of quarter. 'Total Institutions' is cumulative net buying and 'Total Institutions (Net of Flows)' is cumulative net buying minus net buying induced by flows (net active buying). Calculations of flow-induced net buying for mutual funds and other 13f institution types are described in Internet Appendices E and F. Quarter 1 marks the end of the quarter containing the peak, which is on average 33 trading days after the peak for our sample. Quarter -1 marks the end of the quarter prior to peak. Panel B plots the cumulative net active buying excluding flows for the six 13f institution types. Panel C plots the cumulative net buying induced by flows and by individuals directly. Individual net buying is calculated with the similar approach as institutional net buying by using individual ownership (net of insiders). Panel D plots the cumulative institutional net active buying around 91 price peaks that occur within five trading days ([-5, 5] window) from the end of a quarter, where quarter 0 refers to the end of the quarter that coincides with the individual price peak. Panel E plots the cumulative change in supply of shares around individual price peaks due to SEOs, insider selling, stock payments for mergers and acquisitions, and other changes in shares outstanding. Panel F plots the lockup expirations relative to price peaks for the 238 technology firms that have both individual peaks and lockup expirations during the 1997-2002 period. Number of lockup expirations at t refers to the total number of IPO and SEO lockup expirations during the ten day window of (t-5, t+5]. Day 0 refers to the day of the peak. For the amount of lockup expirations at t, we first sum up for each firm the value of expiring shares during the window (t-5, t+5] as a percentage of the firm's market capitalization. We then average the amount across event firms.

Panel A: Cumulative Imbalances during the [-60, 60] Window around IPO Lockup Expirations



Panel B: Cumulative Imbalances during the [-60, 60] Window around SEO Lockup Expirations

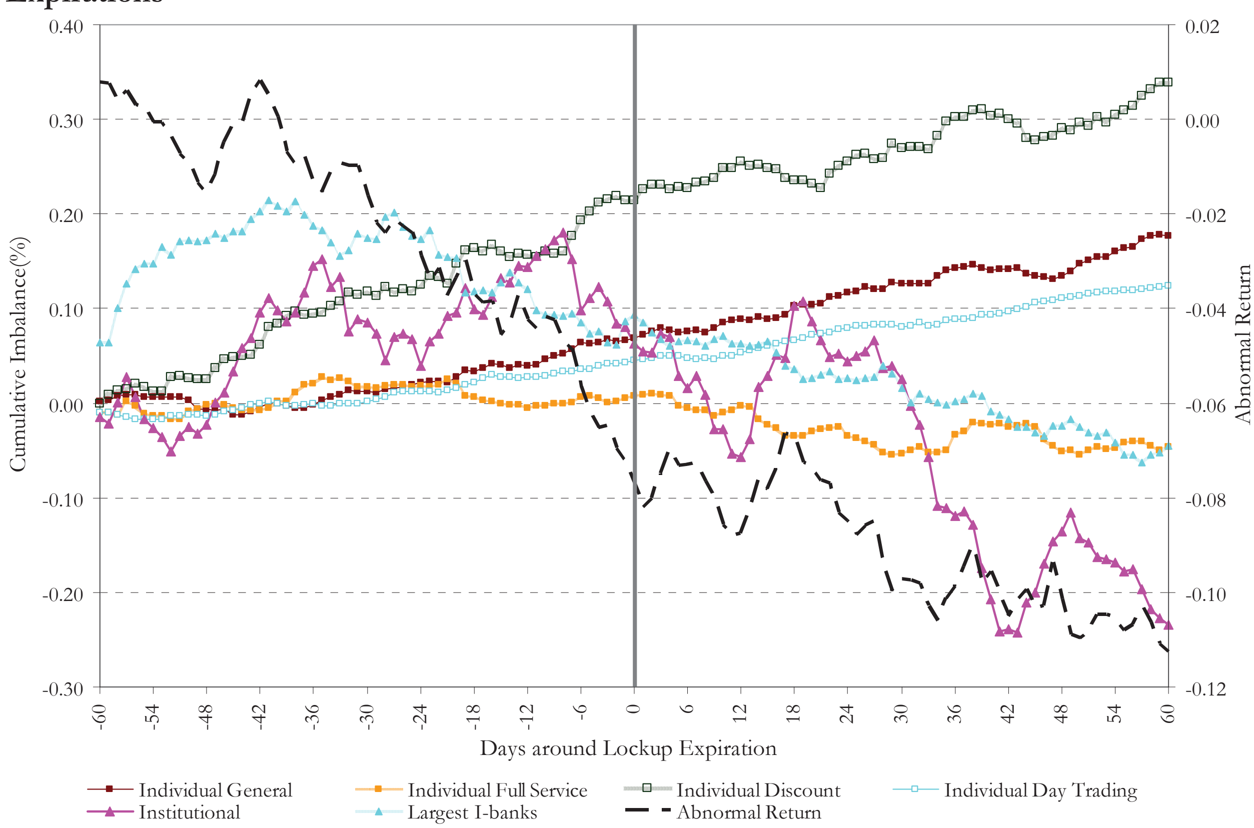
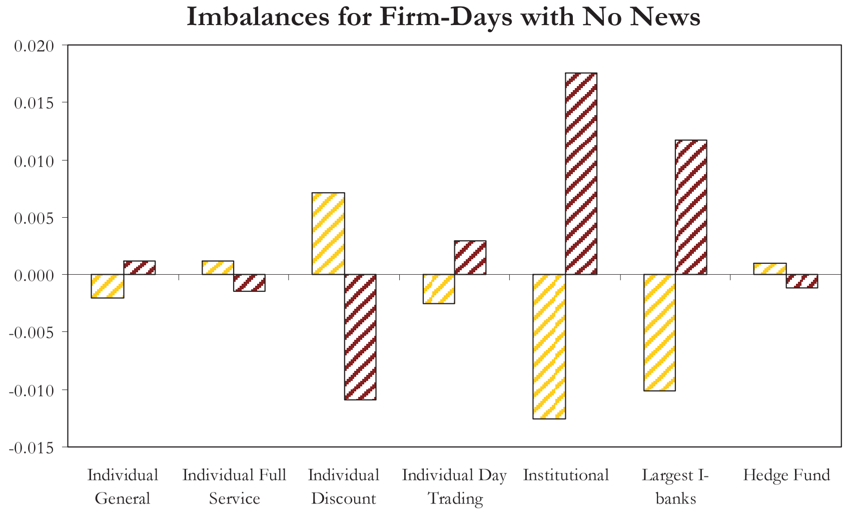
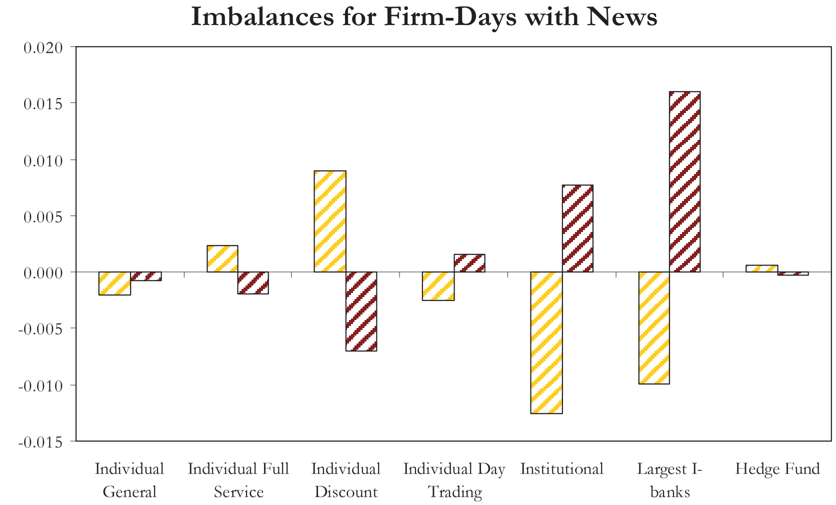


Figure IA.14. Cumulative Imbalances around Lockup Expirations. We collect data from SDC on IPO and SEO lockup expirations for Nasdaq technology stocks (3-digit SIC code=737 with ordinary common shares) during the 1997-2002 period. We manually search prospectuses through the EDGAR database to confirm the expiration dates and fill in missing data on expiration dates and number of shares subject to lockup. We drop issues with multiple lockup expiration dates or with an offer price less than $5. Panels A and B plot the cross-sectional averages of the abnormal return and cumulative imbalances for various investor groups for 121 trading days surrounding IPO and SEO lockup expirations, respectively. Daily imbalance is the difference between the buy and sell volumes expressed as a percentage of shares outstanding. We adjust daily imbalances for firm size by subtracting the average imbalance for the firm's size quartile in the technology sector. Abnormal return is the buy and hold return in excess of value-weighted technology index return.

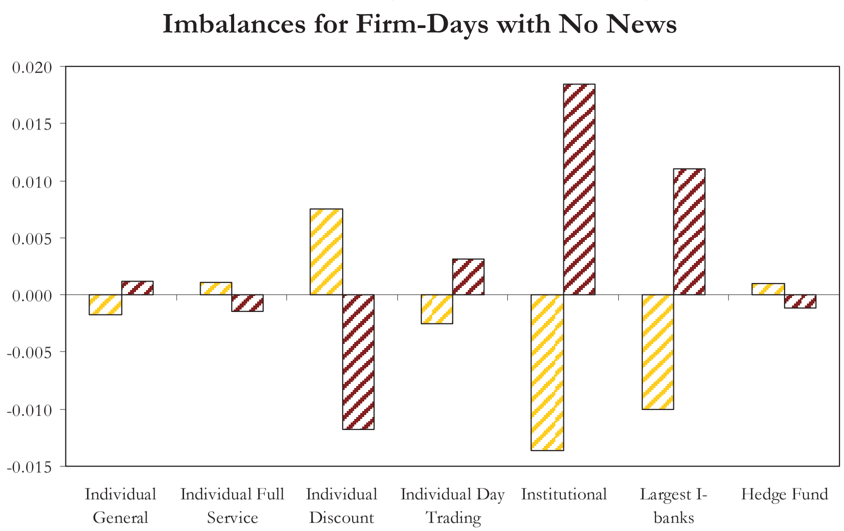
Panel A: Portfolios Based on News Articles in the Top Ten Newswires

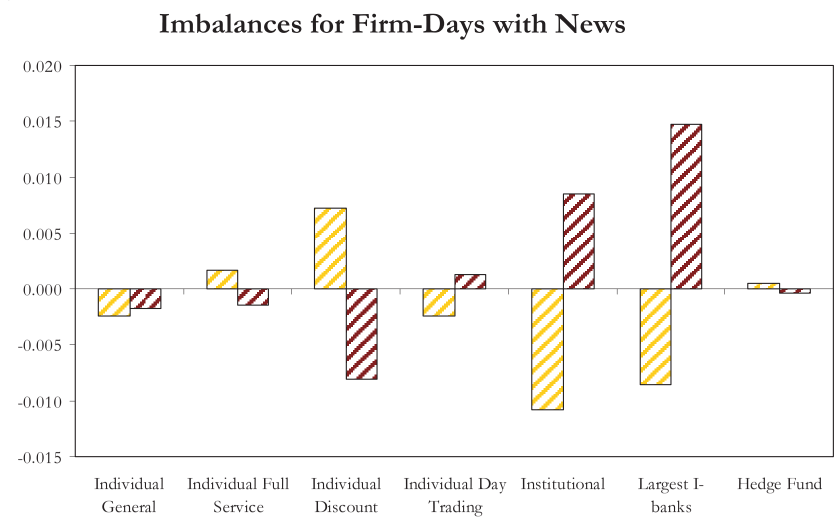




Negative Return Positive Return

Panel B: Portfolios Based on News Articles in All Newswires and Non-Newswire Sources





Negative Return Positive Return

Figure IA.15. Imbalances Sorted on Firm Returns and News. The sample contains Nasdaq technology stocks (3-digit SIC code=737 with ordinary common shares) from January 2, 1997 to March 27, 2000. In Panel A, on each day t we assign stocks to portfolios according to whether their contemporaneous returns in excess of technology index return are negative or positive and whether there are any news articles about the firm in the top ten newswires on day t. We calculate value-weighted average daily imbalance for each portfolio and investor group and then plot the time-series means. Daily imbalance is the difference between the buy and sell volumes expressed as a percentage of shares outstanding. We adjust daily imbalances for firm size by subtracting the average imbalance for the firm's size quartile in the technology sector. Panel B uses news articles from all newswires and non-newswire sources to form portfolios.

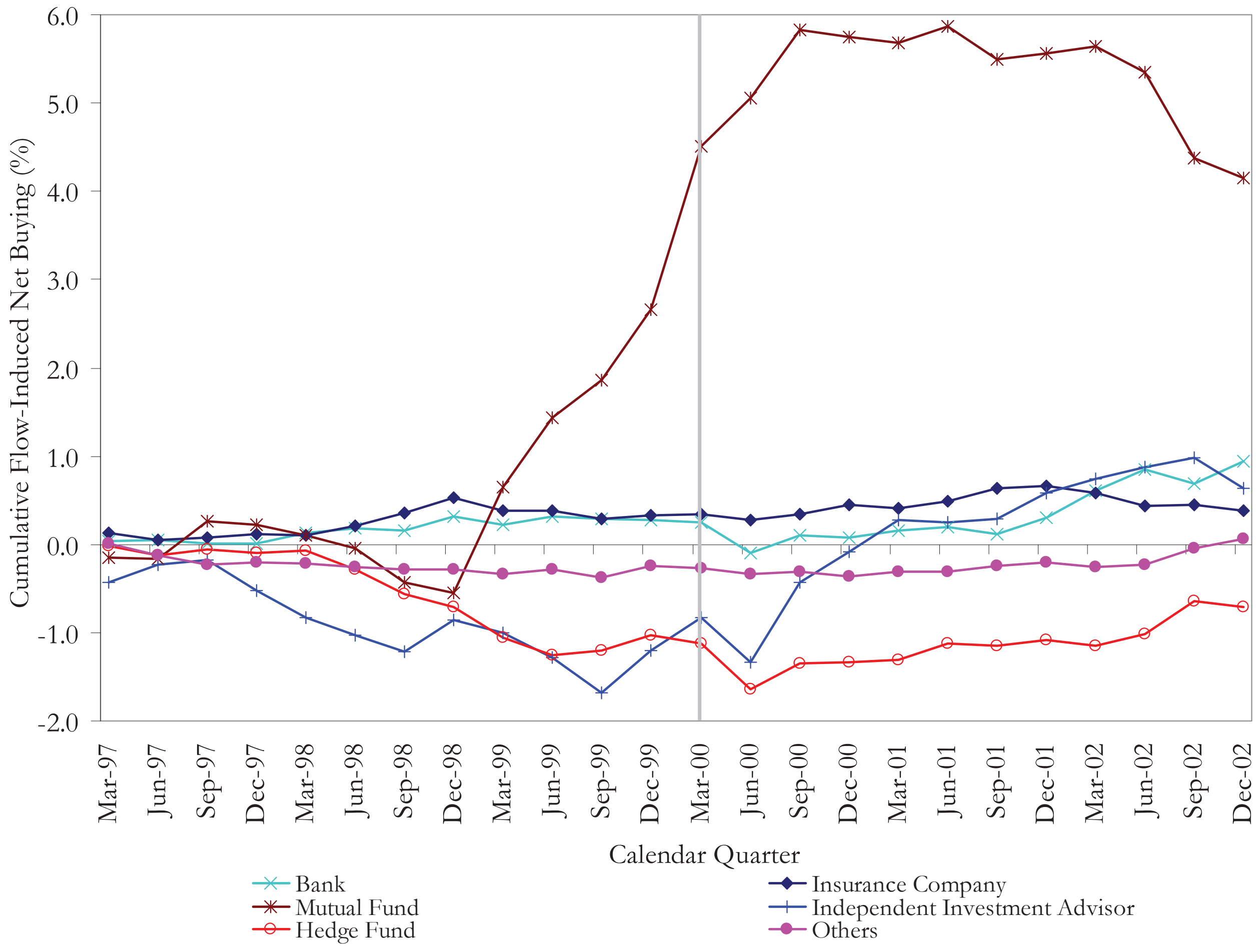
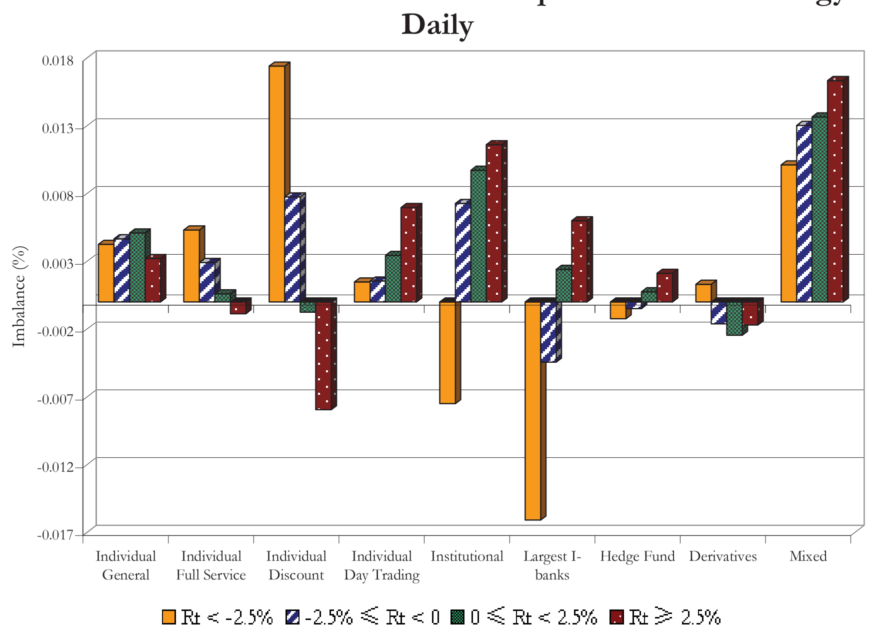
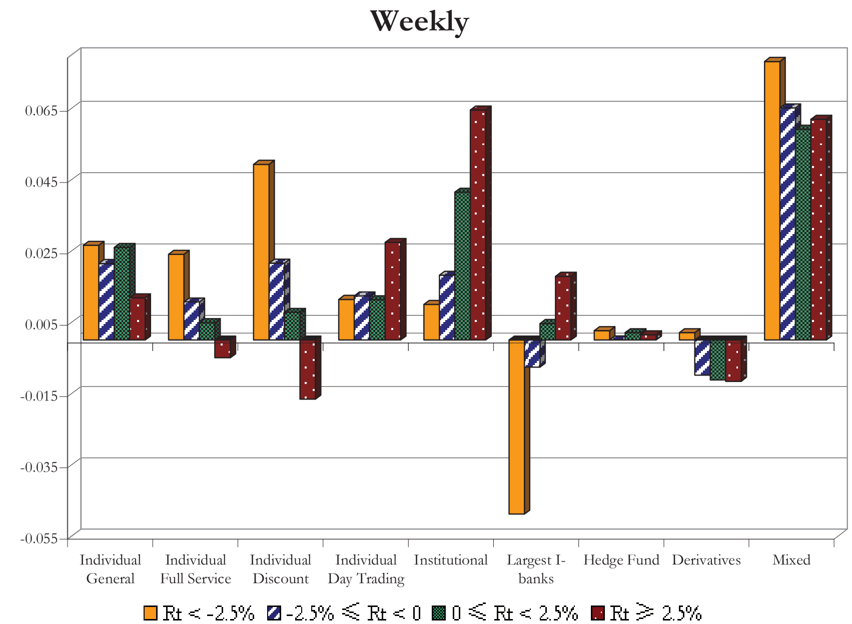


Figure IB.1. Cumulative Net Buying Induced by Flows: 13f Institution Types. This figure plots cumulative net buying induced by flows of 13f institution types for Nasdaq technology stocks (3-digit SIC code=737 with ordinary common shares, excluding Microsoft) during the 1997-2002 period. We require a firm to be in the technology sector at both the beginning and the end of the quarter to be included in the sample. Quarterly net buying is expressed as a percentage of total market capitalization of the technology sector. Net buying induced by mutual fund flows is calculated by applying mutual fund flows for merged CRSP-Thomson Financial sample to 13f mutual fund families. Details of the calculation are described in Internet Appendix E. Flows of institution types other than mutual funds are estimated using quarterly holdings and stock returns. We further calculate flow-induced net buying by institution types other than mutual funds by assuming that managers allocate flows proportionally to their current portfolio. Details of the calculation are described in Internet Appendix F. We then plot cumulative net buying during the 1997-2002 period.

