Insider Trading and Investor Sentiment

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Abstract

This paper provides evidence that corporate insiders consider investors' sentiment toward their firms in their trades. Using turnover ratio and option implied volatility as proxies for firm-specific sentiment, we show that insiders in low-sentiment firms are more likely to purchase their own stocks than those in high-sentiment firms. This role of firm-specific sentiment for insider trading behavior remains significant in the presence of other contributing factors as well as in various subsamples sorted on firm characteristics. Moreover, insider purchases in low-sentiment firms and sales in high-sentiment firms are more profitable. These results suggest that insiders attempt to exploit the misvaluation of their own firms based on the public information about firm-specific investor sentiment.

EFM classification: 120; 720

Keywords: insider trading; investor sentiment; turnover ratio; option implied volatility

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1 Introduction

The trading activity of corporate insiders as informational events has received much attention from academics, practitioners, and regulators alike for various reasons. While quite a few prior studies have documented that insiders' trades earn substantial abnormal returns and predict firms' future performances presumably because of the nature of the information they carry,[1] research in recent years shows that it may not always be the case. Specifically, insider trading may or may not contain substantial private information and could instead be triggered by other motives. For example, Cohen, Malloy, and Pomorski (2012) show that there exists *routine* insider trading that lacks predictive ability for firms' future performances. Some other studies document that insider transactions could be linked to a perception of misvaluation inferred from certain public information including book-to-market ratio (Rozeff and Zaman (1998); Jenter (2005)) and information about the firm's principal clients (Alldredge and Cicero (2015)). Intuitively, there seems to be no reason why corporate insiders do not want to use publicly available information together with the private information they might have unless the former is a proper subset of the latter.

In this paper, we investigate how insider trading behavior is affected by a particular type of public information, i.e., investor sentiment.[2] We also examine whether the insider trades are driven by sentiment-based strategic exploitation of potential misvaluation by analyzing the profitability of their trades conditional on investor sentiment.

There are two related strands of research in investor sentiment relevant for our paper; its impacts on asset returns and on managers' strategic response to perceived misvaluation. Investor sentiment has recently drawn much attention from finance researchers largely because it has been shown to be negatively related to stock returns. This is true for both cross-sectional returns (Baker and Wurgler (2006)) and aggregate market returns (Brown and Cliff (2005); Huang et al.(2015)).

Meanwhile, ample evidence shows that mangers act strategically to take advantage of the perceived misvaluation of their own shares when making investment and

[1] Earlier studies (see, for example, Lorie and Niederhoffer (1968), Seyhun (1992), and Lakonishok and Lee (2001), among others) show that insider purchases can predict future returns, while more recent studies (see Cohen et al.(2012), and Biggerstaff et al.(2015)) suggest that insider sales also contain valuable information about the firm's future.

[2] Prior research also shows that investor sentiment has real effect on the aggregate economy by increasing financing cost. (McLean and Zhao (2014)).

financing decisions. For example, firms tend to issue equity when they are overvalued (Ritter (1991); Loughran and Ritter (1995)) and repurchase their stocks when they are undervalued (Ikenberry et al.(1995)). Also, according to the survey by Graham and Harvey (2001), nearly two thirds of CFOs agree that one important or very important factor they consider when making equity issuance decisions is the amount by which their stocks are overvalued or undervalued. In the context of mergers and acquisitions, bidders are likely to choose stock acquisitions when their firms are overvalued relative to the target firm (Shleifer and Vishny (2003)).[3]

More importantly, previous studies show that corporate insiders tend to trade against the (perceived) mispricing in their firms. For example, Rozeff and Zaman (1998), Jenter (2005), and Piotroski and Roulstone (2005) show that managers of value firms are involved in more insider purchases managers in growth firms, suggesting that insiders have contrarian beliefs about their firm.[4] Ali et al.(2011) find that insiders trade against the mispricing induced by mutual funds' fire sales (and purchases) of the stock. The fact that investor sentiment affects firm valuation and insiders are likely to exploit the mispricing in their firm inspires us to explore whether insiders make trading decisions based on the investor sentiment toward their firms and whether insider trading profitability is influenced by investor sentiment.

When investor sentiment towards a firm is low (high), insiders are likely to perceive the firm as undervalued (overvalued). To exploit the undervaluation (overvaluation), insiders are expected to purchase (sell) the stocks of their own firms in the open market. Therefore, if investor sentiment plays a significant role in insiders' decision-making process, one would expect a decrease (increase) in insiders' buying (selling) activities as the sentiment towards the firm rises.

To test this hypothesis, we use data on insider transactions reported to the Securities and Exchange Commission (SEC) between 1986 and 2014. The insider trading activity is measured by the net purchase ratio, defined as the difference between the numbers of shares purchased and sold divided by the total number of shares traded

[3]Managers' strategic behaviors in other corporate areas have also been linked with insider trading. Specifically, managers change the timing (Cheng and Lo (2006)) and the quality (Rogers (2008)) of voluntary disclosure as well as the timing of mandatory disclosure (Niessner (2015)) prior to insider trading.

[4]In addition to book-to-market ratio, past returns are used as proxy for mispricing in Piotroski and Roulstone (2005). The results consistently show that insiders trade as contrarians.

by insiders(Lakonishok and Lee (2001); Piotroski and Roulstone (2005)).

In this paper, our major objective is to investigate the *cross-sectional* patterns in insider trading activity and insider trading profits across firms with different sentiment levels. Therefore, we need to utilize firm-specific measures to capture investors' sentiment level towards individual firms. Our paper considers two measures for firm-specific sentiment (FS sentiment): turnover ratio (Turnover) and the implied volatility calculated from equity options (ImpVol). The former proxy is based on the liquidity-as-sentiment approach in Baker and Stein (2004), while the latter is a firm-level analog of VIX index which is known as a "fear index".

Consistent with our expectation, we find a strong negative relation between insiders' net purchase and FS sentiment. Univariate analysis shows that the average net purchase ratio decreases monotonically with sentiment deciles. For example, with turnover ratio as the sentiment proxy, the average net purchase ratio falls dramatically from 0.269 in the lowest sentiment decile to -0.577 in the highest sentiment decile. This inverse relationship holds well in subsamples classified by insiders' position within the firm and in different sectors.

We also conduct a double-sort analysis to examine the impacts of FS sentiment conditional on a set of firm characteristics. The results show that the role of sentiment remains significant after considering these firm characteristics. In addition, we find that the conditional effect of sentiment on insider trading behavior is stronger for firms which are relatively difficult to value and arbitrage such as small firms, young firms, and firms with extreme book-to-market ratio. These results are consistent with the subjective-to-value and hard-to-arbitrage arguments in Baker and Wurgler (2006).

Next, we run regressions to control for the effects of other factors that are known to influence insider trading behavior. Our results show that the effect of FS sentiment on insider trading decisions is still significant even in the presence of other contributing factors such as firm size, book-to-market ratio, past returns and variables related to equity-based compensation. We find that the difference in average net purchase ratio between low-sentiment firms and high-sentiment firms could vary from 0.350 to 0.479 depending on the model specifications.

Further evidence indicates that insiders in low-sentiment firms make buying decisions more aggressively than those in high-sentiment firms. Results from a probit

framework also suggest that the probability of becoming a firm with more buyers than sellers in a given month is significantly higher when investor sentiment towards the company is low. This supports our hypothesis that insiders would make trading decisions based on investor sentiment towards their firms.

If, as we argue, the variation in insider trading activities with FS sentiment reflects insiders' strategic exploitation of misvaluation of their firms, one would expect that trading profits are significantly higher from purchasing than selling shares when sentiment is low and the opposite is the case when sentiment is high. In this paper, we examine the differences in profits generated by purchase transactions and sale transactions for insiders in different firms. The results are consistent with our hypothesis. First, we find that insiders in low (high) sentiment firms make significantly higher (lower) profits from purchases than sales. Over a 180-day period following the transaction date, the profit differences are 11.80% and -8.17% for firms in the lowest and the highest turnover deciles, respectively. Second, we show that for purchases (sales), transactions by insiders from low-sentiment firms are more (less) profitable than those by insiders from high-sentiment firms. These findings, which are robust to alternative sentiment measures and different time intervals, suggest that insiders could make profits by correctly utilizing information contained in FS sentiment.

The contribution of our paper to the literature is at least twofold. First, our findings shed new light upon the behavior of corporate insiders. Prior research attempts to understand the determinants of managers' trading decisions. The documented contributing factors include mispricing (Rozeff and Zaman (1998); Jenter (2005); Piotroski and Roulstone (2005); Ali et al.(2011)), time-varying information asymmetry (Alldredge and Cicero (2015); Gider and Westheide (2016)), personal attributes (Hillier et al.(2015)), and herding behavior (Alldredge and Blank (2016). Evidence in this paper indicates that insiders' trading patterns are strongly affected by FS sentiment in the sense that they tend to exploit the misvaluation of their firms. Second, we contribute to the growing literature on investor sentiment[5]. While previous research has linked sentiment with a number of aspects in financial markets, this study is among the first to investigate the role of investor sentiment in insiders' trading decisions.

[5]Examples of work in this area include Brown and Cliff (2005); Kumar and Lee (2006); Cornelli et al.(2006); Baker and Wurgler (2006, 2007); Yu and Yuan (2011); Stambaugh et al.(2012); Baker et al.(2012); Stambaugh et al.(2014); Huang et al.(2015).

The remainder of this paper is organized as follows. Section 2 describes the data and variable construction. Section 3 analyzes the impacts of investor sentiment on insider trading behavior. Section 4 examines the relationship between the profitability of insider trading and investor sentiment. Section 5 concludes the study.

2 Variables and Data

2 .1 Measure for Insider Trading Activity

In this paper, we use the net purchase ratio to measure insiders' trading behavior[6]. The net purchase ratio of firm i in month t is defined as

$$NPR_{it} = \frac{Purchase_{it} - Sale_{it}}{Purchase_{it} + Sale_{it}}$$

where $Purchase_{it}$ ($Sale_{it}$) is the total number of shares purchased (sold) by insiders of firm i in month t. Our main results do not change when we redefine the net purchase ratio in terms of the dollar value rather than the number of shares traded by insiders[7].

