Mutual Fund Trading Pressure: Firm-Level Stock Price Impact and Timing of SEOs

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ABSTRACT

We use price pressure resulting from purchases by mutual funds with large capital inflows to identify overvalued equity. This is a relatively exogenous overvaluation indicator as it is associated with who is buying – buyers with excess liquidity – rather than what is being purchased. We document substantial stock price impact associated with purchases by high-inflow mutual funds, and find the probability of an SEO, insider sales, and the probability of a stock-based acquisition increase significantly in the four quarters following the mutual fund buying pressure. These results provide new evidence that firm managers are able to identify and exploit overvalued equity.

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Seasoned equity offerings have been widely studied in the literature, with little emerging consensus on their determinants and economic consequences. Proposed determinants of SEOs include capital investments, refinancing, liquidity squeezes, corporate control, stock market microstructure and timing by managers with private information that their stock is overvalued (Loughran and Ritter (1995, 1997), Graham and Harvey (2001), Baker and Wurgler (2002)). In this paper we propose a novel approach to testing the market-timing motive for SEOs, and provide evidence of SEO timing.

The main empirical challenge in tests of SEO timing is identifying overvalued firms. Prior studies examining market timing have typically used high *market-to-book* ratios or high past *returns* as identifiers of overvaluation. However, these studies "continue to be hotly debated" (Baker, Ruback and Wurgler (2007)) because, as described in detail in the next section, traditional indicators of overvaluation are correlated with other determinants of SEOs. We respond to this debate in the literature by identifying a setting where overvaluation is relatively exogenous to the firm. In particular, we identify overvalued stocks as those subject to substantial buying pressure by mutual funds experiencing large capital inflows, but not subject to widespread buying pressure by other mutual funds, and refer to these as stocks subject to Inflow-driven Buying Pressure (*IBP*). In this setting, the overvaluation is associated with who is buying – mutual funds with excess liquidity – rather than by what is being purchased.

Mutual funds with large capital inflows are eager to invest the cash since stockpiling cash makes it difficult for them to outperform their benchmarks (Coval and Stafford (2007)) and since they may be precluded by their investment mandate from holding large cash balances. This

excess liquidity is channeled into a narrow set of stocks since mutual funds follow specialized investment strategies (i.e., they face restricted investment opportunity sets or IOS), and since they likely face diminishing marginal investment prospects. Consistent with restricted IOS and diminishing marginal investment prospects, we document that the average number of stocks held by mutual funds in the top capital flow decile is 107, which is a small fraction of the universe of stocks. Further, there is a monotonic positive relation between mutual fund flows and the proportion of existing positions expanded by these funds. Funds with higher inflows expand more of their existing positions as opposed to initiating new positions, and in particular, 39% of the existing positions of funds in the top flow decile are expansions of previously held positions. Funds with higher inflows have about the same proportion of newly initiated holdings as other funds. This is in contrast to a positive relation between fund flows and initiations that would be expected if fund IOS and investment prospects were unrestricted.

We expect inflow-driven mutual fund buying pressure to result in upward stock price pressure, if individual stocks have downward sloping demand curves. To identify overvaluation associated with mutual fund inflow-driven buying pressure rather than with fundamental information about the firms, we require *IBP* stocks to meet two ex ante conditions: (i) they are subject to buying pressure by mutual funds in the top flow decile; and (ii) they are not subject to buying pressure by mutual funds in other flow deciles. Using these criteria we identify about 1.5% of all mutual fund trades as *IBP*. We then document that *IBP* stocks have average prior year returns of 49%, and experience a cumulative decline in market-adjusted returns of 10% over the six quarters subsequent to the buying pressure quarter, consistent with overvaluation due to

inflow-driven buying pressure. In contrast, stocks subject to widespread buying pressure by mutual funds other than those in the top decile of capital flows (*WBP* stocks) have average prior year returns of 32%, and experience a cumulative decline in market-adjusted returns of 2.8% over the subsequent six quarters, consistent with widespread buying being driven more by firm-specific information.[1] The large abnormal return reversion of *IBP* stocks after buying pressure is not consistent with alternative explanations that inflow-driven buying is informed, or that high-inflow fund managers are smart stock pickers.

Identifying equity with pronounced and sustained overvaluation (*IBP* stocks) is a precondition to our main objective, testing the SEO timing theory. If managers privately identify overvaluation and time SEOs to exploit the overvaluation, we expect *IBP*-affected firms to exhibit a higher likelihood of SEOs relative to all firms that are not overvalued. We find 172 SEOs associated with *IBP* stocks, collectively accounting for $23b of new equity. This represents 5.2% by number, and 6.6% by dollar value, of all SEOs in our sample. We test the timing hypothesis by estimating a Logit model of SEO choice that controls for a number of determinants of SEOs, including prior returns and the *market-to-book* ratio. In addition, we construct a number of matched samples in which we first match *IBP* firms to other firms on selected firm characteristics, and then compare SEO probabilities in the 'treatment' and 'control' samples in the four quarters following IBP. In all tests, the probability of an SEO following *IBP* stock-quarters is significantly higher, ranging from 30% to 84% higher probability. This suggests firm managers identify overvaluation and time SEOs.

[1] In our formal tests, when comparing the behavior of IBP stocks to the relevant reference groups, we control for various firm characteristics, such as prior returns.

To corroborate the evidence on SEO timing we test two other predictions. First, if *IBP* firms are overvalued we expect an increase in insider sales. We therefore test for increased insider sales in the four quarters following *IBP*. We estimate a multiple regression model of insider sales (e.g., Rozeff and Zaman (1998), Piotroski and Roulstone (2005), Jenter (2005)), and also test for differences in mean insider sales in matched samples. In all tests, we find significantly higher insider sales in the four quarters following *IBP*, ranging from 5.3% to 9.3% higher sales ratios. An increase in insider sales of *IBP* stocks is not consistent with alternative explanations that inflow-driven mutual fund purchases are informed. However, it is consistent with our hypothesis that excess fund liquidity, combined with funds' restricted IOS and diminishing marginal investment prospects, is associated with some overvalued purchases.

Second, if *IBP* firms are overvalued we expect them to exhibit a higher likelihood of stock-based acquisitions in the four quarters following *IBP*. Shleifer and Vishny (2003), Jensen (2005) and Rhodes-Kropf, Robinson and Viswanathan (2005) suggest overvaluation is associated with stock-based acquisitions, and increases the probability of deal initiation or of completion of previously initiated deals. We find 268 acquisitions associated with *IBP* stocks, collectively accounting for $309b of transactions. This represents 3.9% by number, and 9% by dollar value, of all acquisitions in our sample. We test the timing prediction by estimating a Logit model as well as conducting tests of differences in acquisition frequency in matched samples. In most tests of M&A probability in the four quarters following *IBP*, we find the probability of an acquisition is significantly higher, ranging from 19% to 35% higher probability.

Our findings collectively support the hypothesis that managers exploit "windows of opportunity" (Loughran and Ritter (1995, 1997)) presented by overpricing of their firms' equity to time the market. Our findings are also consistent with a broad class of models in which capital markets are imperfect but managers are able to identify price dislocations (see Baker et al. (2007) for a review). The equity market timing theory has implications for external financing choice, for the firm's capital structure if the impact of timing is persistent, for corporate governance in terms of allowing managers discretion to exploit or ignore market price signals that differ from their private assessment of value, and for understanding determinants of insider trading.

Finally, we note as a caveat that we establish an association, rather than a causal relation, between buying pressure and overvaluation. As we note above, the causal interpretation is consistent with our collective empirical evidence, but without a rigorous proof of causality we cannot rule out potential alternative explanations for the association.

The rest of this paper proceeds as follows. Section I briefly describes our setting and reviews the prior literature on SEO timing and price pressure. Section II describes the identification of overvalued stocks as a result of inflow-driven buying pressure by mutual funds. Section III describes tests of SEO timing, insider sale timing and M&A timing. Section IV discusses a number of sensitivity tests. Section V concludes with a summary, discussion of some implications of our findings and suggestions for future research.

I. The Setting

A number of papers have examined whether managers time the market when issuing equity. The main empirical challenge is to identify mispriced stocks, and prior authors have used ex ante and ex post methods to infer mispricing (Baker et al. (2007)).

Ex ante methods include using a measure of fundamental value scaled by market value such as the *market-to-book* ratio, or using prior returns, to identify overvalued stocks. As emphasized in Baker et al. (2007), both measures are difficult to interpret. For example, measuring fundamental value is difficult since accounting book values are based on historical costs and subject to discretionary managerial accounting choices. Further, the *market-to-book* ratio is correlated with many firm characteristics that may drive financing policy, so high *market-to-book* ratios do not necessarily indicate overvaluation that can be exploited by market timers. Prior returns as a measure of mispricing face similar difficulties in interpretation. Firms with high prior returns may have discovered valuable growth opportunities and harvesting these opportunities, rather than market timing, could drive the issuance decision.

Ex post methods rely on reversion in future abnormal returns to infer overvaluation. For example, tests of long-horizon stock return performance following SEOs find underperformance, suggesting that issuance occurred when the stock was overpriced. One challenge to this interpretation is that risk changes may be associated with SEOs. For example, Eckbo, Masulis and Norli (2000) suggest that equity issuance lowers leverage and therefore systematic risk, leading to lower future returns.

