Front. Bus. Res. China 2009, 3(2): 301–322
DOI 10.1007/s11782-009-0015-1

RESEARCH ARTICLE

**ZHANG Ran**

# Cash flow management in the Chinese stock market: An empirical assessment with comparison to the U.S. Market



**Abstract** This paper examines cash flow management in the Chinese market and compares it to that in the U.S. market. It adopts Burgstahler and Dichev (1997) and Degeorge et al.'s (1999) method and the best-fitted distribution model to analyze the financial data of Chinese listed firms during 1998–2005 and the forecasted cash flow per share (CPS) data for Chinese firms in the I/B/E/S database during 1993–2005. Results reveal that cash flows reports are not as reliable as people think, and managers manipulate cash flows just as they manipulate earnings.

Further analyses show that zero point, last year's cash flow and analyst cash flow forecast are the three thresholds that influence managers' decision when they report cash flow performance. Over 16% of the firms with small positive cash flows manipulate their cash flow. Moreover, 16.64% of the firms with small changes in cash flow and 9.81% of the firms with small surprises manipulate cash flows to reach the targets. A comparative analysis shows that cash flow management behaviors around zero and zero changes are more prevalent in the Chinese market than in the U.S. market. Cash flow management around analyst cash flow forecasts, however, is no more prevalent than that in the U.S. market.

**Keywords** cash flow management, earnings management, thresholds

**摘要** 为了研究中国股市经营现金流量管理行为，运用 Burgstahler and Dichev (1997)、Degeorge et al. (1999) 的方法和最佳拟合曲线模型，通过考察 1998－2005 年间中国上市公司财务数据及 1993－2005 年间 I/B/E/S 数据库中中国上市公司的每股现金流量预测数据，发现企业报告的经营现金流量，像盈余一样，受到了公司管

Translated and revised from *Zhongguo Kuaiji Pinglun* 中国会计评论 (China Accounting Review), 2007, 5(3): 381–400

ZHANG Ran (✉)
Guanghua School of Management, Peking University, Beijing 100871, China
E-mail: rzhang@gsm.pku.edu.cn

理层的控制和操纵。这不同于与以往“现金为王”、“现金流量不可操纵”的观点。由此，提出了与“盈余管理”相对应的概念：“现金流管理”。

进一步的研究显示：0 点，往年的经营现金流量和分析师对现金流量的预测是中国上市公司现金流分布的三个显著的阈值点。16.41%的报告微正现金流量的公司是通过操纵行为来达到报告正现金流量的目的，此外，分别有 16.64%和 9.81%的报告微正变化和微正预测差异的公司同样是通过操纵行为来达到往年现金流量和分析师预测现金流量的目的。对比分析显示，中国 A 股上市公司前两个阈值点的现金流管理比美国上市公司更普遍。

**关键词** 现金流管理，盈余管理，阈值

## 1 Introduction

Operating cash flow (OCF) is an important gauge for performance and valuation of companies (Rayburn, 1986; Dechow et al., 1998). Graham et al.'s (2005) survey of 401 financial executives finds that 21.4% of chief financial officers rank cash flows and free cash flows as the most important performance measures, comparing to 51.6% who rank earnings as the most important. Nwaeze et al. (2006) find that OCF is more important than earnings in managers' performance evaluation and the determination of their compensation and reward. Zhao (2004) argues that OCF is value relevant in the Chinese stock market. The entire body of the literature is based on one assumption: OCF is different from earnings in that it is the reflection of the true cash inflow and outflow of a firm, and thus it cannot be managed as the earning, and is more reliable.

Anecdotal evidence also suggests that analysts and investors, burned by the trust they have placed in reported earnings in an era of questionable accounting ever since Enron, are focusing more on cash flow from operating activities as an indicator of financial health. All those claims are also based on the assumption that OCF is reliable and cannot be manipulated.

However, this paper finds that, contrary to people's expectation, managers can manipulate OCFs to mislead information users. In a mature market, there are several ways for managers to manipulate OCFs, including selling receivables, transferring in and out of trading securities, decreasing working capital, turning trade credit into cash, and capitalizing operating costs (Zhang, 2006). In China's stock market, companies could also manipulate OCFs by ways either within the Chinese GAAP or beyond it. Selling receivables and delaying the payment of accounts receivables or other receivables are methods of manipulating OCFs within the boundary of the Chinese GAAP. While, listing financing or investing cash inflows into "Cash Inflow from Other Operating Activities", an item in the cash flow statement, is a method of manipulating OCFs beyond the boundary of

the Chinese GAAP. For example, the reported OCF for the year 2003 is –35 095 621.56 Yuan for Chengshang Group (stock code 600828), a Chinese listed firm. Its 2003 annual report disclosed that "Cash Inflow from Other Operating Activities" is 39 412 912.84 Yuan, which includes 19 368 518 Yuan received accounts receivables from Chengdu State-owned Asset Administration Bureau, 7 000 000 Yuan received accounts receivables from Chengdu Yellow River Commercial City, and the cash received on incomings and outgoings by its subsidiary firm Chengshang Chuanbei Company. The above cash received, however, should not be listed in Cash Flow from Operating Activities, but should be listed in Cash Flow from Investment Activities in the cash flow statement.

The current U.S. and Chinese GAAP have offered alternatives for managers to manipulate reported OCFs, and the importance of OCFs also provides incentives for managers to do so. Under these circumstances, it is very likely that managers manipulate OCFs just as they manipulate earnings to mislead investors in their evaluation of firms' performance. This paper investigates the significance and prevalence of OCF management in the China's stock market and then compares the results with that in the mature market. The aim is to examine the characteristics of OCF management in the emerging stock markets.

This research adopts Burgstahler and Dichev (BD 1997) and Degeorge et al.'s (DPZ 1999) method and the best-fitted distribution model, basing on the financial data of Chinese listed firms during 1998–2005 and the forecasted CPS (cash flow per share) data for Chinese firms in the I/B/E/S database during 1993–2005. It finds that cash flows report is not as reliable as people think, managers manipulate cash flows just as they do with earnings. Further results show that zero point, last year's cash flows and analyst cash flow forecasts are the three thresholds that influence managers' decisions when they report cash flow performance. Comparison analysis shows that the cash flow management behavior around zero and zero changes are more prevalent in the Chinese market than in the U.S. market. The OCF management around analyst forecast, however, is no more prevalent than that in the mature market.

This paper is among the first to examine the thresholds of cash flow management in China, the world's largest emerging market, and compares them with the U.S. Although research on listed firms' earnings management is quite rich (Sun and Wang, 1999), few paper discusses the manipulation of the Cash Flow Statements.[1] Current research often holds that reported cash flows, different from reported earnings, are hard to be manipulated and thus reliable. However, this paper shows that cash flow information can also be manipulated. Thus, investors and other users of financial statements should not only rely on

[1] Wu et al. (2007) also examine cash flow management in China. However, they use parameter estimation method to forecast cash flow management prevalence.

reported cash flow numbers to evaluate firm performance. Instead, they should carefully investigate whether the reported cash flows are real cash flows from operating activities, whether those cash flows can last for several years. Only in this way, can investors and other financial statement users discover the real performance of the firm and avoid being misled by manipulated financial information. In addition, in the current literature on Chinese firms' cash flow management, this paper is among the first to examine the manipulating behavior of Chinese firms using I/B/E/S database forecasted cash flow information. Results show that Chinese firms included in the I/B/E/S database have the intention to report OCFs that are higher than the analyst forecasted OCFs.

