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“Swimming Ducks Forecast the Coming of Spring”—The predictability of aggregate insider trading on future market returns in the Chinese market



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ABSTRACT

This study systematically examines the ability of aggregate insider trading to predict future market returns in the Chinese A-share market. After controlling for the contrarian investment strategy, aggregate executive (large shareholder) trading conducted over the past six months can predict 66% (72.7%) of market returns twelve months in advance. Aggregate insider trading predicts future market returns very accurately and is stronger for insiders who have a greater information advantage (e.g., executives and controlling shareholders). Corporate governance also affects the predictability of insider trading. The predictability of executive trading is weakest in central state-owned companies, probably because the “quasi-official” status of the executives in those companies effectively curbs their incentives to benefit from insider trading. The predictive power of large shareholder trading in private-owned companies is higher than that in state-owned companies, probably due to their stronger profit motivation and higher involvement in business operations. This study complements the literature by examining an emerging market and investigating how the institutional context and corporate governance affect insider trading. © 2014 Production and hosting by Elsevier B.V. on behalf of China Journal of Accounting Research. Founded by Sun Yat-sen University and City University of Hong Kong.

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1. Introduction

Insiders include a company's corporate officers, directors, supervisors (all referred to as "executives" hereafter) and large shareholders (those with ownership of 5% or more of the company's stock). Insider trading based on a superior information advantage can influence the efficiency and fairness of the financial market, and thus presents a thorny regulatory challenge.

When the Chinese A-share market was initially established, it had a dual share structure comprising tradable and non-tradable shares. Shares owned by large shareholders and executives were basically non-tradable as they were prohibited from being traded on the secondary stock market. As such, insider trading was very rare at that time. Since the end of 2005, with the market reform of non-tradable shares, market segmentation between tradable and non-tradable shares has been gradually removed. To mitigate the supply pressure on the secondary market, the reform prevented non-tradable shares from being sold immediately, and instituted a lock-up period of one to three years. Some locked-up shares have been "lifted" since the beginning of 2007. By the end of 2011, almost all of the non-tradable shares became tradable and insiders began to trade their stocks more frequently, a new occurrence that has attracted a lot of attention. The A-share market is still emerging and its efficiency requires improvement. The quality of its corporate information disclosure is generally not high, its information intermediaries (analysts) have yet to mature and the information asymmetry between insiders and outsiders is still relatively large. These limitations have undoubtedly provided insiders with more trading opportunities. Furthermore, a regulatory system has not yet been developed, making insider trading a potentially serious and complicated challenge.

Based on media reports, insiders from different companies often trade in the same direction during the same period. When the market index is high or rapidly rising, insiders often consistently decrease their holdings. When the market index is in a slump, insiders often uniformly increase their holdings. The "mainstream" aggregate insider trading matches "cleverly" with market movements, suggesting that it is ideal in terms of market timing.

Using A-share market insider transaction data from January 2007 to August 2011, we empirically examine the predictability of aggregate insider trading on market returns. We find that after controlling for contrarian trading, the past six months of aggregate executive (large shareholder) trading can predict 66% (72.7%) of market returns twelve months in advance. We also examine the effect of information hierarchy on predictive power and find that the predicative power of aggregate trading is significantly higher for insiders with more business operation involvement and a higher position in the information hierarchy (e.g., executives and controlling shareholders) than for insiders with a lower position (e.g., supervisors and important shareholders). This evidence strongly supports that an information advantage, beyond being a simple contrarian trading strategy, is the root cause of the strong predictive power of aggregate insider trading. Stemming from their high involvement in business operations, insiders can aggregately form a stronger ability to predict macroeconomic trends and detect deviations in systematic valuation in the stock market (referred to as the "macro information advantage") and use this advantage when trading.

As a typical form of agency conflict, insider trading behavior is affected systematically by corporate governance (Gunny et al., 2008). Corporate governance affects the information content of insider transactions in two ways. First, the ownership structure affects the distribution of control rights and decision-making power between shareholders and executives, thus affecting the information distribution and advantages of specific insiders. Second, insider trading behavior is monitored differently under different corporate governance structures, and corporate governance affects the motives of insiders and thus the possibility that insiders will use their information advantage in trading.

In this study, we examine the effect of corporate governance on the predictive power of aggregate insider trading. Depending on the nature of the largest shareholder's ownership, companies can be divided into three categories: private, local state-owned and central state-owned. Local state-owned companies are controlled by the local State-owned Assets Supervision and Administration Commission (SASAC). Central state-owned companies are controlled by either the central SASAC or central government departments. These three types of companies have systematically different agency problems and governance structures. As investor protection is weak in the A-share stock market, the largest shareholder in most privately owned companies has highly concentrated ownership and even controlling ownership for self-protection purposes. Because these large

shareholders are actively involved in business operations and have strong incentives and the ability to monitor managers, there is only a small agency conflict between shareholders and managers. However, the large private shareholder has a strong incentive to expropriate the interests of small shareholders. He or she can gain lucrative private benefits of control via insider trading in the secondary market, related party transactions and the pyramid shareholding structure. In state-owned companies, the ultimate shareholders can be traced up to local or central SASAC, which always delegates bureaucrats as board chairmen, resulting in serious governance problems such as investor phantoms and manager control. Management occupies a large number of seats on these boards, creating a self-monitoring problem. Despite their high concentration of ownership, large state shareholders have an information disadvantage due to their low participation in business operations. There are also significant differences between the central and local state-owned companies. Central state-owned companies are usually super-large companies tightly controlled by the central SASAC in strategically important industries, such as China Mobile, the four largest state-owned banks, China Petroleum and China Railway Group. These large central state-owned companies tend to have a corresponding administrative hierarchy and serve more political purposes, such as achieving financial and price stability. For example, China Petroleum and China Petrochemical are ministerial-level companies and their executives often have “quasi-official” status along with opportunities for promotion to the provincial or ministerial government levels. Therefore, these executives are under recessive but powerful government administrative control.

In this study, we examine how the nature of ownership affects the predictive power of insider trading. We find that the predictive power of executive trading in central state-owned companies is the weakest. The “quasi-official” status of the executives in this type of company weakens its motivation to profit through trading, forcing it to give up opportunities to trade based on an information advantage. The predictive power of large shareholder trading in private-owned companies is significantly higher than that in state-owned companies, as the shareholders in private-owned companies have a stronger profit motivation and higher involvement in business operations.

This study makes the following contributions to the insider trading literature. First, most of the literature has focused on the information content of insider trading from a micro perspective. It has observed that insiders can use their firm-level information advantage to time trades and that their trading activities can predict their companies' future stock movements. We examine the information content of aggregate insider trading from a macro perspective and find that aggregate insider trading can predict future market movements and that information hierarchy and corporate governance affect the predictability of aggregate insider trading. Second, most insider trading studies focus on mature markets, especially the U.S. market, and provide limited insights into emerging markets with different institutional environments. This study complements previous studies by focusing on an emerging market and provides interesting findings that are different from those observed in mature markets. The general finding in mature markets is that insider buying has higher information content than insider selling and that large shareholder trading has lower information content than executive trading. However, we obtain different findings for the A-share market due to its different institutional context and governance structure. Third, this study expands the research related to how corporate governance affects insider trading. Insider trading activities are not only influenced by statutory laws and law enforcement at the national level, but also affected by corporate governance. The diverse types of corporate governance structures on the Chinese A-share market provide an excellent setting for studying the effects of corporate governance on insider trading. Fourth, our findings provide valuable insights into forming investment strategies. As aggregate insider trading has significant power in predicting future stock returns, external investors can use insider trading activities to forecast future stock movements. As the famous Chinese poem says, “Although winter wind blows briskly, ducks forecast the coming of spring and begin to swim in the lake.” Much like swimming ducks help to forecast the change in season, aggregate insider trading helps to predict the movement of the market.

2. Literature review

Insiders are special traders who possess highly accurate information at a very low access cost. Company executives are more familiar with their own companies than any analyst on Wall Street. They know when a new product will be launched, an inventory will begin to stack, profit margins will expand or product costs will improve. As [Seyhun \(1998\)](#) observes, if you want to find smart investors, these are smart investors.

Insiders have different kinds of information advantages. First, they know in advance which major events will affect stock prices. This type of advantage disappears after the events are announced, usually within a short time. Furthermore, direct use of event-related inside information is often prohibited in many countries. Second, insiders can better assess the company's earnings prospects and growth potential than outsiders. This type of information advantage is usually long term and does not rely on specific events. Third, insiders can better assess the intrinsic value of a company than outsiders and can thus identify and exploit opportunities when the stock market overvalues or undervalues the company. Fourth, insiders have a better sense of industry and macro-economy trends and thus tend to predict future macroeconomic directions more accurately. The first three types of advantages can increase insiders' ability to predict firm-level price movement more precisely. They seem to always be able to cash in when the price is high and purchase when the price is low. The fourth advantage increases aggregate insiders' ability to time the market.

Whether and how insiders use their information advantage to trade is the core issue of empirical studies. These questions may be answered by analyzing the relationship between stock price movements and insider trades, and examining the timing and profitability of the trades. Studies with a micro perspective examine the relationship between insider trades and the corresponding company's stock price movements to verify whether insiders use firm-level private information to trade. In contrast, studies with a macro perspective examine the relationship between aggregate insider trading and future market movements to verify whether insiders have an overall ability to time the market.