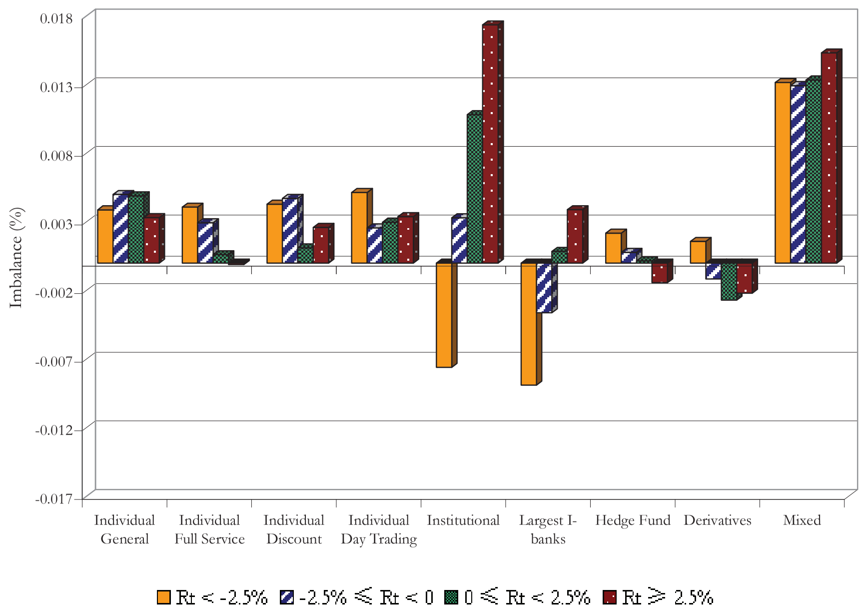
Panel A: Imbalances Sorted on Contemporaneous Technology Index Returns





Panel B: Imbalances Sorted on Lagged Technology Index Returns

Daily



Weekly

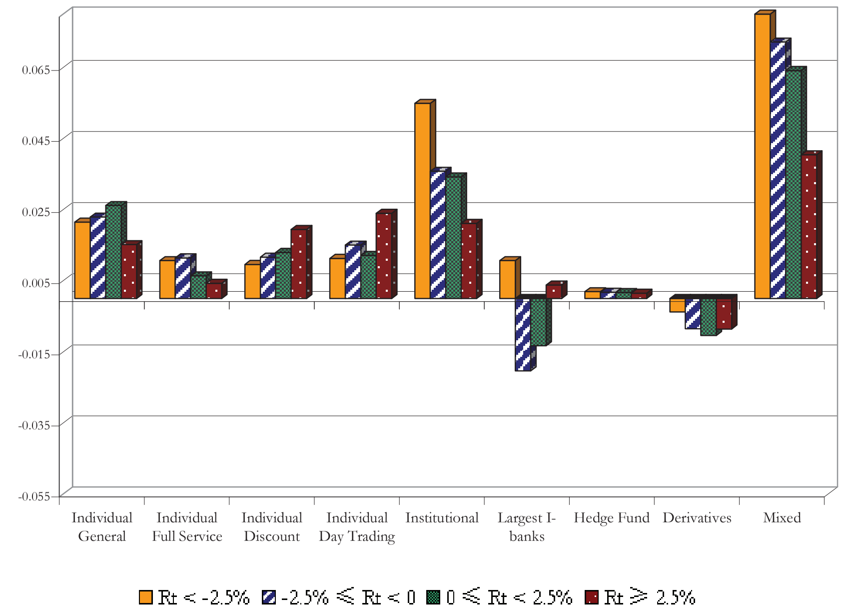


Figure IB.2. Imbalances across Market Return Categories. This figure plots the daily and weekly imbalances for nine investor groups across four index return categories for the value-weighted technology sector from January 2, 1997 to March 27, 2000. Daily imbalance is the difference between the buy and sell volumes expressed as a percentage of shares outstanding. The technology sector is comprised of all Nasdaq stocks with ordinary common shares and 3-digit SIC code 737, excluding Microsoft. In Panel A, the chart on the left plots value-weighted daily imbalances sorted on contemporaneous daily index returns, while the chart on the right plots value-weighted weekly imbalances sorted on contemporaneous weekly index returns. In Panel B, the chart on the left plots value-weighted daily imbalances sorted on lagged daily index returns, while the chart on the right plots value-weighted weekly imbalances sorted on lagged weekly index returns.

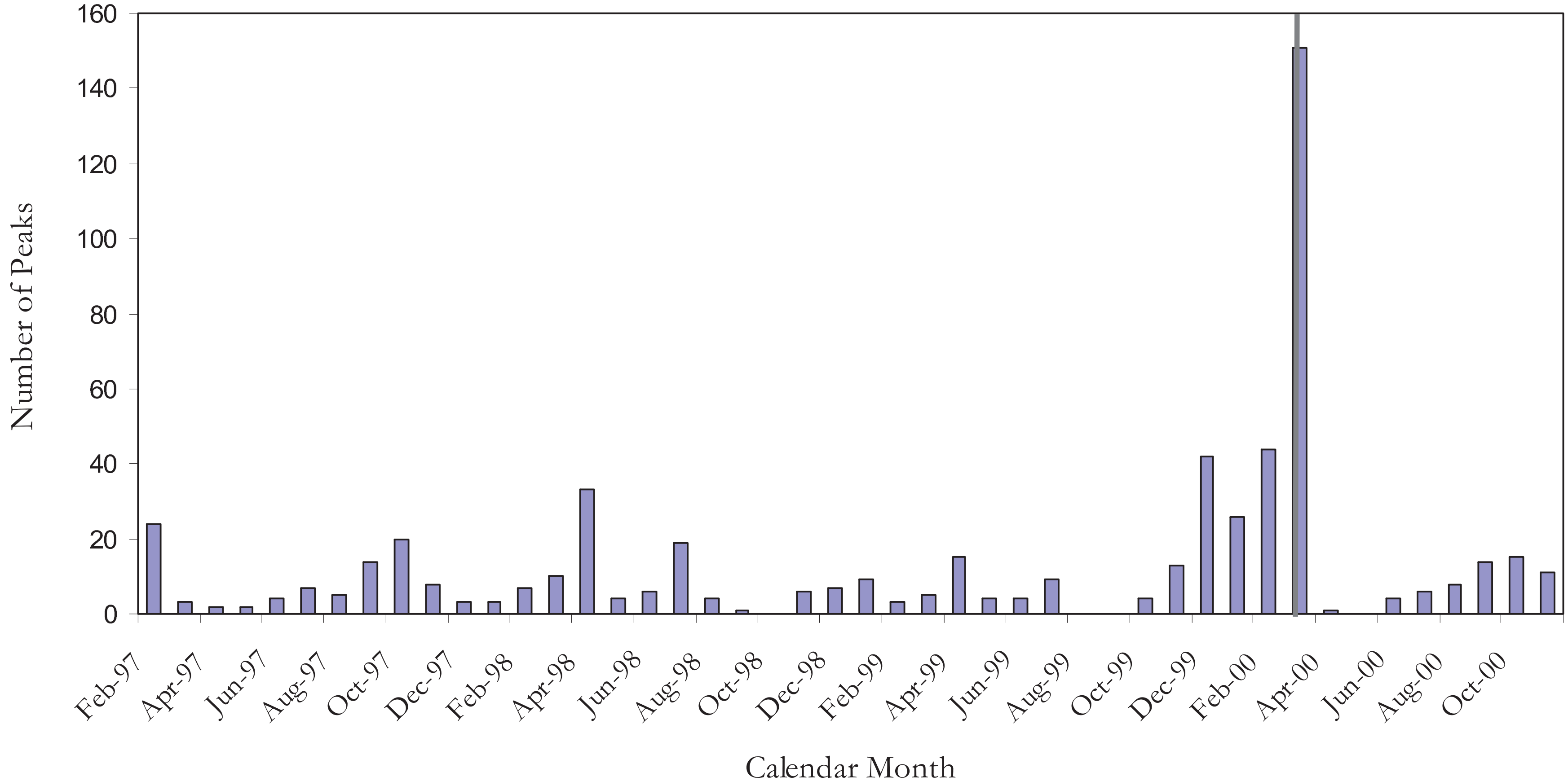
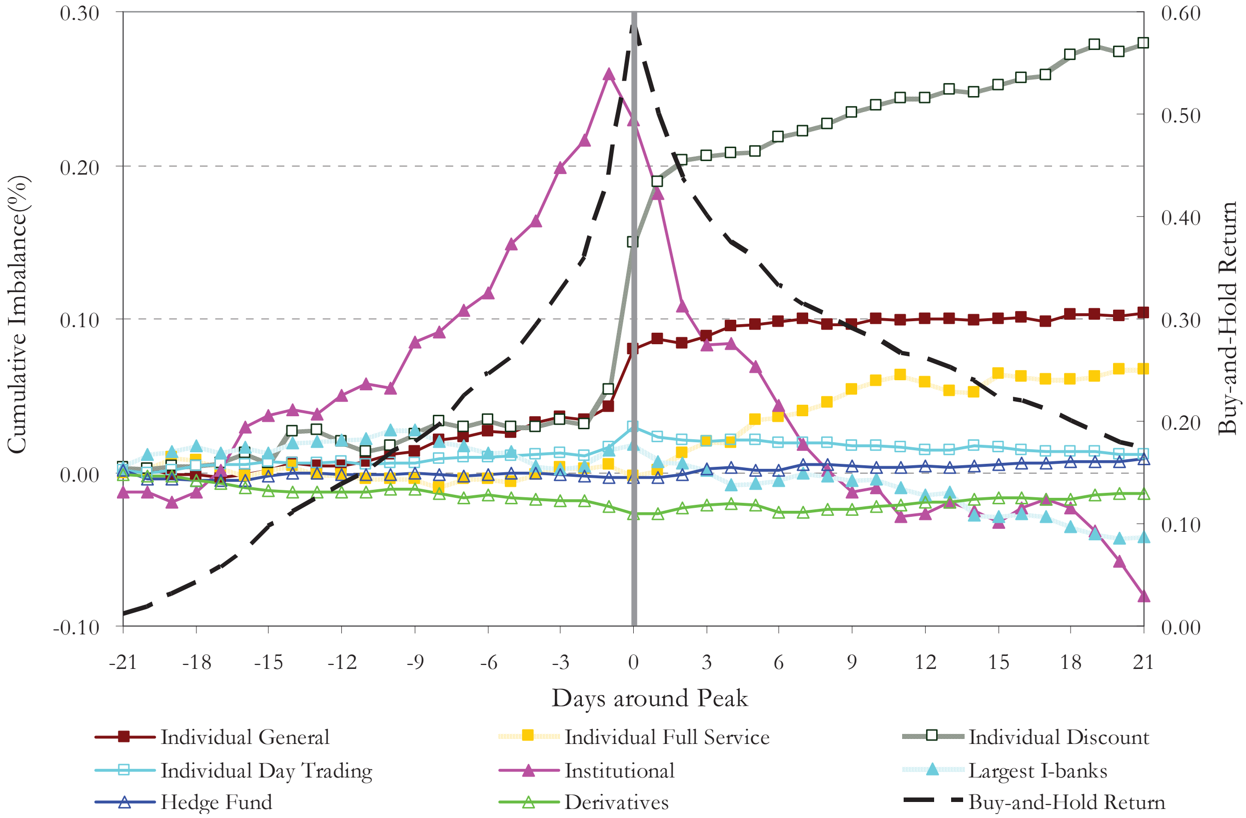
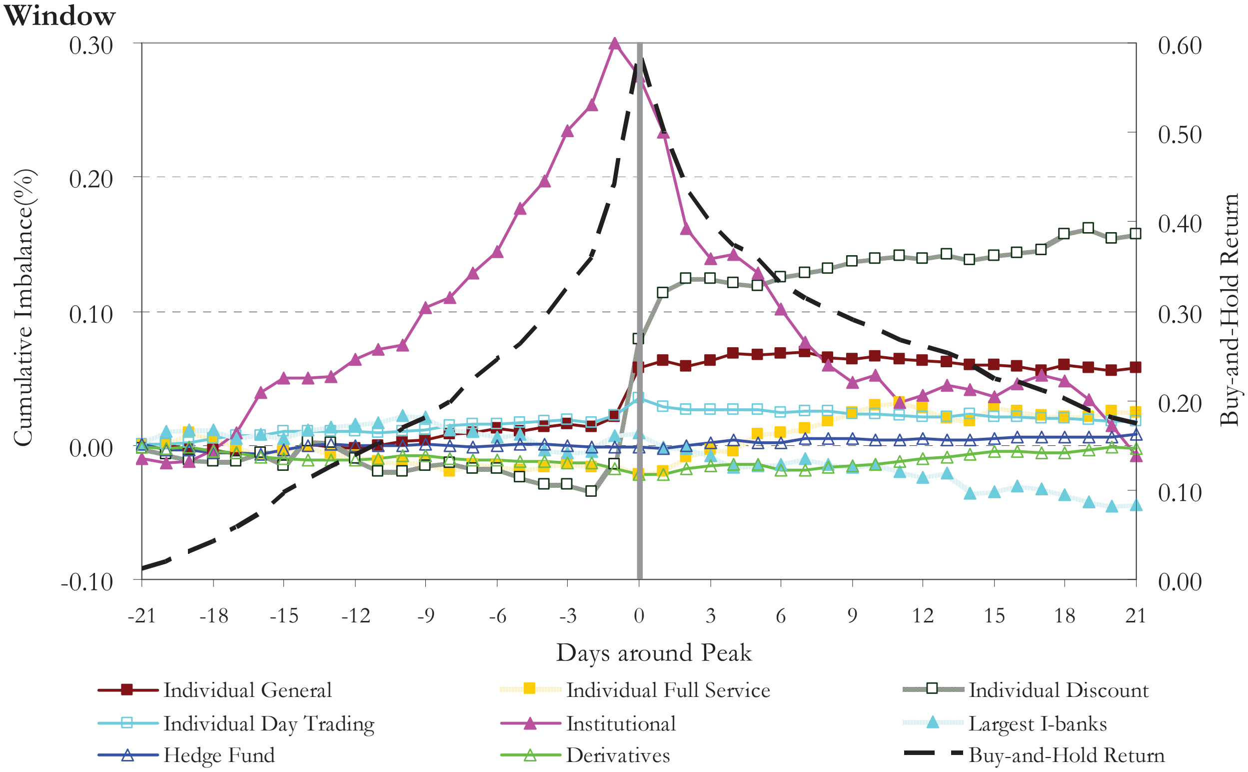


Figure IB.3. Number of Individual Stock Peaks by Month. For all Nasdaq stocks with ordinary common shares and 3-digit SIC code 737 at some point from January 1997 to December 2000, we identify the individual peaks during the same period. In case of a tie, we choose the first peak. Then, we eliminate stocks for which the peak is within the first or last 21 days of trading or the 3-digit SIC code is different from 737 at the time of the peak. We plot the number of individual peaks in each month from January 1997 to December 2000. March 2000 has the highest number of peaks with 151, as compared to a total of 429 peaks in all other months.

Panel A: Cumulative Size-Adjusted Imbalances around Individual Stock Peaks: [-21, 21] Window



Panel B: Cumulative Turnover-Adjusted Imbalances around Individual Stock Peaks: [-21, 21] Window



Panel C: Cumulative Imbalances around Individual Stock Peaks: [-60, 60] Window

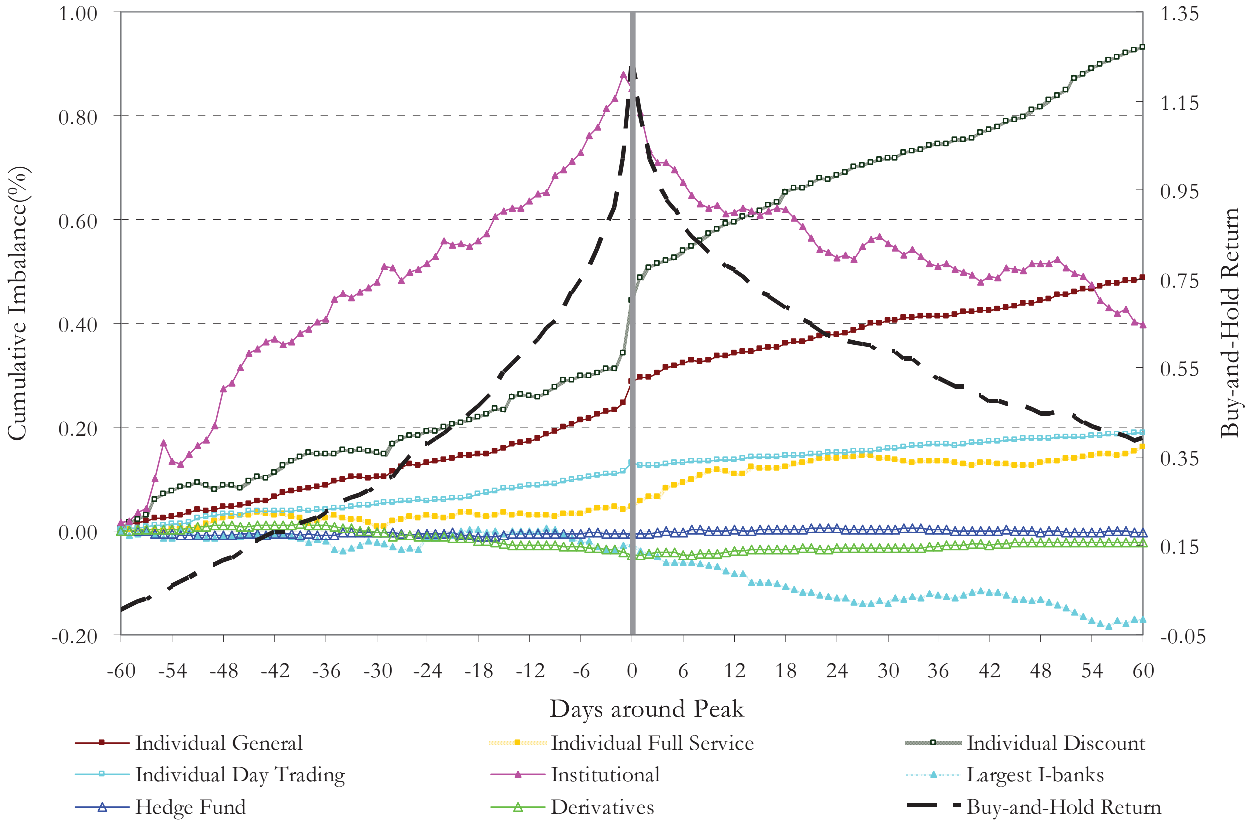


Figure IB.4. Cumulative Imbalances around Individual Stock Peaks: Size- and Turnover-Adjusted Imbalances and [-60, 60] window; Excluding Peaks in March 2000. For all Nasdaq stocks with ordinary common shares and 3-digit SIC code 737 at some point from January 1997 to December 2000, we identify the individual peaks during the same period. In case of a tie, we choose the first peak. Then, we eliminate stocks for which the peak is within the first or last 21 days of trading or the 3-digit SIC code is different from 737 at the time of the peak. We also eliminate stocks with peaks in March 2000 to avoid clustering. We are left with 429 stocks. When two stocks peak on the same day, we take the equal-weighted average of the two observations to avoid clustering. This gives us 258 different peak days. We plot the cross-sectional averages of the buy-and-hold return and cumulative imbalances for various investor groups around individual peaks. Panel A plots cumulative size-adjusted imbalances in the [-21, 21] window surrounding individual peaks. Daily imbalance is the difference between the buy and sell volumes expressed as a percentage of shares outstanding. We adjust daily imbalances for firm size by subtracting the average imbalance for the firm's size quartile in the technology sector. Panel B plots cumulative turnover-adjusted imbalances in the [-21, 21] window surrounding individual peaks. We adjust daily imbalances for turnover by subtracting the average imbalance for the firm's historical turnover quartile in the technology sector. Historical turnover for a stock is sum of daily turnover of the stock in the past twenty trading days. Panel C plots cumulative imbalances in the [-60, 60] window surrounding individual peaks.

