# THE IMPACTS OF MANAGERIAL AND INSTITUTIONAL OWNERSHIP ON FIRM PERFORMANCE: THE ROLE OF STOCK PRICE INFORMATIVENESS AND CORPORATE GOVERNANCE

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## Abstract

This paper provides new evidence on the relations between managerial and institutional ownerships and firm performance. These relations are found to be affected by firm's stock price informativeness and corporate governance. Based on a sample of US firms from NYSE, AMEX, and NASDAQ between 1989 and 2006, we document three important findings. First, managerial ownership and firm future performance are non-linearly related; the positive relation is stronger for firms with less informative prices or more agency problems. This finding suggests that poor governance and uninformative price increase the importance of managerial value creation for their firms by improving internal governance. Second, institutional ownership has a significant positive impact on firm future performance, with larger impact for firms with less informative prices or good governance. However, institutional ownership, which reflects external monitoring, has a weaker positive effect compared to managerial ownership, which controls for internal governance. Third, the interaction between managerial ownership and institutional ownership has a significant positive impact on firm future performance, suggesting that there are synergistic effects of internal and external corporate governance mechanisms in improving firm value.

**Keywords:** Managerial Ownership; Institutional Ownership; Corporate Governance; Stock Price Informativeness

## 1. Introduction

The economic relation between ownership structure and firm performance has long been a key issue in corporate finance and governance. Morck, Shleifer and Vishny (1988) document a non-linear relation between ownership and firm performance. They conjecture that the non-linear relation between managerial ownership and firm performance is due to the balance of alignment of interest and entrenchment between shareholders and managers. Shleifer and Vishny (1986) model the large shareholders, including banks, insurance companies and funds, find that they have enough incentives to monitor the management, initiate takeover if necessary and thereby improve firm value. Voluminous researchers study the ownership-performance relation under various paradigms [Demsetz (1983), Demsetz and Lehn (1985) Holderness and Sheehan (1988), Himmelberg, Hubbard and Palia (1999), Demsetz and Villalonga (2001), Claessens, Djankov, Fan and Lang (2002), Anderson and Reeb (2003), Cronqvist and Nilsson

(2003), and Lins (2003)].[117] Whilst firm performance is related to ownership structure, Faure-Grimuad and Gromb (2004) show that public trading (smaller shareholder activities) affects large shareholder's private incentives to engage in value-increasing activities and increases firm value. They suggest that ownership concentration and stock price informativeness "are likely not to be independent". Wurgler (2000) and Durnev, Morck and Yeung (2003)

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[117] Holderness and Sheehan (1988) find that family firms have a lower Tobin's q than non-family firms while Anderson and Reeb (2003) find that opposite. Demsetz (1983) argues that ownership concentration is the endogenous outcome of profit-maximizing decisions by current and potential shareholders and should have no effect on firm value. Demsetz and Lehn (1985), Himmelberg, Hubbard and Palia (1999), and Demsetz and Villalonga (2001) provide supporting evidences of Demsetz (1983). Claessens et al. (2002) and Lins (2003) evident that in East Asian economies, ownership concentration improve firm values. Cronqvist and Nilsson (2003) further find that in Sweden, the cash flow ownership has a negative impact on firm value. Excellent literature survey are in Villalonga and Amit (2006) and Cheung and Wei (2006).

provide direct evidences of informative prices enhance firm value.

In essence, there are two important dimensions – stock price informativeness and corporate governance (control rights) – that can affect a firm's ownership-performance relation. Aforementioned studies find that ownership structure and firm value are both related to insiders' incentives. More recent studies provide evidence that insider incentives to create firm value are determine by stock price informativeness and corporate governance (control rights). An informative price is vital for manager incentives to have positive effects on the performance of a firm. Faure-Grimaud and Gromb (2004) suggest that an informative stock price increases the manager incentives to engage in value-increasing activities because of his activities can be publicly observed through the informative price. Hence, when mitigating owner-manager agency conflicts, managerial incentives and ownership are positively aligned with the stock price informativeness.

Similar to stock price informativeness, corporate governance and agency cost can also affect the impacts of manager ownership on performance. Classic corporate finance problem of owner-manager conflicts [e.g. Berle and Means (1932) and Jensen and Meckling (1976)] can be mitigated by giving large shareholders enough equity stakes as incentives to monitor the manager. As such, firm value may increase as the advisory and monitoring benefit excess the private benefit of expropriating minority shareholders. Villalonga and Amit (2006) suggest that the classic owner-manager conflict in non-family firms is more costly than the conflict between family and nonfamily shareholders in founder-CEO firms. Claessens et al. (2002) and Lins (2003) find support of excess large shareholders voting right over cash flow rights may reduces firm values but not enough to tradeoff the benefits from ownership concentration. Cronqvist and Nilsson (2003) find evidence in Sweden that cash flow ownership, rather than the excess voting rights, has a negative impact on firm value. However, the effectiveness of the corporate ownerships and their impacts on firm performance remain important research questions.

Moreover, managerial ownership is not the only type of corporate ownerships that determine firm performance. Existing literature shows that institutional ownership can affect stock market valuation of the firm. Davis and Steil (2001) discuss the corporate governance role of institutional investors. Gompers and Metrick (2001) support the impacts of institutional ownership on stock returns. Woidtke (2002) examines valuation effects with respect to public and private pension funds in a firm. Recent studies suggest that institutional investors can have direct impact on firm value (in additional to valuation effect). Hartzell and Starks (2003) show that institutional investors serve as monitor and affect executive compensation. Cornett, Marcus, Saunders, and Tehranian (2007) find a significant relation between institutional ownership and firm's operating performance – especially for institutional investors with potential business relations with the firm in which their investment are considered as monitoring. Chen, Harford, and Li (2007) show that independent institutions with long-term investments will specialize in monitoring during takeover.

Similar to managerial ownership, the impact of institutional investors on firm value can also depend on the availability of firm-specific information and corporate governance practices. Informed institutional investors with sufficient ownerships can perform governance and monitoring on the management (external governance), replace the incumbents and initiate takeover if necessary [Jensen and Meckling (1976), Shleifer and Vishny (1986), Admati, Pfleiderer and Zechner (1994)]. Recent studies, including Kahn and Winton (1998) and Noe (2002), suggest that instead of exerting external governance, institutional investors may choose to benefit from the information asymmetry from outsiders and avoid the cost of activism. Nonetheless, empirical evidences of the impact of institutional investors on firm value are far from conclusive.

Given the motivations above, this study sets out to examine the relationship between managerial ownerships and firm performance, and the variations of such relationship with respect to stock price informativeness and corporate governance. Equally important, we provide parallel examinations of the relationship between institutional ownerships and firm performance, and how the relationship varies with stock price informativeness and corporate governance. By examining the ownership-performance relations above, we are able to gain insightful comparison between internal governance (incentives) provided by managerial ownerships, and external governance (monitoring) provided by institutional investors. Further, this study considers the *joint* impacts of managerial and institutional ownerships provide important insights into the effectiveness of different corporate ownership and control mechanisms. It is not uncommon to have both manager and institutional investors to own significant proportion of a public firm. Manager's ownership can provide internal corporate governance such as incentives and control, while institutional ownership can provide external governance, such as monitoring and control.