In this paper we use ex ante information to identify overvalued stocks, but our identifier is an event rather than a firm characteristic. In particular, the event is large uninformed buying pressure by mutual funds with large capital inflows. We document that this event is associated with large abnormal returns and subsequent return reversion, and argue that this event is likely exogenous to the firm since it is associated with who is buying – buyers with excess liquidity – rather than with what is being bought. We discuss our identification method in detail in the next section.

Prior empirical evidence of short-lived price pressure in equity markets is presented in Kraus and Stoll (1972), Harris and Gurel (1986), Shleifer (1986) and Mitchell, Pulvino and Stafford (2004), and evidence of slightly longer-lived price pressure of a few weeks is presented in Greenwood (2005). However, relatively short-lived price pressure precludes testing the equity market timing theory. Evidence of price pressure due to flow-driven mutual fund trading, with prices persistently reverting over a few quarters, is presented in Coval and Stafford (CS, 2007), but our paper differs in a number of ways: (i) our objective is to test the equity market timing theory, while CS do not test the timing theory; (ii) our focus is on inflow-driven buying and we offer a story for the resulting price pressure, while CS focus on and offer a story for outflow-driven firesales; and (iii) our mispricing identifier differs in that our mispricing candidates are stocks subject to buying pressure by funds in the top flow decile (first condition) but not subject to buying pressure by other funds (second condition). The mispricing identifier in CS imposes our first, but not our second, condition.

Consistent with our results, Frazzini and Lamont (2008) use mutual fund flows as a measure of individual investor sentiment, and find that high sentiment (or dumb money) predicts low future returns. They also report that high sentiment is associated with increases in shares outstanding in the next three years. Our paper differs in a number of ways: (i) our focus is on the timing of SEOs and we provide extensive tests of the SEO timing hypothesis; (ii) we show that insider sales are timed to exploit overvaluation; (iii) we show that stock-based acquisitions are timed to exploit overvaluation; and (iv) we show that managers respond to overvaluation in a more timely manner, within four quarters of being affected by *IBP*.

Our paper is also related to Chen et al. (2007) who examine whether hedge funds exploit mutual fund trading pressure through front-running. We examine whether a different group of market participants, firm managers, exploit *IBP* through SEOs, insider sales and M&A. Consistent with Chen et al. (2007), our results suggest that "sophisticated" market participants are able to identify this particular source of mispricing (price pressure due to inflow-driven mutual fund purchases),[2] although our data allows us to provide more direct evidence since we are able to match SEOs, insider sales and M&A to *IBP*-affected stocks.

II. Mutual Fund Trading Pressure and Stock Price Impact

Mutual funds experiencing large capital inflows face the unique challenge of excess liquidity: quickly finding productive opportunities for the new capital. Stockpiling cash is likely against their charter, and is also likely to increase tracking error with respect to their all-equity

[2] Anecdotal evidence suggests large investment banks also keep track of mutual fund flow-driven price pressure.

benchmarks. Since funds follow specialized investment strategies we do not expect the excess cash to be invested widely in the universe of stocks. Rather, funds' restricted IOS and diminishing marginal investment prospects are likely to result in the excess cash being channeled into a narrow set of stocks and creating buying pressure in some stocks. We expect the buying pressure by such funds to dislocate prices of the stocks they choose to buy (e.g., Coval and Stafford (2007)).

For each stock held by mutual funds, we form a measure of trading pressure as follows. First, we define mutual fund flows as:

$$Flow_{j,s} = \{TA_{j,s} - TA_{j,s-1}(1+R_{j,s-1})\} / TA_{j,s-1} \quad (1)$$

where *TA* is total net assets of mutual fund *j* in month *s*, and *R* is the monthly return for fund *j* in month *s*. We sum the monthly flows each quarter to obtain the quarterly flow, $flow_{j,t}$, of mutual fund *j* in quarter *t*. Monthly total net assets and returns of mutual funds are obtained from *CRSP*, and quarterly mutual fund holdings are obtained from *Thomson Financial*. Mutual funds are required to report their holdings semi-annually, but approximately 60% of them report their holdings quarterly. To calculate quarterly changes in holdings, we retain only contiguous fund-quarters in our sample. In addition, we only consider open-ended U.S. equity funds and eliminate funds with investment objective codes indicating bonds and preferred stocks, international stocks, metals and municipal bonds from our sample.

[TABLE I HERE]

Table I shows quarterly flows, prior-year returns, the total number of holdings, and the percent of holdings that were expanded or initiated, by mutual fund flow decile, for 63,426 fund-quarters from 1990 to 2007. Table I shows a large spread in flows, ranging from 40.3% for the top decile to –17% for the bottom decile. Prior-year fund returns decrease monotonically from 16.6% for the top decile to 6.1% for the bottom decile. This confirms evidence in the prior literature that (a) fund flows vary monotonically with past fund performance, and (b) the flow-performance relation is asymmetric in that inflows due to good past performance are much larger in magnitude than outflows due to poor past performance (Ippolito (1992), Chevalier and Ellison (1997), Sirri and Tufano (1998)).

Table I also shows a roughly inverted U-shaped relation between fund flows and number of holdings, with funds in the top flow decile holding on average 107 stocks. Funds with extreme flows have fewer holdings on average than funds in the middle deciles of flows, suggesting that for some funds extreme performance may be associated with more concentrated positions. A monotonic positive relation (weakly U-shaped relation) between fund flow decile and the percent of holdings expanded (initiated) is also documented in Table I. 39% of the existing holdings of funds in the top flow decile have been expanded from the prior quarter, while 19% of their existing holdings are new initiations (the remaining 42% of holdings have either been maintained or reduced from the prior quarter). These results are consistent with

mutual funds having restricted IOS and diminishing marginal investment prospects for each additional inflow dollar.

We calculate trading pressure for stock *i* in quarter *t* as:

$$Pressure_{i,t} = \{ \sum_j (\max(0, \Delta holding_{j,i,t}) \mid flow_{j,t} > 90^{th}\ percentile_t) - \sum_j (\max(0, -\Delta holding_{j,i,t}) \mid flow_{j,t} < 10^{th}\ percentile_t) \} / Shares\ Outstanding_{i,t-1} \quad (2)$$

where *i* indexes the stock, *j* indexes the mutual fund and *t* indexes the calendar quarter. This measure is similar to those used in Coval and Stafford (2007) and Chen et al. (2007).[3] Intuitively, trading pressure is interpreted as buying pressure when funds with large inflows (top decile of *flow* in quarter *t*) are net buyers of the stock, and as selling pressure when funds with large outflows (bottom decile of *flow* in quarter *t*) are net sellers of the stock. In a sense, *Pressure* is a measure of excess demand from mutual funds with large capital flows.

To distinguish flow-motivated trading from potentially information-motivated trading, we calculate unforced pressure for stock *i* in quarter *t* as:

$$UPressure_{i,t} = \{ \sum_j \Delta holding_{j,i,t} \mid 10^{th}\ percentile_t \leq flow_{j,t} \leq 90^{th}\ percentile_t \} / Shares\ Outstanding_{i,t-1} \quad (3)$$

[3] Results are robust to using average lagged quarterly trading volume over the prior two quarters as the denominator in calculating *Pressure*, as well as to excluding the max function, as reported in the internet appendix.

This variable captures net trading activity in a stock by mutual funds in the middle eight deciles of flows, or widespread net trading. Information-driven purchases are identified as stocks in the top decile of *UPressure*. *UPressure* is similar to measures used in Lakonishok, Shleifer and Vishny (1992) and Wermers (1999) to identify mutual fund demand imbalances.

We sort stock-quarters into deciles of *Pressure* and *UPressure*, and identify *IBP* stocks as those in the top decile of *Pressure* but in the middle three deciles (deciles four, five and six) of *UPressure*.[4] In other words, *IBP* stocks are those that are subject to large buying pressure by mutual funds with extreme inflows, but that are not subject to widespread net trading pressure by other mutual funds. *IBP* stocks are our overvaluation candidates. To examine whether the overvaluation of *IBP* stocks is driven by inflow-driven mutual fund buying pressure, rather than by mutual fund buying pressure generally, we contrast the abnormal return pattern of *IBP* stocks with those of stocks in the top decile of *UPressure*. We refer to stocks in the top decile of *UPressure* as *WBP* (Widespread Buying Pressure) stocks.

[TABLE II HERE]

Table II shows stock-level means of all variables for three samples: the full sample of all stocks used in our tests, *IBP* stocks, and *WBP* stocks. Accounting data are obtained from *Compustat Fundamentals Quarterly*. We exclude all securities that do not have a share code of 10 or 11 in *CRSP*. Insider trading data are obtained from the *Thomson Financial Insider*

[4] Results are robust to intersecting the top *Pressure* decile with the middle two, or middle four, *UPressure* deciles, as reported in Section IV.

database. The full sample includes 313,750 firm-quarters from 1990 through 2007. The *IBP* sample consists of 2,515 stock-quarters, and the *WBP* sample consists of 17,160 stock-quarters, from 1990 through 2007. All variable definitions are presented in the notes to Table II. Table II shows that *IBP* and *WBP* stocks are similar in all characteristics with the exception of prior year return, which is 49.3% for *IBP* stocks and 31.9% for *WBP* stocks, and *Insider Sale*, which is 0.483 for *IBP* stocks and 0.462 for *WBP* stocks. The differences in prior year return and *Insider Sale* are expected if *IBP* stocks are overvalued. *IBP* and *WBP* stocks are also different in terms of *Pressure* and *UPressure*, but these differences occur by construction. Finally, both *IBP* and *WBP* stocks are different from the full sample of stocks in several dimensions.

