IMI Working Paper

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2018

Abstract

This paper studies the information content of aggregate insiders' transactions in their own firms in China by analyzing approximately 28,000 open market transactions from July 2007 to December 2014. The evidence suggests that publicly available information about aggregate insiders' transactions cannot predict future stock returns. However, the ability of aggregate insiders' transactions to predict future stock returns is positively associated with the strength of corporate governance. Results from vector autoregressive (VAR) models and examination of profitable strategies corroborate these findings.

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1. Introduction

With the rise of the Chinese economy, China's capital market increasingly attracts overseas participants. However, there has been strong evidence that the extraction of private benefits by corporate insiders is ubiquitous in the Chinese capital market. Insiders are able to undertake a variety of undisclosed transactions or manipulate information disclosures to benefit themselves at the expense of outside investors (Jiang et al., 2010; Morck et al. 2000; He et al. 2016).

In order to strengthen investor protections, the China Securities Regulatory Commission (CSRC) and other regulatory authorities have made considerable progress on regulating insiders' transactions. Provisions regarding insiders' transactions were stipulated in the Securities Law of the People's Republic of China (Securities Law), which was proposed on December 29, 1998, and amended further several times[1]. Nonetheless, inadequate legal institutions weaken the efficacy of regulation. In view of the difficulty of monitoring corporate insiders' transactions, on August 15th , 2007, the CSRC declared the Rules on the Management of Shares Held by the Directors, Supervisors, and Senior Management Officers of Listed Companies (RMSHLC, No.56 [2007] CSRC) and required compliance from all listed companies. According to this regulation, corporate insiders are required to report their firm share transactions to their companies no later than the second business day after a transaction. The transaction information is disclosed immediately on the stock exchange's web platform.

China's mandatory disclosure of insiders' transactions aims to improve the information environment, and hence enhance investor protection in an emerging market economy. Numerous evidence shows that insider transactions are informative (Jaffe, 1974; Seyhun, 1986; Rozeff and Zaman, 1988). Corporate insiders, by virtue of their job function, have access to privileged information about future cash flows and discount rates that are not reflected in stock prices. The disclosure of their transactions helps investors to incorporate various information (i.e., firm-specific or economy-wide factors), into stock prices, and then accelerate price discovery (Hirschey et al, 1990, Huddart et al., 2001). Seyhun (1988, 1992) shows that the aggregation of insider transactions can predict market returns for the subsequent two months. Fidrmuc et al. (2006) show that firms experience a significant abnormal return after an insider's trade of a firm share. Recently, Brochet (2013) investigates the profits of insider trading after SOX[2] and find that the mean abnormal returns for purchases and sales are 1.89% and -0.11%, respectively, over a 3-day window following insider transactions.

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[1] The Securities Law was proposed on December 29, 1998; implemented on July 1, 1999; and amended first on August 28, 2004 and again in late 2005.

[2] The Sarbanes–Oxley Act of 2002, more commonly called Sarbanes–Oxley, Sarbox or SOX, is a United States federal law that set new or expanded requirements for all U.S. public company boards, management and public accounting firms.

If the China's mandatory disclosure system works, we should have the following expectations. First, it provides a platform for the market and regulatory agencies to monitor the behavior of corporate insiders. By disclosing their transactions, the ensuing market reactions and regulatory interventions are expected to discipline insiders' behavior. Hence, insiders are less likely to use private firm-specific information to trade firm shares in the security market. Illegal insider trading or the expropriation of minority shareholders should be mitigated. Second, to the extent that noise trading is a market-wide phenomenon in China[3], information-related trading by corporate insiders can uncover mispricing in their own firms, contributing the discovery of fundamental values.

To examine this, we investigate the information content of aggregated trading by corporate insiders in their firms, and address the prediction power of aggregated insider trading over future market returns. The rationale is that if the regulation functions well, then the mispricing observed by corporate insiders is primarily caused by publicly available information, such as changes in economy-wide activity, rather than pure firm-specific information. Subsequently, when the market recognizes changes in economy-wide activity, most security prices will also change. As corporate insiders trade prior to changes in security returns, their transactions contain a forecast component of the market return. A positive relationship between aggregate insiders' transactions and subsequent market return should be expected (Seyhun, 1988).

Using approximately 28,000 open market sales and purchases by insiders from July, 2007 to December, 2014 in China, we investigate the degree to which market returns are predicted by aggregate insider transactions. We find that multi-week aggregate insider trading data could only provide modest evidence on the predictability on future stock returns. We do not find any significant relation between aggregate insider trading activity in a given week and the market returns for the subsequent 8 weeks. However, the evidence shows that aggregate insider trading can predict the future stock returns of private companies. In firms with a less concentrated ownership structure and less deviation between control and cash flow rights, future market returns remain predictable after the disclosure of insider trading information. Results from vector autoregressive (VAR) models and examination of profitable strategies corroborate these findings.

Combining the findings from our analysis, we conclude that corporate insiders generally do not trade on the basis of economy-wide information. The mandatory disclosure scheme only plays a rather limited role in regulating insiders' behavior. Corporate insiders still have ample opportunities to make self-serving transactions or obtain other private benefits through privileged information. On the other hand, the strength of the prediction power of aggregate insider trading for future market returns is negatively related with expropriation risk. More specifically, in firms characterized by less expropriation risk, insiders are more likely to be observed and to trade based on economy-wide information. While, in firms with greater expropriation risk, insiders are more likely to selectively report their transactions and make self-serving transactions. Hence, they are less likely to trade on the basis of mispricing caused by economy-wide information. In this sense, the mandatory disclosure of insiders' transactions does not effectively correct corporate insiders' misconduct. Many constraints, such as weak law enforcement and weak corporate governance, limit the impact of the mandatory disclosure of insider trading on regulating corporate insiders' behavior.

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[3] Noise traders can drive stock prices away from their fundamental values (Black, 1986).

Although this study investigates the prediction power of China's insider transactions for future market returns, China has most of the typical features of emerging market countries; so understanding China can help us understand emerging markets in general. For example, similar to most underdeveloped economies, outside investors in China have few rights against insiders' expropriations (Firth et al., 2009). The legal systems are weak and law enforcement is inefficient, which is the case in many emerging countries. Ownership structures remain highly concentrated, which facilitates corporate insiders' misconduct at the expense of minority investors. Our study shows that, in an emerging market, public disclosure of insider transactions is not able to regulate insiders' behavior. Comprehensive reform limiting expropriation risks in an emerging market is necessary.

Our study also relates to previous studies on market timing. There is growing evidence on the predictable nature of expected returns to the market. For example, Keim and Stambaugh (1986) suggest that the expected risk premiums seem to change over time in a way that is, at least partially, explained by variables that reflect asset price levels. At the firm level, the three-factor model of Fama and French (1992, 1993) indicates that firm-specific factors, such as size and book-to-market equity (B/M), help explain the cross-sectional variation in expected stock returns. Our results show that expropriation risk is an important pricing factor in emerging markets.

The remainder of this paper is organized as follows. Section 2 provides a literature review and develops some testable hypotheses. Section 3 describes the methodology and data summary statistics. The main empirical results of this study are presented in Section 4 and the conclusions are in Section 5.

2. Institutional setting and hypotheses development
2.1 Institutional setting
With the rise of the Chinese economy, improving the corporate governance of Chinese companies, as part of the government's efforts to develop the financial market, has become a top priority. Since the establishment of the stock markets in the early 1990s, China has promulgated various laws and regulation systems to aid in corporate monitoring. Because most listed firms were converted from one or several large state-owned enterprises, which then became the controlling shareholders after listing, the potential problem of insiders' expropriation of minority shareholders have been a major concern in the Chinese stock market. On July 1, 1999, the Securities Law of the People's Republic of China (Securities Law) was promulgated by the Chinese regulatory authorities, to protect the interests of minority shareholders. Section 4, Chapter 3 of the Securities Law stipulates several ordinances to regulate the transactions of corporate insiders. Insiders are not allowed to trade their shares on the basis of undisclosed, privileged information. Article 74 defines an insider as a person or corporation directly or indirectly connected with a listed firm[4]. Article 75 further defines insider information as any undisclosed news that may influence the price of shares such as major changes in a company's equity structure, security for debts, distribution of dividend, business guidelines, and major investments, among others. The CSRC regulates the exchanges, and is responsible for the enforcement of the insider trading laws. Nevertheless, these regulations have proven to be far from efficient in curbing expropriation by corporate insiders. Insider dealing, which relies

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[4] The Securities Law gives examples of corporate insiders, such as directors, supervisors, managers and shareholders who hold not less than 5% of the shares in a company; people who are able to obtain material information concerning company trading; staff members of the regulatory authority; and relevant administrators.

on using private material information to trade for profit, is prevalent across Chinese listed corporations (Howson, 2012)[5]. Weak legal institutions have substantially lowered the costs of law violations. At the same time, outside investors and regulatory authorities face exceedingly high costs to obtain and analyze insiders' transactions.