Based on a sample of US firms from NYSE, AMEX, and NASDAQ between 1989 and 2006, we document three sets of new empirical findings.

First, consistent with Morck, Shleifer and Vishny (1988), managerial ownership and firm future performance are non-linearly related. Interestingly, this relation is stronger for firms with less informative prices or more agency problems. This finding suggests that managers improve firm value by (i) reducing costs of agency problem with better internal governance and (ii) lowering monitoring costs with more informative prices. We find that with sufficient equity stake, managers create more value for firms

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with poor governance or less informative stock prices, i.e. where information transparency is low and agency cost is high. The reason is that poor governance and uninformative price increase the importance of managerial value creation for their firms by improving internal governance. This creates additional incentives for managers with sufficient equity stake.

Second, institutional ownership can predict firm future performance, with larger impact for firms with less informative prices or better corporate governance. Institutional investors, contrast to traditional view of advisory and monitoring roles, improve firm value by producing information but not by providing external monitoring. However, the institutional ownership, which reflects external monitoring, has weaker effect compared to managerial ownership, which controls for internal governance.

Third, the interaction between managerial ownership and institutional ownership has a significant positive impact on firm future performance. This result suggests that internal governance (by manager) and external monitoring (institutional investors) have complementary economic impacts on firm performance. In addition, institutional investors create more value for a firm, by providing monitoring service, when managers have more incentives to co-operate results from their holdings of the firm. Our overall results are consistent with Shleifer and Vishny (1986) that large minority shareholders, such as the institution investors, mitigate free rider problem of managerial performance monitoring. This value creation by large minority shareholders is more profound when the stock price of a firm is less informative or better corporate governance. Finally the external monitoring role of institutional investors enhances firm value only when both institutional investors and managers have enough equity stakes to create the synergistic effects on improving corporate governance.

Overall, our results suggest that both manager and institutional investors has an informational role in creating firm value. However, the institutional investors cannot resolve the governance problem on their own when agency is high but can mitigate the agency problem with collective effort from them and a firm's management with incentives aligns with firm performance.

In terms of contributions, our study presents new empirical evidence on how institutional investors, managers and their interactions can enhance firm value, and how these impacts are dependent upon firms' corporate governance and information environments. Our findings provide the following contributions. First, for the ownership-performance relation, we identify two important firm characteristics which affect this relation, namely corporate governance and price informativeness. Our findings enrich the theory on manager ownership and its relation with firm performance [Morck, Shleifer and Vishny (1988) among others] by looking into

what price informative or governance condition will managerial ownership matter for firm value; our findings are also consistent with Ferreira and Laux (2007) that better corporate governance firms has also more informative prices. Second, our overall findings add to the existing literature by demonstrating that internal governance (incentives) provided by managerial ownerships have largest positive impacts on firm value for firms with less informative stock prices and higher agency problems; in contrast, external governance (monitoring) provided by institutional investors can increase firm value when firms are subject to less informative stock prices, but it cannot mitigate agency problems. Our findings suggest that role of institutional investors is informational, while the role of manager ownership/incentives are both informational and governance (e.g. monitoring, incentives, control). Third, managerial ownerships can complement institutional ownerships in improving firm value when firms are subject to less informative stock prices and higher agency problems. Our study is among the first to document that that managerial incentives and institutional influences are complement, rather than substitute, governance mechanisms.

The remainder of the paper is organized as follows. Section 2 provides a description of the empirical framework and the methodology and data adopted for this study. Section 3 presents the descriptive statistics and the empirical findings on the relationships between managerial and institutional ownerships and firm performance. Further evidence on joint impacts of managerial and institutional ownerships is provided in Section 4, followed by the conclusions drawn from this study in Section 5.

## 2. Framework and testable hypotheses

Our paper focuses on the net effect of managerial and institutional ownership on firm value in separate framework and in joint consideration under various governance level and price informativeness. In this section, we develop testable hypotheses on both types of ownership with respect to the existing evidences. Our test not only identifies different roles of managers and institutional investors but also constructs the environment of governance and price informativeness. Ferreira and Laux (2007) suggest that better governance firms are associated with more informative prices. Our tests enable us to identify this unobservable relation of corporate governance and stock price informativeness, by looking at their impact on the each type of ownership-performance relations.

### 2.1 Managerial ownership on firm value

Jin and Myers (2006) model how control rights and information affect the division of risk-bearing between insiders and outside investors, predict that less transparent stocks are more likely to crash. Their

model suggests that firm value is related to (i) control rights and (ii) firm-specific information content in stock prices. Faure-Grimuad and Gromb (2004) show that public trading (smaller shareholder activities) can affect large shareholder's private incentives to engage in value-increasing activities and thus increase firm value. An insider may have to sell part of his stake such that his value-increase activities can be observed by the general public through trading activities. A more informative price rewards his activities and increases his incentive to do so. Their model predicts that insider ownership has stronger relation with firm performance when stock prices are more informative. Durnev, Morck and Yeung (2004) and Ferreira and Laux (2007) suggest that firms with better corporate governance is associated more informative stock prices. Based on the theories, we develop the following hypothesis.

**H1:** Manager of firms with *more* informative prices (less stock price synchronicity) or *better* corporate governance (less agency problem) has stronger impact on firm's performance when his ownership increase because stock price increases the manager incentives to engage in value-increasing activities because of his activities can be publicly observed through the informative price [Faure-Grimaud and Gromb (2004)].

On the other hand, for firms with less informative prices and poorer governance, the marginal productivity is the higher than those firms which are of more informative stock prices and good governance. As such, we have the following alternative hypothesis.

**H2:** Manager of firms with *less* informative prices (more stock price synchronicity) or *poorer* governance (more agency problem) has stronger impact on firm's performance when his ownership increase, because managerial incentive can mitigate agency problem when information transparency is low and agency cost is high. In Faure-Grimaud and Gromb (2004)'s model, there is no agency problem.

## 2.2 Institutional investors on firm value

In the presence of owner-manager conflict, informed institutional investors with sufficient ownership can exert external governance, replace the incumbent management and initiate takeover if necessary [Jensen and Meckling (1976), Shleifer and Vishny (1986), Admati, Pfleiderer and Zechner (1994)]. These studies implicitly assume some degree of information efficiency. However, Kahn and Winton (1998) and Noe (2002) suggest that instead of exerting external governance, institutional investors may choose to benefit from the information asymmetry from outsiders and avoid the cost of activism. These studies collectively suggest that the impact of institutional investors on firm value depends on the availability of firm-specific information and corporate governance practices. Therefore, stock price synchronicity or corporate governance can affect the impact of

institutional investors on firm performance in two possible ways.

