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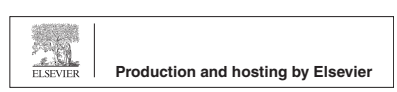

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Effect of auditing: Evidence from variability of stock returns and trading volume

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ABSTRACT

Although the benefits of auditing are uncontroversial in developed markets, there is scant evidence about its effect in emerging economies. Auditing derives its value by increasing the credibility of financial statements, which in turn increases investors' reliance on them in developed markets. Financial statement information is common to all investors and therefore increased reliance on it should reduce divergence in investors' assessment of firm value. We examine the effect of interim auditing on inter-investor divergence with a large sample of listed Chinese firms and find that it decreases more for firms whose reports are audited compared to non-audited firms. This finding suggests that investors rely more on audited financial information. Results of this study are robust to variations in event window length and specification of empirical measures.

1. Introduction

Global competition for scarce financial resources has made it important for emerging economies to stimulate the investment environment by improving the information that is available to ordinary investors. Emerging economies like China have responded by undertaking two approaches to reducing the divergence between sophisticated and other investors both in the public information made available to all investors and making it easier for the public to invest: improving market and legal institutions; and regulating auditing and related institutions to improve the credibility of financial statements. China set up the Shanghai and Shenzhen stock exchanges in the early 1990's and undertook major legal and market reforms in 1992. On

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the regulatory side, it re-established the auditing profession in 1980, allowed international audit firms to practice in China in 1992, established legal penalties for violating audit standards in 1992, promulgated the first set of independent auditing standards in 1995, made audit firms independent of local governments in 2000, made auditors responsible for damages suffered by investors from audit negligence from[1] 2005 and adopted international accounting and auditing standards in 2007. Similar measures have been adopted by other developing economies.

Improving the reliability of financial statements by better auditing is beneficial to ordinary investors only if such improvement makes a discernible difference in asset pricing. Otherwise, the demand for auditing will collapse and even if auditing is mandatory, audit quality will race to the bottom. While the beneficial effects of auditing in developed economies where investors are sophisticated and auditors face high legal and reputation costs are widely recognized (see US based evidence such as in Brown and Pinello, 2007), there is little evidence[2] that auditing benefits investors in emerging economies with less developed markets.

From a policy perspective, for developing economies that face competing demands for scarce resources, it is not clear whether establishing auditing as an independent institution[3] prior to establishing effective legal and market institutions[4] will lead to a lower divergence between investors and greater confidence among ordinary investors. A resolution of this issue demands the collection of systematic evidence on the effect of auditing in emerging markets. Such evidence is scarce. This paper provides evidence supporting the beneficial effects of auditing in an emerging economy.

Financial statement information affects stock prices in two ways. The first is the price effect. Beaver (1968) points out that price changes in response to earnings announcements reflect the average change in traders' beliefs. However, the average hides differential reactions between traders who rely solely on public information and sophisticated investors who develop private information in anticipation of the earnings announcement (Kim and Verrecchia, 1997). This divergence between investors is captured by stock return variability and trading volume (Callen, forthcoming; Beaver, 1968). A complete analysis of the effect of auditing calls for an examination of *inter-investor divergence*[5] in addition to *average* price changes. We argue that a reduction in inter-investor divergence – a more level playing field – creates greater confidence among ordinary investors and creates an environment that stimulates investment.

Haw et al. (2008) examines the price effect of auditing in China using a window of opportunity in which numerous listed Chinese firms had their *semi-annual* statements voluntarily audited by external auditors (annual audits are mandatory). They show that earnings response coefficients (ERC) of audited firms are higher than those for non-audited firms. In contrast, we investigate the effect of auditing on inter-investor divergence, using two measures: variability of risk-adjusted abnormal stock returns and trading volume. This approach differs from the ERC approach in three important ways. First, it captures the differential effects of auditing whereas ERC captures the average effect. Second, returns variability and trading volume encompass the overall

[1] The *Act about the Acceptance of Tort Cases Caused by Fraudulent Financial Reporting in Security Market* enacted by the Chinese Supreme Court in 2002 defined individual auditor's liability for damages to investors for undetected material misstatements and the *Act of Security,* passed in 2005 mandates that auditors be held liable for damages to investors.

[2] Chinese and other emerging markets exhibit some market tensions because of weak country-level governance, weak legal and extra-legal institutions and political economy variables (Craig, 2005; Leahy, 2004) that might reduce the overall reliability of financial statements (LaPorta et al., 1998; Haw et al., 2004; Dyck and Zingales, 2004). A strand of recent literature, however, has addressed the differential effect of auditing on the reliability of financial statements and suggests that auditing substitutes for weakness in the institutional variables mentioned above (Srinidhi et al., 2008; Choi et al., forthcoming). The results of this study are consistent with the argument that the effect of auditing in these emerging markets is in fact, stronger than in the more developed markets.

[3] Establishing the audit institution and making it effective is costly. The cost includes the costs of training and certifying competent auditors and setting up a structure in which they can provide independent opinions in addition to the cost incurred by all listed firms in getting their financial statements audited.

[4] The issue is NOT whether auditing should be promoted at all. The issue is the sequence in which reforms are undertaken. If auditing has a direct effect on asset pricing even when the legal and market institutions are weak, a reform of the auditing institutions should be undertaken early in the sequence of reforms. On the other hand, if auditing is only effective in a sophisticated market with strong legal and market institutions, audit reform is best undertaken after building those institutions.

[5] We use the term "inter-investor divergence" instead of "information asymmetry" in this paper to denote inter-investor differences in information, because the term "information asymmetry" has the connotation of information differences between managers and investors, which is not the focus of this study.

informational effect of audited interim financial reports, whereas ERC focuses on the effect of auditing on earnings only. Third, tests of variability do not rely upon an expected interim earnings model which is difficult to model, given that neither audited annual reports nor non-audited interim reports of the last year provide a justifiable proxy for expected interim earnings.

The variability of risk-adjusted stock returns has been shown to reflect divergence between informed and uninformed investors (Roll, 1988; Morck et al., 2000; Durnev et al., 2003; Ferreira and Laux, 2007). In particular, a select group of privately informed investors increase their return by buying (selling) securities when information is positive (negative) and participating in the options and futures markets. On the other hand, most investors depend on public financial information for their trades. Auditing should reduce this divergence if the market allows ordinary investors to benefit from the quality improvement in public financial information. The use of trading volume as our second measure of inter-investor divergence is also supported by a number of studies. Kim and Verrecchia (1991) use a two-period rational expectations model and show that the expected trading volume is positively associated with information divergence. Atiase and Bamber (1994) and Lobo and Tung (1997) provide empirical evidence that trading volume is associated with information divergence.

Investors aggregate financial and non-financial information available to them in pricing stocks. The findings of Banker and Datar (1989) suggest that investors could benefit from improved audited financial information quality if they correspondingly increase the weight they place on financial information and reduce the weight on other information. Using a similar Bayesian theory-based reasoning, Yeung (2009) argues that greater uncertainty in ex-ante earnings results in investors putting a greater weight on reported earnings. Financial statement information is available to all investors at the same time whereas other information could vary both across investors and in the time at which it becomes available to different investors. Higher weighting of common information reduces inter-investor divergence. Moreover, financial statement information (semi-annual) is released less frequently than other public and private information into the market. A higher weighting of the less frequent financial information also contributes to reduction in variability. At the extreme, if accounting information is the only information available for pricing the stock, the stock price would change only twice in a year, reducing the price variability to nearly zero (except around the earnings announcement times). It is the more frequent and cross-sectionally variant non-accounting information that contributes to stock price variability on a daily basis. Stock price variability will be reduced if non-accounting information is weighted less.

However, more informative announcements could increase the variability in stock returns *temporarily* after the announcement because of the difference between the announced information and prior investor beliefs. This difference will also be sharper and more pronounced for audited earnings announcements that are more accurate. Therefore, we expect a temporary increase in the variability of stock returns (or trading volume) followed by a more permanent decrease after earnings announcements for audited firms compared to non-audited firms. Consistent with our expectation, we find that subsequent to the announcement of semi-annual reports both the variability of stock returns and trading volumes are higher for a short period of two days between $t = 0$ and $t = 1$ and are then significantly smaller for the group of audited observations compared to the group of non-audited ones.[6] In effect, these findings show that audited financial information decreases inter-investor divergence more than non-audited information.

Our study contributes to the literature by showing that auditing of financial statements has the discernible effect of reducing inter-investor divergence even in an emerging economy such as China. In effect, the policy makers in emerging economies are justified in investing resources in auditing and seeking improvements in financial statement quality. In contrast to a mandatory annual audit context, this study exploits a context that allows us to directly compare differences between the effects of voluntarily audited and non-audited interim financial statements. Furthermore, this study also complements the average price level effects of auditing found by Haw et al. (2008).

The remainder of the paper is organized as follows: Section 2 provides the background and literature review; Section 3 develops the theory for the proposition that auditing affects the variability of stock returns

[6] The bid-ask-spread which is a common measure of inter-investor information divergence is not available in the Chinese market context. In a sensitivity test, we find that the daily high-low spread is significantly lower for audited firms (not tabulated).

and trading volume, and presents research questions and propositions; Section 4 gives the sample, research method and empirical results; finally, Section 5 concludes the paper.

2. Background and literature review

2.1. Context of the study: semi-annual auditing in China

Chinese regulation requires mandatory audit of annual financial statements for all listed firms. Further, it also mandates the audit of interim semi-annual statements for firms with poor performance records or weak financial positions, as well as for firms that plan to issue rights offerings or pay dividends in the second half of the year. Other firms can have their semi-annual reports audited voluntarily.[7] Nevertheless, in the period between 1997 and 2000, over seventy percent of firms that did not require to be audited got their interim statements voluntarily audited. We note here three implications of voluntary audits for our study. The effects of semi-annual audits could be attenuated by annual audits via ex-post settling up of accounts, making them less detectable. By implication, an empirical detection of reduced information divergence in this setting shows that auditing of semi-annual reports has an effect beyond the dilutive effects of ex-post settling by annual audits. Second, auditors with whom we held follow-up interviews told us that the scope, reporting requirements and audit procedures they employed in semi-annual audits were substantially similar to those used in annual audits, which makes our results generalizable to annual audits. Third, some firms might systematically self-select to be voluntarily audited. We have taken many steps in this study to control for self-selection, such as Heckman (1976) correction, two-stage regression and change-model specification.

2.2. Related work

Two strands of literature are relevant to this study. The first one examines the effect of auditing in the US. While studies on direct comparison of audited and non-audited reports are scarce, several of these studies examine the effect of audit quality differences on financial statements. The second strand of literature is on the audit structure in China that provides an understanding of why some firms voluntarily choose to be audited and others do not. This helps us in developing controls for self-selection bias.

Chow (1982) takes advantage of a historical regulation in the US in 1926, prior to securities laws, when external audit was optional in public firms. He studied the characteristics of firms that voluntarily chose to have their financial statements audited, but did not examine the differences between audited and non-audited financial statements. Other papers examine voluntary uses of auditor expertise in firms that were not mandated to get their statements audited. For example, Givoly et al. (1978) focus on the audit review function (not mandated) and examine auditor-reviewed and non-reviewed firms. Their conclusions were not definitive due to small sample and data limitations. In a follow-up study, Alford and Edmonds (1981) replicated Givoly et al. (1978) and found similar results. As the scope and procedures applicable to reviews are substantially different from those of annual audits, the results from these studies cannot be generalized to other auditing contexts.

Several other studies have examined the effect of audit quality on financial reporting by using research designs other than direct comparison. Becker et al. (1998) show that the Big 6 auditors constrain earnings management. Teoh and Wong (1993), Choi and Jeter (1992) and Loudder et al. (1992) show that earnings of firms that are audited by large auditors exhibit higher stock return responses to earnings. These studies have focused on the effect of audit quality (typically proxied by auditor size) on earnings management and stock returns and have found that higher quality audits improve the reliability of financial statements.

The Chinese stock market has attracted increasing attention from accounting and auditing researchers. Chen et al. (1999) provide a descriptive analysis of the auditing requirements and environment in China. DeFond et al. (2000) present evidence that the frequency of modified audit opinions (MAOs) increased significantly after the adoption of the auditing standards in 1995, which was immediately followed by "flight

[7] In general, voluntary auditing of semi-annual statements in China and quarterly statements in the US is not forbidden. However, our setting is different as some firms are required to have their semi-annual statements audited. This sensitizes investors and firms to the possibility and benefits of a semi-annual audit.

from audit quality." Chen et al. (2000) present empirical evidence on a negative market reaction to modified audit opinions in China. Chen et al. (2001) find that auditors are more likely to issue MAOs for regulation-induced earnings management. Haw et al. (2003) show that the timeliness of financial reporting is negatively associated with modified audit opinions. These findings document the institutional background in which our study is conducted.

2.3. Voluntary semi-annual audits in China

The reason as to why a majority of firms voluntarily undertake semi-annual audits is particularly intriguing in China because the fees for semi-annual auditing, based on our investigations with local audit firms, typically are 30–50% of annual audit fees. Moreover, the audit could lead to an unfavorable audit opinion that could impact managerial reputation and increase regulatory scrutiny. For the firms that voluntarily get their semi-annual statements audited, the expected benefits of auditing should be higher than the above-mentioned costs.

We conducted several interviews with audit partners and managers of listed companies to identify factors that motivated them to choose voluntary semi-annual audits. Some firms wanted to improve their market image (signaling), which in turn could help in their future share issuance or business negotiations, such as those for strategic alliances or joint ventures. Managers of a Shanghai company told us, for example, that they were negotiating a joint venture with a multinational company and believed that a voluntary audit would make their company more transparent and attractive to the potential partner. Some firms chose semi-annual audits with a view to making annual audits less time consuming and more manageable. As each listed firm is assigned a date by the Stock Exchange for publishing its annual report, it is important that they have the financial statements ready on time. A semi-annual audit reduces the workload of the annual audit and facilitates timely reporting. Managers also suggested that this would be particularly useful if the audit firm was small and had limited resources. Third, some firms chose external auditing to complement their internal auditing. Fourth, better performing firms that had significant increases in revenue and profits in the first half of the year were more likely to choose voluntary auditing to convey this information credibly to the investment community. These interviews helped us identify determinants of voluntary audits and develop a self-selection model to control for potential bias.

3. Theoretical development and research questions

The theoretical basis for the effect of auditing on returns' variance (or stock prices' variance) *in steady state* is obtained from the following reasoning that is formally developed in Appendix A.

1. In valuation decisions, investors aggregate accounting and non-accounting information. The relative weight placed on each of the two information sources is proportional to its performance sensitivity and precision (Banker and Datar, 1989).
2. Audit could decrease the bias and increase the precision of accounting information. If investors discern this improvement in the quality, they will place higher weight on financial statement information relative to non-financial information in audited firms compared to non-audited firms. This is shown in the first part of Appendix A.
3. Accounting information, whether it is audited or not, is common across all investors. Non-accounting information can either be public and common across investors (such as public disclosures of new product introductions, management changes, and strategic initiatives) or private (generated by the private insights of the analyst or the investor). If investors increase the weight on common accounting information, it reduces the inter-investor divergence regarding the estimated stock price for the firm. This is formally shown in the second part of Appendix A.
4. When compared to non-audited firms, audited firms' values are assessed more homogeneously across investors. This results in a smaller variability of stock returns and a lower trading volume for audited firms.

The above reasoning applies only in the steady state after most of the investors have fully incorporated the earnings information in their belief revision process. However, in the short period immediately after earnings

announcements, the stock return variability increases (Beaver, 1968; Rajgopal et al., 2002; May, 1971; Patell and Wolfson, 1981; Gillette et al., 1999; Ederington and Lee, 1996) because of the deviation between the information in the earnings announcement and prior investor beliefs. Audited information is more likely to accentuate the deviation between reported information and prior investor belief, resulting in higher transitory variability for audited firms.

We examine the effect of auditing by comparing the variability of stock returns and trading volume between the audited and non-audited firms. Our hypotheses stated in alternate form are:

H_1. Audited firms exhibit a significantly lower variability in stock returns than non-audited firms after the announcement of semi-annual reports.

H_2. Audited firms exhibit a significantly lower trading volume than non-audited firms after the announcement of semi-annual reports.

4. Sample, research method and results

4.1. The sample

We selected years 1997–2000 as our sample period because many observations had missing values before 1997 and quarterly financial reporting became mandatory after 2000. Table 1 summarizes the auditing status of listed firms during this period. Firms in China could either be restricted to domestic ownership (A shares) or could have both domestic and foreign ownership (A and B shares). Firms cross-listed in Hong Kong also issue H-shares to trade in Hong Kong. The motivations of firms issuing B or H-shares in seeking semi-annual voluntary audits are different from those issuing only A-shares. For example, B and H-share firms could get their

Table 1
Auditing status of listed A-share firms and sample selection results.

	1997	1998	1999	2000	Total
No. of listed firms	746	880	973	1080	3679
(Non-A-Share-only firms)	92	96	100	108	396
No. of A-Share firms	654	784	873	972	3283
(with missing values)	178	113	91	100	482
Firms available for sampling	476	671	782	872	2801
Audited	154	221	212	296	883
Non-audited	322	450	570	576	1918
(PT or ST)[a]	0	21	38	42	101
Non-audited	0	0	2	5	7
Audited	0	21	36	37	94
(Rights offerings)[b]	83	85	99	107	374
Non-audited	51	49	51	50	201
Audited	32	36	48	57	173
Mandatory audit	32	57	84	94	267
Modified Opinion	19	40	53	30	142
Non-audited sample	271	401	517	521	1710
Voluntary audit sample	122	164	128	202	616
Total Sample	393	565	645	723	2326

[a] A firm is publicly labeled as a Special Treatment (ST) firm if it has reported losses for two consecutive years, or when its net asset per share falls below par value. If an ST company continues to report losses in the third year, its label will change to Particular Treatment (PT) and its shares will be traded only once a week, on Fridays. All ST and PT firms are required to have their semi-annual reports audited.

[b] Firms must have their semi-annual reports audited if they plan to issue rights in the second half of the year. Firms that issue rights in the first half of the year do not have to be audited.

interim financial reports audited to attract foreign investors and to minimize their cost of capital. Therefore, we limited our sample to firms that issue only A-shares. Our sample was retrieved from the A-share file of the Taiwan Economic Journal database. Out of a total of 3679 firm-year observations that were available, we excluded 396 non-A-share-only observations and 482 with missing values, and were left with 2801 firm-year observations. Out of these, 883 were audited and 1918 were not. To examine the effect of voluntary auditing, we removed 101 observations of Special Treatment (ST) and Particular Treatment (PT) firms and 374 observations with rights issues during the year where semi-annual auditing is mandatory. This filtering process left us with a final sample of 2326 firm-year observations, of which 616 observations were voluntarily audited.

4.2. Control for self-selection bias–Heckman correction

To control for self-selection, we use the Inverse Mill's Ratio (IMR) estimated by a probit model of voluntary audit choice as an additional control variable when comparing the effects between audited and non-audited firms (Johnston and DiNardo, 1997; Heckman, 1976). In additional analysis, we also complement these results using other methods. We discuss below the probit model.

Our choice of variables for the model is based both on earlier empirical tests and our interviews with managers and auditors in China. While there is no published study that models voluntary audit choice, two prior studies are helpful in identifying relevant variables. Francis et al. (1999) study examines the choice between Big 6 and non-Big 6 auditors in the US by firms to signal better financial statement quality. Signaling by voluntary audit choice is similar to signaling by voluntary choice of a high quality auditor and has been mentioned as one of the factors in our interviews with managers. However, because Francis et al. (1999) is conducted in the US, we also rely on Chen et al. (2001) who find that earnings management incentives in China might motivate voluntary audit decisions. In addition to these two studies, Chow (1982) and Ettredge et al. (2000) provide additional guidance in the choice of variables. Our interviews of managers of listed firms who had the choice to be audited and of auditors who audited some of those firms also yielded some important factors. Based on the findings of prior studies and our interviews, we developed the following probit model to control for self-selection:

$$\begin{aligned}\Pr(z_{it}=1)_{it} = {} & \gamma_0 + \gamma_1 OPCYCLE_{it-1} + \gamma_2 CAPINT_{it-1} + \gamma_3 Size_{it-1} + \gamma_4 Leverage_{it-1} + \gamma_5 PE_{it-1} \\ & + \gamma_6 ROA_{it-1} + \gamma_7 Loss_{it} + \gamma_8 Top5_{it-1} + \gamma_9 TACCR_{it-1} + \gamma_{10} SalesGrwth_{it-1} + \gamma_{11'} Beta_{it-1} \\ & + \gamma_{12} Nontrade_{it-1} + \gamma_{13} y98 + \gamma_{14} y99 + \gamma_{15} y00 + \sum_{k=1}^{21} \gamma_{16k} IND_{ik} + u_{it} \end{aligned} \quad (1)$$

We give below the definitions and then discuss the rationale for selection of the variables in the above model.

Definitions:

OPCYCLE = Operating Cycle: [365 * (average inventory/cost of goods sold) + 365 * (average accounts receivable/sales)]/30.
CAPINT = Capital Intensity: Gross PP&E/sales.
Size: natural logarithm of total assets.
Leverage: total long-term debt to total asset ratio.
PE = P/E Ratio: Stock price over EPS.
ROA = semi-annual net income over beginning total assets.
Loss: 1 for net income less than 0 and 0 otherwise.
TACCR = Total Accrual: annual total accruals.
Top5 = Top 5 Auditor: 1 if the auditor is among the top 5 in China (by market share) and 0 otherwise.
SalesGrwth = Sales growth: (sales in year t – sales in year $t-1$)/sales in year $t-1$.
Beta: Beta estimated by the market model over the period between $t=-150$ to $t=-30$.
Nontrade: Percentage of non-tradable shares outstanding.
y98, y99 y00, indicator variables for years 1998, 1999 and 2000, respectively.
IND: Twenty-one Industry dummies based on Chinese industry classification.

i: firm indicator.
t: interim period indicator, $t-1$ for beginning of the year.

The inclusion of *OPCYCLE, CAPINT, Size, Leverage, PE* and *Loss* in the model is based on Francis et al. (1999). Firms with longer operating cycles develop accrual estimates over a longer time horizon and are therefore likely to have more measurement errors (see Dechow and Dichev, 2002). This resulting skepticism among investors increases the need felt by the firm to send a positive audit signal. Accordingly, we expect firms with longer operating cycles to opt more frequently for voluntary auditing. Firms with high capital intensity (defined as gross property, plant and equipment divided by sales) have relatively high depreciation, and their managers can choose the depreciation method as well as estimated useful asset lives to time the recognition of related expenses. Here again, auditing can improve the perceived reliability of reported earnings and asset values.[8] We include firm size in our model to control for firm-level differences in innate credibility and their information environment. We expect large firms to have less need for semi-annual auditing, *ceteris paribus*, since their financial reports are more carefully scrutinized by the public than those of smaller firms. Consequently, their financial reports are generally perceived to be more reliable. As a firm's debt level increases, its debt holders may need to monitor its management team more closely. Therefore, firms with high leverage ratios are more likely to employ semi-annual audits. Firms with low Price Earnings (PE) ratios are often undervalued. Managers of these firms are more likely to resort to external auditing in their attempts to communicate to investors that their firms are good investment opportunities. Thus, we expect firms with lower PE ratios to opt more frequently for interim auditing.

The selection of four other variables, namely *ROA*, *Top5*, *SalesGrwth*, and *Loss,* was based on our interviews with partners of audit firms and managers of listed companies. *ROA* is the ratio of the semi-annual period income over the previous year-end's total assets. Some partners suggested that firms that do well in the first part of the year choose to be audited to signal the good news early to the market. Based on this rationale, we expect the audited firms to have a significantly higher *ROA* than non-audited firms. Large (*Top5*) auditors are more independent, have high reputation and are more likely to issue modified audit opinions (DeFond et al., 2000, 2002; Ashton and Kennedy, 2002).[9] In anticipation of being held to higher standards by large auditors, firms might be less willing to be voluntarily audited by them. Another factor is auditor workload. Small auditors have limited resources that are stretched during annual audits and might encourage their clients to opt for semi-annual audits to smooth out their workload. At the same time, the voluntary audit choice signal will be even more powerful and the benefits might be seen to be higher if a Top5 auditor is chosen. Therefore, we do not predict a sign on this variable but recognize that it is an important control variable. Firms with low sales growth or losses reported in the most recent fiscal period are expected to be less willing to have their semi-annual reports audited.

Further, high-risk firms (those with high accruals and high beta values) are likely to weigh the negative consequences of audit more than its incremental benefits; but low-risk firms are more likely to choose to be audited. A variable that is unique to China is the percentage of outstanding non-tradable shares which proxies for government control of the firm. Usually, managers in government-controlled firms have less need to communicate with investors, as these firms depend less on the market for finance and receive government protection from regulators and investors. Therefore, we expect firms with more non-tradable shares to show a lower propensity to have their semi-annual reports audited. In our model, we employ an indicator variable for each year and each industry to control for industry and year effects.

In order to construct a parsimonious model, we exclude variables that are trivial in our sample or not reported to be significant in prior studies. For example, the proportion of common stock owned by officers and directors is not included because both the mean and median values of this variable in our sample are

[8] As our test context is different from that of Francis et al. (1999), who employed operating cycle and capital intensity to examine Big 6 auditors' role in the credible reporting of accruals, we do not expect all variables adopted from their model to affect the choice of semi-annual auditing in the same way that they affect the choice of Big 6 auditors.

[9] Identifying a group of large auditors as high quality in China may be arbitrary. Therefore, we also used other classification schemes such as Top 10 (DeFond et al., 2000) instead of Top 5 and did not find qualitatively different empirical results.

too low to affect the audit choice. The ratios of inventory and receivables over total assets are captured by total accruals in our model. The number of business segments is not relevant for most firms.

We report the probit model results in Table 2. The results are generally consistent with our expectations. They show that the decision for semi-annual auditing is negatively associated with PE ratio, loss reported in the previous year, large auditor (*Top5*), risk (*Beta*) and percentage of non-tradable shares outstanding. Leverage, profitability (*ROA*) and sales growth are positively associated with the choice for semi-annual auditing. Firm size has a negative coefficient but is not statistically significant, and the likelihood ratio is very significant, which indicates that the probit model effectively differentiates between audited and non-audited observations.

The Heckman (1976) correction for self-selection bias is an appropriate method to use in this particular context for the following reasons. The method is robust in cases where the two sets of variables overlap (one used for the probit model and the other to determine the effect of audit on information divergence). Johnston and DiNardo (1997) argue that this correction is less sensitive to normality assumptions when these two sets of variables differ. In this study, the variables that affect the outcome include the variability of the returns prior to the announcement and other variables that differ from variables used in the probit model. This makes the IMR method less sensitive to normality assumptions. Second, in most situations, it is difficult to find variables that affect probability but do not factor in the equation that tests the differences (Johnston and DiNardo, 1997). In our study, we use a number of variables that affect stock market variability and trading volume but they do not necessarily predict the choice of voluntary auditing. For example, random arrival of value relevant information may affect both return variability and trading volume. However, it is not expected to affect the choice for semi-annual audit. We include the absolute value of cumulative abnormal returns during the announcement period to control for this factor in the model for testing the effect of auditing, but not in the probit model.[10]

4.3. Effect of auditing on stock-return variability and trading volume

4.3.1. Auditing and stock-return variability

The following model is employed to compare the standard deviations of the risk-adjusted abnormal daily returns between audited and non-audited sub-samples following the announcement of interim financial reports:

$$v_{post} = \alpha_0 + \alpha_1 Audit + \alpha_2 v_{pre} + \alpha_3 Size + \alpha_4 v_{annual} + \alpha_5 IMR + \alpha_6 ABS\_CAR + \alpha_7 y98 + \alpha_8 y99 + \beta_9 00 + \varepsilon \quad (2)$$

where v_{post} is the standard deviation of firm's risk-adjusted abnormal daily returns after semi-annual audit, $Audit = 1$ if audited and 0 if not audited, v_{pre} is the standard deviation of firm's risk-adjusted abnormal daily returns before semi-annual audit, v_{annual} is the standard deviation of firm's returns after announcement of annual earnings made prior to each semi-annual audit, *Size* is the natural logarithm of equity's beginning market value, *IMR* is the Inverse Mills Ratio from the probit model, *ABS_CAR* is the absolute value of risk-adjusted cumulative abnormal returns over the post-announcement period and *y98, y99, y00* are indicator variables for the years 1998, 1999 and 2000, respectively.

Post-announcement return variability is measured by the standard deviation of risk-adjusted[11] daily abnormal returns over three different event windows after the semi-annual earnings announcement date (+1 to +7, +1 to +15 and +1 to +30). Likewise, pre-announcement return variability is measured by the standard deviation of risk-adjusted abnormal returns over three different time windows before the semi-annual earnings announcement dates (−7 to −1, −15 to −1 and −1 to −30). The announcement date is excluded from both pre- and post-announcement periods. This model is estimated separately over each of the three event windows. A significant negative coefficient on the indicator variable, *Audit,* would indicate that audited semi-annual financial statements are associated with less return variability than non-audited firms.

[10] Larcker and Rusticus (2005) show limitations of using instrumental variables in accounting research. As an exercise of caution in interpreting our results, extensive robustness checks are performed and discussed in a subsequent section.

[11] We estimate the alpha and beta of each firm year over the period between 150 and 30 days before the announcement of its semi-annual report. In order to address concerns about the reasonableness of the market model in China and other emerging markets, we have repeated all the tests with market-adjusted return data and found qualitatively similar results.