2.1. Micro perspective: can insider trades predict future stock returns?

The micro perspective widely involves the event study method to investigate a company's share price movements shortly before and after an insider trade is made to determine the insider's ability to obtain abnormal returns. Insiders accurately time trades over the short term (Friedrich et al., 2002). Furthermore, many studies find that insider trading can predict a company's future long-term price movements. Stock prices tend to go up (down) in the long run after insider purchases (sales) are made. This predictability suggests that insiders exploit important private information in advance that affects future stock prices (Givoly and Palmon, 1985; Seyhun, 1998; Pettit and Venkatesh, 1995; Lakonishok and Lee, 2001; Jeng et al., 2003; Ravina and Sapienza, 2010).

Research has verified in different ways that an information advantage accounts for the accurate timing and abnormal returns associated with insider trades. The profitability of insider trades is closely related to the information hierarchy that insiders belong to; the higher the information hierarchy, the higher the profitability. In the U.S., large shareholders' trading profitability is found to be significantly lower than that of executives. Because large shareholders often do not own large proportions of the shares and are rarely directly involved in business decisions, they have less of an information advantage than executives (Lakonishok and Lee, 2001). Even executives have an information hierarchy, with CEOs at the top, other managers in the middle and board directors at the bottom. The trading profitability of different groups is positively correlated with such an information hierarchy (Seyhun, 1998). However, Jeng et al. (2003) find that although CEOs have more information, their trading activities are more likely to be monitored by shareholders and regulators, and therefore their trading profitability is not necessarily significantly higher than that of other managers. In addition, studies consistently find that the profitability of executives' sales is weaker than that of purchases. Executives' purchases are mainly based on private information. In contrast, with the popularity of equity incentives, executives often sell stocks to meet liquidity or diversification needs, and this non-information-driven selling dilutes the overall information content for sales.

2.2. Macro perspective: can aggregate insider trading predict future market trends?

There is some evidence that aggregate insider trading coincides with market price movements. Seyhun (1990) finds through a case study that shortly after the stock market crash in October 1987, insiders aggregate purchased shares and accurately predicted the market rebound. Seyhun (1992) also finds that during 1975–1989, the net insiders' purchase index of the past 12 months predicted 16% (61%) of the next 6 (12) months of market returns. It seems that when future market returns are positive (negative), aggregate insider

trading activities exhibit optimistic purchases (pessimistic sales). [Lakonishok and Lee \(2001\)](#) design different net purchase measures and control for the effects of a simple contrarian strategy. They also find that aggregate insider trading can accurately predict future market returns. The one-year-ahead market return gap between the months with the highest and lowest net purchases index is about 11%, and the aggregate trading of executives exhibits better predictability than that of large shareholders. Overall, empirical studies show that aggregate insider trading is an important leading indicator of future stock market movements and can accurately predict future market returns.

Why does aggregate insider trading effectively predict future market trends? [Seyhun \(1998\)](#) finds that insiders as a group can correctly anticipate the direction of the future real economy and react to changes in future economic trends nearly a year ahead of the stock market. [Jiang and Zaman \(2007\)](#) study the causes of aggregate insider trading's predictability of future market returns and find that although such trading is strongly correlated with cash flow information unexpected by the market, expected cash flow information does not lead to large waves of insider trading. These studies suggest that aggregate insider trading is not simply contrarian trading, but is rather based on insiders' effective assessment of future macroeconomic trends.

Most of the research on China focuses on the micro perspective. Studies consistently find that insider trades can predict both short- and long-term stock movements, and that insiders have the ability to time trades and earn high abnormal returns. In terms of executive trading, researchers find that executive sales can predict the fall of a company's stock price within a short time window ([Zeng, 2008](#); [Zhang and Zeng, 2011](#)). [Zhu et al. \(2011a,b\)](#) investigate the long-term profitability of executive trading and find that executive sales and purchases exhibit a strong predictability of stock price movement six months in advance. In terms of large shareholder trading, studies also find that large shareholder sales are accurately timed within a short window ([Zhu et al., 2011a,b](#); [Cai and Wei, 2009](#); [Lin and Qu, 2010](#); [Wu and Wu, 2010](#); [Shen et al., 2011](#)). However, the timing ability of shareholder purchases is not obvious and purchase activities are not strongly correlated with future performance indicators ([Li et al., 2011](#)).

These Chinese studies have adopted the micro perspective and often focus on executives or large shareholders as a single group, or on "buy or sell" as a one-way transaction. This is the first study to examine the information content of aggregate insider trading in the Chinese A-share stock market from a macro perspective. It comprehensively compares the information content of trades in different directions and trades made by different types of insiders, and offers in-depth analysis of how information hierarchies and corporate governance affect the information content of insider trading.

3. Research hypotheses

At first glance, the public and insiders both observe the same changes in macroeconomic policies. Although insiders have more private company information, it seems that they should only be able to predict the stock movement of their own companies. Insiders have no additional advantage overall for predicting stock market movement.

In fact, insiders at the front line of operations can often perceive macroeconomic trend changes earlier. For example, they can observe changes in inflation earlier through company material and product price movements. In contrast, the public has to wait until the end of the month for such inflation statistics to be released. More importantly, even if insiders and the public were to observe the same macroeconomic policy changes, based on their experience with business operations, insiders have a deeper understanding of the effect of changes on the company, the industry and future macroeconomic performance. Thus, insiders have better analytical capabilities than outside investors in interpreting macroeconomic information. For example, although insiders and the public observe the same changes in interest rates, insiders can better interpret the effect of the changes on the company and industry's future performance. Without knowing the company's specific financing structure, outsiders would have difficulty calculating the effect of the changes on the company's profit ([Seyhun, 1992](#)). As insiders are involved at the forefront of business operations, they are able to detect macro and industry changes earlier and more accurately interpret the effect of these changes on the future performance of the company, industry and macro-economy, and can better predict future market movement and follow their predictions when trading. [Seyhun \(1998\)](#) finds that insider trading can reflect future changes in the real economy one year earlier than the stock market.

In addition to better predictability of macroeconomics and industry changes, insiders are more able to detect systemic bias in their stock market valuations. Because investors can be emotional and irrational at times, the market sometimes systematically overvalues or undervalues stocks, providing uniform opportunities for insider trades. In an overheated bull market, when the prices of most stocks are high, the insiders of different companies appear to decrease their holdings uniformly and thus pool into selling waves. The market eventually returns to rational valuations in the future, resulting in negative future market returns. Insiders also conversely take advantage of systematic market undervaluations to uniformly increase holdings. Aggregate insider trading reacts to both systematic market overvaluations and undervaluations.

In summary, insiders have an evident information advantage when predicting macroeconomic movements and detecting systematic deviations in market valuation. This macro information advantage is not a result of insiders obtaining macro private information (e.g., changes in interest rates) sooner than outsiders. Rather, it stems from insiders' high involvement in business operations, which gives them a superior ability to analyze and interpret macro information, predict macroeconomic trends and identify systematic deviations in market valuation. Most insiders use their macro information advantage when trading and aggregate insider trading can be used to predict future market movements.

The predictability of aggregate insider trading is not a simple summary of insiders' ability to time trades based on private firm-level information. Assuming that insiders use only firm-level information to trade, different companies would report good and bad news during the same period. As such, insiders from different companies would make purchases and sales at the same time, and therefore the aggregated trading should be zero. However, if the majority of the insiders uniformly choose to buy or sell during the same period, it is likely that the information they are using is based on their prediction of future macro-level movements.

Hypothesis 1. Aggregate insider trading can predict future market movements and this predictability reflects insiders' macro information advantage.

Insiders are divided into two major categories: large shareholders and executives. Large shareholders can be subdivided into the largest shareholder and important shareholders (more than 5% stock ownership but excluding the largest shareholder). Executives can be subdivided into board directors, managers and supervisors. There are significant differences in operational involvement and the level of information advantage among insiders. The largest shareholders have an important influence on strategic decisions and can directly appoint directors and managers. Therefore, their operational involvement and level of information advantage are stronger than those of important shareholders. Among executives, directors (especially non-executive and independent directors) are mainly responsible for monitoring managers and making strategic decisions. Because they meet only a few times a year, their involvement in business operations and thus their information advantage is less than that of managers. Chinese companies normally add another position to the executives group: that is supervisors, whose primary responsibility is to perform a compliance check after major decisions are made. Most supervisors are staff delegates or outside retired persons working part time. Thus, their operational involvement is significantly less than that of managers and directors (Zhu et al., 2011a,b).

Insiders' macro information advantage stems from their superior ability to interpret macro information and predict macroeconomic trends as a result of their high involvement in business operations. Therefore, the more insiders are involved in business operations and the higher their position in the information hierarchy (e.g., largest shareholders and managers), the more obvious their macro-information advantage and the stronger the predictive power of their trading activities for future market returns.

Hypothesis 2 (*information hierarchy hypothesis*). The aggregate trading of insiders with higher levels of operational involvement and information hierarchy positions (e.g., largest shareholders and managers) has more predictive power for future market returns than that of insiders with lower information hierarchy positions (e.g., important shareholders and supervisors).

As a type of agency conflict and wealth misappropriation, insider trading is affected by corporate governance. The essence of corporate governance is to limit insiders' self-interest behavior and motivate them to maximize the wealth of their companies through a variety of formal and informal control mechanisms (Gunny et al., 2008). Good corporate governance can help decrease illegal trades and the inappropriate use of an information advantage. At the company level, corporate governance can reinforce the advance approval

of insider trades, develop a comprehensive process for information management and disclosure, set a strict lockout period before news announcements and impose harsh punishments for rule violations. Ravina and Sapienza (2010) confirm that corporate governance can significantly affect the profitability of insider trades. Although insiders of companies with good corporate governance are not able to obtain significant abnormal returns, those of companies with poor corporate governance can obtain abnormal returns up to a level of 21%. Fidrmuc et al. (2006) find that the information content of executive trading for companies with external large shareholder oversight is less than that for companies with dispersed ownership.