With the increasing importance of OCF, it is important to inform investors that reported OCF could be managed. Otherwise, they may simply believe those reported numbers and make wrong judgments or decisions. Thus, research on the OCF management is important in improving market mechanism and protecting investors. As investors attach more importance on OCF in firm valuation, the research on the OCF management will be increasingly necessary.

The remainder of this paper is organized as follows. Section 2 reviews the literature. Section 3 develops testable hypotheses. Section 4 describes the data collection process, research design and summary descriptive statistics. The main results are reported in section 5. Section 6 summarizes the investigation and findings.

## 2 Literature review

Although a number of studies exploring managers' incentives to manage reported earnings to meet various goals, few studies have considered cash flow manipulation and incentives for such behavior. Zhang (2006) is the first study that questions the reliability of Cash Flow Statements. She analyzed the presence of cash flow management in the U.S. and further investigates the influencing factors of such behavior and its market reaction. There are two academic studies related to cash flow manipulations before Zhang (2006) that examined how firms take real actions to manage reported earnings. One is BD (1997) who plotted the $25^{th}$, $50^{th}$ and $75^{th}$ percentiles of unscaled cash flows for each earnings interval and found that the distribution of cash flows shifts upwards in the first interval to the right of zero. They interpreted this as a sign of cash flow manipulation. However, the focus of their paper is on earnings rather than on cash flow management. The other study was conducted by Roychowdhury in 2006, and is most closely related to the present study. It showed that firms reporting small annual positive profits engage in real activity manipulations to enhance earnings,

thereby also affecting cash flows. He investigates three real activities: sales manipulation, decreasing discretionary expenses and reporting lower cost of goods sold by increasing production. Some of these manipulations would also increase operating cash flows, but others would decrease them. While some of the evidence from these earlier studies prove the existence the management of cash flows, neither study focuses on it explicitly. This paper examines cash flow management in China, the largest emerging market in the world, and further compares its cash flow management with U.S. market to reveal characteristics of cash flow management behavior for Chinese listed firms.

Prior studies (BD, 1997; DPZ, 1999) investigate whether earnings thresholds, i.e. earnings zero point, last-period earnings, and analyst earnings forecast, exist by examining the smoothness of cross-sectional distribution of earnings. If there is no earnings management around those thresholds, the cross-sectional distribution of earnings should be smooth. However, if management manipulates earnings, the cross-sectional distribution of earnings should be unsmooth around the thresholds: There will be fewer firms than expected in the bin just left-next to the threshold and more firms than expected in the bin just right-next to the threshold. Thus, testing whether earnings manipulation exists around thresholds is examining whether the "kink" of earnings distribution is significant. In their models, BD and DPZ assume the distributions of earnings are continuous and smooth around the thresholds. They extrapolate from neighborhood densities to compute the expected density at the threshold and reject the null for statistically significant discontinuities. If a significant discontinuity in the distribution is detected, they interpret it as evidence of earnings management to meet or slightly beat the threshold.[2] I use the statistic method from both BD and DPZ to examine discontinuities in cash flow distributions when the thresholds are not at the peak of the histogram. I use DPZ's statistic when the threshold coincides with the peak and therefore BD's statistic is not applicable.

In examining the prevalence of earnings management, BD use the observed frequencies from intervals in the right half of the earnings distribution as measures of the expected frequencies in the corresponding interval in the left half of the distribution. They make the assumption that in the absence of earnings management, the distribution of earnings would be approximately symmetric. However, this method has the following shortcomings: (1) Foster (1986, Chapter 4) has shown that most financial variables, including earnings and cash flows, are not symmetrically distributed. Basu (1997) and Givoly and Hayn (2000) find that earnings tend to be negatively skewed due to conservatism. (2) Only relying on the value of one point on the cross-sectional distribution to deduce the expected

[2] The difference between BD's statistic method and DPZ's is that the latter is applicable when the threshold coincides with the peak. See BD and DPZ's appendices for detailed explanations.

value of another point may not be reliable. (3) We can only estimate the value of points on one half side of the distribution by this method and it is impossible to estimate values of all points on the whole distribution. To avoid those problems, this paper adopt the goodness-of-fit tests procedure to estimate the frequency of cash flow management in China. The expected frequencies deduced in this model use the entire distribution of cash flows, and it does not have to assume that cash flow distributions are symmetric. The appendix describes this method in detail.

## 3 Hypothesis development

Just as the cross-sectional distribution of earnings show irregularity on zero point, last-period earnings and analyst earnings forecasts, if the reported OCF is manipulated by managers, cross-sectional OCF distribution should also show discontinuity around thresholds.

Managers emphasize particular thresholds because the stakeholders monitoring the firms' performance concentrate on the same thresholds. Outsiders utilize thresholds as standards for judging and rewarding managers. When managers respond to manipulate financial data to reach these thresholds, distributions of reported financial numbers get distorted: The number of reported cash flows that fall just below a threshold would be abnormally few, while the number of reported cash flows that fall just above a threshold would be abnormally large (BD, 1997). Following prior literature (Bowen, 1995; BD, 1997; DPZ, 1999), two theories could explicitly explain the above phenomenon, the first based on transaction costs with stakeholders and the second based on prospect theory.

First, transaction cost theory implies that a firm reporting financial performance lower than a certain threshold bears higher cost in transactions with stakeholders than if the firm had beat that threshold (BD 1997; DPZ 1999). Bowen et al. (1995) and DPZ (1999) discuss incentives to report better performance to boards, investors, employees, customers, suppliers, and other stakeholders. Specifically, Customers, especially influential customers, may be willing to pay a higher price for goods because the firm has strong power to generate cash flows and therefore are likely to honor implicit warranty and service commitments. Suppliers offer better terms because the firm is more likely to make large future purchases. Banks may grant loans only to firms with good cash flow performance. The board may be satisfied only if the firm beats analysts' forecasts; otherwise, the board may think that the managers did a poor job, and the managers' bonuses and stock options awards may suffer (Matsunaga and Park, 2001).

Another explanation is provided by prospect theory, as suggested by Kahneman and Tversky (1979) and BD (1997). Prospect theory postulates that decision-makers derive value from gains and losses with respect to a reference point, rather than from an absolute level of wealth. Individuals' value functions are concave in gains and convex in losses, i.e., value functions are steepest around wealth reference points. Thus, for a given wealth increase, the corresponding increase in value is greatest when the increase in wealth moves the individual from a negative number to a positive number relative to a reference point. Therefore, assuming that the cost of cash flow management to achieve a given amount of cash flow increase is approximately constant, we can expect to observe cash-flow-increasing management around those thresholds.

This leads to the following three hypotheses:

**H1** Managers take actions to report positive cash flows.
**H2** Managers take actions to maintain current cash flow performance.
**H3** Managers take actions to report positive cash flow surprises.

