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ORIGINAL RESEARCH

Earnings management and IPO anomalies in China

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Abstract This paper empirically examines the impact of earnings management and investor sentiment on IPO anomalies using a sample of 506 Chinese IPOs issued over the 1998–2003 period. We develop a parsimonious pricing model in which both the offer price and the short-term aftermarket price are influenced by the use of earnings management, and show that the offer price can be below the fair price while the short-term equilibrium price in the aftermarket can be overvalued due to investor sentiment. Consistent with the overreaction hypothesis, the empirical results reveal a positive relation between the initial return and managed accruals and a negative relation between the long-term stock performance and the initial return. Earnings management appears to generate a pattern where the initial price following an IPO tends to be inflated by overreaction in the secondary market but adjusts to its fundamental level in the long run. These findings are robust across a variety of test specifications.

Keywords IPO underpricing · Investor sentiment · Underperformance

JEL Classification G14

1 Introduction

There has been considerable interest among financial economists on the implications of earnings management for post-IPO stock performance. In a seminal paper, Teoh et al.

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(1998b) find that firms with unusually high accruals in the IPO year tend to experience poor stock performance in the three subsequent years and they interpret this as evidence that firms cook the books to obtain a higher offer price. Similar results obtain in many follow-up studies, including Chane and Lewis (1998) and Roosenboom et al. (2003). However, there are also dissenting voices. Venkataraman et al. (2008) investigate pre-IPO financial statements and find no evidence that pre-IPO accruals are positive and larger than post-IPO ones. Ball and Shivakumar (2008) find that the conventional estimate of "discretionary" accruals is biased and the reporting practice changing from private to public can be more consistent with the notion of conservatism rather than earnings manipulation, casting doubt on the finding of Teoh et al. (1998b).[1]

While it is not clear whether firms manipulate earnings leading up the IPO in the USA and UK, evidence for earnings management in China is more conclusive. Aharony et al. (2000) report evidence of earnings management in the financial packaging process before Chinese state-owned enterprises sell shares to investors. Chen et al. (2011) identify related-party transactions as another source of earnings manipulation in China. Recently, Boulton et al. (2011) examine a comprehensive set of international IPOs and establish a link between country-level differences in earnings quality (earnings management as one of its measures) and IPO underpricing. Surprisingly, however, there is little research on how earnings management and underpricing are related. In this paper, we explore the potential role of investor sentiment using a sample of 506 Chinese IPOs issued over the 1998–2003 period.

We focus on the Chinese setting over this period for two reasons. First, among 37 countries included in Boulton et al. (2011), China is the most interesting case given its highest level of underpricing (120.72 %), highest score in average aggregate earnings management[2] (35.87) and highest score in average earnings opacity[3] (8.03), literally topping the world ranking on underpricing and earnings quality. Similarly, Eng and Lin (2012) note significant accounting deficiencies in many Chinese firms even in those cross-listed in the USA. In this sense, the link between earnings management and underpricing in China is more important than elsewhere.[4] Second, Tian (2011) and Cheung et al. (2009) report that the underpricing of Chinese IPOs varies dramatically over time and regulations appear to be the primary reason for this. Thus we draw our sample from such a typical period in which the dominant IPO pricing method was undergoing a transition from the fixed price approach to the book-building approach. Various forms of earnings

[1] Similarly, Li's (2011) findings on discretionary current accruals and US IPOs are difficult to reconcile with behavioral biases and limited arbitrage.

[2] The average aggregate earnings management is defined as the average country ranking of EM1, EM2, EM3 and EM4, respectively defined as the median ratio in country i of the firm-level standard deviations of operating earnings over the cash flow from operations (both scaled by lagged total assets), multiplied by -1, the cross-sectional correlation in country i between the change in accruals and change in cash flows from operations (both scaled by lagged total assets), multiplied by -1, the median ratio in country i of the absolute value of accruals over the absolute value of cash flow from operations, and the ratio in country i of the number of firms operating small profits over the sum of the number of firms reporting small losses and profits. A smaller profit (loss) is defined as a value of net earnings scaled by lagged total assets in the range [0, 0.01] ([−0.01, 0]).

