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Ownership structure and analysts' forecast properties: a study of Chinese listed firms

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Abstract

Purpose – *The purpose of this paper is to investigate the association between ownership structure and the properties of analysts' forecasts in China's unique corporate setting.*

Design/methodology/approach – *Multiple regression models were used to examine the influence of ownership structure mechanisms on analysts' forecast properties for listed Chinese firms during the period 2008-2012.*

Findings – *The paper finds that analysts' forecast accuracy is higher for listed firms with high levels of foreign ownership and managerial ownership. However, the complex pyramidal ownership structure could make corporate information less transparent and then increase the complexity of forecasting; hence, it results in less precise analysts' forecasts. Interestingly, the relationship between state ownership and analysts' forecast properties appears to be non-linear (an inverted U-shape), and the inflection point at which the relationship becomes negative occurs at state ownership over 45 per cent.*

Originality/value – *To the best of the author's knowledge, this paper is the first to investigate the influence of ownership structure mechanisms on the properties of analysts' forecasts in an emerging market, and the findings provide some insight on how the properties of analysts' forecast might be shaped by certain ownership and control features in the context of concentrated state ownership and complex pyramidal ownership structure.*

Keywords *Corporate governance, Corporate ownership, Information*

Paper type *Research paper*

1. Introduction

The question of the determinants of analyst forecast properties, such as forecast accuracy and dispersion, has received a great deal of attention in the accounting and finance literature. Most prior studies have focused on the factors relating to analysts' compensation and expertise/reputation, analysts' commission income, analysts following, forecast horizon, earnings volatility, firm size and growth opportunity (Francis and Philbrick, 1993; Lang and Lundholm, 1996; Brown, 2001; Duru and Reeb, 2002; Gu and Wu, 2003; Karamanou and Vafeas, 2005; Cowen *et al.*, 2006; Ali *et al.*, 2007; Jacob *et al.*, 2008; Barniv, 2009, Firth *et al.*, 2013; Xu *et al.*, 2013). However, the association between ownership structure mechanisms and analysts' forecast properties, especially in emerging markets, remains understudied.

China is an interesting case because of its unique institutional environment. For example, Chinese listed firms typically have a more complex ownership structure than the firms in the West, and a considerable amount of listed firms' shares is held by the government. As the controlling shareholder, the government has appointed the majority of senior managers of state-owned enterprises (SOEs). Also, unlike Western enterprises widely using equity incentives to align the interest of managers and shareholders, listed Chinese firms design the managerial remuneration contracts mainly on the basis of accounting performance measures, such as sales and/or profits, rather than stock performance (Groves *et al.*, 1994). Consequently, managers have neither looked to the stock price as an indicator of the firm's

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performance nor shown any interests in establishing effective communication channels with investors. Worse, if the firm's performance is poor, then managers are tempted to suppress unfavourable information and to cook the accounting books to secure their emoluments, but at the expense of shareholders' interests (Liu and Lu, 2007; Yang *et al.*, 2012). The China Securities Regulatory Commission (CSRC), therefore, issued the *Trail Measures for the Administration of Equity Incentive Plan of Listed Companies* in December 2005 with the aim of increasing the level of managerial ownership in listed firms and then bringing the interests of managers and shareholders into line. However, reforms in the economical and political systems, which could lead to decentralised decision-making authorities and to reduced concentrated state ownership, have largely lagged behind, because of the government concerns about losing control over large listed firms and the safety of state assets.

There is much evidence that corporate disclosure is strongly influenced by institutional environment, including corporate ownership and control characteristics (Ball, 2001; Ball *et al.*, 2003; Eng and Mak, 2003; Leuz *et al.*, 2003; Dobler, 2008; Cormier *et al.*, 2010; Zechman, 2010; Heitzman *et al.*, 2010; Hermalin and Weisbach, 2012). Also, corporate disclosure quality could be reflected in the properties of analysts' forecasts, because corporate disclosure is one of the primary information sources for financial analysts who play an important role in facilitating information transparency in capital markets (Lang and Lundholm, 1996; Brown *et al.*, 2011). For example, financial analysts act as information intermediaries to generate valuable information, such as earnings forecasts and stock recommendations, which are vital for investment decision-making. In addition, analysts can engage in private information production to uncover any manager's misuse of firm resources (Healy and Palepu, 2001). Early developed market studies demonstrate that analysts' forecast error and bias are associated with corporate governance features, such as ownership and control, because corporate governance quality can shape the informativeness of a firm's corporate disclosure, and corporate transparency can reduce uncertainty surrounding the firm's future performance (Bhat *et al.*, 2006; Byard *et al.*, 2006; Ali *et al.*, 2007; Haw *et al.*, 2010; Brown *et al.*, 2011; García-Meca and Sánchez-Ballesta, 2011). Given China's unique corporate setting, this paper extends the above stream of research by investigating the association between ownership structure mechanisms and analysts' forecast properties for Chinese listed firms.

Using a sample of 1,384 firm-year observations during the period 2008-2012, this study finds that analysts' forecast accuracy is positively related to the level of foreign ownership, indicating that the demand for greater corporate information transparency by foreign investors can reduce forecasting complexity and, hence, result in more precise analysts' forecasts (Barniv, 2009). Also, there is a positive association between managerial ownership and analysts' forecast accuracy; this finding is in line with the incentive alignment hypothesis (Jensen and Meckling, 1976; Nasir and Abdullah, 2004; Bhat *et al.*, 2006) which states that managerial ownership can be an effective means to align the interests of managers and shareholders and, then, mitigate information asymmetry. However, analysts' forecast accuracy is lower for firms with more complex pyramidal ownership structure, supporting the view that with the increase of pyramidal layers, managers are more likely to act in self-interest and less likely to disclose corporate information in a timely and objective manner (Aghion and Tirole, 1997; Baker *et al.*, 1999, Fan and Wong, 2002). Interestingly, this study finds that the association between state ownership and forecast accuracy is likely to be non-linear (an inverted U-shape). Initially, the relationship is positive when the level of state ownership is lower than 45 per cent (the inflection point). However, this relationship becomes negative when the state owns more than 45 per cent of the listed firms' equity. Furthermore, it appears that institutional ownership does not have any significant influence on analysts' forecast accuracy, and analysts' forecast dispersion is not associated with most ownership structure variables, including pyramidal structure, foreign ownership, managerial ownership and institutional ownership, at any significance levels.

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This study contributes to the accounting and finance literature in the following aspects. First, it reconciles and expands the ongoing research on the determinants of the properties of analysts' forecasts (Ackert and Athanassakos, 2003; Byard *et al.*, 2006; Barniv, 2009; Haw *et al.*, 2010; García-Meca and Sánchez-Ballesta, 2011; Cormier and Magnan, 2014), and provides new evidence of a non-linear relationship between state ownership and analysts' forecast properties. Also, this study examines the impact of complex pyramidal ownership structure on the corporate information environment, as reflected in analysts' forecast properties. It therefore adds to the understanding of the determinants of analysts' forecast properties in China's unique corporate setting, which is characterised by concentrated state ownership and complex ownership structure. Moreover, given that financial analysts act as information intermediaries by generating earnings forecasts and stock recommendations that considerably affect investment decision-making, this study offers investors and policymakers some insight on how analysts' forecasts might be shaped by corporate ownership and control characteristics.

The remainder of this study is organised as follows. The next section provides an overview of the developments in China's corporate governance system. Section 3 reviews earlier literature on analysts' forecast properties and ownership structure, and develops the hypothesis. The sample selection and research methodology are presented in Section 4, and Section 5 reports the empirical findings and analysis. The final section summarises and concludes the study.

2. China's corporate governance system

In accordance with the economic liberalisation and reform policy introduced by the Chinese government in the late 1970s, the Shanghai and Shenzhen Stock Exchanges were established in early 1990s, aiming to modernise ailing SOEs. Therefore, many Chinese listed firms were created by carving out a part of the assets of SOEs for listing, while the rest of assets were left in unlisted parent firms. After the listing, the unlisted parent firm and listed subsidiary continue to trade with each other as a group, and the corporate structure of such groups normally has multiple layers and many firms in each layer (Piotroski and Wong, 2013). In this way, the government can still maintain its control over "large and crucial" listed firms. However, such complex ownership structure can result in conflicts of interest between the controlling shareholder (the state and its agencies) and outsider investors (Su *et al.*, 2008). Moreover, although La Porta *et al.* (2008) classify China's legal system as being of German-civil-law origin, a unique feature of China's legal tradition is that the judicial system is not independent from the government's administrative system, and politics and adjudication are often mixed (Chen, 2003). Indeed, private property rights were recognised by China's legislative system for the first time in March 2004 during the second session of the *10th National People's Congress Meeting*. However, the definition and explanation of private property rights within listed Chinese firms remain "fuzzy", and the violation of private property rights by the government, especially at the local government level, remains relatively common (Sanders and Chen, 2005; Deng, 2009).