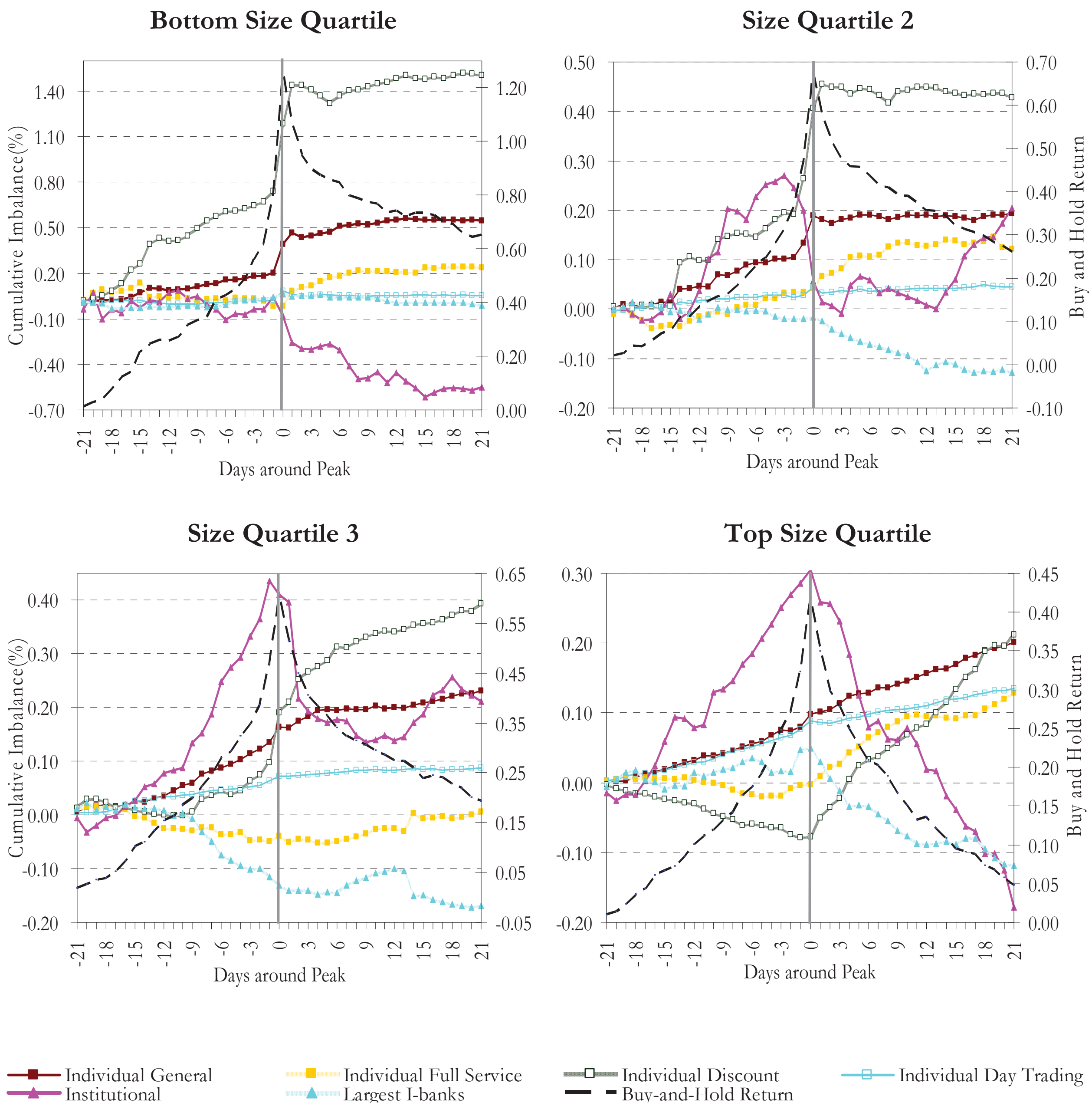


Figure IB.5. Cumulative Imbalances around Individual Stock Peaks: Groups of Firm Size; Excluding Peaks in March 2000. For all Nasdaq stocks with ordinary common shares and 3-digit SIC code 737 at some point from January 1997 to December 2000, we identify the individual peaks during the same period. In case of a tie, we choose the first peak. Then, we eliminate stocks for which the peak is within the first or last 21 days of trading or the 3-digit SIC code is different from 737 at the time of the peak. We also eliminate stocks with peaks in March 2000 to avoid clustering. We are left with 429 stocks and assign them into quartiles based on market capitalization. When two stocks in the same size quartile peak on the same day, we take the equal-weighted average of the two observations to avoid clustering. This figure plots the cross-sectional averages of the buy-and-hold return and cumulative imbalances for various investor groups for 43 trading days surrounding individual peaks for each size quartile. Daily imbalance is the difference between the buy and sell volumes expressed as a percentage of shares outstanding.

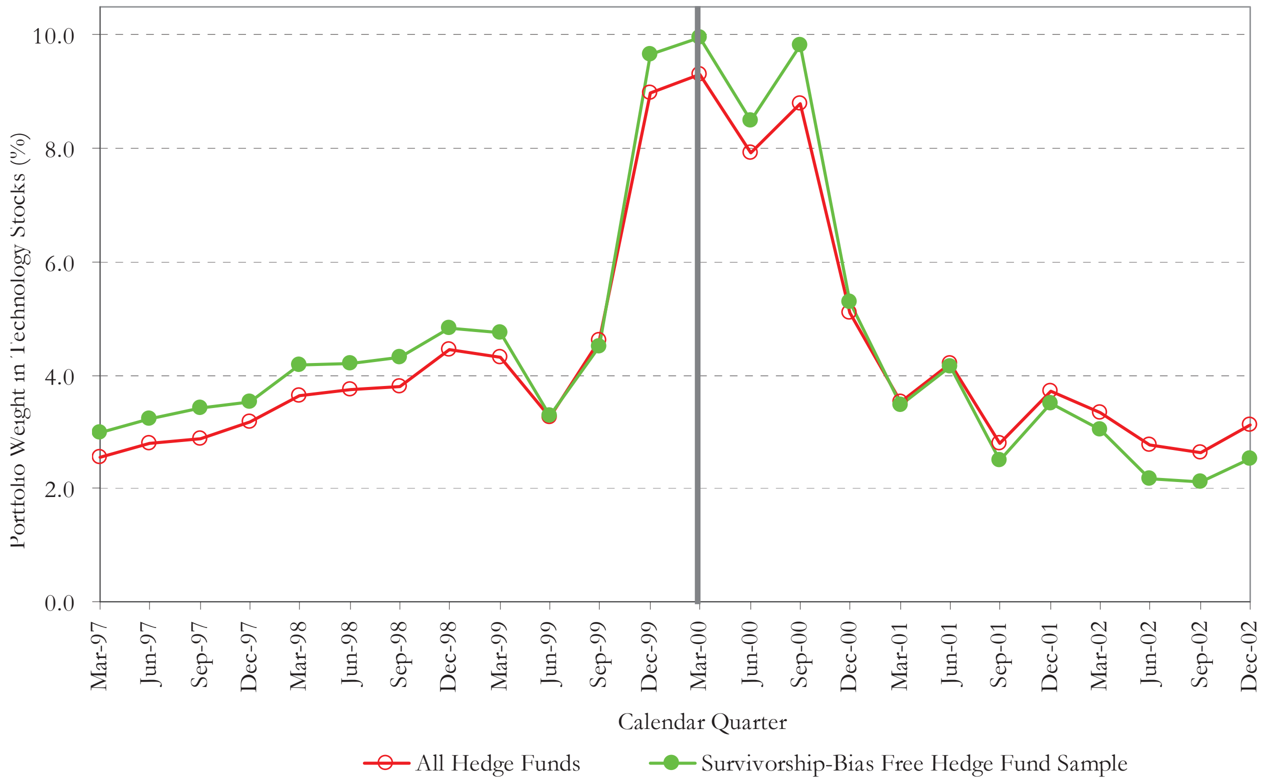


Figure IB.6. Portfolio Weights in Technology Stocks: Hedge Funds in the Survivorship-Bias Free Sub-Sample. This figure plots portfolio weights in Nasdaq technology stocks (3-digit SIC code=737 with ordinary common shares, excluding Microsoft) for hedge funds in the survivorship-bias free sub-sample during the 1997-2002 period. Portfolio weight is the percentage of total dollar holdings accounted for by technology stocks. The survivorship-bias free sub-sample of hedge funds is used in Griffin and Xu (2009), containing fund-years only after a hedge fund first appears in various name lists (without backfill). We also plot portfolio weights for the whole hedge fund sample for comparison.

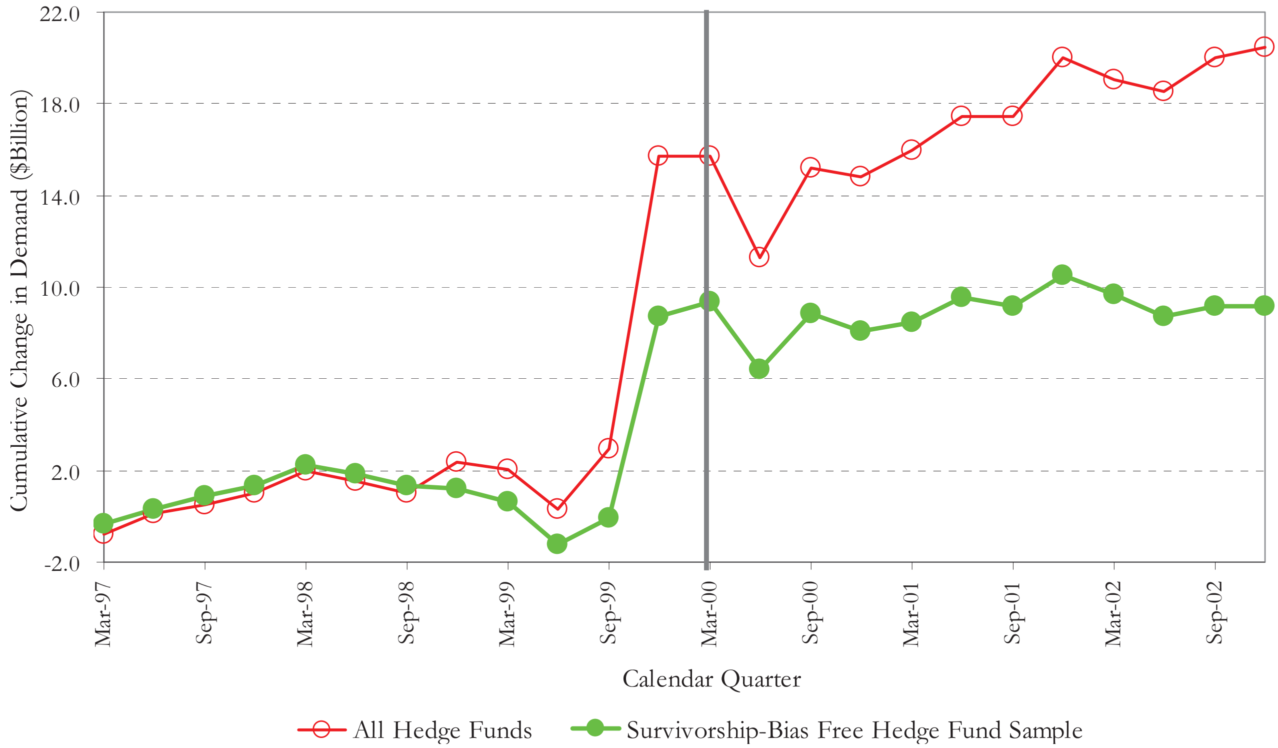
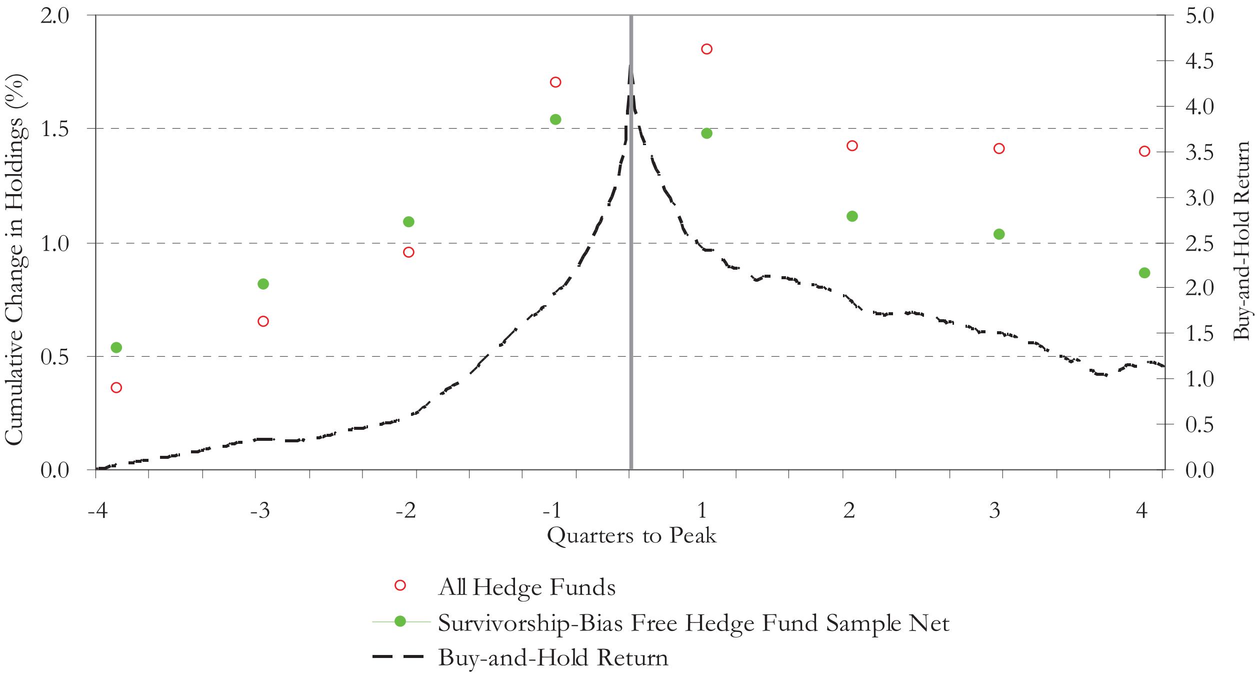


Figure IB.7. Cumulative Change in Demand for Technology Stocks: Hedge Funds in the Survivorship-Bias Free Sub-Sample. We calculate quarterly changes in demand for Nasdaq technology stocks (3-digit SIC code=737 with ordinary common shares, excluding Microsoft) for hedge funds in the survivorship-bias free sub-sample during the 1997-2002 period. We require a firm to be in the technology sector at both the beginning and the end of the quarter to be included in the sample. Quarterly change in demand is the difference between end-of-quarter technology holdings and buy-and-hold value of beginning-of-quarter technology holdings. The survivorship-bias free sub-sample of hedge funds is used in Griffin and Xu (2009), containing fund-years only after a hedge fund first appears in various name lists (without backfill). We also plot cumulative change in demand for the whole hedge fund sample for comparison.

Panel A: Cumulative Net Active Buying: Hedge Funds



Panel B: Peaks within Five Trading Days of Quarter End: Hedge Funds

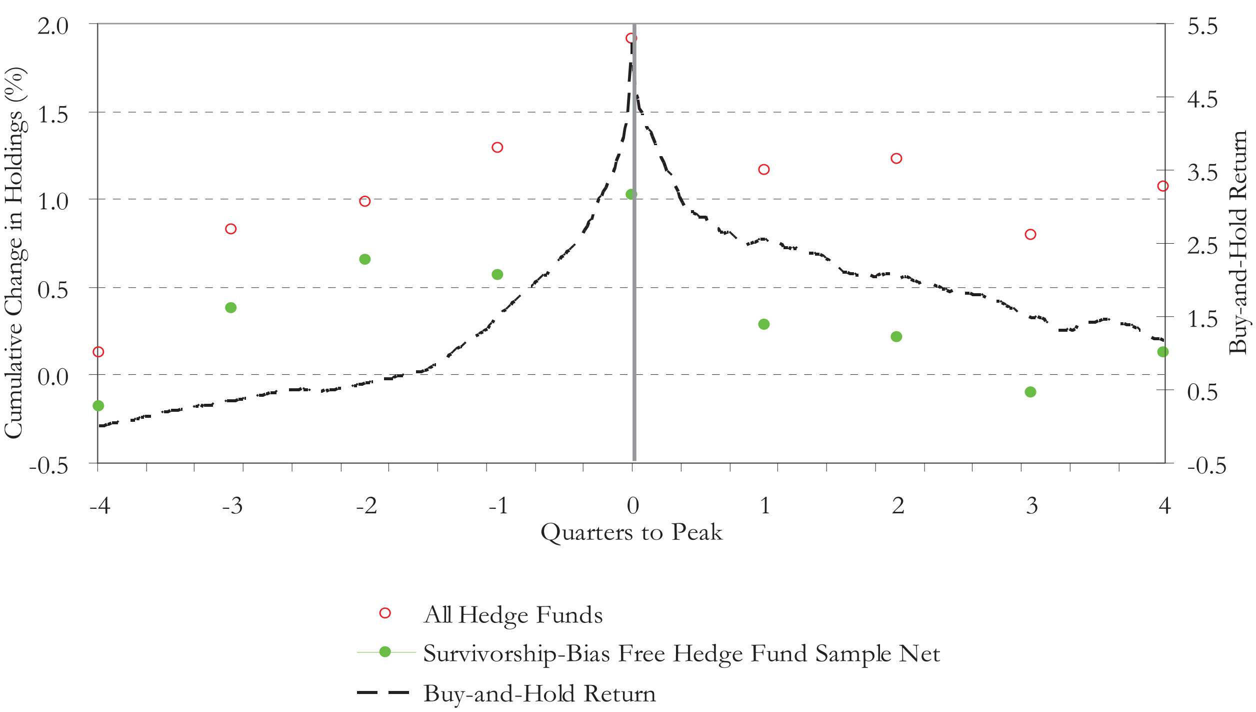


Figure IB.8. Demand around Individual Stock Peaks: Hedge Funds in the Survivorship-Bias Free Sub-Sample. We analyze demand around individual peaks for Nasdaq technology stocks (3-digit SIC code=737 with ordinary common shares, excluding Microsoft) during the period from January 1997 to December 2000. There are 580 technology stock peaks (279 different event days) during this period. When stocks peak in the same quarter, we take the equal-weighted average of the observations. Panel A plots cross-sectional averages of the buy-and-hold return and cumulative net active buying for hedge funds in the survivorship-bias free sub-sample during the eight quarters surrounding individual peaks. Quarterly net buying for a stock is calculated as the difference between end-of-quarter holdings and buy-and-hold value of beginning-of-quarter holdings, expressed as a percentage of the stock's market capitalization at the end of quarter. Cumulative net active buying is cumulative net buying minus net buying induced by flows. Calculations of flow-induced net buying are described in Internet Appendix F. Quarter 1 marks the end of the quarter containing the peak, which is on average 33 trading days after the peak for our sample. Quarter -1 marks the end of the quarter prior to peak. The survivorship-bias free sub-sample of hedge funds is used in Griffin and Xu (2009), containing fund-years only after a hedge fund first appears in various name lists (without backfill). We also plot cumulative net active buying for the whole hedge fund sample for comparison. Panel B plots the cumulative net active buying for hedge funds around 95 price peaks that occur within five trading days ([-5, 5] window) from the end of a quarter, where quarter 0 refers to the end of the quarter that coincides with the individual price peak.

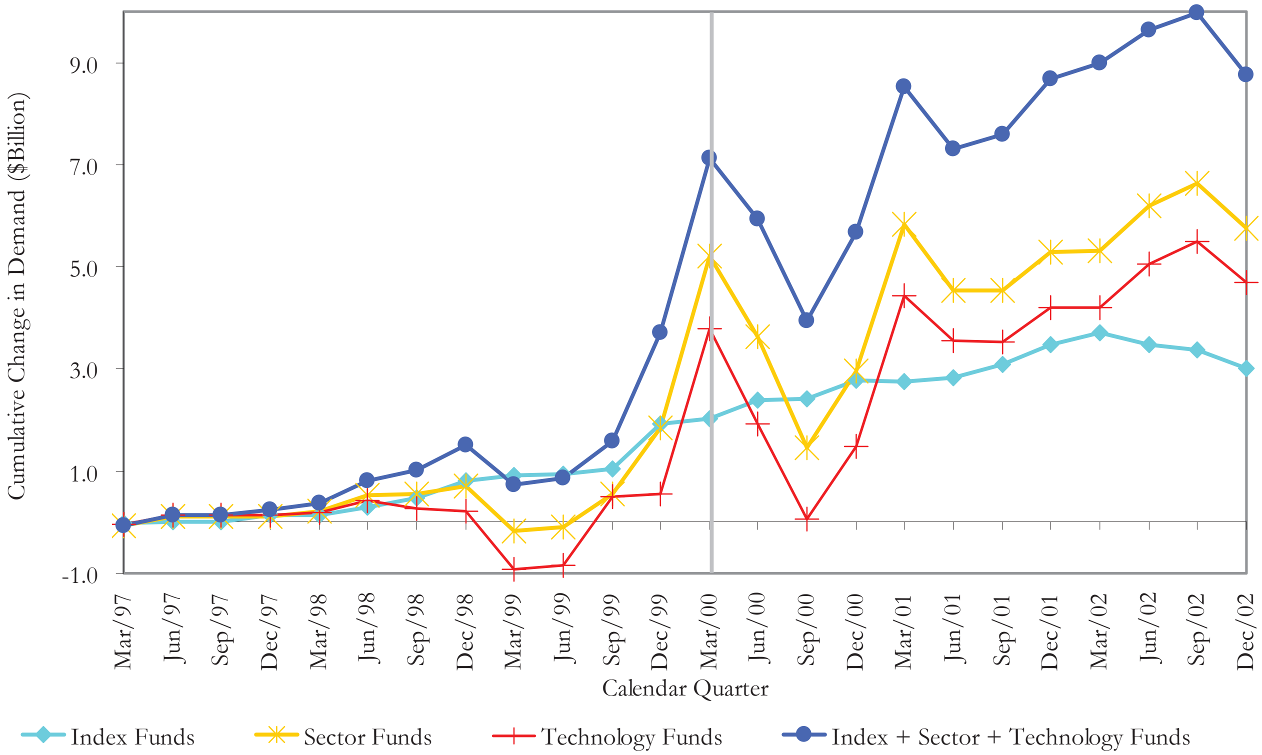
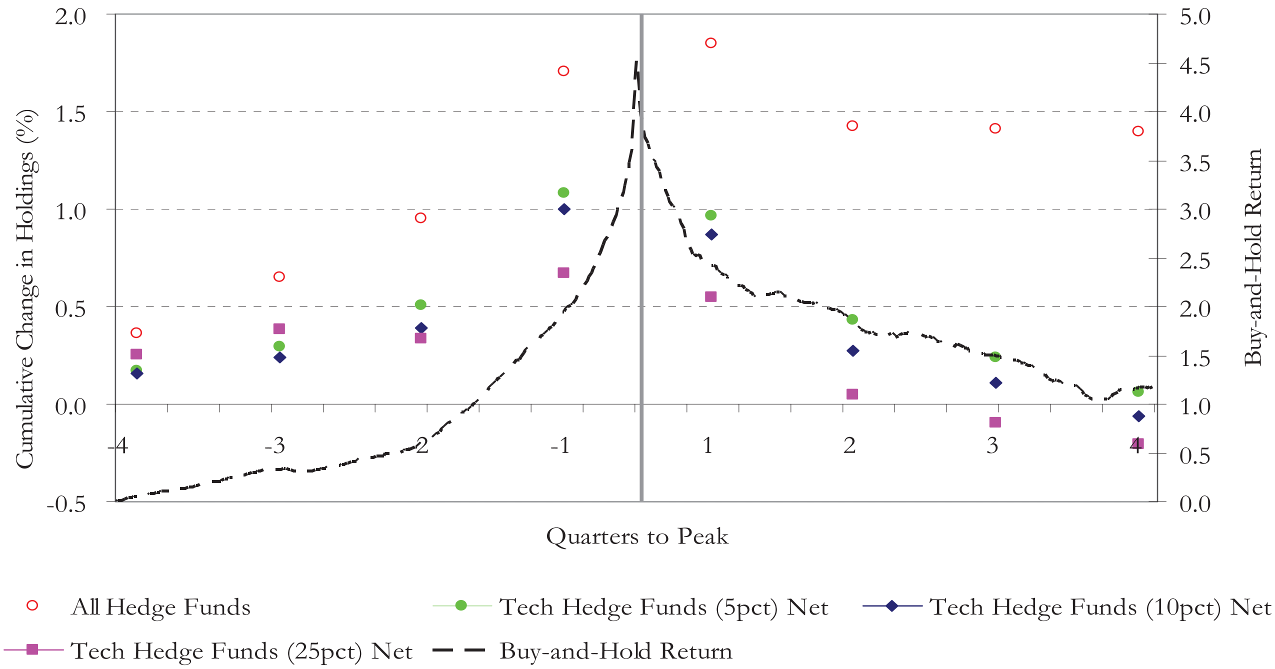