[TABLE III HERE]

Panel A of Table III shows quarterly mean abnormal returns from quarters t−4 to t+6 for stocks subject to mutual fund buying pressure in quarter t=0 (*Pressure* is calculated in quarter t=0). Abnormal returns are industry-adjusted returns, using the Fama-French equal-weighted 48 industry portfolios. We calculate mean abnormal returns each quarter for the portfolio of *IBP* and *WBP* stocks, and use the time series of portfolio abnormal returns for statistical inference to control for cross-sectional correlation (e.g., Fama and MacBeth (1973), Coval and Stafford (2007)). In Panel B of Table III abnormal returns are the *alphas*, or intercepts, from Fama and French (1993) factor model regressions. *IBP* and *WBP* stocks are added to their respective

portfolios in the quarter following buying pressure, and held for three years or five years. Panel B reports monthly *alphas* in percentage points.

Panel A of Table III shows that *IBP* stocks experience significantly positive abnormal returns in buying quarters, followed by persistently negative abnormal returns in subsequent quarters as the buying pressure subsides. *IBP* stocks have cumulative average abnormal returns of -9.82% (p-value<0.05), from quarters t+1 to t+6. In contrast, *WBP* stocks experience small negative abnormal returns after quarter t=0, with cumulative average abnormal returns from t+1 to t+6 of -2.68% (p-value<0.10). In Panel B, *IBP* stocks have statistically significant monthly Fama-French *alphas* of -0.36% (-0.31%) for three-year (five-year) holding periods, while *WBP* stocks have insignificant alphas. The abnormal return reversion for *IBP* stocks, but not for *WBP* stocks, is consistent with inflow-driven buying pressure resulting in overvaluation, and widespread mutual fund buying being associated with favorable firm-specific information.

[FIGURE 1 HERE]

Figure 1 shows cumulative average abnormal returns (*CAAR*) for *IBP* and *WBP* stocks. We sum average abnormal returns over consecutive quarters to obtain the cumulative average abnormal returns shown in Figure 1. The *CAAR* patterns in Figure 1 suggest that flow-driven mutual fund purchases result in substantial overvaluation, or a shift in the demand curve for a

stock. In contrast, widespread buying by mutual funds (non-inflow-driven purchases) does not seem to result in overvaluation.[5]

III. Main Tests

Using the *IBP* stocks identified as overvalued in the previous section, we now turn to our main objective, testing the theory that firms exploit "windows of opportunity" to time SEOs (e.g., Loughran and Ritter (1995, 1997), Graham and Harvey (2001), Baker and Wurgler (2002)). Section A presents tests of SEO timing. To corroborate the inference from Section A, we also test whether insider sales are timed (Section B) and whether stock-based corporate acquisitions are timed (Section C).

A. Timing of SEOs

We test whether firms identify and exploit the overvaluation associated with mutual fund flow-driven buying pressure by issuing seasoned equity within four quarters of the stock being subject to *IBP*. We do not examine SEOs contemporaneous with buying pressure to avoid confounding inferences through any reverse causality (i.e., that mutual funds may be buying because firms are issuing equity, rather than the reverse, which is our hypothesis). The prior evidence in the literature suggests a four-quarter managerial response window allows sufficient time for firms to go to market once they decide to have an SEO.[6] Before the offering, firms have to register securities with the SEC and may also undertake marketing efforts to discover or create

[5] Figure 1 depicts *firm-level*, not *mutual fund-level*, performance.
[6] Results are robust to using a two-quarter managerial response window as reported in the internet appendix.

demand. Registration can be 'traditional,' in which case firms register each offering immediately prior to the offering, or 'shelf,' in which case firms pre-register future potential offerings up to two years in advance and simply take-down these pre-approved offerings as they go to market. Shelf registrations have much lower registration times. Marketing activities can be full or accelerated, depending on the time taken for demand discovery by sellers and due diligence by potential buyers, and take about two weeks for full marketing and as little as a day for accelerated marketing. Overall, including both registration and marketing times, the average time between the SEC filing date and the offering date for SEOs is about 30 business days (e.g., Gao and Ritter (2010)).

We test our hypothesis of SEO timing by estimating a Logit regression of the issuance decision in quarter *t*, including an indicator dummy for stock-quarters with *IBP* in any of the four quarters from *t-4* through *t-1*, which allows a managerial response window of four quarters. Linear regressions of SEO choice on determinants have been estimated in, for example, DeAngelo, DeAngelo and Stulz (2010).

Following the prior literature (e.g., Eckbo et al. (2000)), we obtain SEO data from the *SDC* database. After retaining only common stock issuances that trade on the NYSE, AMEX or NASDAQ, and excluding investment trusts (e.g., REIT's), American Depositary Receipts, utilities (SIC codes 4910-4939) and secondary offerings in which no new shares are issued, we are left with 3307 SEOs between 1990 and 2007 that have all the required data for our tests. We exclude utilities since the duration of the regulatory approval process limits the ability of utilities to time SEOs in response to temporary overpricing (Eckbo and Masulis (1992)). There are 172

SEOs of *IBP* stocks in the four quarters following *IBP*, and they collectively account for about $23b of stock issuance. This represents 5.2% by number, and 6.6% by dollar value, of all SEOs in our sample.

[TABLE IV HERE]

Table IV, Panel A, shows the results of Logit regressions for the seasoned equity issuance choice. The dependent variable is 1 if the firm has a seasoned equity offering (SEO) in quarter *t*, and zero otherwise. *Buy Pressure*, our main independent variable of interest, is a dummy that equals 1 if the stock was subject to *IBP* in any of the four quarters from *t-1* through *t-4*, and zero otherwise. The other independent variables are determinants of the equity issuance decision suggested in the literature, and are described further below. The regressions include industry, year and quarter fixed effects, and standard errors are clustered on both firm and time (two-dimensional clustering) to control for cross-sectional and time-series correlation (Petersen (2009)).

There are four regression specifications reported in Panel A of Table IV. The first specification is estimated over the full available sample of 313,750 stock-quarters. The other three specifications are estimated over smaller samples in which each *IBP* stock-quarter is first matched on industry and two other variables noted at the top of the respective column. For example, in the second column, each *IBP* stock-quarter is matched with another stock in the

same quarter and industry and the same *asset growth* ('first matching variable') and *ROA* ('second matching variable') quintile. If there are multiple matches, we pick the match closest in the first matching variable. This procedure does not yield a match for some *IBP* stock-quarters, but we do not relax the matching requirements because this would defeat the purpose of matching. Sufficient sample sizes remain after matching, as noted in the tables. We match on prior *returns* and *book-to-market* (*BTM*) since these are known determinants of SEOs and have also been used as overvaluation indicators (e.g., Jenter (2005)). We match on *asset growth* and *ROA* since profitability and growth are likely important determinants of the external financing decision (e.g., Fama and French (2005)). Once the matched sample is obtained, we estimate the Logit over the four quarters following *IBP*, controlling for other determinants of SEOs as in the full sample Logit. This is because, even in a paired sample, there continues to be heterogeneity in firm characteristics, including heterogeneity in the matching variables across pairs.

The main result in Panel A of Table IV is that the *Buy Pressure* dummy is significantly positive, with one-tailed *p*-values less than 0.01 in three specifications and less than 0.05 in the fourth specification. This suggests that, *ceteris paribus*, firms are significantly more likely to have SEOs in the four quarters following flow-driven buying pressure. In terms of economic significance, in the full sample test the probability of an SEO in the four quarters following buying pressure is 58.6% higher for *IBP* stocks compared to other stocks. The percent increase in SEO probability is 49.6% for the *BTM-Size* matched sample, 29.7% for the *Return-Size* matched sample and 83.5% for the *Asset Growth-ROA* matched sample. These results hold after controlling for prior annual *returns* and the *book-to-market* ratio (*BTM*) which have been used as

overvaluation indicators in the prior literature. The interpretation is as follows. Consider two firms with similar prior *returns* and *BTM*, only one of which was *IBP*-affected. Under our hypothesis the *IBP* firm is overvalued, while, as described earlier, high prior *returns* and low *BTM* may be interpreted as due to fundamental news. The timing hypothesis suggests *Buy Pressure* should load after controlling for fundamental news in prior *returns* and *BTM*, and the hypothesis is supported in Table IV.