Given concentrated state ownership, unclear laws governing private property rights and a lack of judicial independence, China's political institutional norm is in favour of protecting state interests instead of the rights of individuals. Corporate managers and auditors, therefore, have few incentives to actively communicate with minority or individual investors. Also, listed firms may not be expected to strictly comply with mandated disclosure requirements because litigation risks are generally low, with managers and auditors receiving only a verbal warning from the CSRC (Chen, 2003).

In line with the government's economic policy, new corporate governance rules were also introduced, initially through the *State-owned Industrial Enterprises Law of China* (SOEs Law) in 1988. As Tam (2000, p. 53) documented, this development "has taken a top-down legalistic approach by transplanting the basic structures of corporate governance from the external market based model found in Anglo-American systems"[1]. However, while the

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corporate governance rules have been introduced, the system of related laws and regulations that ensure the efficiency of the corporate governance model have not been effective, and the government focuses rather less on how the corporate governance concepts and practices are interpreted and applied in the Chinese social, economic and legal context (Li, 2008). For example, there is a need for an impartial judicial system which effectively protects the interests not only of controlling shareholders, but also of minority shareholders as well as active markets for corporate control and managerial talents (La Porta *et al.*, 1998). As such, the Chinese corporate governance system, despite importing "the best practices" from the West, does not work in their proposed ways. Particularly, the government's roles of both controlling shareholder and administrator trigger serious conflicts of interest, as other shareholders are concerned that the government may take political objectives as the top priority over the corporation's commercial interests, and then potentially misuse its controlling shareholder position to expropriate the minority shareholders' interests (Su *et al.*, 2008). Therefore, the CSRC issued the *Code of Corporate Governance of Listed Firms* in January 2001, and revised it in October 2005. The Code was especially designed to protect minority shareholders' interests by requiring the controlling shareholder(s) not to act in a detrimental way to other shareholders' legal rights and interests, such as by taking advantage of their position to adversely restructure the listed firm's assets. Furthermore, unlike Western enterprises which widely use equity incentives to bring the management's and shareholders' interests into line, for most Chinese listed firms, managers' compensation are more closely linked to accounting results, such as sales or profits, instead of stock price (Groves *et al.*, 1994). Consequently, managers are tempted to engage in opportunist earnings and disclosure management to secure their own performance-related pay, but at the expense of shareholders' interests (Su *et al.*, 2008). The government, therefore, issued a series of polices on the implementation of equity incentive plans for listed firms during the period 2005-2008, expecting that with the increase of managerial ownership, the interests of managers and shareholders could be effectively aligned.

3. Literature review and hypotheses developments

The separation of ownership and control is arguably the most distinguished feature of modern business corporations. In such corporate settings, the principal (owner) engages the agent (manager) to perform services on behalf of the principal who involves the delegation of some decision-making authority to the agent. Once the contractual relationship is established, the agent obtains information on the environment that will determine which effort level is the most adequate (Jensen and Meckling, 1976). However, the agent's effort is either difficult to observe or, even if it is observable, it is difficult for the principal to know whether it is optimal. Because of information asymmetry, the agent may act in his/her own best interests, rather than those of the principal. This can cause the problem known as "moral hazard with hidden information" (Macho-Stadler *et al.*, 2001). The principal, therefore, establishes various monitoring and control mechanisms, such as corporate governance, to mitigate the information asymmetry problem.

As one of the most important corporate governance mechanisms, ownership structure is likely to influence corporate information disclosure in a number of ways. For example, given dispersed ownership structures, such as those in US and UK firms, there is a high demand for public disclosure of high-quality corporate information for the purpose of monitoring the management (Pratt and Storrar 1997). In contrast, German and French firms typically have a concentrated ownership structure, and controlling shareholders (blockholders) rely on insider monitoring mechanisms to obtain corporate information. Corporate reporting and disclosure, therefore, appears to be less in demand in those countries (Archambault and Archambault, 2003; La Porta *et al.*, 1998). Moreover, Fan and Wong (2002) demonstrate that concentrated ownership and the associated pyramidal structure create agency conflicts, and then, blockholders suppress corporate information disclosure. Indeed, the agency conflicts inherent in ownership structure could significantly affect firm insider's

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reporting incentives and corporate disclosure practices, which, in turn, shape the formation of analysts' forecasts (Haw *et al.*, 2010; Cormier and Magnan, 2014).

Chinese listed firms typically have a complex ownership structure, with shares being of four types:

1. non-tradable state shares;
2. legal-person or legal-institution shares, which are held by other SOEs and tradable with approval of the CSRC or the government;
3. domestic individual or A-shares held by private Chinese citizens; and
4. employee shares, which are non-tradable until the firm allows them to be traded.

In addition, some firms also have foreign shares, whether B-shares (listed on Shanghai and Shenzhen Stock Exchanges, that is, SHSE and SZSE, respectively), H-shares and Red-Chips (listed on the Hong Kong Stock Exchange, HKSE), L-shares (listed on the London Stock Exchange, LSE) or N-shares (listed on the New York Stock Exchange, NYSE).

3.1 State ownership

Many Chinese listed firms were initially state-owned, and the state still has a strategy of control of "large and crucial" companies and industries. Thus, approximately 30 per cent of listed firms' shares are directly held by the government, 30 per cent by legal persons and 30 per cent by the general public (SHSE Statistical Yearbook, 2008). The concentrated state ownership pattern may impede the development of high-quality corporate disclosure because the government and its agencies are blockholders who have easy access to private information, and are then less likely to require high-quality corporate disclosure (Firth *et al.*, 2007; Armstrong *et al.*, 2010). Therefore, the preponderance of state ownership will result in less effective management monitoring and internal control, which is also likely to negatively affect corporate disclosure[2]. Less informative corporate disclosure will increase the complexity of forecasting and, hence, result in less precise and/or more dispersed analysts' forecasts. Indeed, Lang *et al.* (2004) find that analysts are less likely to follow firms with concentrated control, especially in countries with weak investor protection. However, some researchers argue that blockholders could be effective monitors of a firm's activities, because blockholders frequently retain the ability to intervene in the firm's strategic decisions, and then, they have incentives to ensure an information environment sufficiently transparent so as to remain well informed about the firm's activities (Klein, 2002; Borokhowich *et al.*, 2006; Tian and Estrin, 2008). As a result, improved corporate disclosure helps financial analysts to reduce forecast errors. In line with this view, Ajinkya *et al.* (2005) and Karamanou and Vafeas (2005) document that concentrated ownership is associated with more frequent voluntary earnings forecasts and more accurate forecasts. In addition, Wang *et al.* (2008) report a positive association between state ownership and voluntary disclosure by Chinese listed firms.

Although early literature provides the two competing views, the association between state ownership on analysts' forecast properties appears to be determined by whether the state has incentives for promoting high-quality corporate disclosure. For example, if the level of state ownership is relatively low, then the state may only have limited influence on a listed firm. Therefore, unlike insiders, the state may not be able to directly access private corporate information, and it would require the timely and objective corporate disclosure by listed firms to ensure the safety of state assets. Indeed, Tian and Estrin (2008) document that concentrated state ownership might be more effective than dispersed internal ownership structure in reducing agency costs and enhancing monitoring and control mechanisms, especially when legal enforcement is weak. Also, the state may have an incentive to develop a good reputation for information transparency to attract foreign investments (Wang *et al.*, 2008). As a result, more transparent corporate disclosure can

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improve forecast accuracy and reduce forecast dispersion. However, under concentrated state ownership, the state becomes an insider who can directly obtain corporate information through private channels. It therefore has fewer incentives to promote effective monitoring and control and high levels of corporate disclosure, resulting in a greater complexity of analyst forecasting (Armstrong *et al.*, 2010; Firth *et al.*, 2007). As such, the impact of state ownership on analysts' forecast properties may depend on whether the state becomes the insider of the listed firms, and the relationship between state ownership and analysts' forecast properties could be non-linear. It is expected that:

H1a. There is an inverted U-shaped relationship between analysts' forecast accuracy and the level of state ownership.

H1b. There is a U-shaped relationship between analysts' forecast dispersion and the level of state ownership.

3.2 Pyramidal ownership structure

Apart from directly holding a large fraction of shares, the government also indirectly controls many listed firms by pyramidal ownership structure. The State-owned Assets Supervision and Administration Commission (SASAC), a central government agency, was established in 1999, followed by a series of State-owned Asset Management Companies (SOAMCs). SOAMCs were founded under the local governments and the SASAC to divest state ownership stakes in publicly traded firms; state-owned shares were removed from the "state share" to the "institutional shares" category, placing those shares in SOAMCs and, thus, under the control of the SOAMCs. Given that the SOAMCs are usually owned by central and local government administrative offices, transferring the "state share" to the "institutional shares" category actually masks continued state ownership over publicly listed firms through such pyramidal ownership structure (Wang *et al.*, 2011).