[3] The average earnings opacity is defined as the average country i decile ranking across EM2, EM4 and earnings aggressiveness. Earnings aggressiveness is the median ratio in country i of total accruals over the lagged total assets.

[4] See Guo et al. (2011) for an interesting and up to date review of the empirical literature on the underpricing of Chinese IPOs. Nagata and Hachiya (2007) provide a link between the nature of earnings management and underpricing in Japanese IPOs.

management were associated both with the fixed price approach and the book-building approach[5] during the sample period. For fixed-priced IPOs, an increase in reported earnings would be explicitly capitalized into the offer price while for book-built IPOs, the offer price would be inflated less explicitly, depending on whether participating investors see through the inflated numbers. We abstract from several changes in pricing regulations and focus on the use of earnings management only because in response to such a rapidly evolving environment, one might expect firms to adjust their financial reporting strategy, using earnings management to its maximum prior to the IPO. We feel that the variability in the Chinese context due to several changes in institutional arrangements can help to understand the link between earnings management and underpricing and our results are less likely driven by one single regulatory regime.

Motivated by Teoh et al. (1998b) that investors may not immediately understand accruals information fully, we develop the overreaction hypothesis that earnings management, that temporarily boosts earnings around the IPO, causes short term price effects in the aftermarket which gradually are eroded over time. The mechanical offer price setting mechanism for our sample IPOs generates a threshold above which we can measure the degree to which investors overreact by taking accounting accruals at face value. Following Kim and Park (2005), we consider the case where both the offer price and the initial trading price can also be affected by the use of earnings management. To empirically examine whether investors overreact, we develop a parsimonious pricing model from which the short and long term testable implications of this overreaction hypothesis are derived. The short term implication is that underpricing and the extent of earnings management are positively correlated. To the extent investors are able to see through managed accruals, earnings management would affect the offer price but not the stock price in the immediate aftermarket, implying a negative relation between underpricing and earnings management. The overreaction hypothesis has two long run implications. We expect a negative relation between the long run performance and the use of earnings management. As the accrual effects are reversed in the long run, the biased market belief tends to correct itself and prices decline. A separate issue is whether earnings management is an important factor in determining IPO underpricing and long run return performance of IPO companies generally. Our model also predicts a negative relationship between long-run stock performance and the extent of "overpricing" due to temporary overreaction, independently of whether the IPO firms genuinely underprice new issues.

Our empirical results lend support to the overreaction hypothesis. First, consistent with the literature, we find that the extent of underpricing is phenomenal, long-term stock performance is poor, and discretionary (current) accruals are positive and significant in economic terms. While underpricing is as high as 129.32 %, the long-term stock performance is −14.89 % on average. Discretionary accruals and discretionary current accruals are 6.44 and 14.65 % of total assets, respectively. Second, consistent with our short-term prediction, we find a positive between underpricing and discretionary (current) accruals. Firms with more managed accruals tend to have larger initial returns on the first day of

[5] Under the fixed price approach, the IPO price was determined by the product of EPS and a regulatory P/E multiple. Up until the year end of 1996, the EPS used for pricing was defined as the EPS in the past year and the forecasted EPS. Then it changed to use the average of EPS in the past 3 years during the 1996–1998 period and the average of EPS in the IPO year and the past year weighted by the number of shares outstanding during the 1998–1999 period. Under the book-building approach, the IPO price was determined based on interest solicited from (1) institutional investors offline, (2) both institutional investors offline and retail investors online, (3) both institutional investors and retail investors online. See more details in Ma and Faff (2007).

trading. We also find a negative relation between long term stock performance and underpricing, consistent with the long-run prediction. Finally, we find a significant negative relationship between the managed accruals and long run performance. Both the short and long term empirical results are robust to a variety of test specifications.