2 .2 Measures for Firm-specific Sentiment

We use two measures as the proxy for investor sentiment towards an individual company. Baker and Stein (2004) provide a theoretical model in which irrational investors will participate only when sentiment is positive due to short-sales constraints. The prediction of this model is that liquidity increases with investor sentiment. Based on their liquidity-as-sentiment approach, they suggest that share turnover could predict future market returns. Baker and Wurgler (2006, 2007) consider share turnover as one of the proxies for sentiment when they construct a sentiment index for aggregate market. We use monthly turnover ratio as the first measure for investor sentiment towards a firm. It is defined as the ratio of monthly trading volume to total shares outstanding at the end of the month for a firm. A higher value of share turnover indicates higher sentiment.

Our second proxy for firm-specific sentiment is the option implied volatility. Chicago Board Options Exchange constructs a volatility index, VIX, from S&P 500 stock index

[6]Similar ratios are commonly used in the literature. See, e.g., Lakonishok and Lee (2001); Piotroski and Roulstone (2005).

[7]For the sake of simplicity, we do not report the results based on the dollar volume but they are available from the authors upon request.

option prices. VIX captures the market expectation of return volatility in the short term and is known as a "fear index". A high value of VIX indicates that investors expect high market volatility, which usually corresponds to bad mood in the market. Whaley (2000) documents that spikes of VIX appeared during market turmoils like the crash in October 1987. Simon and Wiggins (2001) and Baker and Wurgler (2007) suggest that VIX is a potential sentiment indicator. In this paper, we compute the implied volatilities for individual firms using data on equity options, following the methodology used for VIX calculation[8], and use the monthly average of the daily implied volatility as the sentiment measure. A higher value of option implied volatility indicates lower sentiment.

2 .3 Other Factors Affecting Insider Trading Activity

The previous research shows that insider trading behavior can be influenced by several factors. For example, Seyhun (1986) find that the ratio of insiders' purchases to sales is approximately 2 in small firms and about 0.6 in large firms. Rozeff and Zaman (1988) also show that the proportion of insider purchases is much higher in small firms than that in large firms. In this paper, we use the logarithm of market capitalization to control the effect of firm size, where market capitalization is defined as the monthly closing price multiplied by total number of shares outstanding.

Rozeff and Zaman (1998) and Jenter (2005) document that there is a pattern in insider transactions across value (high book-to-market) and growth (low book-to-market) firms: insiders in high book-to-market firms tend to make more purchases than insiders in low book-to-market firms. We use the ratio of book equity to market capitalization to control this effect, where book equity is the sum of shareholders equity and balance sheet deferred taxes at the end of the previous fiscal year.

Insider trading activities are also affected by stock price movements. Seyhun (1992) shows that insiders are more likely to make purchases (sales) after stock prices decrease (increase). Similarly, Piotroski and Roulstone (2005) find that the ratio of shares purchased to the total number of shares traded by insiders is negatively related to recent returns. Thus, to take into account insiders' contrarian beliefs, we control the stock's

[8]For detailed information on VIX calculation, please refer to the VIX white paper, which is available on the CBOE website.

market-adjusted returns in the past 12 months. To capture the impact of risk, we also include the stock return volatility in the past 12 months.

Stock ownership and equity-based compensation could also influence insiders' transactions in the open market. Ofek and Yermack (2000) find that insiders tend to sell their stocks in the open market after they acquire shares by exercising options. They also show that the level of prior managerial ownership is positively related to the intensity of insiders' selling behavior in response to the receipt of stock-based compensation. To account for managers' incentives for diversification, we include two variables related to managers' holdings of company stock: number of shares owned (options excluded) at the end of the previous fiscal year and number of shares acquired on option exercise in the previous fiscal year, respectively, scaled by total shares outstanding at year-end.

2 .4 Data Sources

The insider transaction data come from the Thomson Financial (TFN) insider filings database, which contains all insider trades reported to SEC. The sample includes all common stocks (with share code of 10 or 11) that are traded on the NYSE, AMEX, or NASDAQ from January 1986 to December 2014[9]. To eliminate the impacts of trivial transactions, we follow procedures in Lakonishok and Lee (2001) to filter the insider trading data. Specifically, we delete transactions with less than 100 shares, transactions with trade price beyond 20% of the closing price on the same day and transactions with shares traded exceeding 20% of the number of shares outstanding.

We collect data on individual stock options from IvyDB OptionMetrics, which provides comprehensive price information of listed equity options after 1996. Due to the data limitation, our results for option implied volatility are restricted to the period from January 1996 to December 2014. We obtain data on managerial stock ownership and option exercise from Standard and Poor's ExecuComp database. ExecuComp collects compensation data from company's annual proxy statement for the five highest paid executives in the firm since 1992. It covers companies in the S&P 500, the S&P MidCap 400, and the S&P SmallCap 600. In addition, we gather stock trading data from Center for Research in Security Prices (CRSP) and financial statement-based information from COMPUSTAT.

[9]The insider trading data was not available in the TFN database before January 1986.

2 .5 Sample Description

Table 1 reports the summary statistics for the sample. As shown in Panel A, our sample contains 3,408,390 insider transactions from January 1986 to December 2014, of which 22.24% are purchases and 77.76% are sales. Insiders bought 26,134.72 million shares and sold 76,873.78 million shares during this period. The total value of shares traded by insiders exceeds $ 2.3 trillion, about 85% of which comes from insider sales. The relative proportion of insider purchases and insider sales almost remains the same for the 1996-2014 period.

Panel B describes the net purchase ratio for firm-month observations with one-month lagged valid sentiment measures. For the period between 1986 and 2014, we have 465,762 observations with valid turnover ratio, for which the mean net purchase ratio is -0.286. For the period between 1996 and 2014, we have 147,861 observations with valid option implied volatility. The number of observations declines dramatically not only because the sample period is shorter but also because the listed equity options for many firms do not exist. The average net purchase ratio for these observations is -0.648. The standard deviation of 0.945 (0.752) indicates there is a substantial variation in insider transactions for 1986-2014 (1996-2014) period. As shown in Panel C, the monthly turnover ratio varies from 0 to 7100.02% with an average value of 14.18%, and the option implied volatility ranges from 1.296 to 21,479.930 with a mean of 52.995.

3 Insider Trading Activity and Investor Sentiment

This section presents our empirical results about the relation between insider trading activities and FS sentiment. We examine the effect of sentiment on insider trading activities first by univariate sorts and then by double sorts. Also, we regress insider net purchase ratio on sentiment decile dummies with control variables. Moreover, we provide further evidence on the role of sentiment in insiders' trading decisions by comparing the proportion of firms with majority buying in different sentiment deciles.

3 .1 Single Sorts

Table 2 presents the univariate relation between net purchase ratio and FS sentiment. We use sentiment measures in month $t-1$ to sort firms into ten deciles and

examine insiders' trading behavior in month t. With turnover ratio as the sentiment proxy, we find that net purchase ratio decreases monotonically as FS sentiment rises. Going from the lowest turnover decile to the highest turnover decile, the average net purchase ratio of all insiders falls from 0.269 to -0.577. The difference between them is statistically significant at 1% significance level. This implies that insiders in low-sentiment firms are more likely to make purchases than insiders in high-sentiment firms.

Using option implied volatility as the proxy for FS sentiment yields the same conclusion. Table 2 shows that for all insiders, the average net purchase ratio increases across implied volatility deciles, from -0.733 in decile one (high sentiment) to -0.359 in decile ten (low sentiment). These results imply an inverse relation between insiders' net purchase and FS sentiment.

The finding that insiders' net purchase ratio decreases strongly with FS sentiment is consistent with the hypothesis that insiders are likely to perceive their firms as undervalued (overvalued) when investor sentiment towards the firm is low (high) and make their trading decisions accordingly to exploit the misvaluation. One concern is that this striking pattern could be driven by the trading behavior of certain groups of insiders, especially those with less access to private information. Insiders with great access to inside information might trade based on their superior knowledge about the firm rather than FS sentiment. To test whether this is the case, we examine the insider trading patterns across sentiment deciles for different subsamples classified by insiders' roles in the firm. Previous research documents that higher-ranked insiders might have better access to inside information about the operation about the firm. For example, Seyhun (1998) shows that compared to other insiders, top executives are able to make more profits through trading in the open market. Lakonishok and Lee (2001) find that the aggregate trading by managers is more informative for market returns than trading by large shareholders. TFN database provides information on insiders' position within the firm based on a four-level hierarchy system. Level 1 is the highest hierarchy which includes chairman of the board, CEO, president, chief operating officer and general counsel, while Level 4 is the lowest hierarchy which includes beneficial owners, indirect shareholders, and so on[10]. As shown in Table 2, we find that

[10]Please refer to the TFN insider fillings database documentation for more details about the four-level classification of insiders.

all subsamples exhibit consistent patterns: there is a significant negative relationship between net purchase ratio and FS sentiment.

The easiness for insiders to exploit private information also varies from industry to industry. For example, Aboody and Lev (2000) suggest that research and development (R&D) affects information asymmetry between insiders and outside investors. They find that insiders in firms with high R&D investment tend to make more profits from their trading. To examine whether the effect of sentiment remains the same in different industries, we classify the firms in our sample by the sector code provided in TFN database. There are eleven sectors in total: Finance, Healthcare, Consumer Non Durable, Consumer Services, Consumer Durables, Energy, Transportation, Technology, Basic Industries, Capital Goods, and Public Utilities. Figure 1 plots the univariate result in each sector. Generally speaking, there is an inverse relationship between net purchase ratio and FS sentiment in every sector. And this pattern is robust to both sentiment measures.

To sum up, the univariate analysis shows that investor sentiment towards the firm does influence insiders' trading decisions. Consistent with our prediction, insiders in low FS sentiment firms are more likely to purchase their own stocks than insiders in high FS sentiment firms. Moreover, the negative relationship between net purchase ratio and the two sentiment proxies seems to hold well across various subsamples. This pronounced pattern is obtained without considering other factors known to influence insider trading behavior. Whether the role of investor sentiment can be absorbed by those factors documented in previous studies is a question to be answered in the next subsection.

3 .2 Double Sorts

In this subsection, we conduct a double-sorting strategy based on FS sentiment and a set of firm characteristics. This analysis allows us to investigate the conditional effects of FS sentiment on insider trading behavior. When studying the relationship between investor sentiment and cross-sectional returns, Baker and Wurgler (2006) consider several firm characteristics related to the subjectivity of their valuation as well as the easiness to arbitrage and find that the impacts of sentiment are stronger for stocks that are harder to value. Specifically, investor sentiment plays a larger role on small firms,

young firms, unprofitable firms, non-dividend-paying firms, firms with less tangible assets, firms with extreme book-to-market ratio, and firms with extreme growth. In our setting, it is interesting to examine whether the transactions by insiders in those harder-to-value firms experience a larger variation across sentiment deciles.