## 4 Sample and research design

### 4.1 Sample selection[3]

This paper uses all available observations with necessary data on the Sinofin database for the 8 years from 1998 to 2005, when the statements of cash flow data are available for Chinese firms. Firms in regulated industries and banks and financial institutions are excluded. We delete firm-year observations: (1) without sufficient financial data to compute cash flows, abnormal cash flows and accrual variables; and (2) missing stock returns. The final sample consists of 9133 firm-year observations.[4] Table 1 shows the detailed sample distribution in the sample period.

[3] For sample selection and description for cash flow management in the U.S. market, refer to Zhang (2006).

[4] Different from Wang et al. (2005), this paper does not delete IPO firms. Although the intention to manipulate CFO for IPO firms may be different from other firms, the aim of this paper is to investigate the significance and prevalence of CFO management for the whole market and thus IPO firms should be included. However, if we exclude IPO firms, main results would not be significantly different.

**Table 1** Annual distribution of the first sample (from Sinofin database)

| Year | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | Total |
|---|---|---|---|---|---|---|---|---|---|
| Firm-year Obs. | 822 | 916 | 1 142 | 1 138 | 1 188 | 1 251 | 1 346 | 1 329 | 9 133 |
| Percent (%) | 9.00 | 10.03 | 12.50 | 12.46 | 13.01 | 13.69 | 14.74 | 14.55 | 100 |

To examine whether managers have the intention to manipulate OCFs above analyst OCF forecasts, this paper uses analyst OCF forecasts from I/B/E/S International to investigate if analyst OCF forecast is a threshold in the cross-sectional cash flow distribution. I/B/E/S collects and summarizes cash flow forecasts from participating analysts just as it does with earnings forecasts for listed firms all over the world.[5] According to the forecast data disclosure method, I/B/E/S has consensus and detailed forecasts. Consensus forecasts include the average or median forecasts of all following analysts of a certain company, while detailed forecasts disclose every forecasted performance of every following analyst of a company. Moreover, I/B/E/S also collects real financial report information for forecasted firms. To make firms in different size comparable, the cash flow information that I/B/E/S collects and discloses is "cash flow per share", defined as OCF divided by weighted shares outstanding for the current year.

We identify all Chinese firms in the I/B/E/S Detail History International Edition tapes for the period 1993 through 2005 with analyst cash flow forecast thresholds. We obtain 7 153 firm-year observations with both forecasted and actual OCFs for Chinese firms from I/B/E/S database. Table 2 shows that analyst cash flow forecasts are available starting from 1993, and they are becoming increasingly prevalent. The increasing trend lasts until 2000, when the number of firms being forecasted decreased in 2001 and increased again in recent years.

**Table 2** Annual distribution of the second sample (from I/B/E/S database)

| Year | No. of firms being forecasted | No. of following analysts | No. of forecasts | The No. of annual forecasts to the No. of all the forecasts(7 153) (%) |
|---|---|---|---|---|
| 1993 | 4 | 4 | 7 | 0.10 |
| 1994 | 59 | 46 | 294 | 4.11 |
| 1995 | 72 | 39 | 386 | 5.39 |
| 1996 | 82 | 52 | 462 | 6.46 |
| 1997 | 92 | 64 | 418 | 5.84 |
| 1998 | 96 | 102 | 725 | 10.13 |
| 1999 | 82 | 155 | 1 115 | 15.59 |
| 2000 | 77 | 111 | 1 022 | 14.29 |
| 2001 | 58 | 87 | 797 | 11.14 |
| 2002 | 30 | 47 | 343 | 4.79 |

(*To be continued*)

[5] Please refer to Jiang (2004) for a detailed description of I/B/E/S database.

(*Continued*)

| Year | No. of firms being forecasted | No. of following analysts | No. of forecasts | The No. of annual forecasts to the No. of all the forecasts (7 153) (%) |
|---|---|---|---|---|
| 2003 | 109 | 64 | 594 | 8.30 |
| 2004 | 142 | 93 | 468 | 6.54 |
| 2005 | 146 | 88 | 522 | 7.30 |

## 4.2 Variable definitions and research design

I use standardized cash flow measures to make firms of different size comparable. I define $CF = OCF/TA$, where *OCF* is "operating cash flow", *TA* is "total assets". Cash flow change is defined as $CHG_t = (CFO_t - CFO_{t-1})/TA_t$. Cash flow surprise, i.e. the difference between actual cash flow per share and forecasted cash flow per share, is defined as $Surp = (CPS - forecasted\ CPS)$, where *CPS* is the "actual cash flow per share" and *forecasted CPS* is the "forecasted cash flow per share".

We use statistical tests developed in BD and DPZ to formally test the significance of cash flow management. Statistic methods from both BD and DPZ are used to examine discontinuities in cash flow distributions when the thresholds are not at the peak of the histogram. DPZ's method is used when the threshold coincides with the peak and therefore BD's method is not applicable. The utilization of BD and DPZ models are discussed in the next paragraph.

There are some differences between BD's statistic calculation and DPZ's. BD's test statistic ($z(0)$) is the difference between the actual number of observations in an interval and the expected number of observations in the interval, which is proxied by the average of the number of observations in the two immediately adjacent intervals, divided by the estimated standard deviation of the difference. DPZ constructs a *t*-like test statistic, $\tau$, to accomplish their test. Specifically,

$$\tau = \frac{\Delta p(x_n) - \underset{i \in R, i \neq n}{mean}\{\Delta p(x_i)\}}{\underset{i \in R, i \neq n}{s.d.}\{\Delta p(x_i)\}} \tag{1}$$

where *p(x)* is the proportion of the observations that lies in each interval, $\Delta p(x_n) = p(x_n) - p(x_{n-1})$; *mean* and *s.d.* denote the sample mean and standard deviation of $\{\cdot\}$.

However, DPZ experiences a problem when using this method to calculate earnings analysts' forecast threshold, when the threshold coincides with the peak. BD does not have the same problem examining earnings and earnings changes thresholds, since they do not coincide with the peaks. DPZ define

$\nabla p_j = \Delta\log\{p(x_{T+j})\}$ - (- 1×$\Delta\log\{p(x_{T-j})\}$) for the peak (or threshold), where $T$ is the threshold. They use the observations $\nabla p_j$ from a small neighborhood $R$ ($j$ >1,) (DPZ use $R$ spanning 10 nearby values, i.e. $j$ = 2, 3… 11. They also find similar results with fewer nearby values.) Compute an estimate of the mean of $\nabla p_1$ as well as its standard deviation, DPZ further compute $\tau_{T=P}$ to assess the significance of $\nabla p_j$. In the tests reported in the main text of this article, the $R$ for computing $\tau_{T=P}$ spans 10 nearby values.

To investigate the prevalence of cash flow management, we estimate the differences between observed frequencies of the interval and the frequencies that would be expected in the absence of cash flow management. Comparing the prevalence of cash flow management and earnings management helps to understand cash flow management. The expectation models used to test for the existence of cash flow management are not applicable for estimating the frequency of cash flow management if we have evidence that the null hypotheses are not supported. In examining the prevalence of earnings management, BD use the observed frequencies from intervals in the right half of the earnings distribution as measures of the expected frequencies in the corresponding interval in the left half of the distribution. They make the assumption that in the absence of earnings management, the distribution of earnings would be approximately symmetric and that the right half of the empirical distribution is largely unaffected by earnings management to avoid loss or earnings decreases. However, the assumption of BD may be problematic as discussed in the second section.