Our study contributes to the literature in two respects. First, we add new insights into IPO anomalies in China. Previous studies have focused on aspects such as information asymmetry (Chen et al. 2004; Chi and Padgett 2005; Gannon and Zhou 2008), ex ante uncertainty (Mok and Hui 1998; Yu and Tse 2006; Huyghebaert and Quan 2009), signaling (Su and Fleisher 1999; Yu and Tse 2006; Chen et al. 2004), agency problems (Chen et al. 2004; Gannon and Zhou 2008; Guo and Brooks 2008), and government regulation (Kao et al. 2009; Tian 2011; Zhou and Zhou 2010). By contrast, we do not restrict our attention to the determination of the offer price but extend our analysis to the short-term equilibrium aftermarket price. We make the case in which the first-day returns and the subsequent price reversal can be driven by optimistic investors overreacting to managed earnings. Our behavioral explanation focusing on earnings management and overreaction is new. Second, we also add to the IPO literature in a wider world. While many empirical studies can only show explanatory power either in underpricing or in underperformance, our study offers one possibility of explaining both the short- and long-term performance of IPOs.

The rest of this paper is thus organized as follows. Section 2 outlines our model with three predictions. Section 3 describes our data and variable definitions. Section 4 presents empirical results. A final section concludes.

2 The investor overreaction hypothesis

This section develops a parsimonious pricing model from which three investor overreaction predictions can be derived. The pricing model incorporates elements of underpricing, earnings management, investor overreaction and long run performance. We explain two important features—earnings management and investor overreaction—before introducing the model.

2.1 Earnings management

Earnings management seems to be the norm rather than the exception for listed firms. Several studies report evidence of positive accruals around equity offerings (Aharony et al. 1993; Teoh et al. 1998b; Teoh et al. 1998c; Aharony et al. 2000; Ducharme et al. 2001; Roosenboom et al. 2003; Yu et al. 2006 among others). It is clear that the use of positive accruals can increase the offer price. It is less clear but more interesting to ask whether the initial market price is also systematically affected in these circumstances. Kahneman et al. (1982) argue that investors subject to cognitive biases often predict future uncertain events by taking a short history of data. When such investors form incorrect beliefs about unusual positive accruals, it is possible that the market price departs from fundamentals over a period. On the theory side, Barberis et al. (1998) develop a model of investor sentiment showing that investors subject to the representativeness heuristic overreact to earnings announcements. On the empirical side, the evidence seems to suggest that the market in general tends to overprice total accruals (Sloan 1996) or more precisely abnormal accruals (Subramanyam 1996; Xie 2001), and this is true for IPO and SEO stocks in the USA (Teoh et al. 1998a, b, c) and also in China (Aharony et al. 2000; Kao et al. 2009).

2.2 Investor overreaction

Due to the influence of cognitive biases, investors may not fully understand managed accruals. This failure may be caused by biased beliefs about pricing on the part of the representative investors as in the Barberis et al. (1998) or Daniel et al. (1998) models, or could alternatively be due to the presence of naïve investors such as in Hong and Stein (1999). While we remain agnostic about why investors fail to understand accruals, we refer to the failure of investors, in particular those in the secondary market, fully to account for the impact of earnings management when pricing new issues as the overreaction hypothesis.

The unique Chinese context implies that earnings management has an impact on stock prices in the immediate aftermarket that can be measured. China is in the midst of transforming itself from a centrally planned towards a market economy and many economic and monetary policies are subject to strict regulation. The pricing of new issues is no exception. When the average market P/E ratio was as high as 30 in the 1990s, the multiple used for pricing new issues was set far below this, normally in the range between 13 and 18 depending on the industry in which firms operated. This severely circumscribes the price discovery role of both the underwriter and the issuer. The impact of managed accruals in the primary market is institutionally restricted by the (often fixed) offer price, but this of course does not apply to the secondary market. This difference is systematic and important and contrasts with the situation in other countries where investors typically can overreact to managed accruals in both the primary and secondary markets.

2.3 Model and predictions

We outline a parsimonious pricing model from which short and long term predictions can be derived. There are three prices of interest—the offer price p_0, the first trading day closing price p_1, and the long run market price after 3 years p_2, which is assumed to be the fundamental value. We define

$$p_0 = p_2(1-u)(1+a_1x) \tag{1}$$

$$p_1 = p_2(1+a_2x) \tag{2}$$

where u is the degree of underpricing relative to the fundamental value and $u < 1$; x is the extent of earnings management and according to the empirical literature, we know $x > 0$; a_1 captures the mechanical price setting effect of earnings management, and a_2 is overreaction coefficient in the aftermarket. Given the record levels of underpricing in Chinese IPOs, we assume $0 < a_1 < a_2$ or that the overreaction effect dominates the first-day closing price.