In the Chinese A-share market, executive trading is dominated by sales. Executives' excessive sales can have a significant negative effect on stock prices and market confidence and can be detrimental to the interests of large shareholders. In addition, due to the historical low popularity of equity incentives, original executive holdings are normally low and large decreases in executive holdings decrease the congruence of interest between executives and shareholders, weakening large shareholders' control over executives and increasing agency conflicts. Therefore, large shareholders must control the decreases in executive holdings within an acceptable range.

The largest shareholders play a key oversight role in executive trading. In private-owned companies, the largest shareholders are more concerned about their own interests and stock prices, and are more willing and have a stronger ability to explicitly or implicitly control executives' excessive sales and illegal trading. This may constrain executives' freedom to exploit their information advantage when trading. Rather, due to investor phantoms and insider control, shareholders' oversight of executive trading is relatively weak in state-owned companies and thus self-interested executive trading is expected to be more serious than that in private-owned companies.

State-owned companies can be further separated into central and local state-owned companies. Despite the weak oversight of their large shareholders, central state-owned companies have a strong alternative administrative control over executives. Executives of central state-owned companies have the status of quasi-government officials. The appointment, promotion and demotion of these executives occur under a strict and opaque administrative control system and are not determined by the professional market of corporate executives. Character and integrity are important aspects of how executives are evaluated. Profitable executive trading may damage the reputation of political executives and their "clean" image, negatively affecting their evaluation by governmental organizations and thus their political futures. With this hidden but powerful administrative control, executives are likely to restrain their profitable trading activities. Chen et al. (2011) provide empirical evidence that supports this argument. They examine the executive stock options held by executives in large red-chip state-owned companies listed on the Hong Kong Stock Exchange (mainly central state-owned companies). They find that lucrative stock options are rarely exercised and state-owned executives give up the opportunity to profit legally from stock options. These executives face a number of "hidden rules." Because they are not only executives but also quasi-government officials, they must comply with a strict personnel system designed for "cadres." As a result, the quasi-government official role of these executives is expected to weaken their motive to trade for profit, forcing them to give up opportunities to use their information advantages (including their macro information advantage) when trading. This in turn decreases the predictive power of aggregate executive trading in central state-owned companies.

Several expectations arise. In local state-owned companies, especially those below the provincial level, executives are more akin to professional managers with fewer "hidden" administrative rules to follow. In addition, because large shareholder oversight of the management in this type of company is relatively weak, executive trading in local state-owned companies is higher than executive trading in private- and central state-owned companies. Executives in local state-owned companies are more likely to exploit their information advantage when trading, including their macro information advantage. Consequently, the aggregate trading of these executives has the highest predictive power.

Hypothesis 3 (*effect of corporate governance on executive trading predictability*). The executive trading of local state-owned companies has the highest predictive power due to ineffective large shareholder and administrative oversight of these executives. In contrast, the executive trading of central state-owned companies has the lowest predictive power, as the "quasi-official" status of these executives limits their motivation to profit from their information advantage.

Large shareholder trading is significantly affected by the ownership nature of the shareholders. There are significant differences among the large shareholders of state-owned versus private-owned companies in terms of interest orientation and operational involvement. These differences can significantly affect the motivation and ability of large shareholders who are trading for profit. Large shareholders of private-owned companies have a stronger motivation to benefit from trading in the secondary market. In contrast, large shareholders of state-owned companies cannot truly retain any profit gained from trading. Because the profits are delivered to the SASAC, the large shareholders' motivation to trade for profit is weaker than that of private-owned shareholders. In addition, because large shareholders of central state-owned companies have political objectives, they cannot focus only on profitability goals when trading. For example, during the 2008 financial crisis, large central state-owned listed companies actively responded to the call for maintaining financial market stability by increasing their holdings of listed companies. This type of "politically driven" purchase is not profit driven. The central government also requires state-owned shareholders to preserve their controlling holdings in strategically important industries and gradually phase out their holdings in non-strategic, competing industries. Therefore, large shareholders of state-owned companies cannot be completely free in their trading decisions. From the perspective of operational involvement, large shareholders of private-owned companies often serve as executive directors or have family members serve as executive directors and managers so that they can be actively involved in major strategic decisions and daily operations. In contrast, large shareholders of state-owned companies often delegate their control and decision-making authority to managers and indirectly acquire their information advantage from directors who are appointed to the companies. From both perspectives of profit motivation and operational involvement, large shareholders of private-owned companies have more incentives to time their trading and maximize returns based on their ability to predict future macroeconomic trends and identify systematic market value deviations.

Hypothesis 4 (*effect of corporate governance on trading predictability of large shareholders*). Due to the greater operational involvement and stronger profit motivation, trades made by large shareholders of private-owned companies have a higher predictive power than those made by large shareholders of state-owned companies.

4. Sample selection and descriptive statistics

4.1. Sample selection

From a macro perspective, this study examines the ability of aggregate insider trading to predict future market returns based on trading data taken from the Chinese A-share market during January 2007 to August 2011. We measure market returns based on the Shanghai Stock Exchange A-share Index. We obtained executive trading data from the Exchange website.¹ After removing executive transactions below 20,000 yuan and adding up multiple transactions made by the same executive on the same day, 9384 transactions remained in the final sample of executive transactions. Large shareholder trading data were taken from the Wind database. We began by manually coding the ownership nature of large shareholder transactions. We also differentiated controlling shareholders from other important shareholders. Controlling shareholders include the largest shareholder and ultimate owner, and other important shareholders include shareholders with more than a 5% stock ownership (non-controlling shareholders) and shareholders who are closely related to the controlling shareholder, even if they have less than 5% ownership. For the large shareholder transaction data, we deleted transactions through a block trading platform² and retained transactions through the secondary market. We

¹ Data are available on the Exchange's website under "Listed Company Creditability Records" and in the column titled "Directors, Supervisors and Managers Changes in Holdings of Company Shares."

² On April 20, 2008, the Commission issued its "Guidance on Transferring Lifted Restrictive Shares of Listed Company," which requires that certain lifted restrictive shares be traded through the stock exchange block trading system when the trading shares in a month are projected to be more than 1% of the total shares. The block trading platform system is different from the secondary market's centralized auction trading system. Membership is required to participate in the block trading platform system. The transaction time is limited to weekdays from 15:00 to 15:30. The participants are mostly institutions and large shareholders. A transaction application is required and the trading price is not included in the market index. Because only a few entities are involved, the block trading platform system is not active and lacks liquidity.

then deleted small transactions below 50,000 yuan and transactions with long trading periods (over 90 days from the transaction's start to end). There are 5553 shareholder transactions in the final sample. Due to the large difference in transaction scale, we examine the executive and shareholder trading samples separately.

4.2. Empirical model

We measure aggregate insider trading using the net purchase ratio (NPR). First, based on the month of the transaction, we combine all of the executive (large shareholder) buying and selling transactions conducted within the same month to obtain the total monthly purchases (BUY_k) and sales (SELL_k) amounts for the executives (large shareholder). Using the following formula, we then calculate the NPR:

$$\text{NPR}_t = \frac{\sum_{k=t-5}^t \text{BUY}_k - \sum_{k=t-5}^t \text{SELL}_k}{\sum_{k=t-5}^t \text{BUY}_k + \sum_{k=t-5}^t \text{SELL}_k} \quad (1)$$

NPR6 aggregates the insider trading activities performed over the past six months. It is a comprehensive macro-level indicator, calculated as the net of the buying and selling amount divided by the total amount of the two types of activities. NPR can be calculated for three, six or twelve months. We mainly provide the results for six months (NPR6). NPR6 is calculated for executives and large shareholders separately. According to our hypothesis, NPR6^{*i*} will be calculated for a specific subgroup of companies or subclass of insiders (*i*), such as NPR6-private, which is calculated using only the trading data from private-owned companies.

We use a model similar to that used by [Lakonishok and Lee \(2001\)](#). The model controls for the reversal feature of market returns over a long period to more accurately measure whether aggregate insider trading has incremental predictive power for future market returns. Our model also controls for the inertia feature of market returns within a short interval.

The model is equated as follows:

$$\text{FR}_6^i = \alpha + \beta \text{NPR}_t^i + \gamma \text{BR}_6^i + \delta \text{BR}_{12}^i + \varepsilon_t$$

$$\text{FR}_6^i = \prod_{k=t+1}^{t+6} (1 + R_k^i) - \prod_{k=t+1}^{t+6} (1 + R_k^f), \quad \text{BR}_6^i = \prod_{k=t-5}^t (1 + R_k^i) - 1, \quad \text{BR}_{12}^i = \prod_{k=t-11}^t (1 + R_k^i) - 1$$

where R_k^i is the return for group *i* in month *k*, calculated as the equally weighted average return for the group *i* companies in month *k*, and R_k^f is the central bank's one-year benchmark interest rate transferred into a monthly rate and serves as a proxy for the risk-free rate. *i* can measure the entire market or a specific subgroup of companies. FR6_{*t*} represents group *i*'s cumulative abnormal returns over the next six months. The future period can be three, nine or twelve months in duration (FR3, FR9 or FR12). This study shows the results for FR6.

BR6_{*t*} and BR12_{*t*} represent the abnormal returns for group *i* during the past six and twelve months, respectively. We use BR6_{*t*} to control for the market return inertia over the short term, and BR12_{*t*} to control for the market return reversal over the long term. NPR_{*t*}^{*i*} represents the aggregated net insider trading for group *i*.