Also in Panel A of Table IV, the probability of issuing equity is significantly increasing in the one-year *return* in all samples, and significantly decreasing in the *book-to-market* ratio (*BTM*) in three samples, consistent with firms issuing equity after they have experienced high returns (e.g., Asquith and Mullins (1986), Loughran and Ritter (1995)) or when their market values are high relative to book values (e.g., Jenter (2005), DeAngelo, DeAngelo and Stulz (2010)). *Leverage* loads significantly positively in all samples, consistent with "financially constrained" firms being more "equity-dependent" (e.g., Baker, Stein and Wurgler (2003)). *ROA* is significantly negative in all three matched samples, consistent with more profitable firms being less dependent on external financing. *Asset growth* is significantly positive in three samples, consistent with a need for external capital to finance growth. The change in stock return *volatility* over the prior year loads significantly negatively in all matched sample regressions, which is consistent, for example, with an increase in volatility delaying an SEO due to the increased basis risk in going to market. The loadings of other variables vary across samples in significance or sign.

To relax the linearity assumption implicit in the regressions of Panel A, Panel B of Table IV reports SEO frequencies and a test of difference in SEO probabilities for *IBP* versus matching firms, for each of the three matched samples used in Panel A. In all three matched samples, the probability of an SEO in the four quarters following *IBP* is significantly higher with one-tailed *p*-values less than 0.01, consistent with the evidence in Panel A. For instance, in the *Return-Size* matched test, the relative frequency of an SEO is 1.4% in the matched sample, compared to 1.9% in the *IBP* sample, which represents a 38% increase in SEO frequency. Overall, Table IV provides support for our main hypothesis that firms time equity issuances to exploit exogenous overvaluation.

B. Timing Insider Sales

If managers identify and exploit price pressure by timing SEOs, we expect them to time their personal sales similarly. This is a powerful test of our hypothesis that mutual fund purchases of stocks we identify as *IBP* are overvalued and result from funds' restricted IOS and diminishing marginal investment prospects, as opposed to the alternative information hypothesis that IBP stock purchases are due to favorable fundamental information about the firm. We expect insiders to sell more shares in the four quarters following *IBP* if the *IBP* stock is overvalued (our hypothesis), but not if their firm faces favorable future prospects (the information hypothesis). The hypothesis is tested by estimating regressions of insider sales in quarter *t*, including an indicator variable for *Buy Pressure* as defined earlier.

The power of our test to detect timing by managers is potentially limited by the fact that

firms frequently restrict insider sales to certain short windows, e.g., within three to twelve days after quarterly earnings announcements (Bettis, Coles and Lemmon (2000)), or require managers to maintain a certain minimum level of holdings. We expect this is unlikely to be an issue because: (a) we examine insider sales over the four quarters following flow-driven buying pressure, not within a narrow window of a few days; and (b) this limitation biases against our ability to reject a null hypothesis of no change in insider sales.

[TABLE V HERE]

Panel A of Table V shows results of panel regressions with *Insider Sale*, the ratio of shares sold to the sum of shares sold and purchased, as the dependent variable.[7] All trades are open market trades. The regressions include time and industry fixed effects, and standard errors are clustered on both firm and time (two-dimensional clustering). Four regressions are estimated, one for a full sample of 211,227 stock-quarters with all available data, and one each for three matched samples. We match on prior one-year *return* and *size*, and on *BTM* and *size*, since *returns* and *BTM* have been used as overvaluation identifiers in the prior literature, as noted earlier. For the third matched sample we match on *size* and lagged *insider sales* to control for individual managers' persistent liquidity and diversification needs. The main result in Panel A of Table V is that the *Buy Pressure* dummy is significantly positive in all samples with one-tailed *p*-values less than 0.01. The coefficient of *Buy Pressure* is of 0.027 in the full sample regression.

[7] Our dependent variable, the sales ratio, is similar to that in Rozeff and Zaman (1998) and Piotroski and Roulstone (2005) who use the purchase ratio, calculated as shares purchased divided by the sum of shares purchased and sold.

Since the mean of *Insider Sale* in Table II is 0.4003, this suggests that insider sales increase by 0.027/0.4003 = 6.9% in the four quarters following *IBP*, which is an economically significant magnitude.

Also in Panel A of Table V, *Insider Sale* is increasing in firm *size* in all samples, consistent with Seyhun (1986), Rozeff and Zaman (1988) and Core et al. (2006). *Insider Sale* is significantly positively related to the past one-year *return*, suggesting that insiders sell relatively more than they purchase when the stock price is high relative to the past. *Insider Sale* is generally decreasing with the *BTM* decile in all samples, consistent with Rozeff and Zaman (1998), Piotroski and Roulstone (2005) and Jenter (2005). The *BTM* decile dummies are labeled *BTM1*, *BTM2* and so on, with *BTM1* being low and *BTM10* being high book-to-market. *BTM10* is omitted from the regression and so it is the reference or base decile. This result suggests insiders at high growth firms sell relatively more than they purchase compared to insiders at value firms, consistent with exit or diversification needs of insiders at high growth firms.

As in Core et al. (2006) we control for insiders' normal propensity to trade with lagged *Insider Sale*, and find that *Insider Sale*$_{t-4}$ is significantly positive with *p*-values less than 0.01 in all samples. *Insider Sale*$_{t-4}$ effectively controls for unidentified omitted variables in our regression. We control for the level of insider holdings, *Insider Holding*, and find that it loads significantly positively with *p*-values less than 0.01 in all samples, suggesting insiders sell more when they have higher exposure to firm-specific risk through higher holdings.

In Panel B of Table V we relax the linearity assumption implicit in the regressions of Panel A. Panel B reports the mean *Insider Sale* ratio for *IBP* vs matching stocks for each of the

three matched samples, as well as *p*-values for a test of difference in means. For each matched sample, insider sales are significantly higher for *IBP* stocks in the four quarters following *IBP*, with *p*-values less than 0.01. Overall the results in Table V align with those reported in Table IV, and suggest insiders are able to identify overvaluation and subsequently to time both firm-level equity issuances and insider sales.

C. Timing Mergers and Acquisitions

Jensen (2005) suggests overvalued equity is used as currency to finance stock-based acquisitions. The models in Shleifer and Vishny (2003) and Rhodes-Kropf and Viswanathan (2004) also predict the same, while the empirical evidence in Rhodes-Kropf, Robinson and Viswanathan (2005) suggests acquirer overvaluation is higher in completed deals than in failed deals. Hence, if *IBP* stocks are overvalued, we expect a higher likelihood of stock-based acquisitions in the four quarters following buying pressure because overvaluation can affect both the likelihood of deal initiation as well as the likelihood of completion of previously initiated deals. However, the power of our test is potentially limited if: (i) acquisitions require time, and overvaluation diminishes with time; (ii) higher overvaluation than results from flow-driven mutual fund purchases is needed to trigger acquisitions; and (iii) mergers occur primarily in waves, in response to industry-wide rather than firm-specific overvaluation. Our overvaluation indicator is firm-specific (recall that Table III and Fig 2 show industry-adjusted negative abnormal returns for *IBP* firms after the buying pressure quarter).

We test for M&A timing using Logit regressions in which the dependent variable is 1 if

the firm completed an acquisition in quarter *t*, and zero otherwise (Harford (1999) also estimates linear regressions of the M&A decision). M&A data is obtained from the *SDC* database. We find 268 acquisitions associated with IBP stocks, collectively accounting for $309b of transactions. This represents 3.9% by number, and 9% by dollar value, of all acquisitions in our sample. The main independent variable of interest in our Logit regressions is the *Buy Pressure* dummy, defined as previously. We control for prior one-year *return* and *BTM* because these have previously been used as overvaluation indicators. We control for *cash*, *ROA* and *dividend yield* because profitable firms that retain cash are more likely to acquire (e.g., Jensen (1986)). We also control for *size* and *asset growth* over the prior year (e.g., Harford (1999)).

Table VI, Panel A, reports results of four Logit regressions, one estimated over the full sample of all available firms, and the other three estimated over matched samples. The *Buy Pressure* dummy is significantly positive with a *p*-value less than 0.01 in the full sample Logit, and the coefficient indicates an increase in acquisition probability of 20%. It is also significantly positive with a *p*-value less than 0.05 in the sample matched on *asset growth* and *ROA*, with a coefficient indicating an increase in acquisition probability of 24.3%. The *Buy Pressure* dummy is insignificant in the other two matched samples (*Return-Size* and *BTM-Size*). Panel A of Table VI also shows that *return*, *size* and *asset growth* are significantly positive in all samples as predicted (e.g., Harford (1999)), and *BTM* is significantly negative as predicted. *ROA* is significantly positive in the matched sample regressions, consistent with more profitable firms being more likely to engage in an acquisition.

[TABLE VI HERE]

In Panel B of Table VI we relax the linearity assumption implicit in Panel A and report acquisition frequencies, as well as a test of difference in M&A probabilities for *IBP* versus matching firms, for each of the three matched samples. *IBP* firms are significantly more likely to acquire than matched firms, with *p*-values less than 0.01 for the *Asset Growth-ROA* and *Return-Size* matched samples, and less than 0.05 for the *BTM-Size* matched sample. The increase in acquisition probability ranges from 18.7% (*BTM-Size* sample) to 34% (*Asset Growth-ROA* sample). Overall, the evidence in Table VI supports the earlier evidence that firm managers identify and exploit overvalued equity.