$$IR = \frac{p_1}{p_0} - 1 = \frac{(1+a_2x)}{(1-u)(1+a_1x)} - 1 \tag{3}$$

$$BHAR = \frac{p_2}{p_1} - \frac{m_2}{m_1} = \frac{1}{(1+a_2x)} - \frac{m_2}{m_1} \tag{4}$$

where m_2 and m_1 are the general market index. Differentiating IR and $BHAR$ with respect to x, we have:

$$\frac{dIR}{dx} = \frac{a_2 - a_1}{(1-u)(1+a_1x)^2} > 0 \tag{5}$$

$$\frac{dBHAR}{dx} = -\frac{a_2}{(1+a_2x)^2} < 0 \tag{6}$$

Since $u < 1$ and $0 < a_1 < a_2$, the first order derivative of *IR* with respect to x is positive. This yields the first prediction of a positive relation between the initial return or the observed "underpricing" and accruals or the use of earnings management. Because the overreaction coefficient is positive, the derivative of *BHAR* with respect to x is negative. Thus our second prediction is that there is a negative relation between long-term stock performance and the use of earnings management.

To derive the predicted relation between *BHAR* and *IR*, we use the chain rule to find the first-order derivative since *IR* is a function of x.

$$\frac{dBHAR}{dIR} = \frac{dBHAR}{dx}\frac{dx}{dIR} = -\frac{a_2(1-u)(1+a_1x)^2}{(1+a_2x)^2(a_2-a_1)} < 0 \tag{7}$$

Because $0 < a_1 < a_2$ and $u < 1$, its sign is negative. This yields our third prediction of an inverse relation between the long-term stock performance and initial return.

Note that we separate the earnings management effect on the offer price from the genuine extent of underpricing, so the overreaction hypothesis is independent of models of underpricing. We do not specifically restrict $u > 0$ which is consistent with the underpricing of IPO offer prices. Thus we can obtain these three predictions not only when new issues are genuinely underpriced but also overpriced relative to the fundamentals. However, we are unable to conclude whether new issues are underpriced or overpriced relative to fundamentals unless the genuine extent of earnings management, which is unobservable, becomes known. New issues are truly underpriced in the primary market when $p_0 < p_2$, or $a_1x < u/(1-u)$, and overpriced otherwise.

3 Data

3.1 Sample and benchmark selection

Data on annual reports and trading come from the Centre for Chinese Economic Research (CCER) database and the China Stock Market Accounting Research (CSMAR) database. The starting point of our sample is dictated by accounting standards and in particular by the *Accounting Standard for Business Enterprises: Cash Flow Statements* that became operative from January 1998. Since it is only feasible to calculate accruals using cash flow statements in the first post-IPO year, we use a sample of 506 IPOs issued during the 1998–2003 period and later listed on the Shanghai Stock Exchange (SHSE) or Shenzhen Stock Exchange (SZSE). The sample ends in 2003 because we try to minimize the potential impact of the 2007 financial crisis and to leave adequate time to estimate the 3-year market performance. We exclude those companies that operated in the financial industry as their financial statements are presented in a different format.

We gather financial information on 4,351 non-IPO benchmark firms that match our sample IPOs firms over the same period to identify the discretionary components in accruals. These benchmark firms are required to have at least 2 years of history in the stock

market. Following convention, we exclude abnormal non-issuing benchmarks with total accruals or current accruals greater than total assets at the beginning of year in absolute terms.

3.2 Variable definition

3.2.1 Underpricing

We define IPO underpricing as the initial return (*IR*) realized on the first day of trading following Ritter and Welch (2002) among others:

$$IR_{j,1} = \left[\frac{P_{j,1}}{P_{j,0}} - 1\right] \times 100\% \tag{8}$$

where $P_{j,0}$ and $P_{j,1}$ are the offer price and the closing price of new issue j on the first day of trading. The initial market return (*IMKTRTN*) is analogously defined:

$$IMKRTN_{m,1} = \left[\frac{m_1}{m_0} - 1\right] \times 100\% \tag{9}$$

where m_0 and m_1 are the general market index on the offer date and the first trading day, respectively.