Our insider trading data covers January 2007 to August 2011. Although there would normally be 56 NPR6_{*t*} observations, because data are missing from the FR6 and FR12 calculations, the actual number of observations in the final sample is less than 56.

4.3. Descriptive statistics

[Fig. 1](#) shows the relationship between the aggregate insider trading NPR6 and the Shanghai A-share Index trend during the sample period, and visually demonstrates that aggregate insider trading has the ability to time the market. NPR6 is calculated for both the executives and large shareholders for each month. As seen in [Fig. 1](#), the two lines representing NPR6-Executive and NPR6-Shareholder are almost parallel to each other, exhibiting similar trends. In addition, aggregate insider trading activities are inversely related to the market index. When the market index is low (high) in a month, NPR6 increases (decreases). For example, during September to December 2008, when the index drops to a historic low point of 2000, NPR6 for executives

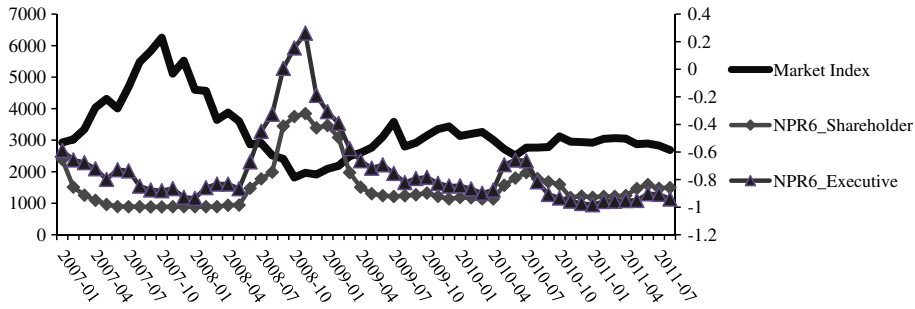


Figure 1. Aggregate insider trading NPR and the Shanghai A-share market index.

and large shareholders spikes. During the period of May to July 2010, when the index is at a localized low, NPR6 spikes again. In hindsight, we can see that insiders can successfully time the market when trading in most cases.

Fig. 2 presents the relationship between aggregate insider trading NPR6 and future market returns FR6. Net insider purchasing activities move in the same direction as future market returns consistently during the sample period. When NPR6 increases, there is a corresponding increase in FR6. On the contrary, when NPR6 is close to -1 , FR6 is mostly negative. Therefore, the NPR6 indicator can effectively predict future market returns.

As shown in Table 1, there are 6925 executive sales transactions worth a total of 25.525 billion yuan and 2459 executive purchase transactions worth a total of 1.153 billion yuan. The ratio of purchases to sales is 1:22.14. On average, the amount for each selling transaction is also much higher than that for each purchasing transaction. Therefore, executive sales are both much higher in terms of frequency and amount than purchases.

As shown in Table 2, there are 5048 large shareholder sales transactions worth a total of 259.4 billion yuan and only 505 purchase transactions worth a total of 16.27 billion yuan. The ratio of purchases to sales is 1:16.3. Furthermore, the amount for each sales transaction is higher than that for each purchase transaction. The prevalence of sales and the inactivity of purchases in the A-share market is due to the removal of restrictions on non-tradable shares.

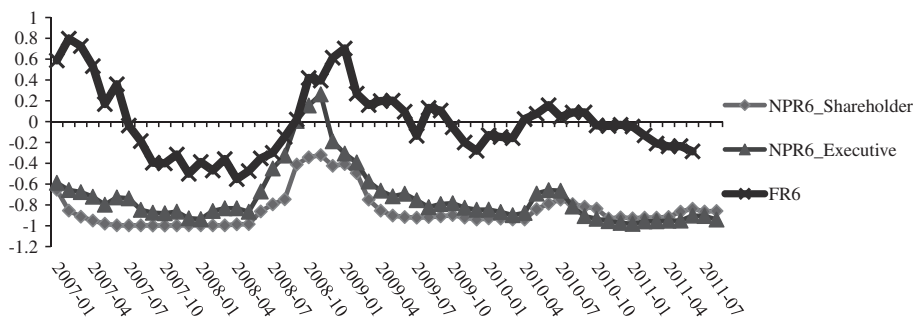


Figure 2. Aggregate insider trading NPR6 and future market returns FR6.

Table 1
Executive transaction analysis.

	Number of transactions	Amount of transactions (in 10,000 yuan)				Number of shares (in 10,000 yuan)			
		Total	Mean	Median	Std.	Total	Mean	Median	Std.
Sell	6925	2,552,541.50	368.60	46.07	1664.67	158,078.19	22.83	2.54	99.67
Buy	2459	115,301.84	46.89	10.55	255.05	9666.07	3.93	1.00	16.10

Table 2
Large shareholder transaction analysis.

	Number of transactions	Amount of transactions (in 10,000 yuan)				Number of shares (in 10,000 yuan)			
		Total	Mean	Median	Std.	Total	Mean	Median	Std.
Sell	5048	25,942,183.84	5139.10	2263.24	12245.41	2,099,230.67	415.85	200.00	910.54
Buy	505	1,627,165.94	3222.11	782.54	9211.89	195,252.42	386.64	100.15	1158.70

Note: Each large shareholder transaction announcement in the Wind database is counted as one transaction.

Table 3
Market returns and NPR analysis.

	Market returns					Aggregate executive trading		Aggregate shareholder trading	
	FR6	FR9	FR12	BR6	BR12	NPR3	NPR6	NPR3	NPR6
Mean	-0.005	-0.027	-0.072	0.117	0.329	-0.696	-0.718	-0.847	-0.848
Median	-0.040	-0.112	-0.075	0.072	0.070	-0.804	-0.818	-0.923	-0.916
Std.	0.332	0.390	0.370	0.408	0.779	0.357	0.276	0.204	0.179
Min.	-0.552	-0.636	-0.750	-0.531	-0.709	-0.994	-0.982	-1.000	-0.998
Max.	0.797	1.112	0.776	1.089	2.237	0.684	0.262	-0.153	-0.321

In Table 3, the mean and median of the future market returns are both negative and the standard deviation is large due to the sudden switch from a bull market to a bear market during 2007–2011 and the long bear market period since 2008. The means and medians of the aggregate executive and shareholder trades are all negative, indicating net sales for both types of insiders. The NPRs are more negative for shareholders than for executives, suggesting that net sales are relatively stronger for shareholders.

According to our hypothesis, NPR6 must be calculated for the subgroup of companies or subclass of insiders. As shown in Table 4, the mean and median of NPR6-Manager are less negative than that of NPR6-Director and NPR6-Supervisor, indicating that executive net sales are relatively weaker for managers. Table 4 also shows that the mean and median of NPR6-Private are more negative than those of NPR6-Local and NPR6-Central, indicating that executive net sales are stronger in private-owned companies. The mean and median of NPR6 are similar for the three different company sizes.

As reported in Table 5, the mean and median of NPR6-Important are more negative, indicating that the net selling tendency is stronger for important shareholders than for controlling shareholders. Table 5 also reports that the mean and median of NPR6-Private are more negative than those of NPR6-Local and NPR6-Central, indicating that the net sales of large shareholders are stronger in private-owned companies than in state-owned companies. The mean and median of NPR6 are similar for the three different company sizes.

Table 4
NPR for executive trading by executive type, ownership structure and company size.

	Executive type			Ownership structure			Company size		
	NPR6-Manager	NPR6-Director	NPR6-Supervisor	NPR6-Private	NPR6-Local	NPR6-Central	NPR6-Small	NPR6-Medium	NPR6-Large
Mean	-0.485	-0.753	-0.744	-0.765	-0.385	-0.434	-0.741	-0.690	-0.711
Median	-0.581	-0.893	-0.721	-0.813	-0.649	-0.491	-0.852	-0.770	-0.805
Std.	0.381	0.304	0.152	0.201	0.483	0.361	0.393	0.266	0.321
Min.	-0.968	-0.983	-0.991	-0.951	-0.946	-0.970	-0.997	-0.986	-0.976
Max.	0.665	0.358	-0.415	0.112	0.799	0.489	0.821	0.066	0.395

Note: NPR6-Manager is the net purchasing ratio for managers, calculated using only manager transaction data. NPR6-Director is the net purchasing ratio for directors. NPR6-Supervisor is the net purchasing ratio for supervisors. NPR6-Private is the net purchasing ratio for executives in private-owned companies. NPR6-Local is the net purchasing ratio for executives in local state-owned companies. NPR6-Central is the net purchasing ratio for executives in central state-owned companies. NPR6-Small is the net purchasing ratio for executives in small companies. NPR6-Medium is the net purchasing ratio for executives in medium-sized companies. NPR6-Large is the net purchasing ratio for executives in large companies. A company's size is determined by its market value (total shares * price per share) at the beginning of each year. The companies are then evenly divided into three groups (small, medium and large) depending on their size.

Table 5

NPR for shareholder trading by shareholder type, ownership structure and company size.