IV. Additional Analysis

In this section we conduct a number of sensitivity tests. We summarize the results below and report all tables as well as additional tests in the online appendix.

(i) Our *return*-matched tests are designed to address the possibility of a non-linear relation between prior year stock returns on the one hand, and SEOs, insider sales, and M&A on the other. We further address the possibility of a non-linear relation using dummies for the first nine return deciles, labeled *ret10* to *ret 90*. For the top return decile, we use percentile dummies labeled *ret91* to *ret99*. Hence, we simultaneously control for *ret10, ..., ret90, ret91, ..., ret99* in the main regressions and find the results are robust. In particular, the probability of an SEO is

50.5% higher (*p*-value<0.01), insider sales are 7.2% higher (*p*-value<0.01) and the probability of a stock-based acquisition is 26.8% higher (*p*-value<0.01), in the four quarters following *IBP*.

(ii) Our hypotheses contrast *IBP* stocks with all other stocks. The rest of the stocks include *WBP* stocks, and we do not separately control for a *WBP* indicator in our main tests. *WBP* stocks are subject to widespread mutual fund buying pressure, which potentially reflects favorable information about these firms and their investment opportunities. Thus, it is quite likely that *WBP* is positively correlated with future SEOs and acquisitions. Such correlation may arise due to the relatively favorable investment opportunities of *WBP* firms (Table III and Figure 1 suggest that WBP stocks are not overvalued since there is no return reversion after *WBP*). As an extension of our benchmark specification, we include an indicator variable for *WBP*. We use this indicator to absorb some of the unexplained variation in the dependent variable across the sample of non-*IBP* stocks. Results are robust to including an indicator for *WBP* stocks. In particular, the probability of an SEO is 58.6% higher (*p*-value<0.01), insider sales are 7.5% higher (*p*-value<0.01) and the probability of a stock-based acquisition is 26.9% higher (*p*-value<0.01), in the four quarters following *IBP*.

(iii) We use both newly initiated holdings and expansions of existing holdings by high inflow funds to identify *IBP* stocks. An argument for price pressure associated with investment constraints applies more naturally to the funds' existing holdings as opposed to the newly initiated positions. We therefore modify the *Pressure* definition to sum increases in holdings by

mutual funds in the top flow decile only if these increases are expansions of previously held positions, and not new initiations. Results are robust. Specifically, *IBP* stocks have cumulative market-adjusted returns of -7.84% (p-value<1%) over the six quarters following buying pressure. In addition, the probability of an SEO is 50% higher (p-value<0.01), insider sales are 5.4% higher (p-value<0.01) and the probability of an acquisition is 22% higher (p-value<0.01), in the four quarters following buying pressure.

(iv) We identify *IBP* firms as those in the top decile of *Pressure* but in the middle three deciles of *UPressure*. Our objective in intersecting with the middle deciles of *UPressure* is to isolate stocks that are not being widely traded by all other mutual funds. Although symmetry considerations may dictate using the middle quintile of *UPressure*, we expand our sample of *IBP* stocks by including three middle deciles. As a robustness check, we replicate our key regressions while intersecting the top decile of *Pressure* with either the middle two or the middle four *UPressure* deciles. In both cases we find slightly stronger results. For the case of the middle two deciles of *UPressure*, we identify 1,523 *IBP* stock-quarters from 1990 to 2007, with cumulative abnormal returns of -12.84% (p-value<0.05) over the six quarters following buying pressure. Furthermore, the probability of an SEO is 63% higher (p-value<0.01), insider sales are 6.9% higher (p-value<0.01) and the probability of an acquisition is 30% higher (p-value<0.05), in the four quarters following buying pressure. For the case of the middle four deciles of *UPressure*, we identify 3384 *IBP* stock-quarters from 1990 to 2007, with cumulative abnormal returns of -7.9% (p-value<0.01) over the six quarters following *IBP*. Furthermore, the probability of an

SEO is 59% higher (p-value<0.01), insider sales are 7.5% higher (p-value<0.01) and the probability of an acquisition is 28% higher (p-value<0.01), in the four quarters following *IBP*.

(v) We repeat the insider sale tests under an alternative definition of insiders as the top 5 executives: the CEO, Chairman, President, CFO and COO. Results are robust, with insider sales increasing by 6.6% (p-value<0.01) in the four quarters following *IBP*.

V. Conclusion

Prior literature has examined the price impact of trades by mutual funds with large capital inflows and outflows. We find that stocks subject to buying pressure by mutual funds experiencing large capital inflows, but not subject to widespread buying pressure by other mutual funds, experience substantial upward price impact. Since we use widespread mutual fund buying pressure as an indicator of informed trading, this result suggests that stock prices change in response to uninformed shifts in demand.

Inflow-driven mutual fund buying pressure is a relatively exogenous overvaluation identifier for SEO timing studies because it is associated with who is buying – buyers with excess liquidity – rather than with what is being purchased. The price effects of mutual fund buying pressure are sufficiently long-lived to allow managers who are able to identify the overvaluation to time SEOs, insider sales and stock-based acquisitions. We find that in the four quarters following the occurrence of flow-driven buying pressure, the probability of an SEO is 59% higher, insider sales are 7% higher and the probability of completion of a stock-based

acquisition is 20% higher. This suggests firm managers are able to identify and exploit overvaluation.

Our evidence of long-lived price impact of uninformed demand shifts, while consistent with empirical evidence in Coval and Stafford (2007) and the arguments of Shleifer (1986), is intriguing. One possible conclusion is that arbitrage was unsuccessful at flattening the demand curve. Reasons for limits to arbitrage include the unavailability of close substitutes, specialization among arbitrageurs combined with a limited number of arbitrageurs, lingering differences in investor opinion about the true value of the stock and short sales constraints. Alternatively, as Coval and Stafford (2007) point out, market participants may have been unaware of the return pattern induced by mutual fund flows because the relevant data was not available at that time. As we show, despite the data limitations, some firm managers were able to identify overvaluation in the equity of their own firm and react to it by issuing additional shares or selling shares from their personal account. The persistence of the price impact presents one opportunity for future research.

Our findings have a number of additional implications for future research. First, in an international context, smaller markets with fewer close substitutes for individual stocks may experience greater price impact from uninformed shifts in demand, which suggests that the patterns of predictability we identify may be even stronger in such markets. Second, the possibility of persistent stock price dislocation due to uninformed demand shifts has implications for managerial performance evaluation and the optimal sensitivity of managerial compensation to short-run stock returns. Third, from a corporate governance perspective, our findings suggest

managers are sometimes better informed than the market and are able to identify market misvaluations, which has implications for the level of discretion they are allowed in responding to price movements through a variety of corporate decisions. Other research opportunities include examining the bond price impact of mutual fund trading pressure and the likelihood of subsequent debt issuances, and examining the effect of mutual fund trading pressure on the use of cash versus stock in corporate acquisitions.

References

Asquith, Paul, and David Mullins, 1986, Equity issues and offering dilution, *Journal of Financial Economics* 15, 61-89.

Baker, Malcolm, and Jeffrey Wurgler, 2002, Market timing and capital structure, *Journal of Finance* 57, 1-32.

Baker, Malcolm, Richard Ruback and Jeffrey Wurgler, 2007, Behavioral corporate finance: a survey, in Espen Eckbo, ed.: *Handbook in Corporate Finance: Empirical Corporate Finance* (North Holland/Elsevier).

Baker, Malcolm, Jeremy Stein and Jeffrey Wurgler, 2003, When does the market matter? Stock prices and the investment of equity-dependent firms, *Quarterly Journal of Economics*, 969-1005.

Bettis, Carr, Jeffrey Coles and Michael Lemmon, 2000, Corporate policies restricting trading by insiders, *Journal of Financial Economics* 57, 191-220.

Chen, Joseph, Samuel Hanson, Harrison Hong and Jeremy Stein, 2007, Do hedge funds profit from mutual-fund distress? Working paper, University of California, Davis.

Chevalier, Judith, and Glenn Ellison, 1997, Risk taking by mutual funds as a response to incentives, *Journal of Political Economy* 105, 1167-1200.

Core, John, Wayne Guay, Scott Richardson and Rodrigo Verdi, 2006., Stock market anomalies: what can we learn from repurchases and insider trading? *Review of Accounting Studies* 11, 49-70.

Coval, Joshua, and Erik Stafford, 2007, Asset firesales (and purchases) in equity markets, *Journal of Financial Economics* 86, 479-512.

DeAngelo, Harry, Linda DeAngelo and Rene Stulz, 2010, Seasoned equity offerings, market timing, and the corporate life cycle, *Journal of Financial Economics* 95, 275-295.

Eckbo, B. Espen, and Ronald Masulis, 1992, Adverse selection and the rights offer paradox, *Journal of Financial Economics* 32, 293-322.

Eckbo, B. Espen, Ronald Masulis and Oyvind Norli, 2000, Seasoned public offerings: resolution of the new issues puzzle, *Journal of Financial Economics* 56: 251-292.

Fama, Eugene, and James MacBeth, 1973, Risk, return, and equilibrium: empirical tests, *Journal of Political Economy* 81, 607-636.