**H3:** Institutional investors of *less* informative price or *poorer governance* firm has stronger impact on firm performance when his ownership increase as they have better opportunity to improve the firm's operations through their advisory and monitoring ability (Shleifer and Vishny, 1986).

**H4:** Institutional investors of *more* informative price or *good* governance firm has stronger impact on firm performance when his ownership increase as the informative price (or good governance) lowers their monitoring costs (Holmstrom and Tirole, 1993), make them less costly to provide their expertise.

## 3. Data collection and variable definitions

## 3.1. Managerial and Institutional Ownerships and Performance

This study analyzes a sample of 49,907 firms, excluding finance and utilities from NYSE, AMEX, and NASDAQ over the 1989 to 2006 period. We construct the sample from different databases including CRSP, Compustat and Thomson Ownership Data. Annual financial data (including managerial ownerships) are obtained from the CRSP and Compustat database, and the percentage equity stake data, as of June-end of every year of different institutional investors, comes from the Thomson Ownership Data. Thomson reports the security holdings of institutional investors with greater than $100 million of securities under discretionary management. Institutional ownership data are then matched to the following fiscal year financial statement data from Compustat.

Similar to other studies that examine the relation between ownerships and the firm performance [e.g. Morck, Shleifer and Vishny (1988)], we use Tobin's Q as a measure of firm value, which is computed as the market value of equity plus the book value of assets minus the book value of equity, scaled by book assets. We lag the explanatory variables so that ownership available in the beginning of the year can predict performance (Q) in the following year. Our regression of Tobin's Q includes different cohorts of explanatory variables that are useful to predict firm performances. These control variables have been used by Chung and Jo (1996), and Gompers and Metrick (2001), plus additional control variables as follows: (i) Log(Number of Shareholders); (ii) Beta (estimated using OLS, from a standard CAPM model on value-weighted market returns over a rolling 5-year period); (iii) Residual variance (estimated using OLS, from a standard CAPM model on value-weighted market returns over a rolling 5-year period); (iv) Log(firm age); (v) Firm size proxy by log(total assets); (vi) Indicator of NYSE firms; and (vii) Log(shares turnover).

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## 3.2. Stock Price Informativeness

We measure the stock price informativeness (the amount of private information of stock) by the stock return synchronicity, first suggested by Roll (1988), developed by Morck, Yeung and Yu (2004), Durnev et al. (2003, 2004) and Chen, Goldstein and Jiang (2007).[118] The stock return synchronicity is measured by the correlation between the stock returns and the returns of corresponding industry and the market. The idea is that if the price of a firm's stock is informative in the sense that firm-specific information is always reflected by informed trading, the firm-specific variation in stock price should dominate the variation driven by a common set of information in the industry or market. Thus, more informative stock price should result in lower stock synchronicity, and vice versa.

Wurgler (2000), Durnev, Morck, Yeung and Zarowin (2003), Durnev, Morck, and Yeung (2004) support this general argument. Moreover, if synchronicity can reflect firm transparency and information cost, lower synchronicity (lower information costs) can facilitate efficient allocation of capital and reduce cost of external capital by reducing hazard and adverse selection problems. Durnev, Morck and Yeung (2004) document a negative relation across industries between synchronicity and the efficiency of external financing and capital budgeting. Chen, Goldstein, and Jiang (2007) show the amount of private information in stock price — inverse measure of price synchronicity — has a strong positive effect on the sensitivity of corporate investment to stock price. Veldkamp (2006) shows that in an information market, if investors price an asset with a common subset of information because of high fixed costs of information production, the information of one asset affects the pricing of other assets and as such, asset prices co-move even if the asset fundamentals are uncorrelated.

Following Durnev et al. (2004) and Chen et al. (2007), we estimate the stock return synchronicity by the $R^2$ of the following model. For each firm-month observation, we regress the daily returns of a firm on the corresponding industry returns and the market returns over the 12 months immediately before the month in question:

$$R_{it} = \alpha_{0i} + \beta_{1i}R_{mt} + \beta_{1i}R_{m,t-1} + \gamma_{1j}R_{jt} + \beta_{1j}R_{j,t-1} + \epsilon_{it}$$

where $R_i$, $R_j$ and $R_m$ are return for stock $i$, industry $j$, and the market, in trading day $t$. We use industry returns in addition to market returns to control for publicly available information that cannot be reflected by the market returns. The industry return is the value-weighted average of individual firms' returns for all firms with the same two-digit SIC code as the firm in concern. The market is the value-weighted average of daily returns of all stocks in CRSP. We exclude the firm in question from the calculation of industry return to eliminate the spurious correlations between firm and industry returns with only a few firms.[119] In addition, we include lag period industry and market returns to control for potential autocorrelation problems due to sparse trading. We use a logistic transformation to circumvent the bounded nature of $R^2$ and to yield a dependent variable more conforming to the normal distribution, that gives,

$$Informativeness = \log\left(\frac{R_i^2}{1-R_i^2}\right).$$

## 3.2. Probability of Informed Trading

As an alternative measure of the stock price informativeness (the amount of private information in stock prices), we use the probability of informed trading, PIN, developed by Easley, Hvidkjaer and O'Hara (2002). Recent studies such as Brown et al. (2004) and Vega (2005) use PIN to investigate issues in corporate finance like post-earnings-announcement-drift. PIN is derived from the market microstructure model in Easley and O'Hara (1992) which is unobservable. The PIN value we use in this paper is used in Easley, Hvidkjaer and O'Hara (2002) and is available from the website of Soeren Hvidkjaer.[120] The idea of PIN is to measure the information asymmetry between informed and uninformed trades in a market by constructing a ratio of informed trades over total trades,

$$PIN = \frac{\alpha\mu}{\alpha\mu + \varepsilon_B + \varepsilon_S},$$

where $\alpha$ is the probability of an information event occurs, $\mu$ is the daily arrival rate of informed traders, $\varepsilon_B$ is the daily arrival rate of uninformed buy orders and $\varepsilon_S$ is the daily arrival rate of uninformed sell orders. All of these structural parameters are estimated using numerical maximization of a likelihood function containing these parameters. The interpretation of PIN is that the higher PIN implies higher probability of informed trading, and hence more informative stock prices. Since PIN covers only NYSE firms, we use this measure as robustness and alternative measure of stock price informativeness. Our results are similar and the same conclusion remains for both the synchronicity and PIN (see section 4 below).

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[118] See Chen et al. (2007) for detailed review of development of the stock return synchronicity, as a measure of amount of private information in the stock price.

[119] See Durnev et al. (2004) for detailed discussion.

[120] See http://www.insead.edu/facultyresearch/faculty/profiles/shvidkjaer/.

