The Frequency and Magnitude of Earnings Management in China

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Abstract

Earnings management is an indicator of the corporate governance quality and investor protection standard. We study the frequencies and magnitudes of earnings management under two different thresholds, zero earnings and prior earnings, in the Chinese market from 1997 to 2004. We model earnings as a mixed-normal distribution and obtain parameter estimators that measure the frequency and magnitude of earnings management. We show that the practice of earnings management has gone up both in frequency and magnitude during the post 2000 period. We also find that the frequency and magnitude of earnings management are higher when firms try to avoid negative earnings than when firms try to report earnings increases. Our findings reflect the current economic environment in China and caution investors on the low disclosure quality in the Chinese stock market.

JEL classification: M41; G10; G30; C89

Keywords: Earnings management; Earnings distribution; Avoid losses; Avoid decreases; Earnings thresholds; Chinese market
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1. Introduction

The quality of accounting disclosure plays a critical role in maintaining an efficient capital market. A market with pervasive accounting frauds and misrepresentations will drive investors out and raise the cost of capital significantly. Among all the factors that represent the quality of corporate governance and investor protection, the commonly used indicators are the frequency and magnitude of earnings management (EM) in the overall market. Earnings management refers to companies’ strong incentives to use judgment in financial reporting and in structuring transactions to alter financial reports. Prior studies have examined various incentives and approaches of earnings management and shown that the pervasiveness of earnings management has reached to a level that significantly compromises the integrity of financial reporting (Healy and Wahlen, 1999).

Research on EM in emerging markets is especially important since the higher demand for capital in these emerging markets can be fulfilled only if investors are protected from accounting frauds and financial misconducts. In the case of Chinese market, we have witnessed the greater role it plays in the world economy and its eagerness to transform its state-owned enterprises into public corporations by embracing good corporate governance practice. In addition, foreign investors have played critical roles in the development of Chinese market economy (Liu, Burridge and Sinclair, 2002; Yao, 2006). Hence it becomes particularly important for policy makers to understand the corporate earnings management practice to ensure a continuous inflow of foreign capital.
Extant research on earnings management has identified three major thresholds (Burgstahler and Dichev, 1997; Degeorge, Patel and Zeckhauser, 1999). The first threshold is to report a positive earning; the second is to report an earning higher than that of previous year, and the third is to report an earning that meet or beat the analyst forecasted earning. A negative earning may have an unfavorable effect on managers’ compensation and stock price, therefore it becomes critical for managers to report a positive earning. Firms have incentives to report improved earnings since firms that consistently report higher earnings command higher price-to-earnings multiples (Barth, Elliott and Finn, 1999). Financial analysts’ forecasts convey important information to investors and firms achieve greater share value, all else equal, by meeting analysts' expectations (Kasznik and McNichols, 2002). Clearly the costs of practicing earnings managements increase with the absolute difference between actual earnings and earnings threshold. If actual earnings were slightly less than earnings threshold, managements might only need to manipulate one or two accounts. However, if the actual earnings were far away from earning threshold, managements might need to apply more complex approaches to disguise true earnings and the subsequent penalty would also be greater. Similarly, managers would prefer managing earnings slightly above the earning thresholds, rather than over-stating earnings excessively. In addition, Dechow, Sloan and Sweeny (1996) show that firms manipulating earnings experience significant increases in their costs of capital when the manipulations are made public. Meanwhile, the direct cost of higher tax payments is proportion to the magnitude of EM (Erickson, Hanlon and Maydew, 2004).
The incentive to report earnings to meet or beat analysts’ forecast does not exist in China since analysts only play a primitive role in the Chinese market and their forecasts usually have no impact on stock price. In this paper, we examine the frequency and magnitude of earnings management under two different thresholds, zero earnings and prior earnings, in the Chinese market from 1997 to 2004. Following Chen, Lin, Wang and Wu (2005), we use a mixed-normal distribution to model the distribution of earnings and obtain parameter estimators that measure the frequency and magnitude of earnings management. We show that the practice of earnings management has gone up both in frequency and magnitude during the post 2000 period. We also find that the frequency and magnitude of earnings management are higher when firms try to avoid negative earnings than when firms try to report earnings increases. This is the first study that provides direct comparisons of the frequencies and the magnitudes of EM across years and around different thresholds in the Chinese market. Within our sample firms, we find that around 20 percent of firms manage earnings to report positive earnings (avoid negative earnings), and 6 percent of firms try to beat the earnings of prior year (avoid earnings decrease). As a result of EM to avoid reporting losses, the magnitude of EM contributes 0.74 cents in value for every Chinese RMB of stock price. The magnitude is over 0.14 cents for avoiding earnings decreases.

The remainder of the paper proceeds as follows. In section 2, we review the institutional background for the Chinese stock market. Section 3 discusses relevant literature on earnings management. Section 4 applies the parametric model and computes the frequency and magnitude of EM in the Chinese market between 1997 and 2004. It
also compares the characteristics of EM around different thresholds and across time. Section 5 offers concluding remarks.

2. Institutional Background

To expedite the economic reform, the Chinese stock market was instituted with the opening of Shanghai Stock Exchange (SHSE) in 1990 and the Shenzhen Stock Exchange (SZSE) in 1991. Initially, only A shares were issued and tradings of securities were available strictly to Chinese domestic investors. In 1992, the issuance of B shares opened up the tradings of Chinese securities for foreign investors. Prior to 2001, B shares could only be bought and sold by foreign investors. In most recent years, domestic investors were also allowed to trade B shares. B shares are denominated in RMB, the Chinese local currency, and payable in foreign currency. By the end of 2004, there were 1,377 companies traded in the above two stock exchanges in China representing 1,353 A-share stocks and 110 B-share stocks. The total market capitalization was around RMB 3,630.9 billion for A shares and RMB 74.6 billion for B shares. The growth of Chinese security market has attracted investors from all over the world. Both institutional investors and individual investors are seeking opportunities to explore the investment opportunities in the Chinese market.