At the beginning of each month, we first sort firms into five quintiles based on one certain firm characteristic and then sort the firms in each bin into ten deciles according to sentiment towards the firm in the previous month. We calculate the average net purchase ratio in the current month for every two-way sorted group. Panel A in Table 3 presents the impacts of FS sentiment conditional on firm size, where firm size is computed as share price times shares outstanding in the previous month. It yields two major findings. First, consistent with our previous results, it shows that the average net purchase ratio goes down (up) with the Turnover (ImpVol) deciles in each size group. This indicates that FS sentiment significantly affects insiders' trading behavior after controlling firm size. Second, as shown in the last row, we find that the conditional effect of FS sentiment varies across firm size bins. As argued in Baker and Wurgler (2006), our results show that small firms are more sensitive to investor sentiment. Specifically, the absolute difference of the average net purchase ratio for the tenth and the first sentiment deciles is 0.534 (0.418) for small firms and 0.366 (0.032) for large firms, with turnover ratio (option implied volatility) as the proxy for FS sentiment.

Table 3 Panel B examines the patterns in groups double sorted by firm age and FS sentiment, where firm age is the number of years since the company's first appearance in CRSP, measured to the previous month. It shows that our conclusion on the relation between sentiment and net purchase ratio is robust in different groups classified by firm age. Also, it indicates that investor sentiment plays a stronger role on the trading behavior of insiders in young firms. The absolute difference of the average net purchase ratio for the tenth and the first Turnover (ImpVol) deciles drops from 0.946 (0.480) in the young firm group to 0.551 (0.184) in the old firm group.

In Table 3 Panel C, we report the results based on book-to-market ratio, which is the ratio of book equity at the end of the previous fiscal year to market equity in the previous month. Jenter (2005) finds that insiders in high B/M firms are more likely to make purchases than those in low B/M firms. We confirm this finding with our

sample: going across rows, one can see that the average net purchase ratio increases with book-to-market ratio. More importantly, our results demonstrate that there is a negative relationship between net purchase ratio and sentiment measures in each B/M group. This implies that, conditional on book-to-market ratio, FS sentiment has additional explanatory power for insider trading behavior. Furthermore, our results are consistent with the findings in Baker and Wurgler (2006) that investor sentiment tends to exert a larger impact on firms with extreme book-to-market ratio. Generally speaking, we find that the variation of net purchase ratio across sentiment deciles is larger for firms in the lowest and highest book-to-market groups than those in the middle groups.

To better display the patterns, we also plot the results of Table 3 in Figure 2. In the appendix, we present the double sorting results based on some other firm characteristics such as profitability, dividend payment, asset tangibility and sales growth rate. We find that the negative relationship between net purchase ratio and FS sentiment remains robust after considering these factors and that the conditional effect of FS sentiment on insider trading behavior varies in a pattern which is consistent with the harder-to-value and harder-to-arbitrage arguments.

3 .3 Multivariate Regressions

To examine the effect of sentiment on the insider trading activity in the presence of other contributors, we estimate the following cross-sectional model in each month:

$$NPR_{i,t} = \alpha + \sum_{k=1}^{9} \beta_k Decile\ k_{i,t-1} + \gamma \times Controls + \epsilon_{i,t} \tag{1}$$

where $NPR_{i,t}$ is the net purchase ratio of firm i in month t, and $Decile\ k_{i,t-1}$ with $k = 1, 2, \cdots 9$ is a dummy variable which equals to one if firm i is sorted into decile k based on the sentiment in month $t-1$ and zero otherwise[11]. Control variables included in the model are as follows: the logarithm of market capitalization in the previous month (SIZE); book-to-market ratio (B/M); market-adjusted returns in the past 12 months (RET), where the CRSP value-weighted return is used as the market return; stock return volatility in the past 12 months (MVOL); number of shares owned (options

[11]Our conclusions remain the same when continuous measures of firm-specific sentiment instead of dummy variables are used.

excluded) at the end of the previous fiscal year scaled by total shares outstanding at year-end (SHROWN); and number of shares acquired on option exercise in the previous fiscal year scaled by total shares outstanding at year-end (OPTEX). The time series of regression coefficients are averaged to generate the final estimates.

Table 4 presents the estimated coefficients together with Newey-West (1987) standard errors in parentheses. Since the data on SHROWN and OPTEX are available only for a subsample, we report the results for regressions both with and without these two controls. The coefficients on sentiment decile dummies are economically and statistically significant in most cases. Consistent with our univariate results, we find that the coefficients on those dummies decrease (increase) across turnover (implied volatility) deciles. This implies that FS sentiment plays a significant role in insiders' decision-making process even when other factors are taken into account. With turnover as the proxy for sentiment, the net purchase ratio for insiders in low-sentiment firms (decile 1) is 0.350 (0.479) higher than that for insiders in high-sentiment firms (decile 10) when compensation-related controls are (not) included in the regression.

The coefficients on control variables also have expected signs. The significantly negative coefficient for firm size supports the well-documented fact that insider purchases tend to concentrate in small firms (Seyhun (1986); Rozeff and Zaman (1988)). The positive coefficient on book-to-market ratio confirms previous findings that insiders in value firms make more net purchases than insiders in growth firms (Rozeff and Zaman (1998); Jenter (2005)). Consistent with prior research (Seyhun (1992); Piotroski and Roulstone (2005)), we find a negative impact of past stock returns on insiders' net purchase. Also, the variables related to equity-based compensation have the predicted negative sign (Ofek and Yermack (2000)).

3 .4 Evidence on Frequency of Buying Versus Selling

The evidence presented in previous subsections shows that insiders in low-sentiment firms make more net purchases than insiders in high-sentiment firms. However, these results could be driven by a small number of transactions which trade a huge number of shares. To further explore the effect of FS sentiment on insiders' decisions about purchases and sales, we investigate the variation in frequencies of buying and selling across the sentiment deciles. If insiders regard their firms as undervalued (overval-

ued) when investor sentiment towards the firm is low (high) and make their trading decisions based on this perceived misvaluation, one would expect insiders in low-sentiment firms tend to make buying decisions more aggressively. In other words, the proportion of firms with more buyers than sellers would be higher in low sentiment deciles than high sentiment deciles.

Table 5 reports the average percentage of firms with more buyers than sellers in each sentiment decile. As expected, we find that this percentage decreases (increases) with turnover (implied volatility) deciles. 65.78% of the firms in the lowest turnover decile have more buyers than sellers, while this proportion is only 21.48% for the firms in the highest turnover decile. The difference of 44.30% has a standard error of 0.83%. The significantly negative relation between FS sentiment and proportion of firms with more buyers than sellers suggests that insiders' decisions on whether to buy or sell are strongly affected by sentiment of outside investors.

Further evidence is provided using a probit framework. The dependent variable is an indicator which equals one if a firm has more buyers than sellers in a given month and zero otherwise. Each month, we run a probit regression of this dummy variable on nine sentiment decile dummies as well as a set of control variables specified in Section 3 .3. The average regression coefficients together with robust standard errors are presented in Table 6. Consistent with our previous findings, we find that all of the coefficients on sentiment decile dummies are economically and statistically significant at 5% level. These regression coefficients decrease (increase) with turnover (implied volatility) deciles, indicating that a firm is more (less) likely to be a firm with more buyers than sellers when FS sentiment is lower (higher). This further corroborates that insiders tend to trade based on FS sentiment in order to exploit the misvaluation.

4 Insider Trading Profitability and Investor Sentiment

In the previous section, we document that insiders tend to make purchases when investor sentiment towards their firm is low. This may indicate that insiders time their transactions to profit from the variation of sentiment. Then, we would expect two findings. First, for the firms with low (high) sentiment, the profits from insider purchases should be higher (lower) than profits from insider sales. Second, purchase (sales) transactions by insiders from low-sentiment firms should generate higher (lower) profits

than those by insiders from high-sentiment firms.

In this section, we test this hypothesis by investigating the relationship between insider trading profits and FS sentiment. Following Aboody and Lev (2000), we measure insider trading profitability by the difference between raw return and the return on the value-weighted NYSE/AMEX/Nasdaq index, multiplied by 1 for insider purchases and by -1 for insider sales. Each month, after sorting firms into ten deciles based on sentiment in the previous month, we calculate the average abnormal profits for purchases and sales in the lowest and highest deciles respectively.

Table 7 presents the annualized abnormal profits over 90, 180 and 360 calendar days following the transaction date. Panel A reports the results with turnover ratio as the proxy for FS sentiment. First, for low (high) sentiment firms, insiders make significantly higher (lower) profits from purchases than sales. Take the 180-day period as an example. We find that for firms in the lowest turnover decile, insiders could earn 13.12% from purchase transactions versus 1.33% from sales transactions. And the difference of 11.80% is significantly different from zero at 1% significance level. By contrast, for insiders in high turnover firms, the average profits from purchases are 8.17% lower than those from sales. Second, we find that for purchase transactions, the abnormal profits are substantially higher for insiders in low-sentiment firms, and the opposite is true for insider sales. Specifically, the differences in profits earned by insiders from high turnover firms and low turnover firms are -5.67% for purchases and 14.29% for sales. As reported in Panel B, using option implied volatility as the sentiment measure yields similar results. For example, for firms with high implied volatility which represents low sentiment, insider purchases could generate an average abnormal profit which is 12.25% higher than insider sales over 180 days after the transaction date.

To sum up, the analysis in this section indicates that insider transactions are more profitable if they are against investor sentiment. These results support our hypothesis that insiders trade for profits by making their trading decisions relying on the levels of investor sentiment towards their firms.

5 Conclusion

This paper provides the empirical evidence that the trading decisions by corporate insiders are strongly influenced by investor sentiment. Our univariate and multivariate analyses consistently show that there is a negative relationship between insiders' net purchase ratio and investor sentiment. That is, insiders in low-sentiment firms are more likely to purchase their own stocks than those in high-sentiment firms. This trading behavior of corporate insiders remains robust to various sorting and empirical specifications. Also, we find that insiders could make substantially higher market-adjusted returns if they buy when sentiment is low and sell when sentiment is high. These results are consistent with the notion that insiders tend to act strategically to exploit the perceived misvaluation of their firms.