# 4. Main findings and interpretation

In this section, we examine: (i) the relationship between managerial ownerships and firm performance; (ii) the relationship between institutional ownerships and firm performance; and (iii) the relationship between interaction effect of the two types of ownership and firm performance. The variations of these relationships are examined with respect to stock price informativeness and corporate governance. Based on a sample of US firms from NYSE, AMEX, and NASDAQ between 1989 and 2006, this study provides the following sets of new findings that may help to shed new light on the impacts of managerial and institutional ownerships on firm performance, as well as the ways in which stock price informativeness and corporate governance can influence the effectiveness of managerial and institutional ownerships.

Table 1 presents the relationship between managerial ownerships and firm future performance (Tobin's Q). We examine this relationship across different firm characteristics including stock price informativeness, corporate governance, and information asymmetry. First, Table 1 shows that managerial ownership is higher for low stock price synchronicity or high PIN (more informative stock prices); this finding supports the theory by Faure-Grimaud and Gromb (2004). Institutional ownership is higher for firms with higher stock price synchronicity (lower stock price informativeness), suggesting that when price is not informative, external agency can provide not only monitoring but also increase information.

## 4.1. Managerial ownerships and firm future performance

Table 2 presents the relationship between managerial ownerships and future firm value (Tobin's Q), for different firms grouped by (i) stock price informativeness (synchronicity), (ii) probability of informed trading, PIN, and (iii) corporate governance level (G-index), according to the following regression equation (1):

$$Q = \alpha_0 + \alpha_1 mgr + \alpha_2 mgr^2 + \alpha_3 \log(share) + \alpha_4 beta + \alpha_5 sigma + \alpha_6 \log(age) + \alpha_7 size + \alpha_8 \log(shrto) + \alpha_9 D_{NYSE} + \varepsilon$$

Table 2 shows that managerial ownership has impact on firm value, and that managerial ownership is non-linearly related to firm performance. The impact of managerial ownership is significant and positive, while the impact of the quadratic term of managerial ownership is significant and negative.

Moreover, we examine this relationship across different firm characteristics including stock price informativeness, information asymmetry and corporate governance. We first examine the impact of managerial ownership for firms with high vis-à-vis low stock price informativeness. Hypothesis H1 posits that managerial ownership of firms with more

informative prices (lower synchronicity) has stronger impact on firm's performance - suggesting that their impacts on firm value are the most important when firms are opaque or low price informativeness. The managerial ownerships have larger positive linear impact on firm's performance for firms with high price synchronicity (less informative prices) than firms with low price synchronicity (more informative prices).

Furthermore, we examine the impact of managerial ownership for firms with high vis-à-vis low Governance-Index, we find that the managerial ownerships have larger positive linearly impact on firm's performance for firms with high Governance-Index where firms are subject to poorer governance. This result is consistent with the theory that managerial ownership (private incentives) becomes more effective governance mechanism in improving firm value when firms are subject to poorer governance. Further examination (results not reported here) shows that managerial ownerships have larger positive linearly impact on firm's performance for firms that have analyst coverage (less information asymmetry). Overall our findings here support the hypotheses H2, as managerial ownership has stronger impact on firm value when price is less informative or governance is poorer.

## 4.2 Institutional ownership and firm value

Table 3 presents the relationship between institutional ownership and firm value (Tobin's Q), for different firms grouped by (i) stock price informativeness (Synchronicity), (ii) probability of informed trading, PIN, and (iii) corporate governance problem (G-index) according to the following regression equation (2):

$$Q = \alpha_0 + \alpha_1 io + \alpha_2 io^2 + \alpha_3 \log\_ sh + \alpha_4 beta + \alpha_5 sigma + \alpha_6 \log(age) + \alpha_7 size + \alpha_8 \log(shrto) + \alpha_9 D_{NYSE} + \varepsilon$$

In Table 3, Panel A reports the results for all firms while Panels B, C and D report subsamples results for firms with different price synchronicity, probability of informed trading and governance index. Panel A of Table 3 shows that institutional ownership is non-linearly related to firm performance. The impact of institutional ownership is significant and positive, while the impact of the quadratic term of institutional ownership is significant and negative.

Panels B and C of Table 3 examine the impact of institutional ownership for firms with high vis-à-vis low stock price informativeness. We find that the institutional ownerships have larger positive linearly impact on firm's performance for high pricing synchronicity or low PIN, both indicating the firms in questions are having less informative stock price (or when firms contain more common information and institutional investors are more effective when firms are subject to higher information asymmetry). Our results in Panel B on informativeness subsamples and Panel C on PIN subsamples support partially the

hypothesis H3 that institutional investors have stronger positive impact on firm value for firms with less informative stock prices.

Moreover, we examine the impact of institutional ownership for firms with high vis-à-vis low Governance-Index. Panel D of Table 3 reports the regression results of governance subsamples, and provides partial support for hypothesis H4. Institutional ownership has larger impact on firm value for low G-index (good corporate governance) firms. We find that the institutional ownerships have larger positive linearly impact on firm's performance for firms with low G-index where firms are subject to better governance. This result is different from the result of managerial ownership; institutional investors become more effective governance mechanism in improving firm value when firms are subject to better governance. This further suggests that managerial ownership (internal governance) could be more important for firms that are subject to poor governance. Further examination (results not reported here) shows that institutional ownerships have larger positive linearly impact on firm's performance for firms that have analyst coverage (less information asymmetry). Finally, these mixed results are interesting, because institutional investors may be valuable with monitors in traditional agency problem setting while their ability of producing information has not been explored fully, also the interacting effect with various corporate governance levels which we report in Table 4.

## 4.3 Interaction effects of managerial and institutional ownership on firm value

To further explore how institutional investors create value for firms with different information content of stock prices and governance (in the presence of managerial ownership), we modify equation (2) to include the interaction of institutional ownership and managerial ownership as equation (3) as follows:

$$Q = \alpha_0 + \alpha_1 io + \alpha_2 io^2 + \alpha_3 io * mgr + \alpha_4 \log\_ sh + \alpha_5 beta + \alpha_6 sigma + \alpha_7 \log(age)$$
$$+ \alpha_8 size + \alpha_9 \log(shrto) + \alpha_{10} D_{NYSE} + \varepsilon .$$

Table 4 presents the interaction between managerial (internal governance) and institutional investors (external governance). This enables us to distinguish if the two types of ownership are substitutes as suggested in the literature or complement. This separation is important for a firm's policy making and value enhancement.

Panel A of Table 4 reports the results of the full sample. All variables are significant to explain the firm future performance with expected signs. Institutional ownership and performance is non-linearly related with the manager-institutional ownership interaction significantly positive, suggesting there exists potential synergistic effect of manager and institutional investors.