However, investor protection in China has been low historically and corporate governance is a relatively new idea in Chinese corporate culture. For example, Heritage Foundation/Wall Street Journal conducts a survey and compiles the index of Economic Freedom for over 100 countries each year. The index uses a list of 50 independent variables and groups them into the following categories: (1) trade policy, (2) fiscal burden of government, (3) government intervention in the economy, (4) monetary policy,
(5) capital flows and foreign investment, (6) banking and finance, (7) wages and prices, (8) property rights, (9) regulation, and (10) informal market activity. Based on the index, all nations are categorized into four groups: (1) free, (2) mostly free, (3) mostly unfree, and (4) repressed. In the last few years, China’s economy has remained mostly unfree. In 2004, China is ranked 126 out of 161 nations. In the description of regulation environment, the survey cites the following U.S. Department of Commerce report: "China's legal and regulatory system lacks transparency and consistent enforcement despite the promulgation of thousands of regulations, opinions, and notices affecting…investment…. Foreign investors continue to rank the inconsistent and arbitrary enforcement of regulations and the lack of transparency as two major problems in China's investment climate." Although Chinese government is taking measures to improve the market environment and regulate business practice, the overall market transparency remains low and disclosure quality continues to be substandard.

The importance of maintaining high accounting quality has become a key concern faced by the Chinese government. The Ministry of Finance conducted a survey in 1999 and concluded that the average accounting disclosure qualities for listed companies were inadequate and many firms were committing accounting frauds and/or significantly managing their earnings. The well-known case of Yinguangxia amplified the prevalence of EM in the Chinese market. In 1999, the company inflated the earnings by over RMB 178 million, and in 2000, they pumped up the earnings by another RMB 567 million. Zou and Chen (2002) survey a series of papers and show that Chinese listed companies actively manage their earnings.
3. Literature Review

A large body of literature examines reasons for which firms may manage earnings. For example, Teoh, Wong and Rao (1998) and Teoh, Welch and Wong (1998) show that firms are more likely to inflate reported earnings prior to new equity offerings; Rangan (1998) show that earnings management during the year around the offering predicts both earnings changes and poor market-adjusted stock returns in the following year; Kim and Park (2005) suggest that SEO firms making opportunistic accounting decisions issue new shares at inflated prices. Healy and Palepu (1990) find that firms manage earnings when they are close to their dividend constraint; Dechow and Sloan (1991) propose that CEOs manage reported earnings in their final years in office to maximize their compensation contracts. The management is often granted rich bonuses if it meets a performance target in term of earnings. Jensen and Murphy (2004) argue that this has strengthened incentives for earnings management. Healy and Wahlen (1999) review the earnings management literature and categorize these incentives into three large groups: (1) capital market motivation, (2) contracting motivation, and (3) regulatory motivation.

Researches on EM in China have also flourished in recent years. Extant studies have documented that EM is a widespread phenomenon in China and the condition shows no signs of improving. Aharony, Lee and Wong (2000) point out the existence of earnings management in the IPOs of China’s B- and H-share companies; Wei, Tan and Lin (2000) suggest a similar case when examining A-Shares. Chen and Yuan (2004) and Haw, Qi, Wu and Wu (2005) study the sample of listed companies that applied for rights issues during 1996-1998. Zou and Chen (2002) survey a series of paper and suggest that some common EM incentives for Chinese companies are (1) better IPO price, (2)
rationed share acquisition, (3) avoidance of delisting, and (4) price manipulation. It is also worth noting that the practice of EM can also be related to managerial compensation in China, although there has been no direct tests that link them together. Pan and Tong (2005) show that managerial compensation for listed companies in China are closely related to firm profitability. Liu, Liu, Li and He (2003) and Ye (2005) have also shown a positive relationship between firm performance and compensation. The incentive to boost compensation through inflated earnings is clearly a viable outcome. Furthermore, Liu and Lu (2004) find that EM in listed companies in China is mainly induced by controlling owners’ tunneling activity.

The above studies on detecting EM apply various versions of accrual-based model. Jones (1991) introduces the accrual approach to measure EM, and alternative models such as modified Jones Model (Dechow, Sloan and Sweeney, 1995) have also been proposed. Noguer and Munoz (2004) compare the Standard Jones model and the Modified Jones Model and conclude that two models produce similar ordinations of sample firms. However accrual-based models rely heavily on the assumption of accruals estimations. The other disadvantage of accrual-based model is its inability to capture EM through cash flows such as different treatments of R&D and advertising expenditure (Healy and Wahlen, 1999). In addition to the limitation of accrual-based models, studies of EM that are contingent on specific events, such as IPO or SEO, shed little light on the overall impact of EM in the economy.

An alternative solution is to set pre-determined threshold earnings and examine if the distribution of the reported earnings is more concentrated around these thresholds. The seminal work by Burgstahler and Dichev (1997) shows that there exist low
frequencies of small decrease in earnings (and small losses) and unusually high frequencies of small increases in earnings (and small positive income). Their finding is consistent with the hypothesizes that managers try to manage earnings to exceed specific thresholds such as (1) prior earnings or (2) zero. Using the method described in Burgstahler and Dichev (1997) and Degeorge, Patel and Zeckhauser (1999), Leuz, Nanda and Wysocki (2003) look at earnings management and investor protection across 31 countries. Shen and Chih (2005) compare EM within the banking industry internationally. Shuto (2003) examines the practice of earnings management in Japan, and Du, Li and Yu (2003) study how prevalent EM is among Chinese companies.