Some researchers argue that the use of a pyramidal ownership structure has certain benefits. For example, it allows the government or governmental agency to delegate decision-making authority to managers without giving up its control over listed SOEs. As a result, political costs deriving from government interference in listed firm's operations, such as excessive taxations and other political burdens on the SOEs, would be mitigated, and managers are likely to induce high-power incentives and improve productivity (Qian, 1996; Fan *et al.*, 2007; Lin and Lin, 2008; Wang *et al.*, 2011). However, empowered managers may act in their own self-interests at the expense of shareholders, such as expropriation of substantial gains from listed firms, especially if there is no effective monitoring and control system in place (Aghion and Tirole, 1997). As such, whether to delegate authority depends on the extent of information barriers between the principal and the agent and the cost of information gathering, interpretation and dissemination (Cremer, 1995; Aghion and Tirole, 1997; Prat, 2005). Given that the government and its agencies typically have insufficient expertise and limited information on business decision-making, the delegation of some decision rights to managers through a pyramidal ownership structure could increase managers' initiative. Indeed, Fan *et al.* (2012) provide evidence that a pyramidal ownership structure plays a positive role in strengthening legal or market discipline on managers of Chinese listed firms, and there is a significant positive correlation between the number of pyramidal layers and the extent of firm managerial professionalism, total factor productivity and profitability. However, more pyramidal layers in an ownership structure could exacerbate agency problems and, then, make corporate information less transparent, as information at the bottom of the pyramid typically travels through multiple layers to reach the top, and managers in intermediate layers, constrained by their own self-interests, may not disclose corporate information to top management in a timely and objective manner (Aghion and Tirole, 1997; Baker *et al.*, 1999). The view that controlling owners of East Asia firms typically use stock pyramids to leverage their control, resulting in less informativeness of accounting earnings, is empirically supported by Fan and Wong (2002). Given that

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ineffective information dissemination would increase forecast complexity, resulting in less precise and more dispersed analysts' forecasts, it is predicted that:

H2. The fewer the layers in listed firms' pyramidal structures, the higher (lower) the analysts' forecast accuracy (dispersion).

3.3 Institutional ownership

Institutional investors play a very influential role in corporate governance in developed markets. Jensen (1993, p. 867) argues that institutions are "active investors which are important to a well-functioning governance system because they have the financial interest and independence to view firm management and policies in an unbiased way". Consequently, institutional investors require timely and reliable information which allows them to better monitor the firm's activities and to participate in business-strategy making (Jensen, 1993; Demsetz and Lehn, 1985; Bushman *et al.*, 2004). The presence of institutional investors can lead to an increase in corporate transparency, which, in turn, attracts analysts following on a firm's performance and reduces forecast errors (Healy *et al.*, 1999; Bushee and Noe, 2000). Consistent with this opinion, Bhushan (1989) and Ackert and Athanassakos (2003) demonstrate that more analysts follow firms with a high level of institutional shareholdings.

In China's case, as the two A-share markets were established in the 1990s, various financial institutions, including investment banks, securities firms and insurance companies, have experienced rapid growth and have become major players in Chinese stock markets. For example, the number of securities firms increased from 44 at the end of 1990 to 140 by 2001, and most of them focused on stock underwriting and trading (Song, 2003). However, unlike institutional investors in developed nations, many Chinese financial institutions lack long-term investment strategies, and most of their trading activities are highly speculative. Heilmann (2002) documents that Chinese financial institutions find that they have to take considerable policy and legal risks, if they hold shares of listed firms in the long term. Because the government's policies on stock markets, especially in economic downturns, are largely based on the aim of producing a desired share price movement, which engenders a lack of continuity and stability. In such a policy-driven market environment, Chinese institutional investors view stock price movements as something that are highly uncertain and out of their control (Lin *et al.*, 2006). As such, many of them use aggressive trading strategies to pursue short-term price gains, rather than acting like long-term investors who have incentives to improve the corporate information environment. Indeed, Liu *et al.* (2013) report a negative association between institutional ownership and voluntary disclosure by listed Chinese firms. In line with the views of previous Chinese stock market literature (Heilmann, 2002; Lin *et al.*, 2006; Liu *et al.*, 2013), this study expects that higher institutional ownership in Chinese listed firms would have a negative impact on corporate transparency, as reflected in the properties of analysts' forecasts. This leads to the following hypothesis:

H3. The higher the level of institutional ownership, the lower (higher) the analysts' forecast accuracy (dispersion).

3.4 Foreign ownership

Since the 1980s, foreign multi-national companies have invested heavily in China's manufacturing sector by establishing joint-venture enterprises with domestic firms. However, because of the unfamiliar social environment and the lack of local connections and networks, foreign shareholders are likely to face high levels of information asymmetry (Wang *et al.*, 2008). Therefore, foreign investors are more likely to invest in Chinese firms that are already well governed and that produce high-quality corporate information. Indeed, Bai *et al.* (2004) find that Chinese listed firms that issued foreign shares were likely to have a higher market value. Furthermore, to alleviate high levels of information asymmetry for foreign investors, the CSRC requires joint-venture enterprises to adopt a

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"dual reporting strategy", in which an annual report must be prepared in line with both Chinese accounting standards (CAS) and international accounting standards (IAS/IFRS). Furthermore, these foreign-invested enterprises must hire foreign CPA firms (normally Big Four) to audit their annual reports. It is widely accepted that IAS accounting regulations are superior to the CAS, implying that the reconciliation and dual reporting mechanism could improve the reliability of corporate information. Therefore, foreign-invested enterprises have to abide by these additional reporting and auditing requirements and to disclose more corporate information. As a result, analysts' forecast for foreign-invested enterprises would be more accurate and/or less biased. Consistent with this review, Barniv (2009) documents that analysts' forecast efforts and expertise increase with the level of foreign ownership in Chinese listed firms. This leads to the fourth hypothesis:

H4. The higher the level of foreign ownership, the higher (lower) the analysts' forecast accuracy (dispersion).

3.5 Managerial ownership

Jensen and Meckling (1976) document that managerial ownership can help to mitigate the agency costs by aligning the interests of managers and shareholders. With the increase of managerial ownership, managers would bear more of the economic consequences of their actions, such as squandering shareholders/corporate wealth. Also, when the interests of managers and shareholders are effectively aligned, managers are less likely to withhold their private information and engage in earnings and disclosure management. Nasir and Abdullah (2004) support this view by documenting that a high level of managerial ownership leads to improved voluntary disclosure in Malaysia. More informative corporate disclosure can reduce the complexity of forecasting and, hence, improve the accuracy of analysts' forecasts (Bhat *et al.*, 2006). However, another stream of studies argues that excessive managerial ownership can be counterproductive, because high levels of managerial ownership can allow managers to entrench their positions and then to indulge their preferences for non-value-maximising behaviours. As such, managers are more likely to engage in opportunistic earnings and disclosure management to conceal their expropriation of other shareholders' interests (Shleifer and Vishny, 1989). Such opportunistic behaviours contribute to an increase in analysts' forecast complexity, which could be associated with less forecast accuracy and high forecast bias (Aboody and Kaznik, 2000; Cheng and Warfield, 2005; Bergstresser and Philippon, 2006; Kanagaretnam *et al.*, 2012). Moreover, although there are two competing views on the association between managerial ownership and earnings management/corporate disclosure quality, García-Meca and Sánchez-Ballesta (2011) report that there is no significant influence of managerial ownership on analysts' forecast accuracy for Spanish firms.