Panel B reports the results of the price synchronicity subsamples. The interactions of manager-institutional ownership are significantly positive and it is stronger for firms with less informative stock prices (high synchronicity) while the individual coefficients of institutional ownership and its quadratic term result insignificantly. Panel C reports the results of the PIN subsamples. Consistent with Panel B, the interactions of manager-institutional ownership are significantly positive in both subsamples. This interaction effect is stronger for firms with less informative stock prices (low PIN). The individual coefficients of institutional ownership and its quadratic term are all insignificant. Our conjecture is that there is an informational role of institutional investors, i.e. the institutional investors are better off from a more informative price results from public trading. However for the institutional investors to increase firm value via increasing the information content of stock prices, the manager of the firm need to have enough private incentives to put effort together with the institutional investors such that the indirect benefit of informative stock prices from active public trading (Faure-Grimuad and Gromb, 2004) can be realized.

Panel D reports subsample results of firm with good governance (low G-index) or poor governance (high G-index). The interaction effect between managerial and institutional ownership has significant and positive impacts on firm performance for both low and high G-index firms, with larger impact for firms with good governance (low G-index). As in Panel D of Table 3, the impact of institutional investors on firm value is significant only for firms with good governance. The signs are in opposite directions with respect to Panel D of Table 4 when we include the interaction of manager-institutional ownership. The result in Panel D of Table 4 suggests that if managerial ownership is zero (non-zero), an increase in institutional ownership lowers (improves) firm value. This is striking as it is a shape contrast to the previous studies that institutional investors monitor the manager and create value by improving a firm's operation strategy. While potential multicollinearity problem maybe of concerns, we offer an explanation on our results. For a firm which its manager have no equity stake (or other forms of compensation align with firm performance), a monitor can only replace the incumbent management. Therefore increase in ownership of the institutional investors in such a firm is more probable to destroy firm value when the costs of expropriation of small shareholders by the large shareholders exceed the benefit of advisory and monitoring by the large shareholders [Villalonga and Amit (2006)].

Overall, our results suggest that both manager and institutional investors has an informational role in creating firm value. In summary, our study contains three sets of findings and contributions. First, Tables 1 and 2 present managerial ownership and firm value with respect to price informativeness and governance.

The overall findings support agency theory and corporate transparency. Second, Tables 1 and 2 present institutional ownership and firm value with respect to price informativeness and governance. The findings support external governance and institutional monitoring. Third, Table 4 presents the interactions of managerial and institutional ownerships on firm value. The findings support that institutional ownership and managers ownerships are complement but not substitute; in contrast with the view that manager's monitoring make institutional investors redundant as monitors. However, the institutional investors cannot resolve the governance problem on their own when agency is high but can mitigate the agency problem with collective effort from them and a firm's management with incentives aligns with firm performance.

## 5. Conclusion

This study is among the first to identify two important dimensions that can influence a firm's ownership and performance relation, namely corporate governance and stock price informativeness. In this respect, we examine managerial ownership, institutional ownership, and the interactions of the two. This study provides new empirical evidence that can enrich the theory of corporate ownership and its relation to firm performance [Morck, Shleifer and Vishny (1988) among others]. We find that, with sufficient equity stake, managers can create more value for firms with poor governance or firms with less informative stock prices, i.e. where information transparency is low and agency cost is high. Poor corporate governance and uninformative prices seem to make managerial ownerships matter more and create additional incentives for managers with sufficient equity stake to improve firm value. On the other hand, institutional investors increase more value for firms with low price informativeness and good governance. This suggests that institutional investors can create more value by producing firm specific information; however, external governance and monitoring performed by institutional investors alone cannot resolve the governance problem when agency conflicts are severe. Furthermore, institutional ownerships can interact with managerial ownerships in improving firm value when firms are subject to less stock price informativeness and higher agency problems. Managerial incentives and institutional influences are complement, rather than substitute, in providing corporate governance and improving firm value. The crux for enhancing corporate governance is to search for the collective efforts from institutional investors and managers who have incentives aligned with firm performance.

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**Table 1.** Summary Statistics

This table reports the summary statistics of 49,907 firms, excluding finance and utilities from NYSE, AMEX, and NASDAQ over the 1989 to 2006 period. Tobin's Q is the market value of equity plus the book value of assets minus the book value of equity, scaled by book assets computed. Percentage equity stake data, as of June-end of every year of different institutional investors, comes from the Thomson Ownership Data. Thomson reports the security holdings of institutional investors with greater than $100 million of securities under discretionary management. Institutional ownership data are then matched to the following fiscal year financial statement data from Compustat. Monthly price synchronicity, *SYNCH*, is measured by the R-square from the market model of regressing the individual stock returns on market index daily over the 12 months immediately before the month in question. Corporate governance index, *G-INDEX*, is from the Gompers, Ishii and Metrick (2003). The probability of informed trading, *PIN*, is from Easley, Hvidkjaer and O'Hara (2002). Beta is estimated using OLS, from a standard CAPM model on value-weighted market returns over a rolling 5-year period. Residual variance is estimated using OLS, from a standard CAPM model on value-weighted market returns over a rolling 5-year period. N represents number of observations used in computing the relevant statistics. Panel A reports the summary statistics for full sample. Panel B reports the summary statistics based on subsamples of cross-sectional median of firm's synchronicity. Panel C reports the summary statistics based on subsamples of cross-sectional median of firm's probability of informed trading. Panel D reports the summary statistics of subsamples split in cross-sectional median of firm's corporate governance index.

| | | Panel A: Full sample | | | Panel B | Stock Price Synchronicity | | | | |
| | | | | | | LOW | | | HIGH | |
| | N | Mean (Median) | Standard Deviation | N | Mean (Median) | Standard Deviation | N | Mean (Median) | Standard Deviation |
| Tobin's Q | | | | | | | | | |
| One Year Ahead | 62,100 | 0.4304 (0.3259) | 0.5705 | 29,973 | 0.3179 (0.2156) | 0.5353 | 30,139 | 0.5353 (0.4308) | 0.5758 |
| Institutional Ownership | 70,545 | 0.2497 (0.1339) | 0.2807 | 33,842 | 0.1894 (0.0854) | 0.2339 | 33,842 | 0.3237 (0.2729) | 0.3085 |
| Managerial Ownership in % | 21,960 | 0.2371 (0.1615) | 0.4009 | 12,452 | 0.2658 (0.1978) | 0.4937 | 8,942 | 0.1950 (0.1152) | 0.2190 |
| Share outstanding | 62,988 | 0.3253 (0.2414) | 1.6672 | 30,768 | 0.0518 (0.0065) | 1.4535 | 29,938 | 0.6783 (0.6302) | 1.7890 |
| Beta | 59,306 | 1.0067 (0.9318) | 0.6670 | 29,750 | 0.8521 (0.7767) | 0.6270 | 29,227 | 1.1659 (1.0847) | 0.6694 |
| Sigma | 59,306 | 0.1281 (0.1265) | 0.0443 | 29,750 | 0.1317 (0.1313) | 0.0419 | 29,227 | 0.1241 (0.1202) | 0.04630 |
| Firm Age | 70,209 | 2.0466 (2.1972) | 1.0200 | 33,763 | 2.0287 (2.0794) | 0.9610 | 33,785 | 2.1543 (2.1972) | 1.0043 |
| Size / Total Asset | 70,545 | 5.3767 (5.1480) | 1.9822 | 33,842 | 4.6651 (4.4761) | 1.6994 | 33,842 | 6.1556 (6.0162) | 1.9590 |
| Share Turnover | 57,917 | 0.7284 (0.6143) | 0.5353 | 29,025 | 0.6035 (0.4909) | 0.5704 | 28,843 | 0.8544 (0.7613) | 0.5185 |