Figure IB.9. Cumulative Change in Demand for Technology Stocks: Index Mutual Funds, Sector Mutual Funds, and Technology Mutual Funds; Including IPOs and Delistings. We calculate quarterly changes in demand for Nasdaq technology stocks (3-digit SIC code=737 with ordinary common shares, excluding Microsoft) for index mutual funds, sector mutual funds, and technology mutual funds during the 1997-2002 period. Quarterly change in demand is the difference between end-of-quarter technology holdings and buy-and-hold value of beginning-of-quarter technology holdings. We further subtract demand induced by fund flows. Internet Appendix E describes how we calculate flow-induced demand. To identify index, sector, and technology funds, we use the Standard and Poor's detailed objective name, Standard and Poor's style name, Standard and Poor's specialist name, ICDI's fund objective code, Wiesenberger objective code, and fund name variables from the CRSP Mutual Funds database and fund names from Thomson Financial N-30D data. We identify a mutual fund as an index fund if the Standard and Poor's specialist name variable includes the keyword 'index', or the fund name from the CRSP Mutual Funds database includes one of the keywords 'index', 'indx', 'idx', 'dow 30', '100', '500', or 'russell 2000', or the fund name from Thomson Financial N-30D data includes one of the keywords 'index' or 'indx'. We identify a mutual fund as a sector fund if the Standard and Poor's detailed objective name variable equals 'Equity USA Misc Sectors', or the Standard and Poor's style name variable equals 'Equity Sector', or the Standard and Poor's specialist name variable equals 'Miscellaneous Sector', or the ICDI's fund objective code variable equals 'SF' (sector funds). We identify a mutual fund as a technology fund if the Standard and Poor's detailed objective name variable equals 'Equity USA Technology', or the Standard and Poor's style name variable equals 'Equity Information Technology Sector' or 'Equity Telecommunications Sector', or the Standard and Poor's specialist name variable equals 'Index ArcaEx Tech 100', 'Index GSTI Composite', 'Index MSCI US IM Info Tech', 'Index MSCI US IM Telecom Svcs', 'Index NYSE Arca Tech 100', 'Index PSE Technology 100', 'Information Technology', 'Internet', 'TMT', 'TMT (Technology Media & Telecom)', 'Technology', or 'Telecommunications', or the Wiesenberger objective code variable equals 'TCH' (technology sector), or the fund name from the CRSP Mutual Funds database includes one of the keywords 'internet', 'technology', or 'telecom' but not 'biotech', or the fund name from Thomson Financial N-30D data includes the keywords 'internet' or 'tech' but neither 'bio tech' nor 'biotech'. Since the dollar value of holdings in our merged mutual fund sample is 22.58% of mutual fund holdings in Thomson Financial N-30D data (more details provided in Internet Appendix D), we further divide the demand for each fund type by 22.58% assuming our merged fund sample is representative of the mutual fund universe. We also plot total cumulative change in demand by index, sector, and technology funds.

Panel A: Cumulative Net Active Buying: Technology Hedge Funds



Panel B: Peaks within Five Trading Days of Quarter End: Technology Hedge Funds

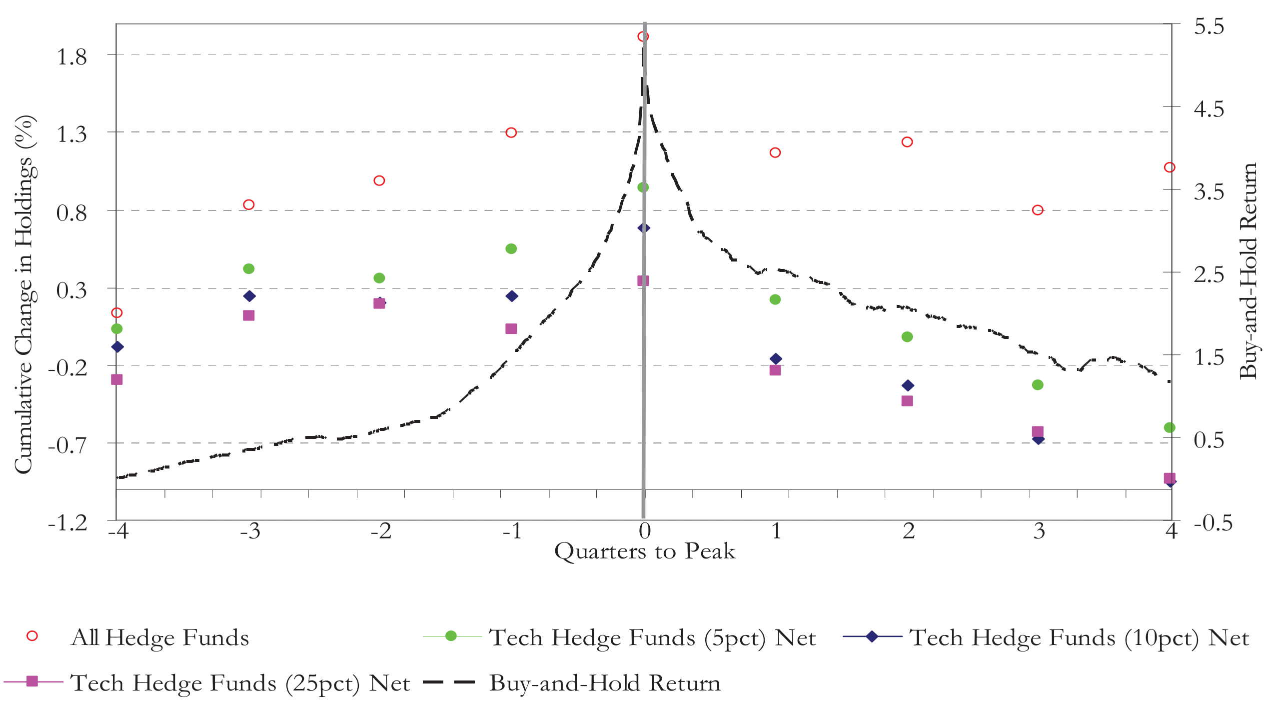
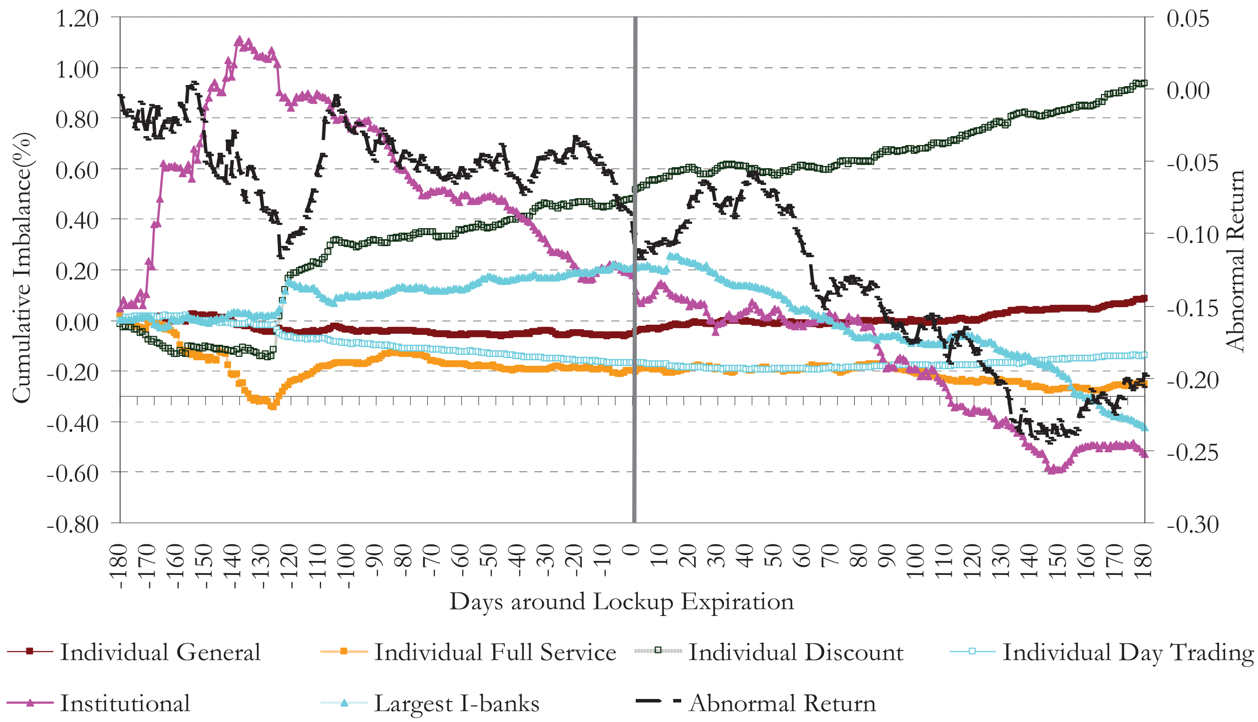


Figure IB.10. Demand around Individual Stock Peaks: Technology Hedge Funds. We analyze demand around individual peaks for Nasdaq technology stocks (3-digit SIC code=737 with ordinary common shares, excluding Microsoft) during the period from January 1997 to December 2000 (excluding March 2000 to avoid clustering). There are 580 technology stock peaks (279 different event days) during this period. When stocks peak in the same quarter, we take the equal-weighted average of the observations. Panel A plots cross-sectional averages of the buy-and-hold return and cumulative net active buying for technology hedge funds during the eight quarters surrounding individual peaks. Quarterly net buying for a stock is calculated as the difference between end-of-quarter holdings and buy-and-hold value of beginning-of-quarter holdings, expressed as a percentage of the stock's market capitalization at the end of quarter. Cumulative net active buying is cumulative net buying minus net buying induced by flows. Calculations of flow-induced net buying are described in Internet Appendix F. Quarter 1 marks the end of the quarter containing the peak, which is on average 33 trading days after the peak for our sample. Quarter -1 marks the end of the quarter prior to peak. We identify 257 technology hedge funds whose portfolio weights in technology stocks for the first quarter of 1997 (or the first quarter in 13f sample for a new fund) are higher than the 5th percentile of the corresponding weights for technology mutual funds (Internet Appendix G describes how we identify technology mutual funds). For robustness, we also identify 210 and 94 technology hedge funds using 10th and 25th percentile cutoffs. We also plot cumulative net active buying for the whole hedge fund sample for comparison. Panel B plots the cumulative net active buying for hedge funds around 95 price peaks that occur within five trading days ([-5, 5] window) from the end of a quarter, where quarter 0 refers to the end of the quarter that coincides with the individual price peak.

Panel A: Cumulative Imbalances during the [-180, 180] Window around IPO Lockup Expirations



Panel B: Cumulative Imbalances during the [-180, 180] Window around SEO Lockup Expirations

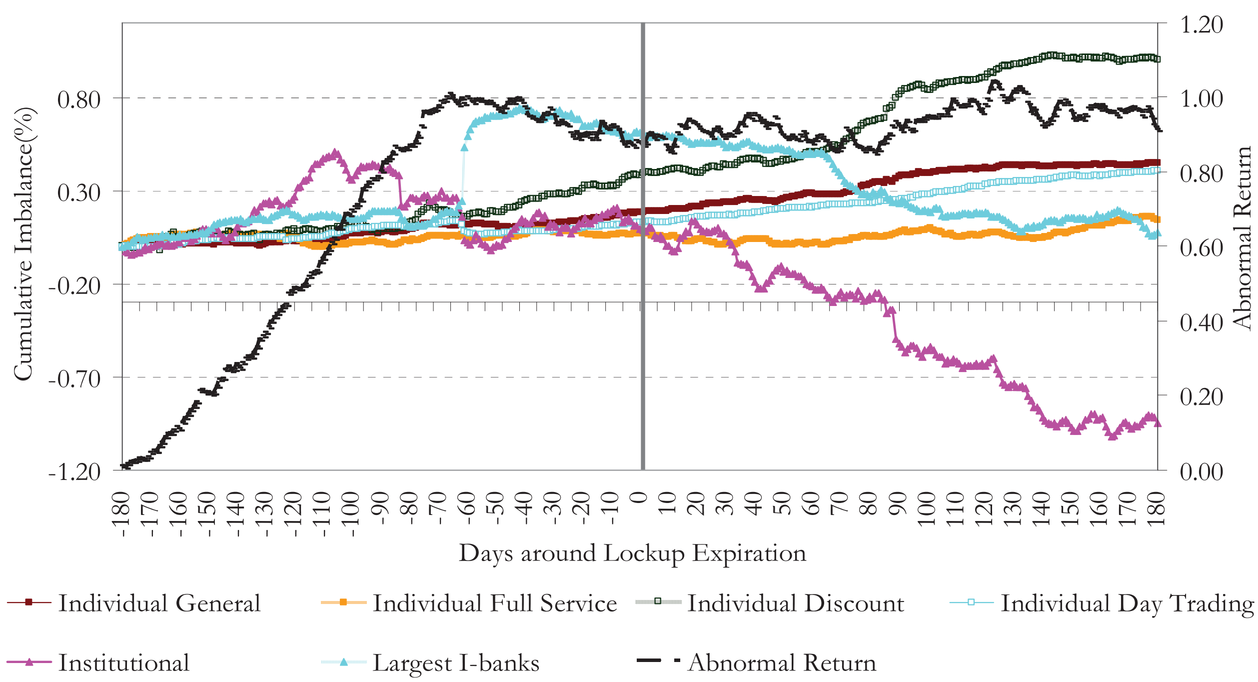


Figure IB.11. Cumulative Imbalances around Lockup Expirations: [-180, 180] Window. We collect data from SDC on IPO and SEO lockup expirations for Nasdaq technology stocks (3-digit SIC code=737 with ordinary common shares) during the 1997-2002 period. We manually search prospectuses through the EDGAR database to confirm the expiration dates and fill in missing data on expiration dates and number of shares subject to lockup. We drop issues with multiple lockup expiration dates or with an offer price less than $5. Panels A and B plot the cross-sectional averages of the abnormal return and cumulative imbalances for various investor groups for 361 trading days surrounding IPO and SEO lockup expirations, respectively. Daily imbalance is the difference between the buy and sell volumes expressed as a percentage of shares outstanding. We adjust daily imbalances for firm size by subtracting the average imbalance for the firm's size quartile in the technology sector. Abnormal return is the buy and hold return in excess of value-weighted technology index return.

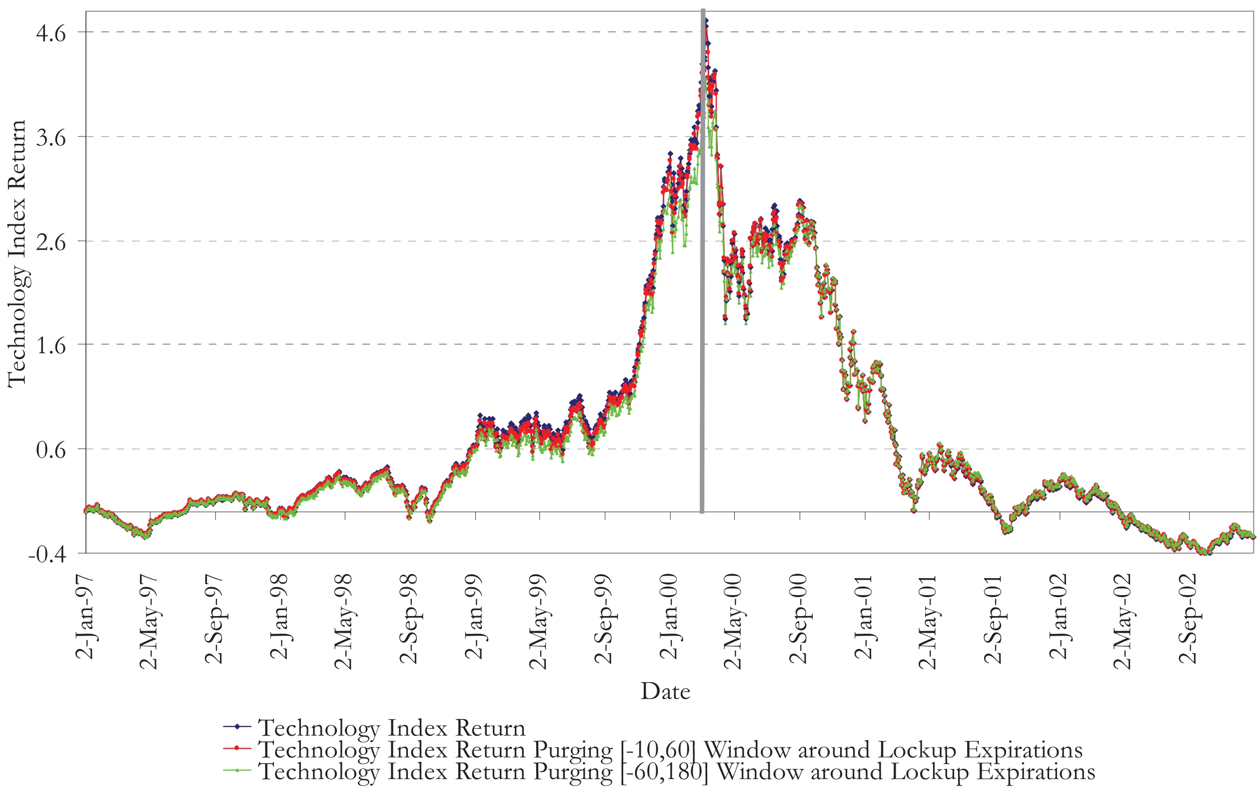


Figure IB.12. Technology Index Returns Excluding Lock-up Expirations. We calculate buy-and-hold index returns for Nasdaq technology stocks (3-digit SIC code=737 with ordinary common shares, excluding Microsoft) during the 1997-2002 period. We plot index returns for the full sample, the sub-sample that excludes a firm-day if it is in the [-10, 60] window of an IPO or SEO lockup expiration for the firm, and the sub-sample that excludes a firm-day if it is in the [-60, 180] window of an IPO or SEO lockup expiration for the firm. Day 0 is the expiration day for the lockup shares.