3.2.2 Long-run performance

We estimate the buy-and-hold abnormal returns (*BHAR*) following Ritter and Welch (2002). We use the event-time approach outlined in Ritter (1991) to measure the length of period T and we use the general market index[6] to adjust stock returns on a monthly basis. BHAR is given in Equation (10):

$$BHAR[0,T] = \frac{\sum_{j=1}^{N}\left[\prod_{t=1}^{T}\left(1+r_{j,t}\right) - \prod_{t=1}^{T}\left(1+r_{m,t}\right)\right]}{N} \tag{10}$$

where $r_{j,t}$ and $r_{m,t}$ are monthly raw and market return for stock j, and N is the number of stocks in month t. We estimate the long-term performance up to 36 months post-issue.

3.2.3 Accruals

Discretionary accruals are the key explanatory variable representing earnings management in our study. We follow the modified Jones model due to Dechow et al. (1995) to separate discretionary current accruals and discretionary total accruals. More details of our estimation procedure can be found in the "Appendix". Since few firms release financial statements before going public, we do not have sufficient pre-IPO information to calculate the accruals variables of interest. Following Teoh et al. (1998b) and others, we instead use the first post-IPO accounting data to estimate the extent of earnings management in the IPO prospectus.

The link between the pre- and post-IPO earnings management can be justified by the incentive of IPO firms to continue managing earnings. In December 1996, a set of penalty

[6] SHSE A-share Index and SZSE A-share Composite Index.

Table 1 Sample IPO characteristics

Years	Freq.	Underpricing (%)	Min (%)	Median (%)	Max (%)	SD (%)
Panel A: Time distribution						
1998	78	131.83	2.08	119.83	429.48	83.13
1999	88	119.14	7.14	103.81	830.21	110.10
2000	135	151.97	0.28	141.35	476.77	86.60
2001	76	138.08	0.74	126.75	413.79	88.35
2002	68	133.54	27.77	116.96	428.25	80.92
2003	61	74.32	−31.45	71.86	227.99	44.66
Total	506	129.23	−31.45	116.31	830.21	89.07

Codes	Freq.	Underpricing (%)	Min (%)	Median (%)	Max (%)	SD (%)	Specifications
Panel B: Industry distribution							
A	9	73.23	3.23	71.03	125.87	47.86	Mining
B	5	154.11	95.68	176.87	185.56	38.58	Real estate
C	346	126.57	0.28	112.21	468.27	83.19	Manufacturing
D	18	149.83	41.82	149.89	344.70	72.65	Agriculture
E	22	121.20	34.61	119.75	198.10	52.28	Utilities
F	11	88.50	21.31	86.30	176.45	52.79	Construction
G	32	81.74	−31.45	73.58	246.44	55.87	Transportation
H	24	171.20	16.43	143.56	476.77	115.37	Information Technology
I	19	174.42	41.38	173.28	404.17	77.22	Wholesales and retails
J	0						Finance
K	11	178.30	7.14	171.45	452.77	122.62	Services
L	0						Media
M	9	200.98	44.29	124.18	830.21	231.88	Conglomerate
Total	506	129.23	−31.45	116.31	830.21	89.07	

The sample consists of 506 domestic IPO firms going public in the period from 1998 to 2003. Panel A Panel B report the distribution by year and by industry respectively

regulations[7] were introduced, penalizing firms if realized earnings in the IPO year fall below the corresponding management earnings forecasts contained in the IPO prospectus by 10 % or more. The CSRC undertook to launch an investigation if the difference was more than 20 % and firms would be banned from submitting a rights offering proposal within 2 years after the IPO. These penalties are substantial and severe. In order for the realized earnings in the IPO year not to drop below some threshold and because earnings management is persistent, firms that manage earnings before IPO are likely to overstate earnings after the IPO. Thus we can use the post-IPO accounting data as an alternative to estimate the extent of earnings management prior to the IPO.

3.3 Descriptive statistics

Table 1 provides descriptive statistics for the 506 IPO firms in our sample.

[7] See the CSRC announcement in year 1996 on several issues regarding stock issuance.