On August 15th, 2007, the CSRC released the RMSHLC to regulate insiders' transactions. The rules are basically in line with insider trading regulations in the U.S[6]. Corporate insiders must inform their companies within two business days of a transaction. In turn, the corporation reports this transaction immediately to its stock exchange, which then disseminates this information on its own web platform. Any person or corporation who makes false statements or fails to make timely notifications will be fined by the stock exchange.

2.2 Hypothesis development

Corporate insiders, by virtue of their job function, have advance knowledge of future cash flows and discount rates that is not reflected in stock prices (Seyhun, 1986, 1988; Fidrmuc et al., 2009; He and Rui, 2016). Information-related trading by corporate insiders may be in response to either firm-specific or publicly available information (i.e., industry-wide or economy-wide factors) (Seyhun, 1988). If insiders trade only on firm-specific information, then their transactions should not contain any information related to changes in economy-wide activity. In contrast, if part of their transaction is due to changes in economy-wide factors not yet reflected in a firm's stock prices, then a positive relationship between aggregate insider trading and subsequent market return should be expected. The extent to which corporate insiders trade on the basis of economy-wide factors depends on the costs and benefits of exploiting their privileged information. If regulation and corporate governance increases the cost of trading in firm-specific information, then insiders prefer to exploit economy-wide information.

Using U.S. data, Seyhun (1988, 1992) provides empirical evidence and shows that the market index rises following increases in aggregate insiders' purchases and falls following increases in aggregate insiders' sales. Aktas et al. (2008) provide further evidence that price discovery is hastened on insider trading days. The paper proposes that some insiders' transactions are due to changes in economy-wide information. However, in most emerging market countries, the legal system and law enforcement are weak. This poor investor protection discourages informed trading and leads to a deficient information environment (Morck et al., 2000). Although China has adopted mandatory disclosure of insiders' transactions, this regulation is not well enforced. Insiders are often observed using firm-specific information to trade in the stock market for their own benefit without incurring penalties. (Howson, 2012; He and Rui, 2016). Hence, we expect that insiders are less likely to use economy-wide information when deciding their transactions. The potential relation between insiders' transactions and stock market returns is muted.

A further insight into insiders' transactions is obtained by considering the expropriation risk of the firm. If insiders obtain benefits from extracting private benefits through a wide range of self-serving transactions at the expense of outside minority shareholders, then the expropriation risk affects insider trading. More

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[5] A noticeable example is the enforcement action taken by the CSRC against Zhejiang Hang Xiao Steel Co. (stock market code 600477). Its stock price rose 150% in the 5 weeks following its announcement of winning a large infrastructure contract with Angola in March 2007. The insiders who purchased the company's stocks before the announcement and sold them afterward received a profit of US$5 million.

[6] Section 403 of SOX requires insiders to report their holding within two business days of their transaction.

specifically, in firms characterized by less expropriation risk or better investor protection, insiders are more likely to trade based on their observation of economy-wide information. As a result, the relation between aggregate insider transactions and market returns is predicted to be positively related to investor protection.

To measure the extent of investor protection at the firm level, we rely on three alternative indicators for corporate governance. First, following La Porta et al. (1998) and Bebchuk and Roe. (1999), we use the percentage of the shareholding of the principal shareholder as the measurement of ownership concentration. A concentrated ownership structure facilitates the transfer of resources away from firms for corporate insiders' own benefit through tunneling, particularly when investor protection is weak. For example, they can transfer assets on preferential terms to other firms in which the controlling shareholder also has a large stake (Johnson et al., 2000). [7]They can also selectively report or withhold valuable firm-specific information to dilute the interest of minority shareholders by purchasing firm shares at a preferential price (Morck et al., 2000; Du et al., 2012). As outside investors fail protect themselves against insiders' self-serving transactions (La Porta et al., 2000), a concentrated ownership structure can help insiders manipulate corporate information, and leads to a camouflaged information environment. As a result, ownership structure concentration is expected to weaken the relationship between aggregate insider trading and subsequent market returns.

Second, we consider the ownership type of listed firms. Since China started its open up policy in 1978, the government has stimulated its economy by relaxing control over state-owned enterprises (SOEs). Meanwhile, a large number of private or foreign enterprises have also emerged and contribute to Chinese economic growth. The mixed ownership types provide us a valuable opportunity to investigate the impact of shareholders' identities on expropriation risk. Boycko et al. (1996) posit that SOEs primarily serve politicians' interests rather than maximizing firms' profits or their market value in that politicians are often observed promoting employment and regional development through corporate financial resources, ultimately to ensure the success of their political career. Numerous studies provide empirical evidence supporting this argument (e.g., Shleifer and Vishny, 1994; Shleifer, 1998; Fan et al., 2007; Fogel et al., 2008). In addition, politically connected firms are less transparent than similar unconnected firms (Leuz et al., 2003; Leuz and Oberholzer-Gee, 2006). Corporate insiders in politically connected firms may hide or obscure reported benefits with the purpose of misleading investors to gain at their expense (Chaney et al., 2011). Based on this, we should expect aggregated insiders trading in SOEs to convey little market-wide information. And hence, a weak relationship between aggregate insider trading and portfolio returns in SOEs is expected.

Finally, we use the ratio of control to cash flow rights as an alternative indicator to measure expropriation risk. The existing literature suggests that the less the controlling shareholder is driven by monetary incentives, the more likely he or she pursues the private benefits of control (Bebchuk and Roe, 1999; La Porta et al., 2002). These problems are more prevalent in emerging market countries where pyramiding and cross-holdings are widely used. Controlling shareholders usually have larger control rights than cash flow rights. The separation of control and cash flow rights exacerbates the entrenchment of the controlling shareholder. Entrenched shareholders can withhold information or selectively disclose information to camouflage their

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self-serving behavior (Morck et al., 2000; Fernandes and Ferreira, 2009). So, we expect a more pronounced relation between aggregate insider trading and subsequent portfolio returns in firms with less separation between control and cash flow rights.

3. Data and summary statistics
3.1 Data

Under RMSHLC, directors, senior officers, and supervisors are required to report their transactions. The collected information is disseminated to the public through the Disclosure of Interests-Integrity Records of Listed Corporation, an online platform run by the stock exchanges. The records provide information on stock code, insiders' identities, volume and prices of transactions, and transaction dates. Mandatory disclosure was implemented on June 1, 2007. We draw insider transaction data for all A-share stocks from the online platforms of the Shanghai and Shenzhen stock exchanges from July 1, 2007 to December 31, 2014. Stock returns and corporate governance variables are drawn from the China Corporate Governance Research Database (CCGRD) developed by the GTA Information Technology Co.

Following the literature (Seyhun, 1986), only open market purchases and sales by corporate insiders are considered in this paper. Panel A in Table 1 shows that our sample has a total of 27751 records of transactions by corporate insiders in 1556 public firms made up of 19432 sales and 8271 purchases. The purchase-to-sale ratio is 0.3, which is much smaller than the insider purchase-to-sale ratio of 0.7 in the U.S. market (Seyhun, 1986). This implies that corporate insiders in China are more likely to be net sellers.

During the sample period, the average value of sales transactions is RMB 2,033,000, much larger than the average purchase transactions of RMB 1,050,000. The median sales transaction is RMB 430,000 while the median purchase transaction is RMB 110,000. Consistent with the findings in Fidrmuc et al. (2006), the results show that the average number and value of insiders' sale transactions are larger than those of their purchase transactions. On average, there are only 0.86 (1.89) purchases (sales) in each firm, per year, compared with 2.77 (4.74) purchases (sales) in the U.S. The number of reported insider transactions in China is much smaller than in the U.S.

To proxy for the insiders' ability to extract private benefits at the expense of minority shareholders, we use three alternative proxies for corporate governance. The variable named Concentration represents the percentage of the largest shareholding. State is a dummy variable that equals 1 if the largest shareholder is government related and is 0 otherwise. Separation represents the extent of separation between control rights and voting rights (the ratio of control to cash flow rights). Following Giannetti and Simonov (2006), we set the ratio of control to cash flow rights equal to 1 if no shareholder holds more than 20% of the voting rights[8].