Table 2
Control for self selection – probit regression results.

$$\Pr(z_{it}=1)_{it} = \gamma_0 + \gamma_1 OPCYCLE_{it-1} + \gamma_2 CAPINT_{it-1} + \gamma_3 Size_{it-1} + \gamma_4 Leverage_{it-1} + \gamma_5 PE_{it-1} + \gamma_6 ROA_{it-1} + \gamma_7 Loss_{it} + \gamma_8 Top5_{it-1} + \gamma_9 TACCR_{it-1} + \gamma_{10} SalesGrwth_{it-1} + \gamma_{11} Beta_{it-1} + \gamma_{12} Nontrade_{it-1} + \gamma_{13} y98 + \gamma_{14} y99 + \gamma_{15} y00 + \sum_{k=1}^{21} \gamma_{16k} IND_{ik} + u_{it}$$

	Estimate	Wald chi-square
Intercept	1.265	3.202*
OPCYCLE	−0.001	0.059
CAPINT	−0.180	4.418**
Size	−0.069	1.304
Leverage	1.203	9.445***
PE	−0.325	14.561***
ROA	13.645	47.137***
Loss	−1.867	19.572***
Top5	−0.718	4.234**
TACCR	0.007	0.001
SalesGrwth	0.201	5.493**
Beta	−0.919	25.540***
Nontrade	−1.880	22.901***
y98	−0.203	1.712
y99	−0.740	21.210***
y00	−0.238	2.351
(21 Industry indicator variables not tabulated)		
Likelihood ratio test:		1186
Pseudo *R*-square		0.186
$N = 1710$ for non-audited and 616 for audited group		

Dependent variable is an audit choice indicator: 1 for audited interim financial statements and 0 otherwise. All independent variables are measured at the beginning of the year except *ROA* which is semi-annual net income over total assets at the last year end. *OPCYCLE*: 365 * (average inventory/cost of goods sold) + 365 * (average accounts receivable/sales)/30; *CPINT*: Gross PP&E/sales; *Size*: Natural logarithm of total assets; *Leverage:* Total debt to total asset ratio; *PE*: Stock price over EPS; *Loss*: 1 for net income less than 0 and 0 otherwise; *TACCR*: Annual total accruals; *Top5*: 1 if the auditor is among the top 5 in China and 0 otherwise; *SalesGrwth*: (sales in year t – sales in year $t-1$)/sales in year $t-1$; *Beta*: Beta estimated by the Market Model; *Nontrade*: Percentage of non-tradable shares outstanding; *y98*, *y99*, *y00*: Indicator variables for years 1998, 1999 and 2000, respectively.

* Significant at 10%, two-tailed.
** Significant at 5%, two-tailed.
*** Significant at 1%, two-tailed.

We control for market size (natural logarithm of the market value of equity at $t = -30$) because larger firms resemble diversified portfolios and consequently have lower return variability. The pre-announcement standard deviation of returns (respectively over the three event windows) is a control for other firm-specific factors that affect the variability of returns. It also captures the level of pre-announcement information divergence among investors as Atiase and Bamber (1994) find it to be positively related with trading volume reaction to announcements of accounting information. Additionally, Atiase and Bamber (1994) also find that trading volume reaction is positively associated with the absolute value of cumulative abnormal returns during the announcement period. Therefore, *ABS_CAR* is included to control for this effect. As a further control for firm-specific factors, we include the post-annual-announcement return variability of the previous year when all financial reports are audited. This control variable is necessary because of the possibility that the trading behavior of investors could be different between the audited and non-audited groups in our sample irrespective

of the effect of semi-annual audits. We control for year-specific effects by year dummies. Finally, we control for self-selection bias by including the IMR from the probit model as an additional control variable.

4.3.2. Auditing and trading volume

We employ the following model to examine the effects of auditing on average daily trading volume in the three windows defined earlier:

$$TV_{post} = \beta_0 + \beta_1 Audit + \beta_2 TV_{pre} + \beta_3 Size + \beta_4 TV_{annual} + \beta_5 IMR + \beta_6 MTV + \beta_7 ABS\_CAR + \beta_8 y98 + \beta_9 y99 + \beta_{10} y00 + \varepsilon \quad (3)$$

where TV_{post} is the average daily trading volume after semi-annual announcements, $Audit = 1$ if audited and 0 if not audited, TV_{pre} is the average daily trading volume before semi-annual announcements, *Size* is the natural logarithm of equity's beginning market value, TV_{annual} is the average daily trading volume after annual announcements, *IMR* is the Inverse Mills Ratio from the probit model, *MTV* is the average daily market trading volume, *ABS_CAR* is the absolute value of risk-adjusted cumulative abnormal returns over the post-announcement period and *y98, y99, y00* are indicator variables for the years 1998, 1999 and 2000, respectively.

We measure trading volume as the average daily percentage of outstanding shares traded for a given firm. The market-wide trading volume is the average daily total number of all trades divided by the total number of all outstanding shares for the stock exchange.

We control for firm-specific effects by including the natural logarithm of the market value of equity at $t = -30$, the pre-announcement trading volume and the post-annual announcement trading volume in the regression. We use market-wide average daily trading volume to control for the market-wide trading intensity effect on the trading volume of the firm. We employ TV_{pre} and *ABS_CAR* to control for the effect of the positive association between these two variables and the trading volume reaction to disclosure of accounting information as reported in Atiase and Bamber (1994). Finally, we use year indicator variables, and include the *IMR* to control for fixed effects and self-selection bias, respectively.

4.4. Univariate analysis

Panel A of Table 3 presents the descriptive statistics of the variables, v_{pre}, v_{post}, v_{annual} (standard deviations of firm returns before and after semi-annual earnings announcements, and after the previous annual announcements, respectively) and market size. The variability after the announcement of semi-annual reports (v_{post}) is significantly ($p < 0.01$) lower for the audited group than for the non-audited group in all the three event windows.

The magnitude of the difference in the variability after announcements is about 10% in each of the three windows. The pre-announcement period return variability (v_{pre}) is also higher for the non-audited group in the 15 and 30-day event windows, but not in the 7-day window. The change in return variability ($v_{post} - v_{pre}$) is positive only in the 7-day event window for the non-audited group. Its negative value in all other cells indicates a general decrease in the variability of stock returns for both audited and non-audited groups after the announcement of interim reports. Moreover, the decrease in the variability is significantly larger for the audited group in all event windows. Though these results are consistent with our expectations, we do not attempt to draw conclusions based on the univariate results without controlling for other factors that may affect the difference between the audited and non-audited groups. The absolute value of cumulative abnormal returns is significantly smaller at conventional levels for the audited group only in the 7-day and 15-day event windows, which indicates that the effect of auditing on the abnormal returns does not persist into the future. Audited observations are larger in terms of market capitalization. The *IMR*, by construction, is significantly different between audited and non-audited observations. Noting that all firms need to be audited annually, a comparison of v_{annual} between audited and non-audited firms fails to show significant differences in any of the three event windows. This corroborates the interpretation that the differences after semi-annual audits are not driven by systematic differences between audited and non-audited firms, because when annual financial reports

Table 3
Descriptive statistics and univariate comparisons of stock-return variability and trading volume between audited and non-audited firms.

Variable	Days	Non-audited			Audited			T	z
		Mean	Std	Median	Mean	Std	Median		
Panel A: Variability model variables									
Stock return variability									
V_{post}	7	2.115	0.930	1.931	1.899	0.864	1.713	5.22***	5.12***
V_{pre}	7	2.055	0.950	1.856	2.055	0.904	1.819	0.01	0.48
$V_{post} - V_{pre}$	7	0.060	1.152	0.073	−0.156	1.118	−0.145	4.08***	4.924***
V_{annual}	7	2.345	1.139	2.077	2.301	1.115	2.050	0.82	0.64
ABS_CAR	7	4.649	3.995	3.546	4.348	3.750	3.547	1.68*	−1.21
V_{post}	15	2.046	0.728	1.933	1.829	0.654	1.691	6.84***	6.47***
V_{pre}	15	2.136	0.790	1.990	2.077	0.745	1.961	1.66*	1.22
$V_{post} - V_{pre}$	15	−0.090	0.885	−0.08/2	−0.247	0.838	−0.260	3.95***	3.95***
V_{annual}	15	2.349	0.968	2.163	2.314	0.934	2.151	0.79	0.49
ABS_CAR	15	6.739	5.646	5.272	6.286	5.310	5.039	1.78*	1.27
V_{post}	30	1.942	0.602	1.885	1.783	0.514	1.703	6.27***	5.52***
V_{pre}	30	2.251	0.703	2.161	2.170	0.686	2.053	2.47**	2.59***
$V_{post} - V_{pre}$	30	−0.309	0.775	−0.289	−0.387	0.727	−0.328	2.26*	2.00*
V_{annual}	30	2.413	0.794	2.334	2.362	0.782	2.231	1.40	1.36
ABS_CAR	30	9.780	8.283	7.523	9.317	8.005	7.355	1.22	1.21
Size	30	7.733	0.747	7.696	7.873	0.755	7.876	−3.96***	−4.19***
IMR	30	−0.427	0.218	−0.419	1.051	0.275	1.025	−120.63***	−36.85***
Panel B: Trading volume model variables									
Trading Volume									
TV_{post}	7	2.038	1.516	1.674	1.580	1.247	1.281	6.97***	6.13***
TV_{pre}	7	1.685	1.254	1.446	1.501	1.106	1.233	3.02***	2.82***
$TV_{post} - TV_{Pre}$	7	0.352	1.588	0.154	0.079	1.254	0.044	4.31***	3.88***
TV_{annual}	7	3.024	2.050	2.772	3.167	2.163	2.817	−1.09	−1.10
MTV	7	1.584	1.704	0.424	1.590	1.723	0.448	−0.30	−0.46
TV_{post}	15	1.931	1.481	1.411	1.467	1.179	1.029	8.63***	7.11***
TV_{pre}	15	1.738	1.426	1.309	1.526	1.184	1.187	3.69***	4.06***
$TV_{post} - TV_{Pre}$	15	0.193	1.381	0.112	−0.592	1.149	−0.010	4.41***	4.01***
TV_{annual}	15	2.819	2.052	2.349	2.941	2.094	2.371	−1.09	−1.26
MTV	15	1.545	1.587	0.349	1.568	1.665	0.371	−1.34	−1.39*
TV_{post}	30	1.729	1.153	1.424	1.305	0.810	1.104	9.85***	8.11***
TV_{pre}	30	1.948	1.321	1.616	1.721	1.298	1.353	3.71***	4.43***
$TV_{post} - TV_{Pre}$	30	−0.220	1.410	−0.097	−0.416	1.203	−0.242	3.30***	3.83***
TV_{annual}	30	2.703	1.856	2.259	2.693	1.836	2.188	0.12	0.19
MTV	30	1.409	0.256	1.358	1.423	0.270	1.409	−1.07	0.76
Size	30	7.744	0.752	7.707	7.877	0.759	7.891	−3.74***	−3.955***
IMR	30	−0.427	0.219	−0.419	1.050	0.273	1.021	−120.70***	−36.82***

V_{post}: Standard deviation of risk-adjusted abnormal returns after semi-annual announcements ($0 < t < 8$, $0 < t < 16$ and $0 < t < 31$ for 7-day, 15-day and 30-day event windows, respectively); V_{pre}: Standard deviation of risk-adjusted abnormal returns before semi-annual announcements ($-8 < t < 0$, $-16 < t < 0$ and $-31 < t < 0$ for 7-day, 15-day and 30-day event windows, respectively); V_{annual}: Standard deviation of risk-adjusted abnormal returns after annual announcements ($0 < t < 8$, $0 < t < 16$ and $0 < t < 31$ for 7-day, 15-day and 30-day event windows, respectively); *ABS_CAR*: absolute value of risk-adjusted cumulative abnormal returns over the post-announcement period; *Size*: Natural logarithm of beginning market value of equity; TV_{post}: Average daily trading volume after semi-annual announcements ($0 < t < 8$, $0 < t < 16$ and $0 < t < 31$ for 7-day, 15-day and 30-day event windows, respectively); TV_{pre}: Average daily trading volume before semi-annual announcements ($-8 < t < 0$, $-16 < t < 0$ and $-31 < t < 0$ for 7-day, 15-day and 30-day event windows, respectively); TV_{annual}: Average daily trading volume after annual announcements ($0 < t < 8$, $0 < t < 16$ and $0 < t < 31$ for 7-day, 15-day and 30-day event windows, respectively); *MTV*: Market-wide average trading volume after semi-annual announcements ($0 < t < 8$, $0 < t < 16$ and $0 < t < 31$ for 7-day, 15-day and 30-day event windows, respectively); *IMR*: Inverse Mills ratio as estimated by Model (1); $N = 1710$ (1706) for non-audited group and 616 (615) for audited group in Panel A (B).

* Significant at 10%, two-tailed.
** Significant at 5%, two-tailed.
*** Significant at 1% two-tailed.

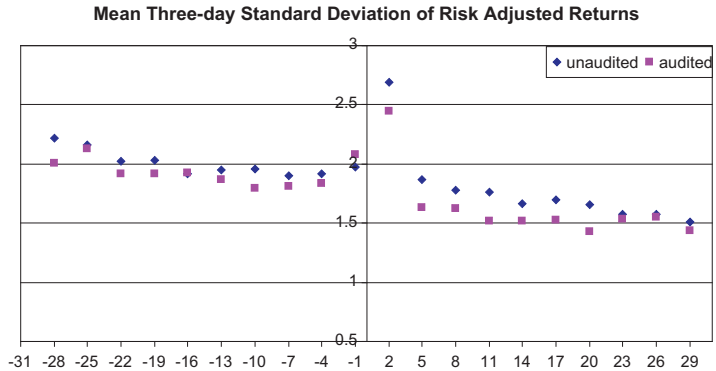

Figure 1.

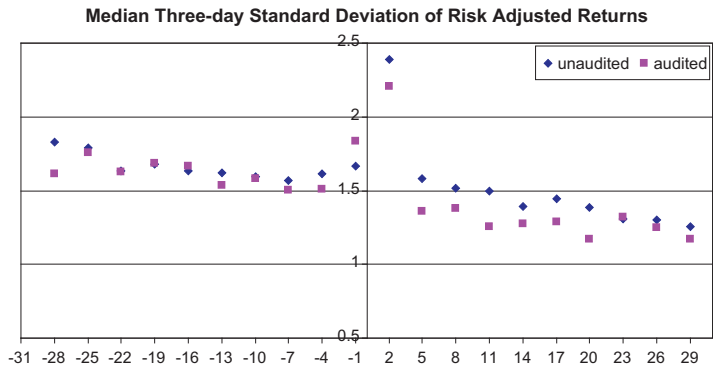

Figure 2.

are required to be audited for all listed firms, there is no systematic difference in stock return variability during any of the post-announcement periods (+1 to +7, +1 to +15, +1 to +30).

Comparison of trading volume in Panel B of Table 3 shows that the average daily post-announcement trading volume for the audited group is significantly smaller than that of the non-audited group in all the three event windows. The magnitude of the difference varies from 22% to 24%, which is economically material. The decrease in average trading volume over the pre- and post-announcement periods is significantly larger for the audited group than for the non-audited groups in all three event windows. Specifically, between −7 and +7 days relative to the announcement of semi-annual reports, the average trading volume increases slightly for both audited (from 1.501 to 1.580) and non-audited groups (from 1.685 to 2.038), but the change is much smaller for the audited (0.079) than for the non-audited group (0.647). In the −15 to +15 window, the average trading volume of the audited group drops from 1.526 to 1.467 (3.8%), but it increases for the non-audited group from 1.738 to 1.931 (11.1%). In the −30 to +30 period, the average trading volume for the audited group drops from 1.721 to 1.305 (24.2%), overshadowing that of the non-audited group, which is only 11.2% from 1.948 to 1.729. A comparison of TVR_{annual} between audited and non-audited groups does not exhibit significant or consistent differences across the three windows. This result further augments the interpretation that the difference in trading volume after semi-annual audits is not driven by systematic differences between audited and non-audited firms.

We also plot the three-day mean and median values of variability of returns and trading volume over the period between −30 and +30 in Figs. 1–4. Consistent with our expectations, there is a marked increase in both measures of inter-investor information divergence immediately following the announcement of semi-annual reports (0 to +2), but a sustained decrease thereafter. The decreases in the return variability and trading volume are consistently greater in the audited group than in the non-audited group.

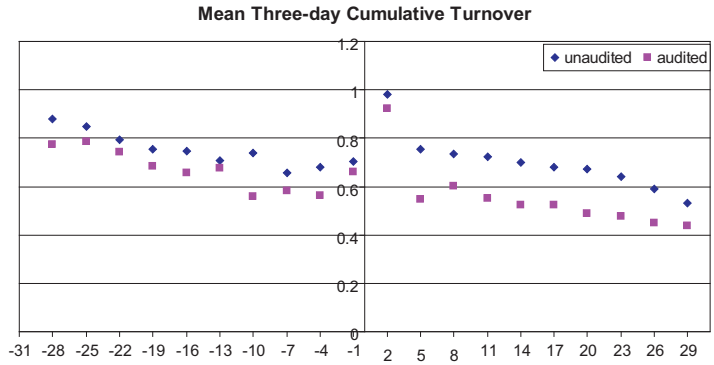

Figure 3.

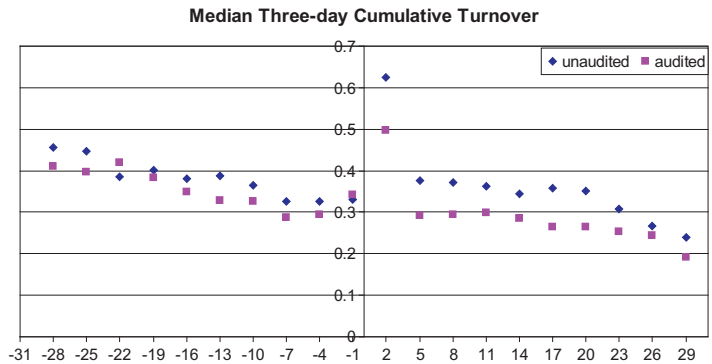

Figure 4.

In effect, these figures show patterns after earnings announcements that are consistent with (i) short-term increases in variability and volume reported in the literature, (ii) a steady state decrease in inter-investor belief divergence for all firms and (iii) a relatively higher decrease in divergence for the audited firms.

4.5. Multivariate analysis

Table 4 summarizes regression results comparing return variability and trading volume between the audited and the non-audited groups. Panel A of Table 4 shows the return variability results of Model 2; and panel B of Table 4 shows the trading volume results of Model 3. *Audit* coefficients in both models are significantly ($p < 0.01$) negative across three different window lengths, which indicates that audited financial statements are associated with smaller standard deviations of stock returns and lower average daily trading volume. Compared to the mean value of the standard deviation of returns in non-audited firms, the coefficients of *Audit* suggest a reduction of 31% in the 7-day window, 35% in the 15-day window and 30% in the 30-day window. Similarly, the turnover reductions are 87%, 94% and 93.7% respectively in the 7, 15 and 30-day windows.[12] These reductions are both statistically significant and economically material.

The adjusted R^2 of the variability model increases for longer event windows, mainly because of increased association between post- and pre-announcement standard deviations. The *IMR* coefficients are significant in all cases. Consistent with our expectations, the post-announcement return variability and trading volume are

[12] These computations are performed as follows. Consider the standard deviation of returns, V_{post} for non-audited firms in the 7-day window in Table 3 = 2.115. The coefficient of *Audit* in Table 4 for the 7-day window is −.654. The reduction is computed as .654/2.115 = 31%.

Table 4
Multivariate analysis of the effect of audit on stock-return variability and trading volume.

Event window	7 Days ($0 < t < 8$)		15 Days ($0 < t < 16$)		30 Days ($0 < t < 31$)	
Panel A: Return variability model (V_{post})						
Intercept	3.145	$(16.14)^{***}$	2.599	$(16.26)^{***}$	2.335	$(18.00)^{***}$
Audit	−0.654	$(-5.48)^{***}$	−0.715	$(-7.73)^{***}$	−0.587	$(-7.80)^{***}$
V_{pre}	0.136	$(6.79)^{***}$	0.213	$(11.66)^{***}$	0.243	$(14.18)^{***}$
Size	−0.190	$(-7.86)^{***}$	−0.150	$(-7.94)^{***}$	−0.149	$(-9.68)^{***}$
V_{annual}	0.030	$(1.99)^{**}$	0.045	$(3.05)^{***}$	0.059	$(4.02)^{***}$
IMR	0.323	$(4.36)^{***}$	0.363	$(6.36)^{***}$	0.308	$(6.58)^{***}$
ABS_CAR	0.082	$(16.97)^{***}$	0.042	$(16.63)^{***}$	0.020	$(14.26)^{***}$
Y98	−0.087	(−1.54)	0.021	(0.50)	0.227	$(6.84)^{***}$
Y99	−0.224	$(-3.88)^{***}$	−0.184	$(-4.02)^{***}$	−0.185	$(-4.98)^{***}$
Y00	−0.228	$(-4.20)^{***}$	−0.108	$(-2.50)^{**}$	0.033	(0.94)
Adjusted R^2	0.248		0.296		0.329	
$n = 1710$ (616) for non-audited (audited) group						
Panel B: Trading volume model (TV_{post})						
Intercept	0.605	(1.50)	2.129	$(5.26)^{***}$	2.433	$(8.25)^{***}$
Audit	−1.766	$(-9.34)^{***}$	−1.814	$(-11.11)^{***}$	−1.621	$(-11.57)^{***}$
TV_{pre}	0.466	$(17.33)^{***}$	0.423	$(17.09)^{***}$	0.268	$(13.81)^{***}$
Size	−0.174	$(-4.68)^{***}$	−0.251	$(-7.53)^{***}$	−0.299	$(-10.42)^{***}$
TV_{annual}	0.020	$(1.83)^{*}$	0.026	$(2.04)^{**}$	0.080	$(5.56)^{***}$
IMR	0.985	$(8.28)^{***}$	0.995	$(9.63)^{***}$	0.869	$(9.84)^{***}$
MTV	0.940	$(7.44)^{***}$	0.511	$(3.15)^{***}$	0.467	$(4.13)^{***}$
ABS_CAR	0.144	$(15.52)^{***}$	0.072	$(14.41)^{***}$	0.033	$(11.97)^{***}$
Y98	0.397	$(2.79)^{***}$	0.167	(1.11)	0.522	$(6.73)^{***}$
Y99	0.208	$(1.74)^{*}$	−0.059	(−0.48)	0.055	(0.63)
Y00	0.095	(1.03)	0.209	$(2.51)^{**}$	0.392	$(5.81)^{***}$
Adjusted R^2	0.455		0.421		0.373	
$n = 1706$ (615) for non-audited (audited) group						

White-covariance-consistent t is reported in parentheses next to the estimated coefficient. Dependent variable in Panel A is V_{post}: Standard deviation of risk-adjusted abnormal returns after semi-annual announcements; V_{pre}: Standard deviation of risk-adjusted abnormal returns before semi-annual announcements; V_{annual}: Standard deviation of risk-adjusted abnormal returns after annual announcements; *Size*: Natural logarithm of beginning market value of equity; *IMR*: Inverse Mills ratio; *ABS_CAR*: absolute value of risk-adjusted cumulative abnormal returns over the post-announcement period. Dependent variable in Panel B is TV_{post}: Average daily trading volume after semi-annual announcements; TV_{pre}: Average daily trading volume before semi-annual announcements; TV_{annual}: Average daily trading volume after annual announcements; *MTV*: Market-wide average daily trading volume after semi-annual announcements.

* Significant at 10%, two-tailed.

** Significant at 5%, two-tailed.

*** Significant at 1%, two-tailed.

significantly and positively associated with pre-announcement and post-annual announcement return variability and trading volume, respectively. *Size* has a negative association with return variability and trading volume in all three event windows. Consistent with results reported by Atiase and Bamber (1994), the estimated coefficients of our measures of pre-announcement level of belief divergence (v_{pre}, TV_{pre}) and *ABS_CAR* are significantly ($p < 0.01$) positive. Results in both Panel A (variability) and Panel B (trading volume) are consistent with our prior expectations; they suggest greater information convergence in the audited group than in the non-audited group after controlling for self-selection (*IMR*), general information environment (*Size*), other inherent differences in the variability (v_{pre}, v_{annual}, TV_{pre}, *MTV*), and year-specific effects (year dummies).

4.6. Alternative control for self-selection: two-stage regression

We employ a two-stage regression analysis through estimation of a simultaneous system of equations in which the post-announcement return variability (or trading volume) is determined simultaneously with the choice of semi-annual audit. We then use all the control variables that we have identified in Models 1–3 to solve the model. Since one of the endogenous variables (*Audit*) is dichotomous and the other (V_{post}) is continuous, we adapt the program suggested by Keshk (2003), which is specifically designed to solve this type of

Table 5
Alternative control for self-selection bias: two-stage regression.

Event window	7 Days ($0 < t < 8$)		15 Days ($0 < t < 16$)		30 Days ($0 < t < 31$)	
Panel A: Return variability model (V_{post})						
Intercept	2.915	$(13.98)^{***}$	2.370	$(13.67)^{***}$	2.129	$(14.74)^{***}$
Audit	−0.769	$(-5.88)^{***}$	−0.854	$(-8.03)^{***}$	−0.728	$(-8.33)^{***}$
V_{pre}	0.146	$(7.54)^{***}$	0.217	$(11.3)^{***}$	0.252	$(13.26)^{***}$
Size	−0.156	$(-5.77)^{***}$	−0.113	$(-5.17)^{***}$	−0.115	$(-6.38)^{***}$
V_{annual}	0.025	(1.58)	0.038	$(2.45)^{**}$	0.049	$(3.14)^{***}$
ABS_CAR	0.082	$(18.31)^{***}$	0.042	$(16.5)^{***}$	0.019	$(13.57)^{***}$
Y98	−0.092	(−1.63)	0.015	(0.33)	0.218	$(5.76)^{***}$
Y99	−0.259	$(-4.23)^{***}$	−0.224	$(-4.46)^{***}$	−0.231	$(-5.53)^{***}$
Y00	−0.254	$(-4.26)^{***}$	−0.137	$(-2.83)^{***}$	0.002	(0.05)
Adjusted R^2	0.229		0.249		0.269	
$n = 1710$ (616) for non-audited (audited) group						
Panel B: Trading volume model (TV_{post})						
Intercept	−0.073	(−0.16)	1.426	$(2.89)^{***}$	1.853	$(5.02)^{***}$
Audit	−2.039	$(-9.14)^{***}$	−2.059	$(-10.12)^{***}$	−1.858	$(-10.50)^{***}$
TV_{pre}	0.462	$(20.85)^{***}$	0.416	$(18.45)^{***}$	0.266	$(13.02)^{***}$
Size	−0.090	$(-1.94)^{*}$	−0.164	$(-3.91)^{***}$	−0.228	$(-6.31)^{***}$
TV_{annual}	0.030	$(2.31)^{**}$	0.037	$(2.63)^{***}$	0.081	$(5.41)^{***}$
MTV	0.972	$(7.00)^{***}$	0.539	$(2.87)^{***}$	0.531	$(3.78)^{***}$
ABS_CAR	0.143	$(19.67)^{***}$	0.072	$(15.34)^{***}$	0.033	$(11.95)^{***}$
Y98	0.438	$(2.68)^{***}$	0.196	(1.15)	0.529	$(5.66)^{***}$
Y99	0.190	(1.45)	−0.070	(−0.52)	0.016	(0.16)
Y00	0.047	(0.45)	0.166	$(1.77)^{*}$	0.334	$(4.07)^{***}$
Adjusted R^2	0.365		0.313		0.264	
$n = 1706$ (615) for non-audited (audited) group						

Dependent variable in Panel A is V_{post}: Standard deviation of risk-adjusted abnormal returns after semi-annual announcements; V_{pre}: Standard deviation of risk-adjusted abnormal returns before semi-annual announcements; V_{annual}: Standard deviation of risk-adjusted abnormal returns after annual announcements; *Size*: Natural logarithm of beginning market value of equity; *ABS_CAR*: absolute value of risk-adjusted cumulative abnormal return over the post-announcement period. Dependent variable in Panel B is TV_{post}: Average daily trading volume after semi-annual announcements; TV_{pre}: Average daily trading volume before semi-annual announcements; TV_{annual}: Average daily trading volume after annual announcements; *MTV*: Market-wide average daily trading volume after semi-annual announcements.

* Significant at 10%, two-tailed.
** Significant at 5%, two-tailed.
*** Significant at 1%, two-tailed.

system of equations. The second stage results are given in Panels A and B of Table 5. After we correct for simultaneity, we continue to find significant negative associations between the audit variable and return variability (or trading volume) in all three windows.

4.7. The change model

To check the sensitivity of our results against alternative model specifications, we test the following change model:

$$Change = \lambda_0 + \lambda_1 Size + \lambda_2 Audit + \lambda_4 Change_{annual} + \lambda_5 IMR + \lambda_6 ABS\_CAR + \lambda_7 y98 + \lambda_8 y99 + \lambda_9 00 + \varepsilon \quad (4)$$

where *Change* is $v_{post} - v_{pre}$ for the return variability test and $TV_{post} - TV_{pre}$ for the trading volume test. Similarly, $Change_{annual}$ is the change in return variability (or trading volume) over the annual report announcement period in the prior year. The results are reported in Table 6. The estimated coefficient of the audit variable is significantly negative across all three windows for both variability and trading volume models. In addition, we tested a size-deflated variability model by dividing both the left-hand side variable ($V_{\_pre}$) and the right-hand side variable ($V_{\_post}$) by *Size* and kept all other control variables unchanged. After running this model in all three event windows, we found that the results were not qualitatively different from that reported in Panel A

Table 6
Analysis of the effect of audit on the change between post- and pre-announcement stock-return variability and trading volume.