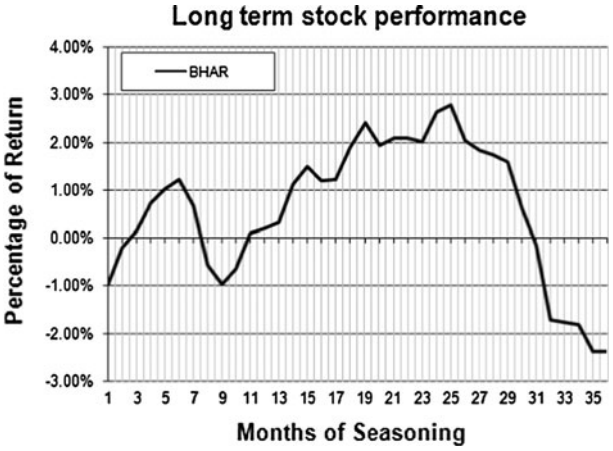

Fig. 1 Buy-and-hold abnormal returns (BHARs) to an equally-weighted portfolio of initial public offerings issued during the 1998–2003 period. This figure graphically demonstrates the performance of 506 IPOs in the 36 post-IPO event months. We follow the event-time approach to define the length of time T, use the general market index as the benchmark for adjustments, and estimate the BHARs as follows: $BHAR[0,T] = \frac{\sum_{j=1}^{N}\left[\prod_{t=1}^{T}(1+r_{j,t})-\prod_{t=1}^{T}(1+r_{m,t})\right]}{N}$

The distribution of the sample is reported in Panel A by year and in Panel B by industry. During the 1998–2003 period, our 506 sample IPOs exhibited average (median) underpricing of some 129 % (116 %). Average underpricing peaks at 152 % in 2000 before declining to a low of 74 % in 2003. The time series pattern of underpricing over this period is generally similar to what observed by Loughran et al. (1994).[8] While this level of underpricing is at the lower end of the spectrum of that reported in other studies of Chinese IPOs (see Su and Fleisher (1999) and Chan et al. (2004), for example), it is still huge by comparison with that reported in advanced economies, such as 18 % in the USA.

IPO activity follows a similar pattern with some 135 issues in 2000 which is more than double that of 61 in 2003. In contrast to the USA, manufacturing industry dominates other industries with 346 new issues that account for more than two thirds of the sample. IPO firms from four industries appear the most underpriced in terms of both average and median underpricing: those in the real estate, services, wholesale and retail, and information technology industries. Information on 58 sector specifications is used to find matching benchmarks and to calculate the discretionary and non-discretionary components of accruals in our study.[9]

Figure 1 reports the long-term performance over the 36 post-IPO event months. We follow the event-time approach to define the length of time, use the general market index

[8] An updated version of their cross-country study is available at Jay Ritter's website. The average underpricing over the 1990–2010 period is 137.4 %.

[9] We check the industry specifications of the firms year by year in case firms change their core business from one industry to another in the years after the IPO.

for adjustments, and calculate the *BHARs* up until the 3rd year anniversary, or until delisted, using the event-time approach.

The figure reveals that *BHARs* swing up and down somewhat in the range between −2 and 2 % over the sample. Except for the very first month, *BHARs* over the other intervals is not significantly different from zero, including the *BHAR* in the 36th event month −2.39 %. In an unreported table where we use the Cumulative Abnormal Returns (CARs) to measure the long-term stock performance, we find that they peak at 0.88 % up to the 19th event month and then they exhibit a steady decline over the course of the remaining months. The extent of underperformance is mild or even insignificant, similar to other studies on Chinese IPOs, for example a wealth relative ranging from 0.90 to 0.98 reported in Chan et al. (2004).

Table 2 presents summary statistics on selected variables for the 506 IPOs. Panel A and B provide descriptive statistics on accrual variables and control variables included in the models for underpricing and long-term performance, respectively.