Our findings have a couple of implications on informational content of insider trading behavior. First, insider trades could be triggered by the strategic exploitation of publicly available factors related to outside investors rather than by exclusive insider information. Second, given the evidence that investor sentiment affects insider trading behavior, the finding in the prior research that insider transactions have predictive power for stock returns due to the exclusive *insider* information perhaps needs to be reconsidered.

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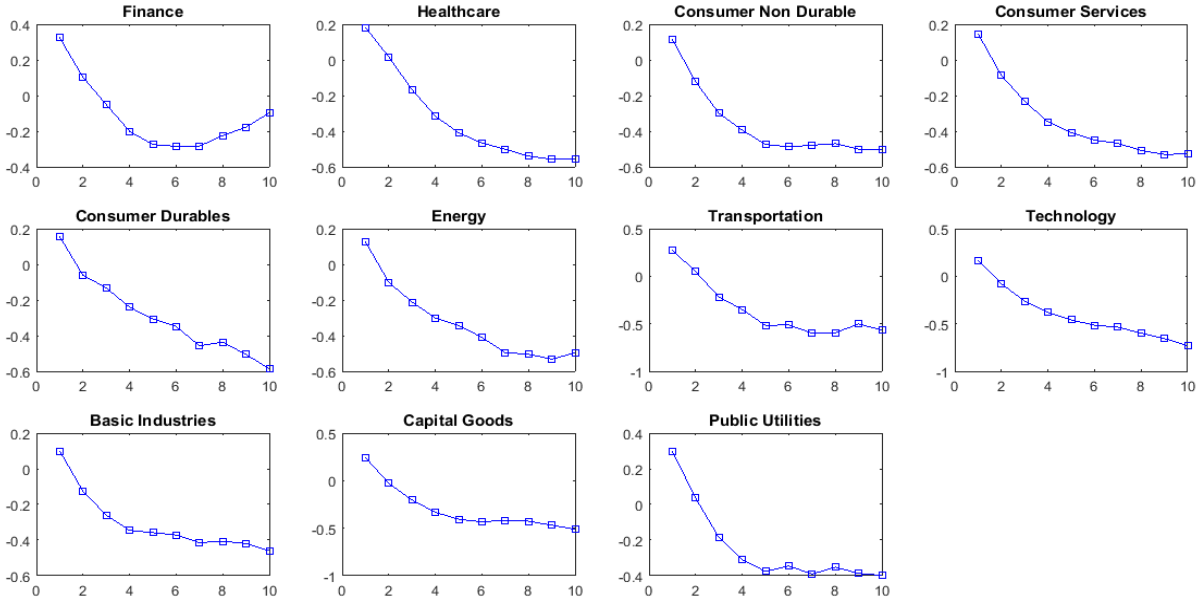
Panel A: Turnover and Net Purchase Ratio



Panel B: ImpVol and Net Purchase Ratio

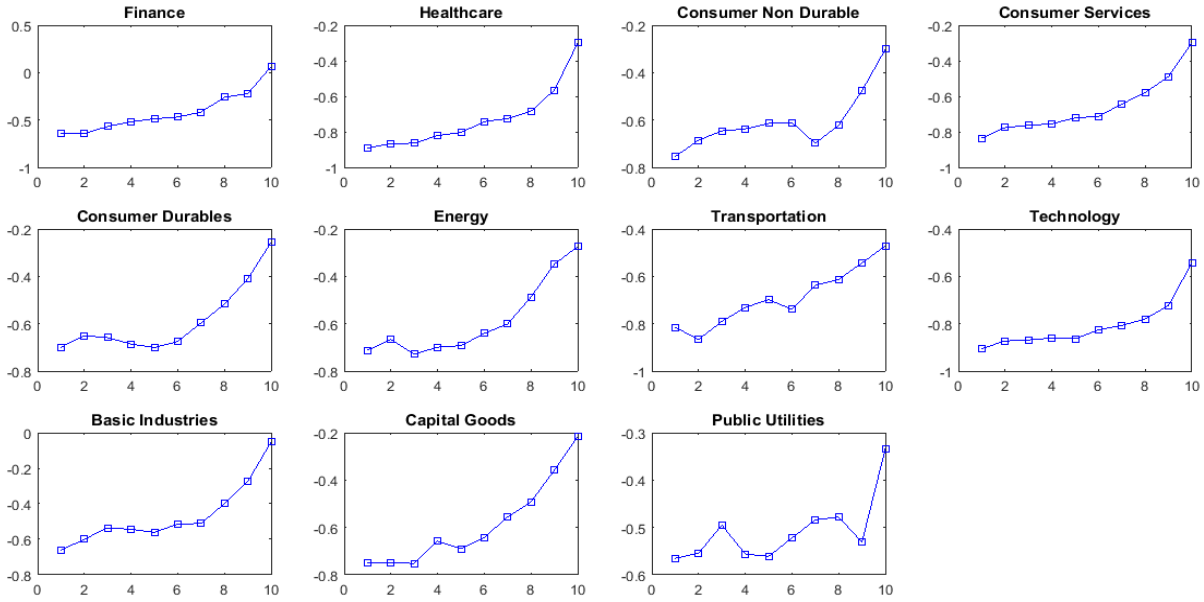
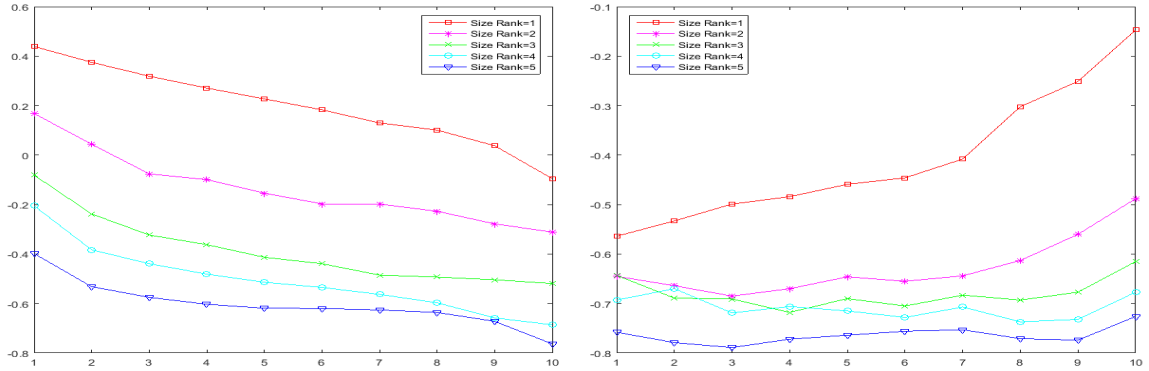


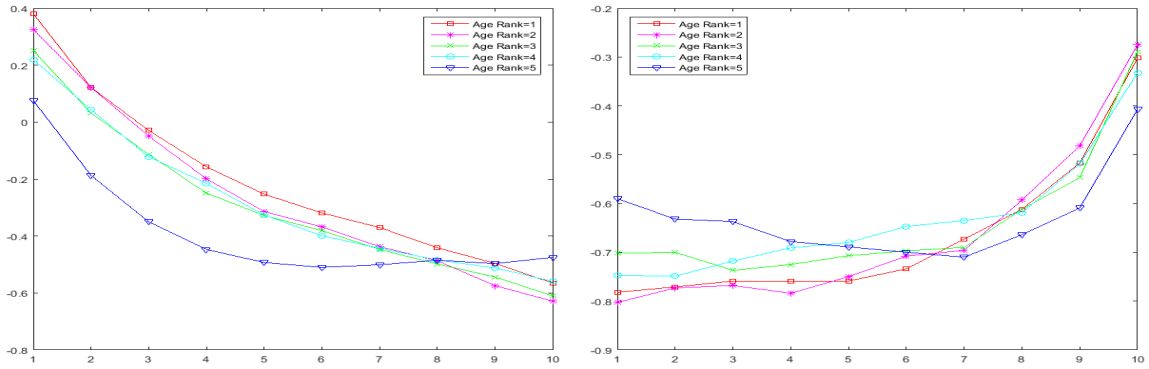
Figure 1 Insider Trading Activity by Sentiment Deciles for Subsamples by Sector

This figure depicts the variation in net purchase ratio across different deciles by sector. Firms are classified into eleven subsamples according to the sector code in TFN database. In each subsample, firms are sorted into ten deciles based on sentiment towards the firm in month $t-1$, and the average net purchase ratio in month t is plotted. The upper panel and lower panel present the results with turnover ratio (January 1986 — December 2014) and option implied volatility (January 1996 — December 2014) as the proxy for FS sentiment, respectively.

Panel A: Firm Size



Panel B: Firm Age



Panel C: Book-to-market Ratio

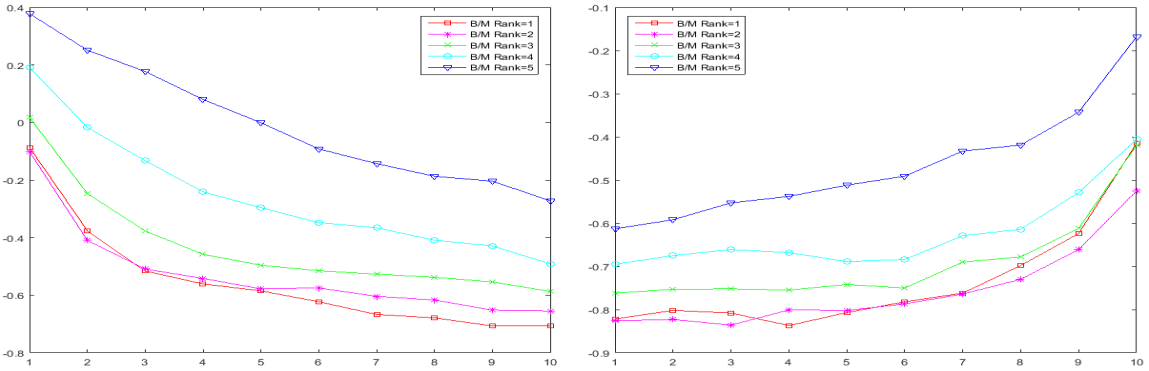


Figure 2 Insider Trading Activity by Firm Characteristics and Sentiment Quantiles

This figure plots the variation in net purchase ratio across different groups double sorted by firm characteristics and FS sentiment. Firms are first classified into five quintiles based on one certain firm characteristic and then firms in each group are sorted into ten deciles according to sentiment towards the firm in month $t-1$. The average net purchase ratio in month t is plotted. Panels A through C are the results based on firm size, firm age, and book-to-market ratio, respectively. Firm size is calculated as share price times shares outstanding in month $t-1$. Firm age is the number of years since the company's first appearance in CRSP, measured to month $t-1$. Book-to-market ratio is the ratio of book equity at the end of the previous fiscal year to market equity in the previous month. In each panel, the graph on the left and on the right depicts the results with turnover ratio (January 1986 — December 2014) and option implied volatility (January 1996 — December 2014) as the proxy for FS sentiment, respectively.