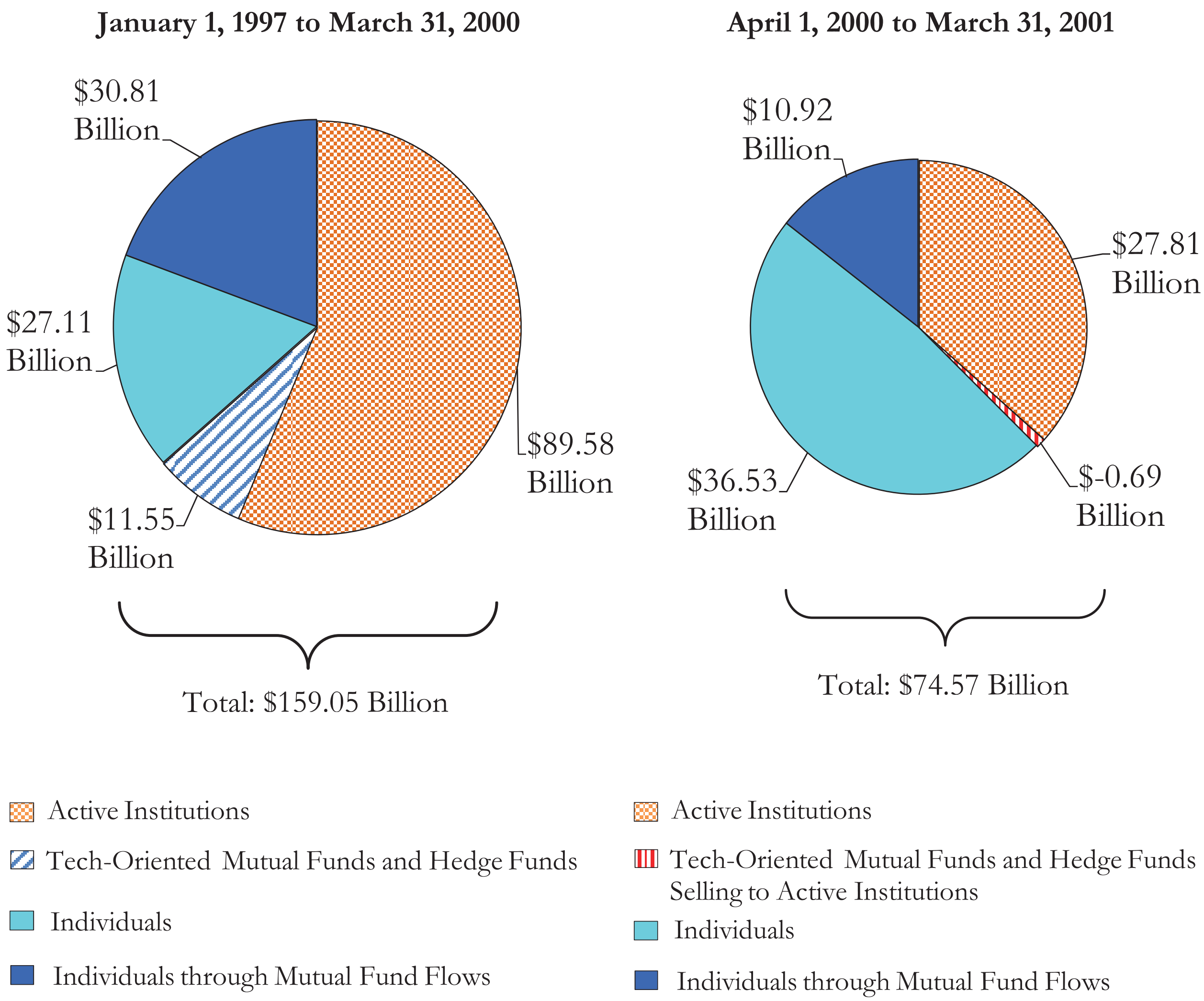


Figure IB.13. Cumulative Change in Demand for Technology Stocks: Examining Technology-Oriented Institutions and Active Institutions Separately. We first calculate quarterly changes in demand from January 1997 to March 2000 and from April 2000 to March 2001 for Nasdaq technology stocks (3-digit SIC code=737, excluding Microsoft) with ordinary common shares. We require a firm to be in the technology sector at both the beginning and the end of the quarter to be included in the sample. Quarterly change in demand for an investor group is the difference between end-of-quarter technology holdings and buy-and-hold value of beginning-of-quarter technology holdings. The individual group is net of insiders. We further isolate the change in demand induced by mutual fund flows from change in demand by technology-oriented mutual funds and hedge funds and change in demand by active institutions. Change in demand induced by mutual fund flows is calculated by applying mutual fund flows for merged CRSP-Thomson Financial sample to 13f mutual fund families. We describe the details of our approach in Internet Appendix E. We then sum up the quarterly changes in demand from January 1997 to March 2000 and from April 2000 to March 2001, respectively. Technology-oriented mutual funds comprise index, sector, and technology funds. To identify such funds, we use the Standard and Poor's detailed objective name, Standard and Poor's style name, Standard and Poor's specialist name, ICDI's fund objective code, Wiesenberger objective code, and fund name variables from the CRSP Mutual Funds database and fund names from Thomson Financial N-30D data. We identify a mutual fund as an index fund if the Standard and Poor's specialist name variable includes the keyword 'index', or the fund name from the CRSP Mutual Funds database includes one of the keywords 'index', 'indx', 'idx', 'dow 30', '100', '500', or 'russell 2000', or the fund name from Thomson Financial N-30D data includes one of the keywords 'index' or 'indx'. We identify a mutual fund as a sector fund if the Standard and Poor's detailed objective name variable equals 'Equity USA Misc Sectors', or the Standard and Poor's style name variable equals 'Equity Sector', or the Standard and Poor's specialist name variable equals 'Miscellaneous Sector', or the ICDI's fund objective code variable equals 'SF' (sector funds). We identify a mutual fund as a technology fund if the Standard and Poor's detailed objective name variable equals 'Equity USA Technology', or the Standard and Poor's style name variable equals 'Equity Information Technology Sector' or 'Equity Telecommunications Sector', or the Standard and Poor's specialist name variable equals 'Index ArcaEx Tech 100', 'Index GSTI Composite', 'Index MSCI US IM Info Tech', 'Index MSCI US IM Telecom Svcs', 'Index NYSE Arca Tech 100', 'Index PSE Technology 100', 'Information Technology', 'Internet', 'TMT', 'TMT (Technology Media & Telecom)', 'Technology', or 'Telecommunications', or the Wiesenberger objective code variable equals 'TCH' (technology sector), or the fund name from the CRSP Mutual Funds database includes one of the keywords 'internet', 'technology', or 'telecom' but not 'biotech', or the fund name from Thomson Financial N-30D data includes the keywords 'internet' or 'tech' but neither 'bio tech' nor 'biotech'. Since the dollar value of holdings in our merged mutual fund sample is 22.58% of mutual fund holdings in Thomson Financial N-30D data (more details provided in Internet Appendix D), we further divide the demand for each fund type by 22.58% assuming our merged fund sample is representative of the mutual fund universe. We identify 257 technology hedge funds whose portfolio weights in technology stocks for the first quarter of 1997 (or the first quarter in 13f sample for a new fund) are higher than the 5th percentile of the corresponding weights for technology mutual funds. We plot cumulative changes in demand for technology-oriented mutual funds and hedge funds, active institutions, and individuals, and demand induced by mutual fund flows for the January 1997-March 2000 and April 2000-March 2001 periods. Active institutions include all institutions other than technology-oriented mutual funds and hedge funds.

Table IA.I

Correlations among Investor Group Imbalances and Market Returns

This table reports the correlations among daily imbalances for nine investor groups and the market return for the technology sector for the period from January 2, 1997 to March 27, 2000. The technology sector is comprised of all Nasdaq stocks with ordinary common shares (CRSP share codes 10 or 11) and 3-digit SIC code 737, which stands for computer programming, data processing, and other computer-related services. Daily imbalance is the difference between the buy and sell volumes expressed as a percentage of shares outstanding. Correlations above the diagonal are computed using equal-weighted averages; correlations below the diagonal are based on value-weighted averages. Significance at the 1% and 5% levels are denoted by ** and *, respectively.

	Ind. General	*Ind. Full Service*	*Ind. Discount*	*Ind. Day Trading*	*Inst.*	*Largest I-banks*	*Hedge Fund*	*Deriv.*	*Mixed*	*Market Return*
Ind. General		0.16^{*}	0.40^{*}	-0.14^{*}	0.00	-0.10^{*}	0.02	-0.10^{*}	0.27^{*}	0.13^{*}
Ind. Full Service	0.30^{*}		0.27^{*}	-0.06	-0.15^{*}	-0.13^{*}	-0.07^{**}	-0.01	0.20^{*}	-0.01
Ind. Discount	0.38^{*}	0.54^{*}		0.07^{**}	-0.34^{*}	-0.18^{*}	-0.17^{*}	0.02	0.15^{*}	-0.07^{**}
Ind. Day Trading	-0.30^{*}	-0.04	-0.25^{*}		-0.09^{*}	-0.11^{*}	0.16^{*}	0.02	-0.09^{**}	0.44^{*}
Institutional	0.07^{**}	-0.19^{*}	-0.27^{*}	-0.06		0.06	0.04	-0.18^{*}	-0.11^{*}	0.16^{*}
Largest I-banks	-0.18^{*}	-0.43^{*}	-0.46^{*}	-0.01	0.08^{**}		-0.02	-0.09^{*}	-0.17^{*}	0.05
Hedge Fund	-0.01	-0.06	-0.28^{*}	0.26^{*}	-0.01	0.08^{**}		-0.07	-0.10^{*}	0.26^{*}
Derivatives	-0.03	0.03	0.04	0.07^{**}	-0.21^{*}	-0.09^{**}	0.06		-0.07^{**}	-0.14^{*}
Mixed	0.19^{*}	0.20^{*}	0.11^{*}	-0.11^{*}	-0.09^{*}	-0.24^{*}	-0.02	-0.13^{*}		0.16^{*}
Market Return	-0.05	-0.15^{*}	-0.49^{*}	0.40^{*}	0.18^{*}	0.21^{*}	0.39^{*}	-0.04	0.15^{*}	

Table IA.II

Firm Characteristics Sorted on the Difference between Institutional and Individual Change in Ownership Up to March 2000: Large Firms

The sample includes all CRSP stocks with ordinary common shares (CRSP share codes 10 or 11) and market capitalizations above the CRSP median on March 31, 2000. We further divide sample firms into two groups according to their market capitalizations as of March 31, 2000. We then assign sample firms in each size group into terciles according to the difference between change in institutional ownership and change in individual ownership. Change in ownership for an investor group is the difference between that group's ownership at the end of March 2000 and March 1999. Ownership for an investor group is defined as share holdings divided by total shares outstanding. Individual ownership is net of insiders. We report simple averages of price-to-sales ratios and buy-and-hold returns for each portfolio. Price-to-sales ratio as of March 31, 2000 is price per share for March 31, 2000 divided by sales per share for most current fiscal year end which is at least six months before March 31, 2000. Returns are buy-and-hold returns. P/S adjusted return is the individual firm return minus the average return for the firm's P/S quartile on March 31, 2000. We also report the percentage of total market capitalization of the CRSP sample accounted for by each portfolio.

	Characteristics Mar.00		**Buy-and-Hold Return**			**PS Adj. Returns**	
	Fraction CRSP ME	**P/S Ratios**	**Apr.99-Mar.00**	**Apr.00-Mar.01**	**Apr.00-Dec.02**	**Apr.00-Mar.01**	**Apr.00-Dec.02**
Largest 25% Firms							
Institutional Buying	0.121	2.126	2.458	-0.196	-0.271	0.026	-0.068
Medium	0.406	1.375	0.596	0.033	0.020	0.152	0.063
Individual Buying	0.432	1.393	0.485	0.022	-0.003	0.140	0.027
Inst. Buying – Indiv. Buying		0.733	1.974	-0.218	-0.268	-0.113	-0.095
t-statistics		(6.95)	(8.90)	(-5.75)	(-5.51)	(-3.39)	(-2.25)
2nd Largest 25% Firms							
Institutional Buying	0.011	1.714	1.901	-0.148	-0.168	0.020	-0.055
Medium	0.010	1.346	0.826	0.062	0.151	0.153	0.137
Individual Buying	0.010	1.250	0.901	-0.058	0.023	0.038	0.011
Inst. Buying – Indiv. Buying		0.465	1.000	-0.090	-0.191	-0.018	-0.066
t-statistics		(4.55)	(3.75)	(-1.79)	(-2.78)	(-0.40)	(-1.05)

Table IA.III
Firm Characteristics Sorted on the Difference between Institutional and Individual Trading Up to March 2000: Second Largest 25% CRSP Firms

The sample includes all CRSP stocks with ordinary common shares (CRSP share codes 10 or 11) and market capitalizations in the second highest quartile of CRSP on March 31, 2000. We first assign sample firms into terciles according to the difference between institutional net active buying and individual net active buying. For net active buying of a stock, we first take the difference between end-of-quarter holdings and buy-and-hold value of beginning-of-quarter holdings, divided by end-of-quarter market capitalization. We further subtract net buying induced by mutual fund flows (calculation described in Internet Appendix E) to obtain net active buying. We set flow-induced net buying to zero for individual investors. We then sum up quarterly net active buying for the four quarters from April 1, 1999 to March 31, 2000. We report simple averages of firm characteristics and institutional and individual (net of insiders) trading for each portfolio. Price-to-sales ratio as of March 31, 2000 is price per share for March 31, 2000 divided by sales per share for most current fiscal year end which is at least six months before March 31, 2000. Returns are buy-and-hold returns. P/S adjusted returns are individual firm returns minus the average returns of their P/S quartile benchmarks on March 31, 2000. We also report the percentage of total market capitalization of CRSP sample accounted for by each portfolio.

	Characteristics Mar.00		Buy-and-Hold Return			PS Adj. Returns	
	Fraction CRSP ME	P/S Ratios	Apr.99-Mar.00	Apr.00-Mar.01	Apr.00-Dec.02	Apr.00-Mar.01	Apr.00-Dec.02
Institutional Buying	0.011	1.565	1.772	-0.105	-0.118	0.038	-0.043
Medium	0.010	1.246	0.616	0.084	0.165	0.170	0.140
Individual Buying	0.010	1.489	1.201	-0.113	-0.032	0.006	-0.004
Inst. Buying – Indiv. Buying		0.076	0.571	0.008	-0.086	0.032	-0.039
t-statistics		(0.70)	(2.00)	(0.16)	(-1.25)	(0.69)	(-0.26)

Table IA.IV

Cross-Sectional Regressions of Post-Peak Returns on Pre-Peak Mutual Fund Flows and Trading by Institutions and Individuals

This table presents cross-sectional regressions of post-peak returns on pre-peak mutual fund flows and trading by institutions and individuals for CRSP stocks with ordinary common shares (CRSP share codes 10 or 11). The dependent variables are buy-and-hold returns from April 1, 2000 to March 31, 2001, March 31, 2002, and December 31, 2002, respectively. In Panel A, the independent variables are institutional net active buying (excluding flows), individual net buying (including flows), or the difference between institutional and individual trading from April 1, 1999 to March 31, 2000, respectively. For institutional net active buying, we first calculate net buying as the difference between end-of-quarter holdings and buy-and-hold value of beginning-of-quarter holdings, divided by end-of-quarter market capitalization. We then subtract net buying induced by mutual fund flows (calculation described in Internet Appendix E) to compute quarterly institutional net active buying and sum up over the four quarters from April 1, 1999 to March 31, 2000. For individual net buying including flows, we sum up individual net buying and net buying induced by mutual fund flows. Panel B presents multivariate regressions on net active buying by institutions (excluding flows), mutual fund flows, and net buying by individuals. We also estimate regressions for two subsamples that include firms in the top 50% and 25% of the CRSP sample according to market capitalization. Panel C repeats the regressions in Panel B but with P/S adjusted returns, which are individual firm returns minus the average returns for the firms' P/S quartiles on March 31, 2000. Panel D repeats the regressions in Panel B but with two-year net buying prior to March 31, 2000. We standardize all variables in the cross-section and estimate with intercepts which are not displayed for brevity. T-statistics computed with White robust errors are in parentheses.

Panel A: Univariate Regressions of Post-Peak Returns on One-Year Pre-Peak Net Buying: Full Sample

	Return Regressed on Inst. (Excl. Flows)			Return Regressed on Indiv. (Incl. Flows)			Return Regressed on (Inst.-Indiv.)		
	Ret (Apr.00-Mar.01)	Ret (Apr.00-Mar.02)	Ret (Apr.00-Dec.02)	Ret (Apr.00-Mar.01)	Ret (Apr.00-Mar.02)	Ret (Apr.00-Dec.02)	Ret (Apr.00-Mar.01)	Ret (Apr.00-Mar.02)	Ret (Apr.00-Dec.02)
Net Buying	-0.09	-0.09	-0.10	-0.14	-0.12	-0.13	0.06	0.04	0.04
	(-3.94)	(-4.16)	(-4.49)	(-3.70)	(-3.95)	(-3.93)	(3.62)	(2.83)	(2.88)
Adj. R^2	0.007	0.008	0.010	0.019	0.014	0.016	0.004	0.002	0.002

Panel B: Multivariate Regressions of Post-Peak Returns on One-Year Pre-Peak Net Active Buying by Institutions (Excluding Flows), Mutual Fund Flows, and Net Buying by Individuals

	Full Sample			Top 50% Market Capitalization			Top 25% Market Capitalization		
	Ret (Apr.00-Mar.01)	Ret (Apr.00-Mar.02)	Ret (Apr.00-Dec.02)	Ret (Apr.00-Mar.01)	Ret (Apr.00-Mar.02)	Ret (Apr.00-Dec.02)	Ret (Apr.00-Mar.01)	Ret (Apr.00-Mar.02)	Ret (Apr.00-Dec.02)
Inst. (Excl. flows)	-0.11	-0.12	-0.13	-0.15	-0.15	-0.15	-0.21	-0.17	-0.16
	(-5.02)	(-6.11)	(-6.61)	(-4.93)	(-5.54)	(-5.85)	(-9.40)	(-9.52)	(-9.51)
Flows	-0.18	-0.16	-0.16	-0.20	-0.18	-0.16	-0.19	-0.18	-0.16
	(-12.41)	(-12.97)	(-12.72)	(-12.83)	(-14.03)	(-13.13)	(-10.76)	(-12.19)	(-11.40)
Indiv.	-0.13	-0.11	-0.12	-0.11	-0.09	-0.09	-0.17	-0.14	-0.14
	(-3.02)	(-3.11)	(-3.11)	(-1.43)	(-1.41)	(-1.45)	(-4.26)	(-4.41)	(-4.44)

	Full Sample			Top 50% Market Capitalization			Top 25% Market Capitalization		
	Ret (Apr.00-Mar.01)	Ret (Apr.00-Mar.02)	Ret (Apr.00-Dec.02)	Ret (Apr.00-Mar.01)	Ret (Apr.00-Mar.02)	Ret (Apr.00-Dec.02)	Ret (Apr.00-Mar.01)	Ret (Apr.00-Mar.02)	Ret (Apr.00-Dec.02)
Adj. R^2	0.057	0.053	0.056	0.122	0.138	0.127	0.235	0.263	0.232
Panel C: Multivariate Regressions of Post-Peak Returns on One-Year Pre-Peak Net Active Buying by Institutions (Excluding Flows), Mutual Fund Flows, and Net Buying by Individuals: P/S Adjusted Returns									
Inst. (Excl. flows)	-0.02	-0.03	-0.04	-0.08	-0.07	-0.07	-0.11	-0.08	-0.08
	(-0.95)	(-1.60)	(-2.29)	(-3.05)	(-3.31)	(-3.52)	(-5.62)	(-4.91)	(-4.62)
Flows	-0.09	-0.07	-0.07	-0.10	-0.08	-0.06	-0.08	-0.07	-0.05
	(-6.30)	(-5.94)	(-5.42)	(-6.91)	(-7.00)	(-5.29)	(-5.06)	(-5.86)	(-3.86)
Indiv.	-0.09	-0.07	-0.08	-0.06	-0.05	-0.04	-0.10	-0.08	-0.07
	(-2.70)	(-2.69)	(-2.67)	(-1.22)	(-1.11)	(-1.14)	(-2.78)	(-2.92)	(-2.77)
Adj. R^2	0.015	0.011	0.011	0.033	0.032	0.023	0.064	0.059	0.035
Panel D: Multivariate Regressions of Post-Peak Returns on Two-Year Pre-Peak Net Active Buying by Institutions (Excluding Flows), Mutual Fund Flows, and Net Buying by Individuals									
Inst. (Excl. flows)	-0.09	-0.09	-0.11	-0.15	-0.13	-0.14	-0.18	-0.15	-0.15
	(-4.73)	(-5.44)	(-6.47)	(-5.53)	(-5.65)	(-6.04)	(-8.26)	(-8.10)	(-7.76)
Flows	-0.13	-0.12	-0.13	-0.16	-0.14	-0.13	-0.17	-0.16	-0.14
	(-8.79)	(-8.84)	(-9.03)	(-8.97)	(-9.99)	(-9.37)	(-7.87)	(-9.39)	(-8.54)
Indiv.	-0.17	-0.14	-0.14	-0.16	-0.14	-0.13	-0.07	-0.06	-0.07
	(-4.25)	(-3.78)	(-3.64)	(-1.95)	(-2.03)	(-2.02)	(-1.47)	(-1.51)	(-1.70)
Adj. R^2	0.051	0.041	0.046	0.095	0.102	0.096	0.174	0.196	0.167

Table IA.V
Imbalances Sorted on Firm Returns and News: Large Technology Firms; Weekly Analysis

The sample contains firms in the top 50% of Nasdaq technology sector (3-digit SIC code=737 with ordinary common shares) according to market capitalization from January 2, 1997 to March 27, 2000. In Panel A, each week (Thursday open to Wednesday close), we assign stocks to portfolios according to whether their contemporaneous weekly returns in excess of technology index return are negative or positive and whether there are any news articles about the firm during the week. We use news articles from the top ten newswires. We calculate equal-weighted average weekly imbalance for each portfolio and investor group and then report the time-series means. Daily imbalance is the difference between the buy and sell volumes expressed as 1/100 of a percentage of shares outstanding. We adjust daily imbalances for firm size by subtracting the average imbalance for the firm's size quartile in the technology sector. Weekly imbalance is the sum of daily imbalances over the week. *Total Individual* is the sum of individual general, individual full service, individual discount, and individual day trading groups. *Total Institution* is the sum of institutional, largest I-banks, hedge fund, and derivatives groups. Panel B is similar to Panel A, but assigns stocks to portfolios according to excess returns for the previous week. T-statistics are calculated for the differences between positive-return and negative-return portfolios. Significance at the 1% and 5% levels are denoted by ** and *, respectively.