To avoid the above problems, we adopt the following procedure to estimate the frequency of cash flow management. Using goodness-of-fit tests, we first identify the function that best fits the empirical distribution, individually for the three different empirical distributions corresponding to H1, H2 and H3 (excluding the suspected interval). Then the estimated frequency from the function with the best fit to the distribution serves as the expected frequency for each threshold. The expected frequencies from this model use the entire distribution of cash flows, and avoid the arbitrary assumption that cash flow distributions are symmetric. The appendix describes this method in detail.

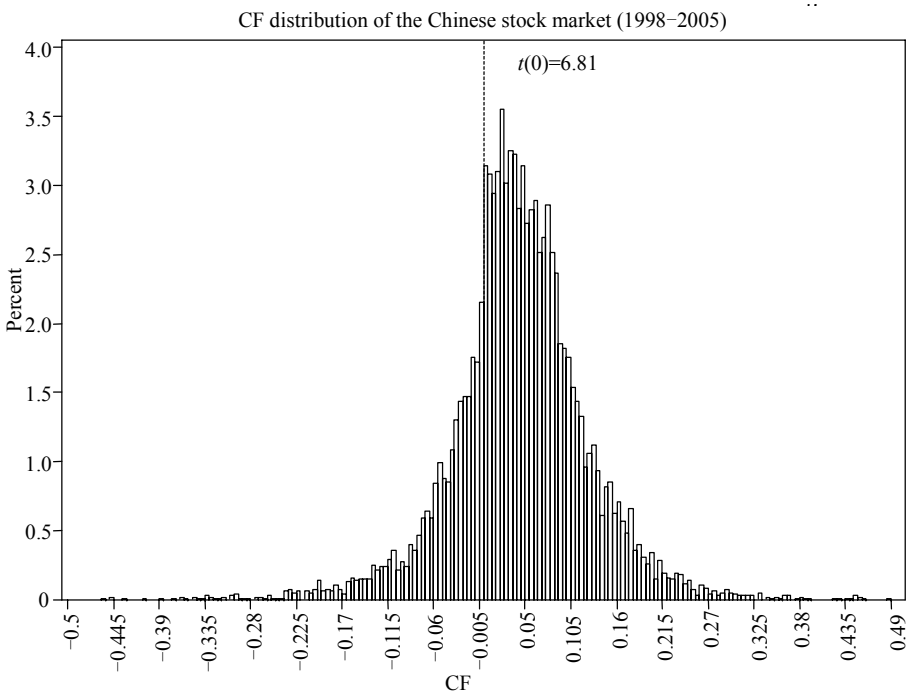
## 5 Results

### 5.1 Existence of cash flow management

The left figure of Fig. 1 plots the empirical distribution of scaled operating cash flows (*OCF*) for Chinese listed firms with histogram interval widths of 0.005

for *OCF* ranging [−0.5, 0.5].[6] The histogram shows a single-peaked, bell-shaped distribution that is relatively smooth except in the area near the zero cash flows: Operating cash flows slightly greater than zero occur much more frequently than expected. The significance of the irregularity near zero is confirmed by statistical tests, in which $t$ (0) = 6.81, $z$(0) = 4.90, which are significant and also the largest positive statistics throughout the whole distribution. This confirms H1. Comparing with the right figure in Fig. 1, which plots the cross-sectional distribution of scaled operating cash flows (*OCF*) for U.S. listed firms with significant discontinuity at zero ($t$(0) = 3.57, $z$(0) = 4.44), we can see that the cash flow management behavior around zero is more obvious in the Chinese market than in the U.S. market.[7]

Fig. 2 plots the cross-sectional distribution of *CHG* (scaled cash flow change=$(CF_t - CF_{t-1})/MV_{t-2}$) for Chinese and U.S. firms. Firms have to report cash inflows and outflows in cash flow statements for the most recent two years. I predict that lagged operating cash flows constitute another threshold for managers to meet or beat analyst earnings forecasts. For the histogram of *CHG*, the peak lies in




[6] Using other interval width, such as 0.0025, does not change the results.

[7] Please refer to Zhang (2006) for the data description and analysis of cash flow management in the U.S.

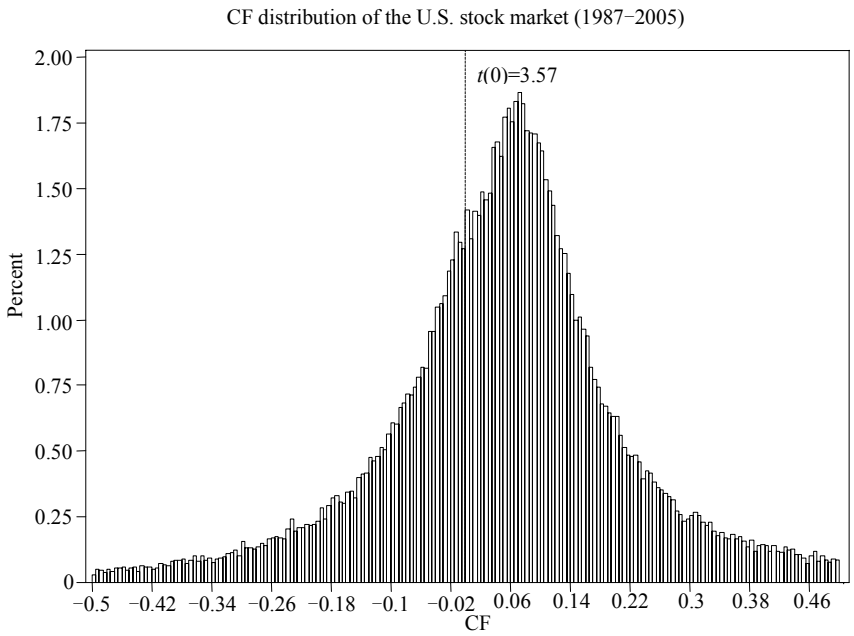



**Fig. 1** The distribution of CF for Chinese and U.S. firms
Note: For details of CF distribution of the U.S. stock market, refer to Zhang (2006).

the (0, 0.005) interval, making BD's test for a discontinuity at zero difficult to implement (Jacob and Jorgensen, 2007). I rely on DPZ's *t*-statistic to investigate discontinuities at zero in this distribution. The *t*-statistic at zero is 0.65 for U.S. firms and it is not significant. However, the left figure of Fig. 2 shows that Chinese firms manage their OCFs around the zero point of *CHGs*, confirmed by $t(0) = 1.87$. We can infer that Chinese listed firms have stronger incentives to manage cash flows above zero or above previous' year cash flow performance than U.S. firms do.

Fig. 3 plots the empirical distribution of the forecast error, which is the cash flow surprise (actual cash flows minus the analyst cash flow forecasts) in 0.01 bins in a range around zero for Chinese and U.S. listed firms. Consistent with the notion that "making the forecast" is an important threshold for managers, I observe a larger mass to the right of zero than to the left for both Chinese and U.S. firms. The easily discernible pileup is confirmed by the $t$-statistic of 6.00 for bin zero for Chinese firms and 5.25 for U.S. firms. My results show that analyst cash flow forecast is also an important performance measure of Chinese firms.