Table 1 Summary Statistics

This table reports the descriptive statistics. Panel A summarizes insider purchases and insider sales for the whole sample from January 1986 to December 2014 and for the subsample period from January 1996 to December 2014. It includes insider transactions in TFN database for all common stocks that are traded on the NYSE, AMEX, or NASDAQ, except for transactions with less than 100 shares, transactions with trade price beyond 20% of the CRSP closing price on that day and transactions with shares traded exceeding 20% of the number of shares outstanding. Panel B reports the summary statistics for net purchase ratio of firm i in month t, defined as the difference between the numbers of shares purchased and sold divided by the total number of shares purchased and sold by insiders of firm i in month t. The first row is the result for firm-month observations with valid one-month lagged turnover ratio between January 1986 and December 2014. The second row is the result for firm-month observations with valid one-month lagged option implied volatility between January 1996 and December 2014. Panel C presents the descriptive statistics for two sentiment measures: turnover ratio and option implied volatility. The sample period is from January 1986 to December 2014 for turnover ratio and from January 1996 to December 2014 for option implied volatility.

Panel A: Insider Transactions

	Sample Period: 1986-2014		Sample Period: 1996-2014	
	Purchases	Sales	Purchases	Sales
Total number of trades	757,928	2,650,462	603,352	2,379,298
Fraction of trades	22.24%	77.76%	20.23%	79.77%
Total number of shares traded (in millions)	26,134.72	76,873.78	23,551.73	70,126.86
Fraction of shares traded	25.37%	74.63%	25.14%	74.86%
Total dollar amount traded (in trillions)	0.34	1.98	0.30	1.84
Fraction of dollar amount traded	14.69%	85.31%	14.10%	85.90%

Panel B: Net Purchase Ratio

	Mean	SD	Min	Max	Obs.
Sample Period: 1986-2014	-0.286	0.935	-1.000	1.000	465,762
Sample Period: 1996-2014	-0.648	0.740	-1.000	1.000	147,861

Panel C: Firm-specific Sentiment

	Mean	SD	Min	Max	Obs.
Turnover	14.18%	27.66%	0.00%	7100.02%	465,762
ImpVol	52.995	64.133	1.296	21,479.930	147,861

Table 2 Insider Trading Activity by Sentiment Deciles

This table shows the variation in net purchase ratio across different sentiment deciles. Firms are sorted into ten deciles based on sentiment towards the firm in month $t-1$, and the average net purchase ratio in month t is reported. The left panel and the right panel present the results with turnover ratio (January 1986 — December 2014) and option implied volatility (January 1996 — December 2014) as the proxy for FS sentiment, respectively. It also reports the results for subsamples by insiders' position within the firm. The classification of insiders is based on the four-level hierarchy system in the TFN insider fillings database, with Level 1 (Level 4) as the highest (lowest) hierarchy. The last row reports the difference in means for decile 10 and decile 1, with standard errors in parentheses.

	Turnover					ImpVol				
Decile	All	Level 1	Level 2	Level 3	Level 4	All	Level 1	Level 2	Level 3	Level 4
1	0.269	0.426	0.259	-0.028	0.266	-0.733	-0.842	-0.719	-0.819	-0.669
2	0.030	0.106	0.031	-0.246	0.055	-0.721	-0.848	-0.705	-0.854	-0.593
3	-0.143	-0.115	-0.143	-0.391	-0.087	-0.710	-0.824	-0.698	-0.800	-0.525
4	-0.278	-0.297	-0.278	-0.478	-0.218	-0.700	-0.799	-0.701	-0.768	-0.525
5	-0.359	-0.398	-0.353	-0.548	-0.283	-0.709	-0.780	-0.712	-0.700	-0.508
6	-0.397	-0.457	-0.393	-0.551	-0.328	-0.685	-0.785	-0.692	-0.707	-0.457
7	-0.431	-0.508	-0.427	-0.563	-0.359	-0.669	-0.756	-0.686	-0.783	-0.436
8	-0.465	-0.548	-0.463	-0.581	-0.413	-0.628	-0.719	-0.656	-0.724	-0.373
9	-0.512	-0.609	-0.516	-0.630	-0.445	-0.563	-0.649	-0.588	-0.783	-0.364
10	-0.577	-0.689	-0.580	-0.701	-0.517	-0.359	-0.397	-0.397	-0.673	-0.158
10 - 1	-0.846	-1.115	-0.840	-0.674	-0.783	0.374	0.445	0.323	0.146	0.512
	(0.006)	(0.009)	(0.007)	(0.019)	(0.017)	(0.009)	(0.015)	(0.010)	(0.043)	(0.041)

Table 3 Insider Trading Activity by Firm Characteristics and Sentiment Quantiles

This table presents the variation in net purchase ratio across groups double sorted by firm characteristics and FS sentiment. Firms are first classified into five quintiles based on one certain firm characteristic and then firms in each group are sorted into ten deciles according to sentiment towards the firm in month $t-1$. The average net purchase ratio in month t is reported. Panel A is the results based on firm size, which is calculated as share price times shares outstanding in month $t-1$. Panel B reports the results base on firm age, which is the number of years since the company's first appearance in CRSP, measured to month $t-1$. Panel C shows the results based on book-to-market ratio, which is the ratio of book equity at the end of the previous fiscal year to market equity in the previous month. In each panel, the columns on the left and on the right present the results with turnover ratio (January 1986 — December 2014) and option implied volatility (January 1996 — December 2014) as the proxy for FS sentiment, respectively. The last row reports the difference in means for the tenth sentiment decile and the first sentiment decile, with standard errors in parentheses.

Panel A: Firm Size

	Size						Size				
Turnover	1	2	3	4	5	ImpVol	1	2	3	4	5
1	0.439	0.168	-0.081	-0.205	-0.398	1	-0.564	-0.645	-0.643	-0.693	-0.758
2	0.375	0.044	-0.238	-0.383	-0.532	2	-0.533	-0.664	-0.689	-0.670	-0.779
3	0.319	-0.076	-0.323	-0.439	-0.575	3	-0.499	-0.685	-0.691	-0.719	-0.789
4	0.271	-0.099	-0.362	-0.481	-0.603	4	-0.484	-0.670	-0.718	-0.706	-0.772
5	0.227	-0.154	-0.413	-0.514	-0.619	5	-0.459	-0.646	-0.690	-0.715	-0.764
6	0.183	-0.197	-0.439	-0.535	-0.620	6	-0.446	-0.655	-0.705	-0.728	-0.756
7	0.130	-0.198	-0.485	-0.563	-0.626	7	-0.408	-0.644	-0.683	-0.707	-0.753
8	0.101	-0.227	-0.493	-0.597	-0.636	8	-0.302	-0.613	-0.693	-0.737	-0.771
9	0.038	-0.278	-0.504	-0.658	-0.672	9	-0.251	-0.560	-0.677	-0.732	-0.774
10	-0.095	-0.311	-0.519	-0.686	-0.763	10	-0.147	-0.488	-0.615	-0.677	-0.726
10 - 1	-0.534	-0.480	-0.438	-0.480	-0.366	10 - 1	0.418	0.157	0.029	0.016	0.032
	(0.014)	(0.014)	(0.013)	(0.012)	(0.011)		(0.026)	(0.021)	(0.020)	(0.018)	(0.016)

Panel B: Firm Age

	Age						Age				
Turnover	1	2	3	4	5	ImpVol	1	2	3	4	5
1	0.381	0.325	0.252	0.219	0.076	1	-0.782	-0.803	-0.702	-0.747	-0.590
2	0.122	0.122	0.032	0.044	-0.187	2	-0.771	-0.773	-0.700	-0.749	-0.632
3	-0.029	-0.049	-0.113	-0.122	-0.350	3	-0.759	-0.768	-0.737	-0.718	-0.637
4	-0.157	-0.199	-0.249	-0.215	-0.447	4	-0.760	-0.784	-0.725	-0.691	-0.678
5	-0.253	-0.314	-0.328	-0.326	-0.493	5	-0.759	-0.750	-0.707	-0.680	-0.689
6	-0.319	-0.368	-0.381	-0.399	-0.510	6	-0.734	-0.708	-0.697	-0.647	-0.700
7	-0.370	-0.437	-0.447	-0.443	-0.501	7	-0.673	-0.696	-0.690	-0.635	-0.710
8	-0.441	-0.487	-0.498	-0.484	-0.485	8	-0.612	-0.593	-0.612	-0.619	-0.664
9	-0.496	-0.574	-0.544	-0.512	-0.497	9	-0.517	-0.482	-0.547	-0.519	-0.609
10	-0.565	-0.629	-0.610	-0.559	-0.475	10	-0.302	-0.275	-0.289	-0.332	-0.407
10 - 1	-0.946	-0.954	-0.861	-0.778	-0.551	10 - 1	0.480	0.528	0.412	0.415	0.184
	(0.013)	(0.012)	(0.013)	(0.013)	(0.014)		(0.021)	(0.021)	(0.022)	(0.021)	(0.022)

(*continued*)