	Shareholder type		Ownership structure			Company size		
	NPR6-Control	NPR6-Important	NPR6-Private	NPR6-Local	NPR6-Central	NPR6-Small	NPR6-Medium	NPR6-Large
Mean	-0.705	-0.914	-0.935	-0.824	-0.764	-0.908	-0.894	-0.808
Median	-0.859	-0.945	-0.967	-0.876	-0.875	-0.942	-0.947	-0.889
Std.	0.424	0.086	0.091	0.173	0.302	0.131	0.127	0.224
Min.	-0.996	-1.000	-1.000	-1.000	-1.000	-1.000	-1.000	-1.000
Max.	0.526	-0.683	-0.622	-0.391	0.122	-0.334	-0.486	-0.168

Note: NPR6-Control is the net purchasing ratio for controlling shareholders. NPR6-Important is the net purchasing ratio for important shareholders. NPR6-Private is the net purchasing ratio for large shareholders in private-owned companies. NPR6-Local is the net purchasing ratio for large shareholders in local state-owned companies. NPR6-Central is the net purchasing ratio for large shareholders in central state-owned companies. NPR6-Small is the net purchasing ratio for large shareholders in small companies. NPR6-Medium is the net purchasing ratio for large shareholders in medium-sized companies. NPR6-Large is the net purchasing ratio for large shareholders in large companies.

5. Empirical results

5.1. The information content of aggregate insider trading

Tables 6 and 7 examine the predictive power of aggregate executive trading for future market returns. Table 6 does not control for historical market returns BR6 and BR12, and Table 7 does. In Table 6, NPR6 explains 25% of FR6 and 58.4% of FR12. As such, aggregate executive trading exhibits fairly good predictive power for future market returns. In Table 7, after controlling for BR6 and BR12, NPR3 and NPR6 continue to provide significant incremental explanatory power of future market returns, indicating that executives use their macro information advantage to time the market. When comparing the results of NPR3 and NPR6, we can see that the t statistics and Adj- R^2 values are higher for NPR6 than NPR3. Therefore, aggregation over the longer term increases the predictability of insider trading.

Furthermore, according to Table 7, as the forecast period is extended from three to twelve months, the predictability of NPR increases, which is reflected in the increasing NPR t statistics and Adj- R^2 values. It is worth mentioning that the NPR6 model explains 66.9% of FR12. The coefficients of BR6 are significantly positive in all of the models, consistent with the short-term market inertia explanation. All of the BR12 coefficients are significantly negative, consistent with the long-term market reversal explanation.

Tables 8 and 9 exhibit the power of aggregate shareholder trading to predict future market returns. Regardless of whether BR6 and BR12 are controlled for, the NPR coefficients are consistently significantly positive in all of the models, indicating that aggregate shareholder trading has a significant ability to predict future mar-

Table 6

Aggregate executive trading and future market returns without controlling for BR6 and BR12.

	(1) FR3	(2) FR6	(3) FR9	(4) FR12	(5) FR3	(6) FR6	(7) FR9	(8) FR12
Intercept	0.0175 (0.28)	0.173* (1.79)	0.338** (3.28)	0.323** (3.56)	0.146* (1.90)	0.440** (3.99)	0.631*** (5.57)	0.631*** (6.82)
NPR3	0.0187 (0.23)	0.256** (2.07)	0.534*** (4.01)	0.593*** (4.96)				
NPR6					0.197* (1.97)	0.619*** (4.32)	0.932*** (6.24)	1.020*** (8.19)
Adj. R^2	-0.018	0.058	0.231	0.334	0.052	0.250	0.431	0.584
F	0.05	4.27	16.04	24.62	3.90	18.67	38.93	67.06
N	54	54	51	48	54	54	51	48

* Significance at the level of 10% or less.

** Significance at the level of 5% or less.

*** Significance at the level of 1% or less.

Table 7
Aggregate executive trading and future market returns controlling for BR6 and BR12.

	(1) FR3	(2) FR6	(3) FR9	(4) FR12	(5) FR3	(6) FR6	(7) FR9	(8) FR12
Intercept	0.0772 (1.32)	0.274*** (3.19)	0.415*** (4.40)	0.317*** (3.81)	0.202*** (2.94)	0.521*** (5.65)	0.675*** (6.56)	0.579*** (6.68)
NPR3	0.115 (1.42)	0.403 *** (3.39)	0.623 *** (4.68)	0.484 *** (4.00)				
NPR6					0.295 *** (3.11)	0.750 *** (5.90)	0.986 *** (6.79)	0.873 *** (6.89)
BR6	0.385*** (3.74)	0.716*** (4.74)	0.679*** (4.10)	0.377** (2.58)	0.375*** (3.99)	0.659*** (5.25)	0.579*** (4.16)	0.294** (2.54)
BR12	-0.115** (-2.16)	-0.249*** (-3.21)	-0.295*** (-3.47)	-0.311*** (-4.07)	-0.090* (-1.79)	-0.195*** (-2.90)	-0.230*** (-3.08)	-0.236*** (-3.71)
Adj. R ²	0.181	0.326	0.414	0.496	0.286	0.511	0.567	0.669
F	4.91	9.54	12.79	16.44	8.08	19.47	22.81	32.72
N	54	54	51	48	54	54	51	48

Note: The dependent variable FR3 (FR6, FR9, FR12) represents the three-month-ahead (six-month-ahead, nine-month-ahead, twelve-month-ahead) cumulative abnormal return of the Shanghai Stock Exchange Composite Index. The independent variable NPR3 (NPR6) is the net purchasing ratio for executives over the past three (six) months. The control variables BR6 and BR12 represent the cumulative abnormal market returns for the past six and twelve months, respectively. The *t* values of the coefficients are included in parentheses.

* Significance at the level of 10% or less.

** Significance at the level of 5% or less.

*** Significance at the level of 1% or less.

Table 8
Aggregate shareholder trading and future market returns without controlling for BR6 and BR12.

	(1) FR3	(2) FR6	(3) FR9	(4) FR12	(5) FR3	(6) FR6	(7) FR9	(8) FR12
Intercept	0.0211 (0.17)	0.368* (1.94)	0.754*** (3.75)	0.908*** (5.63)	0.307** (2.34)	0.865*** (4.64)	1.291*** (7.22)	1.307*** (9.52)
NPR3	0.0196 (0.14)	0.440 ** (2.03)	0.923 *** (4.00)	1.162 *** (6.27)				
NPR6					0.357 ** (2.35)	1.025 *** (4.77)	1.556 *** (7.54)	1.637 *** (10.28)
Adj. R ²	-0.019	0.055	0.230	0.449	0.079	0.291	0.528	0.690
F	0.02	4.10	15.97	39.26	5.55	22.77	56.84	105.75
N	54	54	51	48	54	54	51	48

* Significance at the level of 10% or less.

** Significance at the level of 5% or less.

*** Significance at the level of 1% or less.

ket returns. Furthermore, the predictability of NPR increases as the forecast period is extended (from three to twelve months). The NPR6 model explains almost 73% of the variation in FR12, suggesting that aggregate large shareholder trading has a strong ability to predict future market returns.

The findings shown in Tables 8 and 9 differ from prior empirical evidence identified for the U.S. market. Literature focusing on the U.S. market has unanimously found that large shareholder transactions have low information content, mainly because ownership is more dispersed and the holdings of large shareholders are generally low in the U.S. market. Large shareholders are usually not involved in business operations, but rely on compensation contracts, the corporate management job market, independent directors and other means to indirectly control management. As such, they are mostly passive shareholders and have a much weaker information advantage than executives. However, due to the lack of investor protection in the Chinese A-share market, concentrated ownership is an alternative for shareholders' self-protection. Furthermore, due to the imperfections that corporate managers and independent directors face in the job market and other

Table 9

Aggregate shareholder trading and future market returns controlling for BR6 and BR12.

	(1) FR3	(2) FR6	(3) FR9	(4) FR12	(5) FR3	(6) FR6	(7) FR9	(8) FR12
Intercept	0.221* (1.71)	0.720*** (3.85)	1.017*** (4.87)	0.888*** (5.16)	0.517*** (4.12)	1.186*** (7.42)	1.510*** (8.88)	1.233*** (8.18)
NPR3	0.272* (1.72)	0.878*** (3.85)	1.241*** (4.85)	1.087*** (5.12)				
NPR6					0.637*** (4.17)	1.451*** (7.45)	1.847*** (8.89)	1.520*** (8.16)
BR6	0.402*** (3.88)	0.761*** (5.10)	0.722*** (4.35)	0.440*** (3.22)	0.370*** (4.20)	0.642*** (5.71)	0.549*** (4.61)	0.274** (2.60)
BR12	-0.102* (-1.91)	-0.211*** (-2.74)	-0.246*** (-2.87)	-0.268*** (-3.73)	-0.0474 (-0.96)	-0.106* (-1.68)	-0.122* (-1.81)	-0.162** (-2.66)
Adj. R ²	0.196	0.360	0.428	0.569	0.368	0.607	0.680	0.727
F	5.29	10.95	13.47	21.71	11.28	28.30	36.39	42.67
N	54	54	51	48	54	54	51	48

Note: FR3 (FR6, FR9, FR12) is the three-month-ahead (six-month-ahead, nine-month-ahead, twelve-month-ahead) cumulative abnormal return of the Shanghai Stock Exchange Composite Index. NPR3 (NPR6) is the net purchasing ratio for large shareholders over the past three (six) months. BR6 and BR12 represent cumulative abnormal market returns for the past six and twelve months, respectively. The *t* values of the coefficients are included in parentheses.

* Significance at the level of 10% or less.

** Significance at the level of 5% or less.

*** Significance at the level of 1% or less.

governance mechanisms, large shareholders are usually more actively involved in strategic decisions and operations. This allows them to ensure that they have a firm grasp of the control rights so that other shareholders or managers do not harm their interests. These large shareholders have both the ability and willingness to obtain access to information. In particular, the largest shareholder often plays a central role in corporate governance, as he or she can appoint board members and managers. Therefore, his or her trading should have relatively high information content.