The extensive application of Burgstahler and Dichev (1997) to measure EM has produced many insightful researches. However it does not provide sufficient insights into the magnitude of earnings management. Furthermore, Holland (2004) points out that (1) the result produced using the above approach is very sensitive to the choice of interval width, (2) the symmetric assumption used to test the frequency of EM might not be justified, and (3) the approach may not provide statistically reliable and robust results if the peak of the distribution is adjacent to a threshold. Chen, Lin, Wang and Wu (2005) introduce a model using a mixed-normal distribution and address all concerns raised in Holland (2004). They show that their model is very robust in estimating the frequency and magnitude of EM under different thresholds across various time periods.

4. Model and Empirical Tests

4.1. Model

Chen, Lin, Wang and Wu (2005) assume that there are two types of firms in the economy. Earning is a normally distributed random variable with mean $\mu_1$ and
variance $\sigma_1^2$ for one type of firms and with mean $\mu_1$ and variance $\sigma_2^2$ for the other type of firms. The probability for a firm to be type I and type II will be $\rho$ and $1 - \rho$ ($0 \leq \rho \leq 1$) respectively. Thus the true earnings $x$ follow a mixed normal distribution

$$\varphi(x) = \rho \varphi_1(x) + (1 - \rho) \varphi_2(x).$$

(1)

When a firm’s true earning $x$ is less than the threshold value $\alpha$, the firm may engage in EM and the reported earning $y$ will be greater than or equal to the threshold value $\alpha$. The disincentive to engage in EM when true earnings are much lower than the threshold values can be captured by an exponential function and the likelihood for EM can be written as

$$P(x) = \kappa_0 e^{-\kappa_1 (x - \alpha)}$$

(2)

In equation (2), $\kappa_0$ is the probability for a firm to do EM if its true earning is just below $\alpha$. Similarly, $\kappa_1$ is the disincentive for a firm to manage earnings as its earning falls further away below the threshold value.

In addition, because of the disincentive to report earnings much greater than the threshold value, the reported earnings distribution becomes

$$f(y/EM) = \begin{cases} \hat{\lambda} e^{-\hat{\lambda}(y - \alpha)} & y \geq \alpha \\ 0 & y < \alpha \end{cases}$$

(3)

where $\hat{\lambda}$ characterizes the distribution of the reported earnings for firms that employ EM. It indicates that the proportion of firms managing earnings is lower when the reported earning is further away from the threshold value.

Combining equation (1) to (3), the distribution function of the reported earnings for the whole sample (firms with and without EM) becomes
\[ f(y) = \int_{-\infty}^{\infty} f(y|x) \varphi(x) dx \]

\[
= \begin{cases} 
(1 - P(y))\varphi(y) & y < \alpha \\
\int_{-\infty}^{\alpha} \varphi(x)P(x)dx + \varphi(y) & y \geq \alpha
\end{cases} 
\]  

(4)

This distribution function is very intuitive. When the true earning \( x < \alpha \), the probability to avoid EM is \( 1 - P(x) \), therefore the reported earning density at the point \( y = x \) is \( (1 - P(y))\varphi(y) \). There are \( \int_{-\infty}^{\alpha} \varphi(x)P(x)dx \) firms engaging in EM and the reported earnings \( y \) will follow a distribution \( f(y/EM) \). When \( x > \alpha \), firms do not need to engage in EM, and will report the true earnings with the probability of \( \varphi(y) \). Therefore, the total probability for firms reporting an earning of \( y \) that is larger than \( \alpha \) is \( \int_{-\infty}^{\alpha} \varphi(x)P(x)dx + \varphi(y) \).

Subsequently, if we know the reported earning \( y \), we can apply the maximum likelihood estimate to obtain the parameters \( \rho, \mu, \sigma_1, \mu_2, \sigma_2 \) for the distribution of the estimated true earnings. Meanwhile, we can estimate the parameters \( \kappa_0, \kappa_1, \lambda \) for EM. Finally, we can apply the parameter estimates to compute the frequency and magnitude of EM.

### 4.2. Empirical Tests

Following Burgstahler and Dichev (1997) and DeGeorge, Patel and Zeckharsen (1999), we apply two thresholds to examine the frequencies and magnitudes of EM. The first threshold is to report a positive earning and the second is to report an earning higher

1 See appendix for discussion of the model.
than that of previous year. Degeorge, Patel and Zeckhauser (1999) detail various justifications of using such thresholds to examine EM.

1) Report earnings to avoid losses

Degeorge et al. (1999) argue that when a firm’s earning is slightly less than zero, it might engage in EM and report a small positive earning. Clearly, a negative earning suggests that the company remains unprofitable and may have an unfavorable effect on managers’ compensation and stock price. The incentive for firms to beat the zero earning threshold is also found in Burgstahler and Dichev (1997) and Hayn (1995). It is worth noting that sometimes firms might choose not to meet the zero earning threshold. Instead they would take larger losses in the current period and bank some earnings for the subsequent period. The practice of “taking a big bath” occurs when a firm magnifies its loss in an attempt to report a much higher earning in the future. If this happens, the earnings will not show up near the threshold and using the reported earnings distribution to uncover EM may not identify such practice.