In China, managerial ownership falls into the category of employee shares, and the overall level of managerial ownership in listed Chinese firms is relatively low. For example, since 1993, a Chinese firm was only allowed to allocate up to 2.5 per cent of its total outstanding shares to its employees when going public, and managers would not be granted the company's shares in any other way, although they could purchase shares from the stock market using their personal funds (Wei *et al.*, 2005; Hu and Zhou, 2008). Also, unlike Western enterprises which widely use equity incentives to bring the management's and shareholders' interests into line, for most Chinese listed firms, managerial compensations are more closely linked to accounting results, such as sales or profits, instead of stock price (Groves *et al.*, 1994). Consequently, managers are tempted to engage in opportunist earnings and disclosure management to secure their own performance-related pay, but at the expense of shareholders' interests (Su *et al.*, 2008). To alleviate managers' opportunistic behaviours, the government has recently promulgated a series of policies to increase managerial ownership in Chinese listed firms. For example, the CSRC issued the *Trail Measures for the Administration of Equity Incentive Plans of Listed Firms* in December 2005, and in 2006, the Ministry of Finance (MoF) and the SASAC jointly issued *the Trail Measures of Implementing the Equity Incentive System by the State-Controlled Listed Firms*

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(Domestic and Overseas). Moreover, in 2008, the CSRC issued the *Memorandum on Issues Concerning Equity Incentives (No. 1, No. 2 and No. 3*). As a result, some listed firms, especially non-state-owned firms, adopted equity incentive plans, leading to a swift increase in managerial ownership. Indeed, Geng and Lv (2013) examine the ownership structure of Chinese listed firms for the period 2008-2010, and report that the average and maximum levels of managerial ownership in non-state-owned firms were around 7.46 and 65 per cent, respectively; in contrast, the mean and maximum value of managerial ownership in state-owned firms were only 0.32 and 23 per cent, respectively. They also outline that although the level of managerial ownership in Chinese listed firms has been increasing in recent years, the average level still remains relatively low (around 1.8 per cent). Regarding the effects of managerial ownership on corporate disclosure, early literature provides two competing views – incentive alignment effect versus management entrenchment effect (Jensen and Meckling, 1976; Shleifer and Vishny, 1989; Nasir and Abdullah, 2004; Cheng and Warfield, 2005; Bhat *et al.*, 2006; Kanagaretnam *et al.*, 2012). By investigating the combination of these two effects, Ding *et al.* (2007) find that there is a non-linear (inverted U-shape) relationship between managerial ownership and earnings management for Chinese listed firms. The findings suggest that at a low level of managerial ownership, the incentive alignment effect dominates the management entrenchment effect, reducing a manager's incentive to engage in earnings and disclosure management, but above a certain level, the management entrenchment effect is the dominating factor, resulting in a less transparent corporate information environment and more complexity in analyst forecasting. Therefore, it is predicted that:

H5a. There is an inverted U-shaped relationship between analysts' forecast accuracy and the level of managerial ownership.

H5b. There is a U-shaped relationship between analysts' forecast dispersion and the level of managerial ownership.

4. Data and research design

4.1 Sample collection

First, this study selects all Chinese listed firms with the market consensus estimates available on the Institutional Broker Estimate System (I/B/E/S) database for the period 2008-2012; any firms with consensus estimates made by less than three analysts are deleted[3]. Next, listed firms' financial data are downloaded from the China Stock Market and Accounting Research (CSMAR) database, while listed firms' corporate ownership information is obtained from their annual reports published on the CSRC-approved corporate disclosure website (www.cninfo.com.cn/). Following early studies (García-Meca and Sánchez-Ballesta, 2011; Kanagaretnam *et al.*, 2012), financial institutions are excluded from the sample. These selection criteria yield an initial sample of 553 listed firms with 1,384 firm-year observations.

4.2 Variable measurement

4.2.1 Forecast properties. Analysts' forecasts are considered as a proxy of rational prediction of a firm's future performance (e.g. future earnings). Especially, earnings forecasts produced by analysts are expected to be very useful for investors in making their investment decisions (Ciciretti *et al.*, 2007). However, given the time span between the forecast date and realisation date, there may be a difference between the actual and forecast earnings, known as forecast errors. Obviously, the fewer forecast errors that analysts make, the more useful forecasted earnings would be for investors. Early studies document that forecast environment, especially information asymmetry, plays a vital role in determining analysts' forecast of earnings, and analysts' forecast error/accuracy was widely used as proxies for information asymmetry (Skinner, 1994; Lang and Lundholm, 1996; Karamanou and Vafeas, 2005; Weiss, 2010; Kanagaretnam *et al.*, 2012). Therefore, following Lang and Lundholm (1996), Weiss (2010) and Kanagaretnam *et al.* (2012), this

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study uses forecast accuracy as an inverse measure for forecast error, and the forecast accuracy (FACC) is defined as:

$$FACC_{i,t} = (-1) * \frac{|FEPS_{i,t-1} - AEPS_{i,t}|}{P_{i,t-1}} * 100\%^{4}$$

Where:

$FEPS_{it-1}$ = the mean earnings per share (EPS) forecast for year t made at time $t - 1$;
$AEPS_{it}$ = the actual EPS forecast for year t; and
P_{it-1} = the stock price at the beginning of year t.

Moreover, the disagreement among financial analysts regarding the expected earnings of a given firm is known as analysts' forecast dispersion, and such disagreement can also result from a lack of publicly available information or information asymmetry (Gilson *et al.*, 1998; Krishnaswami and Subramaniam, 1999; Ramnath *et al.*, 2008). For example, if corporate information is of high quality, then financial analysts can process and analyse such information easily, and then, they would produce rather similar forecasts about the firm's future earnings, reflected as low forecast dispersion (Papakroni, 2013). As such, following Lang and Lundholm (1996), Gilson *et al.* (1998) and Krishnaswami and Subramaniam (1999), this study uses analysts forecast dispersion as another proxy for information asymmetry, and forecast dispersion (FDISP) is defined as:

$$FDISP_{i,t} = \frac{SD_{FEPS_{i,t}}}{|M_{FEPS_{i,t}}|} * 100\%$$

Where:

$SD_{FEPS,t}$ = the standard deviation of all EPS forecasts for year t; and
$|M_{FEPS_{i,t}}|$ = the absolute value of the median EPS forecast for year t.

4.2.2 Ownership structure. Early Chinese corporate governance and disclosure studies suggest that state ownership, the number of layers, institutional ownership, foreign ownership and managerial ownership could affect listed firms' corporate disclosure policies and practices (Ding *et al.*, 2007; Firth *et al.*, 2007; Wang *et al.*, 2008; Yeh *et al.*, 2009, Fan *et al.*, 2012; Chen *et al.*, 2014). Given that the properties of analysts' forecast can be shaped by corporate information environment (Haw *et al.*, 2010; Brown *et al.*, 2011), the above ownership structure types are also used as explanatory variables in this study, and definitions of these variables are presented in Appendix A1.

4.3 Empirical model

Following early accounting and corporate governance studies (Adams and Santos, 2006; Ding *et al.*, 2007), a quadratic model is used to examine the non-linear relationships between state ownership, managerial ownership and analysts' forecast properties. Therefore, analyst forecast accuracy (FACC) and analyst forecast dispersion (FDISP) are used as dependent variables, and explanatory variables consist of state ownership (SO), quadratic state ownership (SO^2), managerial ownership (MO), quadratic managerial ownership (MO^2) and other ownership measures. In addition, previously identified determinants of analysts' forecast accuracy and dispersion, including firm size, leverage, growth opportunity, numbers of analysts following, accounting losses, earnings volatility, earnings surprise, independent directors, dual role of board Chairman and CEO and equity exercise indicator, were added as control variables (Lang and Lundholm, 1996; Brown, 2001; Duru and Reeb, 2002; Xie *et al.*, 2003; Gu and Wu, 2003; Lang *et al.*, 2004; Byard *et al.*, 2006; Mouselli and Hussainey, 2014). As such, the quadratic model[4] is presented as follows:

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$$
\begin{aligned}
FACC_{i,t}/FDISP_{i,t} = {} & \beta_0 + \beta_1 SO_{i,t} + \beta_2 SO^2_{i,t} + \beta_3 N_LAY_{i,t} + \beta_4 IO_{i,t} + \beta_5 FO_{i,t} + \beta_6 MO_{i,t} \\
& + \beta_7 MO^2_{i,t} + \beta_8 IND_{i,t} + \beta_9 ESTS_{i,t} + \beta_{10} EX_{i,t} + \beta_{11} M/B_{i,t} \\
& + \beta_{12} LnTA_{i,t} + \beta_{13} LOSS_{i,t} + \beta_{14} DUAL_{i,t} + \beta_{15} EV_{i,t} + \beta_{16} F_MEET_{i,t} \\
& + \beta_{17} ESUP_{i,t} + \beta_{18} LEV_{i,t} + \sum_j \beta_{19j} YearDummies_j \\
& + \sum_k \beta_{20k} IndustryDummies_k + \varepsilon
\end{aligned}
$$

Definitions of ownership structure variables and control variables in the above quadratic model are presented in Appendix A1.