Panel A: Imbalances Sorted on Contemporaneous Firm Returns: Weekly Analysis

	No News			News			News – No News
	Neg. Ret.	**Pos. Ret.**	**Diff.**	**Neg. Ret.**	**Pos. Ret.**	**Diff.**	**Diff.**
Total Individual	1.37	-3.51	-4.88**	3.00	-1.44	-4.44**	0.44
Total Institution	-6.94	8.41	15.35**	-7.85	8.94	16.79**	1.44

Panel B: Imbalances Sorted on Lagged Firm Returns: Weekly Analysis

	No News			News			News – No News
	Neg. Ret.	**Pos. Ret.**	**Diff.**	**Neg. Ret.**	**Pos. Ret.**	**Diff.**	**Diff.**
Total Individual	0.99	-3.02	-4.01**	2.42	-0.77	-3.19**	0.83
Total Institution	-2.04	2.65	4.69**	-2.07	1.73	3.80**	-0.89

Table IA.VI

Imbalances Sorted on Firm Returns: News versus No-News Samples, Full Sample

Our sample contains Nasdaq technology stocks (3-digit SIC code=737 with ordinary common shares) from January 2, 1997 to March 27, 2000. In Panel A, on each day t we assign stocks to portfolios according to whether their contemporaneous returns in excess of technology index return are negative or positive and whether there are any news stories about the firm during the [t-3, t] window. We use news stories from the top ten newswires. We calculate equal-weighted average daily imbalance for each portfolio and investor group and then report the time-series means. Daily imbalance is the difference between the buy and sell volumes expressed as 1/100 of a percentage of shares outstanding. We further adjust daily imbalances for firm size by subtracting the average imbalance for the firm's size quartile in the technology sector. *Total Individual* is the sum of individual general, individual full service, individual discount, and individual day trading groups. *Total Institution* is the sum of institutional, largest I-banks, hedge fund, and derivatives groups. Panel B is similar to Panel A, but assigns stocks to portfolios according to excess returns for the previous day. In Panel C, each week (Thursday open to Wednesday close), we assign stocks to portfolios based on whether their contemporaneous weekly excess returns are negative or positive and whether there are any news stories during the week, and then report weekly imbalances. Weekly imbalance is the sum of daily imbalances over the week. Panel D is similar to Panel C, but assigns stocks to portfolios based on excess returns for the previous week. T-statistics are calculated for the difference between positive-return and negative-return portfolios. Significance at the 1% and 5% levels are denoted by ** and *, respectively.

Panel A: Imbalances Sorted on Contemporaneous Firm Returns: Daily Analysis

	No News			News			News – No News
	Neg. Ret.	Pos. Ret.	Diff.	Neg. Ret.	Pos. Ret.	Diff.	Diff
Indiv. General	-0.14	0.08	0.21**	-0.08	0.53	0.62**	0.40**
Indiv. Full Service	-0.14	0.09	0.22**	0.12	0.06	-0.06	-0.28**
Indiv. Discount	0.21	-0.65	-0.86**	0.84	0.22	-0.62**	0.24*
Indiv. Day Trading	-0.15	0.18	0.34**	-0.20	0.36	0.56**	0.22**
Institutional	-1.22	1.76	2.98**	-2.01	1.46	3.47**	0.49*
Largest I-banks	-0.28	0.30	0.58**	-0.53	0.56	1.09**	0.52**
Hedge fund	0.02	-0.05	-0.07**	0.07	-0.01	-0.08**	-0.01
Derivatives	0.09	-0.08	-0.16**	0.10	-0.22	-0.31**	-0.15**
Total Individual	-0.22	-0.31	-0.09	0.68	1.18	0.49**	0.58**
Total Institution	-1.39	1.93	3.32**	-2.37	1.79	4.16**	0.84**

Panel B: Imbalances Sorted on Lagged Firm Returns: Daily Analysis

Total Individual	-0.16	-0.40	-0.24**	0.83	0.93	0.10	0.34*
Total Institution	-0.21	0.63	0.84**	-0.70	-0.13	0.57**	-0.26

Panel C: Imbalances Sorted on Contemporaneous Firm Returns: Weekly Analysis

Total Individual	-0.83	-1.99	-1.16*	1.91	2.02	0.11	1.27
Total Institution	-3.79	6.45	10.24**	-6.21	5.59	11.80**	1.56

Panel D: Imbalances Sorted on Lagged Firm Returns: Weekly Analysis

Total Individual	-0.53	-2.54	-2.02**	3.40	0.43	-2.97**	-0.95
Total Institution	-0.41	2.36	2.77**	-2.51	0.64	3.15**	0.38

Table IA.VII
Fama-MacBeth Regressions of Returns on Contemporaneous Imbalances: Alternative Sample Selections

This table presents time-series averages of coefficients, number of observations, and adjusted R^2s for cross-sectional regressions estimated each day (week, month) from January 2, 1997 to March 27, 2000, for Nasdaq technology stocks (3-digit SIC code=737 with ordinary common shares). Panel A presents results for firms that are in the top 25% of the technology sector according to market capitalization. Panel B presents results for all technology firms. Panel C presents results for firms that are in the bottom 50% of the technology sector according to market capitalization. The dependent variables are daily (weekly, monthly) returns and the independent variables are contemporaneous daily (weekly, monthly) imbalances and their interactions with news dummies. Daily imbalance is the difference between the buy and sell volumes expressed as a fraction of shares outstanding. We adjust daily imbalances for firm size by subtracting the average imbalance for the firm's size quartile in the technology sector. Weekly or monthly imbalance is the sum of daily imbalances over the week (Thursday open to Wednesday close) or month. Weekly (monthly) returns are buy-and-hold returns over the week (month). For daily cross-sectional regression on day t, news dummy equals one for a firm if there are any news articles about the firm in the top ten newswires during the [t-3, t] window. For weekly (monthly) cross-sectional regressions, news dummy equals one for a firm if there are any news articles about the firm in the top ten newswires during the week (month). We standardize dependent and independent variables in each cross-section except for news dummies and estimate with intercepts which are not displayed for brevity. T-statistics computed using Newey-West standard errors with five lags are reported in parentheses.

Panel A: Top 25% Technology Firms according to Market Capitalization

	Daily	Weekly	Monthly	Daily	Weekly
Indiv. General	0.18	0.08	-0.01	0.16	0.05
	(10.74)	(2.42)	(-0.39)	(9.41)	(1.13)
Indiv. Full Service	0.00	0.01	0.01	0.00	0.00
	(-0.48)	(0.87)	(0.58)	(0.08)	(0.19)
Indiv. Discount	-0.23	-0.19	-0.25	-0.25	-0.22
	(-16.21)	(-7.94)	(-8.11)	(-16.18)	(-6.95)
Indiv. Day Trading		0.19	0.15		0.21
		(5.63)	(3.41)		(5.62)
Institutional	0.21	0.21	0.17	0.20	0.19
	(26.21)	(12.40)	(6.96)	(23.85)	(10.69)
Largest I-banks	0.08	0.08	0.05	0.08	0.09
	(15.90)	(8.54)	(3.85)	(14.73)	(7.68)
Hedge Fund		-0.12	-0.06		-0.13
		(-13.07)	(-3.59)		(-11.24)
Mixed	0.15	0.12	0.09	0.14	0.13
	(21.58)	(8.46)	(4.46)	(20.54)	(7.22)
D_{News} × *Indiv. General*				0.12	0.04
				(1.14)	(0.80)

	Daily	Weekly	Monthly	Daily	Weekly
D_{News} × *Indiv. Full Service*				0.29	-0.01
				(0.72)	(-0.24)
D_{News} × *Indiv. Discount*				0.39	0.01
				(1.07)	(0.33)
D_{News} × *Indiv. Day Trading*					0.02
					(1.03)
D_{News} × *Institutional*				0.11	0.05
				(3.41)	(2.00)
D_{News} × *Largest I-banks*				0.84	0.01
				(1.05)	(0.58)
D_{News} × *Hedge Fund*					-0.01
					(-0.25)
D_{News} × *Mixed*				0.27	0.03
				(1.33)	(1.52)
Avg. N	122.1	121.9	128.6	122.1	121.9
Adj. R^2	0.256	0.307	0.278	0.309	0.339
Panel B: Full Technology Sample					
Indiv. General	0.08	0.08	0.06	0.07	0.06
	(13.33)	(5.91)	(2.41)	(10.15)	(4.29)
Indiv. Full Service	0.06	0.05	0.02	0.08	0.07
	(20.15)	(7.29)	(3.39)	(21.75)	(8.73)
Indiv. Discount	-0.01	0.00	-0.02	-0.01	0.00
	(-0.93)	(0.17)	(-0.68)	(-2.20)	(-0.24)
Indiv. Day Trading	0.16	0.14	0.14	0.16	0.16
	(17.46)	(8.14)	(5.48)	(17.49)	(7.29)
Institutional	0.19	0.21	0.18	0.19	0.21
	(36.28)	(17.24)	(8.58)	(36.82)	(16.55)
Largest I-banks	0.10	0.10	0.08	0.10	-0.04
	(25.00)	(11.87)	(4.08)	(23.46)	(-3.65)
Hedge Fund	0.00	-0.01	0.02	0.00	0.11
	(0.28)	(-1.81)	(1.43)	(-0.81)	(11.14)
Mixed	0.17	0.17	0.13	0.18	0.19
	(36.70)	(18.68)	(7.70)	(40.54)	(19.25)
D_{News} × *Indiv. General*				0.07	0.04
				(4.51)	(1.86)
D_{News} × *Indiv. Full Service*				-0.03	-0.03
				(-2.43)	(-1.94)

	Daily	Weekly	Monthly	Daily	Weekly
D_{News} × *Indiv. Discount*				-0.02	0.00
				(-1.42)	(-0.07)
D_{News} × *Indiv. Day Trading*				0.05	-0.01
				(5.00)	(-0.29)
D_{News} × *Institutional*				0.07	0.02
				(5.51)	(1.19)
D_{News} × *Largest I-banks*				0.02	0.01
				(3.17)	(0.98)
D_{News} × *Hedge Fund*				-0.02	-0.01
				(-1.80)	(-0.80)
D_{News} × *Mixed*				0.03	-0.02
				(2.66)	(-1.31)
Avg. N	489	489.9	490.2	489.0	489.9
Adj. R^2	0.147	0.141	0.127	0.183	0.174

Panel C: Bottom 50% Technology Firms according to Market Capitalization

Indiv. General	0.07	0.07	0.01	0.05	0.05
	(9.69)	(5.40)	(0.59)	(7.05)	(3.15)
Indiv. Full Service	0.09	0.10	0.05	0.11	0.13
	(17.94)	(10.79)	(4.43)	(20.79)	(12.60)
Indiv. Discount	0.04	0.06	0.01	0.02	0.05
	(5.31)	(3.51)	(0.30)	(3.24)	(1.88)
Indiv. Day Trading		0.15	0.06		0.16
		(7.75)	(1.46)		(7.92)
Institutional	0.19	0.21	0.19	0.20	0.23
	(23.21)	(15.04)	(8.33)	(25.85)	(12.71)
Largest I-banks	0.13	0.13	0.08	0.15	0.15
	(13.12)	(7.52)	(2.61)	(15.24)	(8.33)
Hedge Fund		0.05	0.05		0.07
		(2.90)	(1.44)		(3.03)
Mixed	0.21	0.23	0.17	0.23	0.25
	(27.33)	(16.39)	(7.89)	(30.39)	(17.14)
D_{News} × *Indiv. General*				1.29	-0.01
				(0.80)	(-0.14)
D_{News} × *Indiv. Full Service*				0.74	-0.02
				(0.85)	(-0.84)

	Daily	Weekly	Monthly	Daily	Weekly
D_{News} x *Indiv. Discount*				0.28	0.03
				(1.90)	(0.90)
D_{News} x *Indiv. Day Trading*					0.01
					(0.21)
D_{News} x *Institutional*				-0.12	0.09
				(-0.43)	(2.39)
D_{News} x *Largest I-banks*				1.27	0.00
				(0.91)	(0.08)
D_{News} x *Hedge Fund*					-0.38
					(-1.23)
D_{News} x *Mixed*				0.07	0.05
				(0.50)	(1.80)
Avg. N	244.2	243.8	257.1	244.2	243.8
Adj. R^2	0.125	0.154	0.123	0.176	0.204

Table IA.VIII
Fama-MacBeth Regressions of Returns on Contemporaneous Imbalances: Alternative News Measures

This table presents time-series averages of coefficients, number of observations, and adjusted R^2s for cross-sectional regressions estimated each day (week) from January 2, 1997 to March 27, 2000 and from March 28, 2000 to December 31, 2002, for Nasdaq technology stocks (3-digit SIC code=737 with ordinary common shares). The dependent variables are daily (weekly) returns and the independent variables are contemporaneous daily (weekly) imbalances and their interactions with news dummies. Daily imbalance is the difference between the buy and sell volumes expressed as a fraction of shares outstanding. Weekly imbalance is the sum of daily imbalances over the week (Thursday open to Wednesday close). We adjust imbalances for firm size by subtracting the average imbalance for the firm's size quartile in the technology sector. Weekly returns are buy-and-hold returns over the week. For daily cross-sectional regression on day t, news dummy equals one for a firm if there are any news articles about the firm in any Factiva newswire or non-newswire source on day t. For weekly cross-sectional regression, news dummy equals one for a firm if there are any news articles about the firm in any Factiva newswire or non-newswire source during the week. We standardize dependent and independent variables except for news dummies in each cross-section and estimate with intercepts which are not displayed for brevity. T-statistics computed using Newey-West standard errors with five lags are reported in parentheses.

	Jan. 2, 1997 – Mar. 27, 2000		**Mar. 28, 2000 – Dec. 31, 2002**	
	Daily	**Weekly**	**Daily**	**Weekly**
Individual General	0.07	0.07	0.04	0.01
	(10.15)	(4.67)	(6.14)	(0.40)
Individual Full Service	0.08	0.07	0.06	0.06
	(21.75)	(8.50)	(12.49)	(6.89)
Individual Discount	-0.01	-0.01	0.00	-0.01
	(-2.20)	(-0.51)	(0.57)	(-0.89)
Individual Day Trading	0.16	0.14	0.05	0.03
	(17.49)	(7.93)	(9.32)	(2.41)
Institutional	0.19	0.21	0.20	0.24
	(36.82)	(17.41)	(26.88)	(14.28)
Largest I-banks	0.10	0.11	0.10	0.10
	(23.46)	(10.09)	(19.63)	(10.13)
Hedge Fund	0.00	-0.02	0.02	0.01
	(-0.81)	(-2.39)	(6.27)	(1.08)
Mixed	0.18	0.18	0.20	0.21
	(40.54)	(21.08)	(31.82)	(14.98)
D_{News} × *Individual General*	0.07	0.01	-0.01	-0.01
	(4.51)	(1.72)	(-0.64)	(-1.79)
D_{News} × *Individual Full Service*	-0.03	-0.02	-0.02	-0.02
	(-2.43)	(-2.24)	(-1.61)	(-3.19)
D_{News} × *Individual Discount*	-0.02	0.00	-0.02	-0.02
	(-1.42)	(-0.28)	(-1.51)	(-2.24)
D_{News} × *Individual DayTrading*	0.05	0.01	0.05	0.02
	(5.00)	(1.87)	(4.14)	(3.35)
D_{News} × *Institutional*	0.07	0.01	0.05	-0.01
	(5.51)	(1.73)	(5.16)	(-1.27)

	Jan. 2, 1997 – Mar. 27, 2000		Mar. 28, 2000 – Dec. 31., 2002	
	Daily	**Weekly**	**Daily**	**Weekly**
D_{News} × *Largest I-banks*	0.02	0.00	0.02	0.00
	(3.17)	(-0.76)	(3.09)	(-1.07)
D_{News} × *Hedge Fund*	-0.02	-0.01	0.03	-0.01
	(-1.80)	(-0.78)	(4.54)	(-1.95)
D_{News} × *Mixed*	0.03	-0.01	0.01	-0.02
	(2.66)	(-0.90)	(1.11)	(-3.44)
N	489	490	551	552
Adj. R^2	0.183	0.173	0.118	0.118

Table IA.IX

Panel Regressions of Returns on Contemporaneous Imbalances

This table presents coefficients, number of observations, and adjusted R^2s for panel regressions estimated for the periods from January 2, 1997 to March 27, 2000 and from March 28, 2000 to December 31, 2002 for Nasdaq technology stocks (3-digit SIC code=737 with ordinary common shares). Panel A reports results for the period from January 2, 1997 to March 27, 2000. Panel B reports results for the period from March 28, 2000 to December 31, 2002. The dependent variables are daily (weekly, monthly) returns and the independent variables are contemporaneous daily (weekly, monthly) imbalances and their interactions with news dummies. Daily imbalance is the difference between the buy and sell volumes expressed as a fraction of shares outstanding. Weekly or monthly imbalance is sum of daily imbalances over the week (Thursday open to Wednesday close) or month. We adjust imbalances for firm size by subtracting the average imbalance for the firm's size quartile in the technology sector. Weekly or monthly returns are buy-and-hold returns over the week or month. For daily regressions, news dummy equals one for a firm on day t if there are any news articles about the firm in the top ten newswires during the [t-3, t] window. For weekly (monthly) regressions, news dummy equals one for a firm if there are any news articles about the firm in the top ten newswires during the week (month). We standardize dependent and independent variables in each cross-section except for news dummies and estimate with intercepts which are not displayed for brevity. T-statistics computed by clustering standard errors by firm and by month are in parentheses.

Panel A: January 2, 1997 – March 27, 2000

	Daily	Weekly	Monthly	Daily	Weekly
Indiv. General	0.08	0.09	0.08	0.07	0.08
	(10.59)	(7.04)	(3.72)	(9.01)	(5.34)
Indiv. Full Service	0.04	0.03	0.01	0.06	0.05
	(10.27)	(4.52)	(0.95)	(10.91)	(5.74)
Indiv. Discount	-0.01	-0.01	-0.04	-0.02	-0.02
	(-0.71)	(-0.63)	(-1.24)	(-2.04)	(-1.74)
Indiv. Day Trading	0.16	0.15	0.15	0.15	0.14
	(11.31)	(11.20)	(7.56)	(9.95)	(8.25)
Institutional	0.16	0.18	0.16	0.17	0.18
	(22.46)	(14.26)	(6.39)	(24.13)	(16.76)
Largest I-banks	0.08	0.08	0.06	0.09	0.08
	(18.81)	(9.05)	(4.03)	(17.24)	(6.95)
Hedge Fund	-0.01	-0.02	0.01	-0.01	-0.01
	(-1.14)	(-2.65)	(0.72)	(-2.87)	(-1.15)
Mixed	0.14	0.15	0.12	0.16	0.16
	(19.15)	(11.23)	(6.22)	(25.06)	(13.90)
D_{News} × *Indiv. General*				0.05	0.02
				(3.36)	(2.38)
D_{News} × *Indiv. Full Service*				-0.05	-0.02
				(-5.65)	(-3.56)
D_{News} × *Indiv. Discount*				0.03	0.01
				(1.42)	(0.99)
D_{News} × *Indiv. Day Trading*				0.02	0.00
				(1.49)	(0.99)
D_{News} × *Institutional*				-0.02	0.00
				(-0.94)	(-0.33)

	Daily	Weekly	Monthly	Daily	Weekly
D_{News} × *Largest I-banks*				-0.01	0.00
				(-1.01)	(0.64)
D_{News} × *Hedge Fund*				0.01	-0.01
				(1.25)	(-2.98)
D_{News} × *Mixed*				-0.05	-0.01
				(-3.27)	(-1.12)
N	399,016	82,298	19,118	396,965	81,480
Adj. R^2	0.060	0.058	0.049	0.062	0.060
Panel B: March 28, 2000 – December 31, 2002					
Indiv. General	0.02	-0.01	-0.05	0.02	0.00
	(2.03)	(-0.65)	(-3.33)	(2.56)	(-0.08)
Indiv. Full Service	0.03	0.03	0.02	0.05	0.03
	(7.28)	(4.57)	(1.87)	(9.22)	(3.68)
Indiv. Discount	-0.03	-0.05	-0.10	-0.01	-0.04
	(-3.09)	(-3.35)	(-4.43)	(-1.21)	(-2.37)
Indiv. Day Trading	0.05	0.04	0.02	0.05	0.03
	(6.02)	(4.59)	(1.22)	(5.42)	(2.84)
Institutional	0.17	0.20	0.21	0.17	0.20
	(17.85)	(17.87)	(11.84)	(15.15)	(15.33)
Largest I-banks	0.08	0.09	0.08	0.09	0.09
	(17.50)	(13.33)	(6.80)	(13.56)	(12.44)
Hedge Fund	0.03	0.00	0.03	0.02	0.02
	(6.99)	(0.43)	(2.08)	(5.63)	(2.51)
Mixed	0.15	0.16	0.13	0.17	0.16
	(15.63)	(12.89)	(7.61)	(14.73)	(11.51)
D_{News} × *Indiv. General*				-0.01	-0.01
				(-1.04)	(-1.62)
D_{News} × *Indiv. Full Service*				-0.04	0.00
				(-4.93)	(-0.26)
D_{News} × *Indiv. Discount*				-0.04	-0.01
				(-2.60)	(-1.68)
D_{News} × *Indiv. Day Trading*				0.01	0.01
				(1.14)	(1.52)
D_{News} × *Institutional*				-0.01	0.00
				(-0.59)	(-0.90)
D_{News} × *Largest I-banks*				-0.01	0.00
				(-1.43)	(0.24)
D_{News} × *Hedge Fund*				0.02	-0.01
				(3.20)	(-5.20)
D_{News} × *Mixed*				-0.03	0.00
				(-2.82)	(-0.71)
N	381,512	80,074	18,177	381,349	79,877
Adj. R^2	0.039	0.052	0.071	0.040	0.053

Table IB.I

Imbalances Sorted on Contemporaneous and Lagged Firm Returns

This table reports daily and weekly imbalances in Nasdaq technology stocks (3-digit SIC code=737 with ordinary common shares) by firm size quartile and contemporaneous and lagged firm returns from January 2, 1997 to March 27, 2000. In Panel A, we assign stocks in each size quartile to two portfolios based on whether their contemporaneous daily returns in excess of technology index return are negative or positive, and then report equal-weighted imbalances for each portfolio and investor group. We first compute daily cross-sectional averages and then report the time-series means. Daily imbalance is the difference between the buy and sell volumes expressed as 1/100 of a percentage of shares outstanding. We further adjust daily imbalances for firm size by subtracting the average imbalance for the firm's size quartile in the technology sector. *Total Individual* is the sum of individual general, individual full service, individual discount, and individual day trading groups. *Total Institution* is the sum of institutional, largest I-banks, hedge fund, and derivatives groups. Panel B assigns stocks to portfolios according to excess returns for the previous day. Panels C and D assign stocks to portfolios based on contemporaneous and lagged weekly (Thursday open to Wednesday close) excess returns and report average weekly imbalances for each portfolio. Weekly imbalance is the sum of daily imbalances over the week. T-statistics are calculated for the difference in net buying between positive-return and negative-return portfolios for each size quartile. Significance at the 1% and 5% levels are denoted by ** and *, respectively.