We obtain all the listed firms between 1997 and 2004 using SinoFin database and remove banks and financial institutions. The measure of earnings is net income scaled by the beginning-of-the-year market value of common equity\(^2\). In total, our sample includes 8,417 firm-year observations (see Panel A, Table 1). We drop those observations with earnings less than \(-0.38\) or greater than 0.4 as outliers\(^3\). This interval is chosen based on distribution symmetry and parameter estimation stability. Degeorge et al. (1999) take a similar approach to treat outliers. This practice allows us to construct a distribution

\(^2\) Other measures of earnings are also used to ensure the robustness of our results. We replace net income by pre-tax earnings. We also use market value of equity and book value of equity to scale earnings.

\(^3\) We also apply other intervals such as \((-0.33, 0.35), (-0.43, 0.45)\) and the estimations are quite stable and the results are materially similar to those reported in Table 1.
density function that gives a high goodness-of-fit between our estimated distribution and
the underlying sample distribution. The above interval includes 8,387 firm-year
observations (99.64% of the total sample).

Insert Table 1 Here

In Panel B of Table 1, we report the values for parameter estimations and the
associated standard deviations. The ratio of parameter estimation value to the standard
deviation is approximately t-distributed and it can be used to test the significance of
parameter coefficient. First of all, we see that the parameter $\rho$ is significantly different
from zero and one, suggesting that the distribution of the true earnings is indeed non-
normal. This provides the statistical support for using a mixed-normal distribution to
model earnings. The means and standard deviations for the mixed-normal distribution are
estimated through $\mu_1, \sigma_1$ and $\mu_2, \sigma_2$. More importantly, for the full sample, we can
compute the $t$-statistic for $\kappa_0$ in equation (2) is 158.13 (0.9962/0.0063), meaning that $\kappa_0$
is significantly different from zero. Hence we cannot reject the hypothesis that EM exists
in the sample. $\kappa_1$ is significantly positive demonstrating that the probability for firms to
manage earnings diminishes as their true earnings fall further below the threshold value.
Meanwhile $\lambda$ is significantly positive suggesting the disincentives to report earnings that
are too far away from the threshold value. Although not reported in the table, we also find
consistent parameter estimations in each yearly sample from 1997 to 2004.

In Panel C of Table 1, we report some factors that reflect the goodness-of-fit of
our tailored distribution. For the actual sample and our fitted distribution, we examine the
differences in mean, standard deviation and percentage of observations with negative
earnings to evaluate the goodness-of-fit of our estimated distribution. The actual sample has a mean of 0.0125 and a standard deviation of 0.0420, while our estimated distribution has a mean 0.0125 and a standard deviation 0.0421. In the actual sample there are 10.78% observations reporting negative earnings, and our estimated model predicts 10.94%. A separate year-by-year analysis also conforms that the goodness-of-fits are very high for each individual sample. Figure 1 demonstrates the goodness-of-fit for the whole sample. Earnings density function generated by our model (the solid line) is plotted against the actual reported earnings (the histogram bars). We can see that they match very closely with each other.

**Insert Figure 1 Here**

Panel D of Table 1 reports the frequency and magnitude of EM for the whole sample. We find that 19.91% of our sample manages earnings to avoid losses. For those firms performing EM, the mean estimate of true earnings is –0.0134 and the mean reported earning is 0.0239. Therefore the total magnitude of EM is 0.0373: the difference between the mean of reported earnings and the mean of true earnings. In the case of managing earnings to avoid reporting losses, earnings as measured by net income scaled by the beginning-of-the-year market value of common equity are managed upward by 3.73 cents for every Chinese RMB of stock price. If we multiply the total magnitude of EM by the frequency of EM, we can obtain the average magnitude of EM in the whole sample. In this case, the average magnitude of EM is 0.74 cents for every Chinese RMB of stock price between 1997 and 2004 with the lowest amount appears in 1997 and the largest amount takes place in 2003 (see Panel E, Table 1).
The frequency and magnitude of EM are also shown in Figure 1. The histogram bars represent the reported earnings and the solid curve is the earnings distribution density function representing the distribution of the histogram bars. The dotted curve is the estimated true earnings distribution density function. The area between the two curves to the left of the threshold value represents the true earnings distribution of those firms that perform EM. The area between these two curves to the right of the threshold value represents the distribution of reported earnings by those firms that manage earnings.

2) Report earnings to avoid earnings decreases

The incentive to avoid reporting earnings decreases has been widely documented in the literature. Barth, Elliott and Finn (1999) show that firms that consistently report higher earnings command higher price-to-earnings multiples. DeAngelo, DeAngelo and Skinner (1996), Burgstahler and Dichev (1997), and Degeorge, Patel and Zeckhauser (1999) provide strong evidence about why and how firms avoid reporting earnings decreases.

To study if companies report earnings to avoid earnings decreases, we require the sample firms to have earnings information for two consecutive years and retain observations for which changes in earnings can be computed between two consecutive years. Changes in earnings between year t-1 and t are scaled by the beginning-of-the-year market value of equity from year t-1. The sample for this group contains 7,558 firm-year observations (see Panel A in Table 2). We then apply various intervals and attempt to use the largest interval available with a high level of goodness-of-fit. As reported in Panel A

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4 Other measures of earnings are also used to ensure the robustness of our results. We replace difference in net income by difference in pre-tax earnings. We also use market value of equity and book value of equity to scale earnings.
Table 2, using the interval (-0.4, 0.4) we include 7,529 observations (99.60% of the overall sample). Our results are robust using other intervals as well.\footnote{We also apply other intervals such as (-0.3, 0.3), (-0.5, 0.5) and the results are all similar to those reported using interval (-0.4, 0.4).}

**Insert Table 2 Here**

We see that parameter estimate for $\kappa_0$ is significantly different from zero in Panel B of Table 2. This shows that firms actively manage earnings to avoid earnings decreases. Interestingly, the parameter estimate for $\kappa_i$ is very close to zero, suggesting that probabilities for firms to manage earnings do not change significantly as their earnings fall further below the threshold value. The interpretations for other parameters listed in Panel B of Table 2 are similar to those in Table 1.