Table 3 — *Continued*

Panel C: Book-to-market Ratio

	Book-to-market						Book-to-market				
Turnover	1	2	3	4	5	ImpVol	1	2	3	4	5
1	-0.087	-0.101	0.017	0.191	0.378	1	-0.822	-0.826	-0.762	-0.695	-0.613
2	-0.376	-0.410	-0.247	-0.017	0.251	2	-0.802	-0.823	-0.753	-0.675	-0.592
3	-0.516	-0.509	-0.377	-0.133	0.177	3	-0.808	-0.836	-0.752	-0.661	-0.553
4	-0.561	-0.542	-0.458	-0.241	0.080	4	-0.837	-0.801	-0.755	-0.668	-0.538
5	-0.585	-0.578	-0.496	-0.296	-0.001	5	-0.807	-0.802	-0.742	-0.689	-0.512
6	-0.623	-0.575	-0.515	-0.348	-0.092	6	-0.782	-0.787	-0.750	-0.684	-0.491
7	-0.667	-0.604	-0.527	-0.366	-0.143	7	-0.762	-0.764	-0.690	-0.629	-0.433
8	-0.679	-0.617	-0.538	-0.409	-0.187	8	-0.698	-0.730	-0.678	-0.614	-0.419
9	-0.707	-0.652	-0.554	-0.429	-0.204	9	-0.624	-0.661	-0.612	-0.529	-0.343
10	-0.707	-0.655	-0.587	-0.491	-0.272	10	-0.415	-0.525	-0.419	-0.406	-0.168
10 - 1	-0.620	-0.554	-0.604	-0.682	-0.650	10 - 1	0.407	0.301	0.343	0.289	0.444
	(0.014)	(0.015)	(0.015)	(0.015)	(0.016)		(0.021)	(0.020)	(0.022)	(0.023)	(0.026)

Table 4 Cross-sectional Regressions of Insider Trading Activity on Sentiment Deciles

This table presents results from cross-sectional regressions. The dependent variable is the net purchase ratio in a given firm-month. Decile k is a dummy variable which equals to one if the firm is sorted into decile k based on FS sentiment in the previous month and zero otherwise, where $k = 1, 2, \cdots 9$. SIZE is the logarithm of market capitalization in the previous month. B/M is book-to-market ratio. RET is market-adjusted returns in the past 12 months. MVOL is stock return volatility in the past 12 months. SHROWN and OPTEX are number of shares owned (options excluded) at the end of the previous fiscal year and number of shares acquired on option exercise in the previous fiscal year, respectively, scaled by total shares outstanding at year-end. The cross-sectional regression is estimated in each month and the average coefficients are reported. Estimations (1) and (2) are based on turnover ratio (January 1986 — December 2014), while Estimations (3) and (4) are based on option implied volatility (January 1996 — December 2014). The numbers in parentheses are Newey-West (1987) standard errors. ***, ** and * denote significance at the 1%, 5% and 10% significance level, respectively.

	Turnover		ImpVol	
	(1)	(2)	(3)	(4)
Decile 1	0.479***	0.350***	-0.371***	-0.404***
	(0.014)	(0.046)	(0.024)	(0.029)
Decile 2	0.328***	0.239***	-0.366***	-0.383***
	(0.014)	(0.026)	(0.023)	(0.027)
Decile 3	0.236***	0.158***	-0.360***	-0.372***
	(0.014)	(0.018)	(0.023)	(0.027)
Decile 4	0.172***	0.078***	-0.358***	-0.364***
	(0.013)	(0.016)	(0.021)	(0.026)
Decile 5	0.127***	0.049***	-0.365***	-0.371***
	(0.013)	(0.013)	(0.017)	(0.023)
Decile 6	0.107***	0.045***	-0.322***	-0.329***
	(0.013)	(0.014)	(0.016)	(0.023)
Decile 7	0.085***	0.029*	-0.289***	-0.301***
	(0.011)	(0.015)	(0.014)	(0.020)
Decile 8	0.057***	0.012	-0.227***	-0.237***
	(0.010)	(0.011)	(0.013)	(0.020)
Decile 9	0.030***	0.010	-0.157***	-0.152***
	(0.008)	(0.012)	(0.014)	(0.020)
SIZE	-0.088***	-0.063***	-0.037***	-0.030***
	(0.003)	(0.004)	(0.004)	(0.004)
B/M	0.084***	0.180***	0.147***	0.214***
	(0.006)	(0.014)	(0.013)	(0.017)
RET	-0.182***	-0.210***	-0.167***	-0.197***
	(0.011)	(0.015)	(0.014)	(0.015)
MVOL	0.051***	0.173***	-0.284***	-0.261***
	(0.013)	(0.036)	(0.048)	(0.050)
SHROWN		-0.016***		-0.009***
		(0.001)		(0.002)
OPTEX		-0.397***		-0.305***
		(0.026)		(0.027)
Constant	0.563***	0.165**	0.287***	0.178*
	(0.045)	(0.070)	(0.094)	(0.096)
Obs.	342,449	131,928	123,280	89,825
Adj. R-squared	0.159	0.110	0.084	0.089

Table 5 Frequency of Firms with More Buyers across Sentiment Deciles

This table shows insiders' aggressiveness to make buying decisions for firms in different sentiment deciles. Firms are sorted into ten deciles based on sentiment towards the firm in month $t-1$, and we calculate the percentage of firms with more buyers than sellers in month t. The average proportion together with the standard error for each sentiment decile are presented. The last row presents the difference in means for decile 10 and decile 1. All numbers are reported in percentage. The left panel and right panel present the results with turnover ratio (January 1986 — December 2014) and option implied volatility (January 1996 — December 2014) as the proxy for FS sentiment, respectively.

	Turnover		ImpVol	
Decile	Mean	SE	Mean	SE
1	65.780	0.572	15.125	0.743
2	55.647	0.674	15.060	0.779
3	48.234	0.793	15.048	0.777
4	41.444	0.823	15.534	0.740
5	34.984	0.844	15.203	0.742
6	31.299	0.819	16.211	0.729
7	29.205	0.810	17.230	0.765
8	27.010	0.777	19.690	0.821
9	25.011	0.688	23.882	0.870
10	21.476	0.597	33.581	1.038
10 - 1	-44.304	0.827	18.456	1.292

Table 6 Probit Regressions of "More Buyer Dummy" on Sentiment Deciles

This table presents results from probit regressions. The dependent variable is an indicator which equals to one if a firm has more buyers than sellers in a given month and zero otherwise. Decile k is a dummy variable which equals to one if the firm is sorted into decile k based on FS sentiment in the previous month and zero otherwise, where $k = 1, 2, \cdots 9$. SIZE is the logarithm of market capitalization in the previous month. B/M is book-to-market ratio. RET is market-adjusted returns in the past 12 months. MVOL is stock return volatility in the past 12 months. SHROWN and OPTEX are number of shares owned (options excluded) at the end of the previous fiscal year and number of shares acquired on option exercise in the previous fiscal year, respectively, scaled by total shares outstanding at year-end. One probit regression is estimated for each month and the average coefficients together with robust standard errors are reported. Estimations (1) and (2) are based on turnover ratio (January 1986 — December 2014), while Estimations (3) and (4) are based on option implied volatility (January 1996 — December 2014). ***, ** and * denote significance at the 1%, 5% and 10% significance level, respectively.

	Turnover		ImpVol	
	(1)	(2)	(3)	(4)
Decile 1	0.679***	0.568***	-0.724***	-0.689***
	(0.0273)	(0.1998)	(0.0584)	(0.0931)
Decile 2	0.535***	0.420***	-0.720***	-0.649***
	(0.0431)	(0.1012)	(0.0607)	(0.0937)
Decile 3	0.403***	0.366***	-0.688***	-0.601***
	(0.0335)	(0.0602)	(0.0489)	(0.0802)
Decile 4	0.290***	0.205***	-0.653***	-0.546***
	(0.0314)	(0.0492)	(0.0435)	(0.0814)
Decile 5	0.225***	0.163***	-0.701***	-0.617***
	(0.0300)	(0.0484)	(0.0418)	(0.0741)
Decile 6	0.195***	0.140***	-0.648***	-0.563***
	(0.0316)	(0.0505)	(0.0508)	(0.0759)
Decile 7	0.173***	0.128**	-0.536***	-0.505***
	(0.0307)	(0.0534)	(0.0398)	(0.0836)
Decile 8	0.114***	0.121***	-0.405***	-0.360***
	(0.0217)	(0.0458)	(0.0336)	(0.0743)
Decile 9	0.082***	0.107**	-0.268***	-0.185**
	(0.0257)	(0.0482)	(0.0329)	(0.0776)
SIZE	-0.156***	-0.139***	-0.084***	-0.081***
	(0.0054)	(0.0086)	(0.0077)	(0.0089)
B/M	0.145***	0.335***	0.262***	0.379***
	(0.0103)	(0.0332)	(0.0232)	(0.0339)
RET	-0.361***	-0.590***	-0.495***	-0.671***
	(0.0198)	(0.0421)	(0.0372)	(0.0439)
MVOL	0.032	0.165	-0.704***	-0.710***
	(0.0218)	(0.1054)	(0.0947)	(0.1192)
SHROWN		-0.064***		-0.078***
		(0.0128)		(0.0209)
OPTEX		-1.591***		-1.833***
		(0.1376)		(0.1820)
Constant	1.088***	0.734***	0.894***	0.759***
	(0.0830)	(0.1416)	(0.1547)	(0.1887)

Table 7 Insider Trading Profits and Firm-specific Sentiment

This table reports the relationship between insider trading profits and FS sentiment. Firms are sorted into ten deciles based on sentiment towards the firm in month $t-1$, and the average abnormal profits of insider transactions in month t are reported. The abnormal profits are calculated as the difference between raw return and the return on the value-weighted NYSE/AMEX/Nasdaq index, multiplied by 1 for insider purchases and by -1 for insider sales. Annualized percentage abnormal returns for the time intervals of 90 days, 180 days and 360 days following the insider transactions are presented. Panel A and Panel B show the results with turnover ratio (January 1986 — December 2014) and option implied volatility (January 1996 — December 2014) as the proxy for FS sentiment, respectively. The numbers in the brackets are standard errors. ***, **, and * denote the significance at the 1%, 5%, and 10% significance level, respectively.