Panel A: Imbalances Sorted on Contemporaneous Firm Returns: Daily Analysis

	Small			2			3			Large			Large – Small	
	Neg. Ret.	Pos. Ret.	Diff.	Neg. Ret.	Pos. Ret.	Diff.	Neg. Ret.	Pos. Ret.	Diff.	Neg. Ret.	Pos. Ret.	Diff.	Neg. Ret.	Pos. Ret.
Indiv. General	-0.10	0.17	0.27**	-0.11	0.15	0.26**	-0.14	0.19	0.33**	-0.30	0.33	0.62**	-0.20**	0.16**
Indiv. Full Service	-0.32	0.52	0.84**	-0.17	0.25	0.41**	0.04	-0.03	-0.07	0.15	-0.17	-0.32**	0.47**	-0.69**
Indiv. Discount	-0.22	0.34	0.56**	0.13	-0.19	-0.32**	0.48	-0.55	-1.04**	0.86	-0.90	-1.76**	1.08**	-1.24**
Indiv. Day Trading	-0.09	0.12	0.21**	-0.10	0.14	0.25**	-0.18	0.23	0.42**	-0.34	0.35	0.69**	-0.25**	0.23**
Institutional	-0.86	1.53	2.40**	-0.82	1.22	2.04**	-1.67	2.11	3.79**	-1.83	2.03	3.85**	-0.96**	0.48**
Largest I-banks	-0.06	0.09	0.15**	-0.12	0.18	0.30**	-0.17	0.23	0.40**	-0.82	0.90	1.72**	-0.76**	0.81**
Hedge fund	0.00	-0.01	-0.01	-0.01	0.02	0.03	0.02	-0.02	-0.04**	0.10	-0.13	-0.23**	0.10**	-0.12**
Derivatives	0.02	-0.03	-0.05*	0.03	-0.03	-0.06**	0.09	-0.11	-0.20**	0.23	-0.25	-0.49**	0.22**	-0.23**
Mixed	-1.31	2.12	3.43**	-0.95	1.41	2.36**	-0.88	1.16	2.04**	-0.76	0.90	1.66**	0.55**	-1.22**
Total Individual	-0.72	1.16	1.88**	-0.25	0.36	0.60**	0.20	-0.16	-0.36**	0.37	-0.39	-0.76**	1.10**	-1.55**
Total Institution	-0.90	1.59	2.50**	-0.93	1.39	2.32**	-1.74	2.21	3.95**	-2.31	2.55	4.86**	-1.41**	0.94**

Panel B: Imbalances Sorted on Lagged Firm Returns: Daily Analysis

Total Individual	-0.21	0.30	0.51**	-0.30	0.28	0.58**	0.14	-0.25	-0.39**	0.21	-0.34	-0.55**	0.42**	-0.64**
Total Institution	0.09	-0.09	-0.18	-0.04	0.09	0.13	-0.37	0.48	0.85**	-0.75	0.79	1.53**	-0.83**	0.88**

Panel C: Imbalances Sorted on Contemporaneous Firm Returns: Weekly Analysis

	Small			2			3			Large			Large – Small	
	Neg. Ret.	Pos. Ret.	Diff.	Neg. Ret.	Pos. Ret.	Diff.	Neg. Ret.	Pos. Ret.	Diff.	Neg. Ret.	Pos. Ret.	Diff.	Neg. Ret.	Pos. Ret.
Total Individual	-2.62	4.27	6.89**	-0.46	-0.40	0.06	1.98	-1.95	-3.92**	2.53	-2.87	-5.40**	5.15**	-7.14**
Total Institution	-2.09	2.82	4.91**	-2.87	4.52	7.40**	-7.11	8.23	15.35**	-8.10	8.96	17.07**	-6.01**	6.14**

Panel: D Imbalance Sorted on Lagged Firm Returns: Weekly Analysis

	Small			2			3			Large			Large – Small	
	Neg. Ret.	Pos. Ret.	Diff.	Neg. Ret.	Pos. Ret.	Diff.	Neg. Ret.	Pos. Ret.	Diff.	Neg. Ret.	Pos. Ret.	Diff.	Neg. Ret.	Pos. Ret.
Total Individual	0.69	0.34	-0.34	0.30	-1.21	-1.51*	2.13	-2.59	-4.73**	1.26	-1.12	-2.38**	0.58	-1.46
Total Institution	-0.52	0.15	0.67	-0.67	1.10	1.77	-2.57	2.82	5.39**	-1.74	1.40	3.14**	-1.23	1.25

Table IB.II

Daily Imbalances Sorted on Contemporaneous and Lagged Firm Returns: Extreme Return Groups

This table reports daily imbalances in Nasdaq technology stocks (3-digit SIC code=737 with ordinary common shares) by firm size quartile and contemporaneous and lagged firm returns from January 2, 1997 to March 27, 2000. In Panel A, we assign stocks in each size quartile to two portfolios based on whether their contemporaneous daily returns are below -2.5% or above 2.5%, and then report equal-weighted imbalances for each portfolio and investor group. We first compute daily cross-sectional averages and then report the time-series means. Daily imbalance is the difference between the buy and sell volumes expressed as 1/100 of a percentage of shares outstanding. We adjust daily imbalances for firm size by subtracting the average imbalance for the firm's size quartile in the technology sector. *Total Individual* is the sum of individual general, individual full service, individual discount, and individual day trading groups. *Total Institution* is the sum of institutional, largest I-banks, hedge fund, and derivatives groups. Panel B assigns stocks to portfolios according to returns for the previous day. T-statistics are calculated for the difference in net buying between positive-return and negative-return portfolios for each size quartile. Significance at the 1% and 5% levels are denoted by ** and *, respectively.

Panel A: Imbalances Sorted on Contemporaneous Firm Returns

	Small			2			3			Large			Large – Small	
	<-2.5%	>2.5%	Diff.	<-2.5%	>2.5%	Diff.	<-2.5%	>2.5%	Diff.	<-2.5%	>2.5%	Diff.	<-2.5%	>2.5%
Indiv. General	-0.12	0.30	0.42**	-0.12	0.34	0.46**	-0.15	0.53	0.68**	-0.25	0.97	1.22**	-0.13**	0.67**
Indiv. Full Service	-0.28	0.63	0.90**	-0.13	0.38	0.51**	0.02	0.00	-0.02	0.07	-0.14	-0.22**	0.35**	-0.77**
Indiv. Discount	-0.27	0.59	0.86**	-0.02	0.03	0.05	0.22	-0.51	-0.72**	0.44	-1.21	-1.65**	0.71**	-1.80**
Indiv. Day Trading	-0.08	0.17	0.25**	-0.09	0.26	0.34**	-0.16	0.48	0.63**	-0.27	0.78	1.04**	-0.19**	0.60**
Institutional	-0.68	1.66	2.34**	-0.48	1.41	1.89**	-1.05	3.20	4.25**	-1.16	3.45	4.61**	-0.48**	1.80**
Largest I-banks	-0.04	0.10	0.14**	-0.07	0.22	0.29**	-0.11	0.34	0.46**	-0.43	1.30	1.73**	-0.39**	1.20**
Hedge fund	0.00	-0.01	-0.02	-0.01	0.02	0.03	0.00	-0.01	-0.01	0.07	-0.22	-0.29**	0.06**	-0.21**
Derivatives	0.01	-0.03	-0.05	0.02	-0.07	-0.09**	0.07	-0.20	-0.27**	0.15	-0.46	-0.61**	0.14**	-0.43**
Mixed	-1.13	2.59	3.72**	-0.77	2.27	3.05**	-0.56	1.77	2.33**	-0.50	1.74	2.25**	0.63**	-0.85**
Total Individual	-0.74	1.69	2.43**	-0.36	1.00	1.36**	-0.07	0.50	0.57**	0.00	0.40	0.40**	0.74**	-1.29**
Total Institution	-0.70	1.71	2.40**	-0.53	1.58	2.11**	-1.08	3.35	4.43**	-1.38	4.07	5.45**	-0.67**	2.36**

Panel B: Imbalances Sorted on Lagged Firm Returns

	<-2.5%	>2.5%	Diff.	<-2.5%	>2.5%	Diff.	<-2.5%	>2.5%	Diff.	<-2.5%	>2.5%	Diff.	<-2.5%	>2.5%
Total Individual	-0.27	0.58	0.85**	-0.36	0.87	1.23**	-0.06	0.16	0.22	-0.07	0.15	0.21	0.21**	-0.44**
Total Institution	0.09	-0.16	-0.24	0.13	-0.33	-0.46**	-0.19	0.47	0.67**	-0.44	1.11	1.55**	-0.53**	1.27**

Table IB.III
Market Maker Imbalances Sorted on Contemporaneous and Lagged Firm Returns

This table reports daily and weekly market maker imbalances in Nasdaq technology stocks (3-digit SIC code=737 with ordinary common shares) by firm size quartile and contemporaneous and lagged firm returns from January 2, 1997 to March 27, 2000. In Panel A, we assign stocks in each size quartile to two portfolios based on whether their contemporaneous daily returns in excess of technology index return are negative or positive, and then report equal-weighted market maker imbalances for each portfolio and investor group. We first compute daily cross-sectional averages and then report the time-series means. Daily market maker imbalance is the difference between market makers' buy and sell volumes expressed as 1/100 of a percentage of shares outstanding. We further adjust daily market maker imbalances for firm size by subtracting the average imbalance for the firm's size quartile in the technology sector. *Total Individual* is the sum of individual general, individual full service, individual discount, and individual day trading groups. *Total Institution* is the sum of institutional, largest I-banks, hedge fund, and derivatives groups. Panel B assigns stocks to portfolios according to excess returns for the previous day. Panels C and D assign stocks to portfolios based on contemporaneous and lagged weekly (Thursday open to Wednesday close) excess returns and report average weekly market maker imbalances for each portfolio. Weekly market maker imbalance is the sum of daily market maker imbalances over the week. T-statistics are calculated for the difference in net buying between positive-return and negative-return portfolios for each size quartile. Significance at the 1% and 5% levels are denoted by ** and *, respectively.

Panel A: Market Maker Imbalances Sorted on Contemporaneous Firm Returns: Daily Analysis

	Small			2			3			Large			Large – Small	
	Neg. Ret.	Pos. Ret.	Diff.	Neg. Ret.	Pos. Ret.	Diff.	Neg. Ret.	Pos. Ret.	Diff.	Neg. Ret.	Pos. Ret.	Diff.	Neg. Ret.	Pos. Ret.
Indiv. General	0.23	-0.37	-0.60**	0.22	-0.32	-0.54**	0.18	-0.24	-0.41**	0.02	-0.04	-0.05	-0.22**	0.33**
Indiv. Full Service	0.15	-0.25	-0.40**	0.07	-0.12	-0.19**	0.05	-0.06	-0.11**	0.00	0.00	0.00	-0.15**	0.25**
Indiv. Discount	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Indiv. Day Trading	-0.02	0.02	0.04**	-0.02	0.03	0.05**	-0.01	0.01	0.02**	0.00	0.00	-0.01	0.02**	-0.03**
Institutional	1.41	-2.36	-3.77**	0.79	-1.19	-1.98**	1.05	-1.37	-2.42**	1.04	-1.18	-2.21**	-0.37**	1.20**
Largest I-banks	0.00	0.00	0.00	0.05	-0.07	-0.12**	0.10	-0.14	-0.23**	0.56	-0.59	-1.14**	0.56**	-0.59**
Hedge fund	0.01	-0.01	-0.01	0.00	-0.01	-0.01**	-0.01	0.01	0.01	0.01	-0.02	-0.03**	0.01	-0.01*
Derivatives	0.01	-0.02	-0.03**	0.01	-0.02	-0.04**	0.01	-0.01	-0.03**	0.03	-0.03	-0.05**	0.02**	-0.01
Mixed	1.15	-1.89	-3.05**	1.00	-1.46	-2.46**	1.06	-1.41	-2.47**	1.04	-1.21	-2.26**	-0.11*	0.68**
Total Individual	0.36	-0.59	-0.96**	0.28	-0.40	-0.68**	0.21	-0.29	-0.50**	0.02	-0.04	-0.06	-0.34**	0.55**
Total Institution	1.42	-2.38	-3.80**	0.85	-1.29	-2.14**	1.15	-1.51	-2.66**	1.63	-1.81	-3.44**	0.21**	0.59**

Panel B: Market Maker Imbalances Sorted on Lagged Firm Returns: Daily Analysis

Total Individual	0.04	-0.07	-0.11*	0.10	-0.09	-0.19**	0.06	-0.05	-0.11**	0.08	-0.02	-0.10**	0.04	0.05
Total Institution	0.21	-0.36	-0.57**	0.09	-0.09	-0.18*	0.03	0.01	-0.02	0.44	-0.44	-0.87**	0.23**	-0.09

Panel C: Market Maker Imbalances Sorted on Contemporaneous Firm Returns: Weekly Analysis

	Small			2			3			Large			Large – Small	
	Neg. Ret.	Pos. Ret.	Diff.	Neg. Ret.	Pos. Ret.	Diff.	Neg. Ret.	Pos. Ret.	Diff.	Neg. Ret.	Pos. Ret.	Diff.	Neg. Ret.	Pos. Ret.
Total Individual	1.10	-1.79	-2.89**	0.66	-0.67	-1.33**	0.37	-0.48	-0.85**	4.92	-5.51	-10.43**	-1.34**	2.04**
Total Institution	4.04	-5.46	-9.50**	2.24	-3.07	-5.30**	3.19	-3.90	-7.09**	2.54	-3.05	-5.59**	0.88*	-0.05

Panel: D: Market Maker Imbalances Sorted on Lagged Firm Returns: Weekly Analysis

Total Individual	-0.22	0.02	0.24	-0.01	0.35	0.35	-0.47	0.70	1.16**	-0.23	0.22	0.45*	0.58	-1.46
Total Institution	-0.23	0.26	0.49	-0.52	0.84	1.36**	-0.57	0.70	1.27**	-0.20	0.41	0.61	-1.23*	1.25

Table IB. IV

Cross-Sectional Regressions of Post-Peak Returns on Pre-Peak Investor Trading: Insiders

This table presents cross-sectional univariate regressions of post-peak returns on pre-peak insider trading for CRSP stocks with ordinary common shares (CRSP share codes 10 or 11). The samples include firms in the top 50% and 25% of the CRSP sample according to market capitalization on March 31, 2000. The dependent variables are buy-and-hold returns from April 1, 2000 to March 31, 2001, March 31, 2002, and December 31, 2002, respectively. The independent variables are insider trading from April 1, 1999 to March 31, 2000. We calculate net buying for insiders by taking the difference between end-of-quarter holdings and buy-and-hold value of beginning-of-quarter holdings, divided by end-of-quarter market capitalization. We then sum up quarterly net buying for the four quarters from April 1, 1999 to March 31, 2000. We standardize all variables in the cross-section and estimate with intercepts which are not displayed for brevity. T-statistics computed with White robust errors are reported in parentheses.

	Top 50% Market Cap.			**Top 25% Market Cap.**		
	Return (Apr.00-Mar.01)	**Return (Apr.00-Mar.02)**	**Return (Apr.00-Dec.02)**	**Return (Apr.00-Mar.01)**	**Return (Apr.00-Mar.02)**	**Return (Apr.00-Dec.02)**
Insider	0.05	0.04	0.04	0.15	0.13	0.12
	(1.63)	(2.11)	(2.07)	(3.92)	(3.98)	(3.61)
Adj. R^2	0.001	0.002	0.002	0.019	0.019	0.017

Table IB.V
Fama-MacBeth Regressions of Returns on Contemporaneous Imbalances: Imbalances Constructed Using Trading Volume; Large Technology Firms

This table presents time-series averages of coefficients, number of observations, and adjusted R^2s for cross-sectional regressions estimated each day (week, month) from January 2, 1997 to March 27, 2000, for top 50% of Nasdaq technology sector (3-digit SIC code=737 with ordinary common shares) according to market capitalization. The dependent variables are daily (weekly, monthly) returns and the independent variables are contemporaneous daily (weekly, monthly) imbalances and their interactions with news dummies. Daily imbalance is the difference between the buy and sell volumes expressed as a fraction of the sum of buy and sell volumes. Weekly or monthly imbalance is the sum of daily imbalances over the week (Thursday open to Wednesday close) or month. We adjust imbalances for firm size by subtracting the average imbalance for the firm's size quartile in the technology sector. Weekly or monthly returns are buy-and-hold returns over the week or month. For daily cross-sectional regression on day t, news dummy equals one for a firm if there are any news articles about the firm in the top ten newswires during the [t-3, t] window. For weekly (monthly) cross-sectional regressions, news dummy equals one for a firm if there are any news articles about the firm in the top ten newswires during the week (month). We standardize dependent and independent variables in each cross-section except for news dummies and estimate with intercepts which are not displayed for brevity. T-statistics computed using Newey-West standard errors with five lags are reported in parentheses.

	Daily	Weekly	Monthly	Daily	Weekly
Indiv. General	0.02	-0.01	-0.04	0.02	0.00
	(3.78)	(-0.35)	(-2.61)	(3.81)	(-0.20)
Indiv. Full Service	-0.02	-0.02	-0.04	-0.01	-0.01
	(-8.95)	(-3.92)	(-5.49)	(-6.20)	(-2.69)
Indiv. Discount	-0.12	-0.13	-0.17	-0.11	-0.13
	(-31.59)	(-17.77)	(-7.82)	(-30.02)	(-18.81)
Indiv. Day Trading		0.06	0.05		0.06
		(8.91)	(5.80)		(8.86)
Institutional	0.09	0.08	0.08	0.08	0.07
	(33.92)	(13.93)	(5.75)	(33.45)	(12.34)
Largest I-banks	0.02	-0.01	-0.02	0.02	-0.01
	(14.45)	(-2.06)	(-2.62)	(13.25)	(-2.29)
Hedge Fund		-0.07	-0.05		-0.08
		(-8.04)	(-4.92)		(-7.71)
Mixed	0.07	0.06	0.04	0.07	0.06
	(31.72)	(13.86)	(3.62)	(30.43)	(12.20)
D_{News} × *Indiv. General*				0.06	-0.01
				(5.08)	(-0.50)
D_{News} × *Indiv. Full Service*				-0.05	-0.02
				(-6.08)	(-1.95)
D_{News} × *Indiv. Discount*				-0.11	-0.02
				(-9.59)	(-1.72)

	Daily	Weekly	Monthly	Daily	Weekly
D_{News} *x Indiv. Day Trading*					0.01
					(1.42)
D_{News} *x Institutional*				0.05	0.02
				(5.21)	(1.80)
D_{News} *x Largest I-banks*				0.02	0.01
				(2.04)	(1.44)
D_{News} *x Hedge Fund*					0.01
					(1.94)
D_{News} *x Mixed*				0.02	0.02
				(1.78)	(1.78)
Avg. N	244.8	244.4	257.7	244.8	244.4
Adj. R^2	0.052	0.101	0.095	0.066	0.104

Table IB.VI

Fama-MacBeth Regressions of Returns on Contemporaneous Imbalances: Imbalances Constructed Using Trading Volume; Alternative Sample Selections

This table presents time-series averages of coefficients, number of observations, and adjusted R^2s for cross-sectional regressions estimated each day (week, month) from January 2, 1997 to March 27, 2000, for Nasdaq technology stocks (3-digit SIC code=737 with ordinary common shares). Panel A reports results for all firms that are in the technology sector according to market capitalization. Panel B reports results for firms that are in the bottom 50% of the technology sector according to market capitalization. The dependent variables are daily (weekly, monthly) returns and the independent variables are contemporaneous daily (weekly, monthly) imbalances and their interactions with news dummies. Daily imbalance is the difference between the buy and sell volumes expressed as a fraction of the sum of buy and sell volumes. Weekly or monthly imbalance is the sum of daily imbalances over the week (Thursday open to Wednesday close) or month. We adjust imbalances for firm size by subtracting the average imbalance for the firm's size quartile in the technology sector. Weekly or monthly returns are buy-and-hold returns over the week or month. For daily cross-sectional regression on day t, news dummy equals one for a firm if there are any news articles about the firm in the top ten newswires during the [t-3, t] window. For weekly (monthly) cross-sectional regressions, news dummy equals one for a firm if there are any news articles about the firm in the top ten newswires during the week (month). We standardize dependent and independent variables in each cross-section except for news dummies and estimate with intercepts which are not displayed for brevity. T-statistics computed using Newey-West standard errors with five lags are reported in parentheses.