Panel C of Table 2 reports the goodness-of-fit for our tailored distributions. Both mean and standard deviation of our fitted values are very close to the actual sample mean and standard deviation. Similar statistics are also computed for the yearly sample and we consistently find a high goodness-of-fit between our estimated distribution and the actual sample. Figure 2 plots the goodness-of-fit for the full sample. It shows the goodness-of-fit between our fitted values (the solid line) and the reported values (the histogram bars). We can see that our estimated earnings distribution fits very well with the reported earnings distribution.

**Insert Figure 2 Here**

Panel D of Table 2 shows the frequency and magnitude of EM. We find 6.03 % of the observations in the sample managing earnings to avoid earnings decreases. It suggests
that for the overall sample the frequency of EM to avoid earnings decreases is less than the frequency of EM to avoid earnings losses (19.91 % Panel D Table 1). We also notice in Panel E of Table 2 that the frequency of EM is higher between 2002 and 2004.

For the full sample of firms whose earnings experience declines from year t-1 to t, the actual magnitude of decline is 0.0225 and the reported increase in earnings is 0.0011, resulting in a total magnitude of EM of 0.0236. Since the total magnitude of EM is 0.0236 and the frequency of EM is 0.0603, we can calculate the average magnitude of EM for our sample firms is 0.14 cents for every Chinese RMB of stock price. In Panel E of Table 2, we see that the magnitude of EM starts to increase after 2001. At the same time, we observe the amount is often lower than that in Table 1. This shows that the incentive to report earnings increase is generally lower than the incentive to report positive earnings.

Figure 2 depicts the frequency and magnitude of EM to avoid earnings decreases. Similar to the earlier discussions, the area to the left of zero between the dotted line and the solid line represents the estimated true earnings distribution for firms that perform EM. The area between these two curves to the right of the threshold value represents the actual earnings distribution reported by firms that manage earnings.

3) Time-series and multi-threshold analyses

Next, we conduct a series of statistical analyses and highlight how the frequencies and magnitudes of EM differ around different thresholds and time periods. In Table 3, we use the annual estimates of frequency and magnitude of EM found in Panel E of Table 1 and 2 to compute the differences in mean and median around different thresholds. We see
that the frequency and magnitude of EM are significantly higher for avoiding negative earnings threshold than for avoiding earnings decreases threshold. The differences in mean and median are significant at the 5% level. These are consistent with the results presented in the earlier sections.

**Insert Table 3 Here**

To understand the trend in earnings management across time, we run separate regression analyses where we use the frequency or the average magnitude of EM as the dependent variable and Year as the independent variable. In Panel A of Table 4, the dependent variable is the frequency of EM. We find that coefficients for the Year variable are both positive for loss aversion EM and decrease avoidance EM. The overall results suggest that the incentives to manage earnings are becoming greater in recent years. In addition, the coefficient for the model of avoiding losses is 0.0484, much higher than the coefficient (0.0052) for the model of avoiding decreases. Approximately, the frequency of EM to avoid earnings losses increases ten times faster than the frequency of EM to avoid earnings decreases. The above results can also be shown visually in Figure 3. Overall, we observe a higher frequency of EM for firms trying to avoid losses over time. However, the difference is small between 1997 and 2000. After 2000, the frequency of EM to avoid losses increase at a much higher rate than the frequency of EM to avoid earnings decreases.

**Insert Table 4 Here**

**Insert Figure 3 Here**
In Panel B of Table 4, the dependent variable is the average magnitude of EM. Coefficients for Year variable are positive for both thresholds suggesting that the average magnitude of EM is increasing for firms trying to avoid losses and earnings decreases. We also see that the coefficient for the model of avoiding losses is 0.0024 while the coefficient for the model of avoiding decreases is 0.0001. The difference in the coefficients suggests that the magnitude of EM to avoid negative earnings is rising at a greater speed (24 times faster) than the magnitude of EM to avoid earnings decreases. This pattern can also be seen in Figure 4. We can see that from 2001 to 2004, the magnitude of EM to report positive earnings is much greater than the magnitude of EM to report earnings increases.

5. Conclusions

The quality of accounting disclosure plays a critical role in maintaining an efficient capital market. Earnings management is the commonly used indicator that represents the quality of corporate governance and investor protection. It also suggests the effectiveness of market regulation and policy enforcement. As China moves into the market economy and becomes an active participant in the world economy, Chinese stock market is drawing investors from all over the world. A comprehensive study of the frequency and magnitude of earnings management allows investors to properly account for the investment risk in China.

In this paper, we study the frequency and magnitude of earnings management under two different thresholds, zero earnings and prior earnings, in the Chinese market.
from 1997 to 2004. Using a mixed-normal distribution, we model the distribution of earnings and obtain parameter estimators that measure the frequency and magnitude of earnings management. We show that the practice of earnings management has gone up both in frequency and magnitude during the post 2000 period. We also find that the frequency and magnitude of earnings management are higher when firms try to avoid negative earnings than when firms try to report earnings increases. Overall, the frequency and magnitude of EM are much greater than those found in the U.S. market (Burgstahler and Dichev, 1997; Degeorge, Patel and Zeckhauser, 1999; Chen, Lin, Wang and Wu, 2005). This is consistent with earlier discussions regarding the economic environment in China. One indirect result of being an “unfree” economy is that Chinese market remains opaque and the disclosure quality continues to be low.