Event window	7 Days		15 Days		30 Days	
Panel A: Return variability model ($V_{post} - V_{pre}$)						
Intercept	0.719	(2.79)***	0.327	(1.66)*	0.233	(1.44)
Audit	−0.394	(−2.42)**	−0.450	(−3.54)***	−0.410	(−3.99)***
Size	−0.120	(−3.55)***	−0.079	(−3.09)***	−0.082	(−3.88)***
Ch_V$_{annual}$	−0.016	(−0.84)	−0.017	(−0.93)	−0.047	(−2.71)***
IMR	0.131	(1.28)	0.192	(2.43)**	0.190	(2.94)***
ABS_CAR	0.059	(8.41)***	0.032	(8.84)***	0.013	(6.54)***
Y98	0.084	(1.02)	0.239	(3.97)***	0.477	(10.53)***
Y99	−0.109	(−1.34)	−0.214	(−3.45)***	−0.461	(−9.51)***
Y00	0.203	(2.60)***	0.219	(3.64)***	0.255	(5.33)***
Adjusted R^2	0.059		0.093		0.244	
$n = 1710$ (616) for non-audited (audited) group						
Panel B: Trading Volume Model ($TV_{post} - TV_{pre}$)						
Intercept	−2.082	(−5.08)***	−0.432	(−0.96)	−0.202	(−0.56)
Audit	−0.818	(−4.33)***	−0.756	(−4.24)***	−0.644	(−3.56)***
Size	0.077	(2.03)**	0.048	(1.33)	0.043	(1.24)
Ch_TV$_{annual}$	−0.005	(−0.45)	−0.007	(−0.52)	−0.002	(−0.16)
IMR	0.448	(3.70)***	0.409	(3.61)***	0.322	(2.77)***
Ch_$_{MKT}$	0.929	(6.42)***	0.095	(0.48)	−0.294	(−1.95)*
ABS_CAR	0.190	(18.40)***	0.119	(20.11)***	0.068	(19.21)***
Y98	0.575	(3.76)***	0.099	(0.58)	0.479	(5.33)***
Y99	−0.150	(−1.27)	−0.692	(−5.53)***	−1.161	(−12.36)***
Y00	−0.258	(−2.93)***	−0.123	(−1.61)	0.065	(0.89)
Adjusted R^2	0.294		0.302		0.343	
$n = 1706$ (615) for non-audited (audited) group						

White-covariance-consistent t is reported in parentheses next to the estimated coefficient. Dependent variable in Panel A is $V_{post} - V_{pre}$ as defined in Table 4 over semi-annual announcement period; *Audit*: 1 for audited observations and 0 otherwise; *Ch_V$_{annual}$*: $V_{post} - V_{pre}$ over the annual financial statement announcement period; *Size*: Natural logarithm of beginning market value of equity; *IMR*: Inverse Mills Ratio; *ABS_CAR*: absolute value of risk-adjusted cumulative abnormal return over the post-announcement period. Dependent variable in Panel B is $TV_{post} - TV_{pre}$ over semi-annual announcement period; *Ch_TV$_{annual}$*: TV_{post} - TV_{pre} over annual announcement period; *Ch_$_{MKT}$*: Market-wide average daily trading volume after semi-annual announcements minus market-wide average daily trading volume before the announcements.

* Significant at 10%, two-tailed.
** Significant at 5%, two-tailed.
*** Significant at 1%, two-tailed.

of Table 4. Similarly, we constructed a size-deflated trading volume model and did not find results that were qualitatively different from that reported in Panel B of Table 4. Therefore, we conclude there is no evidence that our main results were driven by size.

4.8. Robustness checks[13]

4.8.1. Effect of auditing on frequency of modified audit opinions

Financial statements that are more reliable should be associated with a lower frequency of modified audit opinions (MAOs) *ceteris paribus*. We adopt the logistic regression model constructed by Chen et al. (2001) to test whether firms with audited semi-annual reports are less likely to receive MAOs at the year end as compared to those whose semi-annual reports are not audited. This model controls for the client's firm size, accounting performance (ROA), debt level, systematic risk (Beta) and other factors that affect the likelihood of receiving MAOs in China. The results show that the audited group has a significantly ($p < 0.01$) lower frequency of receiving MAOs than the non-audited group. This evidence is consistent with the notion that auditing improves the reliability of financial statements and thereby decreases the likelihood of MAOs.

[13] In the interest of space, empirical results reported in this section are not tabulated. However, they are available from authors upon request.

4.8.2. Analysis of firms that discontinue semi-annual audits

We compared a sample of 435 observations whose interim reports are audited in the current year with 377 observations whose interim reports were audited previously but not in the current year by estimating Model (2) and find that the *Audit* variable is significantly negative in all three event windows. This indicates that firms whose interim reports are audited in the current year show a lower return variability than firms who chose auditing of interim reports in the past but have since discontinued it. This finding is consistent with the argument that the reduced variability in returns arises from auditing of interim statements that year rather than firm characteristics or the auditing of the interim statements in previous years.

4.8.3. Analysis of first-time semi-annual audits

In this test, we focused on observations without repeated semi-annual audits to test whether our results were driven by repeatedly audited observations. The results remained qualitatively unchanged after we excluded repeatedly audited observations from our sample.

4.8.4. Effect of auditing when alternative empirical proxies are used

We performed additional tests to examine the robustness of the results when alternative empirical proxies are employed by repeating all regression analyses reported in Table 4. In the variability model, we replaced risk-adjusted returns with market-index-adjusted returns to calculate the standard deviation. In the trading volume model, we replaced average trading volume with total trading volume over the event window. Results were not qualitatively different. Furthermore, in addition to return variability and trading volume, we used the average difference between the daily high and low prices of the stock (the bid-ask spread information is not available to us) as a rough proxy for information asymmetry and found a significantly larger reduction in this variable for the audit group than for the non-audited group in all three event windows.

4.8.5. Examination of stock-return variability and volume using a matched sample

We also perform matched sample tests to check the robustness of our results as inherent firm-specific differences between audited and non-audited firms may affect both pre and post-announcement trading behavior. Audited observations are matched with non-audited ones by year on the following firm-specific variables individually: *SIZE*, *beta*, V_{pre} and TV_{pre}. This approach is essentially similar to including these firm characteristics as control variables in the model. However, matched samples are more homogeneous and the subsequent comparison of the effect of auditing is conducted between two groups of observations with similar size, systematic risk or pre-announcement belief divergence level, respectively. The results are not qualitatively different from those reported in Table 4.

4.8.6. Extended time period analysis

We explore the persistent length of time in the difference between audited and non-audited groups. We find no substantial differences between the standard deviations of audited and non-audited observations before -30 and after $+30$. Even though some minor differences continue for up to 180 days after the release of semi-annual financial statements, the system seems to typically reset itself after 30 days, with the inflow of more information.

4.8.7. Analysis after removing the period of variability and volume increase

As discussed earlier, the pattern of variability and volume changes shows an increase in the variability of stock returns[14] and volume of trading for two days following the announcement. We repeated our analysis removing the $[-2, +2]$ time period from the sample periods but this did not change our results.

[14] The absence of a well-developed options market in China precludes us from measuring implied variability based on option prices. Further, since variances calculated over a short window of two days may not be very reliable, we subtracted the variance calculated over the truncated post-announcement windows from that over the full post-announcement windows and compared the differences between these variance with the variances in the corresponding pre-announcement windows and found them to be positive for both audited and non-audited firms (showing an increase in variance over a two-day post-announcement period).

5. Concluding remarks

Using a sample of Chinese firms, we provide evidence that auditing decreases information divergence across investors measured by reduced stock return variability and trading volume. We find that the reduction in stock return variability and trading volume are both statistically significant and economically material. Results are robust after controlling for self-selection bias and several other factors. Our findings are consistent with the argument that investors place more weight on audited financial statements than on non-audited ones in pricing stocks.

Our results show that auditing has the beneficial effect of decreasing inter-investor divergence even in an emerging economy such as China. Our findings are consistent with the argument that the benefits of auditing in improving the confidence of ordinary investors who rely on public information do not require a highly developed market and legal infrastructure. From a policy perspective, emerging economies are justified in investing in auditing infrastructure and seeking to improve financial reporting quality to stimulate investments without necessarily waiting for the full development of legal and market infrastructures. China has justifiably taken steps to increase investor confidence by changes in regulations that create a disciplined and regulated audit market (China Securities Regulation Commission, 2000). The actions taken by Chinese regulators include: revocation of audit licenses for those involved in fraudulent financial reporting; closure of auditing firms that provide misleading audit reports; implementation of new audit standards modeled after international practices; and effecting more stringent disclosure requirements on firms receiving modified audit opinions.[15]

Although this study is based on the Chinese context, we believe that investors in China are motivated by similar economic incentives as in other parts of the world and to that extent the findings can be generalized to other emerging economies. However, institutional differences between countries should be considered when generalizing our results.

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Appendix A

In this appendix, we present a formal development of our reasoning. We show that when auditing reduces the bias and/or improves the precision of accounting information, there is less variability in stock returns and less trading volume in audited firms as compared to non-audited firms.

Step 1: Auditing increases the weight placed by investors on accounting information relative to non-accounting information in valuing stocks.

In this step, we consider only one investor and one stock. Ohlson (1995) and Easton (1999), posit a valuation model that combines accounting and non-accounting information. We write the market price of the stock as P, a linear combination of an accounting-based value as z, and a non-accounting based value as u:

$$P = \alpha_1 z + \alpha_2 u \tag{A1}$$

In Eq. (A1) the time t is suppressed. Under the Clean surplus model in Ohlson (1995), $z_t = [y_t - \delta(R-1)\, y_{t-1}] + \delta x_t$, where the subscript t represents a particular period, y is the book value, x is the earnings, R is the risk-free return and δ is a scalar. In a more general case, we can think of z as the valuation that results from all

[15] For example, since 1998, the names of firms that receive disclaimers and adverse opinions are required to be exposed on the front page of major securities newspapers once every two weeks.

accounting information inclusive of (but not limited to) book values and earnings of current and previous periods. On the other hand, u represents the valuation that results from all non-accounting information available in the market during the relevant period.

For any particular individual investor, however, the valuation of the stock depends on how he or she aggregates the two sources of information. In particular, all non-accounting information is not available to all investors. Non-accounting information includes private information that is distributed among investors. Some investors receive more information than others.[16] Given these differences, the stock valuation by investor i can be written as follows:

$$V_i = \gamma_1 z^R + \gamma_2 u_i \tag{A2}$$

In Eq. (A2), z^R represents valuation that results from the set of reported financial statement information. Since financial statement information is public and common to all investors, there is no subscript i in the valuation of that information.[17] Yet, z^R may still differ from the true z (which is unobservable). We capture the dispersion of the accounting information by the variance of z^R. In contrast, non-accounting information u_i denotes investor i's valuation of non-accounting information that he can access.[18] The valuation component u_i could vary across different investors depending on the access, interpretation ability and the effort of the investors.[19] We denote dispersion in the valuation component based on non-accounting information by its variance σ^2. We assume that the stock value expected across investors, $E(V_i)$ is the expected stock market price.

We focus on the relative weights, γ_1 and γ_2, that investors place on accounting and non-accounting valuation, respectively. In this analysis, we assume that auditing could have two specific effects on accounting information and, therefore, on valuation: (i) to screen firms whose financial reports are biased and/or unreliable by issuing qualified reports and (ii), to discipline the report production process and increase the precision and unbiasedness of reported financial statement numbers.[20]

We assume (without loss of generality) that when financial statements are not qualified, investors do not expect statements to be biased and attribute a high reliability to numbers reflected by a low variance of z^R which we denote by ψ_1^2. However, when financial statements are qualified, this signals to investors the possibilities of bias and lower reliability in the reported accounting valuation z^R, relative to unqualified reports. We denote the perceived bias by the variable 'a' and the reduced perceived reliability[21] of financial statements by an increased variance $\psi_2^2 > \psi_1^2$. These notations are captured in the following expressions of probability density functions[22]:

$$f(z^R|z,\ \textit{clean opinion}) \sim f(z, \psi_1^2);\ \text{and,}$$
$$f(z^R|z,\ \textit{qualified opinion}) \sim f(z + a,\ \psi_2^2) \tag{A3}$$

Further, if the firm is not audited, the lack of audit information adds an additional variance ψ_3^2. We also denote the prior probability of an unqualified report by p.

[16] There is considerable recent literature that recognizes this difference between informed and relatively uninformed investors (Easley and O'Hara, 2004; Brockman and Chung, 2003; Goel and Thakor, 2003; Brennan and Subrahmanyam, 1996).

[17] It is possible for investors to use different valuation functions to value common information and arrive at different valuations. Alternatively, the differences in valuation function can also be viewed as differences in other information.

[18] Even though much of the non-accounting information might be available publicly, its interpretation by different investors can be different. There is no common process like GAAP that guides the production and communication of non-accounting information. We seek to capture this aspect of non-accounting information in the model by the term u_i.

[19] We assume the information risk to be common to all the investors, but different for different sources of information. In other words, we assume that all investors harbor the same degree of skepticism about accounting information; and that they share similar skepticism about non-accounting information, which could differ from their skepticism about accounting information.

[20] We show later that either one of these audit effects is sufficient to reduce the variance of the stock price (and returns) in the market.

[21] This is the signaling effect of auditing. While the bias and reliability of the numbers are not known, investors will assume that the bias and lack of reliability are at threshold levels that can be detected by an auditor after prescribed auditing practices. These threshold levels are 'a' for the bias and the increased variance ψ_2^2.

[22] Only the mean and the variance of the density function are shown in expressions (A3). This is not meant to imply that the density function is fully defined by the first two moments.

With the above notation, the variance of the accounting component of the valuation in a non-audited firm is given by

$$\xi^2 = p\psi_1^2 + (1-p)\psi_2^2 + p(1-p)a^2 + \psi_3^2 \tag{A4}$$

The investor optimally weighs the accounting and non-accounting sources of valuation information by a minimum variance aggregation process (see Banker and Datar, 1989, for a theoretical basis for the aggregation process) by solving the following optimization problem[23]:

$$\underset{\gamma_{1ui},\,\gamma_{2ui}}{Minimize} \quad \gamma_{1u}^2\xi^2 + \gamma_{2u}^2\sigma^2 \quad subject\ to\ \gamma_{1u} + \gamma_{2u} = 1 \tag{A5}$$

In the above expression, γ_{1u} is the weight placed on accounting information and γ_{2u} is the weight placed on non-accounting information. The subscript '*u*' denotes 'non-audited' financial statements.

This yields optimal weights

$$\gamma_{1u} = \frac{\sigma^2}{\sigma^2 + \xi^2} \quad \text{and} \quad \gamma_{2u} = \frac{\xi^2}{\sigma^2 + \xi^2} \tag{A6}$$

With the audit, the firm might get a clean opinion with probability p or a qualified opinion with a probability $(1-p)$. The expected optimal weights will be as follows:

$$\gamma_{1a} = \left[\frac{p\sigma^2}{\sigma^2 + \psi_1^2} + \frac{(1-p)\sigma^2}{\sigma^2 + \psi_2^2}\right] \quad \text{and} \quad \gamma_{2a} = \left[\frac{p\psi_1^2}{\sigma^2 + \psi_1^2} + \frac{(1-p)\psi_2^2}{\sigma^2 + \psi_2^2}\right] \tag{A7}$$

In (A7), subscript 1 stands for weight on accounting information and subscript 2 for weight on non-accounting information. Subscript 'a' denotes audited financial statements.

An examination of (A6) and (A7) reveals that $\gamma_{1a} > \gamma_{1u}$ and $\gamma_{2a} < \gamma_{2u}$. In effect, audited financial statement numbers are weighted more than non-audited ones relative to the weighting of non-accounting information.

Step 2: Auditing reduces the variance in stock valuations by investors.

Heretofore, we have focused on one investor. We will now examine the divergence among investors. The valuation of the stock by the *i*th investor is given by (A2):

$$V_i = \gamma_1 z^R + \gamma_2 u_i$$

The first term is common to all investors. The second term consists of non-accounting information, which could be different for different investors. When we take the variance of V_i across investors, we have

$$Variance\ (V_i) = \gamma_2^2 Variance\ (u_i) \tag{A8}$$

From step 1, we know that $\gamma_{2a} < \gamma_{2u}$. Therefore, from (A8) we see that the expected variance of the stock values perceived by investors is less for audited firms than for non-audited firms, *ceteris paribus.*

Further, for a given market price of the previous period, (P_{t-1}), the expected return on the stock is given by $(V_i - P_{t-1})/P_{t-1}$. The expected return will be equal to the market return. The expected variance of the market return will be equal to $[Variance\ (V_i)]/P_{t-1}^2$. Therefore, we expect audited firms to have a lower variance of market returns relative to non-audited firms. The differences in valuation by different investors also lead to a greater trading volume. Therefore, after we control for other determinants of trade volume, we expect the trade volume for audited firms to be less than the expected trade volume for non-audited firms.

[23] This problem is solved under the assumption that the two information sources do not covary with each other. Adding covariance does not change results, but complicates the expressions. Therefore, we present the no covariance version.

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Address forms in Chinese audit opinions

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ABSTRACT

Although forms of address are widely used in textual and other types of disclosure, empirical evidence of their effects is rare. China provides a unique setting in which to test the economic consequences of the forms of address used in audit reports. From 2003 to 2011, about 60% of auditors surveyed addressed their clients by their real names in audit opinions, while the others used honorifics. Based on a sample of Chinese audit opinions, I report the following findings. First, the announcement of an audit opinion that uses the client's real name elicits a greater market response than the announcement of an opinion featuring an honorific form of address. Second, the effects of real-name forms of address are stronger in firms with weak board governance. Third, the association between audit fees and audit risk factors, such as loss-making, is stronger in firms that are addressed by their real names in audit reports. I conclude from these findings that the forms of address used in audit opinions may reveal private information on audit quality. The results of this study are consistent with the power-solidarity effect described by sociolinguists.

1. Introduction

Digital indicators are widely used in financial reports to communicate private information. In addition to numerical information, textual information plays an important role in corporate disclosure. With the development of computer technologies, the textual analysis of financial reports has become increasingly common in developed capital markets. However, powerful tools for analyzing textual information are rare in China. For example, no emotion-mapping dictionary is available for use with Chinese financial reports. Therefore, Chinese audit reports provide a unique opportunity to examine the consequences of different forms of address. Due to the traditional politeness principle embedded in the Chinese language, two main types of address can be observed in audit opinions. From 2003 to 2011, about 60% of clients surveyed were addressed by their real

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names, while the others were addressed using honorifics ('guì gōng sī'). The clear distinction between these two types of address makes it easy to empirically analyze forms of address in Chinese audit opinions.

In ancient China, particular styles of writing were used to communicate political opinions. In a classic text entitled *Chūn qiū*, Confucius used subtle words to convey profound meanings. The aim of this research was to determine whether auditors select forms of address to disclose specific information about audit quality. I test two hypotheses, based respectively on the theories of audit quality and sociolinguistic theory. I find that audit opinions that address clients by their real names yield greater market returns than opinions featuring honorific forms of address. I also find that the effects of forms of address are more pronounced in firms with weak board governance. Finally, the relationship between audit fees and audit risk factors, such as loss-making, is stronger in firms addressed by their real names in audit opinions than firms addressed using honorifics. Viewed collectively, these findings suggest that independent auditors have a greater incentive to address clients by their real names. The results are consistent with the power-solidarity effect described by sociolinguists.

This study contributes to the literature in the following ways. First, it provides further evidence on textual disclosure via forms of address. The results show that the rules of the Chinese language affect communication between a company and its investors. Second, the findings of this paper suggest that investors distinguish between 'clean' opinions by textual differences, as the imperative of client confidentiality prevents potential investors from viewing unaudited financial reports. This conclusion may shed light on the insufficiency of information in the existing audit-report system. Finally, the results of the study indicate that digital indicators such as board independence are related to the consequences of textual information, suggesting that textual and numerical information interact.

The remainder of the paper is organized as follows. Section 2 provides background information on the topic under study, such as a review of the relevant literature in the fields of audit quality and sociolinguistics. In Section 3, I describe the study's methodology, with attention to the research sample and model. Section 4 provides the results of tests of the consequences of different forms of address. I conclude the paper with a summary of the findings and their implications for future research.

2. Address forms in audit reports: background and relation to past research

Despite important research on the information content of English-language text, evidence of the effects of forms of address is rare. China provides a unique setting in which to analyze the forms of address used in audit reports. I propose that auditors' choice of address affects the market reaction to audit reports. This hypothesis is based on three assumptions. First, as an unaudited financial report cannot be observed by investors, auditors have an incentive to reveal information on audit quality. Second, common guidelines for modes of address are accepted by all stakeholders in China's capital market. Third, there is some variation in the forms of address used in audit reports, due to power-related motives and the Chinese tradition of polite language.

2.1. Are all clean opinions the same?

I focus on clean opinions because they are not differentiated by numerical information. The audit quality of a client firm that receives a clean opinion depends on the quality of the client's unaudited financial report. However, investors cannot observe unaudited financial reports, due to client confidentiality. Auditors issue clean opinions to three types of clients. Firms in the first category receive clean opinions in return for high-quality unaudited reports. Second, firms that offer poor-quality unaudited reports but accept all of their auditors' suggestions for adjustment also receive clean opinions. Firms of the third type, which offer poor-quality reports and refuse to make all of the adjustments proposed by auditors, receive clean opinions only if the risk of litigation is low. Clearly, the audit quality of the second type of firm is higher than that of the third type. However, it is difficult to evaluate the audit quality of firms in the first category. Investors cannot differentiate between firms that receive clean opinions in return for high-quality reports because the audit service is unobservable. Some researchers argue that auditors are under pressure to issue unmodified opinions because modified opinions have a huge negative effect on clients (Sun and Wang, 1999; Zhao, 2007; Simunic and Wu, 2009). However, other researchers point out that auditors have an incentive to circumvent pressure from investors and regulators, and thus engage in collaborative governance with independent directors (Zhao and Zhou,

2013). Approximately 90% of the sampled audit opinions issued in China from 2003 to 2011 were clean. I hypothesize that auditors issuing clean opinions and offering high-quality services have an incentive to reveal information to the market. Therefore, different types of clean opinion have distinct consequences.

2.2. Information-conveying function of corporate textual disclosure

Several aspects of textual disclosure, such as readability, tone and keyword frequency, are subject to managers' discretion. According to past research, managers' reporting incentives affect the consequences of textual disclosure. First, the short-term market returns to an earnings-release announcement are positively related to the level of optimism conveyed in the textual content of the earnings-release report (Henry, 2008; Demers and Vega, 2011; Davis et al., 2012). Loughran and McDonnald (2011) find a similar association between market returns and optimism in the text of 10-K Securities and Exchange Commission filings. Second, the level of optimism expressed in an earnings report is positively associated with future market returns (Feldman et al., 2009). Third, De Franco et al. (2011) find a positive relationship between the readability of analysts' reports and the stock-turnover rate. Finally, Loughran and McDonnald (2011) find evidence to suggest that the trading volume of small investors is positively associated with the readability of their annual reports. Taken together, these findings indicate that textual disclosure provides investors with private information.

Merkley (2011) finds that when a company's financial performance is in decline, its management is likely to disclose more information on research and development in the text of financial reports to assure the market of the long-term value of the company. Second, Nelson and Pritchard (2007) find that the greater the litigation risk faced by a firm, the more cautionary language managers use. Third, the mispricing of changes of accruals is larger when a firm discloses more information on competition in its annual report (Li et al., 2011).

It is worth mentioning that managers are also likely to provide obfuscatory information when firm performance declines. As demonstrated by Li (2008), firms with more complicated annual reports have less persistent positive earnings. Consistent with this result, Tama-Sweet (2009) finds that managers release more optimistic information when they plan to exercise their stock options, suggesting an opportunistic incentive for textual reporting.

2.3. Analysis based on theories of sociolinguistics and audit quality

Audit quality is traditionally believed to depend on auditors' competence and independence (DeAngelo, 1981). Clearly, investors will respond to textually disclosed information on auditor competence or auditor independence. As shown by sociolinguists, people use language to define their relationships with others. The term 'forms of address' denotes the words used by speakers to designate the people with whom they are talking. Such words can be used to communicate information about the relationship between speaker and addressee. Ervin-Tripp (1972) proposes that an address system is composed of a series of choices made by speakers. For example, a faculty member who wishes to address the dean by his first name will check whether expectations of status marking exist before using this form of address. The relative formality of the relationship between the faculty member and the dean will also affect the former's choice of address. Zhang (2009) posits that in China, choices of forms of address are driven by psychological as well as cultural factors. Accordingly, the authors of Chinese literary works use distinct forms of address to convey particular information.

2.3.1. Power-solidarity effect and politeness principle

Two sociolinguistic theories help to explain the consequences of different forms of address in audit opinions. The first is the power-solidarity theory suggested by Brown and Gilman (1960), according to which the use of real-name forms of address represents a relationship of equal power between auditor and client. Based on this assumption, I hypothesize that the use of real names in audit opinions indicates a greater degree of auditor independence. The second useful sociolinguistic theory is the politeness principle proposed by Brown and Levinson (1978), who suggest that speakers use honorifics to address people of higher status. Accordingly, auditors may use honorific forms to suggest that clients are important. Although investors respond positively to both auditor independence and client importance, an event study may help to determine

which of the two factors is dominant. For example, if the market returns on audit opinions with real names are higher than those on audit opinions with honorific forms of address, the power-solidarity effect can be assumed to be more pronounced in Chinese audit opinions. However, if there is no difference in the market returns on these two types of address, it can be assumed either that the power-solidarity effect and the politeness principle are non-existent, or that these two effects are evenly matched and cancel each other out. The full set of permutations leading to these results is presented in the following figure (see Fig. 1).

'Auditor independence' refers to the likelihood of auditors reporting a breach in its client's accounting system. The theoretical probability of reporting a breach usually decreases in practice, because a client can impose costs on an auditor by terminating the audit service. Therefore, auditor independence is assumed to be positively related to characteristics such as audit size (DeAngelo, 1981; Dye, 1993). 'Opinion shopping' describes the practice of searching for an auditor willing to comply with the client's needs by issuing an unqualified opinion. This phenomenon is of concern to both regulators and investors. Investors require information on auditor independence to evaluate a firm's audit quality, even when the firm has received a clean opinion. I hypothesize that auditors' choice of forms of address provides information on auditor independence, for two reasons. First, forms of address are of concern to clients when auditors issue clean opinions. Second, sociolinguistic theories suggest that different forms of address reflect different relationships between clients and auditors.

Brown and Gilman (1960) propose that pronoun usage is governed by power and solidarity semantics. Brown and Ford (1961) identify a natural progression in the forms of address chosen by English speakers from mutual title with first name to mutual first name, indicating that power differences between levels of society are less important in modern social interactions. According to Scotton and Zhu (1983), honorifics such as 'lo shī' ('teacher') were retained in Chinese forms of address after 1949. Such honorific titles convey respect for the addressee, indicating that power difference is still important in China. With the development of China, the popularity of honorific titles continues to depreciate and addresses based on the solidarity effect, such as 'tóng zhì' (comrade), are supported by the government. As discussed in these literatures, I expect that real name address suggests a smaller power differential between auditor and client. I also hypothesize that the more balanced the auditor–client relationship, the more independent the auditor is likely to be.

In China, words such as 'guì' ('esteemed') are used in honorific forms of address to convey the speaker's respect. For example, the Chinese word 'guì xìng' means 'your esteemed name' in English. In contrast, words such as 'b' are used in self-abasing forms of address. For example, the Chinese word 'b rén' means 'your humble friend' in English. Both honorifics and self-abasing forms of address can positively affect face, which is consistent with the politeness principle proposed by Brown and Levinson (1978). Therefore, I hypothesize that

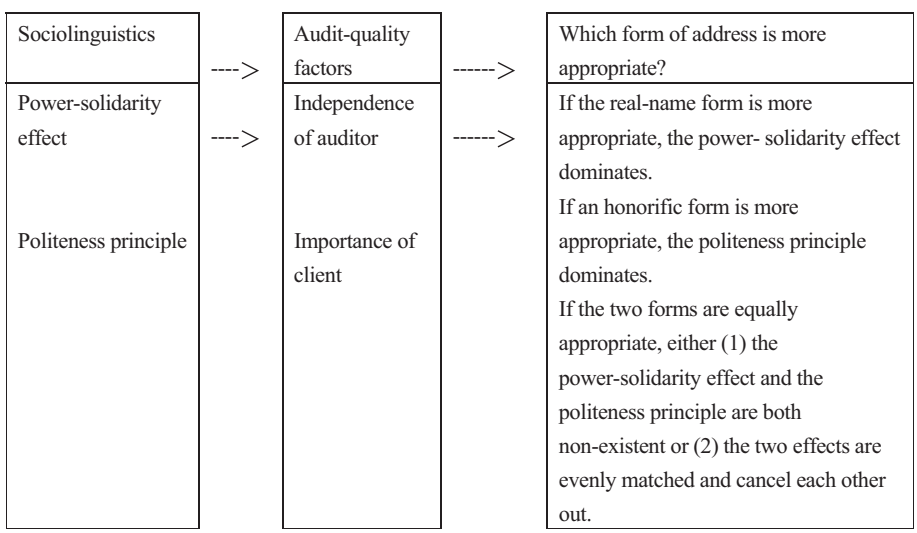

Figure 1. Paths leading to three possible sets of results of the event study.

the use of honorifics to address clients in audit opinions provides information on the importance of the clients. An important client is likely to elicit greater effort from an auditor, leading to higher audit quality.