Panel B of Table 1 reports the summary statistics of our main proxy for corporate governance. In general, our sample firms display a large cross-sectional variation in all proxies for corporate governance. The mean and median of Concentration are 35.79 and 34.35, with a range of 4.08 to 86.32. This suggests that shares of most listed firms are highly concentrated. The government still plays an important role in the Chinese capital market. A substantial proportion of firms (42%) are still controlled by government or government-related agencies. Not surprisingly, over the sample period, both the mean and median of Separation are larger than 1. This suggests that agency problems due to separation between ownership and control are prevalent.

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[8] Faccio and Lang (2002) suggest holding 20% of the voting rights is sufficient for control.

To examine whether insiders' transactions are related to our main proxy for corporate governance, we sort companies into several groups using corporate governance variables and then analyze the differences for insiders' trading. Panel C of Table 1 reports the distribution of insiders' open market transactions by corporate governance variables. First, we classify insiders' transactions into two groups using State, and analyze the difference of insiders' transactions between state firms and non-state firms. There are 8625 transactions in state firms compared to 18282 transactions in non-state firms. The average value traded per transaction in non-state firms is also much larger than for state firms. Second, using the average of ownership concentration in the sample, we group insider transactions into ownership concentration quintiles. Ownership concentrations for the groups are as follows: Group 1 less than 20%[9] ; Group 2 20-36%, Group 3 36-48%, and Group 4 greater than 48%. In line with the literature, this classification ensures that each group of firms has more than 4000 insider transactions while still maintaining a large variety of ownership structure. Interestingly, the value of shares traded per purchase decreases significantly from 2261 in Group 1 to 968 in Group 2, and then increases to 741 in the highly concentrated ownership group (Group 4). Finally, we sort companies into two groups using separation. We also find that the average value per purchase in firms without separation is 992, which is larger than that of firms with separation between cash flow rights and control rights. These results indicate that corporate insiders in firms with better corporate governance are more likely to conduct a larger transaction per purchase.

Table 1. Summary Statistics for All Insiders' Trades and Net Trades

Pane A: All trades

	No.firms	N	Ave.trades	Number of transactions			Value of transactions		
				Median	Mean	Std.	Median	Mean	Std.
Buys	1288	8271	0.86	10000	98228	723565	110	1050	4070
Sells	1367	19432	1.90	29193.5	136501	588302	430	2033	7081
Total	1556	27751	2.39	.	.	.	.	.	.

Panel B: Descriptive statistics of corporate governance variables

	Total Obs.	Mean	Std.	Min.	p10	Median	p90	Max.
State	4984	0.42	0.49	0	0	0	1	1
Concentration	4984	35.79	14.42	4.08	17.47	34.35	54.15	86.32
Separation	4984	1.22	0.63	1.00	1.00	1.004	1.77	15.72

Panel C: Transactions by ownership type, ownership concentration and separation

	No. Sales	No. Purchases	Ave. Value of Sales	Ave. Value of Purchases	No. Trades
Ownership type					
State=1	4882	3743	1664	338	8625
State=0	14050	4232	2126	1362	18282
Ownership Structure					
Group 1	3546	1173	2142	2261	4719
Group 2	8705	3703	2176	968	12408
Group 3	4621	1816	1730	698	6437
Group 4	2576	1593	1941	741	4169
Separation					
Separation=1	6343	2559	2227	992	8902
Separation>1	13105	5726	1939	866	18831

Note: Table 1 reports the descriptive statistics for all trades and net trades (value in thousands of RMB). In Panel A, No.firms is the number of firms, N is the number of transactions, Ave.trades denotes the average number of trades per firm per year (2007.7.1 to 2014.12.31, roughly 391 weeks). Panel B reports the descriptive statistics of the three proxies for corporate governance – *Concentration*, *State* and *Separation*. Panel C reports the descriptive statistics for insider transactions grouped by ownership type, ownership concentration and separation.

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[9] The company is considered to be widely held when all shareholders hold less than 20% of the votes (Faccio and Lang, 2002; Giannetti and Simonov, 2006).

3.2 Aggregate insider trading activity

Weekly data are used in this study to examine the relationship between aggregate insider transactions and market returns. The net number of insider transactions in firm i and week t, $NH_{i,t}$, is defined as follows:

$$NH_{i,t} = \sum_{j=1}^{J_{i,t}} H_{t,j} \tag{1}$$

where $t=1,2,\ldots, 386$ denotes the number of weeks from June 1, 2007 to December 31, 2014. $J_{i,t}$ denotes the total number of transactions by insiders in firm i and week t, and $H_{t,j}$ equals 1 if transaction j is a purchase and -1 if transaction j is a sale. To ensure that each firm has the same weight in the aggregating insider transaction measure, we standardize $NH_{i,t}$ by subtracting the mean and dividing by its standard deviation over 386 weeks. Specifically, the standardized aggregate insider transactions in group k and in week t, $SANE_t^k$ is defined as

$$SANE_t^k = \sum_{i=1}^{I_k} (NH_{i,t} - \overline{NH}_i)\left(\frac{\square}{s(NH]_i)}\right) \tag{2}$$

where I_k is the number of firms in group k. We see that

$$\overline{NH}_i = \sum_{t=1}^{386} \frac{NH_{i,t}}{386} \tag{3}$$

Then we can write

$$s(NH_i) = \left[\sum_{t=1}^{386} \frac{(NH_{i,t} - \overline{NH}_i)^2}{385}\right]^{\frac{1}{2}} \tag{4}$$

.

Figure 1 plots the time pattern of $SANE_t^{All}$ for all firms from July 1, 2007 through December 31, 2014. The $SANE_{All}^t$ series appears to be stationary and positively correlated.

Figure 1. Weekly Standardized Aggregate Net Transactions by Executives (SANE) – All firms (July 1, 2007 – December 31, 2014)
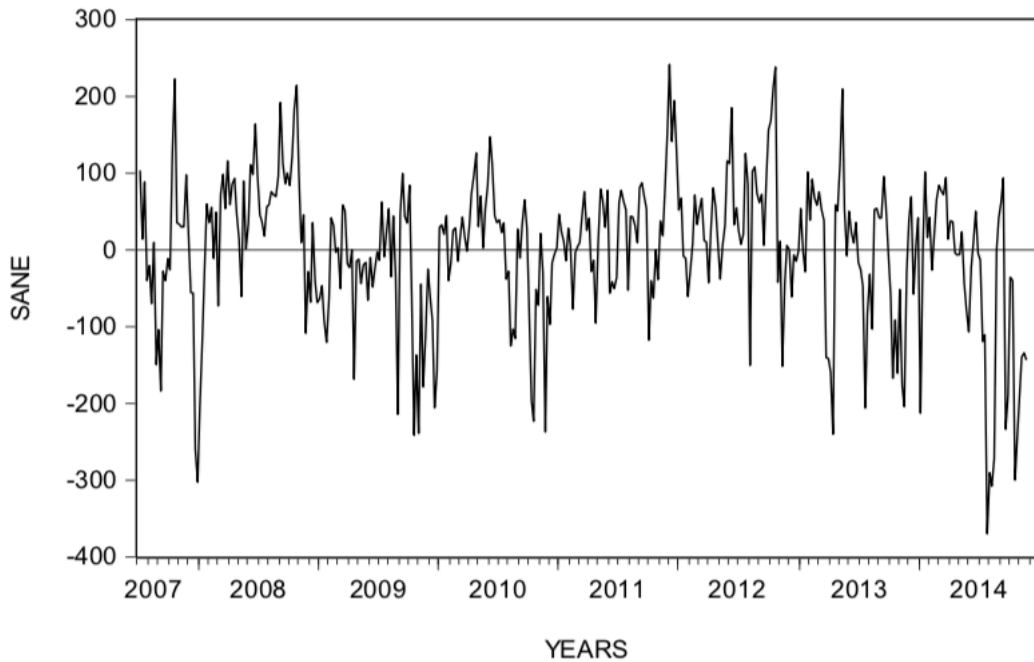
Table 2 reports the statistical properties of the standardized aggregate net number of transactions by corporate insiders (SANE) for all firms and for all firm groups. The means of SANE are zero in our construction. Variable SANE for all firms has a standard deviation of 96.14, much larger than the standard deviations of each firm group. The serial correlation coefficients of SANE show patterns of geometric decay. The Box-Pierce-Q statistics suggest that a third-order autoregressive model (AR(3)) is appropriate for most of our series [10]. In addition, Table 2 also reports cross-correlations of aggregate insider trading for different firm groups. The cross-sectional correlation coefficients of the standardized aggregate net number of transactions among the corresponding group are generally positive, varying from 0.44 to 0.61, but are relatively smaller than those between firm groups and for all firms. This suggests that insiders from different firm groups are less likely to trade the stock of their firms at the same time. It provides first-hand evidence that insiders in different firms do not seem to react to the same economy-wide factors.