Both investors and regulators should be cautious about the increases in both the frequency and magnitude of EM in the Chinese market. Enforcing an effective mechanism to monitor the occurrence of EM, and introducing regulations to discourage self-dealing activities by management should be the major tasks for the Chinese government if China aims to fully embrace the market economy and actively raise capital in international markets.
References


Table 1: Frequency and Magnitude of EM: the Case of Avoiding Losses

The data is from 1997 to 2004. Our measure of earnings is net income scaled by the beginning-of-the-year market value of common equity. To facilitate the analysis, our sample retains observations with earnings between -0.38 and 0.40. In Panel A, % of observations used is defined as number of observations within the interval divided by total number of observations. Parameters in Panel B are defined in equation (1) through (3). In Panel C the reported (estimated) mean and standard deviation represent parameters for reported (estimated) earnings distributions. % reported (estimated) negative is the percentage of observations with reported (estimated) negative earnings. In Panel D, frequency is defined as the number of observations doing EM divided by the number of observations within the sample. Mean of TE stands for the mean of estimated true earnings. It is the average estimated true earnings for earnings management firms. Mean of RE is the mean of reported earnings. It is the average observable reported earnings for earnings management firms. Total magnitude is defined as the difference between the mean of reported earnings and the mean of true earnings. Average magnitude is computed by multiplying total magnitude of EM by the frequency of EM. Panel E reports the frequency and magnitude of EM by year.

Panel A: Sample Description

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<th># of obs.</th>
<th># of obs. within the interval</th>
<th>% of obs. used</th>
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<td>8,387</td>
<td>99.64</td>
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</table>

Panel B: Parameter Estimation (Standard deviation is reported in parentheses)

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<th>( \rho )</th>
<th>( \mu_1 )</th>
<th>( \sigma_1 )</th>
<th>( \mu_2 )</th>
<th>( \sigma_2 )</th>
<th>( \kappa_0 )</th>
<th>( \kappa_1 )</th>
<th>( \lambda )</th>
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<td>(0.0070)</td>
<td>(0.0005)</td>
<td>(0.0063)</td>
<td>(1.5399)</td>
<td>(3.2595)</td>
</tr>
</tbody>
</table>

Panel C: Goodness-of-Fit

<table>
<thead>
<tr>
<th>Reported (estimated) mean</th>
<th>Reported (estimated) standard deviation</th>
<th>Reported (estimated) % negative</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0125 (0.0125)</td>
<td>0.0420 (0.0421)</td>
<td>10.7786 (10.9377)</td>
</tr>
</tbody>
</table>

Panel D: Frequency and Magnitude of EM

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Mean of TE</th>
<th>Mean of RE</th>
<th>Total magnitude</th>
<th>Average magnitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1991</td>
<td>-0.0134</td>
<td>0.0239</td>
<td>0.0373</td>
<td>0.0074</td>
</tr>
</tbody>
</table>

Panel E: Frequency and Magnitude by Year

<table>
<thead>
<tr>
<th>Year</th>
<th># of obs.</th>
<th>Frequency</th>
<th>Average magnitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>1997</td>
<td>715</td>
<td>0.0322</td>
<td>0.0010</td>
</tr>
<tr>
<td>1998</td>
<td>819</td>
<td>0.0489</td>
<td>0.0015</td>
</tr>
<tr>
<td>1999</td>
<td>916</td>
<td>0.0910</td>
<td>0.0032</td>
</tr>
<tr>
<td>2000</td>
<td>1051</td>
<td>0.1011</td>
<td>0.0038</td>
</tr>
<tr>
<td>2001</td>
<td>1127</td>
<td>0.2942</td>
<td>0.0069</td>
</tr>
<tr>
<td>2002</td>
<td>1189</td>
<td>0.3672</td>
<td>0.0122</td>
</tr>
<tr>
<td>2003</td>
<td>1248</td>
<td>0.3281</td>
<td>0.0162</td>
</tr>
<tr>
<td>2004</td>
<td>1322</td>
<td>0.2672</td>
<td>0.0145</td>
</tr>
</tbody>
</table>
Table 2: Frequency and Magnitude of EM: the Case of Avoiding Decreases

The data is from 1997 to 2004. Our measure of earnings is difference in earnings between year t-1 and t scaled by the beginning-of-the-year market value of equity from year t – 1. To facilitate the analysis, our sample retains observations with earnings between -0.40 and 0.40. In Panel A, % of observations used is defined as number of observations within the interval divided by total number of observations. Parameters in Panel B are defined in equation (1) through (3). In Panel C the reported (estimated) mean and standard deviation represent parameters for reported (estimated) earnings distributions. % reported (estimated) negative is the percentage of observations with reported (estimated) negative earnings. In Panel D, frequency is defined as the number of observations doing EM divided by the number of observations within the sample. Mean of TE stands for the mean of estimated true earnings. It is the average estimated true earnings for earnings management firms. Mean of RE is the mean of reported earnings. It is the average observable reported earnings for earnings management firms. Total magnitude is defined as the difference between the mean of reported earnings and the mean of true earnings. Average magnitude is computed by multiplying total magnitude of EM by the frequency of EM. Panel E reports the frequency and magnitude of EM by year.