5. Empirical results

5.1 Descriptive statistics

The descriptive statistics are presented in Table I. The mean (median) value of analysts' forecast accuracy FACC is −0.65 per cent (−0.32 per cent) of stock price. The standard deviation of analysts' forecast dispersion FDISP is rather high (99.33), suggesting that earnings forecasts from different analysts are much dispersed. Moreover, the levels of managerial ownership and foreign ownership are fairly low, as the mean (median) of managerial ownership MO and foreign ownership FO are at 4.86 (1.04 per cent) and 5.07 per cent (0 per cent), respectively. Also, the mean and median of institutional ownership IO are 16.37 and 8.48 per cent, respectively, suggesting that institutional investors do not appear to be very influential in Chinese listed firms. In contrast, the mean and median of state ownership SO are 32.42 and 39.21 per cent, respectively, indicating that the state is deemed to have considerable influence on listed firms' corporate governance policies. Moreover, it appears that pyramidal ownership structure is widely used by listed firms, as the mean and median of the number of layers in such structure N_LAY are 3.12 and 3, respectively. Table II presents the correlation between the ownership structure variables and control variables. Firms with higher state ownership are characterised by larger size, more analysts following, higher leverage, higher earnings surprises, but lower market-to-book ratio. In addition, foreign ownership is higher in larger size firms, while managerial ownership is lower in SOEs.

Table I Summary statistics

Variables	*Mean*	*SD*	*Minimum*	*Q1*	*Median*	*Q3*	*Maximum*
Dependent variables							
FACC	−0.65	1.35	−14.85	−0.68	−0.32	−0.13	0.00
FDISP	37.70	99.33	1.76	8.96	17.62	36.05	1,026.14
Explanatory variables							
SO	32.42	25.16	0.00	0.94	39.21	52.39	77.91
N_LAY	3.12	0.92	2.00	2.50	3.00	4.00	7.00
IO	16.37	20.53	0.00	3.26	8.48	20.86	86.68
FO	5.07	9.96	0.00	0.00	0.00	2.72	44.68
MO	4.86	19.21	0.00	0.03	1.04	2.63	78.14
Control variables							
IND	0.36	0.06	0.18	0.33	0.33	0.38	0.67
ESTS	6.46	4.58	1.00	3.00	6.00	9.00	27.00
EX	0.21	0.40	0.00	0.00	0.00	0.00	1.00
M/B	1.81	1.78	0.06	0.62	1.21	2.24	12.27
LnTA	19.61	1.64	17.69	18.45	19.32	21.47	24.12
LOSS	0.02	0.12	0.00	0.00	0.00	0.00	1.00
EV	0.16	0.14	0.01	0.08	0.11	0.21	1.16
DUAL	0.20	0.40	0.00	0.00	0.00	0.00	1.00
F_MEET	10.83	6.25	3.00	8.00	9.00	13.00	57.00
ESUP	8.14	31.03	0.00	1.00	7.39	11.91	103.81
LEV	15.79	17.34	0.00	0.23	13.34	23.82	89.92

Notes: n = 1,384; see Appendix A1 for definitions of variables

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Table II Pearson correlation matrix

Variables	*SO*	*N_LAY*	*IO*	*FO*	*MO*	*IND*	*ESTS*	*EX*	*M/B*	*LnTA*	*LOSS*	*DUAL*	*EV*	*F_MEET*	*ESUP*
N_LAY	−0.11														
IO	−0.62**	0.31***													
FO	0.17***	0.03	−0.20***												
MO	−0.52***	−0.22**	0.01	−0.20**											
IND	−0.09*	−0.07**	−0.04	−0.13**	0.17**										
ESTS	0.15**	−0.13***	−0.14**	0.11*	−0.14**	0.05									
EX	−0.28***	−0.01	0.18***	−0.09*	0.12**	−0.02	−0.10*								
M/B	−0.41***	−0.16***	0.19**	−0.12**	0.57***	0.11*	−0.09	0.51							
LnTA	0.53***	−0.81	−0.17***	0.27***	−0.78***	−0.02	0.49***	−0.20***	−0.56***						
LOSS	0.07	0.11**	−0.02	0.13**	−0.21	−0.03	−0.10	−0.06	−0.08	0.06					
DUAL	−0.27***	−0.35***	−0.02	−0.77	0.69***	0.14**	−0.05	0.06	0.28***	−0.24***	−0.06				
EV	0.82	0.18***	−0.84	0.33***	−0.18***	−0.34	0.26***	−0.07	−0.17***	0.39***	0.08	0.02			
F_MEET	−0.17*	0.12	0.12**	0.14***	−0.49	−0.03	0.01	0.08	−0.09	0.55***	0.01	−0.10*	0.20***		
ESUP	0.19***	0.13***	−0.12**	0.26***	−0.14***	−0.19	−0.40	−0.85	−0.27***	0.27***	0.33***	−0.01	0.30***	0.20***	
LEV	0.42**	0.04	−0.19*	0.62	−0.79**	−0.17	0.37	−0.26***	−0.52***	0.66***	0.73	−0.68***	0.73***	0.24***	0.36***

Notes: n = 1,384, p-value in parentheses; ***; **; *significant at the 1, 5 and 10% levels (two-tailed test); see Appendix A1 for definitions of variables

5.2 Multivariate analysis

First, the variance inflation factor (VIF) was used to identify any potential multicollinearity among independent and control variables when running the multivariate model. The results (unreported) show that the VIFs for four independent variables – SO, SO^2, MO and MO^2 – are rather high (VIFs > 15), while the VIFs for the rest of independent variables and control variables are lower than 4. However, when dropping the two quadratic ownership variables – SO^2 and MO^2 – out of the multivariate equation and re-running the tests, the VIFs for independent and control variables are all lower than 4. In addition, given that the correlation between SO (MO) and SO^2 (MO^2) is non-linear, there is no serious multicollinearity between these independent variables. Therefore, it concludes that there is no evidence of a serious multicollinearity problem.

Moreover, as presented in Table I, the distributions of two dependent variables – FACC and FDISP – appear to be heavily skewed. This could result in the errors of OLS regression being not normally disturbed. Therefore, the normal scores approach is used, as it is more appropriate when the distribution of errors is non-normal, and/or the theoretically correct form of the relationship between dependent and independent variables is unknown (Cooke, 1998; Hutcheson and Sofroniou, 1999). Two versions of the multivariate model are run; one version using untransformed data and another version where all variables in the above equations, with the exception of the dummies, are normalised[5].

Furthermore, outliers are identified in Table I, and then, the winsorisation technique has been used to limit the effect of these extreme values in the data[6]. The (unreported) results obtained using the winsorised data were qualitatively similar to those results (using the original/un-winsorised data) reported here. Also, because this study uses a sample of unbalanced panel data, the multivariate regression was run by using both fixed-effect and random-effect model types. Subsequently, Hausman tests were run to identify the appropriate model type that should be chosen.

Tables III and IV report the results of the multivariate/fixed-effect panel regression of two forecast property measures – FACC and FDISP – on ownership structure and control variables by using untransformed data and normalised data, respectively. The test results in both tables are fairly similar, and the forecast accuracy model (Model A) using untransformed data and normalised data are both significant, with R-square (adjusted) of approximately 32.3 and 20.8 per cent, respectively. However, for the forecast dispersion model (Model B), ownership structure variables are not correlated with analysts' forecast dispersion FDISP at any significance levels in both tables. First, *H1a* is supported, with the level of state ownership SO being positively significant at 1 per cent, while quadratic state ownership SO^2 being negatively significant at the level of 1 per cent. It indicates that the

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Table III Multivariate/fixed-effect panel regression of analyst forecast properties on ownership structure and control variables – using untransformed data[a]

	Model A: Forecast accuracy			Model B: Forecast dispersion		
Variables	*Expected sign*	*Coefficient*	*t-statistics*	*Expected sign*	*Coefficient*	*t-statistics*
SO	+	0.054	4.39***	−	−1.612	−1.53
SO²	−	−0.0006	−3.87***	+	0.027	1.44
N_LAY	−	−0.145	−1.80*	+	2.752	0.40
IO	−	0.009	0.45	+	−0.127	−0.30
FO	+	0.024	3.56***	−	−0.290	−0.50
MO	+	0.047	3.06***	−	−1.288	−0.97
MO²	−	−0.0004	1.26	+	0.010	0.52
IND	+	−0.671	−0.64	−	4.951	0.957
ESTS	+	0.065	3.65***	+	5.615	3.65***
EX	−	0.011	0.07	+	24.596	1.83*
M/B	+	0.058	1.21	−	−1.642	−0.40
LnTA	+	0.037	0.47	−	−20.504	−3.02***
LOSS	−	−2.982	−5.91***	+	96.786	2.23**
EV	−	−1.940	−3.66***	+	−10.297	−0.23
DUAL	−	0.126	0.72	+	7.970	0.53
F_MEET	+	0.006	0.58	−	−1.573	−0.77
ESUP	−	−0.116	−5.15***	+	0.720	0.37
LEV	−	0.003	0.07	+	0.221	0.61
Year dummies		Yes			Yes	
Ind. dummies		Yes			Yes	
Adjusted R^2(%)		32.3			14.6	