In Fig. 3, we use the estimated coefficients of the NPR6 model (including BR6 and BR12) to calculate the predicted FR6 for each month and then compare the predicted FR6 curve with the corresponding actual FR6 curve. As shown in Fig. 3, the predicted FR6 values based on both the executive and large shareholder models match closely with the actual FR6 value. The results suggest that the predictability of aggregate insider trading is very high.

5.2. Empirical tests of the direction of trade

To further determine whether buying or selling has more predictive power, we divide the transactions into “buy” and “sell” and replace the NPR with LNBUY6 and LNSELL6, as shown in Table 10. Because the

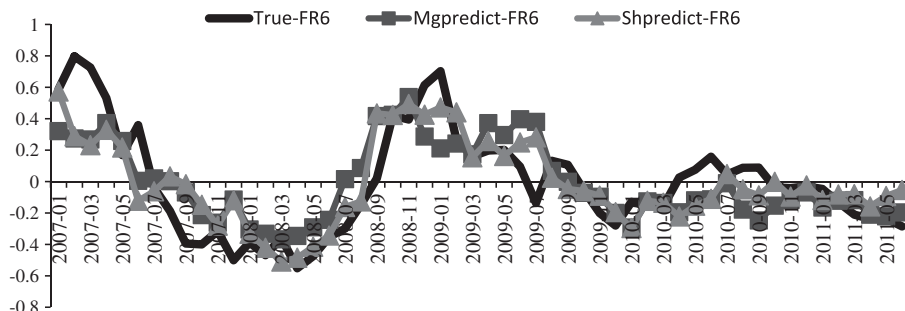


Figure 3. Comparison of actual and projected future market returns. Note: True-FR6: the actual FR6 (six-month-ahead market returns). Mgpredict-FR6: predicted FR6 (six-month-ahead market returns) using the executive NPR6 model. Shpredict-FR6: predicted FR6 (six-month-ahead market returns) using the large shareholder NPR6 model.

Table 10
Predictive power by trading direction for the executive sample.

	(1) FR6	(2) FR6	(3) FR6	(4) FR6
Intercept	−1.003 (−0.82)	1.864*** (2.91)	−0.0918 (−0.07)	2.159*** (3.93)
LNBUY6	0.0548 (0.82)		0.0059 (0.09)	
LNSELL6		−0.0917*** (−2.92)		−0.105*** (−3.91)
BR6			0.597*** (3.61)	0.659*** (4.59)
BR12			−0.275*** (−2.96)	−0.305*** (−4.06)
Adj. R²	−0.006	0.125	0.171	0.365
<i>F</i>	0.67	8.55	4.63	11.14
<i>N</i>	54	54	54	54
Model		(1) vs. (2)		(3) vs. (4)
Vuong <i>Z</i>		−2.328**		−2.470**
<i>p</i> -Value		0.020		0.014

Note: LNBUY6 (LNSELL6) is the natural logarithm of the total amount of executives' buying (selling) transactions over the past six months. The Vuong test examines the significance of the differences in terms of the Adj. *R*² value.

* Significance at the level of 10% or less.

** Significance at the level of 5% or less.

*** Significance at the level of 1% or less.

original yuan amount of the purchase and sales transactions for each month varies widely, we use the natural logarithm of the yuan amount.

$$\text{LNBUY6}_t = \text{LN} \left(\sum_{k=t-5}^t \text{BUY}_k \right), \quad \text{LNSELL6}_t = \text{LN} \left(\sum_{k=t-5}^t \text{SELL}_k \right)$$

Table 10 compares the executives' purchases and sales. The coefficients of LNSELL6 are significant in both models 2 and 4, with or without BR6 and BR12. In contrast, the coefficients of LNBUY6 are not significant in models 1 and 3. Next, we use the Vuong test (1989) to examine the significance of the differences in *R*² values. The results suggest that aggregate executive selling activities have more predictive power than buying activities. These findings are different from prior studies that use U.S. market data. Prior studies of the U.S. market have consistently found that executive buying has more information content than selling. In the U.S., equity incentives are often the largest components of executive compensation. Executives often decrease their holdings for liquidity or diversification reasons, which dilutes the information content of selling. In contrast, their buying is usually driven by private information and has high information content. However, executives in the Chinese A-share market do not have equivalent equity incentives like their counterparts in the United States. Executive holdings are also often very low,³ so selling is more likely to be based on an information advantage. In contrast, executive buying is sparse and often occurs for diverse reasons. For example, executives may increase their holdings for political reasons,⁴ to increase the stock price shortly before a seasoned equity offering⁵ or because doing so is mandated by equity incentive plans.⁶ These types of purchases undoubtedly dilute the information content of executive buying (Zhu et al., 2011a,b).

³ The average stock ownership of board directors, executives and supervisors in companies listed on the Shenzhen Stock Exchange was only 0.06% in 2008.

⁴ For example, during the 2008 financial crisis, large central state-owned listed companies actively responded to the call to maintain financial market stability by increasing their insider holdings of listed companies.

⁵ Companies may want to take advantage of market participants who follow executive purchases to increase their holdings and therefore the stock price shortly before a seasoned equity offering.

⁶ Executive equity incentive programs sometimes mandate that annual bonuses be used to purchase a company's stock.

Table 11 compares the large shareholders' purchases and sales. Although the coefficients of the large shareholder LNBUY6 are significant and the Adj- R^2 values of models 1 and 3 are not low, the higher coefficients of LNSELL6 and the higher Adj- R^2 values in the LNSELL6 models suggest that large shareholder selling has a much stronger predictive power than buying. Large shareholders and especially those in central state-owned companies may respond to political calls to increase their holdings during an economic crisis or in strategically important industries. Large shareholders may also increase their holdings during a control rights competition. These non-information-driven buying activities dilute the information content of aggregate shareholder buying.

5.3. The effect of an information hierarchy on the predictive power of insider trading

Executives can be divided into three categories: managers, directors and supervisors. Each of these categories has a different position on the information hierarchy. As shown in Table 12, based on the results of the Vuong tests and the significance of the coefficients, regardless of whether BR6 and BR12 are controlled for, managers have the strongest trading predictability, followed by directors and then supervisors. These findings coincide with the order of the executive information hierarchy discussed earlier. Involvement in business operations and the information hierarchy significantly affect the predictive power of insider trading. This finding strongly supports the argument that insider trading is beyond simple contrarian trading and is stronger mainly due to the macro information advantage insiders have based on their operational involvement.

We now divide large shareholders into two categories: controlling and important shareholders. These two categories have different positions on the information hierarchy. Small shareholders with less than 5% ownership and no relation to the largest shareholders as a benchmark are also included, as they normally do not have an information advantage (see Table 13).

Regardless of whether BR6 and BR12 are controlled for, the predictability of controlling shareholder trading is significantly stronger than that of important shareholder trading. When BR6 and BR12 are not controlled for, the Adj. R^2 value of the important shareholder model is only 6.2%, and that of the controlling shareholder model is 35.5%. Because NPR6-Smallsh is not significant, small shareholders' trading activities have no information content. The descending predictive power of trading belonging to controlling, important

Table 11
Predictive power by trading direction for the large shareholder sample.

	(1) FR6	(2) FR6	(3) FR6	(4) FR6
Intercept	-1.114*** (-3.45)	7.170*** (7.09)	-1.896*** (-3.91)	6.802*** (7.52)
LNBUY6	0.0979*** (3.46)		0.162*** (3.96)	
LNSELL6		-0.489*** (-7.10)		-0.464*** (-7.51)
BR6			0.368** (2.39)	0.482*** (4.27)
BR12			0.0477 (0.43)	-0.170*** (-2.81)
Adj. R^2	0.172	0.482	0.368	0.610
F	12.00	50.39	11.31	28.64
N	54	54	54	54
Model		(1) vs. (2)		(3) vs. (4)
Vuong Z		-2.210**		-2.725***
p-Value		0.027		0.006

Note: LNBUY6 (LNSELL6) is the natural logarithm of the total amount of large shareholder purchases (sales) over the past six months.

* Significance at the level of 10% or less.

** Significance at the level of 5% or less.

*** Significance at the level of 1% or less.

Table 12
Predictive power of trading by executive type.

	(1) FR6	(2) FR6	(3) FR6	(4) FR6	(5) FR6	(6) FR6
Intercept	0.251 ^{***} (4.24)	0.381 ^{***} (3.52)	−0.0647 (−0.28)	0.276 ^{***} (5.88)	0.464 ^{***} (4.98)	0.374 (1.56)
NPR6_Manager	0.527^{***} (5.48)			0.568^{***} (7.37)		
NPR6_Director		0.513^{***} (3.84)			0.642^{***} (5.22)	
NPR6_Supervisor			−0.0802 (−0.26)			0.466 (1.52)
BR6				0.663 ^{***} (5.86)	0.654 ^{***} (4.97)	0.705 ^{***} (4.05)
BR12				−0.254 ^{***} (−4.29)	−0.189 ^{**} (−2.67)	−0.349 ^{***} (−3.65)
Adj. R²	0.354	0.206	−0.018	0.603	0.463	0.207
<i>F</i>	30.07	14.74	0.07	27.80	16.22	5.61
<i>N</i>	54	54	54	54	54	54
Model	(1) vs. (2)	(2) vs. (3)	(1) vs. (3)	(4) vs. (5)	(5) vs. (6)	(4) vs. (6)
Vuong <i>Z</i>	1.320	2.359 ^{**}	3.043 ^{***}	1.940 [*]	2.814 ^{***}	4.134 ^{***}
<i>p</i> -Value	0.187	0.018	0.002	0.052	0.005	0.000

Note: NPR6-Manager is the net purchasing ratio for managers. NPR6-Director is the net purchasing ratio for directors. NPR6-Supervisor is the net purchasing ratio for supervisors. FR6 is the dependent variable. The Vuong tests examine the significance of the differences in Adj. *R*² values.