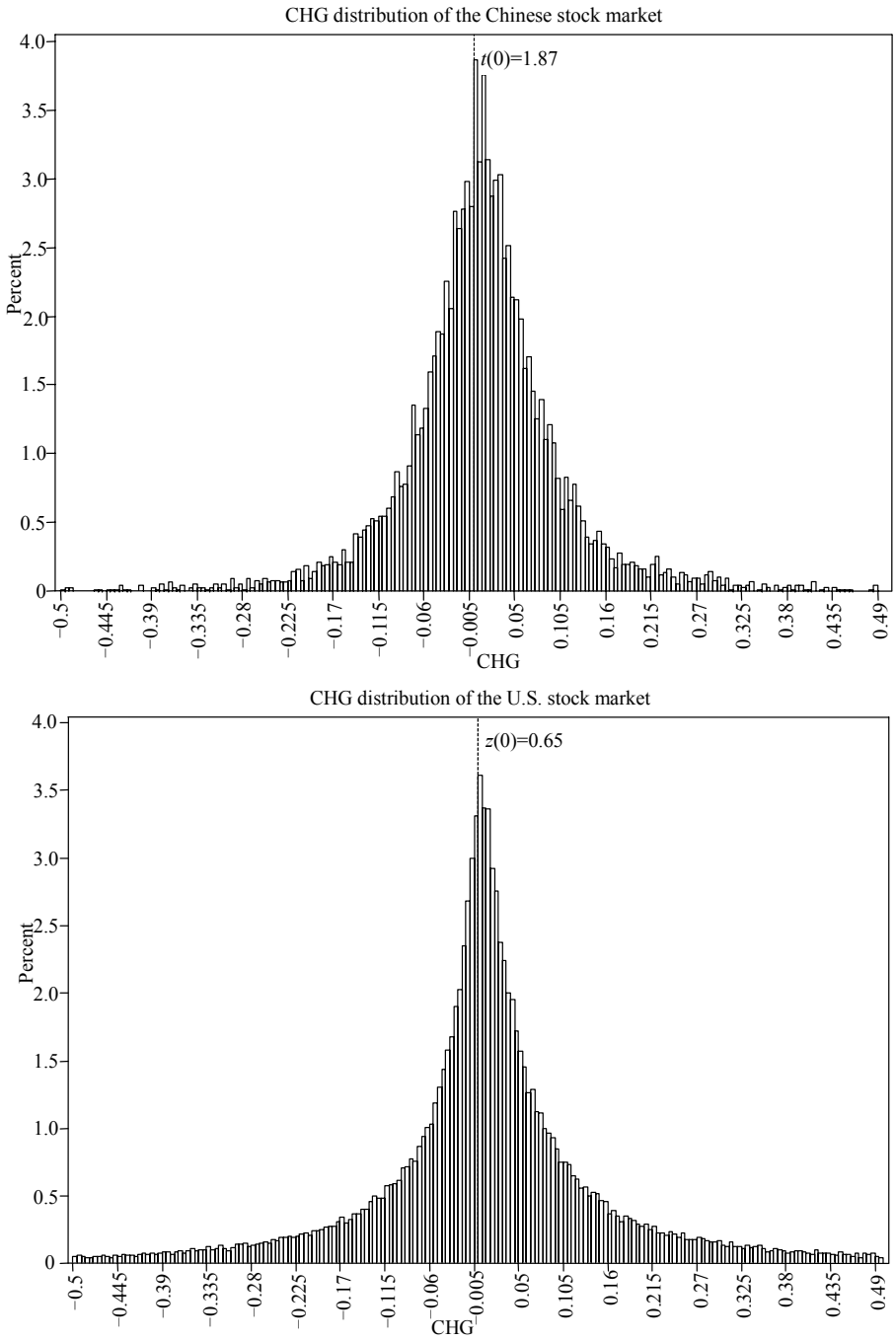



**Fig. 2** The distribution of CHG for Chinese and U.S. firms

Note: For details of CHG distribution of the U.S. firms , refer to Zhang(2006).

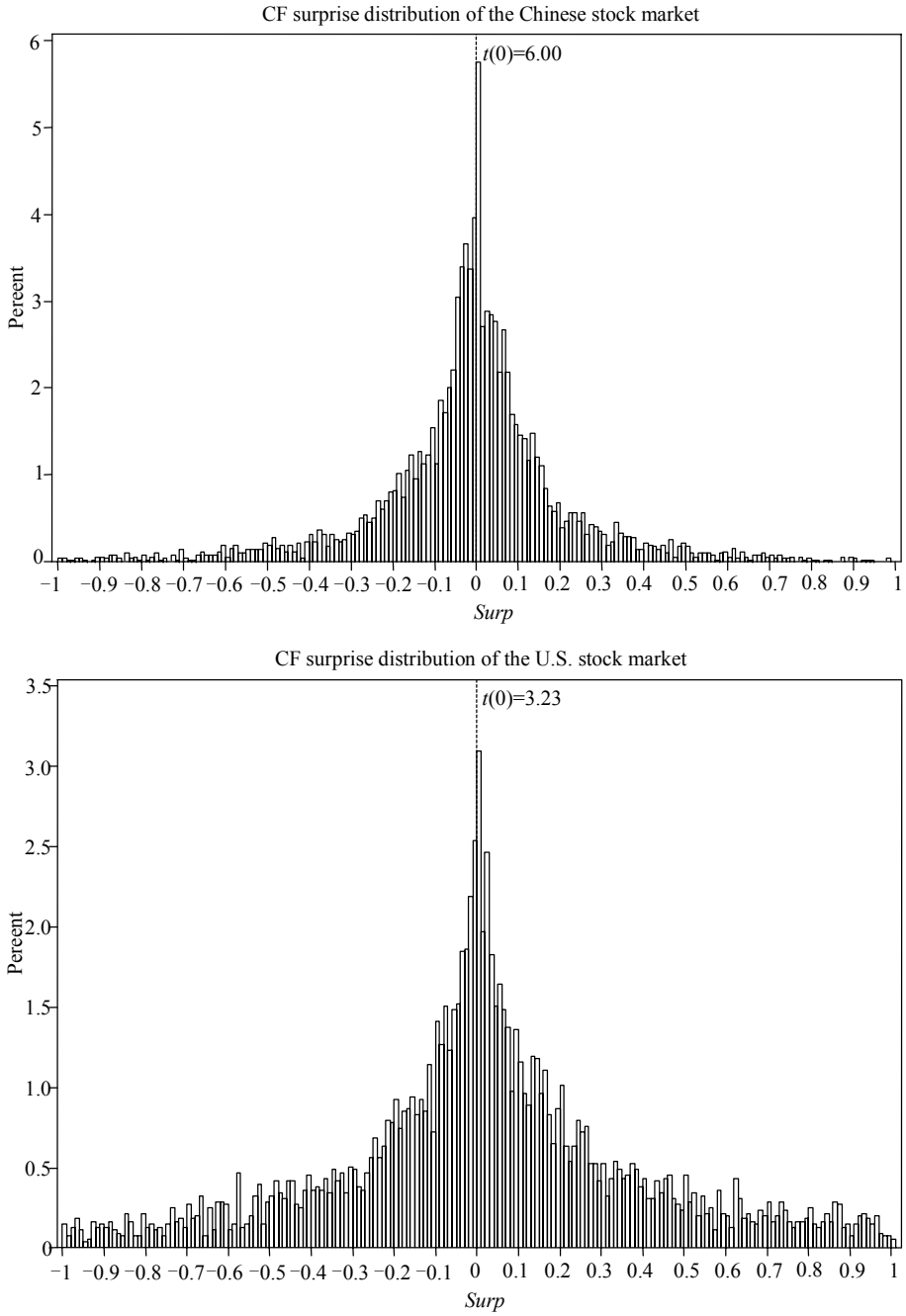



**Fig. 3** The distribution of *Surp* for Chinese and U.S. firms
Note: For details of U.S.firms'*Surp* distribution, refer to Zhang (2006).