Table 2. Statistical Properties of the Standardized Aggregate Insider Trading

Panel A: All firms

| Variable | Std. | Min. | p10 | Median | p90 | Max. | Serial Corr. Coef. | | | |
							lag1	lag2	lag3	lag4
SANE	96.07	-369.86	-136.82	14.19	98.30	241.88	0.63*	0.44*	0.28*	0.12*

Panel B: Statistical and time series properties for SANE by *State*

| Group | Std. | Min. | Median | Max. | Cross-Sectional Corr. Coef. | | Serial Corr. Coef. | | | |
					$SANE_{2,2}$	SANE	lag1	lag2	lag3	lag4
$SANE_{2,1}$	42.23	-199.72	4.60	145.32	0.55	0.82	0.51*	0.32*	0.20*	0.12*
$SANE_{2,2}$	66.36	-279.47	10.20	188.34		0.93	0.61*	0.43*	0.30*	0.12*

Panel C: Statistical and time series properties for SANE by *Concentration*

| Variable | Std. | Min. | Median | Max. | Cross-Sectional Corr. Coef. | | | | Serial Corr. Coef. | | | |
					$SANE_{1,2}$	$SANE_{1,3}$	$SANE_{1,4}$	SANE	lag1	lag2	lag3	lag4
$SANE_{1,1}$	21.17	-82.33	4.01	65.61	0.61	0.51	0.48	0.77	0.48*	0.35*	0.24*	0.09
$SANE_{1,2}$	45.72	-168.28	6.75	154.74		0.59	0.55	0.91	0.54*	0.40*	0.24*	0.11*
$SANE_{1,3}$	28.18	-140.33	3.92	85.75			0.44	0.78	0.45*	0.29*	0.22*	0.05
$SANE_{1,4}$	22.35	-108.16	2.66	58.17				0.72	0.38*	0.18*	0.08	0.08

Panel D: Statistical and time series properties for SANE by *Separation*

| Group | Std. | Min. | Median | Max. | Cross-Sectional Corr. Coef. | | Serial Corr. Coef. | | | |
					$SANE_{2,2}$	SANE	lag1	lag2	lag3	lag4
$SANE_{3,1}$	30.20	-105.02	4.15	80.45	0.67	0.83	0.48*	0.38*	0.22*	0.10
$SANE_{3,2}$	73.15	-277.16	11.83	196.98		0.97	0.60*	0.40*	0.25*	0.12*

Note: Table 2 reports the statistical and time series properties of the standardized aggregate net number of transactions by executives (SANE, $SANE_{i,j}$). Refer to Equations (1)-(4) for the computation. In Panel A, SANE is the standardized aggregate net number of all transactions. In Panel B, transactions are divided into two groups based on *State*, where $SANE_{2,1}$ is the standardized aggregate net number of transactions of government-related shareholders and $SANE_{2,2}$ otherwise. In Panel C, all transactions are divided into four groups: firms in Group 1 have the largest shareholdings as less than 20%; Group 2, between 20% and 36%; Group 3, between 36% and 48%; and Group 4, greater than 48%. Variable $SANE_{1,j}$ (j=1, 2, 3, 4) is the standardized aggregate net number of transactions of group *j*. Likewise, in Panel D, transactions are grouped based on *Separation*, where in SepGroup1, the *Separation* value is equal to 1 and in SepGroup2 it is higher than 1. Variable $SANE_{3,j}$ (j=1, 2) is the standardized aggregate net number of transactions for group *j*. The mean of SANE, $SANE_{i,j}$ is zero by definition, and therefore not reported in the table. There are 386 weekly observations for each series. The cross-sectional correlation coefficients and serial correlation coefficients of SANE, $SANE_{i,j}$ are also reported. The serial correlation coefficient of orders 1-4 are denoted by lag1-lag4. Serial correlation coefficients of higher orders are not significant, and thus not reported. Significance is denoted by *(star) at the 5% level.

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[10] The higher-order serial correlation coefficients are insignificant.

4. Empirical results
4.1 Main results

To examine the relationship between aggregate insider transactions and stock market returns, we conduct a series of multivariate regression analysis. The dependent variable is the one-week excess market return, RME, defined as the difference between the weekly return for the market portfolio and the 7-day repo rate[11]. To proxy for the market portfolio, we use equally weighted portfolios of all Chinese listed firms[12]. The independent variables are the lagged terms of SANE. As most regressions contain serially correlated residuals, we include an error model with a significant moving average term at the 4th lag[13]. The market return and the one-week risk-free rate during the same period are obtained from CSMAR.

If the mandatory disclosure of insiders' transactions works, then insiders ought to trade primarily based on their observations of changes in economy-wide activity before other market participants; a positive relationship between current insider trading and future excess market return is expected.

The results are shown in Table 3. In Model (1), the independent variable is the one-week lagged term of SANE. The results show limited prediction power for aggregating insider trading. Although the coefficient for $SANE_{t-1}$ is positive, it is statistically insignificant at conventional confidence levels. Model (2) includes lagged terms of SANE for up to four weeks. The coefficient for $SANE_{t-1}$ is still insignificant, while both coefficients for $SANE_{t-3}$ and $SANE_{t-4}$ are insignificantly positive. Model (3) includes lagged terms of SANE for up to eight weeks. The estimated coefficients are basically unchanged[14]. These results suggest that corporate insiders are less likely to trade based on economy-wide information[15]. Consistent with our hypothesis, the mandatory disclosure of insider transactions has a marginal contribution to the improvement of the information environment.

Table 3. Regression of Excess Market Return against Standardized Aggregate Insider Transactions

Constant	$SANE_{t-1}$	$SANE_{t-2}$	$SANE_{t-3}$	$SANE_{t-4}$	$SANE_{t-5}$	$SANE_{t-6}$	$SANE_{t-7}$	$SANE_{t-8}$	R^2
3.0868	0.0179								
(2.2630)	(0.0236)								0.0015
2.5706	0.0117	-0.0178	0.0033	0.0449					
(2.2549)	(0.0302)	(0.0349)	(0.0349)	(0.0303)					0.0092
2.4311	0.0121	-0.0161	0.0045	0.0553	-0.0106	-0.0022	-0.0020	-0.0443	
(2.2683)	(0.0306)	(0.0354)	(0.0355)	(0.0355)	(0.0355)	(0.0357)	(0.0356)	(0.0310)	0.0200

Note: Table 3 reports the OLS regression results of the excess weekly returns to the equally weighted market returns (RME) against the lagged values of the weekly standardized aggregate net number of transactions by executives (SANE) in Panel A. Excess market return is defined as the actual return to the market portfolio minus the return on the contemporaneous risk-free rate. The standard deviation of estimated coefficients are shown in parentheses. All estimated coefficients and the standard deviations are multiplied by 1,000. White heteroscedasticity robust standard errors are in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

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[11] The 7-day repo rate is often used as a benchmark interest rate (Green, 2005).

[12] We also use the value-weighted portfolios of all Chinese listed firms to measure market returns, and obtain similar results.

[13] For reasons of space, the estimates of the error model are not reported, but are available upon request.

[14] We also include more lagged terms of SANE, but all coefficients are statistically insignificantly different from zero.

[15] We also conduct additional tests to examine the sensitivity of the results. First, we use the value-weighted market portfolio to measure excess market return. Second, we include more lagged terms of SANE. Third, we exclude a few outliers. Similar results are obtained.

The previous discussion suggests that corporate insiders in China are able to selectively report their transactions or to hide their transactions for their own benefit. Hence, they are less likely to trade based on the effect of economy-wide shocks. In firms characterized by better corporate governance, insiders have fewer opportunities to expropriate the benefits of minority shareholders. Hence, insiders are more likely to observe and therefore to trade on economy-wide information. The prediction power of aggregate insider trading is expected to be positively related to the strength of corporate governance. The tests presented next examine this hypothesis.