* Significance at the level of 10% or less.

** Significance at the level of 5% or less.

*** Significance at the level of 1% or less.

Table 13
Predictive power of trading by shareholder type.

	(1) FR6	(2) FR6	(3) FR6	(4) FR6	(5) FR6	(6) FR6
Intercept	0.329 ^{***} (4.65)	0.987 ^{**} (2.10)	0.0730 (0.73)	0.358 ^{***} (6.05)	1.903 ^{***} (3.85)	0.0978 (1.00)
NPR6-Control	0.474^{***} (5.49)			0.554^{***} (6.88)		
NPR6-Important		1.086^{**} (2.12)			2.114^{***} (3.83)	
NPR6-Smallsh			0.125 (0.88)			0.149 (0.94)
BR6				0.538 ^{***} (4.59)	0.735 ^{***} (4.98)	0.607 ^{***} (3.75)
BR12				−0.106 (−1.61)	−0.190 ^{**} (−2.42)	−0.245 ^{**} (−2.67)
Adj. R²	0.355	0.062	−0.004	0.574	0.358	0.185
<i>F</i>	30.16	4.50	0.77	24.80	10.87	5.01
<i>N</i>	54	54	54	54	54	54
Model	(1) vs. (2)	(1) vs. (3)	(2) vs. (3)	(4) vs. (5)	(4) vs. (6)	(5) vs. (6)
Vuong <i>Z</i>	2.592 ^{***}	2.873 ^{***}	1.438	1.771 [*]	3.524 ^{***}	2.103 ^{**}
<i>p</i> -Value	0.010	0.004	0.150	0.077	0.000	0.036

Note: NPR6-Control is the net purchasing ratio for controlling shareholders. NPR6-Important is the net purchasing ratio for important shareholders. NPR6-Smallsh is the net purchasing ratio for small shareholders (less than 5% ownership and no relation to the largest shareholder). The Vuong tests examine the significance of the differences in Adj. *R*² values.

* Significance at the level of 10% or less.

** Significance at the level of 5% or less.

*** Significance at the level of 1% or less.

and small shareholders coincides with the order of the shareholders' information hierarchy. This finding further validates the argument that the predictability of insider trading is a result of the insiders' macro information advantage.

5.4. Effect of corporate governance on the predictive power of insider trading

To investigate the effect of corporate governance on executive trading, we divide companies into three categories: private-, local state- and central state-owned. As shown in Table 14, based on the significance of the coefficients and the Vuong tests of the Adj. R^2 values, the predictive power of executive trading is the weakest for central state-owned companies. Furthermore, it is slightly higher for local state-owned companies than for private-owned companies, but the difference is not significant. Table 15 exhibits the results of a sensitivity test where the NPR ratio is calculated using the number of transactions instead of the amount of yuan. The regression results are consistent with those shown in Table 14.

The preceding findings are partly consistent with Hypothesis 3. As expected in Hypothesis 3, given the hidden but strong administrative control, the executives in central state-owned companies are restrained from trading for profit. The "quasi-official" status of these executives weakens their profit motivation, forcing them to give up opportunities to profit from their macro information advantage. This explains the relatively low predictive power of aggregate trading by this type of executive.

The predictive power of executive trading between local state- and private-owned companies is not significantly different. Because trading based on macro information advantage would not harm the interests of large shareholders as seriously as trading based on company-level private information, large shareholders do not monitor it, even in private-owned companies. Therefore the difference in shareholder oversight between local state-owned companies and private-owned companies has no significant effect on executive trading based on a macro information advantage and the predictability of executive trading. However, as reported by Fidrmuc

Table 14
Effect of corporate governance on the predictive power of executive trading.

	(1) FR6-Private	(2) FR6-Local	(3) FR6-Central	(4) FR6-Private	(5) FR6-Local	(6) FR6-Central
Intercept	0.990 ^{***} (7.09)	0.307 ^{***} (6.19)	0.341 ^{***} (4.44)	0.987 ^{***} (7.08)	0.269 ^{***} (6.02)	0.397 ^{***} (5.27)
NPR6-Private	1.124^{**} (6.53)			1.151^{***} (6.21)		
NPR6-Local		0.586^{***} (6.93)			0.753^{***} (8.42)	
NPR6-Central			0.429^{***} (4.14)			0.483^{***} (4.97)
BR6-Portfolio				0.205 [*] (1.90)	0.293 ^{***} (3.15)	0.404 ^{***} (3.30)
BR12-Portfolio				-0.0464 (-0.70)	0.0343 (0.58)	-0.195 ^{***} (-3.00)
Adj. R^2	0.440	0.470	0.233	0.461	0.600	0.356
<i>F</i>	42.70	48.03	17.10	16.12	27.53	10.77
<i>N</i>	54	54	54	54	54	54
Model	(2) vs. (1)	(2) vs. (3)	(1) vs. (3)	(5) vs. (4)	(5) vs. (6)	(4) vs. (6)
Vuong <i>Z</i>	0.725	2.646 ^{***}	1.738 [*]	1.466	2.121 ^{**}	1.662 [*]
<i>p</i> -Value	0.469	0.008	0.082	0.143	0.034	0.097

Note: NPR6-Private is the net purchasing ratio for executives in private-owned companies. NPR6-Local is the net purchasing ratio for executives in local state-owned companies. NPR6-Central is the net purchasing ratio for executives in central state-owned companies. BR6-Portfolio and BR12-Portfolio correspond with the historical return of the company group. For example, when the dependent variable is FR6-Private, the BR6-Portfolio is BR6-private. The Vuong tests examine the significance of the differences in Adj. R^2 values.

* Significance at the level of 10% or less.

** Significance at the level of 5% or less.

*** Significance at the level of 1% or less.

Table 15
Effect of corporate governance on the predictive power of executive trading (sensitivity test).

	(1) FR6-Private	(2) FR6-Local	(3) FR6-Central	(4) FR6-Private	(5) FR6-Local	(6) FR6-Central
Intercept	0.492 ^{***} (4.89)	0.176 ^{***} (3.60)	0.139 ^{**} (2.25)	0.544 ^{***} (5.72)	0.116 ^{**} (2.28)	0.214 ^{***} (3.34)
TRNPR6-Private	0.700^{***} (4.23)			0.830^{***} (4.76)		
TRNPR6-Local		0.622^{***} (4.70)			0.897^{***} (5.85)	
TRNPR6-Central			0.234 (1.55)			0.540^{***} (3.22)
BR6-Portfolio				0.388 ^{***} (3.16)	0.378 ^{***} (3.33)	0.571 ^{***} (3.56)
BR12-Portfolio				-0.131 [*] (-1.86)	-0.00702 (-0.10)	-0.238 ^{***} (-3.16)
Adj. R²	0.242	0.285	0.026	0.343	0.426	0.203
<i>F</i>	17.91	22.12	2.39	10.21	14.13	5.50
<i>N</i>	54	54	54	54	54	54
Model	(2) vs. (1)	(1) vs. (3)	(2) vs. (3)	(5) vs. (4)	(5) vs. (6)	(4) vs. (6)
Vuong <i>Z</i>	0.869	1.797 [*]	1.925 [*]	1.4127	1.850 [*]	1.127
<i>p</i> -Value	0.385	0.072	0.054	0.158	0.064	0.260

Note: TRNPR6 is a net purchasing ratio measure similar to NPR6, except it is calculated based on the number of transactions instead of the amount of yuan. It is equal to the net purchase transactions within the past six months divided by the total transactions in the same six months.

* Significance at the level of 10% or less.

** Significance at the level of 5% or less.

*** Significance at the level of 1% or less.

et al. (2006), the difference in large shareholder oversight may affect executive trading based on company-level insider information. When there is strong large-shareholder oversight, the profitability of executive trading is lower than that for executives in companies with dispersed ownership.

Table 16 examines the effect of corporate governance on large shareholder trading. The predictive power of large shareholder trading in private-owned companies is strongest when historical returns are not controlled for. As shown in model 1, when the NPR6-Private is used to predict FR6, the model can explain 54.4% of the portfolio returns. In contrast, the NPR6-Local model (2) and the NPR6-Central model (3) explain only 18.3% and 34.4% of the variation in the portfolio returns, respectively. When historical returns are controlled for, the NPR6-Private model (4) still has higher explanatory power than the NPR6-Local model (5). However, there is no significant difference in the Adj. R^2 values between the NPR6-Private model (4) and the NPR6-Central model (6), partially due to the increased explanation power of BR6 in the NPR6-Central model (6). These findings are consistent with Hypothesis 4. Because large shareholders in private-owned companies have stronger profit motivations and active roles in business operations, the information content of their trading is significantly higher than that of large shareholders in state-owned companies.

5.5. Effect of company size on the predictive power of insider trading

Several studies examine the effect of company size on the information content of insider trading (Seyhun, 1992; Lakonishok and Lee, 2001). To be consistent with those studies, we examine the size effect and the results are shown in Tables 17 and 18.

The predictive power of large company executive trading is significantly lower than that of small- and medium-sized companies. This finding is consistent with the prior literature. Because large companies tend to offer more public disclosures and can attract more attention from the public and professional investors, the chance of their stock being mispriced is smaller. As a result, executives in large companies have less private information and fewer mispricing opportunities. In addition, the literature consistently finds that the executive trading

Table 16
Effect of corporate governance on the predictive power of large shareholder trading.