## 5.2 Prevalence of cash flow management

The above analysis shows that zero point of OCFs, last year OCFs and analyst cash flow forecasts are three thresholds of cash flow distributions. Then, how many firms manipulate their OCFs to reach those thresholds? This paper will answer this question by investigating the prevalence of cash flow management. Table 3 shows the characteristics of best-fitted distributions of cross-sectional OCF, CHG, and *Surp* distributions and the goodness-of-fit test of those fitting distributions. We can see from the table that all of the three best-fitted distributions fit the raw distributions well and coefficients of multiple determinations are all above 0.98, which shows the reliability of the results.

**Table 3** Parameter analysis of the best-fitted distribution

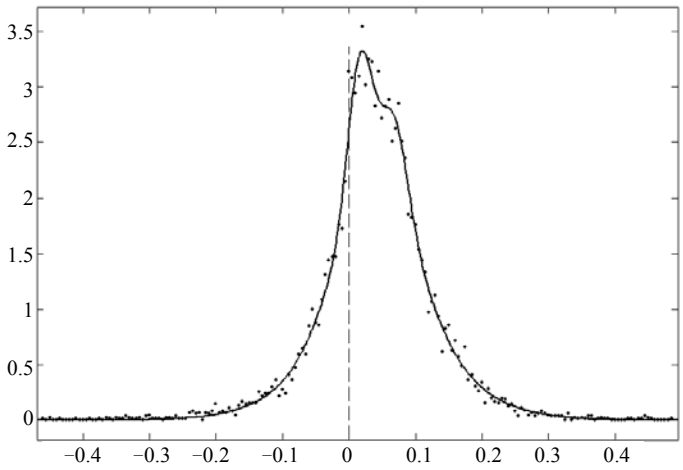
| Fitting Characteristics | CF distribution | CHG distribution | Surp Distribution |
|---|---|---|---|
| Best-fitted distribution | f(x) = a1*exp(–((x–b1)/c1)^2) + a2*exp(–((x–b2)/c2)^2) + a3*exp(–((x–b3)/c3)^2) + a4*exp(–((x–b4)/c4)^2) | f(x) = a1*exp(–((x–b1)/c1)^2) + a2*exp(–((x–b2)/c2)^2) + a3*exp(–((x–b3)/c3)^2) + a4*exp(–((x–b4)/c4)^2) + a5*exp(–((x–b5)/c5)^2) | f(x) = a1*exp(–((x–b1)/c1)^2) + a2*exp(–((x–b2)/c2)^2) + a3*exp(–((x–b3)/c3)^2) + a4*exp(–((x–b4)/c4)^2) + a5*exp(–((x–b5)/c5)^2) + a6*exp(–((x–b6)/c6)^2) |
| Parameter estimate (under 95% confidence interval) | a1=1.302 (0.778, 1.825)<br>b1=0.016 (0.013, 0.019)<br>c1=0.025 (0.019, 0.031)<br>a2=0.740 (0.191, 1.289)<br>b2=0.067 (0.061, 0.074)<br>c2=0.028 (0.017, 0.039)<br>a3=0.655 (–0.283, 1.594)<br>b3=0.047 (0.033, 0.061)<br>c3=0.154 (0.099, 0.208)<br>a4=1.468 (0.827, 2.109)<br>b4=0.041 (0.035, 0.048)<br>c4=0.084 (0.048, 0.121) | a1=1.830 (–2.722, 6.382)<br>b1=0.005 (–0.023, 0.034)<br>c1=0.035 (0.008, 0.063)<br>a2=1.292 (–0.574, 3.158)<br>b2=0.041 (–0.058, 0.141)<br>c2=0.066 (0.008, 0.125)<br>a3=0.960 (–0.908, 2.830)<br>b3=–0.044 (–0.095,0.006)<br>c3=0.039 (–0.044, 0.124)<br>a4=0.367 (0.107, 0.626)<br>b4=0.015 (–0.011, 0.042)<br>c4=0.216 (0.157, 0.274)<br>a5=0.265 (–0.559, 1.091)<br>b5=0.108 (–0.257, 0.041)<br>c5=0.045 (–0.051, 0.141) | a1=0.484 (0.268, 0.700)<br>b1=0.005 (0.002, 0.008)<br>c1=0.009 (0.004, 0.014)<br>a2=1.502 (–179.8, 182.8)<br>b2=0.013 (–1.532, 1.559)<br>c2=0.052 (–0.276, 0.381)<br>a3=0.568 (–170.2, 171.3)<br>b3=–0.017 (–5.807, 5.773)<br>c3=0.054 (–1.315, 1.424)<br>a4=5.2 (–7.828, 7.828)<br>b4=–3263 (–9.702e+010, 9.702e+010)<br>c4=1450 (–2.156e+010, 2.156e+010)<br>a5=0.874 (–9.144, 10.89)<br>b5=0.044 (–0.722, 0.812)<br>c5=0.11 (–0.159, 0.379)<br>a6=0.490 (–9.797, 10.78)<br>b6=–0.063 (–1.283, 1.156)<br>c6=0.107 (–0.304, 0.518) |

(*To be continued*)

(*Continued*)

| Fitting Characteristics | CF distribution | CHG distribution | Surp Distribution |
|---|---|---|---|
| Minimum square fitting error sum | 1.433 | 1.573 | 1.543 |
| Coefficient of multiple determination | 0.991 | 0.989 | 0.989 |
| Adjusted coefficient of determination | 0.990 | 0.988 | 0.988 |
| Root-mean-square error | 0.089 | 0.093 | 0.092 |

Fig. 4 plots the best fitted distribution curves of OCF for Chinese and U.S. firms. The estimated number of cases in which firms have engaged in cash flow management to achieve the positive cash flow target is the difference between the observed and the expected number of observations. The estimated number of cases represents approximately 0.51% of the 7 153 available observations and approximately 16.41% of the observations in the suspect interval for Chinese firms. Comparing with the prevalence of cash flow management around the zero



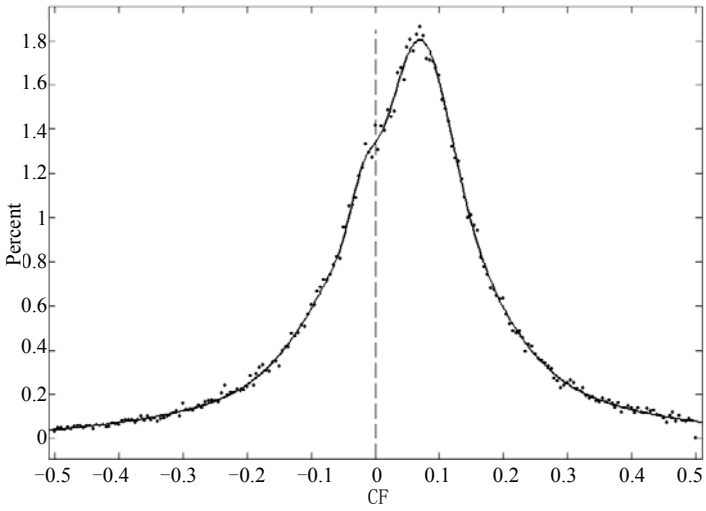



**Fig. 4** Fitted curves of the CF distributions for Chinese and U.S. firms
Note: For details of fitted curve of CF distribution for U.S. firms, refer to Zhang (2006).

point (approximately 0.06% of the 96 201 available observations and 5.52% of the observations in the suspect interval), Chinese listed firms are more prevalent in managing cash flows to report positive OCFs.