We sort companies into several groups using three corporate governance variables and analyze the prediction power of aggregate insider transaction in each group. The results are exhibited in Table 4. Panel A reports the prediction power of insider transactions up to eight weeks ahead, separating the transactions into government and non-government firms. As predicted, there is no significant positive relation between aggregate insider trading and the excess returns for the group of state firms. In contrast, the estimated coefficient for SANEt-4 is positive and significant at the 5% level for the non-state firms. In Panel B, the relation between aggregate insider trading and subsequent market returns is examined separately by aggregating insider transactions by firms with different levels of ownership concentration. We find that aggregate insider trading is positively and significantly related with the portfolio returns of firms in both the diversified group (Group 1) and the highly concentrated group (Groups 3 and 4). A possible explanation is that the concentrated ownership structure allows the controlling shareholders to expropriate the interests of minority shareholders. However, when the percentage of controlling shareholdings is above a certain threshold, the company is more likely to operate as a private firm. The interests of controlling and minority shareholders are essentially aligned. The controlling shareholders have more incentive, and sufficient voting powers, to intervene in daily corporate operations, which benefits all shareholders (Jensen and Meckling, 1976). In Panel C, we divide companies into two groups using separation. Consistent with our expectation, the estimated coefficient for SANEt-4 is positive and significant at the 5% level in the separation=1 group. However, we do not find any significant relation between aggregate insider trading and subsequent returns in the separation>1 group. This suggests that corporate insiders are more likely to expropriate the benefits of minority shareholders in firms where the controlling rights are larger than the cash flow rights. Hence, their transactions are less likely to convey economy-wide information.

Table 4. Regression Results by Groups

Panel A: Regression results by *State*

Constant	SANE$_{t-1}$	SANE$_{t-2}$	SANE$_{t-3}$	SANE$_{t-4}$	SANE$_{t-5}$	SANE$_{t-6}$	SANE$_{t-7}$	SANE$_{t-8}$	R^2
State=1									
3.0887	0.0364								
(2.2634)	(0.0561)								0.0003
2.6083	-0.0013	0.0210	0.0545	0.0177					
(2.2595)	(0.0650)	(0.0717)	(0.0716)	(0.0652)					0.0052
2.3427	0.0117	0.0205	0.0491	0.0460	-0.0115	0.0472	-0.1282*	-0.0066	
(2.2710)	(0.0664)	(0.0738)	(0.0737)	(0.0734)	(0.0724)	(0.0721)	(0.0719)	(0.0656)	0.0165
State=0									
3.0878	0.0232								
(2.2632)	(0.0335)								0.0019
2.5631	0.0210	-0.0351	-0.0142	0.0839**					
(2.2509)	(0.0420)	(0.0481)	(0.0481)	(0.0422)					0.0141
2.4543	0.0164	-0.0318	-0.0009	0.0842*	-0.0085	-0.0286	0.0496	-0.0938**	
(2.2598)	(0.0426)	(0.0488)	(0.0490)	(0.0490)	(0.0489)	(0.0495)	(0.0495)	(0.0433)	0.0260

Panel B: Regression results by *Concentration*

Constant	SANE$_{t-1}$	SANE$_{t-2}$	SANE$_{t-3}$	SANE$_{t-4}$	SANE$_{t-5}$	SANE$_{t-6}$	SANE$_{t-7}$	SANE$_{t-8}$	R^2
Group 1									
3.0870	0.0638								
(2.2636)	(0.1071)								0.0009
2.5232	0.0115	-0.0308	-0.0968	0.3127**					
(2.2461)	(0.1234)	(0.1330)	(0.1322)	(0.1237)					0.0171
2.4374	0.0129	-0.0350	-0.0406	0.3799***	-0.1876	-0.0309	0.0157	-0.1634	
(2.2576)	(0.1246)	(0.1352)	(0.1362)	(0.1369)	(0.1369)	(0.1382)	(0.1368)	(0.1266)	0.0298
Group 2									
3.0893	0.0290								
(2.2636)	(0.0496)								0.0009
2.5660	-0.0200	0.0077	0.0674	0.0491					
(2.2533)	(0.0592)	(0.0652)	(0.0652)	(0.0594)					0.0107
2.3804	-0.0259	0.0043	0.0702	0.0541	0.0206	-0.0093	-0.0300	-0.0539	
(2.2720)	(0.0598)	(0.0659)	(0.0667)	(0.0667)	(0.0669)	(0.0674)	(0.0667)	(0.0609)	0.0168
Group 3									
3.0910	0.0364								
(2.2640)	(0.0804)								0.0005
2.5623	0.0325	-0.0201	-0.1552	0.2429***					
(2.2420)	(0.0893)	(0.0956)	(0.0963)	(0.0904)					0.0206
2.3236	0.0131	0.0140	-0.1439	0.2547**	-0.0596	-0.0394	0.0884	-0.1126	
(2.2593)	(0.0914)	(0.0985)	(0.0981)	(0.0984)	(0.0985)	(0.0983)	(0.0986)	(0.0921)	0.0275
Group 4									
3.0871	0.0826								
(2.2627)	(0.1015)								0.0017
2.6418	0.1027	-0.1402	0.2193*	-0.1237					
(2.2501)	(0.1090)	(0.1161)	(0.1163)	(0.1093)					0.0132
2.3776	0.1382	-0.1583	0.2252*	-0.1225	0.0498	0.1162	-0.2542**	-0.1614	
(2.2432)	(0.1093)	(0.1169)	(0.1171)	(0.1166)	(0.1163)	(0.1165)	(0.1164)	(0.1096)	0.0404

Panel C: Regression results by *Separation*

Constant	SANE$_{t-1}$	SANE$_{t-2}$	SANE$_{t-3}$	SANE$_{t-4}$	SANE$_{t-5}$	SANE$_{t-6}$	SANE$_{t-7}$	SANE$_{t-8}$	R^2
Separation=1									
3.0887	0.0354								
(2.2640)	(0.0752)								0.0006
2.5519	0.0124	-0.0582	-0.0040	0.1828**					
(2.2503)	(0.0867)	(0.0931)	(0.0932)	(0.0872)					0.0133
2.4182	0.0219	-0.0620	0.0158	0.2098**	-0.0711	0.0181	-0.0535	-0.0997	
(2.2652)	(0.0874)	(0.0938)	(0.0960)	(0.0961)	(0.0960)	(0.0964)	(0.0944)	(0.0885)	0.0226
Separation>1									
3.0875	0.0250								
(2.2627)	(0.0310)								0.0017
2.5867	0.0158	-0.0159	0.0123	0.0408					
(2.2581)	(0.0385)	(0.0441)	(0.0442)	(0.0387)					0.0064
2.4174	0.0155	-0.0141	0.0130	0.0482	0.0027	-0.0120	0.0085	-0.0620	
(2.2723)	(0.0388)	(0.0446)	(0.0446)	(0.0446)	(0.0447)	(0.0450)	(0.0451)	(0.0395)	0.0164

Note: Table 4 reports the regression results by firms in different groups. Panel A provides regression results grouped by *Concentration*. Firms in Group 1 have the largest shareholdings as less than 20%; Group 2, between 20% and 36%; Group 3, between 36% and 48%; and Group 4, greater than 48%. Variable SANE$_{1,j}$ (j=1,2,3,4) is the standardized aggregate net number of transactions of group *j*. In Panel B, SANE$_{2,1}$ is the standardized aggregate net number of transactions of government-related shareholders, and SANE$_{2,2}$ is otherwise. Likewise, in Panel C, transactions are grouped based on *Separation*, where in SepGroup1 separation is equal to 1 and, in SepGroup2, larger than 1. Variable SANE$_{3,j}$ (j=1,2) is the standardized aggregate net number of transactions for group *j*. White heteroscedasticity robust standard errors are in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

4.2 Alternative specifications

In this section, we conduct various tests to examine the sensitivity of the results. First, additional measures of aggregate insider trading are computed. The aggregate net number of insiders transaction in firm *i* and week *t*, $NQ_{i,t}$, is defined by the standardized product of H$_{t,j}$ in Equation (1) and the number of trade shares following Equation (4) to compute standardized aggregate net shares by executives (SANQ). The aggregate net value of insiders trading in firm *i* and week *t*, $NV_{i,t}$, is defined by the standardized product of H$_{t,j}$ in Equation (1) and the value of trade shares following Equation (4) to compute standardized aggregate net values by executives (SANV). Panel A and Panel B of Table 5 report the empirical results for SANQ and SANV, respectively, and similar results are obtained. There is no forecasting ability for aggregate insider trading in the sample of all firms. However, aggregate insider trading is able to predict future stock returns in non-state firms, diversified ownership or highly concentrated firms, and firms without separation between control and cash flow rights. These findings suggest that our empirical results are not sensitive to different definitions of insider trading activities.