Fama, Eugene, and Kenneth French, 1993, Common risk factors in the returns on stocks and bonds, *Journal of Financial Economics* 33, 3-56.

Fama, Eugene, and Kenneth French, 2005, Financing decisions: who issues stock? *Journal of Financial Economics* 76, 549-582.

Frazzini, Andrea, and Owen Lamont, 2008, Dumb money: mutual fund flows and the cross-section of stock returns, *Journal of Financial Economics* 88, 299-322.

Gao, Xiaohui, and Jay Ritter, 2010, The marketing of seasoned equity offerings, *Journal of Financial Economics* 97, 33-52.

Greenwood, Robin, 2005, Short- and long- term demand curves for stocks: theory and evidence on the dynamics of arbitrage, *Journal of Financial Economics* 75, 607-649.

Graham, John, and Campbell Harvey, 2001, The theory and practice of corporate finance: evidence from the field, *Journal of Financial Economics* 60, 187-243.

Harford, Jarrod, 1999, Corporate cash reserves and acquisitions, *Journal of Finance* 54, 1969-1997.

Harris, Lawrence, and Eitan Gurel, 1986, Price and volume effects associated with changes in the S&P 500 list: new evidence for the existence of price pressures, *Journal of Finance* 41, 815-829.

Ippolito, Richard, 1992, Consumer reaction to measures of poor quality: evidence from the mutual fund industry, *Journal of Law and Economics* 35, 45-70.

Jensen, Michael, 1986, Agency costs of free cash flow, corporate finance, and takeovers, *American Economic Review*, 76, 323-329.

Jensen, Michael, 2005, Agency costs of overvalued equity, *Financial Management* 34, 5-19.

Jenter, Dirk, 2005, Market timing and managerial portfolio decisions, *Journal of Finance* 60, 1903-1949.

Kraus, Alan, and Hans Stoll, 1972, Price impacts of block trading on the New York Stock Exchange, *Journal of Finance* 27, 569-588.

Lakonishok, Josef, Andrei Shleifer and Robert Vishny, 1992, The impact of institutional trading on stock prices, *Journal of Financial Economics* 32, 23-44.

Loughran, Tim, and Jay Ritter, 1995, The new issues puzzle, *Journal of Finance* 50, 23-51.

Loughran, Tim, and Jay Ritter, 1997, The operating performance of firms conducting seasoned equity offerings, *Journal of Finance* 52, 1823-1850.

Mitchell, Mark, Todd Pulvino and Erik Stafford, 2004, Price pressure around mergers, *Journal of Finance* 59, 31-63.

Petersen, Mitchell, 2009, Estimating standard errors in finance panel data sets: comparing approaches, *Review of Financial Studies* 22, 435-480.

Piotroski, Joseph, and Darren Roulstone, 2005, Do insider trades reflect both contrarian beliefs and superior knowledge about future cash flow realizations? *Journal of Accounting and Economics* 39, 55-82.

Rhodes-Kropf, Matthew, and S. Viswanathan, 2004, Market valuation and merger waves, *Journal of Finance* 59, 2685-2718.

Rhodes-Kropf, Matthew, David Robinson and S. Viswanathan, 2005, Valuation waves and merger activity: The empirical evidence, *Journal of Financial Economics* 77, 561-603.

Rozeff, Michael, and Mir Zaman, 1988, Market efficiency and insider trading: new evidence, *Journal of Business* 61, 25-44.

Rozeff, Michael, and Mir Zaman, 1998, Overreaction and insider trading: evidence from growth and value portfolios, *Journal of Finance* 53, 701-716.

Seyhun, H. Nejat, 1986, Insider profits, costs of trading, and market efficiency, *Journal of Financial Economics* 16, 189-212.

Shleifer, Andrei, 1986, Do demand curves for stocks slope down? *Journal of Finance* 41, 579-590.

Shleifer, Andrei, and Robert Vishny, 2005, Stock market driven acquisitions, *Journal of Financial Economics* 70, 295-311.

Sirri, Erik, and Peter Tufano, 1998, Costly search and mutual fund flows, *Journal of Finance* 53, 1589-1622.

Wermers, Russ, 1999, Mutual fund herding and the impact on stock prices, *Journal of Finance* 59, 581-622.

Table I: Mutual Fund Flow Predictability and Prior Performance

Mutual funds are sorted quarterly into deciles of capital flows. The sample consists of 63,426 fund-quarters from 1990 to 2007. *Flow* is calculated as as $\{TA_{j,s} - TA_{j,s-1}(1+R_{j,s-1})\} / TA_{j,s-1}$, where *TA* is total net assets of mutual fund *j* in month *s*, and *R* is the quarterly return for fund *j* in month *s*. Monthly flows are summed to obtain the quarterly flow, $flow_{j,t}$, of mutual fund *j* in quarter *t*. *Prior Fund Return* is the fund return in the last year. *Avg # Holdings* is the average number of stocks in a fund-quarter. *% Holdings Expanded* is the percent of stocks held in quarter t that were held in *t-1* and in which the fund increased its holdings. *% Holdings Initiated* is the percent of stocks held in quarter *t* that were not held in *t-1*.

Flow Decile	*Flow*	*Prior Fund Return*	*Avg # Holdings*	*% Holdings Expanded*	*% Holdings Initiated*
Inflow	40.3%	16.6%	107	39%	19%
9	14.1%	14.6%	122	34%	17%
8	7.0%	13.2%	149	31%	16%
7	3.3%	12.1%	145	26%	16%
6	1.0%	11.0%	144	23%	16%
5	-0.7%	9.8%	126	20%	16%
4	-2.3%	9.1%	117	19%	17%
3	-4.1%	7.8%	106	18%	18%
2	-6.8%	6.3%	99	18%	19%
Outflow	-17.0%	6.1%	103	16%	20%

Table II: Stock-level Means, and Tests of Differences in Means

Table II reports means for the full sample, for the stocks subject to inflow-driven buying pressure (*IBP* sample), and for stocks subject to widespread buying pressure by all mutual funds other than funds in the top decile of capital flows (*WBP* sample). *ROA* is operating income before depreciation over total assets. *1-year Return* is the stock return over the prior year. *BTM* is book value of shareholders' equity over market value of equity. *Size* is the natural logarithm of total assets. *Leverage* is long-term debt plus long-term debt in current liabilities, over total assets. *Dividend yield* is the dividend per share divided by the stock price. *Cash* is cash and short-term investments over total assets. *Volatility* is the standard deviation of daily stock returns over the quarter. *ΔVolatility* is the change in volatility from the same quarter in the previous year. *Asset growth* is the change in the log of total assets from the same quarter in the previous year. *Insider Sale* is the ratio of shares sold by all insiders to the sum of shares sold and purchased by all insiders in a firm-quarter. *Insider Holding* is the number of shares held by insiders scaled by total shares outstanding. The full (*IBP*) [*WBP*] sample consists of 313,750 (2,515) [17,160] stock-quarters from 1990 through 2007. *IBP* stocks are those in the top decile of *Pressure*, but in the middle three deciles of *UPressure*, in quarter *t=0*. *WBP* stocks are those in the top decile of *UPressure* in quarter *t=0*. *Pressure* of stock *i* in quarter *t* is a stock-level measure of *flow-motivated* trading by all mutual funds *j*, and is calculated as

$$Pressure_{i,t} = \frac{\sum_j (\max(0, \Delta holding_{j,i,t}) \mid flow_{j,t} > 90^{th}\ percentile_t) - \sum_j (\max(0, -\Delta holding_{j,i,t}) \mid flow_{j,t} < 10^{th}\ percentile_t)}{Shares\ Outstanding_{i,t-1}}$$

UPressure is a measure of widespread trading by mutual funds that is not motivated by capital flows and is intended to capture information-motivated trading. The middle three deciles of *UPressure* capture stock quarters that are not subject to *widespread* net trading in any direction.

$$UPressure_{i,t} = \{ \sum_j \Delta holding_{j,i,t} \mid 10^{th}\ percentile_t \leq flow_{j,t} \leq 90^{th}\ percentile_t \} / Shares\ Outstanding_{i,t-1}$$

The last three columns report tests of differences in means between the three samples. Differences in means are calculated each quarter for each pair of samples, and the time series of differences are used for statistical inference to control for cross-sectional correlation. *** (**) [*] represents one-tailed statistical significance at less than 1% (5%) [10%].