	(1) FR6-Private	(2) FR6-Local	(3) FR6-Central	(4) FR6-Private	(5) FR6-Local	(6) FR6-Central
Intercept	3.337 ^{***} (8.28)	0.961 ^{***} (3.94)	0.687 ^{***} (5.74)	3.533 ^{***} (8.54)	1.092 ^{***} (3.95)	0.837 ^{***} (7.73)
NPR6-Private	3.437^{***} (8.01)			3.697^{***} (8.15)		
NPR6-Local		1.041^{***} (3.59)			1.256^{***} (3.50)	
NPR6-Central			0.781^{***} (5.36)			1.093^{***} (7.19)
BR6-Portfolio				0.226 ^{**} (2.40)	0.251 [*] (1.93)	0.433 ^{***} (4.12)
BR12-Portfolio				−0.0201 (−0.34)	−0.0283 (−0.33)	−0.0258 (−0.43)
Adj. R²	0.544	0.183	0.344	0.590	0.224	0.527
<i>F</i>	64.18	12.86	28.74	26.38	6.09	20.70
<i>N</i>	54	54	54	54	54	54
Model	(1) vs. (2)	(2) vs. (3)	(1) vs. (3)	(4) vs. (5)	(5) vs. (6)	(4) vs. (6)
Vuong <i>Z</i>	2.990 ^{***}	−1.500	1.904 [*]	2.713 ^{***}	−2.041 ^{**}	0.127
<i>p</i> -Value	0.003	0.134	0.057	0.007	0.041	0.899

Note: NPR6-Private is the net purchasing ratio for large shareholders in private-owned companies. NPR6-Local is the net purchasing ratio for large shareholders in local state-owned companies. NPR6-Central is the net purchasing ratio for large shareholders in central state-owned companies. BR6-Portfolio and BR12-Portfolio correspond with the historical return of the company group. The Vuong tests examine the significance of the differences in Adj. *R*² values.

* Significance at the level of 10% or less.

** Significance at the level of 5% or less.

*** Significance at the level of 1% or less.

Table 17
Effect of company size on the predictive power of executive trading.

	(1) FR6-Small	(2) FR6-Medium	(3) FR6-Large	(4) FR6-Small	(5) FR6-Medium	(6) FR6-Large
Intercept	0.649 ^{***} (7.96)	0.917 ^{***} (8.91)	0.437 ^{***} (3.30)	0.653 ^{***} (8.44)	0.907 ^{***} (8.69)	0.526 ^{***} (4.27)
NPR6-Small	0.764^{***} (7.85)			0.795^{***} (7.93)		
NPR6-Medium		1.167^{***} (8.37)			1.186^{***} (7.85)	
NPR6-Large			0.446^{**} (2.62)			0.639^{***} (3.59)
BR6-Portfolio				0.267 ^{***} (2.71)	0.116 (1.22)	0.493 ^{***} (3.60)
BR12-Portfolio				−0.0756 (−1.19)	−0.0127 (−0.21)	−0.129 [*] (−1.89)
Adj. R²	0.538	0.566	0.100	0.584	0.566	0.260
<i>F</i>	61.61	70.11	6.87	25.36	24.07	7.21
<i>N</i>	53	54	54	53	54	54
Model	(1) vs. (2)	(2) vs. (3)	(1) vs. (3)	(4) vs. (5)	(5) vs. (6)	(4) vs. (6)
Vuong <i>Z</i>	−0.342	4.015 ^{***}	4.254 ^{***}	0.626	2.569 ^{**}	2.839 ^{***}
<i>p</i> -Value	0.732	0.0001	0.000	0.532	0.010	0.005

Note: NPR6-Small, NPR6-Medium and NPR6-Large are the net purchasing ratios of executive trading for small, medium-sized and large companies, respectively. Company size is determined by the market value at the beginning of the year. BR6-Portfolio and BR12-Portfolio correspond with the historical returns of the company group. The Vuong tests examine the significance of the differences in Adj. *R*² values.

* Significance at the level of 10% or less.

** Significance at the level of 5% or less.

*** Significance at the level of 1% or less.

Table 18
Effect of company size on the predictive power of large shareholder trading.

	(1) FR6-Small	(2) FR6-Medium	(3) FR6-Large	(4) FR6-Small	(5) FR6-Medium	(6) FR6-Large
Intercept	1.719 ^{***} (5.34)	2.142 ^{***} (7.03)	0.890 ^{***} (4.55)	1.803 ^{***} (5.74)	2.471 ^{***} (7.34)	1.320 ^{***} (6.76)
NPR6-Small	1.792^{***} (5.11)			1.800^{***} (5.32)		
NPR6-Medium		2.257^{***} (6.73)			2.709^{***} (6.91)	
NPR6-Large			1.098^{***} (4.07)			1.947^{***} (6.26)
BR6-Portfolio				0.0936 (0.78)	0.151 (1.49)	0.434 ^{***} (3.88)
BR12-Portfolio				-0.194 ^{***} (-2.64)	0.0633 (0.90)	0.0462 (0.69)
Adj. R²	0.322	0.455	0.227	0.397	0.505	0.478
<i>F</i>	26.14	45.27	16.55	12.64	19.00	17.16
<i>N</i>	54	54	54	54	54	54
Model	(1) vs. (2)	(2) vs. (3)	(1) vs. (3)	(4) vs. (5)	(5) vs. (6)	(4) vs. (6)
Vuong <i>Z</i>	-0.854	2.350 ^{**}	1.624	-0.941	0.487	-0.254
<i>p</i> -Value	0.393	0.019	0.104	0.347	0.627	0.800

Note: NPR6-Small, NPR6-Medium and NPR6-Large are the net purchasing ratios of large shareholder trading for small, medium-sized and large companies, respectively. BR6-Portfolio and BR12-Portfolio correspond with the historical returns of the company group. The Vuong tests examine the significance of the differences in Adj. R^2 values.

* Significance at the level of 10% or less.

** Significance at the level of 5% or less.

*** Significance at the level of 1% or less.

of large companies, which may be subject to more rigorous monitoring, has less information content than that of small companies.

Without controlling for historical returns, the predictive power of large shareholder trading in large companies is significantly smaller than that of medium-sized companies. When BR6 and BR12 are controlled for, company size has no effect on the predictive power of shareholder trading. Thus, the effect of company size is more noticeable in executive trading than in shareholder trading.

We conduct a variety of sensitivity tests. First, we use the number of shares traded and the number of transactions as alternative measures to the amount of yuan in calculating the NPR index, and the conclusions stay the same. Second, we use FR9 and FR12 as alternative dependent variables, and the empirical results are consistent with the use of FR6. Third, given the significant differences in turnover, company size and listing history between the main board, small-cap and growth enterprise markets, we remove the small-cap and growth enterprise markets, leaving only the main board market, and find that all of the regression results are robust. We use another method to consider the effects of different markets on the results. We use the small-cap market index to calculate the future and prior market returns, and find that insider trading in companies listed on the small-cap and growth enterprise markets also has strong predictability for future small-cap market returns. Fourth, Zhang and Zeng (2011) find that the relatives of executives can serve as an alternate and implicit insider trading method to avoid strict monitoring and that relative trading has a similar timing ability. We conduct a sensitivity test by using NPR6-Relatives in the models and find that relative trading cannot predict future market returns. Although relatives do not seem to have a macroeconomic information advantage, their information advantage may be limited to the company level.

6. Conclusions

Using Chinese A-share market data taken from January 2007 to August 2011, we examine the predictive power of aggregate insider trading on future market returns from a macro perspective. We find that after

controlling for the contrarian investment strategy, aggregate executive (large shareholder) trading from the prior six months predicts 66% (72.7%) of market returns twelve months in advance. The predictive power is caused by insiders' information advantage in predicting macroeconomic trends and detecting deviations in stock market valuation. Compared with the results found in the U.S. market, aggregate insider trading in the A-share market has a stronger predictability, which may highlight the severity of insider trading in the A-shares market or indicate that the market may be more prone to systematic valuation bias to create more opportunities for insider trading. Furthermore, we find that the information hierarchy and corporate governance have a significant effect on the information content of aggregate insider trading. The trading of insiders who are more involved in business operations and at higher positions in the information hierarchy have significantly more predictive power. The corporate ownership structure also has a significant effect on insider trading. The predictive power of executive trading is weakest for central state-owned companies. Although there is a lack of effective large-shareholder oversight, the implicit administrative control in central state-owned companies becomes an alternative mechanism for curbing executive trading. Large shareholders in private-owned companies have stronger incentives to benefit from insider trading and have more power to control business operations. As such, the predictive power of their trading is significantly higher than that of large shareholders in state-owned companies.

The relationship between insider trading and information advantage and how external regulation and corporate governance affect insider trading have been important issues for regulators, academia and investors. This study complements prior studies by examining an emerging market and investigating how institutional context and corporate governance affect insider trading. It provides interesting findings that are different from those observed in mature markets. For example, it finds that the trading activities of large shareholders in the Chinese A-share market have much higher information content than those in mature markets. The findings differ mainly due to China's institutional background and corporate governance. Due to the weak investor protection in the Chinese A-share market, large shareholders tend to be actively involved with business operations and thus become important insiders who cannot be ignored. This study also further examines the relationship between corporate governance and insider trading. We find that private- and state-owned companies face different agency problems and governance structures, resulting in significant differences in insider trading behavior. The information content of the trading of executives in central state-owned companies is lowest because they are subject to implicit but strong administrative control. This suggests that executive trading is influenced by not only large shareholders' oversight, but also another implicit informal monitoring system such as the administrative control of an organization.

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