So far, we have documented a strong relationship between stock returns and aggregate insider trading in relatively better governed firms. Seyhun (1992) shows that both changes in business conditions and stock price movements deviating from the expected value based on fundamentals can explain the prediction ability of aggregate insider trading. To examine which contributes to the forecasting ability of aggregate insider trading, we include several variables related to changes in future real economic activity as additional predictors of stock returns. Specifically, we use the future growth rates of GDP and industrial production as two measures of future real economic activities and include past stock returns as an additional variable. As weekly data for GDP and industrial production are not available, we use the next quarter growth rate of GDP and the next month growth rate of industrial production. The relationship between aggregate insider trading and subsequent stock returns is examined first by all firms, and then separately by each firm group. The empirical results are reported in Panel C of Table 5. Interestingly, the coefficients of GDP are negative and significantly different from zero in all specifications. This suggests that the future growth rate of GDP is negatively related to excess stock returns. A possible explanation is that stock prices are not driven by the economic or business conditions in China's stock market (Morck et al., 2000). We also find that past stock returns are a significant predictor of future excess stock returns. The coefficients of RME $_{t-2}$ are positive and statistically significant at the conventional level across all specifications. Consistent with the corresponding simple regression in Table 3, Panel C of Table 5 shows that aggregate insider transactions have no marginal explanatory power in the sample of all firms. In contrast, aggregate insider trading is positively related with excess stock returns for non-state firms, diversified ownership or highly concentrated firms, and firms without separation between control and cash flow rights. Including future economic activity and past stock returns as additional explanatory variables does not affect either the magnitude or significance of the coefficients of aggregate insider trading. This suggests that movements of insiders' transactions are not influenced by the expectation of future economic activity. Hence, the prediction ability of aggregate insider trading is not attributed to the expectation of future real economic activity.

Table 5 Regression Results of Alternative Specifications

Panel A: Regression of excess market return against SANQ

Constant	SANQ$_{t-1}$	SANQ$_{t-2}$	SANQ$_{t-3}$	SANQ$_{t-4}$	SANQ$_{t-5}$	SANQ$_{t-6}$	SANQ$_{t-7}$	SANQ$_{t-8}$	R^2
Overall									
2.3910	-0.0117	0.0048	0.0126	0.0672	-0.0147	0.0023	-0.0208	-0.0375	
(2.2702)	(0.0368)	(0.0425)	(0.0426)	(0.0427)	(0.0426)	(0.0430)	(0.0431)	(0.0380)	0.0188
State=1									
2.3008	-0.0593	0.0888	0.0233	0.0705	0.0378	-0.0017	-0.1391*	0.0185	
(2.2635)	(0.0700)	(0.0759)	(0.0760)	(0.0756)	(0.0750)	(0.0746)	(0.0739)	(0.0688)	0.0233
State=0									
2.4179	-0.0032	-0.0139	-0.0241	0.1188**	-0.0263	-0.0031	0.0337	-0.0933*	
(2.2655)	(0.0495)	(0.0571)	(0.0571)	(0.0578)	(0.0577)	(0.0586)	(0.0590)	(0.0517)	0.0240
Group1									
2.4681	-0.0205	-0.0626	-0.0122	0.3650**	-0.1195	-0.0570	0.0747	-0.2554*	
(2.2613)	(0.1301)	(0.1408)	(0.1415)	(0.1420)	(0.1420)	(0.1489)	(0.1483)	(0.1401)	0.0296
Group2									
2.3347	-0.0483	0.0207	0.0582	0.0744	0.0072	-0.0062	-0.0422	-0.0383	
(2.2774)	(0.0654)	(0.0710)	(0.0714)	(0.0719)	(0.0719)	(0.0719)	(0.0719)	(0.0667)	0.0126
Group3									
2.2770	-0.0104	0.0309	-0.1273	0.2352**	0.0048	-0.0229	0.0428	-0.0356	
(2.2701)	(0.0993)	(0.1044)	(0.1042)	(0.1041)	(0.1045)	(0.1044)	(0.1044)	(0.0997)	0.0177
Group4									
2.4254	-0.1713	0.0568	0.3261*	-0.0189	0.0951	0.0066	-0.3846**	-0.2185	
(2.2531)	(0.1723)	(0.1750)	(0.1808)	(0.1814)	(0.1811)	(0.1825)	(0.1796)	(0.1755)	0.0324
Separation=1									
2.3828	-0.0082	0.0162	-0.0114	0.1317**	0.0094	-0.0382	-0.0626	-0.0276	
(2.2657)	(0.0578)	(0.0622)	(0.0622)	(0.0621)	(0.0619)	(0.0632)	(0.0637)	(0.0592)	0.0219
Separation>1									
2.3440	-0.0236	-0.0019	0.0255	0.0741	-0.0039	0.0159	0.0183	-0.0953	
(2.2751)	(0.0572)	(0.0629)	(0.0631)	(0.0638)	(0.0643)	(0.0637)	(0.0636)	(0.0586)	0.0152

Panel B: Regression of excess market return against SANV

Constant	$SANV_{t-1}$	$SANV_{t-2}$	$SANV_{t-3}$	$SANV_{t-4}$	$SANV_{t-5}$	$SANV_{t-6}$	$SANV_{t-7}$	$SANV_{t-8}$	R^2
Overall									
2.3548	-0.0137	0.0051	0.0209	0.0679	-0.0203	0.0081	-0.0209	-0.0282	
(2.2694)	(0.0362)	(0.0419)	(0.0421)	(0.0420)	(0.0419)	(0.0423)	(0.0425)	(0.0372)	0.0196
State=1									
2.2837	-0.0792	0.0936	0.0472	0.0651	0.0254	-0.0062	-0.1101	0.0308	
(2.2633)	(0.0673)	(0.0733)	(0.0735)	(0.0731)	(0.0724)	(0.0720)	(0.0710)	(0.0660)	0.0234
State=0									
2.3928	0.0026	-0.0175	-0.0227	0.1299**	-0.0329	0.0107	0.0224	-0.0842	
(2.2642)	(0.0498)	(0.0577)	(0.0577)	(0.0584)	(0.0582)	(0.0591)	(0.0596)	(0.0519)	0.0253
Group1									
2.3957	-0.0099	-0.0913	0.0051	0.3814***	-0.1054	0.0048	0.0238	-0.1977	
(2.2625)	(0.1291)	(0.1407)	(0.1419)	(0.1424)	(0.1423)	(0.1477)	(0.1467)	(0.1375)	0.0280
Group2									
2.3038	-0.0399	0.0083	0.0825	0.0789	0.0092	-0.0196	-0.0389	-0.0199	
(2.2741)	(0.0646)	(0.0704)	(0.0706)	(0.0710)	(0.0709)	(0.0712)	(0.0713)	(0.0659)	0.0156
Group3									
2.2589	-0.0119	0.0340	-0.0908	0.2408**	-0.0246	-0.0209	0.0624	-0.0215	
(2.2693)	(0.0972)	(0.1023)	(0.1025)	(0.1025)	(0.1030)	(0.1028)	(0.1025)	(0.0977)	0.0185
Group4									
2.4073	-0.1880	0.0957	0.3108*	-0.0023	0.0794	0.0114	-0.3579**	-0.2026	
(2.2540)	(0.1682)	(0.1710)	(0.1752)	(0.1761)	(0.1759)	(0.1771)	(0.1752)	(0.1713)	0.0314
Separation=1									
2.3582	-0.0072	0.0157	-0.0031	0.1427**	-0.0183	-0.0220	-0.0602	-0.0143	
(2.2655)	(0.0574)	(0.0619)	(0.0621)	(0.0620)	(0.0618)	(0.0632)	(0.0634)	(0.0588)	0.0223
Separation>1									
2.2974	-0.0292	-0.0005	0.0418	0.0695	0.0142	0.0059	0.0201	-0.0811	
(2.2732)	(0.0558)	(0.0614)	(0.0616)	(0.0621)	(0.0625)	(0.0621)	(0.0619)	(0.0569)	0.0166

Note: Table 5 reports the regression results of excess market return against standardized aggregate net shares by executives (SANQ) in Panel A and the results against standardized aggregate net values by executives (SANV) in Panel B. White heteroscedasticity robust standard errors are in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

4.3 A vector autoregressive (VAR) analysis

To ensure that our empirical results of the simple regression are not spurious, we use the vector autoregressive (VAR) model to examine the interdependence between excess market return and aggregate insider trading in a multi-equation model[16]. Our empirical results show that aggregate insider trading is able to predict stock returns in firms with better investor protections. Thus, we use Granger causality tests and examine whether there is causality running from aggregate insider trading to market returns in these firms. In addition, we use impulse response functions to capture the speed of the reactions of variables to shocks.