**Table 1** (Continued). Summary Statistics

This table reports the summary statistics of 49,907 firms, excluding finance and utilities from NYSE, AMEX, and NASDAQ over the 1989 to 2006 period. Tobin's Q is the market value of equity plus the book value of assets minus the book value of equity, scaled by book assets computed. Percentage equity stake data, as of June-end of every year of different institutional investors, comes from the Thomson Ownership Data. Thomson reports the security holdings of institutional investors with greater than $100 million of securities under discretionary management. Institutional ownership data are then matched to the following fiscal year financial statement data from Compustat. Monthly price synchronicity, *SYNCH*, is measured by the R-square from the market model of regressing the individual stock returns on market index daily over the 12 months immediately before the month in question. Corporate governance index, *G-INDEX*, is from the Gompers, Ishii and Metrick (2003). The probability of informed trading, *PIN*, is from Easley, Hvidkjaer and O'Hara (2002). Beta is estimated using OLS, from a standard CAPM model on value-weighted market returns over a rolling 5-year period. Residual variance is estimated using OLS, from a standard CAPM model on value-weighted market returns over a rolling 5-year period. N represents number of observations used in computing the relevant statistics. Panel C reports the summary statistics based on subsamples of cross-sectional median of firm's probability of informed trading. Panel D reports the summary statistics based on subsamples of cross-sectional median of firm's corporate governance index.

| | Panel C | Probability of Informed Trading, PIN | | | | | Panel D | Corporate Governance Index, G-INDEX | | | | |
| | | LOW | | | HIGH | | | LOW | | | HIGH | |
| | N | Mean (Median) | Standard Deviation | N | Mean (Median) | Standard Deviation | N | Mean (Median) | Standard Deviation | N | Mean (Median) | Standard Deviation |
| Tobin's Q One Year Ahead | 8,555 | 0.4632 (0.3810) | 0.4646 | 8,475 | 0.2521 (0.1734) | 0.4445 | 3,487 | 0.1545 (0.4127) | 0.5417 | 3,438 | 0.4516 (0.3739) | 0.4477 |
| Institutional Ownership | 9,042 | 0.4299 (0.5094) | 0.3001 | 9,042 | 0.2670 (0.2162) | 0.2484 | 3,645 | 0.4302 (0.4784) | 0.3098 | 3,590 | 0.4979 (0.5798) | 0.2910 |
| Managerial Ownership in % | 3,603 | 0.1277 (0.0409) | 0.1874 | 4,950 | 0.2280 (0.1491) | 0.2344 | 1,055 | 0.1781 (0.0903) | 0.2106 | 1,281 | 0.0925 (0.0337) | 0.1399 |
| Share outstanding | 8,593 | 1.7118 (1.7829) | 1.5929 | 8,791 | 0.3462 (0.3750) | 1.3215 | 3,516 | 0.8876 (0.8040) | 1.5747 | 3,464 | 1.8273 (1.8152) | 1.4275 |
| Beta | 8,758 | 0.9912 (0.9685) | 0.4629 | 8,537 | 0.9154 (0.8966) | 0.5363 | 3,601 | 1.1526 (1.0792) | 0.6448 | 3,536 | 0.9797 (0.9388) | 0.5160 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sigma | 8,758 | 0.0948 (0.0891) | 0.0358 | 8,537 | 0.1134 (0.1097) | 0.0366 | 3,601 | 0.1189 (0.1144) | 0.0425 | 3,536 | 0.0978 (0.0910) | 0.0365 |
| Firm Age | 9,040 | 2.6790 (3.0910) | 0.8656 | 9,027 | 2.4168 (2.7726) | 0.9367 | 3,645 | 2.4283 (2.4849) | 0.7387 | 3,590 | 2.8729 (3.1355) | 0.7233 |
| Size / Total Asset | 9,042 | 7.2648 (7.2777) | 1.5762 | 9,042 | 5.2191 (5.2441) | 1.4249 | 3,645 | 6.6759 (6.4978) | 1.3833 | 3,590 | 7.2550 (7.1341) | 1.4104 |
| Share Turnover | 8,589 | 0.6518 (0.6060) | 0.3221 | 8,371 | 0.4377 (0.3666) | 0.3145 | 3,545 | 0.8911 (0.8010) | 0.5165 | 3,480 | 0.7796 (0.6996) | 0.3968 |

**Table 2.** Impact of Managerial Ownership on Firm Value

This table reports the results of the impact of managerial ownership on firm value, measured by 1-year ahead Tobin's q, includes 18,110 firm-year observations from 1989 to 2006,

$$Q = \alpha_0 + \alpha_1 mgr + \alpha_2 mgr^2 + \alpha_3 \log(share) + \alpha_4 beta + \alpha_5 sigma + \alpha_6 \log(age) + \alpha_7 size + \alpha_8 \log(shrto) + \alpha_9 D_{NYSE} + \varepsilon$$

where Q is one year ahead Tobin's q of the firm in question. Tobin's Q is computed as the market value of equity plus the book value of assets minus the book value of equity, scaled by book assets. Independent variables include the followings: (i) managerial ownership in percentage of total shares. (ii) square percentage of managerial ownership, (iii) share outstanding, (iv) beta computed by CAPM model on value-weighted market returns over a rolling 5-year period, (v) Residual variance, Sigma, is estimated using OLS, from a standard CAPM model on value-weighted market returns over a rolling 5-year period, (vi) firm size computed by market capitalization over total asset. (vii) share turnover, and (viii) indicator variable of NYSE listed firms. Partitioning variables include the followings: (i) Monthly price synchronicity, *SYNCH*, is measured by the R-square from the market model of regressing the individual stock returns on market index daily over the 12 months immediately before the month in question, (ii) Corporate governance index, *G-INDEX*, is from the Gompers, Ishii and Metrick (2003), and (iii) probability of informed trading, *PIN*, is from Easley, Hvidkjaer and O'Hara (2002). Panel A reports the regression results for full sample. Panel B reports the regression results based on subsamples of cross-sectional median of firm's synchronicity. Panel C reports the regression results of subsamples based on subsamples of cross-sectional median of firm's probability of informed trading. Panel D reports the regression results based on subsamples of cross-sectional median of firm's corporate governance index. t-statistics are reported in parentheses. *, ** and *** are ten, five and one percent significance respectively.