2.3.2. Forms of address in China: tradition and modernity

Changes in forms of address in China, whether arising from cultural, commercial or historical developments, may have important organizational consequences. The authors of *Chūn qiū*, one of the most famous texts of the Pre-Qin era, used forms of address to express opinions on political events. For example, when references to the king of Qi are downgraded from 'qí hóu' ('King Qi') to 'qí rén' ('Guy Qi'), the reader infers that the king's behavior is contrary to the welfare of his people.[1]

In modern China, political and business organizations select forms of address that both maximize the power-solidarity effect and conform to the politeness principle. For example, when a faculty member wishes to address his superior, the most common form of address comprises position title and last name. According to the theory of power solidarity, position titles reveal information on power difference, and may thus lead to bureaucratic delay. The local government of Shanghai has released an official document that deals specifically with forms of address. The General Office of the Communist Party of China Shanghai Municipal Committee requires members of the Communist Party, especially party cadres, to address each other as 'tóng zhì' ('comrade') in official documents. The government is clearly concerned that forms of address featuring titles such as 'secretary' or 'minister' will lead to bureaucratic and organizational inefficiencies.

Forms of address are also of concern to commercial organizations. Before 1999, the company Lenovo experienced steady growth due to its exceptional performance. With the expansion of the company's management hierarchy and personnel, the probability of a manager's being addressed by his or her last name accompanied by the word 'zǒng' ('chief officer') significantly increased. The Chief Executive Officer of Lenovo, Yuanqin Yang, was concerned that the company's cohesion would be compromised by the power effect of this form of address. He thus established two forms of address for himself: 'lo yáng' ('Old Yang') and his first name. His goal was to eliminate the power effect and create a family culture for the company.[2] Huawei, another Chinese company, responded positively to the restructuring of forms of address at Lenovo. A special report was published in an internal newspaper named 'Management Optimization' on the decision to implement Lenovo's reforms at Huawei.[3] These two cases indicate that forms of address concern both the government of China and Chinese companies.

2.4. Research opportunities provided by China

China provides a unique opportunity for textual analysis of the forms of address used in audit opinions for two reasons. First, the difference between the two types of address is very clear. Therefore, the variable capturing 'form of address' is not ambiguous. In addition, the tests can be conducted in the absence of an emotion-mapping dictionary for the Chinese language. Second, more than 10,000 audit opinions using identifiable forms of address were issued from 2003 to 2011, providing a sufficiently large sample to capture the whole market. In addition, the ratio of real names to honorifics is about 6:4, which allows me to examine not only the consequences of forms of address, but also the moderating effects of auditor and client characteristics.

2.4.1. Forms of address in Chinese audit opinions

About 90% of China's listed companies receive standard unqualified audit opinions. There is no variation in digital indicators in these opinions, providing a clean setting in which to examine the consequences of different forms of address. The following table provides examples of the forms of address used in Chinese audit opinions.

As shown in Table 1, the first company is addressed by its full name, whereas the second company is addressed as 'guì gōng sī' ('your esteemed company'). In the United States, auditors address their clients

[1] See Xiong (2007), Spirit of Chinese people in the Spring and Autumn: imperial power and academia in traditional context of China, Xi an: Shaanxi Normal University General Publishing House Co., Ltd., 105–111.

[2] See http://tech.sina.com.cn/news/it/1999-11-1/10141.shtml.

[3] See http://iye.net.blog.163.com/blog/static/3148921200861933851979/.

Table 1
Forms of address used in Chinese audit opinions.

Real-name address	Honorific address
To the shareholders of ABC Co., Ltd., We have audited the accompanying consolidated balance sheet of ABC and its subsidiaries as of . . .	To the shareholders of XYZ Co., Ltd., We have audited the accompanying consolidated balance sheet of XYZ ['guì gōng sī' ('your esteemed company')] and its subsidiaries as of . . .
• Opinion In our opinion, the financial statements give a true and fair view of the financial position of ABC Co., Ltd and the Group as of 31 December 2006, and of its financial performance and its cash flows for the year then ended, in accordance with the Accounting Standards for Business Enterprises and China Accounting System for Business Enterprises	• Opinion In our opinion, the financial statements give a true and fair view of the financial position of 'guì gōng sī' (your esteemed company) and the Group as of 31 December 2006, and of its financial performance and its cash flows for the year then ended, in accordance with the Accounting Standards for Business Enterprises and China Accounting System for Business Enterprises

by their real names or use abbreviations (such as 'your company'). The abbreviated form would be translated as 'n gōng sī' if the politeness principle were neglected, which would have no positive effect on face. Following the Chinese politeness principle, however, the abbreviation is transformed into an honorific ('guì gōng sī'). 'Guì gōng sī' means 'your esteemed company' in English. This unique setting enables me to divide forms of address in Chinese audit opinions into two categories.

2.4.2. Distribution of forms of address in China from 2003 to 2011

Before 2003, all auditors addressed their clients using honorifics ('guì gōng sī'). In 2003, regulators revised the standards for independent audit and recommended a new style for the text of audit opinions. The guidelines on the new standards provide an example of a clean opinion in which a real-name address is used. Forms of address are thus subject to auditors' discretion, as this example is provided only for guidance; the use of real names is not mandatory. Since 2003, two forms of address have been used in Chinese audit opinions. The following table presents the distribution of forms of address since 2003.

As shown in Table 2, the proportion of real-name forms of address increased every year between 2003 and 2009. In 2006, there was a particularly substantial increase in the relative use of real-name forms of address. However, the proportion of honorific addresses has fluctuated around the 30% level since 2006. On average, the audit opinions that use honorifics account for approximately one third of the full sample. Thus, it is clear that real names were favored by auditors during the research period.

2.4.3. Forms of address in audit opinions: habit or choice?

If auditors never change the style in which they address their clients, the variation in address forms may be driven by habit rather than choice. To rule out this possibility, I conduct several tests of the distribution of forms of address. Table 3 presents the distribution by year and CPA firm. The results indicate that about

Table 2
Distribution of forms of address used by certified public accounting (CPA) firms from 2003 to 2011.

Year	Honorific	%	Real name	%
2003	558	52.00	515	48.00
2004	555	51.68	519	48.32
2005	561	49.73	567	50.27
2006	414	35.00	769	65.00
2007	399	31.79	856	68.21
2008	434	30.52	988	69.48
2009	435	29.71	1029	70.29
2010	524	32.35	1096	67.65
2011	506	27.16	1357	72.84
Total	4386	36.30	7696	63.70

The frequency statistics are based on the full set of usable observations obtained in the event study.

Table 3
Proportion of real-name forms of address used by CPA firms during the sample period.

Proportion of real-name forms of address	Frequency	Percentage	Cumulative frequency	Cumulative percentage
0	70	12.37	70	12.37
0–33%	74	13.07	144	25.44
33–66%	112	19.79	256	45.23
66–100%	171	30.21	427	75.44
100%	139	24.56	566	100.00

63% (13.07 + 19.79 + 30.21) of the CPA firms used different forms of address for different clients in the same year. Next, I check the distribution of forms of address by CPA firm and the first-signing auditor. Of the 2,659 resulting observations, 586 use different forms of address, which accounts for 22% of the sample. Defining an auditor as the first-signing auditor in a CPA firm in a year gives 6025 observations, of which 587 use different forms of address during the sample period. The results indicate that the variation in forms of address is at least partly driven by auditor choice. Table 3 also reveals that 12% of the CPA firms solely used honorifics in their opinions between 2003 and 2011, which may indicate that variation in forms of address is partly driven by auditors' habits. These habit-driven observations weaken the difference between the consequences of the two forms of address.

3. Research methodology

3.1. Research model

As discussed in the previous section, I hypothesize that the market reaction to audit opinions using clients' real names is higher if the power-solidarity effect dominates. To test my hypothesis, I build the following model to examine the consequences of forms of address.

$$CAR_{[-3,3]} = \beta_0 + \beta_1 ARF + \beta_2 UE + \beta_3 SIZE + \beta_i INDUSTRY + \beta_j YEAR$$

$CAR_{[-3,\ 3]}$ denotes the market response to the announcement of an audit opinion over the short-term window of [−3, 3]. The cumulative abnormal returns are calculated using either the market model ($RCAR_{[-3,\ 3]}$) or market-adjusted returns ($ACAR_{[-3,\ 3]}$). The capital asset pricing model (CAPM) is as follows.

$$DR = \alpha + \beta MR + \varepsilon$$

where DR denotes firms' daily returns including the reinvestment of cash dividends. MR denotes the tradable value-weighted daily market returns including reinvestment of cash dividends. Both items are extracted from the China Stock Market Accounting Research database. I estimate beta over 120 trading days before the event window. Observations are deleted if the adjusted R^2 of the market model is negative.

ARF is a dummy variable that takes the value of 1 if an auditor addresses the client by its real name, and 0 otherwise. Thus, β_1 is designed to capture the consequences of forms of address. If the power-solidarity effect dominates, β_1 is expected to be significantly positive. Conversely, β_1 is expected to be significantly negative if the politeness principle is dominant.

UE denotes change in earnings from $t - 1$ to t divided by total assets, which captures unexpected earnings.
Size is the natural logarithm of total assets in year t.
Industry and *Year* are dummy variables to control for industry and year effects.

If the characteristics of auditors or clients affect the choice of the form of address, the coefficient β_1 may capture market returns that are unrelated to the form of address. Therefore, I use the following treatment-effect model to deal with the potential endogeneity of variable ARF.

$$CAR_{[-3,3]} = f\ (ARF, UE, SIZE)$$

$$ARF = f\ (TO; RSB; LOSS; SP; ARTA; INVTA; GROW; BELOW; OCFTA; STATE; DINDEP; COM; DE; SIZE)$$

where *TO* is a dummy variable that takes a value of 1 if firms change their auditors in t, and 0 otherwise. *RSB* denotes auditors' ranking based on clients' total assets. *ROA* is the net income in year t divided by total assets in $t-1$. *LOSS* is equal to 1 if a firm suffers a loss in year t, and 0 otherwise. *SP* is equal to 1 if a firm's ROA lies in the window [0, 0.01], and 0 otherwise. *ARTA* denotes accounts receivable in year t divided by total assets in $t-1$. *INVTA* is inventory in year t divided by total assets in $t-1$. *GROW* denotes the change in sales from $t-1$ to t divided by total assets in $t-1$. *BELOW* denotes below the line items divided by total assets in $t-1$. *OCFTA* signifies net cash flow from operating activities divided by total assets in $t-1$. *STATE* is equal to 1 if the firm is a state-owned company, and 0 otherwise. *DINDEP* is equal to 1 if the proportion of independent directors to all members of the board is higher than 1/3, and 0 otherwise. *COM* is equal to 1 if a firm sets up all four committees, and 0 otherwise. *DE* is the debt to asset ratio.

To determine whether the information conveyed in forms of address is related to corporate governance, I build the following model to examine the moderating effects of *DINDEP* and *COM* on the consequences of forms of address. As noted in the previous paragraph, *DINDEP* and *COM* capture firms' board quality. A significantly negative coefficient of $DINDEP^{*}ARF$ or $COM^{*}ARF$ indicates that the market returns to audit opinions in which clients are addressed by their real names are higher when corporate governance is weak.

$$CAR_{[-3,3]} = f\ (AFR, DINDEP, DINDEP * AFR, COM, COM * AFR, UE, SIZE)$$

Finally, I use the following model to test the effects of forms of address on the relationship between audit fees and corporate risk factors.

$$LFEE = f\ (AFR, RISK, RISK * AFR, ControlVariables)$$

Here, *LFEE* is the natural logarithm of audit fees in year t. *LOSS*, *SP*, *ARTA*, *BELOW* and *OCFTA* are corporate risk factors. *SEO*, an auditor risk factor, is a dummy variable equal to 1 for firms whose returns on equity are in the range [0.06, 0.065]. Past research has shown that all of these six risk factors are of concern for auditors (Zhang et al., 2006; Wu, 2012; Zhu and Sun, 2012).

3.2. Sample and data

My sample is composed of Chinese audit reports issued between 2003 and 2011. I focus solely on clean opinions because this type of opinion lacks numerical information. Forms of address can be identified in 13,217 of the observations with complete financial data and returns data. Deleting observations with missing data gives 12,064 observations that can be used to test the research hypotheses. The sample size is smaller when the expected market return is based on the market model, because observations with a negative adjusted R^2 from the CAPM are deleted. Data on most of the research variables are available from the China Stock Market Accounting Research (CSMAR) database. I use 10,101 observations to test the audit-fee model. Approximately 2000 firm-year audit-fee observations are missing from the CSMAR database. The data on address forms are collected manually from annual reports.

Finally, I winsorize each continuous variable by year in the top and bottom 1% to remove the effect of potential outliers. The outlier-adjusted descriptive statistics are provided in Table 4.

As shown in Table 4, the mean value of *ARF* is 0.637, which indicates that over 60% of the companies are addressed by their real names in audit opinions. In addition, the mean value of *SP* is 0.13, indicating that more than 10% of Chinese firms make a small profit.

4. Empirical results

4.1. Consequences of forms of address

The observed market responses to different forms of address are presented in Table 5. The results indicate that *ARF* is positively related to both types of cumulative abnormal returns, suggesting that the market returns to audit opinions that address companies by their real names are higher than those that use honorific

Table 4
Descriptive statistics.

Variable	*n*	Minimum	Maximum	Mean	Median	Std. Dev.
$ACAR_{[-3,\ 3]}$	12,064	−0.339	1.056	0.001	−0.008	0.087
$RCAR_{[-3,\ 3]}$	11,969	−0.344	0.618	−0.002	−0.008	0.084
LFEE	10,101	11.918	15.664	13.173	13.122	0.583
ARF	12,064	0.000	1.000	0.637	1.000	0.481
UE	12,064	−0.404	0.373	0.002	0.003	0.054
TO	12,064	0.000	1.000	0.183	0.000	0.387
RSB	12,064	1.000	71.000	21.801	18.000	15.049
ROA	12,064	−0.184	0.560	0.049	0.038	0.071
LOSS	12,064	0.000	1.000	0.080	0.000	0.272
SP	12,064	0.000	1.000	0.128	0.000	0.334
ARTA	12,064	0.000	0.619	0.118	0.088	0.112
INVTA	12,064	0.000	1.496	0.207	0.152	0.209
GROW	12,064	−0.666	4.083	0.150	0.085	0.343
BELOW	12,064	0.000	0.262	0.018	0.010	0.025
OCFTA	12,064	−0.353	0.574	0.059	0.055	0.107
STATE	12,064	0.000	1.000	0.622	1.000	0.485
DINDEP	12,064	0.000	1.000	0.386	0.000	0.487
COM	12,064	0.000	1.000	0.685	1.000	0.465
DE	12,064	0.036	0.955	0.488	0.501	0.197
SIZE	12,064	19.061	27.071	21.618	21.448	1.227

$ACAR_{[-3,\ 3]}$ denotes the cumulative abnormal return in the window [−3, 3], based on market-adjusted returns.
$RCAR_{[-3,\ 3]}$ denotes the cumulative abnormal return in the window [−3, 3], based on the capital asset pricing model.
ARF is a dummy variable that takes a value of 1 if the auditor addresses the client by its real name, and 0 otherwise.
UE denotes a change in earnings from $t-1$ to t divided by total assets in t.
TO is a dummy variable that takes a value of 1 if firms change their auditors in period t, and 0 otherwise.
RSB denotes an auditor's ranking based on clients' total assets.
ROA is net income in year t divided by total assets in $t-1$.
LOSS is equal to 1 if the firm suffered a loss in year t, and 0 otherwise.
SP is equal to 1 if the firm's ROA is in the range [0, 0.01], and 0 otherwise.
ARTA denotes accounts receivable in year t divided by total assets in $t-1$.
INVTA denotes inventory in year t divided by total assets in $t-1$.
GROW denotes the change in sales from $t-1$ to t divided by total assets in $t-1$.
BELOW denotes below the line items divided by total assets in $t-1$.
OCFTA denotes net cash flow from operating activities divided by total assets in $t-1$.
STATE is equal to 1 if the company is a state-owned company, and 0 otherwise.
DINDEP is equal to 1 if independent directors constitute more than a third of the members of the board, and 0 otherwise.
COM is equal to 1 if a firm sets up all four committees, and 0 otherwise.
DE is the debt to asset ratio.
SIZE is the natural logarithm of total assets in t.

Table 5
Economic consequences of forms of address in audit opinions.

	$ACAR_{[-3,\ 3]}$		$RCAR_{[-3,\ 3]}$	
	Coefficient	*p*-Value	Coefficient	*p*-Value
Intercept	−0.0012	0.96	−0.0280	0.16
ARF	0.0036	0.03	0.0029	0.07
UE	0.0862	0.00	0.0174	0.37
SIZE	0.0010	0.21	0.0024	0.00
n		12,064		11,969
F Test		6.43^{***}		10.28^{***}
R^2		0.0199		0.0338
Industry	Controlled		Controlled	
Year	Controlled		Controlled	

The *p*-values are based on standard errors clustered by firm. All of the variables are defined in Table 4. *, **, *** denote significance levels at 10%, 5% and 1% respectively.

Table 6
Treatment-effect model.

	$ACAR_{[-3, 3]}$		$RCAR_{[-3, 3]}$	
	Coefficient	*p*-Value	Coefficient	*p*-Value
Intercept	−0.0239	0.29	−0.0451	0.04
ARF	0.0253	0.03	0.0193	0.08
UE	0.0841	0.00	0.0158	0.28
SIZE	0.0017	0.04	0.0029	0.00
LAMBDA	−0.0135	0.06	−0.0102	0.14
ARF: selection model				
Intercept	0.7197	0.02	0.7183	0.03
TO	0.0883	0.01	0.0837	0.01
RSB	0.0113	0.00	0.0114	0.00
ROA	0.9395	0.00	1.0290	0.00
LOSS	0.1130	0.04	0.1166	0.04
SP	0.0465	0.23	0.0441	0.26
ARTA	0.0589	0.66	0.0921	0.49
INVTA	0.1767	0.03	0.1737	0.03
GROW	−0.0256	0.57	−0.0399	0.39
BELOW	−0.5989	0.31	−0.4741	0.44
OCFTA	0.1938	0.15	0.1814	0.19
STATE	−0.0765	0.01	−0.0816	0.00
DINDEP	0.0213	0.39	0.0188	0.45
COM	−0.0847	0.00	−0.0801	0.01
DE	0.2359	0.00	0.2621	0.00
SIZE	−0.0672	0.00	−0.0682	0.00
n		12,064		11,969
Wald Chi^2		792.24***		959.53***
Industry	Controlled		Controlled	
Year	Controlled		Controlled	

All of the variables are defined in Table 4. *, **, *** denote significance levels at 10%, 5% and 1% respectively.

addresses. This result also indicates that a portfolio based on the forms of address used in clean opinions will obtain a cumulative abnormal return of 0.3% in the [−3, 3] event window. This evidence is consistent with the power-solidarity effect rather than the politeness principle.

To deal with the potential endogeneity of *ARF*, I construct a treatment-effect model to determine whether the results displayed in Table 5 are robust. As shown by the selection model of *ARF* in Table 6, *ARF* is positively related to *TO* and *RSB*, which suggests that firms are more likely to be addressed by their real names when they change their auditors or their auditors are small CPA firms. This result also suggests that auditor characteristics are related to forms of address. For instance, a client is more likely to be addressed by its real name when the following conditions apply: (1) the client's return on assets is higher; (2) the client has a larger inventory; (3) the client is a non-state-owned listed firm; and (4) the client is smaller. After controlling for endogeneity, *ARF* is still significantly positive in the returns model, indicating that the results shown in Table 5 are robust.

In addition to enriching the literature on textual disclosure, the findings have implications for audit standard setting. For instance, the Public Company Accounting Oversight Board (PCAOB) is now facing a dilemma: should auditors disclose more information in audit opinions?[4] It could be argued that greater disclosure is good for investors; however, it may also impose huge costs on auditors. The current study sheds light on this debate by showing that auditors have an incentive to reveal information in textual differences, which is consistent with amendments to audit standards in European audit markets that require more information to be disclosed in audit opinions.

[4] PCAOB Release No. 'Concept release on possible revisions to PCAOB standards related to reports on audited financial statements and related amendments to PCAOB standards' (2011).

Table 7
Forms of address and board quality.

	$ACAR_{[-3,\ 3]}$		$RCAR_{[-3,\ 3]}$		$ACAR_{[-3,\ 3]}$		$RCAR_{[-3,\ 3]}$	
	Coefficient	*p*-Value	Coefficient	*p*-Value	Coefficient	*p*-Value	Coefficient	*p*-Value
Intercept	−0.0018	0.94	−0.0286	0.15	−0.006	0.82	−0.0335	0.09
DINDEP	0.0030	0.25	0.0028	0.28				
*DINDEP*ARF*	−0.0056	0.09	−0.0061	0.06				
COM					0.0061	0.03	0.0067	0.01
*COM*ARF*					−0.0063	0.09	−0.0052	0.13
ARF	0.0058	0.00	0.0052	0.01	0.0079	0.01	0.0064	0.02
UE	0.0861	0.00	0.0173	0.37	0.0862	0.00	0.0174	0.37
SIZE	0.0010	0.22	0.0024	0.00	0.0011	0.19	0.0025	0.00
n		12,064		11,969		12,064		11,969
F test		6.06^{***}		9.67^{***}		6.08^{***}		9.81^{***}
R^2		0.020		0.034		0.020		0.034
Industry	Controlled		Controlled		Controlled		Controlled	
Year	Controlled		Controlled		Controlled		Controlled	

The *p*-values are based on standard errors clustered by firm. All of the variables are defined in Table 4. *, **, *** denote significance levels at 10%, 5% and 1% respectively.

4.2. Effects of corporate governance on the market response to real-name forms of address

Empirical evidence suggests that in emerging markets, independent audits and corporate governance substitute for each other as investor-protection mechanisms. For instance, Choi and Wong (2007) find that firms in weak legal environments have an incentive to hire high-quality auditors. Similarly, Fan and Wong (2005) show that firms facing serious agency problems due to ultimate-ownership structure are more likely to hire Big-5 auditors. In this section, I aim to determine whether the market response to real-name forms of address is greater in firms with weak corporate governance. If so, it can be assumed that forms of address convey information about audit quality. I use board quality as a measure of corporate governance because it concerns all stakeholders in China's stock market. As shown in Table 7, both $DINDEP^{*}ARF$ and $COM^{*}ARF$ are significantly negative, suggesting that the market response to real-name forms of address is greater when there are fewer independent directors or board committees.

4.3. Effects of forms of address on the relationship between audit risk factors and audit fees

In this section, I attempt to determine whether forms of address affect the association between audit risk factors and audit fees. Simunic (1980) posits that audit fees are positively related to audit risk factors because auditors suffer the litigation costs associated with audit failure. I expect the coefficients of the interaction of *ARF* and the audit risk factors to be significantly positive, in accordance with the power-solidarity effect. As shown in Table 8, the coefficients of $ARF^{*}LOSS$, $ARF^{*}SP$ and $ARF^{*}SEO$ support my conjecture. *SP* and *SEO* capture the risk that the manager has an incentive to engage in earnings management to meet the income target of the listing and seasoned equity offering regulations. Therefore, the results suggest that auditors that address clients by their real names are more concerned about earnings management.

4.4. Test of the role of signing auditors' habits in determining forms of address

As shown in Table 4, some auditors use different forms of address during the research period, while others do not. Therefore, some forms of address may be driven by habit instead of choice. I define *DUM* as a dummy variable denoting the effect of habit. *DUM* is equal to 1 if the first-signing auditor uses different forms of address during the research period, and 0 otherwise. I expect the coefficient of $DUM^{*}ARF$ to be significantly positive, because the market response to a real-name address will be strong if forms of address are not determined by habit. The results are shown in Table 9. Unfortunately, both *DUM* and $DUM^{*}ARF$ are insignificant, indicating that *DUM* does not capture the effect of habit.

Table 8
Test of audit fees.

	Expected sign	Coefficient	*p*-Value
Intercept		5.2930	0.00
ARF	?	−0.0554	0.02
*ARF*ROA*	−	0.2850	0.23
*ARF*LOSS*	+	0.0988	0.02
*ARF*SP*	+	0.0504	0.05
*ARF*ARTA*	+	0.0286	0.78
*ARF*BELOW*	+	−0.4362	0.37
*ARF*OCFTA*	+	0.0555	0.56
*ARF*SEO*	+	0.0846	0.08
RSB	−	−0.0058	0.00
ROA	−	−0.4270	0.05
LOSS	+	−0.0378	0.29
SP	+	−0.0258	0.24
SEO	+	−0.0692	0.10
ARTA	+	0.1569	0.09
INVTA	?	−0.1769	0.00
GROW	?	0.0359	0.07
BELOW	+	0.8255	0.05
OCFTA	+	−0.0481	0.55
STATE	−	−0.0903	0.00
DE	?	0.0212	0.66
SIZE	+	0.3595	0.00
n			10,101
F test			72.58***
R^2			0.5667
Industry	Controlled		
Year	Controlled		

SEO is a dummy variable equal to 1 for firms whose returns on equity lie in the range [0.06, 0.065]; the *p*-values are based on standard errors clustered by firm. All of the variables are defined in Table 4. *, **, *** denote significance levels at 10%, 5% and 1% respectively.

Table 9
Test of the role of auditors' customary behavior in determining forms of address.

	$ACAR_{[-3, 3]}$		$RCAR_{[-3, 3]}$		$ACAR_{[-3, 3]}$		$RCAR_{[-3, 3]}$	
	Coefficient	*p*-Value	Coefficient	*p*-Value	Coefficient	*p*-Value	Coefficient	*p*-Value
Intercept	−0.0005	0.99	−0.0282	0.16	−0.0023	0.93	−0.0305	0.13
DUM	−0.0008	0.61	0.0003	0.87	0.0010	0.70	0.0025	0.32
*DUM*ARF*					−0.0029	0.39	−0.0035	0.27
ARF	0.0034	0.05	0.0029	0.08	0.0051	0.04	0.0049	0.04
UE	0.0863	0.00	0.0173	0.37	0.0864	0.00	0.0175	0.36
SIZE	0.0010	0.22	0.0024	0.00	0.0011	0.20	0.0024	0.00
n		12,064		11,969		12,064		11,969
F test		6.23***		9.95***		6.09***		9.69***
R^2		0.020		0.034		0.020		0.034
Industry	Controlled		Controlled		Controlled		Controlled	
Year	Controlled		Controlled		Controlled		Controlled	

DUM is equal to 1 if the first signatory uses different forms of address in the research period, and 0 otherwise; the *p*-values are based on standard errors clustered by firm. All of the variables are defined in Table 4. *, **, *** denote significance levels at 10%, 5% and 1% respectively.

4.5. Tests using shorter event windows around audit-opinion announcements

The most commonly used window in event studies is [−1, 1]. If the event is particular, the research window is extended. For example, Sikes et al. (2014) use [−2, 2] as a test window in which to investigate

Table 10
Tests using [−1, 1] and [−2, 2].

	$ACAR_{[-2,\ 2]}$ [−2, 2]		$RCAR_{[-2,\ 2]}$ [−2, 2]		$ACAR_{[-1,\ 1]}$ [−1, 1]		$RCAR_{[-1,\ 1]}$ [−1, 1]	
	Coefficient	*p*-Value	Coefficient	*p*-Value	Coefficient	*p*-Value	Coefficient	*p*-Value
Intercept	0.0051	0.83	−0.0272	0.11	0.0142	0.51	−0.0279	0.03
ARF	0.0031	0.04	0.0024	0.09	0.0025	0.06	0.0018	0.12
UE	0.0743	0.01	0.0106	0.52	0.0550	0.03	−0.0016	0.91
SIZE	0.0007	0.40	0.0020	0.00	0.0002	0.75	0.0018	0.00
n		12,064		11,969		12,064		11,969
F TEST		6.07***		8.49***		5.30***		6.17***
R^2		0.018		0.027		0.017		0.019
Industry	Controlled		Controlled		Controlled		Controlled	
Year	Controlled		Controlled		Controlled		Controlled	

The *p*-values are based on standard errors clustered by firm. All of the variables are defined in Table 4. *, **, *** denote significance levels at 10%, 5% and 1% respectively.

Table 11
Consequences of forms of address; *p*-values based on Newey–West adjusted standard errors.

	$ACAR_{[-3,\ 3]}$		$RCAR_{[-3,\ 3]}$	
	Coefficient	*p*-Value	Coefficient	*p*-Value
Intercept	−0.0012	0.97	−0.0280	0.19
ARF	0.0036	0.03	0.0029	0.07
UE	0.0862	0.00	0.0174	0.37
SIZE	0.0010	0.23	0.0024	0.00
n		12,064		11,969
Adjusted R^2		0.0174		0.0313
Industry	Controlled		Controlled	
Year	Controlled		Controlled	

The *p*-values are based on Newey–West adjusted standard errors. All of the variables are defined in Table 4.

the consequences of poison pills. In the emerging market of China, this event window could be extended further, for two reasons. First, information leakage is possible in this environment. Second, all listed firms are subject to a daily price limit on trading of 10%. To address these characteristics of the Chinese market, Chen et al. (2009) use multiple test windows, such as [−1, 1], [−2, 2] and [−5, 5]. Li (1999) and Chen and Zhang (1999) all conduct tests with larger event windows. In this paper, I use [−3, 3] as the main test window, because the sample is composed solely of clean opinions, and the differences between forms of address are subtle. However, to fully capture the market reaction to different forms of address, I also use the windows [−1, 1] and [−2, 2] in additional tests. The results are presented in Table 10. As shown in the table, shorter windows give smaller coefficients of *ARF*. When *CAR* is based on market-adjusted returns, the coefficient of *ARF* drops from 0.0031 to 0.0025 as the window shrinks from [−2, 2] to [−1, 1]. The results of tests using $RCAR_{[-2,\ 2]}$ and $RCAR_{[-1,\ 1]}$ show similar trends. Somewhat unexpectedly, however, the test of $RCAR_{[-1,\ 1]}$ produces a significantly positive coefficient of *ARF* (one-tailed test; *p*-value = 0.12), indicating that the evidence is weaker for the [−1, 1] window.