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[16] As weekly data for real economic activities, e.g., GDP and industrial output, is not available, the VAR model only includes aggregate insider transactions and market returns.

Table 6 presents the results of the Granger causality tests by all firms, and separately by each firm group. In the full sample, significant Granger causality was not observed from aggregate insider trading to market returns. Consistent with our hypothesis, the results seem to suggest that insiders are less likely to incorporate economy-wide information in their transactions. However, market returns depend significantly on lagged aggregate insider trading in non-state firms, diversified ownership or highly concentrated firms, and firms without separation between control and cash flow rights. It appears that aggregate insider trades contain more information in firms with a better governance structure.

Table 6. Granger Causality Tests

Group	Null Hypothesis	Prob.
Overall	SANE does not Granger Cause RME	0.257
Group1	SANE does not Granger Cause RME	0.035**
Group2	SANE does not Granger Cause RME	0.567
Group3	SANE does not Granger Cause RME	0.039**
Group4	SANE does not Granger Cause RME	0.020**
State=1	SANE does not Granger Cause RME	0.338
State=0	SANE does not Granger Cause RME	0.056*
Separation=1	SANE does not Granger Cause RME	0.029**
Separation>1	SANE does not Granger Cause RME	0.140

Note: Table 6 reports the Granger causality tests on the relationship between SANE and RME. The sample firms are grouped by three dimensions. First, by whether the firm is state-owned, if yes, we have State=1, otherwise State=0. Second, by ownership concentration. Firms in Group 1 have the largest shareholdings as less than 20%; Group 2, between 20% and 36%; Group 3, between 36% and 48%; and Group 4, greater than 48%. Third, by separation of control and cash flow rights. The ratio of control to cash flow rights is equal to one if no shareholders have more than 20% voting rights. White heteroscedasticity robust standard errors are in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

The impulse response functions, as shown in Figure 2, represent the lagged responses of SANE and RME to an exogenous shock in all firms. Figure 2a shows the normalized impulse responses to a positive shock in market returns. The week 1 coefficient of the response to this shock in SANE is -0.2964. The coefficient drops below 10% in absolute value in week 7 and continues to become smaller. Figure 2b displays the responses of market returns to a one standard deviation shock in net insider transactions. The signs of the coefficients show that a positive innovation in aggregate insider transactions is followed by an increase in stock returns. However, the magnitude of the response is relatively small. The week 1 and week 2 coefficients are 0.0439 and 0.0295, respectively. Market returns in the following weeks exhibit virtually no response to these shocks.
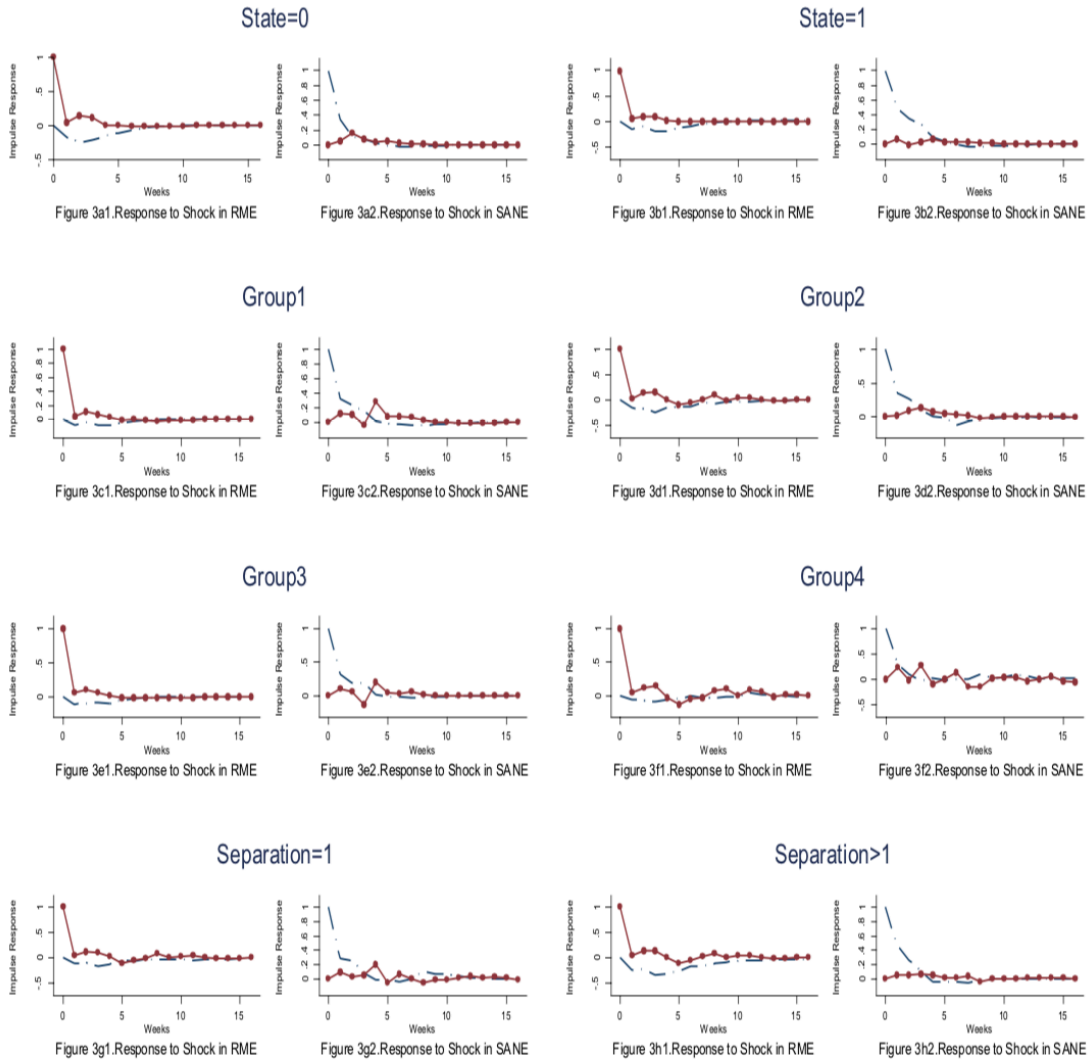
Figure 2. Impulse Response Function

Figure 2a.Response to Shock in RME

Figure 2b.Response to Shock in SANE
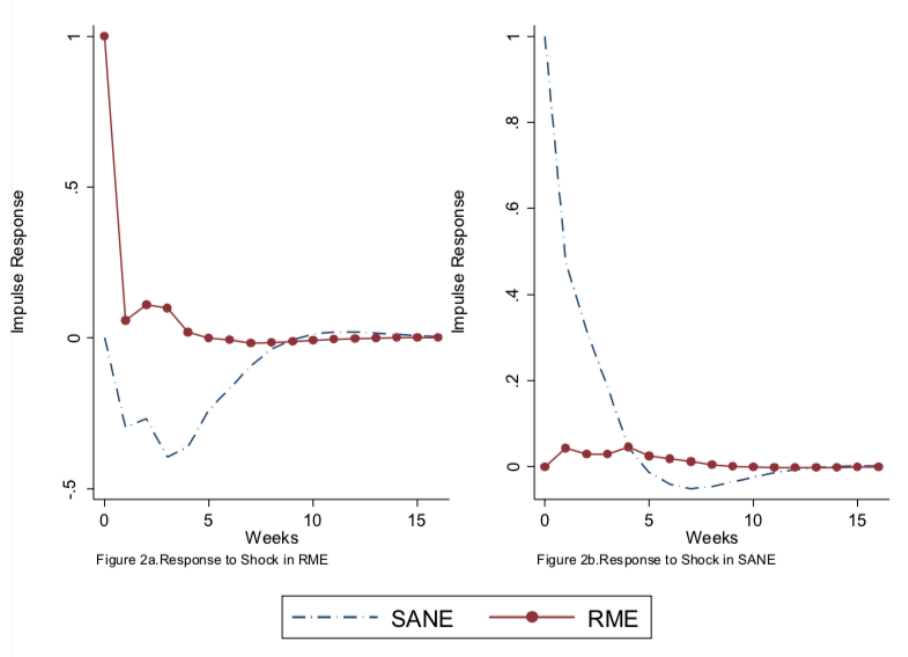
Note: Figure 2 shows the lagged response of SANE and RME to an exogenous shock. Figure 2a shows the normalized impulse responses to a positive shock in market returns. Figure 2b displays the responses of market returns to a one standard deviation shock in net insider transactions.