| | Panel A: FULL SAMPLE | Panel B: SYNCH | | Panel C: PIN | | Panel D: G-INDEX | |
|---|---|---|---|---|---|---|---|
| | | LOW | HIGH | LOW | HIGH | LOW | HIGH |
| Managerial ownership | 0.1791*** | 0.1458*** | 0.2781*** | 0.2137 | 0.0694 | 0.3906* | 0.4956** |
| | (6.55) | (4.89) | (2.65) | (1.28) | (0.63) | (1.83) | (2.44) |
| (Managerial ownership)$^2$ | -0.0033*** | -0.0026*** | -0.0229 | -0.1406 | 0.0298 | -0.2267 | -0.4777** |
| | (-5.87) | (-4.28) | (-0.18) | (-0.68) | (0.22) | (-0.86) | (-1.97) |
| log(share outstanding) | 0.0441*** | 0.0310*** | 0.0558*** | 0.0634*** | 0.0210** | 0.0644*** | 0.0682*** |
| | (7.84) | (5.11) | (7.02) | (5.24) | (2.26) | (3.79) | (4.21) |
| Beta | 0.0579*** | 0.0446*** | 0.0455*** | 0.0119 | 0.0211 | 0.0348 | 0.0233 |
| | (6.33) | (4.35) | (3.32) | (0.48) | (1.07) | (0.94) | (0.67) |
| Sigma | -3.2231*** | -2.2750*** | -4.6163*** | -5.6633*** | -2.8761*** | -6.4732*** | -5.2656*** |
| | (-15.90) | (-11.12) | (-14.38) | (-10.85) | (-8.91) | (-8.90) | (-7.72) |
| log(firm age) | -0.0485*** | -0.0417*** | -0.0558*** | -0.648*** | -0.0660*** | -0.0747*** | -0.03577 |
| | (-5.97) | (-4.69) | (-4.95) | (-3.40) | (-4.81) | (-2.74) | (-1.13) |
| Firm size | -0.0556*** | -0.0554*** | -0.0868*** | -0.0928*** | -0.0644*** | -0.0892*** | -0.0904*** |
| | (-9.21) | (-8.22) | (-10.04) | (-6.83) | (-6.22) | (-4.37) | (-5.64) |
| log(share turnover) | 0.4933*** | 0.4585*** | 0.4848*** | 0.2677*** | 0.4518*** | 0.4395*** | 0.3425*** |
| | (30.23) | (25.19) | (21.84) | (4.99) | (10.73) | (8.09) | (5.71) |
| NYSE indicator | 0.1109*** | 0.1107*** | 0.0917*** | 0.0998** | 0.0892*** | -0.0116 | -0.0576 |
| | (6.61) | (6.14) | (3.94) | (2.00) | (3.23) | (-0.26) | (-0.92) |
| R square | 0.2859 | 0.2750 | 0.2872 | 0.2166 | 0.2081 | 0.2800 | 0.2640 |
| F Statistics | 1,660.48*** | 1,819.23*** | 59.69*** | 18.24*** | 20.53*** | 13.75*** | 15.66*** |
| N | 18,110 | 10,521 | 7,581 | 3,255 | 4,491 | 1,003 | 1,205 |

**Table 3.** Institutional Ownership on Firm Value

This table reports the results of the impact of institutional ownership on firm value, measured by 1-year ahead Tobin's q, includes 49,907 firm-year observations from 1989 to 2006,

$$Q = \alpha_0 + \alpha_1 io + \alpha_2 io^2 + \alpha_3 \log\_sh + \alpha_4 beta + \alpha_5 sigma + \alpha_6 \log(age) + \alpha_7 size + \alpha_8 \log(shrto) + \alpha_9 D_{NYSE} + \varepsilon$$

where Q is one year ahead Tobin's q of the firm in question. Tobin's Q is computed as the market value of equity plus the book value of assets minus the book value of equity, scaled by book assets. Independent variables include the followings: (i) institutional ownership in percentage of total shares. (ii) square percentage of institutional ownership, (iii) share outstanding, (iv) beta computed by CAPM model on value-weighted market returns over a rolling 5-year period, (v) Residual variance, Sigma, is estimated using OLS, from a standard CAPM model on value-weighted market returns over a rolling 5-year period, (vi) firm size computed by market capitalization over total asset, (vii) share turnover, and (viii) indicator variable of NYSE listed firms. Partitioning variables include the followings: (i) Monthly price synchronicity, *SYNCH*, is measured by the R-square from the market model of regressing the individual stock returns on market index daily over the 12 months immediately before the month in question, (ii) Corporate governance index, *G-INDEX*, is from the Gompers, Ishii and Metrick (2003), and (iii) probability of informed trading, *PIN*, is from Easley, Hvidkjaer and O'Hara (2002). Panel A reports the regression results for full sample. Panel B reports the regression results based on subsamples of median of firm's synchronicity. Panel C reports the regression results based on subsamples of cross-sectional median of firm's probability of informed trading. Panel D reports the regression results based on subsamples of cross-sectional median of firm's corporate governance index. t-statistics are reported in parentheses. *, ** and *** are ten, five and one percent significance respectively.

| | Panel A: FULL SAMPLE | Panel B: SYNCH | | Panel C: PIN | | Panel D: G-INDEX | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| | | LOW | HIGH | LOW | HIGH | LOW | HIGH |
| Institutional ownership | 0.4339*** | 0.2522*** | 0.5227*** | 0.2635** | 0.1727** | 0.3723*** | 0.1619 |
| | (9.19) | (4.68) | (8.78) | (2.56) | (1.97) | (2.94) | (1.23) |
| (Institutional ownership)$^2$ | -0.2968*** | -0.0664 | -0.4391*** | -0.1153 | -0.0564 | -0.2421 | -0.1057 |
| | (-4.84) | (-0.93) | (-5.82) | (-0.88) | (-0.47) | (-1.58) | (-0.68) |
| log(share outstanding) | 0.0311*** | 0.0179*** | 0.0362*** | 0.0544*** | 0.0191*** | 0.0345*** | 0.0669*** |
| | (9.14) | (4.74) | (8.65) | (6.83) | (2.68) | (4.11) | (6.61) |
| Beta | 0.0506*** | 0.0434*** | 0.0299*** | 0.0314* | 0.0118 | 0.0059 | 0.0333 |
| | (8.07) | (5.80) | (3.57) | (1.77) | (0.79) | (0.31) | (1.61) |
| Sigma | -2.3799*** | -1.6169*** | -3.2918*** | -4.1312*** | -1.9714*** | -4.3572*** | -4.6375*** |
| | (-17.35) | (-10.95) | (-17.68) | (-12.02) | (-7.74) | (-9.93) | (-11.50) |
| log(firm age) | -0.0471*** | -0.0453*** | -0.0466*** | -0.0424*** | -0.0659*** | -0.0603*** | -0.0175 |
| | (-8.34) | (-7.22) | (-6.37) | (-3.33) | (-6.17) | (-3.32) | (-1.05) |
| Firm size | -0.0452*** | -0.0465*** | -0.0610*** | -0.0784*** | -0.0623*** | -0.0682*** | -0.0699*** |
| | (-11.09) | (-10.40) | (-11.23) | (-8.44) | (-7.59) | (-5.24) | (-5.82) |
| log(share turnover) | 0.4139*** | 0.3915*** | 0.4135*** | 0.1927*** | 0.3749*** | 0.3848*** | 0.2411*** |
| | (41.47) | (31.72) | (32.59) | (5.51) | (12.32) | (13.70) | (7.33) |
| NYSE indicator | 0.0620*** | 0.0874*** | 0.0208 | 0.0954** | 0.1055*** | 0.0047 | -0.1599*** |
| | (4.64) | (6.41) | (1.20) | (2.36) | (4.74) | (0.14) | (-4.11) |
| R square | 0.2788 | 0.2644 | 0.2667 | 0.2120 | 0.2213 | 0.2661 | 0.2604 |
| F Statistics | 194.02*** | 116.82*** | 112.58*** | 26.36*** | 29.02*** | 30.05*** | 25.27*** |
| N | 49,907 | 25,116 | 24,751 | 7,914 | 7,850 | 3,331 | 3,275 |