Variable	(1) Full Sample	(2) *IBP* Sample	(3) *WBP* Sample	(1) - (2)	(1) - (3)	(2) - (3)
ROA	0.017	0.030	0.032	*	**	
1 year Return	0.183	0.493	0.319	***	***	***
BTM	0.669	0.489	0.534	**	*	
Size	5.342	6.259	6.231	***	***	
Leverage	0.206	0.202	0.208			
Dividend yield	0.004	0.002	0.003			
Cash	0.167	0.198	0.177	*		

Volatility	0.030	0.029	0.028			
ΔVolatility	0.000	-0.002	-0.002			
Asset growth	0.083	0.192	0.164	***	***	
Insider Sale	0.400	0.483	0.462	***	***	**
Insider Holding	0.025	0.016	0.015	***	***	
Pressure (%)	0.032	1.055	0.157	***	***	***
Upressure (%)	0.375	0.685	9.676	*	***	***

Table III: Quarterly Abnormal Stock Returns due to Mutual Fund Buying Pressure

Panel A shows mean quarterly abnormal returns from quarters *t-4* to *t+6* for stocks subject to mutual fund buying pressure in quarter *t=0*. Abnormal stock returns are industry-adjusted returns using the Fama-French equal-weighted 48 industry portfolios. In Panel B, abnormal returns are the *alphas* (intercept) from calendar-time Fama and French (1993) three-factor regressions. The dependent variable in Panel B is the monthly excess return, over the risk-free rate, on a portfolio of *IBP* Stocks, and *WBP* Stocks, held for 3 years (upper panel) or 5 years (lower panel). *Mkt-Rf, SMB and HML* are the Fama-French factors. The *alpha* is in percentage points. Inflow-driven Buying Pressure (*IBP*) stocks are those in the top decile of *Pressure*, but in the middle three deciles of *UPressure*, in quarter *t=0*. Widespread Buying Pressure (*WBP*) stocks are those in the top decile of *UPressure* in quarter *t=0*. The *IBP* (*WBP*) sample consists of 2,515 (17,160) stock-quarters from 1990 through 2007. Pressure of stock *i* in quarter *t* is a stock-level measure of *flow-motivated* trading by all mutual funds *j*, and is calculated as

$$Pressure_{i,t} = \frac{\sum_j (\max(0, \Delta holding_{j,i,t}) \mid flow_{j,t} > 90^{th}\ percentile_t) - \sum_j (\max(0, -\Delta holding_{j,i,t}) \mid flow_{j,t} < 10^{th}\ percentile_t)}{Shares\ Outstanding_{i,t-1}}$$

UPressure is a measure of widespread trading by mutual funds that is not motivated by capital flows and is intended to capture information-motivated trading. The middle three deciles of *UPressure* capture stock quarters that are not subject to *widespread* net trading in any direction.

$$UPressure_{i,t} = \{ \sum_j \Delta holding_{j,i,t} \mid 10^{th}\ percentile_t \leq flow_{j,t} \leq 90^{th}\ percentile_t \} / Shares\ Outstanding_{i,t-1}$$

In Panel A, mean abnormal returns are calculated each quarter for the portfolio of *IBP* stocks and *WBP* stocks, and the time series of portfolio abnormal returns are used for statistical inference to control for cross-sectional correlation. *** (**) [*] represents one-tailed statistical significance at less than 1% (5%) [10%].

Panel A: Industry-adjusted Returns

Quarter	*IBP* Stocks	*WBP* Stocks
t-4	1.99% **	2.33% ***
t-3	3.53% ***	2.24% ***
t-2	2.29% **	2.64% ***
t-1	2.82% **	3.22% ***
t=0	5.12% ***	2.57% ***
t+1	-3.10% ***	-0.23%
t+2	-1.11%	-0.80% *
t+3	-2.19% ***	-0.52%
t+4	-1.55% **	-0.29%
t+5	-1.41% *	-0.61%
t+6	-0.45%	-0.23%
[t+1, t+6]	-9.82% ***	-2.68% *

Panel B: Fama-French *Alphas (α)*

3 year		
	IBP	*WBP*
α	-0.36 **	-0.08
Mkt-Rf	1.3 ***	1.21 ***
SMB	0.68 ***	0.61 ***
HML	0.07	0.33 ***
Adj. Rsq	86%	88%

5 year		
	IBP	*WBP*
α	-0.31 **	-0.04
Mkt-Rf	1.28 ***	1.19 ***
SMB	0.66 ***	0.61 ***
HML	0.12 *	0.34 ***
Adj. Rsq	87%	88%

Table IV: Timing Seasoned Equity Offerings

Panel A reports coefficients from logit regressions of the equity issuance choice on the independent variables shown. The dependent variable is 1 if the firm has a seasoned equity offering (SEO) in quarter *t*, and zero otherwise. *Buy Pressure* is a dummy that equals 1 if the stock was subject to *IBP* in any of the four quarters from *t-1* to *t-4*. *ROA* is operating income before depreciation over total assets. *Cash* is cash and short-term investments over total assets. *1-year Return* is the stock return over a one-year period ending at the end of the current quarter. *Size* is the natural logarithm of total assets. *BTM* is book value of shareholders' equity over market value of equity. *Leverage* is long-term debt plus long-term debt in current liabilities, over total assets. *Dividend yield* is the dividend per share divided by the stock price. *Volatility* is the standard deviation of daily stock returns over the quarter. *ΔVolatility* is the change in volatility from the same quarter in the previous year. *Asset growth* is the change in the log of total assets from the same quarter in the previous year. The second column shows results for the full sample. The last three columns show results for matched samples in which *IBP* stock-quarters are first matched on {quarter, industry, first matching variable, second matching variable}, where the first and second matching variables are indicated at the top of the column. Once the matched sample is obtained, a Logit regression is estimated with dependent and independent variables as described above. Standard errors are clustered on both firm and time (two-dimensional clustering), and the samples span 1990 through 2007. *** (**) [*] represents one-tailed statistical significance at less than 1% (5%) [10%]. Panel B reports SEO frequencies in all three matched samples. In Panel B, SEO=1 for stock-quarters with an SEO, and 0 otherwise, while *IBP*=1 if the stock was subject to *IBP* in any of the quarters from *t-1* to *t-4*, and 0 otherwise. *IBP* is described in the notes to Table II. The *p*-value in Panel B is from a test of difference in SEO relative frequencies when *IBP*=1 vs 0.

Panel A: SEO Logit Regression Coefficients

	Full Sample	Matched Samples		
Variable		*BTM-Size*	*Return-Size*	*AssetGrowth-ROA*
Intercept	-6.077 ***	-4.163 ***	-4.086 ***	-4.633 ***
Buy Pressure	**0.461** ***	**0.403** ***	**0.260** **	**0.607** ***
ROA_{t-4}	-0.105	-2.413 **	-3.406 ***	-2.754 ***
$Cash_{t-4}$	0.689 ***	0.512 *	0.404	0.471
1 year Return	0.482 ***	0.459 ***	0.494 ***	0.364 ***
$Size_{t-4}$	0.177 ***	-0.115 ***	-0.077 *	-0.059
BTM_{t-4}	-0.532 ***	-0.111	-0.592 ***	-0.458 ***
$Leverage_{t-4}$	0.564 ***	1.348 ***	1.162 ***	1.141 ***
Dividend yield$_{t-4}$	-15.178 ***	-28.904	-0.204	-1.265
$Volatility_{t-4}$	14.659 ***	0.335	1.542	3.318
$\Delta Volatility_{t,t-4}$	-0.611	-15.033 ***	-12.524 **	-12.550 **

Asset growth	0.421 ***	0.225	0.271 *	0.397 ***
Time f.e.	Yes	Yes	Yes	Yes
Industry f.e.	Yes	Yes	Yes	Yes
Adj R-sq	9.4%	8.3%	9.2%	7.7%
N	313750	16620	16642	16650

Panel B: SEO Frequencies

		Matched Samples		
SEO	*IBP*	*BTM-Size*	*Return-Size*	*AssetGrowth-ROA*
0	0	8202	8202	8230
0	1	8146	8157	8163
1	0	108	119	95
1	1	164	164	162
p-value		<0.01	<0.01	<0.01

Table V: Timing Insider Sales

Panel A reports coefficients from regressions of insider sales (*Insider Sale*) in quarter *t* on the independent variables shown. *Insider Sale* is the ratio of shares sold by insiders in a firm-quarter to the sum of shares sold and purchased by insiders in that firm-quarter. *Buy Pressure* is a dummy that equals 1 if the stock was subject to *IBP* in any of the four quarters from *t-1* to *t-4*. *Size* is the natural logarithm of total assets. *1-year Return* is the stock return over a one-year period ending at the end of the current quarter. *Volatility* is the standard deviation of daily stock returns over the quarter. *ΔVolatility* is the change in volatility from the same quarter in the previous year. *BTM* is book value of shareholders' equity over market value of equity, at the end of the same quarter in the prior year. *BTM* is ranked into deciles from *BTM1* (low *BTM*) to *BTM10* (high *BTM*). The *BTM10* dummy is omitted. *Insider Holding* is the number of shares held by insiders scaled by total shares outstanding. The second column shows results for the full sample. The last three columns show results for matched samples in which *IBP* stock-quarters are first matched on {quarter, industry, first matching variable, second matching variable}, where the first and second matching variables are indicated at the top of the column. Once the matched sample is obtained, a regression is estimated with dependent and independent variables as described above. Standard errors are clustered on both firm and time (two-dimensional clustering), and the samples span 1990 through 2007. *** (**) [*] represents one-tailed statistical significance at less than 1% (5%) [10%]. Panel B reports mean insider sales in all three matched samples. In Panel B, *IBP*=1 if the stock was subject to *IBP* in any of the quarters from *t-1* to *t-4*, and 0 otherwise. *IBP* is described in the notes to Table II. The *p*-value in Panel B is from a test of difference in mean insider sales when *IBP*=1 vs 0.