Notes: n = 1,384; [a]The Hausman test results show Prob > chi-square = 0.028, suggesting that the fixed-effect panel regression should be used; ***; **; *significant at the 1, 5 and 10% levels (two-tailed test); see Appendix A1 for definitions of variables

Table IV Multivariate/fixed-effect panel regression of analyst forecast properties on ownership structure and control variables – using normalised data[b]

	Model A: Forecast accuracy			Model B: Forecast dispersion		
Variables	*Expected sign*	*Coefficient*	*t-statistics*	*Expected sign*	*Coefficient*	*t-statistics*
SO	+	0.317	3.26***	−	−0.064	−1.07
SO²	−	−0.154	−2.90**	+	0.121	1.09
N_LAY	−	−0.038	−1.77*	+	0.028	0.39
IO	−	0.138	0.89	+	−0.137	−1.56
FO	+	0.125	1.86*	−	−0.006	−0.07
MO	+	0.242	2.91***	−	−0.061	−0.65
MO²	−	−0.0003	−0.01	+	0.041	0.64
IND	+	0.008	0.15	−	−0.113	−1.91*
ESTS	+	0.119	1.86*	+	0.094	1.29
EX	−	−0.168	−1.40	+	−0.022	−0.16
M/B	+	0.174	1.89*	−	0.056	0.53
LnTA	+	0.105	1.03	−	−0.051	−0.44
LOSS	−	−1.155	−3.07***	+	1.456	3.42***
EV	−	−0.152	−2.91***	+	−0.052	−0.87
DUAL	−	0.010	0.76	+	−0.065	−0.44
F_MEET	+	0.017	0.33	−	−0.003	−0.06
ESUP	−	−0.119	−2.20**	+	0.053	0.85
LEV	−	−0.093	−1.14	+	0.024	0.26
Year dummies		Yes			Yes	
Ind. dummies		Yes			Yes	
Adjusted R^2(%)		20.8			10.7	

Notes: n = 1,384; [b]The Hausman test results show Prob > chi2 = 0.041, suggesting that the fixed-effect panel regression should be used; ***; **; *significant at the 1, 5 and 10% levels (two-tailed test); see Appendix A1 for definitions of variables

association between SO and FACC appears to be an inverted U-shape (non-linear) with an inflection point around 45 per cent[7]. This finding suggests that modest levels of SO (≤45 per cent) could enhance the effectiveness of internal monitoring and control, resulting in more transparent corporate information environment and, subsequently, more accurate analyst forecasts (Ajinkya *et al.*, 2005; Karamanou and Vafeas, 2005, Wang *et al.*, 2008), but at high levels (>45 per cent), SO has a negative effect on FACC, because the state becomes an insider who can directly obtain private information and, then, has fewer incentives to promote effective monitoring and control and high levels of corporate disclosure (Armstrong *et al.*, 2010; Firth *et al.*, 2007). Second, consistent with *H2*, the number of layers in pyramidal structure N_LAY is negatively associated with FACC at a significance level of 10 per cent. This result is in line with the argument that the use of complex pyramidal structures can exacerbate agency problems, and self-interested managers may engage in earnings and disclosure management to conceal their non-value-maximising behaviours (Aghion and Tirole, 1997; Baker *et al.*, 1999; Fan and Wong, 2002). Earnings and disclosure management, therefore, can increase the complexity of forecasting, resulting in less accurate analysts' forecasts. Furthermore, *H4* is also supported, as foreign ownership FO is positively correlated with FACC at a significance level of 1 per cent. This finding is in line with Barniv's (2009) argument that analysts' forecast accuracy increases with the level of foreign ownership, because of better corporate disclosure practices by foreign-invested enterprises (Wang *et al.*, 2008).

However, *H3* is unsupported, as the level of institutional ownership IO is not associated with FACC and FDISP at any significance levels. Although this result is inconsistent with some early Chinese stock studies (Liu *et al.*, 2013), it can be explained by the fact that unlike their Western counterparts who tend to invest shares for the long run, Chinese institutional investors tend to adopt aggressive trading strategies to pursue short-term price gains and, then, have few incentives to monitor listed firms' management and to participate in business strategy making; as such, they help little in improving corporate disclosure. Indeed, Gong and Peng (2014) report that there is no significant relationship between corporate disclosure quality and the level of institutional ownership when the shares are being held by "pressure-sensitive" financial institutions with aggressive trading strategies. Moreover, in contrast to *H5a* and *H5b*, this study fails to find any non-linear relationship between managerial ownership MO and analyst forecast properties. Indeed, the relationship between MO and FACC is only positive and statistically significant at 5 per cent. This finding can be explained, as reported in Table I, by the overall level of managerial ownership being low in listed Chinese firms, indicating that the incentive alignment effect is the dominating factor. As a result, the interests of managers and shareholders are better aligned with the increase of managerial ownership, and then, managers are less likely to withhold their private information, reducing information asymmetry and improving analysts' forecast accuracy (Nasir and Abdullah, 2004; Bhat *et al.*, 2006; Brown *et al.*, 2011).

Turning to control variables, analysts following ESTS is positively related to both FACC and FDISP at a significance level of 1 per cent, while the association between accounting loss indicator LOSS and FACC (FDISP) is negative (positive) and statistically significant at 1 per cent (5 per cent). These findings are consistent with previous studies (Lang and Lundholm, 1996; Duru and Reeb, 2002; Gu and Wu, 2003; Ho and Tsay, 2004) which state that forecast accuracy (dispersion) is higher for firms with more analysts following, and forecast dispersion (accuracy) is higher (lower) for poorly performing firms. Moreover, FACC is negatively and significantly correlated with earnings volatility EV and earnings surprise ESUP, as would be expected. However, this study fails to find any significant relationships between the two analysts' forecast properties and other control variables, including the proportion of independent directors, the equity exercise indicator, firm size, the dual role dummy, the frequency of board meetings and leverage.

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5.3 Robustness tests

5.3.1 Controlling for endogeneity issues. This study develops a series of hypotheses that ownership structure variables, such as state ownership, are expected to have significant impacts on the two analyst forecast properties. However, it may also be true that certain ownership structure types, such as the state, prefer to hold shares in listed firms that are covered by better analysts with more (less) forecast accuracy (dispersion). As such, there may be a two-way causal relationship between the two analysts forecast properties and ownership structure variables. To address the potential "reverse causality" problem, this study uses a two-stage least-squares (2SLS) model by using the first lag ownership structure variables as instruments.

The 2SLS results, as presented in Table V, are largely in line with those reported in Tables III and IV.

In addition, one may argue that one or some of the ownership structure variables, such as managerial ownership, can be determined simultaneously with the two dependent variables – forecast accuracy and forecast dispersion. For example, early research documents that the level of managerial ownership is determined by certain firm-specific factors, such as firm size, profitability, leverage and the dual role of board Chairman and CEO (Shleifer and Vishny, 1997; Core *et al.*, 1999; Aggarwal and Samwick, 1999). Also, analysts' forecast accuracy is associated with company size, leverage, profit volatility and the separation of the Chairman and the CEO (Eddy and Seifert, 1992; Chan *et al.*, 1996; Kanagaretnam *et al.*, 2012). Consequently, several variables, including managerial ownership, forecast accuracy, company size and leverage, could be simultaneously determined and are interdependent, and then, the "simultaneity" issue might result in the correlation between dependent and independent variables being overestimated. This study therefore uses Hausman specification tests to identify this potential "simultaneity" issue, and the test results (unreported) show that the integrated residuals of reduced-form regressions are not significant in all multivariate regressions. It therefore concludes that there is no indication of "simultaneity" issue in the test models[8].