Panel A: Turnover Deciles

	90-day			180-day			360-day		
Decile	Purchases	Sales	Purchases - Sales	Purchases	Sales	Purchases - Sales	Purchases	Sales	Purchases - Sales
1	19.664***	-1.157	20.821***	13.123***	1.327	11.797***	9.227***	1.656***	7.571***
	(1.556)	(1.862)	(2.570)	(0.895)	(0.850)	(1.410)	(0.558)	(0.432)	(0.856)
10	13.900***	12.550***	1.349	7.453***	15.618***	-8.165***	0.201	14.358***	-14.156***
	(0.871)	(0.558)	(1.569)	(0.708)	(0.278)	(0.808)	(0.484)	(0.145)	(0.437)
10 - 1	-5.764***	13.708***		-5.670***	14.291***		-9.026***	12.702***	
	(1.905)	(2.025)		(1.185)	(1.007)		(0.758)	(0.532)	

Panel B: Implied Volatility Deciles

	90-day			180-day			360-day		
Decile	Purchases	Sales	Purchases - Sales	Purchases	Sales	Purchases - Sales	Purchases	Sales	Purchases - Sales
1	2.228**	14.119***	-11.891***	-4.664***	7.789***	-12.453***	-1.420**	7.852***	-9.272***
	(1.027)	(0.234)	(0.892)	(0.748)	(0.156)	(0.601)	(0.602)	(0.107)	(0.420)
10	53.691***	10.324***	43.367***	22.891***	10.643***	12.249***	14.892***	6.828***	8.064***
	(1.013)	(0.506)	(1.014)	(0.706)	(0.353)	(0.707)	(0.594)	(0.253)	(0.551)
10 - 1	51.462***	-3.795***		27.555***	2.854***		16.311***	-1.025***	
	(2.636)	(0.574)		(1.856)	(0.397)		(1.542)	(0.278)	

Appendix

This appendix presents additional evidence for the impacts of FS sentiment conditional on some firm characteristics. Following Baker and Wurgler (2006), we consider profitability, dividend payment, asset tangibility, and sales growth rate. These results are tabulated in Table A1 and plotted in Figure A1.

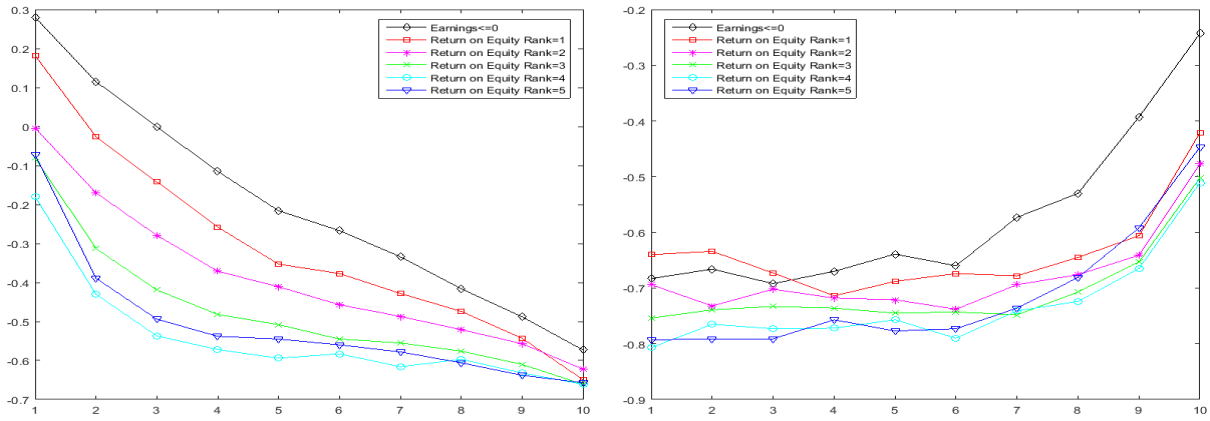
In the first panel, we consider firm profitability measured by the return on equity, that is, earnings divided by book equity at the end of the previous fiscal year. To compare the patterns for unprofitable (Earnings <=0) and profitable firms, we first classify firms based on whether their earnings are negative or not. And the firms with positive earnings are further sorted into five quintiles. Consistent with the arguments in Baker and Wurgler (2006), we find that the trading by insiders in unprofitable firms are more heavily affected by investor sentiment.

Panel B is the results based on dividends to equity. We first determine whether a firm is a dividend payer and then further sort the dividend-paying firms into five groups. The results show that FS sentiment plays a stronger role for non-dividend-paying (Dividends=0) companies.

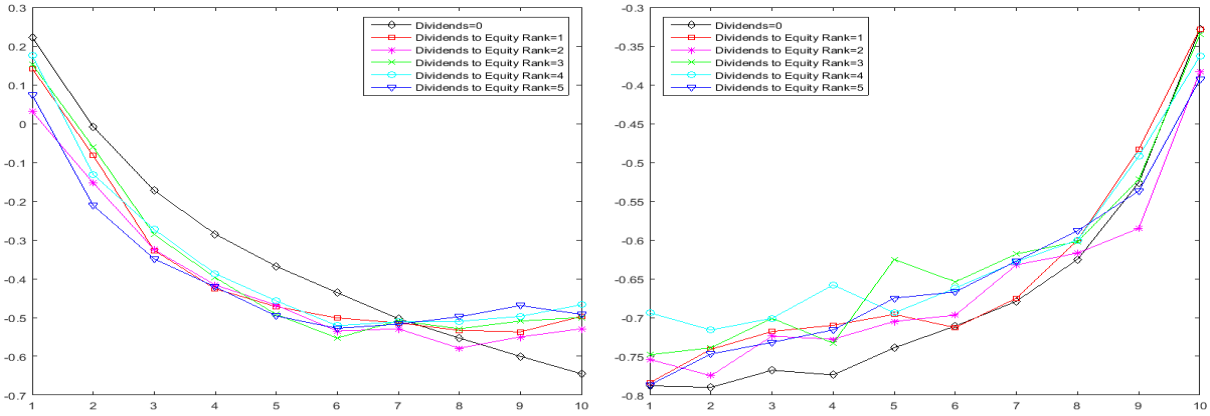
Panel C and Panel D examine two measures for asset tangibility: plant, property and equipment, and research and development at the end of the previous fiscal year, both scaled by total assets. Generally speaking, we find that the variation in net purchase ratio across sentiment deciles is larger for firms with less plant, property and equipment and higher research and development, which supports the conjecture that the valuation of firms with fewer tangible assets are more subjective.

Finally, we investigate sales growth rate, which is defined as the percentage change in net sales. Consistent with the results in Baker and Wurgler (2006), we find that firms with extreme growth are more sensitive to investor sentiment.

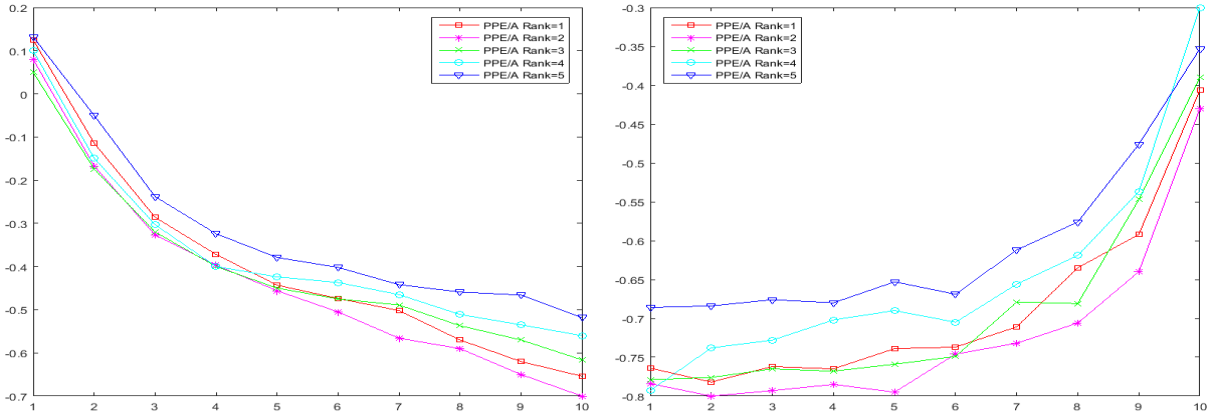
Panel A: Profitability



Panel B: Dividends Payment



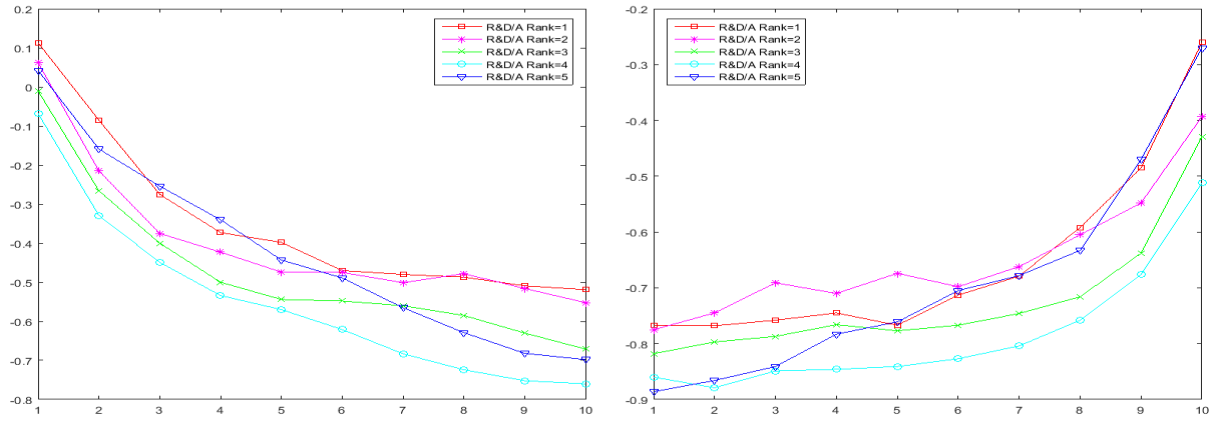
Panel C: Plant, Property, and Equipment



(*continued*)

Figure A1 Insider Trading Activity by Firm Characteristics and Sentiment Quantiles

Panel D: Research and Development



Panel E: Sales Growth

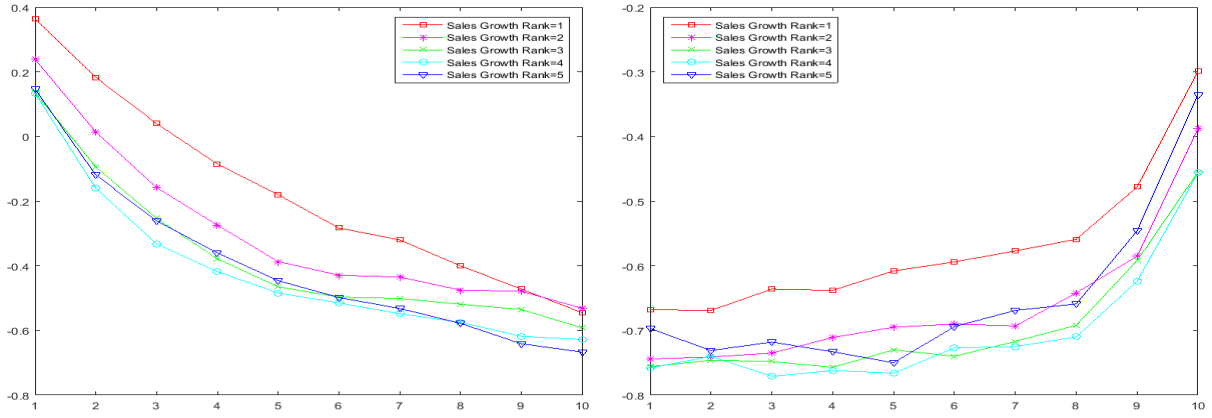


Figure A1 — *Continued*

Table A1 Insider Trading Activity by Firm Characteristics and Sentiment Quantiles