Panel A: Sample Description

<table>
<thead>
<tr>
<th># of obs.</th>
<th># of obs. within the interval</th>
<th>% of obs. used</th>
</tr>
</thead>
<tbody>
<tr>
<td>7,558</td>
<td>7,529</td>
<td>99.60</td>
</tr>
</tbody>
</table>

Panel B: Parameter Estimation (Standard deviation is reported in parentheses)

<table>
<thead>
<tr>
<th>$\rho$</th>
<th>$\mu_1$</th>
<th>$\sigma_1$</th>
<th>$\mu_2$</th>
<th>$\sigma_2$</th>
<th>$\kappa_0$</th>
<th>$\kappa_1$</th>
<th>$\lambda$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.2489</td>
<td>-0.0077</td>
<td>0.0854</td>
<td>-0.003</td>
<td>0.0095</td>
<td>0.0999</td>
<td>0.0000</td>
<td>937.88</td>
</tr>
</tbody>
</table>

(0.0155) (0.0065) (0.0019) (0.0016) (0.0020) (0.0307) (16.0769) (118.81)

Panel C: Goodness-of-Fit

<table>
<thead>
<tr>
<th>Reported (estimated) mean</th>
<th>Reported (estimated) standard deviation</th>
<th>Reported (estimated) % negative</th>
</tr>
</thead>
<tbody>
<tr>
<td>-0.0027 (-0.0028)</td>
<td>0.0422 (0.0423)</td>
<td>56.32 (54.27)</td>
</tr>
</tbody>
</table>

Panel D: Frequency and Magnitude of EM

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Mean of TE</th>
<th>Mean of RE</th>
<th>Total magnitude</th>
<th>Average magnitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0603</td>
<td>-0.0225</td>
<td>0.0011</td>
<td>0.0236</td>
<td>0.0014</td>
</tr>
</tbody>
</table>

Panel E: Frequency and Magnitude by Year

<table>
<thead>
<tr>
<th>Year</th>
<th># of obs.</th>
<th>Frequency</th>
<th>Average magnitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>1997</td>
<td>506</td>
<td>0.0279</td>
<td>0.0009</td>
</tr>
<tr>
<td>1998</td>
<td>713</td>
<td>0.0613</td>
<td>0.0015</td>
</tr>
<tr>
<td>1999</td>
<td>819</td>
<td>0.0588</td>
<td>0.0019</td>
</tr>
<tr>
<td>2000</td>
<td>915</td>
<td>0.0683</td>
<td>0.0016</td>
</tr>
<tr>
<td>2001</td>
<td>1044</td>
<td>0.0470</td>
<td>0.0011</td>
</tr>
<tr>
<td>2002</td>
<td>1118</td>
<td>0.0777</td>
<td>0.0016</td>
</tr>
<tr>
<td>2003</td>
<td>1184</td>
<td>0.0771</td>
<td>0.0017</td>
</tr>
<tr>
<td>2004</td>
<td>1230</td>
<td>0.0737</td>
<td>0.0023</td>
</tr>
</tbody>
</table>
Table 3: Comparisons of EM around Different thresholds

Frequency of EM is defined as the number of observations doing EM divided by the number of observations within our sample. Average magnitude is computed by multiplying total magnitude of EM by the separate frequency of EM. Total magnitude is defined as the difference between the mean of reported earnings and the mean of estimated true earnings. Avoiding losses refers to the incentive of doing EM to avoid reporting negative earnings. Avoiding decreases is the incentive of doing EM to avoid reporting earnings decreases. The difference in mean (median) is the difference between the avoiding losses incentive and the avoiding decreases incentive. The difference in mean is tested using $t$-statistics. The difference in median is tested using non-parametric Wilcoxon Singed-rank tests.

<table>
<thead>
<tr>
<th>Difference in Mean</th>
<th>t Value</th>
<th>Difference in Median</th>
<th>Singed Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>0.1298</td>
<td>2.89**</td>
<td>0.1131</td>
</tr>
<tr>
<td>Average magnitude</td>
<td>0.0059</td>
<td>2.84**</td>
<td>0.0040</td>
</tr>
</tbody>
</table>

*** significant at the 1% level; ** significant at the 5% level; * significant at the 10% level
Table 4: Characteristics of EM through time

The dependent variable is the frequency of EM in Panel A and the average magnitude of EM in Panel B. Frequency of EM is defined as the number of observations doing EM divided by the number of observations within our sample. Average magnitude of EM is computed by multiplying total magnitude of EM by the respective frequency of EM. Total magnitude is defined as the difference between the mean of reported earnings and the mean of estimated true earnings. The independent variable is Year. Year 1997, 1998… is set to 1, 2 … and year 2004 is set to 8. Avoiding losses refers to the incentive of doing EM to avoid reporting negative earnings. Avoiding decreases is the incentive of doing EM to avoid reporting earnings decreases. The regression is ordinary least squares regression and the t-statistics are reported in parentheses.

<table>
<thead>
<tr>
<th></th>
<th>Avoiding losses</th>
<th>Avoiding decreases</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Panel A: Change in Frequency</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
<td>0.0561</td>
<td>0.0382</td>
</tr>
<tr>
<td></td>
<td>(-0.47)</td>
<td>(3.95*** )</td>
</tr>
<tr>
<td>Year</td>
<td>0.0484</td>
<td>0.0052</td>
</tr>
<tr>
<td></td>
<td>(4.32*** )</td>
<td>(2.70* )</td>
</tr>
<tr>
<td>F Value</td>
<td>18.68***</td>
<td>7.31**</td>
</tr>
<tr>
<td>Adj R-square</td>
<td>0.7164</td>
<td>0.4740</td>
</tr>
<tr>
<td><strong>Panel B: Change in Average Magnitude</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
<td>-0.0032</td>
<td>0.0011</td>
</tr>
<tr>
<td></td>
<td>(-2.03* )</td>
<td>(3.67** )</td>
</tr>
<tr>
<td>Year</td>
<td>0.0024</td>
<td>0.0001</td>
</tr>
<tr>
<td></td>
<td>(7.65*** )</td>
<td>(2.01* )</td>
</tr>
<tr>
<td>F Value</td>
<td>58.47***</td>
<td>4.02*</td>
</tr>
<tr>
<td>Adj R-square</td>
<td>0.8914</td>
<td>0.3016</td>
</tr>
</tbody>
</table>