Table V Two-stage least-squares regression of ownership forecast properties on ownership structure and control variables

	Model A: Forecast accuracy			*Model B: Forecast dispersion*		
Variables	*Expected sign*	*Coefficient*	*Z-statistics*	*Expected sign*	*Coefficient*	*Z-statistics*
SO	+	0.131	2.66***	−	−0.579	−1.09
SO²	−	−0.0016	−3.81***	+	0.013	0.56
N_LAY	−	−0.112	−2.09**	+	1.423	0.22
IO	−	0.022	1.17	+	0.166	0.43
FO	+	0.039	1.86*	−	−0.219	−0.39
MO	+	0.013	2.28**	−	−0.336	−0.69
MO²	−	−0.001	−1.42	+	0.053	0.78
IND	+	−0.966	−0.93	−	10.904	0.12
ESTS	+	0.069	3.88***	+	5.427	3.63***
EX	−	0.018	0.12	+	25.167	1.92*
M/B	+	0.037	0.77	−	−0.792	−0.20
LnTA	+	−0.074	−1.00	−	−15.670	−2.53**
LOSS	−	−3.114	−6.23***	+	102.250	2.42****
EV	−	−1.447	−2.82***	+	−31.484	−0.73
DUAL	−	0.162	0.94	+	6.826	0.47
F_MEET	+	0.011	1.04	−	1.384	1.60
ESUP	−	−0.124	−5.59***	+	1.101	0.59
LEV	−	0.002	0.57	+	0.130	0.37
Year dummies		Yes			Yes	
Ind. dummies		Yes			Yes	
Adjusted R^2(%)		29.3			17.2	

Notes: Using the first lag of the ownership structure variables as instruments, n = 1,384; ***; **; *significant at the 1, 5 and 10% levels (two-tailed test); see Appendix A1 for definitions of variables

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5.3.2 Using alternative analysts forecast data. This study uses analyst consensus estimates from I/B/E/S database in the above multivariate analyses. However, several earlier studies argue that using I/B/E/S forecast data in accounting and finance research is not free from issues. First, Payne and Thomas (2003) report that research conclusions are more likely to be affected by the rounding procedure in samples that have stock splits, especially for firms with larger size, higher market-to-book ratio and better performance. Also, given that I/B/E/S calculates actual EPS figures by using a "majority rule", I/B/E/S EPS figures may not represent the earnings that all individual analysts were forecasting (Brown and Larocque, 2013). Therefore, this study downloaded another set of analysts forecast data from the CSMAR database[9], and re-ran the multivariate/fixed-effect panel regression. The test results, as presented in Tables VI (using untransformed data) and VII (using normalised data), are largely similar to those reported in Tables III and IV, except for that the correlation between forecast dispersion FDISP and state ownership SO (state ownership SO^2) becomes negatively (positively) significant at level of 10 per cent (1 per cent). This finding supports the *H1a* (*H1b*) of an inverted U-shaped (U-shaped) relationship between analysts forecast accuracy (dispersion) and the level of state ownership. Overall, using alternative analysts forecast data obtained from the CSMAR database does not result in any different findings.

5.3.3 Using alternative measures of some variables. Some of the explanatory and control variables can be measured in alternative ways. For example, given the influential role of the CEO in a listed firm, managerial ownership could be proxied as the proportion of equities grants to CEO to total number of shares outstanding (Kanagaretnam *et al.*, 2012). The multivariate/fixed-effect panel regression, therefore, was re-run by using the alternative measure – CEO ownership – which is measured by the number of shares held by CEO scaled by total number of shares outstanding. The results, as presented in Table VIII, are qualitatively similar to those reported in Table III. Furthermore, size has been proxied in prior studies not only by total assets but also by total sales, number of employees or market value. Similarly, instead of using market-to-book ratio (M/B) as a measure of growth, annual

Table VI Multivariate/fixed-effect panel regression of analyst forecast properties on ownership structure and control variables – using alternative forecast data

	Model A: Forecast accuracy			*Model B: Forecast dispersion*		
Variables	*Expected sign*	*Coefficient*	*t-statistics*	*Expected sign*	*Coefficient*	*t-statistics*
SO	+	0.120	3.27***	−	−0.066	−1.77*
SO^2	−	−0.0013	−2.73***	+	0.0009	1.76*
N_LAY	−	−0.021	−1.85*	+	0.334	1.40
IO	−	0.022	1.49	+	−0.024	−1.60
FO	+	0.031	2.03**	−	−0.002	−0.22
MO	+	0.038	1.94*	−	−0.018	−0.39
MO^2	−	−0.0003	−0.48	+	0.0003	0.44
IND	+	1.320	0.43	−	4.481	1.43
ESTS	+	0.129	2.47**	+	0.213	2.93***
EX	−	−0.676	−1.48	+	0.189	0.41
M/B	+	0.224	1.79*	−	−0.042	−0.39
LnTA	+	0.206	0.89	−	−0.027	−0.82
LOSS	−	−3.963	−2.43**	+	2.586	1.87*
EV	−	−3.296	−2.12**	+	0.297	0.56
DUAL	−	0.001	0.31	+	0.062	0.12
F_MEET	+	0.033	1.07	−	−0.015	−0.29
ESUP	−	−0.536	−6.86***	+	0.237	3.00***
LEV	−	−0.006	−0.47	+	0.015	1.23
Year dummies		Yes			Yes	
Ind. dummies		Yes			Yes	
Adjusted R^2(%)		33.1			18.3	

Notes: Untransformed, n = 3,796; [c]The Hausman test results show Prob > chi-square = 0.019, suggesting that the fixed-effect panel regression should be used; ***; **; *significant at the 1, 5 and 10% levels (two-tailed test); see Appendix A1 for definitions of variables

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Table VII Multivariate/fixed-effect panel regression of analyst forecast properties on ownership structure and control variables – using alternative forecast data[d]

	Model A: Forecast accuracy			Model B: Forecast dispersion		
Variables	*Expected sign*	*Coefficient*	*t-statistics*	*Expected sign*	*Coefficient*	*t-statistics*
SO	+	0.187	2.18**	−	−0.160	−1.85*
SO²	−	−0.139	−2.62***	+	0.125	2.70***
N_LAY	−	−0.005	−1.91*	+	0.109	0.73
IO	−	0.065	0.89	+	−0.056	−0.87
FO	+	0.034	1.76*	−	−0.019	−−0.33
MO	+	0.017	1.21	−	0.068	0.93
MO²	−	−0.037	−0.66	+	0.073	1.49
IND	+	0.002	0.34	−	0.062	1.38
ESTS	+	0.103	1.67*	+	−0.061	−1.13
EX	−	−0.135	−1.39	+	0.060	0.58
M/B	+	0.234	2.58***	−	−0.256	−3.23***
LnTA	+	0.033	0.33	−	−0.175	−0.98
LOSS	−	−0.892	−2.23**	+	−0.701	−2.01**
EV	−	−0.156	−2.97***	+	0.114	2.51**
DUAL	−	−0.185	−1.43	+	0.041	0.36
F_MEET	+	0.011	0.22	−	0.061	1.42
ESUP	−	−0.218	−4.05***	+	0.087	1.86*
LEV	−	−0.039	−0.49	+	0.071	1.02
Year dummies		Yes			Yes	
Ind. dummies		Yes			Yes	
Adjusted R^2(%)		29.5			21.6	

Notes: Normalised, n = 3,796; [d]The Hausman test results show Prob > chi-square = 0.036, suggesting that the fixed-effect panel regression should be used; ***; **; *significant at the 1, 5 and 10% levels (two-tailed test); see Appendix A1 for definitions of variables

Table VIII Multivariate/fixed-effect panel regression of analyst forecast properties on CEO ownership and other explanatory and control variables[e]

	Model A: Forecast accuracy			Model B: Forecast dispersion		
Variables	*Expected sign*	*Coefficient*	*t-statistics*	*Expected sign*	*Coefficient*	*t-statistics*
SO	+	0.019	2.61**	−	−0.994	−1.11
SO²	−	−0.0002	−2.24**	+	0.023	1.32
N_LAY	−	−0.069	−1.93*	+	0.061	0.53
IO	−	−0.018	−0.43	+	0.315	0.41
FO	+	0.008	1.75*	−	−0.250	−0.54
CEO[f]	+	0.007	2.18**	−	−0.315	−0.33
CEO² [g]	−	−0.0004	−1.02	+	0.0004	1.28
IND	+	−0.878	−1.06	−	−20.891	−0.32
ESTS	+	0.043	2.36**	+	2.132	1.92*
EX	−	0.019	0.14	+	16.54	2.02**
M/B	+	0.034	0.96	−	−1.465	−0.77
LnTA	+	0.163	1.94*	−	−4.180	−0.82
LOSS	−	−2.50	−3.85***	+	44.120	1.54
EV	−	−1.275	−1.75*	+	64.93	1.48
DUAL	−	−0.101	−0.64	+	8.160	0.85
F_MEET	+	0.021	1.38	−	−0.594	−0.65
ESUP	−	−0.247	−4.42***	+	9.369	2.08**
LEV	−	−0.018	−1.04	+	0.558	1.60
Year dummies		Yes			Yes	
Ind. dummies		Yes			Yes	
Adjusted R^2(%)		27.2			15.2	

Notes: n = 1,384; [e]The Hausman test results show Prob > chi-square = 0.041, suggesting that the fixed-effect panel regression should be used; ***; **; *significant at the 1, 5 and 10% levels (two-tailed test; [f]CEO = CEO ownership, measured by the number of shares held by CEO/total number of shares outstanding × 100%; [g]CEO^2 = quadratic CEO ownership; see Appendix A1 for definitions of other variables

percentage change in sales has also been used in prior studies. Hence, the test models were re-run using the log of market value and then again with the percentage change in sales, and the results (untablulated) show that the alternative ways of measuring size and growth failed to lead to any quantitative differences.