Panel A: Full Sample

	Daily	Weekly	Monthly	Daily	Weekly
Indiv. General	-0.003	-0.028	-0.052	-0.005	-0.030
	(-0.72)	(-2.54)	(-2.58)	(-1.14)	(-3.03)
Indiv. Full Service	0.017	0.020	0.016	0.021	0.030
	(9.15)	(3.64)	(2.51)	(11.54)	(5.79)
Indiv. Discount	-0.078	-0.109	-0.143	-0.073	-0.101
	(-30.50)	(-18.39)	(-10.74)	(-29.94)	(-16.65)
Indiv. Day Trading	0.073	0.053	0.047	0.067	0.049
	(27.83)	(9.00)	(6.07)	(28.48)	(8.76)
Institutional	0.090	0.082	0.072	0.088	0.079
	(41.46)	(21.91)	(8.18)	(41.16)	(19.34)
Largest I-banks	0.029	0.011	0.002	0.029	0.011
	(17.85)	(1.96)	(0.23)	(18.00)	(1.89)
Hedge Fund	-0.022	-0.060	-0.014	-0.022	-0.064
	(-8.80)	(-6.78)	(-0.94)	(-9.44)	(-6.16)
Mixed	0.092	0.086	0.077	0.090	0.082
	(40.59)	(26.61)	(12.00)	(39.19)	(20.86)
D_{News} × *Indiv. General*				0.037	0.007
				(3.64)	(0.68)
D_{News} × *Indiv. Full Service*				-0.045	-0.033
				(-4.65)	(-4.55)

	Daily	Weekly	Monthly	Daily	Weekly
D_{News} × Indiv. Discount				-0.079	-0.031
				(-7.09)	(-3.96)
D_{News} × Indiv. Day Trading				0.066	0.009
				(5.85)	(1.06)
D_{News} × Institutional				0.045	0.014
				(4.12)	(1.58)
D_{News} × Largest I-banks				0.000	0.002
				(-0.03)	(0.32)
D_{News} × Hedge Fund				-0.003	0.012
				(-0.42)	(1.22)
D_{News} × Mixed				0.035	0.024
				(3.42)	(2.62)
Avg. N	489	489.9	490.2	489	489.9
Adj. R^2	0.034	0.043	0.047	0.044	0.046
Panel B: Small Firms					
Indiv. General	-0.02	-0.05	-0.09	-0.03	-0.05
	(-5.76)	(-5.61)	(-6.05)	(-6.50)	(-6.35)
Indiv. Full Service	0.06	0.07	0.08	0.06	0.08
	(17.56)	(9.56)	(6.63)	(18.18)	(11.14)
Indiv. Discount	-0.05	-0.07	-0.11	-0.05	-0.07
	(-16.61)	(-12.50)	(-7.29)	(-16.72)	(-10.75)
Indiv. Day Trading		0.04	0.00		0.04
		(3.89)	(0.27)		(3.23)
Institutional	0.10	0.08	0.10	0.09	0.08
	(27.46)	(14.06)	(10.77)	(28.26)	(13.50)
Largest I-banks	0.05	0.07	0.06	0.05	0.07
	(11.41)	(6.64)	(4.64)	(12.93)	(6.18)
Hedge Fund		0.11	0.12		0.06
		(4.72)	(3.60)		(2.25)
Mixed	0.11	0.11	0.11	0.11	0.10
	(36.28)	(24.08)	(9.46)	(35.29)	(19.59)
D_{News} × Indiv. General				-0.09	0.00
				(-0.68)	(0.14)
D_{News} × Indiv. Full Service				-0.04	-0.04
				(-0.45)	(-2.09)
D_{News} × Indiv. Discount				-0.09	0.01
				(-0.53)	(0.75)
D_{News} × Indiv. Day Trading					0.07
					(1.21)

	Daily	Weekly	Monthly	Daily	Weekly
D_{News} x *Institutional*				0.24	0.02
				(1.14)	(1.18)
D_{News} x *Largest I-banks*				0.25	0.01
				(0.38)	(0.48)
D_{News} x *Hedge Fund*					0.11
					(0.37)
D_{News} x *Mixed*				0.06	0.04
				(1.49)	(2.29)
Avg. N	244.2	243.8	257.1	244.2	243.8
Adj. R^2	0.025	0.038	0.063	0.052	0.064

Table IB.VII
Panel Regressions of Returns on Contemporaneous Imbalances: Imbalances Constructed Using Trading Volume

This table presents coefficients, number of observations, and adjusted R^2s for panel regressions estimated for the periods from January 2, 1997 to March 27, 2000 and from March 28, 2000 to December 31, 2002 for Nasdaq technology stocks (3-digit SIC code=737 with ordinary common shares). Panel A reports results for the period from January 2, 1997 to March 27, 2000. Panel B reports results for the period from March 28, 2000 to December 31, 2002. The dependent variables are daily (weekly, monthly) returns and the independent variables are contemporaneous daily (weekly, monthly) imbalances and their interactions with news dummies. Daily imbalance is the difference between the buy and sell volumes expressed as a fraction of the sum of buy and sell volumes. Weekly or monthly imbalance is the sum of daily imbalances over the week (Thursday open to Wednesday close) or month. We adjust imbalances for firm size by subtracting the average imbalance for the firm's size quartile in the technology sector. Weekly or monthly returns are buy-and-hold returns over the week or month. For daily regressions, news dummy equals one for a firm on day t if there are any news articles about the firm in the top ten newswires during the [t-3, t] window. For weekly (monthly) regressions, news dummy equals one for a firm if there are any news articles about the firm in the top ten newswires during the week (month). We standardize dependent and independent variables in each cross-section except for news dummies and estimate with intercepts which are not displayed for brevity. T-statistics computed by clustering standard errors by firm and by month are reported in parentheses for all regressions.

Panel A: January 2, 1997 – March 27, 2000

	Daily	Weekly	Monthly	Daily	Weekly
Indiv. General	-0.01	-0.03	-0.05	-0.01	-0.03
	(-1.06)	(-4.30)	(-3.54)	(-1.26)	(-4.32)
Indiv. Full Service	0.02	0.02	0.02	0.02	0.03
	(5.95)	(3.62)	(1.88)	(8.50)	(4.84)
Indiv. Discount	-0.08	-0.11	-0.15	-0.07	-0.11
	(-18.81)	(-17.52)	(-12.53)	(-17.53)	(-16.12)
Indiv. Day Trading	0.07	0.05	0.05	0.07	0.05
	(18.47)	(9.30)	(5.22)	(19.02)	(9.77)
Institutional	0.09	0.08	0.07	0.09	0.08
	(23.04)	(17.54)	(8.46)	(21.66)	(20.39)
Largest I-banks	0.03	0.01	0.00	0.03	0.01
	(12.66)	(2.15)	(0.04)	(12.04)	(1.63)
Hedge Fund	-0.02	-0.06	-0.01	-0.02	-0.06
	(-7.44)	(-9.73)	(-1.13)	(-7.13)	(-7.88)
Mixed	0.09	0.09	0.08	0.09	0.08
	(26.14)	(20.62)	(10.49)	(25.91)	(21.86)
D_{News} × *Indiv. General*				0.00	0.00
				(0.49)	(0.72)
D_{News} × *Indiv. Full Service*				-0.03	-0.01
				(-5.65)	(-4.04)
D_{News} × *Indiv. Discount*				-0.03	-0.01
				(-6.13)	(-2.96)
D_{News} × *Indiv. Day Trading*				0.01	0.00
				(2.74)	(1.37)

	Daily	Weekly	Monthly	Daily	Weekly
D_{News} x Institutional				0.00	0.00
				(0.66)	(1.40)
D_{News} x Largest I-banks				-0.01	0.00
				(-1.78)	(0.75)
D_{News} x Hedge Fund				0.00	0.00
				(0.41)	(0.01)
D_{News} x Mixed				0.00	0.00
				(0.48)	(1.09)
N	399,018	82,298	19,118	396,965	81,480
Adj. R^2	0.028	0.032	0.034	0.029	0.033

Panel B: March 28, 2000 – December 31, 2002

	Daily	Weekly	Monthly	Daily	Weekly
Indiv. General	-0.02	-0.06	-0.10	-0.02	-0.05
	(-5.54)	(-8.73)	(-9.43)	(-4.06)	(-6.25)
Indiv. Full Service	0.02	0.01	0.00	0.02	0.02
	(4.30)	(1.26)	(-0.04)	(6.14)	(3.11)
Indiv. Discount	-0.05	-0.08	-0.14	-0.04	-0.07
	(-9.57)	(-9.25)	(-6.91)	(-8.54)	(-7.80)
Indiv. Day Trading	0.01	0.01	0.01	0.01	0.00
	(2.98)	(1.33)	(0.92)	(2.50)	(0.44)
Institutional	0.10	0.10	0.12	0.10	0.10
	(34.12)	(21.77)	(14.85)	(31.17)	(16.66)
Largest I-banks	0.03	0.01	0.02	0.03	0.01
	(10.51)	(1.62)	(1.99)	(9.98)	(1.28)
Hedge Fund	-0.02	-0.08	-0.05	-0.02	-0.07
	(-5.29)	(-16.26)	(-4.73)	(-5.16)	(-12.65)
Mixed	0.11	0.10	0.09	0.11	0.10
	(31.18)	(18.90)	(7.08)	(29.88)	(16.58)
D_{News} x Indiv. General				-0.01	-0.01
				(-2.58)	(-3.07)
D_{News} x Indiv. Full Service				-0.02	-0.01
				(-2.80)	(-3.56)
D_{News} x Indiv. Discount				-0.03	-0.02
				(-4.62)	(-4.90)
D_{News} x Indiv. Day Trading				0.01	0.01
				(2.27)	(1.59)
D_{News} x Institutional				0.03	0.01
				(6.04)	(3.81)
D_{News} x Largest I-banks				0.00	0.00
				(-0.69)	(0.56)
D_{News} x Hedge Fund				0.00	-0.01
				(0.11)	(-5.67)
D_{News} x Mixed				0.02	0.01
				(4.30)	(2.38)

	Daily	Weekly	Monthly	Daily	Weekly
N	381,512	80,074	18,177	381,349	79,877
Adj. R^2	0.024	0.038	0.059	0.024	0.040

Table IB.VIII

Fama-MacBeth Regressions of Returns on Contemporaneous Imbalances: Alternative News Measures; Imbalances Constructed Using Trading Volume

This table presents time-series averages of coefficients, number of observations, and adjusted R^2s for cross-sectional regressions estimated each day (week) from January 2, 1997 to March 27, 2000 and from March 28, 2000 to December 31, 2002, for Nasdaq technology stocks (3-digit SIC code=737 with ordinary common shares). The dependent variables are daily (weekly) returns and the independent variables are contemporaneous daily (weekly) imbalances and their interactions with news dummies. Daily imbalance is the difference between the buy and sell volumes expressed as a fraction of the sum of buy and sell volumes. Weekly imbalance is the sum of daily imbalances over the week (Thursday open to Wednesday close). We adjust imbalances for firm size by subtracting the average imbalance for the firm's size quartile in the technology sector. Weekly returns are buy-and-hold returns over the week. For daily cross-sectional regression on day t, news dummy equals one for a firm if there are any news articles about the firm in any Factiva newswire or non-newswire source on day t. For weekly cross-sectional regressions, news dummy equals one for a firm if there are any news articles about the firm in any Factiva newswire or non-newswire source during the week. We standardize dependent and independent variables in each cross-section except for news dummies and estimate with intercepts which are not displayed for brevity. T-statistics computed using Newey-West standard errors with five lags are reported in parentheses.

	Jan. 2, 1997 – Mar. 27, 2000		**Mar. 28, 2000 – Dec. 31, 2002**	
	Daily	**Weekly**	**Daily**	**Weekly**
Individual General	-0.005	-0.029	-0.011	-0.044
	(-1.07)	(-2.80)	(-3.67)	(-7.06)
Individual Full Service	0.022	0.029	0.023	0.023
	(11.81)	(5.47)	(9.69)	(3.98)
Individual Discount	-0.072	-0.100	-0.042	-0.059
	(-29.14)	(-17.51)	(-7.62)	(-4.57)
Individual Day Trading	0.067	0.049	0.009	0.004
	(28.10)	(9.06)	(3.62)	(0.68)
Institutional	0.088	0.077	0.095	0.094
	(41.14)	(19.14)	(37.46)	(11.96)
Largest I-banks	0.030	0.007	0.025	0.010
	(17.57)	(1.27)	(11.99)	(1.67)
Hedge Fund	-0.022	-0.059	-0.016	-0.065
	(-8.72)	(-5.35)	(-7.74)	(-8.87)
Mixed	0.090	0.081	0.110	0.096
	(39.32)	(21.33)	(31.62)	(11.72)
D_{News} × *Individual General*	0.026	-0.001	-0.020	0.007
	(3.30)	(-0.13)	(-3.39)	(1.96)
D_{News} × *Individual Full Service*	-0.044	-0.014	-0.024	-0.027
	(-6.35)	(-3.19)	(-3.93)	(-5.60)
D_{News} × *Individual Discount*	-0.073	-0.016	-0.041	-0.012
	(-8.81)	(-3.91)	(-5.89)	(-3.34)
D_{News} × *Individual DayTrading*	0.054	0.005	0.012	-0.007
	(8.34)	(1.32)	(2.05)	(-1.58)
D_{News} × *Institutional*	0.026	0.012	0.049	-0.013
	(3.26)	(2.33)	(7.64)	(-4.50)

	Jan. 2, 1997 – Mar. 27, 2000		Mar. 28, 2000 – Dec. 31, 2002	
	Daily	**Weekly**	**Daily**	**Weekly**
D_{News} × *Largest I-banks*	-0.003	0.006	0.004	0.000
	(-0.43)	(1.66)	(0.85)	(0.10)
D_{News} × *Hedge Fund*	-0.002	0.000	0.004	0.014
	(-0.53)	(-0.11)	(0.93)	(2.97)
D_{News} × *Mixed*	0.027	0.015	0.039	0.012
	(3.56)	(3.11)	(6.38)	(2.69)
Avg. N	489	490	550.5	552
Adj. R^2	0.040	0.049	0.037	0.055

Table IB.IX

Cross-Sectional Regressions of Post-Peak Returns on Pre-Peak Investor Imbalances

This table presents cross-sectional univariate regressions of post-peak returns on pre-peak investor imbalances for CRSP stocks with ordinary common shares (CRSP share codes 10 or 11). The samples include firms in the top 50% and 25% of the CRSP sample according to market capitalization on March 31, 2000. The dependent variables are buy-and-hold returns from April 1, 2000 to March 31, 2001, March 31, 2002, and December 31, 2002, respectively. In Panel A, the independent variables are institutional imbalances from April 1, 1999 to March 31, 2000. Daily imbalance is the difference between the buy and sell volumes expressed as a fraction of shares outstanding. We then sum up daily imbalances for each investor group from April 1, 1999 to March 31, 2000. *Total Institution* is the sum of institutional, largest I-banks, hedge fund, and derivatives groups. We also control for price-to-sales ratio as of March 31, 2000, calculated as price per share for March 31, 2000 divided by sales per share for most current fiscal year end which is at least six months before March 31, 2000. In Panel B, the independent variables are individual imbalances from April 1, 1999 to March 31, 2000 and the price-to-sales ratio as of March 31, 2000. *Total Individual* is the sum of individual general, individual full service, individual discount, and individual day trading groups. In Panel C, the independent variables are institutional imbalances in excess of individual imbalances from April 1, 1999 to March 31, 2000 and the price-to-sales ratio as of March 31, 2000. We standardize all variables in the cross-section and estimate with intercepts which are not displayed for brevity. T-statistics computed using White robust errors are reported in parentheses.

Panel A: Regressions of Post-Peak Returns on One-Year Pre-Peak Institutional Imbalances

	Top 50% Market Cap.			Top 25% Market Cap.		
	Return (Apr.00-Mar.01)	**Return (Apr.00-Mar.02)**	**Return (Apr.00-Dec.02)**	**Return (Apr.00-Mar.01)**	**Return (Apr.00-Mar.02)**	**Return (Apr.00-Dec.02)**
Total Institution	-0.01	-0.01	-0.02	-0.07	-0.04	-0.06
	(-0.76)	(-0.50)	(-1.60)	(-2.27)	(-1.8)	(-2.72)
P/S Ratio	-0.38	-0.32	-0.30	-0.40	-0.33	-0.31
	(-25.05)	(-24.78)	(-24.81)	(-20.92)	(-21.03)	(-20.09)
Adj. R^2	0.201	0.211	0.187	0.295	0.305	0.271
Institutional	-0.03	-0.02	-0.03	-0.06	-0.03	-0.05
	(-1.44)	(-1.2)	(-2.21)	(-2.16)	(-1.51)	(-2.47)
Largest I-banks	0.01	0.01	0.01	-0.02	-0.02	-0.03
	(0.94)	(1.22)	(0.61)	(-1.78)	(-1.89)	(-2.60)
Hedge Fund	0.01	0.00	0.00	0.18	0.12	0.14
	(0.4)	(0.02)	(-0.12)	(3.18)	(3.12)	(3.49)
Derivatives	0.05	0.033	0.03	0.12	0.09	0.06

	Top 50% Market Cap.			Top 25% Market Cap.		
	Return (Apr.00-Mar.01)	**Return (Apr.00-Mar.02)**	**Return (Apr.00-Dec.02)**	**Return (Apr.00-Mar.01)**	**Return (Apr.00-Mar.02)**	**Return (Apr.00-Dec.02)**
	(3.76)	(3.12)	(3.33)	(3.94)	(4.05)	(3.17)
P/S Ratio	-0.37	-0.32	-0.32	-0.38	-0.31	-0.29
	(-23.94)	(-23.91)	(-23.89)	(-19.91)	(-19.93)	(-19.16)
Adj. R^2	0.204	0.214	0.189	0.308	0.316	0.279
Panel B: Regressions of Post-Peak Returns on One-Year Pre-Peak Individual Imbalances						
Total Individual	-0.09	-0.04	-0.03	-0.01	0.00	0.02
	(-3.86)	(-2.34)	(-1.70)	(-0.39)	(-0.10)	(0.60)
P/S Ratio	-0.36	-0.31	-0.29	-0.40	-0.33	-0.31
	(-22.38)	(-22.48)	(-22.65)	(-19.59)	(-19.78)	(-19.02)
Adj. R^2	0.206	0.213	0.187	0.292	0.302	0.267
Indiv. General	-0.08	-0.04	-0.03	0.02	0.01	0.03
	(-1.70)	(-1.08)	(-0.77)	(0.29)	(0.31)	(0.78)
Indiv. Full Service	0.00	0.00	0.01	0.04	0.02	0.03
	(-0.24)	(0.23)	(0.68)	(1.43)	(0.85)	(1.20)
Indiv. Discount	-0.03	-0.02	-0.01	-0.02	-0.01	0.00
	(-0.83)	(-0.52)	(-0.33)	(-0.37)	(-0.24)	(0.06)
Indiv. Day Trading	-0.09	-0.06	-0.06	-0.11	-0.05	-0.05
	(-4.40)	(-3.70)	(-4.15)	(-4.15)	(-2.81)	(-3.11)
P/S Ratio	-0.33	-0.29	-0.27	-0.34	-0.30	-0.28
	(-18.51)	(-19.20)	(-19.35)	(-14.96)	(-15.83)	(-15.36)
Adj. R^2	0.212	0.216	0.191	0.303	0.306	0.271
Panel C: Regressions of Post-Peak Returns on One-Year Pre-Peak 'Institutional Imbalance – Individual Imbalance'						
Institution - Individual	0.33	0.16	-0.05	-0.05	-0.03	-0.05
	(1.31)	(0.79)	(-0.27)	(-1.63)	(-1.33)	(-2.36)
P/S Ratio	-0.37	-0.32	-0.30	-0.40	-0.33	-0.31
	(-24.02)	(-23.90)	(-24.02)	(-20.60)	(-20.65)	(-19.88)
Adj. R^2	0.202	0.211	0.186	0.294	0.303	0.269