Panel A reveals two really interesting patterns. First, average discretionary accruals dwarf average non-discretionary accruals in absolute terms. *DA* are five times *NDA*, *DCA* are almost 10 times *NDCA* while *DLA* are more 30 times *NDLA*. Second, average discretionary total accruals and discretionary current accruals are both significantly positive whilst average discretionary long term accruals are significantly negative, all at the 1 % critical value. While discretionary accruals are on average 6.44 % of total assets at the beginning of the year, discretionary current accruals are more than double that at 14.65 % and discretionary long-term accruals are some −8.21 % on average. The positive values for both *DA* and *DCA* are consistent with evidence in the literature that issuers use income-increasing accruals to manage earnings. The large negative value of discretionary long term accruals seems to indicate that the IPO firms shift earnings from the future to the present. Thus earnings manipulation around the IPO is short-term oriented at the expense of long-run gains.

Panel B reports data statistics for the sample used for the long-term analysis. In addition to the buy-and-hold returns under the event-time approach proposed by Ritter (1991), we also use the calendar-time approach to calculate the buy-and-hold abnormal return (BHAR), and rely on the latter as the long-term performance measure in the cross sectional analysis, following Teoh et al. (1998b). Since audited financial statements are required to be released to the public by the end of the following April, our estimation of the *BHAR* starts from the first of May so that all the accrual information contained in the first financial statement can be known for sure to investors. Panel B shows the *BHAR* over the subsequent 36 calendar months is −3.87 %. While the market return is −11.01 % over this 3-year period, the performance of new issues is even worse than the benchmark. The panel also reports some aspects of the change in operating performance over 3-year period. For example, net income and capital expenditure of these newly listed companies do not change much during the first 3 years.

Panel C reports the details of accrual variables and operating performance measures in each and every financial year. While average *DCA* is positive in the first financial year, it becomes significantly negative in the second and third years. In sharp contrast, *DLA* is negative on average in the first year but turns positive in the second and third years. The relative importance of the two major components of *DA* undergoes a dramatic change: the dominance of the *DCA* component declines after the first year and is overtaken by the *DLA* component in the subsequent years.

Table 2 Descriptive statistics on selected variables

Variable	Mean	(*t* value)	Median	Minimum	Maximum	SD
Panel A: Variables for underpricing (506 IPOs)						
IR	129.23 %	(32.64)***	116.31 %	−31.45 %	830.21 %	89.07 %
DA	0.0644	(8.10)***	0.0554	−1.6718	0.7256	0.1787
NDA	−0.0128	(−5.31)***	−0.0062	−0.5418	0.1648	0.0542
DCA	0.1465	(11.16)***	0.1162	−1.6137	1.9274	0.2953
NDCA	−0.0154	(−8.27)***	−0.0126	−0.4241	0.2099	0.0420
DLA	−0.0821	(−6.80)***	−0.0564	−1.8456	1.4328	0.2717
NDLA	0.0026	(1.14)	0.0069	−0.3022	0.2332	0.0520
PROCEEDS	8.6166	(671.93)***	8.8513	7.8405	10.0725	0.2885
IMKTRTN	0.91 %	(2.65)***	0.58 %	−19.32 %	48.51 %	7.74 %
Variable	Mean	(*t* value)	Median	Minimum	Maximum	SD
Panel B: Variables for underperformance (380 IPOs)						
BHAR	−3.87 %	(−1.87)*	−15.95 %	−58.05 %	216.74 %	40.36 %
DA	0.0738	(8.32)***	0.0595	−1.4233	0.7256	0.1730
NDA	−0.0027	(−1.20)	−0.0006	−0.1610	0.1648	0.0433
DCA	0.1749	(11.53)***	0.1387	−1.3252	1.9274	0.2956
NDCA	−0.0127	(−6.16)***	−0.0111	−0.2232	0.2097	0.0402
DLA	−0.1010	(−6.96)***	−0.0776	−1.8456	1.4328	0.2830
NDLA	0.0100	(4.23)***	0.0116	−0.2442	0.2332	0.0463
PROCEEDS	8.6312	(592.33)***	8.6018	7.8405	10.0725	0.2841
MKTRTN	−11.01 %	(−7.11)***	−24.43 %	−43.50 %	46.64 %	30.21 %
IR	138.85 %	(29.04)***	122.94 %	−5.46 %	820.50 %	91.85 %
Δ*NetIncome*	−0.0024	(−0.74)	−0.0009	−0.6401	0.1694	0.0618
Δ*ROA*	−0.0719	(−18.42)***	−0.0544	−0.5238	0.1048	0.0761
Δ*CFOA*	0.0175	(1.78)*	0.0092	−1.7123	0.7180	0.1926
Δ*SalesG*	0.4716	(9.37)***	0.2945	−0.7097	13.0123	0.9813
Δ*CapExp*	−0.0003	(−0.06)	0.0061	−0.4070	0.5377	0.1012
Δ*ATO*	−0.0699	(−5.02)***	−0.0625	−2.2105	1.1877	0.2715
IR	138.13 %	(28.88)***	125.05 %	0.28 %	830.21 %	93.23 %