Panel A: Insider Sale Regression Coefficients

	Full Sample	Matched Samples		
Variable		*BTM-Size*	*Return-Size*	*Size-InsiderSale$_{t-1}$*
Intercept	0.247 ***	0.214 ***	0.218 ***	0.184 ***
Buy pressure	**0.027** ***	**0.021** ***	**0.025** ***	**0.025** ***
Size$_{t-4}$	0.008 ***	0.009 ***	0.008 ***	0.011 ***
Insider Sale$_{t-4}$	0.170 ***	0.181 ***	0.192 ***	0.176 ***
1 year Return	0.062 ***	0.063 ***	0.061 ***	0.060 ***
Volatility$_{t-4}$	-0.902 ***	-0.071	-0.133	-0.009
ΔVolatility$_{t,t-4}$	-1.674 ***	-2.172 ***	-2.164 ***	-2.173 ***
BTM1	0.094 ***	0.090 ***	0.093 ***	0.101 ***
BTM2	0.099 ***	0.094 ***	0.091 ***	0.108 ***
BTM3	0.088 ***	0.067 ***	0.056 ***	0.084 ***
BTM4	0.078 ***	0.070 ***	0.079 ***	0.086 ***
BTM5	0.069 ***	0.069 ***	0.056 ***	0.075 ***

BTM6	0.056 ***	0.043 **	0.052 ***	0.064 ***
BTM7	0.043 ***	0.031	0.036 **	0.048 ***
BTM8	0.026 ***	0.024	0.021	0.032 *
BTM9	0.025 ***	0.014	0.013	0.031 *
Insider Holding	0.373 ***	0.716 ***	0.747 ***	0.909 ***
Time f.e.	Yes	Yes	Yes	Yes
Industry f.e.	Yes	Yes	Yes	Yes
Adj R-sq	8.82%	7.31%	8.00%	7.81%
N	211227	13526	13590	13596

Panel B: Mean Insider Sales

	Matched Samples		
IBP	*BTM-Size*	*Return-Size*	*Size-InsiderSale*$_{t-1}$
0	0.438	0.427	0.433
1	0.467	0.466	0.467
p-value	<0.01	<0.01	<0.01

Table VI: Timing Acquisitions

Panel A reports coefficients from logit regressions of the acquisition choice on the independent variables shown. The dependent variable is 1 if the firm engages in a stock-based acquisition in quarter *t*, and zero otherwise. *Buy Pressure* is a dummy that equals 1 if the stock was subject to *IBP* in any of the four quarters from *t-1* to *t-4*. *1-year Return* is the stock return over a one-year period ending at the end of the current quarter. *Size* is the natural logarithm of total assets. *BTM* is book value of shareholders' equity over market value of equity. *ROA* is operating income before depreciation over total assets. *Cash* is cash and short-term investments over total assets. *Dividend yield* is the dividend per share divided by the stock price. *Volatility* is the standard deviation of daily stock returns over the quarter. *ΔVolatility* is the change in volatility from the same quarter in the previous year. *Asset growth* is the change in the log of total assets from the same quarter in the previous year. The second column shows results for the full sample. The last three columns show results for matched samples in which *IBP* stock-quarters are first matched on {quarter, industry, first matching variable, second matching variable}, where the first and second matching variables are indicated at the top of the column. Once the matched sample is obtained, a Logit regression is estimated with dependent and independent variables as described above. Standard errors are clustered on both firm and time (two-dimensional clustering), and the samples span 1990 through 2007. *** (**) [*] represents one-tailed statistical significance at less than 1% (5%) [10%]. Panel B reports acquisition frequencies in all three matched samples. In Panel B, M&A=1 for stock-quarters with an acquisition, and 0 otherwise, while *IBP*=1 if the stock was subject to *IBP* in any of the quarters from *t-1* to *t-4*, and 0 otherwise. *IBP* is described in the notes to Table II. The *p*-value in Panel B is from a test of difference in relative acquisition frequencies when *IBP*=1 vs 0.

Panel A: M&A Logit Regression Coefficients

	Full Sample	Matched Samples		
Variable		*BTM-Size*	*Return-Size*	*AssetGrowth-ROA*
Intercept	-4.891 ***	-5.120 ***	-5.188 ***	-5.279 ***
Buy pressure	**0.183** ***	**0.114**	**0.098**	**0.218** **
1 year Return	0.255 ***	0.251 ***	0.228 ***	0.250 ***
$Size_{t-4}$	0.175 ***	0.138 ***	0.153 ***	0.153 ***
BTM_{t-4}	-0.749 ***	-0.585 ***	-0.557 ***	-0.638 ***
ROA_{t-4}	0.265	2.714 ***	1.756 *	2.755 ***
$Cash_{t-4}$	0.374 ***	0.177	0.156	-0.023
Dividend yield$_{t-4}$	-6.202 **	12.246	11.796 *	8.134
$Volatility_{t-4}$	2.992 *	19.161 ***	18.819 ***	18.846 ***
$\Delta Volatility_{t,t-4}$	-0.276	12.138 ***	5.321	7.259 **
Asset growth	0.438 ***	0.569 ***	0.644 ***	0.680 ***
Time f.e.	Yes	Yes	Yes	Yes

Industry f.e.	Yes	Yes	Yes	Yes
Adj R-sq	7.2%	4.7%	4.7%	6.1%
N	313750	16620	16642	16650

Panel B: M&A Frequencies

		Matched Samples		
M&A	*IBP*	*BTM-Size*	*Return-Size*	*AssetGrowth-ROA*
0	0	8085	8108	8125
0	1	8043	8056	8057
1	0	225	213	200
1	1	267	265	268
p-value		0.02	<0.01	<0.01

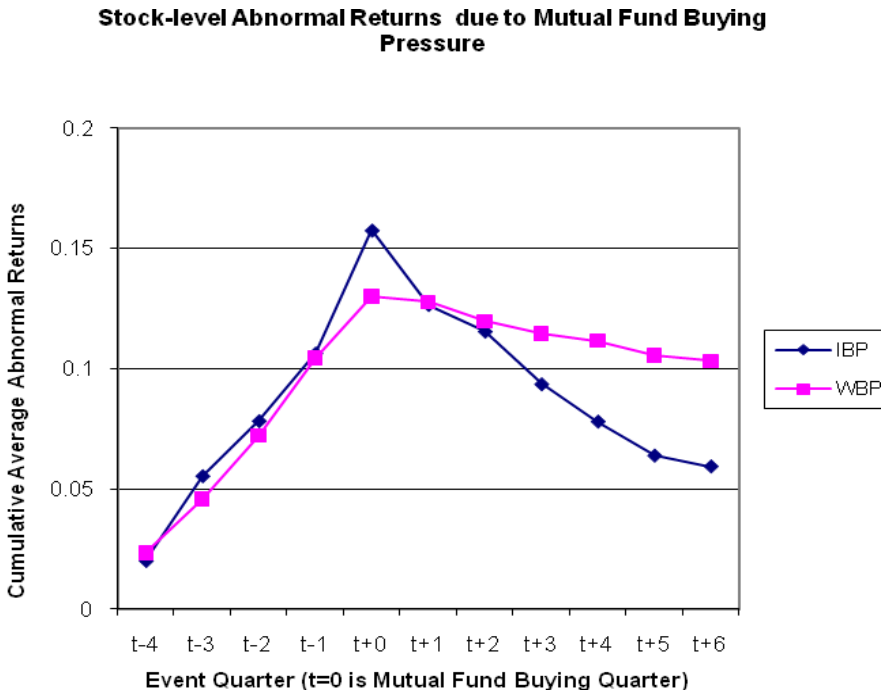

Figure 1: The figure shows cumulative average abnormal returns of stocks subject to buying pressure by mutual funds. Abnormal returns are industry-adjusted returns, using the Fama-French equal-weighted 48 industry portfolios. We sum average quarterly abnormal returns to obtain the cumulative average abnormal returns. Inflow-driven Buying Pressure (*IBP*) stocks are those in the top decile of *Pressure*, but in the middle three deciles of *UPressure*, in quarter *t=0*. Widespread Buying Pressure (*WBP*) stocks are those in the top decile of *UPressure* in quarter *t=0*. The *IBP* (*WBP*) sample consists of 2,515 (17,160) stock-quarters from 1990 through 2007. *Pressure* of stock *i* in quarter *t* is a stock-level measure of *flow-motivated* trading by all mutual funds *j*, and is calculated as

$$Pressure_{i,t} = \frac{\sum_j (\max(0, \Delta holding_{j,i,t}) \mid flow_{j,t} > 90^{th}\ percentile_t) - \sum_j (\max(0, -\Delta holding_{j,i,t}) \mid flow_{j,t} < 10^{th}\ percentile_t)}{Shares\ Outstanding_{i,t-1}}$$

UPressure is a measure of widespread trading by mutual funds that is not motivated by capital flows and is intended to capture information-motivated trading. The middle three deciles of *UPressure* capture stock quarters that are not subject to *widespread* net trading in any direction.

$$UPressure_{i,t} = \{ \sum_j \Delta holding_{j,i,t} \mid 10^{th}\ percentile_t \leq flow_{j,t} \leq 90^{th}\ percentile_t \} / Shares\ Outstanding_{i,t-1}$$