6. Summary and conclusion

This paper examines the association between ownership structure mechanisms and the properties of analysts' forecasts in China's unique corporate setting. It finds that analysts' forecast accuracy is higher for listed firms with more foreign ownership and managerial ownership. These findings are in line with arguments that the demand for high-quality corporate disclosure by foreign investors leads to more effective monitoring and control, and managerial ownership can be a useful means to align the interests between managers and shareholders, resulting in more informative corporate disclosure and, hence, less forecasting complexity (Nasir and Abdullah, 2004; Bhat *et al.*, 2006; Barniv, 2009; Brown *et al.*, 2011). However, analysts' forecast accuracy tends to be lower for firms with complex pyramidal ownership structure, supporting the view that extra pyramidal layers in ownership structure could make corporate disclosure less transparent, because self-interested managers may withhold their private information to conceal their non-value-maximising behaviours (Aghion and Tirole, 1997; Baker *et al.*, 1999; Fan and Wong, 2002). Moreover, the influence of state ownership on analysts' forecast properties – accuracy and dispersion – is likely to be non-linear, with an inflection point around 45 per cent. This suggests that if the level of state ownership is lower than 45 per cent, then the state could act effectively in enhancing the internal mentoring and control mechanisms and, then, reduce information asymmetry (Tian and Estrin, 2008); however, higher levels of state ownership impede the efficiency of internal monitoring and control mechanisms, making the corporate information environment less transparent (Firth *et al.*, 2007; Armstrong *et al.*, 2010). Furthermore, this study fails to find any significant association between analysts' forecast accuracy and institutional ownership. Also, analysts' forecast dispersion is not significantly correlated with various ownership structure mechanisms, including pyramidal structure, foreign ownership, institutional ownership and managerial ownership.

There are several implications for the above results. First, the finding of a non-linear relationship between state ownership and analysts' forecast properties suggests that the government should maintain a modest level ($\leq$ 45 per cent) of state ownership in SOEs to facilitate the development of the corporate information environment and to reduce forecast complexity for financial analysts in Chinese stock markets. More specially, as reported in Table III, when state ownership increases by one percentage point, analysts' forecast accuracy, on average, would increase by 0.054 percentage point. However, if the level of state ownership is in excess of 45 per cent, then one percentage point further increase in state ownership leads to a decrease in forecast accuracy by 0.0006 percentage point. Second, given the result of a negative association between pyramidal ownership structure and analysts' forecast accuracy, listed Chinese firms should reduce the number of layers in their ownership structure to mitigate agency problems and to encourage timely and objective corporate disclosure, improving analyst forecast accuracy. Third, the finding of a positive correlation between managerial relationship and forecast accuracy is consist with the alignment effect hypothesis (Jensen and Meckling, 1976; Nasir and Abdullah, 2004); it supports the government's recent policies of equity incentive plans which aim to align the interests of shareholders and managers and to improve corporate information transparency, as reflected in analysts' forecast properties. Indeed, the empirical results, as presented in Table III, suggest that with one percentage point increase in managerial ownership, analysts' forecast accuracy would increase by 0.047 percentage point. Furthermore, the findings of this study can be of interest to investors. Given that earnings forecasts provided by analysts are vital for investment decision-making, investors should

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invest in listed Chinese firms with modest levels of state ownership, less complex ownership structures, higher levels of foreign ownership and managerial ownership.

This study has few limitations. First, the sample size is relatively small. Although this study selected all listed Chinese firms with analyst forecast consensus data available in the I/B/E/S database, the initial sample only consists of 553 listed firms or approximately 25 per cent of the whole population, which could be a source of bias. Furthermore, the robustness test uses an alternative set of analysts' forecast data downloaded from the CSMAR database, and the new sample consists of 1,207 listed firms or about 55 per cent of the whole population. Although the sample size increases in the robustness test, it still cannot rule out possible sampling bias. Second, given the unique features of ownership structure in listed Chinese firms, some of the results cannot be generalised to other developing countries or emerging markets, especially the finding of the non-linear relationship between state ownership and analysts' forecast properties. Also, because this study only focuses on listed firms, the findings cannot be generalised to private and unlisted Chinese firms.

Notes

1. This approach continued with the Code of Corporate Governance of Listed Companies in China, based on the OECD Principles of Corporate Governance, issued by CSRC in January 2001 and revised in October 2005.

2. This problem appears to have been recognised in the 2005 split-share structure reform which aimed to reduce non-tradable share ownership (Yeh *et al.*, 2009).

3. Some researchers document that individual analyst's investment recommendations may not be completely independent and unbiased, and individual analyst's competence/expertise can also affect the accuracy of his/her earnings forecasts (Firth *et al.*, 2013; Xu *et al.*, 2013). However, the market consensus estimate is a figure based on the combined estimates of a group of analysts covering one listed firm, and it should be less affected by analyst's personal attributes (e.g. bias). This study, therefore, uses the market consensus estimates, rather than individual investment recommendation data, to measure the analysts' forecast accuracy. Also, any market consensus estimates made by less than three analysts have been deleted to control individual analyst' bias and/or competence.

4. If letting $SO^2 = X1$ and $MO^2 = X2$, then the quadratic model can be transformed to a multivariate linear model.

5. This was done using SPSS version 17 routines, "transform – rank cases" function.

6. The winsorisation was done using STATA version 11 routines to alter extreme observations in the sample and, then, to take on values at given percentiles of the distribution.

7. The quadratic model: $f = \beta_0 + \beta_1 SO_{i,t-1} + \beta_2 SO^2_{i,t-1} + \beta_3 N_LAY_{i,t} + \cdots + \Sigma_k \gamma_{20k} YearDummines_k + \varepsilon$; Let $d(f)/d(SO) = \beta_1 + 2\beta_2 SO = 0$, and then, the inflection point $= -\beta_1/2\beta_2$. The state ownership (SO) and quadratic state ownership (SO^2) coefficients, β_1 and β_2, are available in Table III, and then, the inflection point is computed as 45 per cent for Model A.

8. 2SLS regression analyses are also applied to address this "simultaneity" issue, and the results (unreported) are qualitatively similar to those reported in Tables III and IV.

9. The analysts forecast data obtained from the CSMAR database covers 1,207 Chinese listed firms with 3,796 firm-year observations during the period 2008-2012.

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Appendix 1

Table AI Definition of variables

Variable names	*Variable definitions*
Analysts' forecast accuracy (FACC)	FACC = [−1 × absolute value of the difference between mean EPS forecast and actual EPS/year-end stock price] × 100%
Analysts' forecast dispersion (FDISP)	FDISP = (the standard deviation of all EPS forecasts for the year scaled by the absolute value of the median EPS forecast) × 100%
State ownership (SO)	SO = (the number of state-owned shares/total number of shares outstanding) × 100%
Quadratic state ownership (SO^2)	SO^2 = the square of SO
The number of layers (N_LAY)	N_LAY = the number of layers in listed firms' pyramidal ownership structure, measured as the number of layers between a listed company and its ultimate owner(s)
Instructional ownership (IO)	IO = (the number of shares held by institutional investors/total number of shares outstanding) × 100%
Foreign ownership (FO)	FO = (the number of shares held by foreign investors/total number of shares outstanding) × 100%
Managerial ownership (MO)	MO = (the number of shares hold by senior managers/total number of shares outstanding) × 100%
Quadratic managerial ownership (MO^2)	MO^2 = the square of MO
The proportion of independent directors (IND)	IND = the number of independent directors/the size of the board
Analysts following (ESTS)	ESTS = the number of analysts following the firm
Equity exercise dummy (EX)	EX = 1 for managers exercising their incentive shares in year *t*, and 0 otherwise
Growth opportunity (M/B)	M/B = market value of a listed firm/book value of the firm
Firm size (LnTA)	LnTA = natural logarithm of firms' total assets at the end of year *t*
Accounting loss dummy (LOSS)	LOSS = 1 for the firm reporting accounting loss in year *t*, and 0 otherwise
Dual role dummy (DUAL)	DUAL = 1 for the roles of CEO and Chairman are combined in year *t*, and 0 otherwise
Earning volatility (EV)	EV = the standard deviation of return on assets for previous five-year period
Frequency of board meetings (F_MEET)	F_MEET = the number of meeting the board had in year *t*
Earnings surprise (ESUP)	ESUP = (absolute value of the difference between year *t*'s EPS and year *t* − *1*'s EPS, scaled by price at the beginning of year *t*) × 100%
Leverage (LEV)	LEV = (long-term liability/capital used) × 100%

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