Figure 3a(i)-h(i) (i=1, 2) then exhibit the impulse response functions for different firm groups. Similar to Figure 2a, the signs of the coefficients in all firm groups show that a positive shock in returns is followed by a decrease in aggregate insider trading. However, for the response of market returns to a positive shock to aggregate insider trading, the magnitudes differ significantly across firm groups. Although we observe a shock in aggregate insider trading in both state firms and non-state firms, the week 1 coefficient in non-state firm, 0.4865, is much larger than that in state firms, where the coefficient is 0.3417. The response is also much larger for the full sample. For the impulse response with different ownership concentrations, similar results are obtained. The week 1 coefficients in Group 1 and 4 are 0.2188 and 0.2604, respectively, while the coefficient in Group 2 is 0.0204, and exhibits virtually no response. The results also show that the market response to a positive innovation in aggregate insider trading in firms without separation between control and cash flow rights is much larger than for firms with this separation. The week 1 coefficients are 0.4550 and 0.2801, respectively. This suggests that the latter has less prediction power for subsequent stock returns. These results corroborate the findings using simple regression analysis and Granger causality tests.

Figure 3. Impulse Response Functions by Firm Groups

Note: Figures 3a(1)-3b(2) compare the lagged response of SANE and RME to an exogenous shock between state firms and non-state firms. Figures 3c(1)-3f(2) compare the impulse response across firms with different levels of ownership concentration. Figures 3g (1)-h (2) compare the impulse response between firm groups with different levels of control and cash flow right separation.

5. A simple prediction test

While our regression analysis shows the prediction ability of aggregate insider trading, its economic significance is not addressed. In this section, we attempt to examine whether the relationship between aggregate insider trading and market return could be used to construct a profitable trading strategy.

For each week, we estimate SANE. When SANE falls below zero, we obtain a down signal; otherwise we obtain an up signal. Given a down prediction, we short sell a market (portfolio) index, while we buy a market (portfolio) index when an up signal is obtained. The profitability of this strategy is the difference of the average equally weighted market (portfolio) returns during the up- and down-predicted weeks. More specifically, we examine whether the average market (portfolio) returns during up-predicted weeks exceed those of the down-predicted weeks. Table 7 uses the signal of aggregate insider trading to forecast the stock market up to eight weeks ahead. For

various forecasting intervals, in the full sample, the average market return in up-predicted weeks exceeds that of the down-predicted weeks, however, the difference is statistically insignificantly different from zero. This suggests that future market returns are not predictable after the release of aggregate insider trading information.

However, we find that our trading strategy become profitable, to some extent, in the group of firms with better corporate governance. For an 8-week-ahead forecasting interval, the average portfolio return in non-state firms during up-predicted weeks exceeds that of down-predicted weeks by 1.61%. The value is significant at the 1% confidence level. In contrast, the difference is not statistically significant for any forecasting intervals in state firms. We also find that the profit is significantly positive in several forecasting intervals for firms with diversified or highly concentrated ownership and firms without separation between control and cash flow rights. For other types of firms, differences for all forecasting intervals are smaller and statistically insignificant.

Consistent with our previous findings, Table 7 suggests that the prediction power of aggregate insider trading, to a certain extent, can be used to construct a profitable strategy. For firms with better corporate governance, the magnitude of predicted return is large and economically significant.

Table 7. Weekly Average Excess Returns to Strategy Based on Past Aggregate Insider Trading Information

Group	Forecasting Horizon: # weeks ahead							
	1	2	3	4	5	6	7	8
Overall	0.0037	0.0032	0.0028	-0.0002	0.0025	0.0024	0.0002	-0.0025
	(1.22)	(1.04)	(0.88)	(-0.07)	(0.81)	(0.77)	(0.05)	(-0.81)
State=1	0.0061	0.0041	0.0023	0.0020	0.0028	0.0031	0.0005	-0.0033
	(1.81)	(1.23)	(0.69)	(0.55)	(0.95)	(1.05)	(0.17)	(-1.09)
State=0	0.0023	0.0045	0.0027	0.0024	0.0039	0.0087	0.0057	0.0161
	(0.44)	(0.87)	(0.53)	(0.46)	(0.77)	(1.64)*	(1.08)	(3.00)***
Group1	-0.0047	-0.0031	0.0015	0.0023	0.0053	0.0002	0.0049	0.0098
	(-0.91)	(-0.56)	(0.29)	(0.44)	(1.00)	(0.04)	(0.88)	(1.69)**
Group2	0.0026	0.0048	0.0032	0.0047	-0.0051	-0.0037	-0.0009	0.0010
	(0.78)	(1.54)	(0.99)	(1.59)	(1.74)	(1.24)	(0.29)	(-0.33)
Group3	-0.0020	-0.0032	-0.0015	0.0044	-0.0012	0.0001	0.0010	0.0089
	(-0.41)	(-0.64)	(-0.29)	(0.86)	(-0.24)	(0.01)	(0.19)	(1.65)*
Group4	0.0020	0.0002	0.0056	-0.0062	0.0042	0.0022	0.0178	0.0106
	(0.36)	(0.04)	(1.11)	(-1.28)	(0.85)	(0.44)	(3.63)***	(2.13)**
Sep=1	0.0021	0.0016	0.0032	0.0050	0.0036	0.0030	0.0069	0.0050
	(0.66)	(0.52)	(1.04)	(1.71)**	(1.10)	(0.84)	(2.10)**	(1.55)*
Sep>1	0.0027	0.0043	0.0032	0.0005	0.0027	0.0019	-0.0009	-0.0034
	(0.90)	(1.34)	(1.02)	(0.14)	(0.86)	(0.60)	(-0.28)	(-1.03)

Note: Table 7 exhibits the predictability of a strategy based on past aggregate insider trading information for weekly excess returns. The sample firms are grouped by three dimensions. First, whether the firm is state-owned, if yes, we have State=1, otherwise 0. Second, the ownership concentration. Firms in group 1 have the largest shareholdings less than 20%; group 2, between 20% and 36%; group 3, between 36% and 48%; group 4, greater than 48%. Third, separation of control and cash flow rights. The ratio of control to cash flow rights equal to one if no shareholders have more than 20% voting rights. White heteroscedasticity robust standard errors are in parentheses. ***, **, and * indicate statistical significance at 1%, 5%, and 10% levels.

6. Conclusions

In this paper, we examine the relationship between past aggregate insider trading and future stock returns. On the whole, our empirical results show that net aggregate insider trading activity in a given week is not able to predict the returns of the market portfolio for the subsequent eight weeks. It shows that China's insiders do not trade their shares merely based on their assessment of the mispricing in their own firms' securities. Although the CSRC requires corporate insiders to report their transactions of firm shares, there are various ways to selectively report transactions or hide certain transactions for private benefit.

However, aggregate insider trading in non-state firms, diversified ownership or highly concentrated firms, and firms without separation between control and cash flow rights can predict future stock returns. In firms with less risk of expropriation, insiders' transactions are more likely to be scrutinized, and so they tend to trade their own firms' stocks based on the mispricing due to economy-wide factors. When the market recognizes changes in economy-wide activity, the prices of the portfolio stocks will change.

We checked the robustness of our results using alternative measures of aggregate insider transactions, and additional explanatory variables for control, e.g., past stock returns and proxies of future real economic activity. Our results remain qualitatively unchanged. The results also suggest that the prediction ability of aggregate insider trading is not attributed to the expectation of future real economic activity. The VAR analysis and simple prediction test results reinforce our argument that better corporate governance strengths the prediction power of aggregate insider trading for future market returns.

Our results have a number of policy implications for regulators in emerging markets. Learning from developed countries, most emerging market economies have implemented and enforced insider trading laws to regulate the transactions of corporate insiders. However, these reforms have not resulted in substantial improvement. Many of these countries, like China, lack investor protections. The market regulator alone is not enough to mitigate insiders' abuse. To circumvent insider trading laws, corporate insiders are more likely to obtain private benefits through undisclosed self-dealing instead of trading in the secondary market. A comprehensive strengthening of the enforcement of regulations to limit the expropriation risks in emerging markets is necessary.

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