4.6. Statistics based on Newey–West adjusted standard errors

The p-values in the previous tests are based on standard errors clustered by firm. However, heteroskedastic panel data may still lead to biased results. To rule out this possibility, I conduct a sensitivity test using the method of standard-error adjustment recommended by Newey and West (1987). As shown in Table 11, *ARF* is still significantly positive, indicating that the results are robust to differently adjusted standard errors.

5. Conclusion

This study investigates the consequences of auditors' use of different forms of address in the unique research setting provided by the Chinese market. From 2003 to 2011, about 60% of the listed firms under study were addressed by their real names in audit opinions, while the others received audit opinions featuring honorific forms of address. Based on a sample of Chinese audit opinions, I report the following findings. First, there are greater short-term responses to the announcement of audit opinions using real names than to audit opinions featuring honorifics. Second, the market response to real-name opinions is stronger for firms with weak board governance. Third, the association between audit fees and audit risk factors is stronger for firms that receive audit opinions with real-name forms of address. The findings of this study provide further evidence on textual disclosure via forms of address.

As many as 2000 years ago, nuanced words were used to convey profound meanings in the classic Chinese text *Chūn qiū*. More specifically, forms of address were used to convey the authors' political opinions. The results of the current study suggest that this traditional use of language has been preserved. This study also sheds light on the significance of the flexibility of the Chinese language in modern financial reports.

One limitation of this study is common to all studies of audit opinions. As the real process of auditing cannot be observed, I was unable to test the possibility that auditors make adjustments to neutralize the negative effects of honorific address. This paper is also limited by the inability to identify items in the sample in which forms of address reflect auditors' customary practice rather than their choice. In future research, this limitation could be addressed by surveying more transparent forms of disclosure or through experimental research.

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Inflation, operating cycle, and cash holdings

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ABSTRACT

A corporate cash-holding strategy is a trade-off between the costs and benefits of holding cash. At the macrolevel, firms are inclined to adjust and optimize their cash-holding strategies in response to changes in purchasing power due to inflation. At the microlevel, the operating cycle, which indicates the speed and turnover of corporate cash flow, also influences the corporate cash-holding strategy. Firms flexibly adjust their cash-holding strategies in response to changes in the internal and external environment, which is referred to as the cash adjustment strategy. We examine these predicted relationships using a sample of listed firms in China's stock market over the 1998–2009 period. Consistent with our predictions, the empirical results indicate a significant negative association between cash holdings and the CPI, but the relationship is reversed when the CPI reaches a certain level. There is also a U-shaped relationship between operating cycle and cash holdings, and this relationship is similarly influenced by changes in the inflation level. In examining the macroeconomic environment and microlevel firm-specific characteristics simultaneously, our findings supplement the literature on firms' cash-holding strategies and provide theoretical and practical implications.

1. Introduction

A firm's cash-holding strategy determines its fate and future. In an incomplete market, firms tend to hold and accumulate cash for future trading and to mitigate risk (Keynes, 1936). However, holding too much cash can increase opportunity costs, while holding too little can induce shortage costs that disadvantage invest-

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ment. The optimum level of corporate cash holdings is a trade-off between the costs and benefits of holding cash (Opler et al., 1999; Harford, 1999). Increases in inflationary pressure undoubtedly influence the amount and cost of monetary supply, thus affecting the trade-off between the costs and benefits of holding cash. In addition, a firm's operating cycle, which is directly related to the time and speed at which it gains cash, also influences its cash-holding level. By considering both the economic cycle at the macrolevel and the firm-specific operating cycle at the microlevel, this study extends our knowledge of the factors affecting corporate cash holdings under inflation.

Studies on corporate cash holdings discuss the effects of corporate financial conditions, governance systems, capital structures, external financing costs, and so forth on the level of cash holdings. In the financial condition literature, for example, the corporate cash-holding level is found to have a significant relationship with firms' financial features (Xin and Xu, 2006b); a positive relationship with leverage, information asymmetry, corporate age and size, investment opportunities and cash flow changes (Faulkender, 2002); and a negative relationship with corporate size and credit-ratings (Ozkan and Ozkanm, 2004; Wang, 2009). Bates et al., 2008 find that riskier cash flow, decreasing inventory holdings and receivables, and increasing R&D lead to increasing levels of corporate cash holdings in the US. In the corporate governance systems and capital structures literature, Kusnadi (2003) finds that the relationship between cash holdings and board size is positive, whereas the relationship between cash holdings and non-management block-holder ownership is negative. Zhang and Liu (2005) find a negative linear relationship between corporate cash holdings and shareholder protection, dependent on ownership structure. Similarly, Xin and Xu (2006) find that Chinese listed firms with better corporate governance mechanisms have more reasonable levels of cash holdings with less cash redundancy or shortages. Chen and Chuang (2009) find that CEO ownership, risk investment, and the number of independent directors also have a strong effect on cash policy. Faleye (2004) examines the relationship between takeover defenses and cash holdings from a control-rights market perspective and finds that the more cash firms hold, the more bidders they face in a takeover bid. Studies on the external financing environment also report important findings. For example, firms with greater growth opportunities and those that find it more risky and more difficult to enter the capital market hold more cash (Opler et al., 1999). A firm's financial restraints policy plays a decisive role in its cash holdings (Wang, 2009). The monopoly power of banks (Pinkowitz and Williamson, 2001) and past financing difficulties (Faulkender, 2002) also have important effects on cash holdings. Some studies find that diversified enterprises hold less cash compared with those in the same industry (Subramaniam and Tang, 2010). Firms are likely to hold more cash to help smooth R&D expenditure but face financing frictions (Brown et al., 2010).

In contrast, recent research on corporate cash holdings focuses on the macrolevel or medium level, including political, economic, legislative, and industry-environment factors. In a cross-country comparison, Pinkowitz et al. (2006) finds that firms in countries with low levels of investor protection and more political risk tend to hold more cash. Firms facing financing constraints increase their cash holdings during economic recession periods and raise their liquidity levels during credit crunch periods (Custodio et al., 2005). The increase in tax costs due to differences in tax rates between countries also contributes to increases in the proportion of cash holdings of multi-national corporations (Titman et al., 2004). Some studies examine the specific macroenvironment in China. In China's weak institutional environment, firms that face high financing constraints can gain higher yields with high-level cash-holding policies (Zhou and Xie, 2007). In China's specific institutional and governance environment, the judgments made by Chinese enterprises and their agents regarding the costs and benefits of cash holdings may be different or distorted, which may affect their cash-holding decisions (Gu and Sun, 2009). Cash holdings vary with the tightening of monetary policies. During periods of monetary contractions, firms that grow rapidly will increase their cash holdings to reduce external financing constraints and thus meet the future demand for investment (Zhu and Lu, 2009). Viewed from an industry competition and market characteristics perspective, a firm's cash-holding level is the equilibrium outcome of the corporate financing, investment, and market environment. Enterprises tend to hold more cash as a precautionary measure to maintain their market share and reduce the risk of being exploited (Haushalter et al., 2007). Competition intensity and life-cycle stage also have significant effects on cash-holding levels (Zhang and Zhang, 2009). Higher levels of cash holdings enable enterprises to benefit from market share segmentation and competition in the future, especially in the face of financing constraints and fierce competition (Fresard, 2010).

In conclusion, although numerous studies focus on the microdeterminants of cash holdings, few examine the operating cycle, and studies at the macrolevel and medium levels could be further developed or extended. Although Zhu and Lu (2009) examine the relationship between monetary policy tightening and cash-holding levels, few studies examine the mutual influence of macrolevel and microlevel factors on cash holdings. Investigating the effects of inflation levels on firms' cash-holding policies would provide direct and useful evidence because it is usually inflation that induces governments to tighten their monetary policies.

From the perspective of the costs and benefits of cash holdings, inflation affects the capital supply cost and value. Increasing inflation also induces government macroeconomic control, which directly affects the capital supply cost and value. A firm's operating cycle indicates the speed and scale of its cash flow acquisition, which then influences the costs and benefits of internal cash holdings. A business is inseparable from its external environment. In this study, we not only consider the influence of firms' operating characteristics on the costs and benefits of holding cash, but also examine changes in the external environment and how firms make adjustments to the tradeoff. Hence, this study provides a comprehensive examination of how corporate enterprises determine their cash-holding policies in response to changes in the macroeconomic environment. The current macroeconomic inflation provides us with an opportunity to extend the study.

Fig. 1 illustrates the large fluctuations in the consumer price index (CPI) between 1998 and 2009. China's CPI indicates that inflationary pressure increased consistently from 2003 to the beginning of 2008. The huge effect of the 2009 global economic crisis on Chinese real economics, together with the reversion and rebound in the domestic economic cycle, pulled the CPI down for the first time. This fluctuation prompted firms to adjust or optimize their production and operation plans, either actively or passively, and then change their cash-holding behavior (Rao and Jiang, 2013). Changes in macroeconomic policy, especially monetary policy, due to fluctuations in the CPI also influence firms' external financing costs and capabilities, which in turn influence their cash-holding levels. We examine the relationship between operating cycle and cash holdings by highlighting the interaction between the operating cycle and the "generating blood" function, which becomes more complex when the CPI or inflation is fluctuating. Therefore, it is important to understand the mutual influence of the operating cycle and CPI on corporate cash-holding levels.

This study investigates the effect of inflation levels and operating cycles on corporate cash holdings from both the macro- and the microperspective in China's current situation. The empirical results confirm that corporate cash-holding levels decline as the level of inflation increases. Once inflation reaches a certain level, corporate cash-holding levels start to rise; hence, there is a U-shaped relationship between a firm's operating cycle and its cash holdings. We further examine the interactive effect of inflation and operating cycle on the level of cash.

The main contributions of our study are as follows. We reveal the effects of inflation and operating cycle on corporate cash holdings from both the macroperspective of the financial environment and the microperspective of firm characteristics, thus enriching the literature on cash holdings at home and abroad. We also present a preliminary analysis of the factors that influence the relationship between inflation, operating cycle, and cash-holding levels to enhance our understanding of corporate cash-holding behavior and to provide listed firms with empirical evidence on how best to adjust their cash holdings according to price changes and their

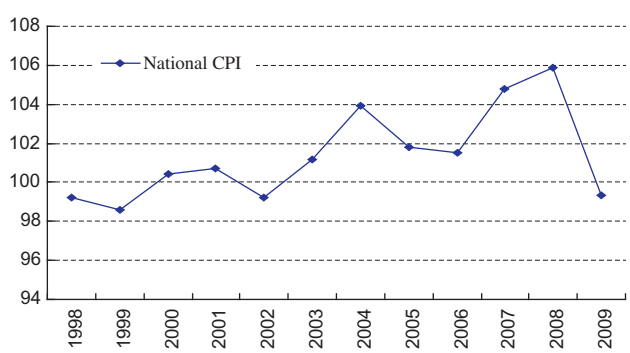

Figure 1. National CPI from 1998 to 2009.

operating cycle. Given the current background of accelerated inflation and increasing *CPI* in China, this study is particularly timely. It also reveals the effect of macrocontrol policies on microlevel corporate cash holdings and provides a reference for enterprises to optimize their allocation of resources based on changes in the macrofinancial environment and their own financial circumstances.

The remainder of this article is structured as follows. Section 2 presents the theoretical analysis and assumptions. Section 3 describes the research design. Section 4 reports the results and Section 5 provides the conclusions.

2. Theoretical analysis and hypothesis development

2.1. Effect of inflation on corporate cash holdings

In recent years, China's CPI and inflation have been consistently increasing. Periods of inflation influence firms' operating performance, management situation, and need for and supply of cash; thus, they need to actively or passively change their levels of cash holdings. The level of corporate cash holdings is a balance between the costs and benefits (Opler et al., 1999; Peng and Zhou, 2006). As cash is a non-profitable asset, especially during periods of inflation, cash holdings can cause a loss of purchasing power which increases the cost of holding cash and, as prices and interest rates rise, capital costs also rise. As a result, currency financing demands higher interest rates to compensate for the loss of purchasing power, investors require an additional investment rate of return, which determines the expected investment return rate. When evaluating an investment project, the expected investment return rate is usually used as the discount rate to adjust the amount of future cash flow to the present value. This results in a positive net present value of enterprise investment projects, as the value of investment opportunities and the potential future investment returns of corporate cash holdings are reduced. As a result, the enterprise will reduce their cash holdings for investment (Ferreira, 2003). In addition, when firms hold a cash equivalent that can be converted into cash at a lower cost, it is economical to raise funds through selling these assets (Shleifer and Vishny, 1984). Firms that hold many realizable assets tend to hold less cash. They will transfer assets that can be held at a lower cost into cash to raise money, particularly during periods of inflation when prices are higher and the fair value of assets is generally above their book value. Therefore, rather than holding cash, firms tend to increase their liquid assets, for instance by stocking up on inventory, to obtain price gains, and avoid their monetary assets shrinking. For these reasons, we believe that during periods of inflation, when the cost of corporate cash holdings is high and income is reduced, enterprises will have less demand for cash and may actively reduce their levels of cash holdings.

Inflation may also affect an enterprise's cash supply. In times of inflation, firms need more money to purchase the same amount of raw materials and other goods, thus taking up more of their working capital, while they also generate less money through their operating cycles. As prices continue to rise, firms may anticipate further inflation and thus will purchase raw materials in advance to avoid increases in cost or to serve as excess reserves. Others may invest in gold or real estate to avoid the loss of purchasing power and generate excess earnings, which may result in firms holding too much working capital and reducing their cash holdings. In the capital market, rising prices can lead to interest rate rises and increasing uncertainty over investment income, so that the residents or institutions are less likely to invest in stocks and bonds, thus increasing stock prices and making it more difficult to raise money in capital markets (Friedman, 1977).

However, when inflation reaches a certain level, the continued deterioration in macroeconomic regulation will cause the government to exert tighter macroeconomic control, which in turn changes the external financing environment. As the level of inflation continues to rise, the government must adopt tighter monetary policies for macroeconomic regulation, such as raising the deposit reserve rate, improving the level of interest rates, and controlling the scale of credit in commercial banks. Banks will become more cautious about lending and loan conditions will be stricter, thus creating strong external financing constraints that make it more difficult for firms to obtain loans (Stiglitz and Weiss, 1981). External financial constraints in the finance market cause the value of money to become more apparent due to the sharp drop in the overall supply of funds and extremely scarce cash resources. Under such conditions, corporate cash holdings inevitably change and firms

tend to hold more cash. The primary benefit of holding more cash is to protect against the increasing risk of bankruptcy.

To sum up, due to the current economic situation in China, ongoing inflationary pressures have devalued the currency assets held by firms. Under such conditions, firms significantly increase their inventories to minimize risk and fulfill long-term contracts. Consequently, they experience reduced liquidity for resource allocation, production, sales distribution and operating capacity, together with a deteriorating business environment and a shortage of cash. Meanwhile, the emergence of inflation also causes a tightening of macrocontrol policies, especially monetary policies, which also affects the cost and capacity of external financing and in turn influences the level of corporate cash holdings. Based on the above theoretical and practical analysis, we propose Hypothesis 1.

H1. As inflation rises, corporate cash holdings decline. However, when inflation reaches a certain level, corporate cash holdings increase as the level of inflation increases.

2.2. The effect of the operating cycle on cash holdings

The length of a firm's operating cycle is affected by industry factors, the firm's business model, and its management efficiency. Generally, corporate operating assets and working capital need to be kept in balance if the firm is to continue as a going concern. In other words, from the demand perspective, if the products have a shorter operating cycle, capital takes relatively less time to circulate and the firm must continuously invest funds to complete the rapid cycle of purchase, production, and sales. Such firms have to hold more cash to cover ongoing transactions, which is consistent with the transactions motive for holding cash. From the supply perspective, a shorter operating cycle means that the process of obtaining inventory, selling and regaining cash is shorter. Internal capital accumulation is then more efficient, the amount of current capital taken up by inventory and accounts receivable declines, and the firm's own cash supply increases, with a subsequent increase in internal cash holdings.

Conversely, in firms with longer operating cycles, it takes longer to purchase raw materials and produce products. From the demand perspective, the period of continuous investment in production and operation is extended accordingly, which reduces average cash holdings. From the supply perspective, a longer operating cycle means a slower turnover of cash flow, inventory sales, and recovery of accounts receivable. More cash is frozen in current assets for a longer time, which decreases the firm's own cash supply and reduces its cash holdings.

As the operating cycle increases, a firm's own "blood-making" capacity becomes weaker, capital turnover is likely to create problems, the capital chain cannot meet the firm's normal production needs, and operational demands and good investment opportunities may be lost. Opler et al. (1999) analyze the effects of cash flow risk and financing capacity on cash holdings and find that firms suffering from higher risk and with less access to the capital market tend to hold more cash. If firms cannot fully spread the risk of breaks in their cash flow, they must hold more cash to meet future transactions and speculative demand. Thus, once the operating cycle reaches a certain point, firms raise their cash-holding levels to prevent risk and to meet uncertain production and management demands and investment needs, which is consistent with the precautionary motive theory of cash holdings.

Based on the above analysis, we argue that there is a U-shaped relationship between the operating cycle and cash holdings. Within a certain range, extending the operating cycle means that there is a continuous supply of money pouring through the longer cash cycle, and firms do not need to hold large amounts of cash for transactions. At the same time, extending the operating cycle reduces the efficiency of working capital, more money is taken up by inventory and accounts receivable and the lower speed of inventory realization leads to a decline in cash holdings. However, at a certain level, with the product turnover cycle increasing, especially when the collection rate of accounts receivable falls, firms experience a longer operating cycle and with the consequent risk need to hold an increasing amount of cash to guard against future risk and uncertainty. Therefore, we state the above relationship as follows:

H2. As the operating cycle increases, cash holdings decline. However, when the operating cycle reaches a certain level, cash holdings increase as the operating cycle increases.

3. Data and empirical methodology

Our sample consists of all A-share firms listed on the Shanghai and Shenzhen stock exchanges from 1998 to 2009. We select our sample firms as follows. First, we exclude financial firms. Second, we remove firms with total assets and operating cycles below zero. Third, we remove firms with missing related data. Fourth, we exclude the top and bottom 1% (greater than 99% quantile) of the variables as extreme values. As our model is based on the differences between consecutive years, all of the data are from firms that have been listed for more than two years and the overall data range is from 1997 to 2009. Our final sample comprises 9165 firm-year observations. The data on regional *CPI* are only available from 1999 to 2009, so we use the national rather than the regional *CPI* for 1998. All of the data were retrieved from the WIND, CSMAR, and CCER databases.

According to Almeida et al. (2004), the actual situation in China and the above theoretical analysis, we estimate the following equation to test our hypotheses:

$$\begin{aligned}\Delta Cash_{i,t} = {} & \beta_0 + \beta_1 CPI_{i,t} + \beta_2 CPI_{i,t}^2 + \beta_3 Cycle_{i,t} + \beta_4 Cycle_{i,t}^2 + \beta_5 CF_{i,t} + \beta_6 Tobinq_{i,t} + \beta_7 Lnasset_{i,t} \\ & + \beta_8 \Delta NWC_{i,t} + \beta_9 \Delta SDebt_{i,t} + \beta_{10} Risk_{i,t} + FixEffects + \varepsilon_{i,t} \end{aligned} \quad (1)$$

Table 1 provides the variable definitions. Internal cash flow (*CF*) reflects corporations' self-blood-making function, and internal cash flow changes also affect cash holdings in the firm. The size and growth of investment opportunities can also change cash holdings. *Tobinq* is used to control for corporate growth opportunities. *Lnasset* is used to control for firm size, as levels of corporate expansion and financing constraints may differ among different-sized firms. Financial conditions may also influence corporate cash-holding behavior, so we use $\triangle NWC$ and $\triangle SDebt$ (working capital and current liabilities) from the previous to the current year to measure the effect of changes in financial conditions on corporate cash holdings (Opler et al., 1999). Firms may hold cash to protect against future risk, so we choose beta to measure *Risk* (beta is the regression coefficient of the daily stock return and market return for every firm in a fiscal year). Therefore, we include the following five control variables: cash flow (*CF*), size (*Lnasset*), growth (*Tobinq*), beta risk (*Risk*), and financial status ($\triangle NWC$ and $\triangle SDebt$). Following previous studies, we use fixed year effects to reduce the effect of macroenvironment changes to a certain extent. Price fluctuation is a macrolevel variable, so when the model includes *CPI*, we only control for firm fixed effects, but when the model excludes *CPI*, firm and year fixed effects are controlled for at the same time. We decompose the operating cycle into the inventory turnover period ($Invent_{i,t}$) and the accounts receivable payback period ($Recv_{i,t}$) to analyze the effects of the inventory turnover period and the accounts receivable payback period on the level of cash holdings.

Table 1
Variable definitions.

Variable	Definition
$\triangle Cash$	The difference in cash and securities investment between year t and year $t-1$, divided by total assets
CPI	The consumer price index based on the previous year (last year = 100) for firm i in corresponding province
Cycle	Operating cycle divided by 1000 (inventory sales period + accounts receivable payback period)
Invent	Inventory turnover period (360 × average net inventory/operating cost)/1000
Recv	Accounts receivable payback period (360 × average accounts receivable/prime operating revenues)/1000
CF	Cash flow (regular income + depreciation − cash dividends) divided by total assets
Lnasset	Logarithm of total assets
Tobinq	Ratio of market value to book value of assets; market value of assets is proxied by market value of equity plus book value of total liabilities
Risk	Beta value (excluding financial leverage) = Beta/(1 + debt-equity ratio)
$\triangle NWC$	The difference in net working capital between year t and year $t-1$, divided by total assets in year t
$\triangle SDebt$	The difference in current liabilities between year t and year $t-1$, divided by total assets in year t
Indu	Industry dummy variables, according to the 13 major categories of the CSRC classification criteria

4. Results

4.1. Descriptive statistics

Table 2 presents the descriptive statistics for the main variables. On average, the change in the cash holdings to total assets ratio for our sample firms is 1.1%, the standard deviation is 8.6%, the minimum is -63.7% and the maximum is 69.6%, indicating that there are large differences between the cash-holding changes of different firms. The average operating cycle in our sample is 282 days, with a standard deviation of 396 days and a range from 14 to 277 days, indicating that the operating cycle varies widely between firms. The average inventory turnover period in our sample is 203 days, and the average accounts payable turnover period is 75 days.

Table 2
Summary Statistics.

	N	Mean	SD	Min	Max
△*Cash*	9165	0.011	0.086	−0.637	0.696
CPI	9165	101.660	2.265	96.700	110.090
Cycle	9165	0.282	0.396	0.014	0.277
Invent	9165	0.203	0.350	0.003	0.242
Recv	9165	0.075	0.089	0.000	0.567
CF	9165	0.139	0.156	−0.468	0.993
Lnasset	9165	21.352	0.992	19.076	24.254
Tobinq	9165	1.579	0.725	0.231	4.805
Risk	9165	0.471	0.245	0.001	1.214
△*NWC*	9165	−0.009	0.226	−13.805	3.550
△*SDebt*	9165	0.040	0.285	−20.729	3.637

Table 3
CPI and △*Cash*.

CPI	*N*	Mean	Median
0	902	0.025	0.015
1	911	0.018	0.011
2	952	0.019	0.009
3	748	0.009	0.004
4	1166	0.006	0.002
5	744	0.005	0.007
6	1062	0.004	0.004
7	841	0.013	0.008
8	913	0.007	0.009
9	926	0.010	0.007

Table 4
Operating cycle and △*Cash*.

Cycle	*N*	Mean	Median
0	916	0.021	0.013
1	917	0.021	0.014
2	916	0.012	0.009
3	917	0.015	0.011
4	916	0.010	0.005
5	917	0.012	0.008
6	917	0.014	0.009
7	916	0.004	0.004
8	917	0.001	−0.001
9	916	0.005	0.001

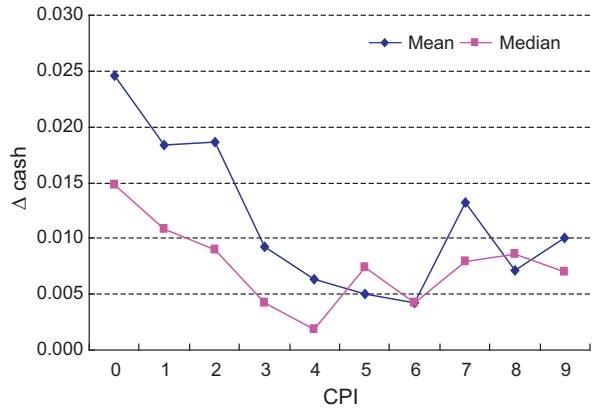

Figure 2. CPI and △*Cash*.

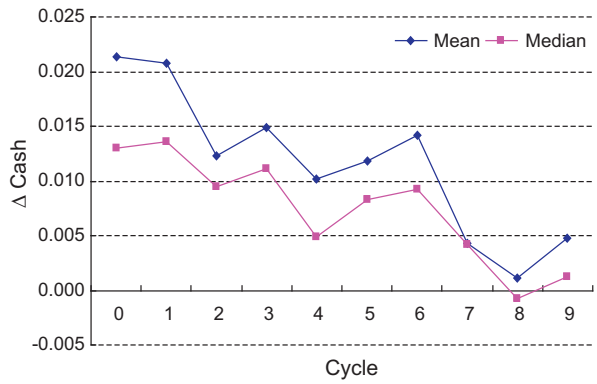

Figure 3. Operating cycle and △*Cash*.

Compared with receivables, inventory accounts for a greater amount of working capital and slower turnover, and the inventory turnover period constitutes the greatest proportion of the operating cycle.

In Tables 3 and 4, we divide our sample into 10 groups according to changes in the *CPI* and operating cycle, which are defined from 0 (low) to 9 (high). Table 3 and Fig. 2 reveal a strong negative relationship between the cash rate of public firms and the *CPI*. When inflation falls, the cash-holding ratio increases, and when inflation rises, the cash-holding ratio decreases. Specifically, as the inflation level drops toward its lowest point, the change in cash holdings is greater. From Table 4 and Fig. 3, we can also see a close relationship between the cash-holding rate and the operating cycle. When the operating cycle is longer, the cash-holding rate is lower, indicating a negative relationship, but when the operating cycle is very long, the ratio of cash holdings begins to increase.

4.2. Main results

The OLS regression results are shown in columns 4–6 of Table 5. To control the problem of biased estimates due to potentially important omitted variables, we construct non-balanced panel data to enhance the reliability. The panel regression results are shown in columns 1–3 of Table 5. The OLS results show that if we only take *CPI* and *CPI2* into account and do not consider the influence of *Cycle*, the regression coefficient of *CPI* is −0.1227, which is significant at the 0.001 level. The regression coefficient of *CPI2* is 0.0006, which is significant at the 0.001 level. These results indicate a U-shaped rather than a simple linear relationship between

Table 5
Study of the U-shaped relationship between changes in the inflation rate and changes in cash holdings.

	Panel result			OLS result		
Intercept	8.7659***	−0.9020***	8.7868***	6.0772***	−0.2356***	6.1737***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
CPI	−0.1851***		−0.1850***	−0.1227***		−0.1241***
	(0.000)		(0.000)	(0.000)		(0.000)
CPI^2	0.0009***		0.0009***	0.0006***		0.0006***
	(0.000)		(0.000)	(0.000)		(0.000)
Cycle		−0.0514***	−0.0310**		−0.0125*	−0.0201**
		(0.000)	(0.003)		(0.031)	(0.002)
$Cycle^2$		0.0159***	0.0094*		0.0040*	0.0056*
		(0.000)	(0.013)		(0.081)	(0.032)
CF	0.1204***	0.1390***	0.1190***	0.0368***	0.0325***	0.0355***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Lnasset	0.0267***	0.0346***	0.0266***	0.0113***	0.0102***	0.0106***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Tobinq	0.0212***	0.0125***	0.0208***	0.0168***	0.0175***	0.0167***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Risk	0.0038	−0.0026	0.0043	−0.0032	−0.0032	−0.0034
	(0.407)	(0.587)	(0.347)	(0.373)	(0.375)	(0.339)
$\triangle NWC$	0.1055***	0.1014***	0.1046***	0.1015***	0.1022***	0.1013***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$\triangle Sdebt$	0.0101***	0.0056	0.0098***	0.0223***	0.0224***	0.0219***
	(0.000)	(0.113)	(0.000)	(0.000)	(0.000)	(0.000)
Control	Fixone	Fixtwo	Fixone	Yes	Yes	Yes
R^2	0.247	0.268	0.248	0.127	0.121	0.128
N	8658	8647	8656	9165	9165	9165

Absolute values of *t*-statistics are shown in brackets. Fixone controls for firm fixed effects; Fixtwo controls for year and firm fixed effects.
*** Significance at equal to or less than the 1% level.
** Significance at equal to or less than the 5% level.
* Significance at equal to or less than the 10% level.

inflation and changes in the cash holdings of listed firms. The panel results are similar to the OLS results. If we only take *CPI* and *CPI2* into account and do not consider the influence of *Cycle*, the regression coefficient of *CPI* is significantly negative and the regression coefficient of *CPI2* is significantly positive. Even when we take *Cycle* and *Cycle2* into consideration, the regression coefficients for *CPI* and *CPI2* remain at a similar level. This indicates that as the inflation level increases, firms reduce their levels of cash holdings for the purposes of trading and speculative dynamic opportunities. However, when the macroenvironment inflation deteriorates to a certain extent, the government's macrocontrol limits the size of funds in the capital markets, which creates financial constraints. The extreme scarcity of cash means it becomes an object of pursuit in the market, and listed firms increase their levels of cash holdings. This finding supports Hypothesis 1.