**Table 4.** Interaction between Managerial and Institutional Ownership

This table reports the results of the impact of managerial ownership on firm value, measured by 1-year ahead Tobin's q, includes 18,110 firm-year observations from 1989 to 2006,

$$Q = \alpha_0 + \alpha_1 io + \alpha_2 io^2 + \alpha_3 io * mgr + \alpha_4 \log\_ sh + \alpha_5 beta + \alpha_6 sigma + \alpha_7 \log(age) + \alpha_8 size + \alpha_9 \log(shrto) + \alpha_{10} D_{NYSE} + \varepsilon$$

where Q is one year ahead Tobin's q of the firm in question. Tobin's Q is computed as the market value of equity plus the book value of assets minus the book value of equity, scaled by book assets. Independent variables include the followings: (i) managerial ownership in percentage of total shares. (ii) square percentage of managerial ownership, (iii) share outstanding, (iv) beta computed by CAPM model on value-weighted market returns over a rolling 5-year period, (v) Residual variance, Sigma, is estimated using OLS, from a standard CAPM model on value-weighted market returns over a rolling 5-year period, (vi) firm size computed by market capitalization over total asset, (vii) share turnover, and (viii) indicator variable of NYSE listed firms. Partitioning variables include the followings: (i) Monthly price synchronicity, *SYNCH*, is measured by the R-square from the market model of regressing the individual stock returns on market index daily over the 12 months immediately before the month in question, (ii) Corporate governance index, *G-INDEX*, is from the Gompers, Ishii and Metrick (2003), and (iii) probability of informed trading, *PIN*, is from Easley, Hvidkjaer and O'Hara (2002). Panel A reports the regression results for full sample. Panel B reports the regression results based on subsamples of cross-sectional median of firm's synchronicity. Panel C reports the regression results of subsamples based on subsamples of cross-sectional median of firm's probability of informed trading. Panel D reports the regression results based on subsamples of firm's corporate governance index. t-statistics are reported in parentheses. *, ** and *** are ten, five and one percent significance respectively.

| | Panel A: FULL SAMPLE | Panel B: SYNCH | | Panel C: PIN | | Panel D: G-INDEX | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| | | LOW | HIGH | LOW | HIGH | LOW | HIGH |
| Institutional ownership | 0.0892*** | 0.1305 | -0.080 | 0.2088 | -0.0641 | -0.6174** | -0.5075 |
| | (2.57) | (1.22) | (-0.63) | (0.79) | (0.35) | (-1.77) | (-0.81) |
| (Institutional ownership)$^2$ | -0.0032*** | -0.0523 | 0.1305 | -0.1306 | 0.1383 | 0.8807** | 0.5683 |
| | (-5.64) | (-0.43) | (0.85) | (0.5) | (0.7) | (2.41) | (0.99) |
| Institutional ownership x Managerial ownership | 0.4020*** | 0.1777*** | 0.6727*** | 0.5112*** | 0.2841** | 0.9171*** | 0.5466*** |
| | (4.01) | (2.58) | (5.69) | (3.44) | (2.15) | (3.66) | (2.81) |
| log(share outstanding) | 0.0467*** | 0.3123*** | 0.0582*** | 0.0691*** | 0.0217** | 0.0748*** | 0.0739*** |
| | (8.26) | (5.15) | (7.29) | (5.4) | (2.3) | (4.22) | (4.37) |
| Beta | 0.0551*** | 0.0391*** | 0.0396*** | 0.0065 | 0.017384 | 0.0317 | 0.0198 |
| | (6.05) | (3.84) | (2.86) | (0.27) | (0.89) | (0.86) | (0.60) |
| Sigma | -3.1094*** | -2.0239*** | -4.2790*** | -5.287*** | -2.7017*** | -5.8295*** | -5.1370*** |
| | (-15.47) | (-9.53) | (-13.07) | (9.75) | (7.74) | (-7.84) | (-6.71) |
| log(firm age) | -0.0471*** | -0.0486*** | -0.0582*** | 0.0624*** | -0.0675*** | -0.0611** | -0.0334 |
| | (-5.79) | (-5.61) | (-5.11) | (3.28) | (4.96) | (-2.28) | (-1.10) |
| Firm size | -0.0589*** | -0.0639*** | -0.0906*** | -0.0989*** | -0.0672*** | -0.0996*** | -0.0988*** |
| | (-9.69) | (-9.02) | (-10.37) | (7.12) | (6.43) | (-4.81) | (-5.82) |
| log(share turnover) | 0.4794*** | 0.4241*** | 0.4432*** | 0.2305*** | 0.4273*** | 0.3472*** | 0.3172*** |
| | (29.16) | (22.51) | (19.15) | (4.25) | (9.96) | (6.53) | (5.51) |
| NYSE indicator | 0.1063*** | 0.1037*** | 0.0785*** | 0.0799 | 0.0811*** | -0.0379 | -0.0674 |
| | (6.32) | (5.67) | (3.31) | (1.57) | (2.7) | (-0.81) | (-1.05) |
| R square | 0.2878 | 0.2740 | 0.2882 | 0.2233 | 0.2087 | 0.2954 | 0.2671 |
| F Statistics | 1,422.10*** | 75.49*** | 57.05*** | 17.70*** | 19.22 | 13.69*** | 14.86*** |
| N | 18,110 | 10521 | 7,581 | 3,255 | 4.491 | 1,003 | 1,205 |