Fig. 5 shows that, 16.64% of the firms in the bin that is just right of the zero point of CHG distribution manispulate cash flows to report positive cash flow change and those firms occupy 0.63% of the whole sample. As the zero point of CHG is not a significant discontinuity for U.S. firms, I do not examine the prevalence of such management for U.S. firms.

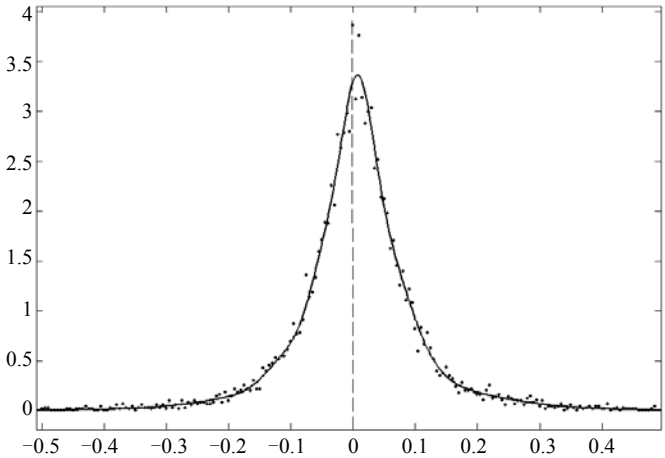



**Fig. 5** Fitted curve of the CHG distribution for Chinese firms

The test for the prevalence of cash flow management to meet analyst cash flow forecasts (Fig. 6) suggests that about 9.81% of observations in the suspect interval may result from cash flow manipulation and this represents 0.36% of the whole sample. Comparing with the prevalence of U.S. firms' cash flow management to meet analyst forecasts (approximately 0.46% of total observations and 14.95% of the observations in the suspect interval), it is less prevalent. The reason could be that the Chinese stock market is only built up in 1990's and analyst forecast mechanism has not been fully developed and thus Chinese firms may not pay that much attention on those forecasts as firms in the U.S.

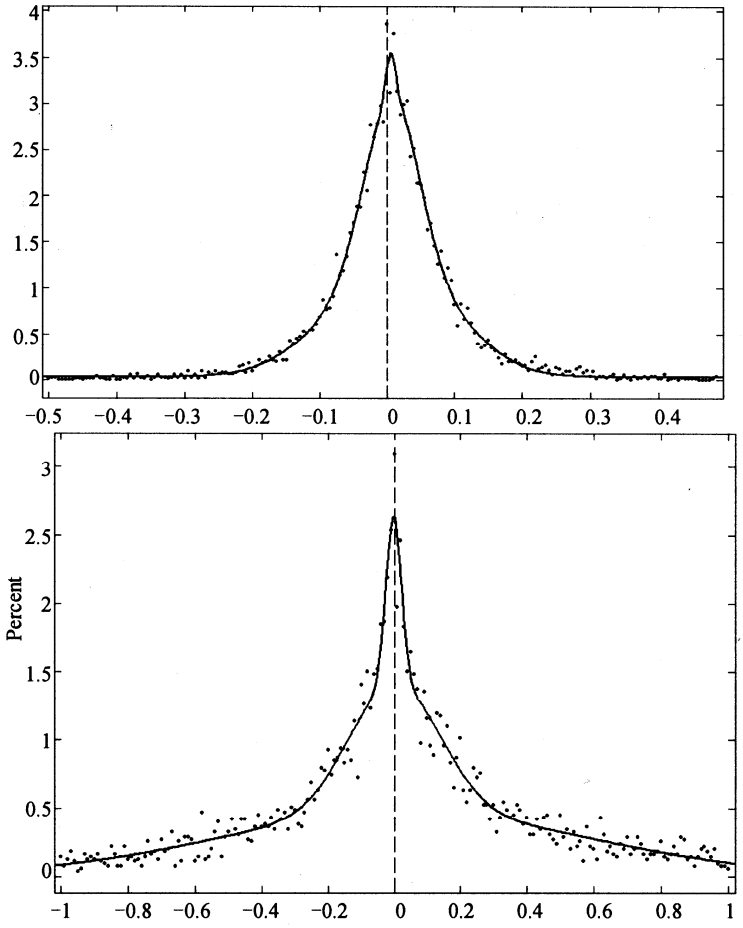



**Fig. 6** Fitted curves of the *Surp* distributions for Chinese and U.S. firms
Note: For details of fitted curve of the *Surp* distribution for U.S. firms , refer to Zhang (2006).

Table 4 and Table 5 are Comparison of t-statistics for the significance and

prevalence of three cash flow management thresholds for Chinese and US firms, respectively.

**Table 4** Comparison of t-statistics for the significance of three cash flow management thresholds for Chinese and US firms

| Cash Flow Thresholds | OCF 0 point | CHG 0 point | Surp 0 point |
|---|---|---|---|
| Chinese firms | 6.81 | 1.87 | 6.00 |
| U.S.firms | 3.57 | 0.65 | 5.25 |

**Table 5** Comparison of t-statistics for the prevalence of three cash flow management thresholds for Chinese and U.S. firms

| Cash flow thresholds | OCF 0 point | CHG 0 point | Surp 0 point |
|---|---|---|---|
| Chinese firms (%) | 16.41 (0.51)[a] | 16.64 (0.63) | 9.81 (0.36) |
| U.S. firms (%) | 5.52 (0.06) | — | 14.95 (0.46) |

Note: [a] The percent of the number of firms manipulating cash flows to reach thresholds to the number of firms in the right bin of the thresholds (to the number of all firms in the sample).

## 6 Conclusion

Financial information users always believe that OCF is different from earnings in that it is the true reflection of the cash inflows and outflows of a firm, and it cannot be managed as earnings and thus more reliable. However, this study finds that cash flow reports are not as reliable as people think. Managers can manipulate cash flows just as they manipulate earnings. Cash flow at zero point, last year's cash flows and analyst cash flow forecasts are three thresholds that affect managers' decision when they report cash flow performance.

The best-fitted distribution model shows that 16.41% of the Chinese firms with small positive cash flows are cash-flow-manipulating firms. 16.64% of the firms with small changes and 9.81% of the firms with small surprises manipulate cash flows to reach the thresholds. Comparison analysis shows that the cash flow management behavior around zero and zero changes is more prevalent in the Chinese market than in the U.S. market. The OCFs management around analyst forecast OCFs, however, is not significantly more prevalent than in the U.S. This shows that the Chinese firms are still not fully aware of the importance of meeting or beating analyst forecasts.