The OLS regression results in column 5 show that without considering *CPI* and *CPI2*, the regression coefficient of *Cycle* is −0.0125, which is significant at the 1% level and the regression coefficient of *Cycle2* is significantly positive at the 10% level. Compared with the OLS regression, the regression results for the panel data in column 2 are much stronger. The regression coefficients also remain steady when we take *CPI* and *CPI2* into consideration. This indicates that the effect of operating cycle on cash holdings is not a simple negative linear relationship. The cash holdings of listed firms decrease as the operating cycle increases, but once it exceeds a critical value, listed firms increase their cash holdings as a precautionary measure, in response to the gradually increased operational risk. The mathematical meaning of the regression results is that in a coordinate system with *Cycle* along the x axis and $\triangle Cash$ along the y axis, *Cycle* is a concave function. The regression based on the panel data calculates the range of the inflection point distribution around 1.6164, with most of the data distributed on the left of the axis of symmetry, and few data points on the right (see Fig. 4). These results validate Hypothesis 2.

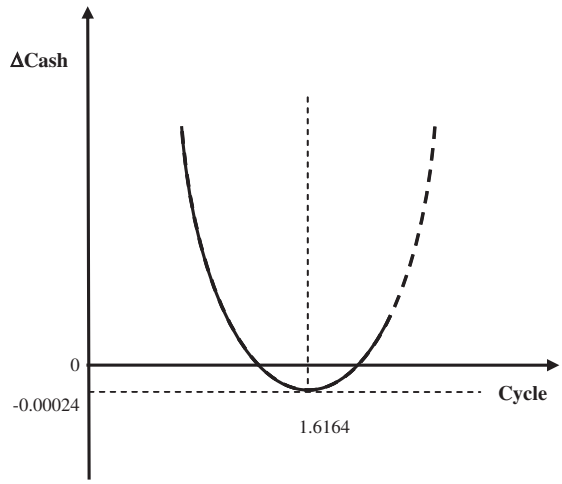

Figure 4. U-shaped curve of the relationship between operating cycle and cash holdings.

4.3. Further analysis

4.3.1. Inventory turnover period, accounts receivable turnover period and cash holdings

Table 6 further tests the effect of listed firms' cash holdings on the inventory turnover period and the accounts receivable turnover period. From the regression results in columns 1 and 4, we can see that *Invent* has a negative coefficient, significant below the 1% level. *Invent2* is not significant, indicating that the cash holdings of listed firms gradually reduce as the inventory turnover period increases and that there is a linear relationship between the inventory turnover period and cash holdings. The regression results in columns 2 and 5 indicate that *Recv* has a larger coefficient than *Invent* and is significantly negative at the 1% level, and *Recv2* has a positive coefficient and is significant below the 10% level. The results remain robust regardless of whether we use the *CPI* or its squared term. As the accounts receivable turnover period increases, listed firms gradually reduce their cash holdings, but start to increase them once the accounts receivable turnover period increases above a critical threshold. From the combined regression results in Tables 5 and 6, we can infer that due to the relationship between the level of cash holdings and the accounts receivable turnover period, firms will increase their cash holdings when the operating cycle increases beyond a certain level, perhaps because they are more sensitive to the extension of the receivables payback period. Inventory backlogs and slow-moving and defective risks can be dispersed by sales channels, price discounts, and re-working. However, receivables' bad debt losses have an immediate effect on the normal turnover of funds. When the accounts receivable turnover period reaches the critical level, according to the precautionary motive, listed firms will pay more attention to internal capital accumulation and increase their cash holdings to protect themselves against future uncertainties and the risk of loss.

4.3.2. Investigation of the interaction effect between inflation and the operating cycle

Inflation not only has a direct effect on firms' cash holdings by affecting the demand and supply for cash, but also an indirect affect via the operating cycle. Changes in the level of inflation, inventory turnover, and accounts receivable turnover have different effects on cash holdings. The level of inflation has different effects on cash holdings as the operating cycle (inventory turnover, accounts receivable recovery period) extends or shortens. Hence, we conduct further analysis to examine the interactive effect of *CPI* and *Cycle* on cash holdings.

Taking the level of inflation as the standard, we divide the whole sample into three groups according to *CPI*, with group 0 representing low CPI and group 2 representing high CPI. We use Model (1) to test the effect of operating cycle on the level of cash holdings under different levels of inflation and the results are presented in Table 7.

Table 6
Inflation, inventory turnover period, receivable accounts turnover period, and cash holding changes (panel results).

	Non-CPI^2			*CPI*^{2}		
Intercept	−0.5973***	−0.5648***	−0.5558***	8.7943***	8.8412***	8.8630***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
CPI	−0.0015***	−0.0016***	−0.0016***	−0.1854***	−0.1857***	−0.1860***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
CPI^2				0.0009***	0.0009***	0.0009***
				(0.000)	(0.000)	(0.000)
Invent	−0.0278*		−0.0263*	−0.0273*		−0.0258*
	(0.028)		(0.043)	(0.030)		(0.047)
Invent^2	0.0051		0.0044	0.0049		0.0042
	(0.323)		(0.402)	(0.345)		(0.429)
Recv		−0.0919*	−0.0878*		−0.0933*	−0.0893*
		(0.022)	(0.030)		(0.020)	(0.027)
Recv^2		0.1438*	0.1669*		0.1465*	0.1699*
		(0.070)	(0.036)		(0.064)	(0.033)
CF	0.1117***	0.1128***	0.1111***	0.1185***	0.1195***	0.1178***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Lnasset	0.0276***	0.0260***	0.0266***	0.0271***	0.0255***	0.0261***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Tobinq	0.0221***	0.0219***	0.0217***	0.0209***	0.0207***	0.0205***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Risk	0.0066	0.0074*	0.0070	0.0034	0.0042	0.0038
	(0.142)	(0.099)	(0.120)	(0.453)	(0.352)	(0.404)
$\triangle NWC$	0.1061***	0.1055***	0.1060***	0.1054***	0.1048***	0.1053***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$\triangle Sdebt$	0.0090**	0.0096**	0.0094**	0.0097**	0.0103**	0.0101**
	(0.010)	(0.006)	(0.008)	(0.006)	(0.003)	(0.004)
Control	Fixone	Fixone	Fixone	Fixone	Fixone	Fixone
Adj R^2	0.245	0.244	0.246	0.248	0.247	0.249
N	8657	8657	8655	8656	8656	8654

Absolute values of *t*-statistics are shown in brackets. Fixone controls for firm fixed effects and Fixtwo controls for year and firm fixed effects.
*** Significance at equal to or less than the 1% level.
** Significance at equal to or less than the 5% level.
* Significance at equal to or less than the 10% level.

For group 0, when inflation is at a low level, the coefficient of *Cycle* is not significant under a linear specification. However, the coefficient of *Cycle* is significantly positive and the coefficient of *Cycle2* is significantly negative in the quadratic specification. For group 1, when inflation is at a medium level, the coefficient of *Cycle* is not significant. When inflation is high (Group 2), the coefficient of *Cycle* is significantly negative and the coefficient of *Cycle2* is significantly positive.

The regression results indicate that when the inflation level is low, there is a significant positive association between the operating cycle and cash holdings up to a certain point, after which the association turns negative. When the inflation level is high, there is a significant negative association between the operating cycle and cash holdings up to a certain point, after which the association turns positive. This difference may occur because in periods of low inflation, enterprises face a more relaxed financing environment and fewer financial constraints, and thus are able to obtain low-cost external funds. Meanwhile, firms with longer operating cycles realize that the value of their funds is reduced; hence, they increase their cash holdings as a precaution. As inflation rises, the excess liquidity in the country usually causes money supplies to tighten. The government may exercise macrocontrol by raising the deposit-reserve ratio to reduce the money supply. The size of the banks' credit will shrink, so the banks become particularly cautious in granting loans and set more demanding conditions, which causes strong external financing constraints. At the same time, for enterprises with long operating cycles, the usage efficiency of working capital is relatively low. An insufficient supply of operating cash flow

Table 7
Operating cycle and cash holding changes (grouped by CPI and without CPI^2).

	Group 0		Group 1		Group 2	
	(1)	(2)	(1)	(2)	(1)	(2)
Intercept	0.2262	0.1929	−0.4925	−0.4842	−1.5534***	−1.5265***
	(0.336)	(0.413)	(0.153)	(0.160)	(0.000)	(0.000)
CPI	−0.0076***	−0.0074***	0.0053*	0.0052*	0.0058***	0.0055***
	(0.001)	(0.001)	(0.093)	(0.100)	(0.000)	(0.001)
Cycle	−0.0028	0.0367*	−0.0006	0.0100	−0.0151*	−0.0591*
	(0.690)	(0.049)	(0.920)	(0.563)	(0.056)	(0.011)
$Cycle^2$		−0.0161*		−0.0042		0.0162*
		(0.022)		(0.508)		(0.043)
CF	0.2353***	0.2349***	0.1721***	0.1729***	0.1794***	0.1790***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Lnasset	0.0179***	0.0181***	−0.0039	−0.0039	0.0414***	0.0419***
	(0.000)	(0.000)	(0.393)	(0.397)	(0.000)	(0.000)
Tobinq	0.0228***	0.0238***	0.0182***	0.0183***	0.0237***	0.0233***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Risk	−0.0021	−0.0041	0.0005	0.0002	−0.0042	−0.0028
	(0.810)	(0.639)	(0.946)	(0.974)	(0.639)	(0.752)
$\triangle NWC$	0.3454***	0.3480***	0.2803***	0.2809***	0.0731***	0.0736***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$\triangle Sdebt$	0.2474***	0.2499***	0.2218***	0.2217***	−0.0191***	−0.0191***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.006)	(0.006)
Control	Fixone	Fixone	Fixone	Fixone	Fixone	Fixone
Adj R^2	0.597	0.598	0.558	0.558	0.419	0.420
N	2881	2880	2891	2890	2886	2885

Absolute values of *t*-statistics are shown in brackets. Fixone controls for firm fixed effects.
*** Significance at equal to or less than the 1% level.
** Significance at equal to or less than the 5% level.
* Significance at equal to or less than the 10% level.

leads to greater operational risks, making it harder for them to obtain bank loans and thus increasing their external financing constraints. In addition, increases in raw material prices due to inflation demand more working capital, which makes internal funds generally tight and causes more serious delinquency, which extends the operating cycle. In other words, the effect of inflation on business enterprises leads to further deterioration in their ability to generate operating cash and external financing capacity. It becomes increasingly difficult for them to maintain a certain level of cash holdings. Therefore, when levels of inflation are high, the cash holdings of firms with longer operating cycles will be significantly reduced.

4.4. Robustness tests

We replace operating cycle with the cash turnover period to evaluate firms' operating capacity. Verlyn and Laughlin (1980) take the cash cycle as a measure of working capital management because it can reflect capital operating efficiency more comprehensively than the turnover rates of current assets, such as the inventory turnover and accounts receivable turnover rates. Wang et al. (2007) holds that the cash turnover period associates working capital management with supply chain management and avoids the contradiction derived from examining the elements in isolation without considering the relationship between them (for example, the easing of credit policy shortens the inventory turnover period and increases the accounts receivable, leading to a decrease in the accounts receivable turnover rate). In addition, different from the operating cycle, the cash turnover period takes into account both current liabilities in working capital and the time factor in cash inflows and outflows, so that we can identify the effects of the flow of inventory, accounts receivable and accounts payable on working capital as a whole. Therefore, we conduct this robustness test by substituting operating cycle with cash turnover period and achieve the same findings (see Fig. 5).

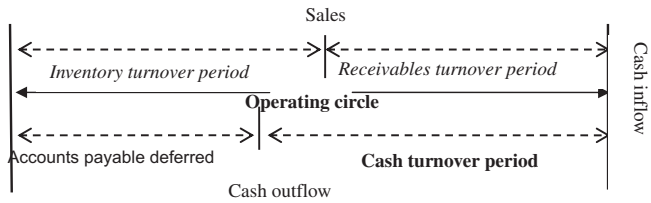

Figure 5. Cash turnover period = inventory turnover period + accounts receivable payback period − accounts payable deferred period.

5. Concluding remarks

At the macrolevel, continuously rising prices and inflation, which are the focus of state macrocontrol policies, affect firms' production decision making and cash holdings. Using the consumer price index, this study verifies and explains the finding that corporate cash holdings decrease as inflation increases from the perspective of the loss in purchasing power of monetary assets. However, when inflation reaches a certain level, firms increase their cash holdings to guard against bankruptcy. At the microlevel, we find that corporate cash holdings decrease with longer operating cycles, but when inflation reaches a certain level, firms increase their cash holdings to mitigate risk. Hence, there is a U-shaped relationship between operating cycle and cash holdings. This study also investigates the interactive influence of inflation and operating cycle on the amount of cash holding, thus expanding our knowledge of this area.

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Firm-specific information, analysts' superiority and investment value

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ABSTRACT

Using a sample of Chinese security analysts' recommendations from 2005 to 2010, we examine the source of analysts' superiority and the investment value of their recommendations. Using a calendar-time portfolio approach, we find that, on average, analysts' recommendations are valuable and that analysts are better at analyzing and transferring firm-specific information than market-wide or industry-level information. In addition, we show that the investment value of recommendations increases as firm-specific information becomes more important in stock pricing. Our empirical results are useful in guiding investors and helping brokerage houses to evaluate the output of research departments.

1. Introduction

The securities analyst industry has grown rapidly with the development of the Chinese capital market. The number of practitioners, their salaries and the market influence of the securities-consulting industry has undergone rapid changes over the past few years. Meanwhile, problems related to security analysts, such as the value of the securities analyst industry, the information content of analysts' research reports and the investment value of analysts' recommendations, have caused great concern among academics and practitioners.

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The solutions to these issues will inevitably involve studying analysts' expertise. According to the efficient market hypothesis (EMH), Roll (1988) decomposes the information incorporated into stock prices into three types: market-level, industry-level and firm-specific information. However, the extent to which these three types of information explain the variations in firms' stock returns varies. If firms' stock returns are mainly explained by firm-specific information, investors have a greater need for firm-specific information than for market- or industry-level information. In this case, security analysts who are good at analyzing and transferring firm-specific information will be favored, as their research reports are better able to alleviate the information asymmetry between listed companies and investors. In contrast, if firms' stock returns are mainly explained by industry-level information, then security analysts who are good at analyzing and transferring industry-level information will perform better. Unfortunately, previous studies still provide no consistent conclusion on what makes a superior securities analyst. Some studies have shown that analysts' expertise lies in analyzing and transferring firm-specific information (e.g., Grossman and Stiglitz, 1980; Diamond and Verrecchia, 1991; Bhushan, 1989; Ramnath et al., 2008; Palmon and Yezegel, 2012). Other scholars suggest that analysts play an important role during the process of searching, analyzing and transferring industry-level information (e.g., Piotroski and Roulstone, 2004; Chan and Hameed, 2006). The conclusions of these studies are inconsistent due to differences in their research samples and designs. As a securities analyst may be good at analyzing and transferring either firm-specific or industry-level information, which of these is superior is an empirical question. This study attempts to answer the question of what constitutes security analysts' superiority and their role in the capital market.

In this paper, we use 192,012 recommendations issued by Chinese security analysts from 2005 to 2010 and use a calendar-time portfolio approach to study the following two questions: (1) what constitutes Chinese security analysts' superiority? and (2) how do the demand and supply factors of analysts' research activities influence the investment value of recommendations? We calculate three estimates of abnormal returns for each portfolio, namely market-adjusted returns, the intercept of the Capital Asset Pricing Model (CAPM) and the intercept of the Fama and French (1993) three-factor model. The empirical results indicate, first, that Chinese security analysts are better at analyzing and transferring firm-specific information than market- or industry-level information. Specifically, ceteris paribus, analysts' research reports increase the ability of firm-specific information to explain variations in stock returns, but reduce the ability of market- and industry-level information to explain variations in firms' stock returns. In addition, covering more firms in the same industry does not improve security analysts' ability to capture the changes in industry-level information and hence improve the investment value of their recommendations. Second, analysts' recommendations have greater investment value when firm-specific information plays a major role in stock pricing, but there is no significant difference in investment value when industry-level information plays a major role in stock pricing.

This paper helps us to understand the comparative advantages of analysts and enriches the literature on the relationship between analyst behavior and R^2. Assessing the investment value of analysts' recommendations is actually identical to identifying and confirming the source of analysts' superiority. Loh and Mian (2006) suggest that the comparative advantages of superior analysts lie in their ability to accurately predict accounting earnings and then convert them into stock recommendations. Hence, they examine the investment value of recommendations based on the accuracy of accounting earnings predictions. Palmon and Yezegel (2012) shows that the advantages of analysts lie in analyzing and transferring firm-specific information, and thus uses the R&D expenditure ratio (as a proxy of the degree of information asymmetry between listed companies and investors) to measure the investment value of analysts' recommendations. As the investment value is rooted in analysts' comparative advantages, any empirical findings regarding when and which research reports have greater investment value will also help to explain analysts' comparative advantages. Our study indicates that Chinese security analysts are better at processing firm-specific than industry information. Unlike Piotroski and Roulstone (2004), who only explore the relationship between the number of analysts following and R^2, this study combines the supply and demand factors of analysts' research activities and provides more direct and convincing empirical evidence for how analysts' recommendations influence stock prices, which enriches the literature on the relationship between analyst behavior and R^2.

2. Literature view and hypotheses development

Roll (1988) decomposes information into market-level, industry-level and firm-specific information. He points out that firms' stock returns should be explained by these three kinds of information under the EMH. The extent to which market, industry and firm-level information explain variations in firms' stock returns are calculated as follows.

$$R_{i,j,t} = \alpha_i + \beta_i \cdot R_{m,t} + \varepsilon_{i,j,t} \quad (1)$$

$$R_{i,j,t} = \alpha_i + \beta_i \cdot R_{m,t} + \gamma_i \cdot R_{j,t} + \varepsilon_{i,j,t} \quad (2)$$

where $R_{i,j,t}$ denotes the stock return for firm i in industry j on day t, $R_{m,t}$ denotes the value-weighted market return on day t and $R_{j,t}$ denotes the industry return for industry j on day t. The regression statistic for model (1), R^2, measures the percentage of the variation in firms' stock returns that is explained by market-level information. The regression statistic for model (2), R^2, measures the percentage of the variation in firms' stock returns that is explained by market- and industry-level information. Thus, the difference in R^2 between model (2) and model (1) represents the percentage of the variation in firms' stock returns that is explained by industry-level information. $1 - R^2$ measures the percentage of the variation in firms' stock returns that is explained by firm-specific information. Roll (1988) shows that on average, only 20–30% of the variation in stock returns can be explained by market- and industry-level information. Morck et al. (2000) find that R^2 is lower in developed than in emerging economies and conclude that the high R^2 in emerging economies is associated with poor protection of investor property rights, thus reducing investors' incentives to use firm fundamentals. They also propose the concept of synchronicity to reflect the extent to which stock returns tend to move together. Based on the study by Morck et al. (2000), Durnev et al. (2003) further explore the economic consequences of R^2 and find that a lower R^2 indicates more information about future earnings in current stock returns, and vice versa. They argue that stock markets with more synchronous returns exhibit lower efficiency, which means that the degree of stock price synchronicity is no longer a neutral phenomenon.

It should be noted that Morck et al. (2000) define two stock price synchronicity measures: F, defined as the fraction of stocks in a country whose prices rise (or fall) and weighted R^2. F represents the proportion of stock prices that move in the same direction within a country, a higher F indicates that stock prices frequently move together. R^2 represents the relationship between stock returns and market returns (i.e. the extent to which market returns explains variations in firms' stock returns). In contrast to F, R^2 neither reflects the relationship between two changes (in the same or the opposite direction), nor characterizes the magnitude of the changes. In fact, it is hard to judge whether a high R^2 is a good or bad phenomenon. The use of the word synchronicity seems to imply that a high R^2 is a bad phenomenon. For example, Jin and Myers (2006) suggest that R^2 can be used as an indicator of a firm's transparency. Opaque stocks with a high R^2 are also more likely to crash.

However, other studies do not support the interpretation of Morck et al. (2000), while agreeing with Roll's (1988) classification of information. For example, Piotroski and Roulstone (2004) find that R^2 is positively associated with analyst forecasting activities in the U.S., consistent with analysts increasing the amount of industry-level information in prices through intra-industry information transfers. Therefore, a higher R^2 neither indicates a less efficient market, nor greater opacity. Chan et al. (2013) show that a higher R^2 improves liquidity, contradicting the view that it is usually negatively related to market efficiency and firm transparency. Kelly (2005) also opposes the view of Durnev et al. (2003) that R^2 can be used as a proxy for information efficiency. Teoh et al. (2007) consider that a lower R^2 is the result of noisy trading and Hou et al. (2013) also doubt the conclusion that a lower R^2 is associated with higher pricing efficiency.

From this contradictory evidence, we can draw the following two conclusions. First, the factors that influence R^2 are varied and it is hard to judge whether a high R^2 is good or bad. Second, regardless of the cause of a high R^2 and whether it is a good or bad phenomenon, Roll (1988) interprets R^2 as the extent to which market- and industry-level information explains the variation in firms' stock returns. Brockman and Yan (2009) use $1 - R^2$ as a proxy of the percentage of the variation in a firm's stock returns that is directly explained by firm-specific information.

Feng et al. (2009) also justify that R^2 can be used as a proxy for measuring private information arbitrage activities. However, we argue that this may be open to question. The direct extension of Roll's interpretation is

that R^2 measures whether firm-specific information is valuable. Specifically, a low R^2 indicates that the ability of market- and industry-level information to explain the variation in firms' stock returns is weak, thus firm-specific information plays a more important role in predicting stock returns. In contrast, a high R^2 illustrates that market- and industry-level information can easily predict firm performance, while firm-specific information is relatively less important. Here, firm-specific information is not necessarily private information. For example, announcements of accounting earnings, mergers and acquisitions, and management turnovers are all types of firm-specific information, but are not necessarily private information. Roll (1988) excludes stock returns near the event day to investigate the effect of market- and industry-level information on R^2. Using a clean sample that is unaffected by firm-specific information, the results show that R^2 does not improve significantly, confirming the existence of private information. However, due to the following reasons, there are still some problems with Roll's (1988) method. First, for firms with different R^2, firm-specific information does not have the same importance, thus the extent of the effect of such information on stock returns is distinct. Roll's approach underestimates the influence of events for firms with low R^2 and overestimates it for firms with high R^2. As the magnitude of R^2 measured by Roll's (1988) method is low, excluding daily stock returns near the event day will seriously underestimate the influence of firm-specific information. Second, as firm-specific information is endless, it is difficult to perfectly exclude the effect of events from two newspapers, thus underestimating the influence of firm-specific information. Therefore, a low R^2 does not necessarily imply the existence of private information, but it must indicate that firm-specific information is very important.

In summary, we suggest that R^2 can be used as an indicator to measure the importance of firm-specific information in stock pricing. The higher the value of R^2, the less important firm-specific information is.

Yang et al. (2014) examine whether the research reports of Chinese security analysts have investment value and find that, on average, analysts' recommendations are valuable. Specifically, the duration of the investment value is quite short (usually a couple of days) when it comes to favorable recommendations, while the duration is much longer (usually several months) when it comes to unfavorable recommendations. Furthermore, they also investigate the difference in investment value between star analysts' and non-star analysts' research reports. The empirical results show that the investment value of favorable recommendations issued by star analysts is greater than non-star analysts, while the difference in investment value is not significant for unfavorable recommendations. Unlike Yang et al. (2014), we attempt to answer the question of what constitutes the Chinese security analysts' superiority, which helps to understand the comparative advantages of analysts.

In fact, the expertise of security analysts is examined extensively in the literature and the majority of studies investigate whether analysts are able to identify the effect of a specific accounting variable or economic event. Piotroski and Roulstone (2004) investigate the relationship between the number of analysts following and R^2, and the results confirm that analysts are good at analyzing and transferring industry-level information. The advantage of our research is that it examines the relationship between analysts' recommendations and R^2 to provide a better understanding of the influence of analysts' behavior, and thus provides more direct evidence on the source of analysts' superiority. Therefore, we aim to answer the following three questions.

First, once research reports are issued, the extent to which market- and industry-level information can explain the variation in firms' stock returns will increase if the security analysts are mainly analyzing and transferring industry-level information, thus increasing R^2. Therefore, we expect that R^2 should decrease if daily stock returns around the report announcement date are removed. Conversely, when analysts are good at analyzing and transferring firm-specific information, we expect that R^2 should increase if daily stock returns around the event day are excluded. Considering that the main role of analysts is to improve the extent to which firm-specific information explains the variation in firms' stock returns, R^2 should decline. Based on the above analysis, we propose the following two competing hypotheses.

H1a. The release of research reports increases firms' R^2 when security analysts are good at analyzing and transferring industry-level information.

H1b. The release of research reports decreases firms' R^2 when security analysts are good at analyzing and transferring firm-specific information.

Second, both Clement (1999) and Jacob et al. (1999) find that the accuracy of an analyst's earnings forecasts is negatively associated with the number of firms and industries that the analyst covers (proxy for the degree of analyst expertise). To further test the influence of analysts' superiority, we examine the relationship between the number of firms in the same industry that the analyst covers and the investment value of research reports. Analysts covering a larger number of firms in the same industry should be able to obtain more timely and accurate industry-level information, thus improving the investment value of research reports when security analysts are good at analyzing and transferring such information. Conversely, when analysts are not good at analyzing and transferring industry-level information, covering more firms in the same industry should not bring additional knowledge or improve the investment value of their research reports. Based on the above analysis, we propose the following two competing hypotheses.

H2a. The investment value of research reports is positively associated with the number of firms in the same industry that a securities analyst covers when the analyst is good at analyzing and transferring industry-level information.

H2b. The investment value of research reports is unrelated to the number of firms in the same industry that a securities analyst covers when the analyst is good at analyzing and transferring firm-specific information.

The supply factors that influence analysts' activities are discussed above. Next, we analyze the demand factors that derive from the information asymmetry in the capital market. However, the concept of information asymmetry is used as a general term because different firms have varied information asymmetry. For example, Bradshaw et al. (2001) and Barth et al. (2001) point out that accruals and intangible assets are important sources of information asymmetry. Palmon and Yezegel (2012) argue that the R&D expenditure ratio is also an important source of information asymmetry. All of these types of information asymmetry affect the behavior of security analysts. Lang and Lundholm (1996), Healy and Palepu (2001) and Byard and Shaw (2003) use different disclosure indices to measure the degree of information asymmetry, and examine the influence of these indices on analyst behavior. We can see that information asymmetry is varied and the key question is which types of information are most important. Although previous studies examine several types of information asymmetry, none considers which type of information is the most valuable overall. In fact, prior studies only examine incremental information asymmetry caused by a particular account, which is not necessarily the most important demand from the perspective of analysts' activities.

By combining the supply and demand factors of analysts' research activities, this study attempts to provide a more comprehensive framework to investigate these research questions. As mentioned, Roll (1988) decomposes the information incorporated into stock prices into three kinds of information: market-wide, industry-level and firm-specific information. Specifically, market-wide information such as monetary policy, fiscal policy and market shocks is value relevant for all stocks. Industry-level information such as industry policy and industry shocks is value relevant for all stocks in a particular industry. Firm-specific information such as announcements of accounting earnings, dividends and mergers and acquisitions is value relevance for a particular stock.

Theoretically, all of the company's stock returns can be explained by these three types of information, but the extent to which market-, industry- and firm-level information explain the variation in a firm's stock returns differs. Dechow et al. (2010) suggest that a firm's fundamental earnings process is jointly determined by its operating cycle, macro environment, investment opportunities, management and other firm characteristics. These firm characteristics not only affect the profitability of the company directly, but also determine the importance of different types of information for stock pricing. For some companies, industry-level information is more important, whereas for others, firm-specific information may be more important. This study attempts to identify which type of information asymmetry is the most important, thus resulting in the demand for analysts' activities. If companies' stock returns are mainly explained by industry-level (firm-specific) information, investors will have a great need for analysts who are good at searching and analyzing industry-level (firm-specific) information.

Our research combines the supply and demand factors of analysts' research activities to examine the investment value of analysts' recommendations. Table 1 summarizes the framework of supply and demand factors.

Table 1 illustrates that if firms' stock returns are mainly explained by industry-level information, the supply and demand of security analysts' activities will match perfectly if the analysts are good at analyzing and transferring such information. In this case, their research reports have higher investment value because they are better able to alleviate the information asymmetry. In contrast, the supply and demand of analysts' activities will be mismatched if the analysts are good at analyzing and transferring firm-specific information. In this case, their research reports have lower investment value because they have limited ability to alleviate the information asymmetry. If firms' stock returns are mainly explained by firm-specific information, the supply and demand of analysts' activities will match perfectly if the analysts are good at analyzing and transferring such information. In this case, their research reports have greater investment value because they are better able to alleviate the information asymmetry. Conversely, the supply and demand of analysts' activities will be mismatched if the analysts are good at analyzing and transferring industry-level information. In this case, their research reports have lower investment value because they have limited ability to alleviate the information asymmetry. Based on the above analysis, we propose the following pair of competing hypotheses.