*** significant at the 1% level; ** significant at the 5% level; * significant at the 10% level
Figure 1: Manage Earnings to Avoid Losses

Earnings are measured as net income scaled by the beginning-of-the-year market value of common equity. The histogram bars are the reported earnings. The solid line is the fitted distribution of the reported earnings. The dotted line is the distribution of estimated true earnings. The nearness between the histogram bars and the solid line measures the goodness-of-fit. The area between the dotted line and the solid line represents earnings management firms. The area to the left of zero between the dotted line and the solid line represents the estimated true earnings distribution of earnings management firms. The area between the two curves to the right of zero is the reported earnings distribution of earnings management firms.
Figure 2: Manage Earnings to Avoid Earnings Decreases

Earnings are measured by differences in earnings between year t-1 and t scaled by the beginning-of-the-year market value of equity from year t-1. The histogram bars are the reported earnings. The solid line is the fitted distribution of the reported earnings. The dotted line is the distribution of estimated true earnings. The nearness between the histogram bars and the solid line measures the goodness-of-fit. The area between the dotted line and the solid line represents earnings management firms. The area to the left of zero between the dotted line and the solid line represents the estimated true earnings distribution of earnings management firms. The area between the two curves to the right of zero is the reported earnings distribution of earnings management firms.
Figure 3: Frequencies of Earnings Management through Time

Frequency of EM is defined as the number of observations doing EM divided by the number of observations within our sample. Avoiding losses refers to the incentive of doing EM to avoid reporting negative earnings. Avoiding decreases is the incentive of doing EM to avoid reporting earnings decreases.
Figure 4: Average Magnitudes of Earnings Management through Time

Average magnitude of earnings management is computed by multiplying total magnitude of EM by the frequency of EM. Total magnitude is defined as the difference between the mean of reported earnings and the mean of true earnings. Frequency of EM is defined as the number of observations doing EM divided by the number of observations within our sample. Avoiding losses refers to the incentive of doing EM to avoid reporting negative earnings. Avoiding decreases is the incentive of doing EM to avoid reporting earnings decreases.
Appendix

According equation (1) to (4), percentage of firms in the whole sample that conduct EM can be calculated as

\[
\int_{-\infty}^{a} \varphi(x)P(x)dx.
\]  

(5)

Difference between the mean of the true earnings and the threshold value for firms that conduct EM can be calculated as

\[
\int_{-\infty}^{a} x\varphi(x)P(x)dx \div \int_{-\infty}^{a} \varphi(x)P(x)dx.
\]  

(6)

Difference between the mean of the reported earnings and the threshold value for firms that conduct EM can be calculated as

\[
\int_{a}^{\infty} yf(y/EM)dy = \frac{1}{\lambda}.
\]  

(7)

Hence, the total magnitude of EM is the sum of equation (6) and (7).

In equation (4) – (7)

\[
\int_{-\infty}^{a} \varphi(x)P(x)dx = \rho \kappa \Phi \left( \frac{a - \mu_{1} - \sigma_{1}^{2} \kappa_{1}}{\sigma_{1}} \right) \exp \left[ \left( \mu_{1} - a \right) \kappa_{1} + \frac{\sigma_{1}^{2} \kappa_{1}^{2}}{2} \right]
\]

\[
+ (1 - \rho) \kappa \Phi \left( \frac{a - \mu_{2} - \sigma_{2}^{2} \kappa_{1}}{\sigma_{2}} \right) \exp \left[ \left( \mu_{2} - a \right) \kappa_{1} + \frac{\sigma_{2}^{2} \kappa_{1}^{2}}{2} \right]
\]

\[
\int_{-\infty}^{a} \varphi(x)dx = \rho \Phi \left( \frac{a - \mu_{1}}{\sigma_{1}} \right) + (1 - \rho) \Phi \left( \frac{a - \mu_{2}}{\sigma_{2}} \right)
\]
\[
\int_{-\infty}^{a} x\varphi(x)P(x)dx = \\
\rho \kappa_{0} \exp \left[ \left( \mu_{1} - a \right) \kappa_{1} + \frac{\sigma_{1}^{2} \kappa_{1}^{2}}{2} \right] \left\{ \Phi \left( \frac{a - \mu_{1} - \sigma_{1}^{2} \kappa_{1}}{\sigma_{1}} \right)(\mu_{1} + \sigma_{1}^{2} \kappa_{1}) - \frac{\sigma_{1}}{\sqrt{2\pi}} \exp \left[ -\frac{(a - \mu_{1} - \sigma_{1}^{2} \kappa_{1})^{2}}{2\sigma_{1}^{2}} \right] \right\} \\
+(1 - \rho) \kappa_{0} \exp \left[ \left( \mu_{2} - a \right) \kappa_{1} + \frac{\sigma_{2}^{2} \kappa_{1}^{2}}{2} \right] \left\{ \Phi \left( \frac{a - \mu_{2} - \sigma_{2}^{2} \kappa_{1}}{\sigma_{2}} \right)(\mu_{2} + \sigma_{2}^{2} \kappa_{1}) - \frac{\sigma_{2}}{\sqrt{2\pi}} \exp \left[ -\frac{(a - \mu_{2} - \sigma_{2}^{2} \kappa_{1})^{2}}{2\sigma_{2}^{2}} \right] \right\}
\]

( where \( \Phi(\cdot) \) is the standard normal distribution function )