Panel A: Profitability

	Return on Equity							Return on Equity						
Turnover	Earnings<= 0	1	2	3	4	5	ImpVol	Earnings<=0	1	2	3	4	5
1	0.280	0.182	-0.004	-0.080	-0.180	-0.072	1	-0.683	-0.640	-0.694	-0.754	-0.807	-0.793
2	0.115	-0.026	-0.170	-0.313	-0.430	-0.389	2	-0.666	-0.634	-0.732	-0.739	-0.765	-0.791
3	-0.001	-0.142	-0.279	-0.419	-0.537	-0.494	3	-0.692	-0.673	-0.702	-0.733	-0.773	-0.791
4	-0.115	-0.258	-0.371	-0.482	-0.572	-0.538	4	-0.67	-0.714	-0.718	-0.736	-0.772	-0.757
5	-0.216	-0.353	-0.411	-0.508	-0.594	-0.545	5	-0.639	-0.688	-0.721	-0.745	-0.757	-0.777
6	-0.267	-0.377	-0.457	-0.545	-0.583	-0.560	6	-0.66	-0.674	-0.738	-0.743	-0.790	-0.773
7	-0.334	-0.428	-0.487	-0.555	-0.616	-0.578	7	-0.573	-0.678	-0.694	-0.748	-0.741	-0.736
8	-0.416	-0.474	-0.521	-0.576	-0.597	-0.606	8	-0.53	-0.645	-0.676	-0.707	-0.724	-0.681
9	-0.488	-0.543	-0.557	-0.610	-0.632	-0.638	9	-0.393	-0.606	-0.641	-0.653	-0.665	-0.592
10	-0.573	-0.649	-0.622	-0.661	-0.661	-0.657	10	-0.243	-0.421	-0.477	-0.502	-0.511	-0.447
10 - 1	-0.853	-0.831	-0.618	-0.581	-0.481	-0.585	10 - 1	0.439	0.219	0.217	0.253	0.296	0.346
	(0.013)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)		(0.024)	(0.028)	(0.026)	(0.025)	(0.024)	(0.025)

(*continued*)

Table A1 — *Continued*

Panel B: Dividend Payment

	Dividends to Equity							Dividends to Equity					
Turnover	Dividends= 0	1	2	3	4	5	ImpVol	Dividends=0	1	2	3	4	5
1	0.222	0.142	0.031	0.153	0.176	0.074	1	-0.788	-0.784	-0.754	-0.748	-0.694	-0.787
2	-0.008	-0.082	-0.153	-0.061	-0.131	-0.211	2	-0.790	-0.741	-0.775	-0.739	-0.716	-0.747
3	-0.173	-0.327	-0.325	-0.286	-0.273	-0.349	3	-0.768	-0.718	-0.724	-0.701	-0.701	-0.732
4	-0.285	-0.426	-0.416	-0.397	-0.387	-0.421	4	-0.774	-0.710	-0.728	-0.733	-0.658	-0.716
5	-0.368	-0.472	-0.468	-0.492	-0.457	-0.496	5	-0.739	-0.696	-0.705	-0.625	-0.694	-0.675
6	-0.436	-0.501	-0.535	-0.553	-0.521	-0.528	6	-0.711	-0.713	-0.697	-0.654	-0.662	-0.667
7	-0.503	-0.514	-0.529	-0.508	-0.511	-0.517	7	-0.679	-0.675	-0.632	-0.618	-0.628	-0.627
8	-0.553	-0.533	-0.579	-0.529	-0.510	-0.498	8	-0.625	-0.600	-0.617	-0.602	-0.600	-0.588
9	-0.600	-0.537	-0.550	-0.509	-0.497	-0.469	9	-0.526	-0.483	-0.585	-0.522	-0.492	-0.537
10	-0.645	-0.497	-0.529	-0.500	-0.467	-0.492	10	-0.328	-0.328	-0.383	-0.335	-0.363	-0.393
10 - 1	-0.867	-0.639	-0.560	-0.653	-0.643	-0.566	10 - 1	0.459	0.456	0.371	0.413	0.331	0.394
	(0.008)	(0.026)	(0.026)	(0.026)	(0.026)	(0.026)		(0.013)	(0.036)	(0.037)	(0.037)	(0.038)	(0.036)

(*continued*)

Table A1 — *Continued*

Panel C: Plant, Property, and Equipment

	Plant, Property, and Equipment						Plant, Property, and Equipment				
Turnover	1	2	3	4	5	ImpVol	1	2	3	4	5
1	0.125	0.080	0.050	0.100	0.132	1	-0.764	-0.784	-0.779	-0.793	-0.686
2	-0.114	-0.167	-0.174	-0.149	-0.050	2	-0.782	-0.800	-0.776	-0.738	-0.684
3	-0.286	-0.327	-0.320	-0.303	-0.238	3	-0.762	-0.793	-0.765	-0.728	-0.676
4	-0.372	-0.397	-0.400	-0.400	-0.324	4	-0.765	-0.785	-0.768	-0.702	-0.680
5	-0.443	-0.456	-0.450	-0.424	-0.379	5	-0.739	-0.795	-0.759	-0.690	-0.653
6	-0.474	-0.505	-0.475	-0.437	-0.402	6	-0.737	-0.746	-0.749	-0.705	-0.669
7	-0.502	-0.566	-0.489	-0.465	-0.442	7	-0.711	-0.732	-0.679	-0.656	-0.612
8	-0.570	-0.590	-0.537	-0.511	-0.459	8	-0.635	-0.706	-0.681	-0.619	-0.576
9	-0.620	-0.650	-0.570	-0.535	-0.466	9	-0.592	-0.640	-0.547	-0.537	-0.476
10	-0.654	-0.700	-0.616	-0.560	-0.518	10	-0.406	-0.430	-0.390	-0.300	-0.353
10 - 1	-0.780	-0.780	-0.666	-0.660	-0.649	10 - 1	0.358	0.354	0.389	0.493	0.333
	(0.015)	(0.014)	(0.015)	(0.015)	(0.015)		(0.022)	(0.021)	(0.022)	(0.022)	(0.023)

(*continued*)

Table A1 — *Continued*

Panel D: Research and Development

	Research and Development						Research and Development				
Turnover	1	2	3	4	5	ImpVol	1	2	3	4	5
1	0.113	0.062	-0.010	-0.068	0.042	1	-0.767	-0.775	-0.818	-0.860	-0.886
2	-0.085	-0.215	-0.266	-0.329	-0.159	2	-0.768	-0.745	-0.797	-0.879	-0.866
3	-0.275	-0.375	-0.400	-0.449	-0.254	3	-0.758	-0.691	-0.787	-0.849	-0.841
4	-0.373	-0.423	-0.500	-0.534	-0.340	4	-0.745	-0.710	-0.766	-0.846	-0.783
5	-0.398	-0.474	-0.544	-0.570	-0.443	5	-0.767	-0.674	-0.777	-0.841	-0.761
6	-0.470	-0.475	-0.548	-0.621	-0.489	6	-0.713	-0.698	-0.767	-0.827	-0.705
7	-0.480	-0.501	-0.560	-0.683	-0.565	7	-0.679	-0.662	-0.746	-0.804	-0.678
8	-0.487	-0.478	-0.585	-0.724	-0.629	8	-0.592	-0.605	-0.716	-0.758	-0.633
9	-0.509	-0.516	-0.630	-0.752	-0.682	9	-0.485	-0.548	-0.638	-0.676	-0.470
10	-0.519	-0.552	-0.671	-0.760	-0.698	10	-0.260	-0.393	-0.429	-0.512	-0.270
10 - 1	-0.633	-0.614	-0.661	-0.692	-0.740	10 - 1	0.508	0.382	0.389	0.348	0.616
	(0.020)	(0.020)	(0.019)	(0.018)	(0.019)		(0.028)	(0.027)	(0.026)	(0.024)	(0.026)

(*continued*)

Table A1 — *Continued*

Panel E: Sales Growth

	Sales Growth						Sales Growth				
Turnover	1	2	3	4	5	ImpVol	1	2	3	4	5
1	0.364	0.239	0.136	0.134	0.147	1	-0.668	-0.744	-0.756	-0.758	-0.697
2	0.183	0.014	-0.094	-0.160	-0.119	2	-0.669	-0.741	-0.746	-0.740	-0.731
3	0.040	-0.158	-0.253	-0.332	-0.261	3	-0.636	-0.735	-0.748	-0.771	-0.718
4	-0.085	-0.274	-0.378	-0.418	-0.360	4	-0.638	-0.711	-0.757	-0.762	-0.733
5	-0.180	-0.387	-0.465	-0.484	-0.446	5	-0.608	-0.695	-0.730	-0.766	-0.750
6	-0.283	-0.429	-0.497	-0.515	-0.498	6	-0.594	-0.690	-0.740	-0.727	-0.694
7	-0.320	-0.435	-0.501	-0.548	-0.532	7	-0.577	-0.693	-0.717	-0.725	-0.669
8	-0.400	-0.475	-0.519	-0.575	-0.578	8	-0.559	-0.642	-0.692	-0.710	-0.659
9	-0.472	-0.479	-0.535	-0.618	-0.641	9	-0.478	-0.585	-0.592	-0.624	-0.546
10	-0.545	-0.531	-0.592	-0.628	-0.667	10	-0.299	-0.388	-0.455	-0.456	-0.335
10 - 1	-0.909	-0.770	-0.728	-0.761	-0.814	10 - 1	0.369	0.356	0.301	0.302	0.362
	(0.014)	(0.014)	(0.014)	(0.014)	(0.013)		(0.023)	(0.021)	(0.021)	(0.020)	(0.022)