H3a. Analysts' research reports have greater investment value when industry-level information plays a more important role in stock pricing.

H3b. Analysts' research reports have greater investment value when firm-specific information plays a more important role in stock pricing.

3. Research design

Following previous studies (Barber et al., 2001; Loh and Mian, 2006), we construct calendar-time portfolios to calculate the abnormal returns of analysts' recommendations. This methodology was initially used by Jaffe (1974) and Mandelker (1974), and was strongly supported by Fama (1998). Compared with buy-and-hold portfolios, our methodology has several advantages. First, bad-model problems are more acute with long-term buy-and-hold abnormal returns, which compound an expected-return model's problems in explaining short-term returns (Fama, 1998). Second, it is difficult to control for intra-portfolio correlations and easy to obtain significant results when we estimate the long-term buy-and-hold abnormal returns. Conversely, using calendar-time portfolios to calculate long-term abnormal returns automatically cancels out the intra-portfolio correlations. Last but not least, the calendar-time portfolio approach is more investor-oriented and more feasible as an investment strategy.

In this paper, we construct two kinds of portfolios, one based on analysts' consensus recommendations and another based on revised or initial recommendations. As we need a long period to calculate analysts' consensus recommendations, the former portfolio is used to examine the long-term investment value of research reports, while the latter portfolio is more suitable to examine the short-term investment value because the exact recommendation dates are available.

3.1. Test of Hypothesis 1

To investigate the influence of research reports issued by security analysts on a firm's R^2 (i.e. Hypothesis 1), we use the following procedure.

First, using daily stock returns from day $T-2X$ to $T-1$ (where $X=30, 90, 180$), we regress model (3) and model (4) by firm to estimate the R^2 statistic, respectively.

$$R_{i,j,t} = \alpha_i + \beta_{1,i} \cdot R_{m,t} + \beta_{2,i} \cdot R_{m,t-1} + \varepsilon_{i,j,t} \tag{3}$$

$$R_{i,j,t} = \alpha_i + \beta_{1,i} \cdot R_{m,t} + \gamma_{1,i} \cdot R_{j,t} + \beta_{2,i} \cdot R_{m,t-1} + \gamma_{2,i} \cdot R_{j,t-1} + \varepsilon_{i,j,t} \tag{4}$$

where

$$R_{j,t} = \sum_{k \in j} R_{k,j,t} \cdot W_{k,j,t} - R_{i,j,t} \cdot W_{i,j,t}$$

Table 1
Analysis of supply and demand factors in the investment value of recommendations.

Type of information asymmetry	Analysts' superiority	
	Industry-level information	Firm-specific information
Stock returns are mainly explained by industry-level information	High investment value (perfect match between supply and demand)	Low investment value (mismatch between supply and demand)
Stock returns are mainly explained by firm-specific information	Low investment value (mismatch between supply and demand)	High investment value (perfect match between supply and demand)

$$R_{m,t} = m_t - (R_{j,t} + R_{i,j,t} \cdot W_{i,j,t}) \cdot W_{j,t}$$

where $R_{i,j,t}$ denotes the stock return for firm i in industry j on day t. $R_{j,t}$ denotes the industry return for industry j on day t with $R_{i,j,t}$ omitted. The industry classification criteria are based on the "Industry Classification Guidance for Listed Companies" published by the China Securities Regulatory Commission (CSRC) in 2001. We adopt a three-digit code category for the manufacturing industry (C) and a two-digit code category for other industries. We also restrict industries with no less than 10 listed companies when calculating industry returns. $R_{m,t}$ denotes the value-weighted market return on day t with $R_{j,t}$ omitted. $W_{k,j,t}$, $W_{i,j,t}$ and $W_{j,t}$ represent the weight of market capitalization on day t.

The R^2 regression statistic for model (3) measures the percentage of the variation in firms' stock returns that is explained by market-level information. The R^2 regression statistic for model (4) measures the percentage of the variation in firms' stock returns that is explained by market- and industry-level information. Therefore, the difference between the R^2 values for models (3) and (4) represents the percentage of the variation in firms' stock returns that is explained by industry-level information.

Second, for each firm i, we exclude daily stock returns on the day before, the day of and the day following the recommendation date, and re-regress model (4) to estimate R^2_{new}.

Finally, we test the difference between R^2 and R^2_{new}. An R^2 value that is higher (lower) than the R^2_{new} value indicates that security analysts are good at analyzing and transferring industry-level (firm-specific) information, thus increasing (decreasing) R^2.

3.2. Test of Hypothesis 2

To examine whether the number of firms that analysts cover in the same industry affects the investment value of research reports (i.e. Hypothesis 2), we adopt the following procedure.

We begin with a simple calculation of the number of firms covered by each analyst and for each industry. For each analyst, the number of firms in the same industry covered is calculated on a 180-day window before day T (i.e. from day $T-180$ to $T-1$). The industry classification is defined as described in Section 3.1.

Next, we divide the sample into low and high groups according to the median number of firms that the analysts cover in the same industry.

Finally, we test the difference in the investment value of the two groups for each of our constructed portfolios. We calculate three estimates of abnormal returns for each portfolio, namely market-adjusted returns, the intercept of the CAPM and the intercept of the Fama-French three-factor model. All portfolio returns are monthly returns.

For the revised or initial recommendations portfolio, the portfolio on date T is constructed as follows. We purchase stocks depending on the revised or initial recommendations during the $T-d$ to $T-1$ period (where $d = 1, 5, 7$).[1] Specifically, we purchase stocks with initial recommendations no higher than 2, or upgrade ratings with new recommendations no higher than 2.[2]

[1] All recommendations of strong buy, buy, hold, sell and strong sell are defined as integer numbers between 1 and 5, respectively. In other words, a rating of 1 reflects a strong buy recommendation, 2a buy, 3a hold, 4a sell and 5a strong sell.

[2] Given that downgrade recommendations are rare in our sample, we do not construct short portfolios.

For the consensus recommendations portfolio, the portfolio on date T is constructed as follows. We begin by calculating the consensus recommendations of each covered firm during the $T-X$ to $T-1$ period (where $X=30, 90, 180$) according to model (5). Then, we purchase stocks in the portfolio with consensus recommendations no higher than 2 and sell short stocks in the portfolio with consensus recommendations higher than 2.5. Stocks with consensus recommendations between 2 and 2.5 are excluded from the transactions to reduce the effect of analyst optimism (Barber et al., 2001; Loh and Mian, 2006).

$$\text{Consensus}_{i,T-1,T-X} = \frac{1}{N_{i,T-1,T-X}} \sum_{j=1}^{N_{i,T-1,T-X}} Rec_{i,j,T-1,T-X} \tag{5}$$

where $N_{i,T-1,T-X}$ is the number of recommendations for firm i during the $T-X$ to $T-1$ period, $Rec_{i,j,T-1,T-X}$ is the standardized analyst recommendation of analyst j for firm i. All recommendations of strong buy, buy, hold, sell and strong sell are defined as integer numbers between 1 and 5, respectively.

3.3. Test of Hypothesis 3

To examine how the supply and demand factors affect the investment value of research reports (i.e. Hypothesis 3), we sort the sample by the extent to which firm-specific and industry-level information explain the variation in firms' stock returns, respectively.

(1) Sort by the extent to which firm-specific information explains the variation in stock returns.

First, we regress model (4) by firm to calculate the extent to which firm-specific information explains the variation in stock returns from day $T-60$ to $T-1$ (i.e. $1-R^2$), and classify all covered firms into one of five groups.

Second, for each group, using the investment strategy in Section 3.2, we construct two kinds of portfolios based on consensus recommendations and revised recommendations, respectively. After determining the composition of each portfolio on date $T-1$, the value-weighted portfolio returns are calculated.

Finally, we calculate three estimates of abnormal returns for each portfolio, namely market-adjusted returns, the intercept of CAPM and the intercept of the Fama-French three-factor model.

(2) Sort by the extent to which industry-level information explains the variation in stock returns.

First, using daily returns from day $T-60$ to $T-1$, we regress models (3) and (4) for each firm to calculate R^2, respectively. The difference in R^2 between models (3) and (4) measures the extent to which industry-level information explains the variation in firms' stock returns. We classify all covered firms into one of five groups.

Second, for each group, using the investment strategy in Section 3.2 we construct two portfolios based on consensus recommendations and revised recommendations, respectively. After determining the composition of each portfolio on date $T-1$, the value-weighted portfolio returns are calculated.

Finally, we calculate three estimates of abnormal returns for each portfolio, namely market-adjusted returns, the intercept of CAPM and the intercept of the Fama-French three-factor model.

4. Empirical results

4.1. Sample selection and data sources

We obtain analysts' recommendation data from the WIND database during the 2005–2010 period. The WIND database covers most of the analysts' recommendations, including details such as the recommendation date, the type of recommendation (if the recommendation is not an initially offered one, the record also includes the last recommendation), the analysts' names and their affiliated brokerage houses. One problem is that for a certain period, the WIND database only allows querying the latest recommendation for each firm

Table 2
Distribution of analysts' recommendations.

Year	Recommendations					Total
	1	2	3	4	5	
2005	3810 (11.27%)	13,677 (40.47%)	14,780 (43.73%)	1480 (4.38%)	50 (0.15%)	33,797
2006	12,326 (21.64%)	27,030 (47.46%)	16,208 (28.46%)	1345 (2.36%)	42 (0.07%)	56,951
2007	7682 (31.05%)	11,796 (47.67%)	4987 (20.16%)	261 (1.05%)	17 (0.07%)	24,743
2008	7403 (33.24%)	10,749 (48.26%)	3855 (17.31%)	222 (1.00%)	44 (0.20%)	22,273
2009	7561 (29.25%)	13,851 (53.59%)	4233 (16.38%)	175 (0.68%)	27 (0.10%)	25,847
2010	10,727 (37.77%)	14,838 (52.24%)	2773 (9.76%)	49 (0.17%)	14 (0.05%)	28,401
Total	49,509 (25.78%)	91,941 (47.88%)	46,836 (24.39%)	3532 (1.84%)	194 (0.10%)	192,012

Note: Recommendations of 1, 2, 3, 4 and 5 indicate strong buy, buy, hold, sell and strong sell, respectively. The percentages of respective types of recommendations to the total number of recommendations are reported in parentheses.

and each analyst, thus it is difficult to export all recommendations including the history at one time. Therefore, for each brokerage-firm-analyst keyword, we query the recommendation records by week. Finally, we obtain 192,012 recommendations as the initial sample.

Both the financial and stock return data are obtained from the CSMAR database. To reduce the effect of potential outliers, we drop all observations with an absolute value of daily returns higher than 11%. The risk-free rate (measured by the monthly yield rate on treasury bills) and Fama-French three-factor data are collected from the RESSET database.

Table 2 reports the distribution of analysts' recommendations. We find that two types of recommendations, strong buy (1) and buy (2), account for almost three quarters of the total number, while no more than 2% of recommendations are lower than sell (4), consistent with Loh and Mian (2006). The results indicate that on average, security analysts are less willing to issue unfavorable than favorable recommendations, and tend to be optimistic. Following Loh and Mian (2006), we purchase stocks with consensus recommendations no higher than 2 and sell short stocks with consensus recommendations higher than 2.5 to control for analyst optimism.

Next, we divide the sample into revised and initially offered recommendations. Table 3 illustrates that for the initial recommendations sample, strong buy (1) and buy (2) recommendations account for more than 70%, while sell (4) and strong sell (5) recommendations account for only about 2%. For revised recommendations, most of the downgrade ratings are changed to buy (2) or hold (3) recommendations, consistent with the finding that analysts rarely issue unfavorable recommendations even when they downgrade a firm. Most of the revised recommendations are upgrades or reiterations, which further supports the view that analysts tend to be optimistic.

4.2. Empirical results of Hypothesis 1: analysts' superiority

Hypothesis 1 examines whether the research reports issued by analysts increase the percentage of the variation in firms' stock returns that is explained by firm-specific (or industry-level) information.

Table 4 reports the results using a 60-day window ending on date $T-1$ to estimate firms' R^2 (i.e. $X=30$). We find that the mean (median) percentage of the variation in firms' stock returns that is explained by industry-level information is 36.30% (35.33%) and the percentage of the variation in firms' stock returns that is

Table 3
Descriptive statistics of analysts' revised and initially offered recommendations.

Type of recommendation	Recommendations					Total
	1	2	3	4	5	
Upgrade	6767 (52.95%)	5577 (43.64%)	433 (3.39%)	4 (0.03%)	0 (0.00%)	12,781
Reiteration	37,331 (26.01%)	68,697 (47.87%)	34,801 (24.25%)	2607 (1.82%)	72 (0.05%)	143,508
Downgrade	0 (0.00%)	4490 (42.62%)	5524 (52.44%)	462 (4.39%)	58 (0.55%)	10,534
Initially offered	5411 (21.48%)	13,177 (52.31%)	6078 (24.13%)	459 (1.82%)	64 (0.25%)	25,189

Note: Recommendations of 1, 2, 3, 4 and 5 indicate strong buy, buy, hold, sell and strong sell, respectively. The percentages of respective types of recommendations to the total number of recommendations are reported in parentheses.

explained by market- and industry-level information is 52.45% (52.88%). The mean (median) percentage of the influence of analysts' research reports on firms' R^2 is −3.80% (−1.41%), which indicates that the extent to which firm-specific information explains the variation in stock returns increases by 3.80% (1.41%). Although some of the research reports seem to increase the extent to which market- and industry-level information explain the variation in stock returns, the main role of analysts is to improve the extent to which firm-specific information explains the variation in firms' stock returns, and thus their superiority is in analyzing and transferring firm-specific information.

As a robustness test, we also use 180-day and 360-day windows ending on date $T-1$ to estimate firms' R^2 (i.e. $X = 90, 180$). The results are consistent.[3]

From the above evidence, we can conclude that the main role of analysts is to improve the extent to which firm-specific information explains the variation in firms' stock returns, which supports H1b. Therefore, Chinese security analysts are good at analyzing and transferring firm-specific information. If the above conclusion is correct, we further expect that covering more firms in the same industry will not improve the investment value of analysts' research reports (Hypothesis 2).

4.3. Empirical results of Hypothesis 2: the influence of the number of firms covered

Hypothesis 2 examines whether the research reports issued by analysts who cover more firms in the same industry have greater investment value.

Table 5 presents the results based on the portfolio of analysts' revised recommendations. Specifically, Panel A shows the investment value of favorable recommendations issued by analysts who cover a low number of firms. Using the recommendations issued on date $T-1$ to construct the portfolio (the daily portfolio contains 4.09 stocks on average), we find that the portfolio raw and market-adjusted returns are 11.43% and 8.30%, respectively, while the intercept of the CAPM and Fama-French three-factor model is 7.76% and 7.78%, respectively. All portfolio returns are significant at the 1 percent level. We expect that less frequent rebalancing will cause portfolio returns to diminish in magnitude. With a 5-day rebalancing period, for example, the portfolio returns decline from 7.78% to 2.75% under the Fama-French three-factor model (column 4) and remain significant. When we further expand the rebalancing period to 7 days, the portfolio returns decline from 7.78% with 1-day rebalancing to 1.59% with 7-day rebalancing under the Fama-French three-factor model, but still with marginal significance. These empirical results suggest that the favorable recommendations issued by analysts who cover a low number of firms are valuable.

Panel B of Table 5 illustrates the investment value of favorable recommendations issued by analysts who cover a high number of firms. Similarly, using the recommendations issued on date $T-1$ to construct the

[3] For simplicity, we do not tabulate the results of the robustness tests, but they are available upon request.

Table 4
The influence of analysts' research reports on firms' stock returns.

Types of information	Mean (%)	Q1 (%)	Median (%)	Q3 (%)	*t*-Value (%)
% of variation in firms' stock returns explained by industry-level information	36.30	22.75	35.33	48.94	1670.11
% of variation in firms' stock returns explained by market- and industry-level information	52.45	39.61	52.88	65.96	2368.62
The influence of analysts' research reports on firms' R^2	−3.80	−6.40	−1.41	1.32	−267.15

Note: We use daily stock returns from day $T-60$ to $T-1$ to estimate the R^2 statistic by firm. The percentage of the variation in firms' stock returns explained by market- and industry-level information is defined as the R^2 statistic for model (4). The percentage of the variation in firms' stock returns explained by industry-level information is defined as the difference in R^2 between models (3) and (4). For each firm, we exclude daily stock returns on the day before, the day of and the day following the recommendation date, and re-regress model (4) to estimate R^2_{new}. The difference between R^2 and R^2_{new} measures the influence of analysts' research reports on firms' R^2.

Table 5
The influence of the number of firms covered on the investment value of analysts' revised recommendations.

Rebalancing period	Raw Returns (1)	Market-adjusted Returns (2)	Intercept of CAPM (3)	Intercept of three-factor model (4)	Daily covered stocks (5)
Panel A: Low number of firms covered					
1 day	0.1143***	0.0830***	0.0776***	0.0778***	4.09
	(5.21)	(6.25)	(5.73)	(5.40)	
5 days	0.0619***	0.0306***	0.0279***	0.0275**	15.44
	(3.20)	(2.93)	(2.59)	(2.42)	
7 days	0.0496***	0.0184**	0.0156*	0.0159	23.67
	(2.66)	(2.00)	(1.65)	(1.62)	
Panel B: High number of firms covered					
1 day	0.0903***	0.0590***	0.0566***	0.0573***	8.15
	(4.54)	(5.09)	(4.71)	(4.57)	
5 days	0.0541***	0.0228***	0.0219**	0.0263***	31.63
	(3.10)	(2.76)	(2.55)	(2.98)	
7 days	0.0476***	0.0164**	0.0159*	0.0208**	48.32
	(2.79)	(2.11)	(1.97)	(2.54)	
Panel C: Difference between low and high					
1 day		0.0240	0.0210	0.0205	
		(1.36)	(1.16)	(1.07)	
5 days		0.0078	0.0060	0.0012	
		(0.58)	(0.43)	(0.08)	
7 days		0.0020	−0.0003	−0.0049	
		(0.17)	(−0.02)	(−0.38)	

Note: The number of firms covered in the same industry is calculated on a 180-day window before day T (i.e. from day $T-180$ to $T-1$) for each analyst. The recommendations issued by analysts who cover less than the median number of firms in the same industry are classified as "low number of firms covered" and the rest are classified as "high number of firms covered". We adopt a three-digit code category for the manufacturing industry and a two-digit code category for other industries. For each portfolio, we estimate abnormal returns using market-adjusted returns, the intercept of the CAPM and the intercept of the Fama-French three-factor model, respectively. ***, ** and * represent significance at the 1%, 5% and 10% levels, respectively, and *t*-statistics are presented in parentheses.

portfolio (the daily portfolio contains 8.15 stocks on average), we find that the portfolio raw and market-adjusted returns are 9.03% and 5.90%, respectively, while the intercept of the CAPM and Fama-French three-factor model is 5.66% and 5.73%, respectively. All portfolio returns are significant at the 1 percent level. The portfolio returns diminish in magnitude as the rebalancing period is lengthened to 5 days, declining from 5.73% with 1-day rebalancing to 2.63% with 5-day rebalancing under the Fama-French three-factor model (column 4), which is significant at the 1 percent level. Further expanding the rebalancing period to 7 days, the portfolio returns decline to 2.08% under the Fama-French three-factor model, but remains significant.

These findings suggest that the favorable recommendations issued by analysts who cover a high number of firms also have significant investment value.

Panel C of Table 5 compares the difference in investment value for favorable recommendations between the two types of analysts. A zero-investment portfolio based on the recommendations issued on $T-1$ indicates that investors can earn positive abnormal returns. The portfolio market-adjusted return is 2.40% (with a t-statistic of 1.36), whereas the intercepts of the CAPM and Fama-French three-factor model are 2.10% (with a t-statistic of 1.16) and 2.05% (with a t-statistic of 1.07), respectively. However, all of the hedge returns are insignificantly different from zero. The hedge returns decrease significantly as the rebalancing period is lengthened to 5 days, declining from 2.05% to 0.12% (with a t-statistic of 0.08) under the Fama-French three-factor model (column 4), and further decrease as the rebalancing period is lengthened to 7 days, declining to −0.49% (with a t-statistic of −0.38) under the Fama-French three-factor model. Overall, the findings show that the favorable recommendations issued by analysts who cover a high number of firms do not have a greater investment value than those issued by analysts who cover a low number of firms. This finding also suggests that covering more firms does not mean that analysts have more industry-level information. From the above evidence, we can conclude that Chinese security analysts are better at searching for and analyzing firm-specific information rather than industry-level information.

Table 6 presents the estimated coefficients for the Fama-French three-factor model. We find that the coefficients on *RMRF*, *SMB* and *HML* are not significantly different between the portfolios of the two types of analysts, indicating that firm characteristics such as market risk, growth and book-to-market ratios are qualitatively the same for each portfolio.

Table 7 presents the results based on the portfolio of analysts' consensus recommendations. Specifically, Panel A shows the investment value of favorable recommendations issued by the two types of analysts. For analysts covering a low number of firms, the portfolio raw return of 2.86% is significant at the 10 percent level, whereas the portfolio abnormal returns estimated by market-adjusted returns and the intercepts of the

Table 6
Fama-French three-factor regressions based on the portfolio of analysts' revised recommendations.

Rebalancing period	Coefficient estimates for the three-factor model			Adj-R^2	N
	RMRF	SMB	HML		
Panel A: Low number of firms covered					
1 day	1.1732***	0.0006	0.0365	63.03	60
	(9.49)	(0.00)	(0.08)		
5 days	1.1163***	−0.1063	−0.3162	70.18	60
	(6.88)	(−0.48)	(−0.87)		
7 days	1.1278***	−0.2014	−0.3978	76.23	60
	(13.34)	(−1.05)	(−1.27)		
Panel B: High number of firms covered					
1 day	1.1219***	−0.2547	−0.4422	65.85	60
	(10.42)	(−1.04)	(−1.11)		
5 days	1.0295***	−0.3594**	−0.0162	78.09	60
	(13.57)	(−2.09)	(−0.06)		
7 days	1.0077***	−0.3650**	0.0719	80.13	60
	(14.29)	(−2.28)	(0.27)		
Panel C: Difference between low and high					
1 day	0.0513	0.2554	0.4788	0.99	120
	(0.31)	(0.69)	(0.79)		
5 days	0.0868	0.2531	−0.3000	0.54	120
	(0.70)	(0.90)	(−0.65)		
7 days	0.1200	0.1636	−0.4697	0.44	120
	(1.09)	(0.65)	(−1.15)		

Note: Following Fama (1998), we define *RMRF* as value-weighted market returns minus the risk-free rate; *SMB* as the difference between the daily returns of a value-weighted portfolio of small stocks and one of large stocks; and *HML* as the difference between the daily returns of a value-weighted portfolio of high book-to-market stocks and one of low book-to-market stocks. ***, ** and * represent significance at the 1%, 5% and 10% levels, respectively, and t-statistics are presented in parentheses.

Table 7
The influence of the number of firms covered on the investment value of analysts' consensus recommendations.

Number of firms covered by analysts	Raw Returns (1)	Market-adjusted Returns (2)	Intercept of CAPM (3)	Intercept of three-factor model (4)	Daily covered stocks (5)
Panel A: Long portfolios					
Low number of firms	0.0286*	−0.0027	−0.0013	0.0020	127.77
	(1.92)	(−0.59)	(−0.27)	(0.45)	
High number of firms	0.0315**	0.0003	0.0013	0.0052	211.56
	(2.07)	(0.06)	(0.25)	(1.09)	
Difference between low and high	−0.0030	−0.0030	−0.0026	−0.0028	−83.79
	$p = 89.0\%$	$p = 65.9\%$	$p = 70.1\%$	$p = 61.5\%$	
Panel B: Short portfolios					
Low number of firms	0.0114	−0.0199***	−0.0223***	−0.0196***	38.27
	(0.65)	(−2.93)	(−3.21)	(−2.80)	
High number of firms	0.0138	−0.0175***	−0.0193***	−0.0195***	77.09
	(0.81)	(−2.95)	(−3.15)	(−3.03)	
Difference between low and high	−0.0024	−0.0024	0.0030	0.0001	−38.82
	$p = 92.2\%$	$p = 79.2\%$	$p = 73.9\%$	$p = 99.2\%$	
Panel C: Hedge portfolios					
Low number of firms		0.0172**	0.0210**	0.0217***	
		(2.10)	(2.51)	(2.58)	
High number of firms		0.0178**	0.0201***	0.0247***	
		(2.32)	(2.60)	(3.09)	
Difference between low and high		−0.0006	0.0009	−0.0030	
		$p = 95.9\%$	$p = 96.6\%$	$p = 79.7\%$	

Note: Following Barber et al. (2001) and Loh and Mian (2006), we begin by calculating the consensus recommendations of each covered firm during the $T-30$ to $T-1$ period according to model (5). Then we purchase stocks in the portfolio with consensus recommendations no higher than 2 and sell short stocks in the portfolio with consensus recommendations higher than 2.5, while the stocks with consensus recommendations between 2 and 2.5 are excluded. The recommendations issued by analysts who cover less than the median number of firms in the same industry are classified as "low number of firms covered" and the rest are classified as "high number of firms covered". For each portfolio, we estimate abnormal returns using market-adjusted returns, the intercept of the CAPM and the intercept of the Fama-French three-factor model, respectively. ***, ** and * represent significance at the 1%, 5% and 10% levels, respectively, and *t*-statistics are presented in parentheses.

CAPM and Fama-French three-factor model are neither statistically nor economically significant. The findings suggest that investors who purchase stocks based on analysts' consensus recommendations during the $T-30$ to $T-1$ period (i.e. $X=30$) do not earn positive abnormal returns. Similarly, for analysts covering a high number of firms, the portfolio abnormal returns are neither statistically or economically significant. The investment values of favorable recommendations also show no significant difference between the two types of analysts. The corresponding *p*-values of the abnormal returns estimated by market-adjusted returns and the intercepts of the CAPM and Fama-French three-factor model are 65.9%, 70.1% and 61.5%, respectively.

Panel B illustrates the investment value of unfavorable recommendations issued by the two types of analysts. For analysts covering a low number of firms, except for the portfolio raw return of 1.14%, which is not significant, the portfolio abnormal returns estimated by market-adjusted returns and the intercepts of the CAPM and Fama-French three-factor model are −1.99%, −2.23% and −1.96%, respectively, and all of them are significant at the 1 percent level. The results for analysts covering a high number of firms are qualitatively the same, with portfolio abnormal returns of −1.75%, −1.93% and −1.95%, respectively. The investment values of unfavorable recommendations also show no significant differences between the two types of analysts. The corresponding *p*-values of the abnormal returns estimated by market-adjusted returns and the intercepts of the CAPM and Fama-French three-factor model are 79.2%, 73.9% and 99.2%, respectively. The findings suggest that both types of analysts' unfavorable recommendations have significant investment value.

Table 8
Fama-French three-factor model regressions based on the portfolios of analysts' consensus recommendations.

Number of firms covered by analysts	Coefficient estimates for the three-factor model			Adj-R^2	N
	RMRF	SMB	HML		
Panel A: Long portfolios					
Low number of firms	0.9530***	−0.2825***	−0.0338	91.83	60
	(24.09)	(−3.15)	(−0.23)		
High number of firms	0.9740***	−0.3581***	−0.1007	95.68	60
	(23.98)	(−3.88)	(−0.67)		
Panel B: Short portfolios					
Low number of firms	1.0243***	0.0304	0.5566**	86.23	60
	(17.01)	(0.22)	(2.49)		
High number of firms	1.0394***	0.0925	0.1638	87.54	60
	(18.78)	(0.74)	(0.80)		
Panel C: Hedge portfolios					
Low number of firms	−0.0714	−0.3130*	−0.5904**	1.62	120
	(−0.99)	(−1.91)	(−2.21)		
High number of firms	−0.0655	−0.4506***	−0.2644	1.53	120
	(−0.95)	(−2.89)	(−1.04)		

Note: Following Fama (1998), we define *RMRF* as value-weighted market returns minus the risk-free rate; *SMB* as the difference between the daily returns of a value-weighted portfolio of small stocks and one of large stocks; and *HML* as the difference between the daily returns of a value-weighted portfolio of high book-to-market stocks and one of low book-to-market stocks. ***, ** and * represent significance at the 1%, 5% and 10% levels, respectively, and *t*-statistics are presented in parentheses.

Panel C presents the hedge returns for each portfolio. The results show that the hedge returns for portfolios formed on the basis of analysts' consensus recommendations are not only significant at the 5 percent level, but also do not depend on the number of firms covered by analysts.

Table 8 reports the estimated coefficients for the Fama-French three-factor model. The significant coefficients on *SMB* and *HML* indicate that favorable recommendations are associated with firms of large size and lower book-to-market ratios, while unfavorable recommendations are associated with firms of small size and higher book-to-market ratios.

As a robustness test, we also examine the abnormal returns for portfolios formed on the basis of analysts' consensus recommendations during the $T-90$ to $T-1$ period (i.e. $X=90$) and the $T-180$ to $T-1$ period (i.e. $X=180$), respectively. The results are qualitatively the same.

From the above evidence, we can conclude that the investment value of neither favorable nor unfavorable recommendations shows a significant difference between the two types of analysts. In other words, covering more firms in the same industry does not help analysts to incorporate industry-level information into their recommendations, supporting H2b. The results also further confirm the findings of Hypothesis 1, that Chinese analysts are good at analyzing and transferring firm-specific rather than industry-level information.