OCFs management research is relatively few according to the prior literature. However, with the increasing importance of OCF, it is necessary to inform investors that reported OCFs could be managed. Otherwise, they may simply believe those reported numbers and make wrong judgments or decisions. Thus,

research on the OCFs management could improve market mechanism and protect investors.

**Acknowledgements** This study is sponsored by the National Science Foundation of China Youth Science Foundation (No. 70802003) and the Scientific Research Foundation for the Returned Overseas Chinese Scholars, Ministry of Education. Part of this paper is based on my doctoral research work at Leeds School of Business, the University of Colorado at Boulder. I am especially grateful for the guidance and support from my advisor, Prof. John Jacob. I thank Weiying Zhang, Liyan Wang, Zhengfei Lu, Xiao Chen, Liansheng Wu, Guohua Jiang, Heng Yue, Wei Luo, Bin Ke, Tong Lu, workshop participants at 2006 the Fifth Empirical Accounting Research International Conference and the First Annual Meeting of China Management Research, Beijing, China, the 2006 Across-strait Accounting and Management Academic Meeting, Beijing, China.

## References

Basu S (1997). The conservatism principle and the asymmetric timeliness of earnings. Journal of Accounting and Economics, 24(1): 3–37

Bowen R, Ducharme L, Shores D (1995). Stakeholders' implicit claims and accounting method choice. Journal of Accounting and Economics, 20(3): 255–295

Burgstahler D, Dichev I (1997). Earnings management to avoid earnings decreases and losses. Journal of Accounting and Economics, 24(1): 99–126

Dechow P (1994). Accounting earnings and cash flows as measures of firm performance: The role of accounting accruals. Journal of Accounting and Economics, 18(1): 3–42

Dechow P, Kothari S P, Watts R (1998). The relation between earnings and cash flows. Journal of Accounting and Economics, 25(2): 133–168

Degeorge F, Patel J, Zeckhauser R (1999). Earnings management to exceed thresholds. Journal of Business, 72(1): 1–33

Foster G (1986). Financial Statement Analysis. 2nd edition. Upper Saddle River, NJ: Prentice-Hall

Givoly D, Hayn C (2000). The changing time series properties of earnings, cash flows and accruals: Has financial reporting become more conservative? Journal of Accounting and Economics, 29(3): 287–320

Graham J, Harvey C, Rajgopal S (2005). The economic implications of corporate financial reporting. Journal of Accounting and Economics, 40: 3–73

Jacob J, Jorgensen B (2007). Earnings management and accounting income aggregation. Journal of Accounting and Economics, 43(2-3): 369–390

Kahneman D, Tversk A (1979). Prospect theory: An analysis of decision under risk. Econometrica, 47(2): 263–291

Nwaeze E, Yang S, Yin Q J (2006). Accounting information and CEO compensation: The role of cash flow from operations in the presence of earnings. Contemporary Accounting Research, 23(1): 227–265

Rayburn J (1986). The association of operating cash flow and accruals with security returns. Journal of Accounting Research, 24(3): 112–133

Roychowdhury S (2006). Earnings management through real activities manipulation. Journal

of Accounting and Economics, 42(3): 335–370
Zhang R (2006). Cash flow management, incentives and market pricing. Working Paper, University of Colorado at Boulder
姜国华 (Jiang Guohua) (2004). 关于证券分析师对中国上市公司会计收益预测的实证研究 (Empirical research on analyst earnings forecasts to Chinese listed firms). 经济科学, (6): 72–79
孙铮，王跃堂 (Sun Zheng, Wang Yuetang) (1999). 盈余操纵与资源配置之实证研究 (Empirical research on earnings management and asset allocation). 财经研究, (4): 30–34
王亚平，吴联生，白云霞 (Wang Yaping, Wu Liansheng, Bai Yunxia) (2005). 中国上市公司盈余管理的频率和幅度 (Frequency and extent of Chinese firms' cash flow management). 经济研究, (12): 102–112
吴联生，薄仙惠, 王亚平 (Wu Liansheng, Bo Xianhui, Wang Yaping) (2007). 现金流量在多大程度上被管理了 (To what extent are cash flow being managed). 金融研究, (3): 162–174
赵春光 (Zhao Chunguang) (2004). 现金流量价值相关性的实证研究 (Empirical research on the value relevance of cash flows). 会计研究, (2): 29–35

## Appendix

Test for the Prevalence of Cash Flow Management

Let $x$ be the variable we are interested in, i.e. one variable among the cash flow, cash flow change or cash flow surprise. I estimate the frequencies of cash flow management by calculating the differences between observed frequencies of the suspect interval in cash flow distributions and the expected frequencies without cash flow management.

To make a histogram, I break up the range of values covered by the data set $X_1, X_2, \cdots, X_n$ into $k$ disjoint adjacent intervals $[b_0, b_1), [b_1, b_2), \cdots, [b_{k-1}, b_k)$. All the intervals are of the same width $\Delta b$, $\Delta b = b_j - b_{j-1}$. For $j = 1, 2, \cdots, k$, let $h_j$ be the proportion of $X_i$'s that are in the $j$th interval $[b_{j-1}, b_j)$. I define the function

$$h(x) = \begin{cases} 0 & \text{if } x < b_0 \\ h_j & \text{if } b_{j-1} < x < b_j \quad \text{for} \quad j = 1, 2, \cdots, k \\ 0 & \text{if } x > b_j \end{cases}$$

The plot of $h$, which is piecewise constant, is then compared with plots of densities of various distributions on the basis of shape alone to see which distribution has densities that resemble the histogram $h$.

To see why the shape of $h$ should resemble the true density $f$ of the data, let $X$ be a random variable with density $f$, so that $X$ is distributed as $X_i$'s. Then when $y \in (b_{j-1}, b_j)$, for any fixed $j$ ( $j = 1, 2, \cdots, k$ ),

$$P(b_{j-1} < X < b_j) = \int_{b_{j-1}}^{b_j} f(x)dx = \Delta b f(y)$$

On the other hand, the probability that $X$ falls in the $j$th interval is approximated by $h_j$, which is the value of $f(y)$. Therefore,

$$h(y) = h_j = \Delta b f(y)$$

So $h(y)$ is roughly proportional to $f(y)$. That is, $h$ and $f$ have roughly the same shape.

As we have noted, a histogram is an estimate of the density function. According to the basic shape of the histogram, we could find a particular input distribution,—e.g., exponential, normal, or Poisson—that appears to be appropriate on the basis of its shape. Then, after several candidate families of distributions have been hypothesized, I specify the values of their parameters in order to specify distributions for possible use in the simulation. I use maximum-likelihood methods to find the fitted observation for each candidate distribution family (after eliminating the suspect interval observations). After determining the probability distributions that might fit the observed data, I examine these distributions to see how well they represent the true underlying distribution of my data. The best distribution function is then determined by the goodness-of-fit hypothesis tests. The expected frequency of the suspect interval without cash flow management is $P(b_{j-1} < X < b_j) = \Delta b f(y)$ . The actual frequency minus the expected frequency of the suspect interval is the prevalence of cash flow management for that specific threshold.