4.4. Empirical results of Hypothesis 3: the influence of supply and demand factors

Given that the above evidence shows that Chinese analysts are good at analyzing and transferring firm-specific information, we expect the investment value of analysts' recommendations to increase (decrease) as firm-specific (industry-level) information plays a more important role in stock pricing. Specifically, we examine the following four cases.

Case #1: Sort by the extent to which firm-specific information explains the variation in stock returns and construct portfolios based on recommendation changes. Table 9 reports the investment value of favorable recommendations that involve daily portfolio rebalancing. As shown in columns 1–5 of Panel A, there is a monotonic decrease in portfolio returns. Taking the intercept of the Fama-French three-factor model as an example, the abnormal returns on portfolios 1–5 are 11.15%, 7.44%, 6.91%, 6.41% and 3.24%, respectively, and all of them are significant at the 1 percent level. The hedge returns that can be generated by a strategy

Table 9
The investment value of analysts' revised recommendations by the importance of firm-specific information in stock pricing.

Ranked by the importance of firm-specific information	Raw Returns (1)	Market-adjusted Returns (2)	Intercept of CAPM (3)	Intercept of three-factor model (4)	Daily covered stocks (5)
Panel A: Portfolio returns					
P1 (most important)	0.1314***	0.1001***	0.1054***	0.1115***	2.65
	(5.12)	(4.40)	(4.49)	(4.50)	
P2	0.1053***	0.0741***	0.0745***	0.0744***	2.85
	(5.62)	(6.40)	(6.18)	(5.96)	
P3	0.1055***	0.0742***	0.0662***	0.0691***	2.80
	(4.22)	(4.45)	(3.92)	(3.89)	
P4	0.1040***	0.0727***	0.0656***	0.0641***	2.66
	(4.47)	(5.00)	(4.47)	(4.18)	
P5 (least important)	0.0619***	0.0306**	0.0318**	0.0324**	2.47
	(3.03)	(2.11)	(2.11)	(2.10)	
P1–P5	0.0695**	0.0695**	0.0736***	0.0791***	
	$p = 3.6\%$	$p = 1.1\%$	$p = 0.4\%$	$p = 0.2\%$	

Ranked by the importance of firm-specific information	Coefficient estimates for the three-factor model			Adj-R^2	N
	RMRF	SMB	HML		
Panel B: Fama-French three-factor model regressions					
P1 (most important)	0.7570***	−0.2098	0.6368	19.13	60
	(3.56)	(−0.43)	(0.81)		
P2	1.0410***	−0.2576	−0.5895	62.06	60
	(9.72)	(−1.06)	(−1.48)		
P3	1.3020***	−0.3806	−0.3366	56.83	60
	(8.55)	(−1.10)	(−0.60)		
P4	1.1826***	0.3476	0.5056	62.89	60
	(8.99)	(1.16)	(1.04)		
P5 (least important)	1.0406***	−0.4217	−0.8414*	51.02	60
	(7.86)	(−1.40)	(−1.71)		

Note: We regress model (4) by firm to calculate the extent to which firm-specific information explains the variation in firms' stock returns during the $T-60$ to $T-1$ period (i.e. $1-R^2$) and classify all firms with revised or initial recommendations on date $T-1$ into one of five groups. For each group, we purchase stocks with an initial recommendation no higher than 2 or upgrade ratings with a new recommendation no higher than 2 to construct portfolios on date T. We estimate portfolio abnormal returns using market-adjusted returns, the intercept of the CAPM and the intercept of the Fama-French three-factor model, respectively. ***, ** and * represent significance at the 1%, 5% and 10% levels, respectively, and t-statistics are presented in parentheses.

of purchasing stocks in portfolio 1 and selling short stocks in portfolio 5 are 7.91% (with a p-value of 0.2%). The portfolio abnormal returns estimated by market-adjusted returns and the CAPM intercept shows qualitative similar patterns. Panel B presents the estimated coefficients for the Fama-French three-factor model. Overall, Table 9 provides strong evidence that the investment value of analysts' favorable recommendations increases as firm-specific information plays a more important role in stock pricing.

Case #2: Sort by the extent to which industry-level information explains the variation in stock returns and construct portfolios based on recommendation changes. Table 10 reports the investment value of favorable recommendations that involve daily portfolio rebalancing. From portfolios 1 to 5, the importance of industry-level information in stock pricing increases. As shown in columns 1–5 of Panel A, there is no monotonic trend in the portfolio returns. Taking the intercept of the Fama-French three-factor model as an example, the abnormal returns range from a low of 5.09% on portfolio 3, to a high of 9.54% on portfolio 4. The portfolio abnormal returns estimated by market-adjusted returns and the CAPM intercept shows qualitative similar patterns. Panel B presents the estimated coefficients for the Fama-French three-factor model. Overall, the above findings suggest that security analysts are not good at analyzing and transferring industry-level information.

As a robustness test, we first rank the full sample into five groups by the extent to which firm-specific information explains the variation in stock returns and then re-construct long portfolios based on revised

Table 10
The investment value of analysts' revised recommendations by the importance of industry-level information in stock pricing.

Ranked by the importance of industry-level information	Raw Returns (1)	Market-adjusted Returns (2)	Intercept of CAPM (3)	Intercept of three-factor model (4)	Daily covered stocks (5)
Panel A: Portfolio returns					
P1 (least important)	0.0940***	0.0627***	0.0699***	0.0760***	2.65
	(4.99)	(4.04)	(4.45)	(4.66)	
P2	0.1030***	0.0718***	0.0704***	0.0723***	2.73
	(4.74)	(4.74)	(4.47)	(4.38)	
P3	0.0822***	0.0510***	0.0471***	0.0509***	2.77
	(3.53)	(3.16)	(2.82)	(2.88)	
P4	0.1221***	0.0908***	0.0877***	0.0954***	2.78
	(5.35)	(5.75)	(5.36)	(5.59)	
P5 (most important)	0.0998***	0.0686***	0.0625***	0.0589***	2.50
	(4.40)	(4.87)	(4.36)	(3.90)	
P1–P5	−0.0059	−0.0059	0.0074	0.0171	
	$p = 84.3\%$	$p = 78.0\%$	$p = 69.3\%$	$p = 33.3\%$	

Ranked by the importance of industry-level information	Coefficient estimates for the three-factor model			Adj-R^2	N
	RMRF	SMB	HML		
Panel B: Fama-French three-factor model regressions					
P1 (least important)	0.7671***	−0.5360*	−0.1103	35.79	60
	(5.48)	(−1.69)	(−0.21)		
P2	1.0896***	−0.3595	−0.4721	50.82	60
	(7.70)	(−1.12)	(−0.90)		
P3	1.1138***	−0.2471	0.1344	50.63	60
	(7.34)	(−0.72)	(0.24)		
P4	1.0518***	−0.3769	0.5406	52.03	60
	(7.18)	(−1.13)	(0.99)		
P5 (most important)	1.2451***	0.0818	−0.4690	62.01	60
	(9.61)	(0.28)	(−0.98)		

Note: We define the percentage of the variation in firms' stock returns explained by industry-level information as the difference in R^2 between models (3) and (4) during the $T-60$ to $T-1$ period, and classify all firms with revised or initial recommendations on date $T-1$ into one of five groups. For each group, we purchase stocks with an initial recommendation no higher than 2 or upgrade ratings with a new recommendation no higher than 2 to construct portfolios on date T. We estimate portfolio abnormal returns using market-adjusted returns, the intercept of the CAPM and the intercept of the Fama-French three-factor model, respectively. ***, ** and * represent significance at the 1%, 5% and 10% levels, respectively, and t-statistics are presented in parentheses.

recommendations with a frequency of portfolio rebalancing of no more than 7 days. Fig. 1 illustrates the intercept of the Fama-French three-factor model for each portfolio and each frequency of portfolio rebalancing. The figure shows that (1) the analysts' favorable recommendations are valuable, (2) investors react quickly (within three days) to changes in analysts' favorable recommendations and (3) the portfolio returns decrease significantly on portfolios 1–5. These findings support that the short-term investment value of analysts' reports increases as firm-specific information plays a more important role in stock pricing.

Similarly, we rank the full sample into five groups by the extent to which industry-level information explains the variation in stock returns and then re-construct long portfolios based on recommendation changes with a frequency of portfolio rebalancing of no more than 7 days. Fig. 2 illustrates the intercept of the Fama-French three-factor model for each portfolio and each frequency of portfolio rebalancing. The figure shows that there is no monotonic trend in portfolio returns, consistent with the results in Table 10.

Case #3: Sort by the extent to which firm-specific information explains the variation in stock returns and construct portfolios based on consensus recommendations. Table 11 reports the portfolio returns. Specifically, Panel A shows the investment value of favorable recommendations for each portfolio. From portfolios 1 to 5, the importance of firm-specific information in stock pricing decreases. As shown in column 1, the raw returns on portfolios 1–5 are significantly positive at the 1 percent level, but the difference between portfolio 1 and portfolio 5 is not significant. In contrast, regardless of whether abnormal returns are estimated by market-adjusted

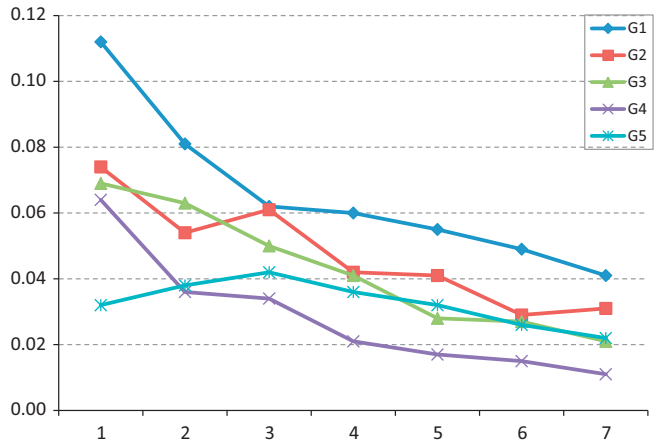

Figure 1. The importance of firm-specific information and the investment value of analysts' revised recommendations by rebalancing frequency.

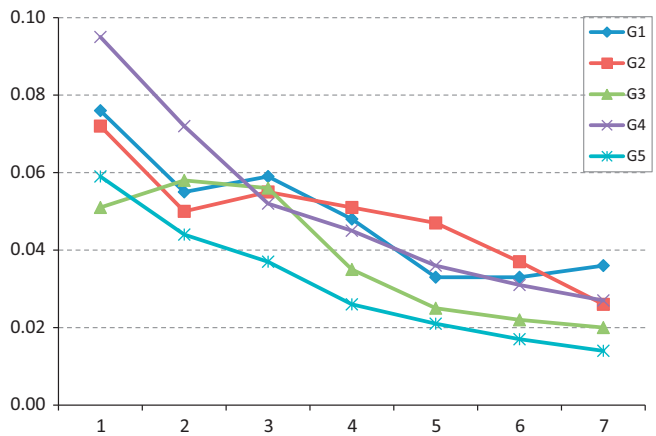

Figure 2. The importance of industry-level information and the investment value of analysts' revised recommendations by rebalancing frequency.

returns, the intercept of the CAPM or the intercept of the Fama-French three-factor model, most of the portfolios (except portfolio 1) abnormal returns are neither statistically nor economically significant. These results suggest that the duration of the investment value is quite short when it comes to favorable recommendations. With a one-month delay, the portfolio abnormal returns are not significantly greater than zero. It should be noted that the slightly positive abnormal returns on portfolio 1 show, to some extent, that the investment value of analysts' recommendations increases as firm-specific information plays a more important role in stock pricing.

Panel B illustrates the investment value of unfavorable recommendations for each portfolio. Most of the portfolio abnormal returns in columns 2–4 are significantly negative and diminish in magnitude as the importance of firm-specific information in explaining the variation in stock returns decreases. Taking the intercept of Fama-French three-factor model as an example, the abnormal returns on portfolios 1–5 are −5.42%, −1.73%, −2.29%, −2.55% and −1.56%, respectively, which are all significant at the 1 percent level except for portfolio 2. In addition, the difference between portfolio 1 and portfolio 5 is 3.86% (with a *p*-value of 0.1%). These results suggest that analysts' unfavorable recommendations are valuable and that the duration of the investment value is much longer than that for favorable recommendations. Also as expected, the investment value of analysts' unfavorable recommendations increases as firm-specific information plays a more important role in stock pricing.

Table 11
The investment value of analysts' consensus recommendations by the importance of firm-specific information in stock pricing.

Ranked by the importance of firm-specific information	Raw Returns (1)	Market-adjusted Returns (2)	Intercept of CAPM (3)	Intercept of three-factor model (4)	Daily covered stocks (5)
Panel A: Long portfolios					
P1 (most important)	0.0406***	0.0093	0.0137**	0.0112*	53.13
	(2.88)	(1.42)	(2.15)	(1.75)	
P2	0.0335**	0.0022	0.0059	0.0046	52.70
	(2.42)	(0.45)	(1.26)	(0.96)	
P3	0.0283**	−0.0030	0.0003	−0.0009	50.48
	(2.03)	(−0.64)	(0.07)	(−0.18)	
P4	0.0380**	0.0067	0.0069	0.0082*	48.17
	(2.46)	(1.59)	(1.56)	(1.79)	
P5 (least important)	0.0318**	0.0005	0.0009	0.0071	43.63
	(1.99)	(0.08)	(0.14)	(1.22)	
P1–P5	0.0088	0.0088	0.0128	0.0095	
	$p = 68.0\%$	$p = 32.7\%$	$p = 10.9\%$	$p = 58.0\%$	
Panel B: Short portfolios					
P1 (most important)	−0.0205	−0.0517***	−0.0472***	−0.0542***	12.69
	(−1.24)	(−4.77)	(−4.29)	(−4.89)	
P2	0.0190	−0.0123	−0.0160	−0.0173*	13.17
	(0.99)	(−1.27)	(−1.62)	(−1.76)	
P3	0.0157	−0.0155**	−0.0185**	−0.0229***	14.89
	(0.87)	(−2.01)	(−2.34)	(−2.82)	
P4	0.0131	−0.0182***	−0.0187***	−0.0255***	16.40
	(0.79)	(−2.76)	(−2.73)	(−4.38)	
P5 (least important)	0.0198	−0.0115*	−0.0123**	−0.0156***	18.93
	(1.21)	(−1.97)	(−2.02)	(−2.94)	
P1–P5	−0.0403*	−0.0403***	−0.0349***	−0.0386***	
	p = 8.6%	p = 0.1%	p = 0.4%	p = 0.1%	
Panel C: Hedge portfolios					
P1 (most important)		0.0610***	0.0609***	0.0654***	
		(4.82)	(4.79)	(5.10)	
P2		0.0145	0.0218**	0.0219**	
		(1.34)	(2.00)	(2.00)	
P3		0.0125	0.0189**	0.0220**	
		(1.39)	(2.07)	(2.34)	
P4		0.0249***	0.0256***	0.0337***	
		(3.18)	(3.14)	(4.55)	
P5 (least important)		0.0120	0.0131	0.0228***	
		(1.42)	(1.50)	(2.88)	
P1–P5		0.0490***	0.0478***	0.0426***	
		$p = 0.1\%$	$p = 0.1\%$	$p = 0.3\%$	

Note: We regress model (4) by firm to calculate the extent to which firm-specific information explains the variation in stock returns during the $T-60$ to $T-1$ period (i.e. $1-R^2$), and classify all firms with consensus recommendations into one of five groups. For each group, we purchase stocks in the portfolio with consensus recommendations no higher than 2 and sell short stocks in the portfolio with consensus recommendations larger than 2.5, while the stocks with consensus recommendations between 2 and 2.5 are excluded (Barber et al., 2001; Loh and Mian, 2006). We estimate portfolio abnormal returns using market-adjusted returns, the intercept of the CAPM and the intercept of the Fama-French three-factor model, respectively. ***, ** and * represent significance at the 1%, 5% and 10% levels, respectively, and *t*-statistics are presented in parentheses.

Panel C presents the hedge returns for each portfolio. The results indicate that, except for portfolio 4, the portfolio hedge returns decrease monotonically as in Panel B. The portfolio hedge returns estimated by market-adjusted returns and the intercepts of the CAPM and Fama-French three-factor model are 4.90%, 4.78% and 4.26%, respectively, and all of them are significant at the 1 percent level. These results further confirm that

Table 12
Fama-French three-factor model regressions based on analysts' consensus recommendations portfolios by the importance of firm-specific information in stock pricing.

Ranked by the importance of firm-specific information	Coefficient estimates for the three-factor model			Adj-R^2	N
	RMRF	SMB	HML		
Panel A: Long portfolios					
P1 (most important)	0.8954***	−0.0267	−0.5065**	82.23	60
	(16.24)	(−0.21)	(−2.47)		
P2	0.9052***	−0.0488	−0.3476**	90.00	60
	(22.32)	(−0.53)	(−2.03)		
P3	0.8992***	0.0222	−0.1685	90.11	60
	(22.10)	(0.24)	(−1.12)		
P4	0.9990***	−0.1388	−0.0727	92.49	60
	(25.42)	(−1.56)	(−0.50)		
P5 (least important)	0.9834***	−0.4873***	0.0374	88.52	60
	(19.61)	(−4.28)	(0.20)		
Panel B: Short portfolios					
P1 (most important)	0.8396***	0.5527**	−0.0121	61.28	60
	(8.82)	(2.56)	(−0.03)		
P2	1.0575***	0.3819**	0.6254**	77.75	60
	(12.52)	(1.99)	(2.00)		
P3	1.0979***	0.3284**	−0.0466	82.82	60
	(15.75)	(2.08)	(−0.18)		
P4	0.9882***	0.6357***	0.2036	89.40	60
	(19.74)	(5.59)	(1.10)		
P5 (least important)	0.9753***	0.4680***	0.4550***	91.03	60
	(21.38)	(4.52)	(2.69)		
Panel C: Hedge portfolios					
P1 (most important)	0.0559	−0.5794**	−0.4944	7.85	120
	(0.51)	(−2.32)	(−1.21)		
P2	−0.1523	−0.4307**	−0.9729***	3.30	120
	(−1.63)	(−2.03)	(−2.80)		
P3	−0.1988**	−0.3062*	−0.1219	1.59	120
	(−2.46)	(−1.67)	(−0.41)		
P4	0.0108	−0.7745***	−0.2762	3.30	120
	(0.17)	(−5.36)	(−1.17)		
P5 (least important)	0.0081	−0.9553***	−0.4176*	3.75	120
	(0.12)	(−6.21)	(−1.66)		

Note: Following Fama (1998), we define *RMRF* as value-weighted market returns minus the risk-free rate; *SMB* as the difference between the daily returns of a value-weighted portfolio of small stocks and one of large stocks; and *HML* as the difference between the daily returns of a value-weighted portfolio of high book-to-market stocks and one of low book-to-market stocks. ***, ** and * represent significance at the 1%, 5% and 10% levels, respectively, and *t*-statistics are presented in parentheses.

the greater the importance of firm-specific information in stock pricing, the greater the investment value of analysts' research reports.

Table 12 reports the estimated coefficients for the Fama-French three-factor model. The significant coefficients on *SMB* indicate that unfavorable recommendations are associated with larger firm size than favorable recommendations, while the coefficients on *RMRF* and *HML* suggest that there are no significant differences in the market risk and book-to-market ratios between the two types of recommendations.

Case #4: Sort by the extent to which industry-level information explains the variation in stock returns and construct portfolios based on consensus recommendations. Table 13 reports the portfolio returns. Panel A shows that the abnormal returns for portfolios formed on the basis of analysts' favorable recommendations are neither statistically nor economically significant. Panel B shows that although analysts' unfavorable recommendations are valuable, there is no monotonic trend in portfolio returns across portfolios 1–5, especially portfolio 5 in which industry-level information plays the most important role in stock pricing and which

Table 13
The investment value of analysts' consensus recommendations by the importance of industry-level information in stock pricing.

Ranked by the importance of industry-level information	Raw Returns (1)	Market-adjusted Returns (2)	Intercept of CAPM (3)	Intercept of three-factor model (4)	Daily covered stocks (5)
Panel A: Long portfolios					
P1 (least important)	0.0320**	0.0007	0.0030	0.0046	53.19
	(2.18)	(0.14)	(0.56)	(0.95)	
P2	0.0310**	−0.0002	0.0033	0.0070	52.22
	(2.22)	(−0.04)	(0.67)	(1.49)	
P3	0.0330**	0.0018	0.0026	0.0027	50.49
	(2.19)	(0.43)	(0.61)	(0.60)	
P4	0.0386***	0.0073	0.0090*	0.0097**	48.69
	(2.61)	(1.65)	(1.97)	(2.02)	
P5 (most important)	0.0332**	0.0019	0.0018	0.0005	43.52
	(2.04)	(0.30)	(0.27)	(0.08)	
P1–P5	−0.0012	−0.0012	0.0012	0.0041	
	$p = 95.7\%$	$p = 88.5\%$	$p = 88.0\%$	$p = 62.7\%$	
Panel B: Short portfolios					
P1 (least important)	0.0001	−0.0311***	−0.0320***	−0.0335***	12.18
	(0.01)	(−3.52)	(−3.49)	(−3.45)	
P2	0.0065	−0.0248***	−0.0272***	−0.0302***	13.22
	(0.37)	(−3.42)	(−3.64)	(−4.00)	
P3	0.0199	−0.0114	−0.0121	−0.0194**	14.71
	(1.14)	(−1.34)	(−1.37)	(−2.35)	
P4	0.0125	−0.0188***	−0.0200***	−0.0256***	16.33
	(0.75)	(−3.05)	(−3.14)	(−4.46)	
P5 (most important)	0.0212	−0.0101*	−0.0098	−0.0149***	19.64
	(1.33)	(−1.73)	(−1.62)	(−2.86)	
P1–P5	−0.0210	−0.0210**	−0.0222**	−0.0186*	
	p = 37.8%	p = 4.9%	p = 3.8%	p = 6.7%	
Panel C: Hedge portfolios					
P1 (least important)		0.0319***	0.0350***	0.0381***	
		(3.11)	(3.31)	(3.51)	
P2		0.0246***	0.0305***	0.0372***	
		(2.77)	(3.40)	(4.18)	
P3		0.0132	0.0147	0.0221**	
		(1.40)	(1.50)	(2.35)	
P4		0.0261***	0.0290***	0.0354***	
		(3.44)	(3.70)	(4.72)	
P5 (most important)		0.0120	0.0116	0.0154*	
		(1.40)	(1.29)	(1.78)	
P1–P5		0.0199	0.0234*	0.0227*	
		$p = 13.6\%$	$p = 7.8\%$	$p = 8.5\%$	

Note: We define the percentage of the variation in firms' stock returns explained by industry-level information as the difference in R^2 between models (3) and (4) during the $T-60$ to $T-1$ period, and classify all firms with consensus recommendations into one of five groups. For each group, we purchase stocks in the portfolio with consensus recommendations no higher than 2, and sell short stocks in the portfolio with consensus recommendations higher than 2.5, while the stocks with consensus recommendations between 2 and 2.5 are excluded (Barber et al., 2001; Loh and Mian, 2006). We estimate portfolio abnormal returns using market-adjusted returns, the intercept of the CAPM and the intercept of Fama-French three-factor model, respectively. ***, ** and * represent significance at the 1%, 5% and 10% levels, respectively, and *t*-statistics are presented in parentheses.

obtains the lowest abnormal returns. Overall, the findings suggest that the investment value of research reports is unrelated to the importance of industry-level information in stock pricing.

Table 14 reports the estimated coefficients for the Fama-French three-factor model. The coefficients on *RMRF*, *SMB* and *HML* indicate that both the market risk and book-to-market ratios show no significant

Table 14
Fama-French three-factor model regressions based on analysts' consensus recommendations portfolios by the importance of industry-level information in stock pricing.

Ranked by the importance of industry-level information	Coefficient estimates for the three-factor model			Adj-R^2	N
	RMRF	SMB	HML		
Panel A: Long portfolios					
P1 (least important)	0.9621***	−0.3204***	−0.4227***	90.60	60
	(23.03)	(−3.38)	(−2.73)		
P2	0.8897***	−0.3470***	−0.1137	90.39	60
	(22.12)	(−3.80)	(−0.76)		
P3	0.9871***	−0.0941	−0.2028	92.56	60
	(25.85)	(−1.09)	(−1.43)		
P4	0.9295***	−0.0154	0.1053	90.93	60
	(22.54)	(−0.16)	(0.69)		
P5 (most important)	0.9829***	0.1685	0.1571	84.67	60
	(84.67)	(1.26)	(0.72)		
Panel B: Short portfolios					
P1 (least important)	1.0161***	0.1482	0.0740	74.31	60
	(12.20)	(0.78)	(0.24)		
P2	1.0504***	0.3420**	0.2322	84.38	60
	(16.22)	(2.33)	(0.97)		
P3	1.0007***	0.6483***	0.1394	80.85	60
	(14.09)	(4.02)	(0.53)		
P4	1.0167***	0.5233***	0.1694	89.90	60
	(20.60)	(4.67)	(0.92)		
P5 (most important)	0.9522***	0.5370***	0.3026*	90.85	60
	(21.33)	(5.30)	(1.83)		
Panel C: Hedge portfolios					
P1 (least important)	−0.0540	−0.4686**	−0.4967	2.90	120
	(−0.58)	(−2.22)	(−1.44)		
P2	−0.1607**	−0.6890***	−0.3459	3.77	120
	(−2.11)	(−3.98)	(−1.22)		
P3	−0.0137	−0.7423***	−0.3422	2.41	120
	(−0.17)	(−4.06)	(−1.14)		
P4	−0.0872	−0.5386***	−0.0641	2.46	120
	(−1.36)	(−3.69)	(−0.27)		
P5 (most important)	0.0307	−0.3685**	−0.1455	0.76	120
	(0.41)	(−2.19)	(−0.53)		

Note: Following Fama (1998), we define *RMRF* as value-weighted market returns minus the risk-free rate; *SMB* as the difference between the daily returns of a value-weighted portfolio of small stocks and one of large stocks; and *HML* as the difference between the daily returns of a value-weighted portfolio of high book-to-market stocks and one of low book-to-market stocks. ***, ** and * represent significance at the 1%, 5% and 10% levels, respectively, and *t*-statistics are presented in parentheses.

difference between long and short portfolios, while firm size is larger for short portfolios, consistent with the findings in Table 12.

As a further robustness test, we examine the abnormal returns for portfolios formed on the basis of analysts' consensus recommendations during the $T-90$ to $T-1$ period (i.e. $X=90$) and the $T-180$ to $T-1$ period (i.e. $X=180$), respectively. The results are consistent.

Overall, the empirical results in Section 4.4 show that (1) analysts' recommendations are valuable; (2) the investment value of recommendations increases as firm-specific information becomes more important in stock pricing, while there is no significant relationship between the investment value of recommendations and the importance of industry-level information; (3) the duration of the investment value is quite short (usually a couple of days) when it comes to favorable recommendations; and (4) the duration of the investment value is much longer (usually several months) when it comes to unfavorable recommendations, which may be due to short-sale constraints and analyst optimism.

In summary, we can conclude that (1) Chinese security analysts are better at analyzing and transferring firm-specific information than industry-level information. On the one hand, analysts' research reports increase the ability of firm-specific information to explain the variation in stock returns, while on the other hand, covering more firms in the same industry does not help analysts incorporate industry-level information into their research reports and thus improve the investment value of their recommendations. (2) As expected, the investment value of analysts' recommendations increases as firm-specific information becomes more important in stock pricing, which confirms the analysts' superiority.

5. Conclusion and limitations

5.1. Conclusion and implications

With the development of the Chinese capital market, the securities analyst industry is growing rapidly. Whether analysts' activities help to decrease information asymmetry and thus improve the efficiency of resource allocation in the capital market has caused great concern among academics and practitioners. However, the findings in the literature are controversial. Our study explores this debate and provides a new form of evidence.

Using data on 192,012 recommendations issued by Chinese security analysts from 2005 to 2010, we find that on the whole, analysts are better at analyzing and transferring firm-specific than industry-level information. Specifically, ceteris paribus, analysts' research reports increase the ability of firm-specific information to explain the variation in stock returns. Furthermore, covering more firms in the same industry does not help analysts to incorporate industry-level information into their research reports and thus improve the investment value of their recommendations. The investment value of analysts' recommendations increases as firm-specific information plays a more important role in stock pricing, which also confirms that analysts are good at analyzing and transferring firm-specific information. Our empirical results suggest that security analysts play an important role in alleviating the information asymmetry in the capital market and that their research reports can guide investors. Our findings also show that the investment value of analysts' recommendations is mainly derived from their research activities of analyzing and transferring firm-specific rather than industry-level information.

The results of this study also generate some important implications. First, the securities analyst industry should further enhance its ability to process industry-level information, so that it may play a more important role in alleviating the information asymmetry arising from industry-level information. Second, listed companies should further improve their information disclosure environment. Our findings suggest that the investment value of analysts' research reports increases as firm-specific information becomes more important in stock pricing, which means that firm-specific information is not well understood by investors, thus resulting in the demand for information from intermediaries. Once the information environment of listed companies improves at the institutional level, a huge amount of transaction costs will be saved.

5.2. Limitations

First, our study shows that security analysts' superiority lies in analyzing and transferring firm-specific information, which ignores the fact that some analysts are good at processing industry-level information. Unfortunately, this paper does not distinguish between analysts who are good at processing industry-level and firm-specific information.

Second, the descriptive statistics in Section 4 show that security analysts tend to be optimistic. Although we follow Loh and Mian's (2006) method to construct our portfolios, it is still possible that the reliability of our conclusions is affected by analyst optimism.[4] Therefore, readers should be aware that some limitations exist in the reliability of our conclusions. We look forward to more academic research based on mature data in the future.

[4] We thank the referee for pointing this out.

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