Variable	T = 1 (506 IPOs)		T = 2 (448 IPOs)		T = 3 (380 IPOs)	
	Mean	Median	Mean	Median	Mean	Median
Panel C: Changes in discretionary variables and operating performance variables over three subsequent years						
DA	0.0644	0.0554	0.0310	0.0268	0.0103	0.0134
	(8.10)***	(6.97)***	(6.94)***	(6.00)***	(2.29)**	(2.97)***
DCA	0.1465	0.1162	−0.0327	−0.0361	−0.0292	−0.0282
	(11.16)***	(8.85)***	(−3.15)***	(−3.48)***	(−3.57)***	(−3.45)***
DLA	−0.0821	−0.0564	0.0637	0.0641	0.0395	0.0381
	(−6.80)***	(−4.67)***	(5.68)***	(5.71)***	(4.86)***	(4.69)***
NetIncome	0.1116	0.0947	0.0595	0.0556	0.0465	0.0456
	(35.68)***	(30.26)***	(28.39)***	(26.52)***	(17.25)***	(16.93)***

Table 2 continued

Variable	T = 1 (506 IPOs)		T = 2 (448 IPOs)		T = 3 (380 IPOs)	
	Mean	Median	Mean	Median	Mean	Median
ROA	0.1273	0.1111	0.0653	0.0589	0.0544	0.0525
	(34.71)***	(30.31)***	(26.49)***	(23.90)***	(17.93)***	(17.31)***
CFOA	0.0601	0.0649	0.0469	0.0434	0.0615	0.0608
	(7.17)***	(7.73)***	(9.94)***	(9.21)***	(13.13)***	(12.99)***
SalesG	0.2042	0.1294	0.2217	0.1660	0.2497	0.1821
	(12.26)***	(7.77)***	(12.21)***	(9.14)***	(10.80)***	(7.88)***
CapExp	0.1903	0.1082	0.1237	0.0855	0.0986	0.0785
	(18.40)***	(10.46)***	(22.27)***	(15.40)***	(23.10)***	(18.40)***
ATO	0.6739	0.5639	0.5644	0.4586	0.5855	0.4770
	(34.02)***	(28.46)***	(29.52)***	(23.99)***	(30.62)***	(24.95)***

Panel A and Panel B provide descriptive statistics for selected variables used in the underpricing and underperformance model respectively. Panel C provides descriptive statistics on some selected variable over 3 years after going public. *IR* is the initial return; *PROCEEDS* is the natural logarithm of the issuing size in monetary units; *DA* is discretionary total accruals scaled by total assets at the beginning of year; *NDA* is non-discretionary total accruals estimated from the fitted coefficients generated from benchmarks; *DCA* is discretionary current accruals scaled by total assets at the beginning of year; *NDCA* is non-discretionary current accruals estimated from the fitted coefficients generated from benchmarks; *DLA* is discretionary long term accruals scaled by total assets at the beginning of year; *NDLA* is non-discretionary long term accruals estimated from the fitted coefficients generated from benchmarks; *MKTRTN* is the contemporaneous 3-year buy-and-hold market returns; $\Delta NetIncome$ is the asset-scaled change in net income; ΔROA is the change in operating profits on assets; $\Delta CFOA$ is the change in operating cash flows on assets; $\Delta SalesG$ is the change in sales growth; $\Delta CapExp$ is the change in capital expenditure scaled by lagged total assets; ΔATO is the change in asset turnover

* Significance at the 10 % level

** Significance at the 5 % level

*** Significance at the 1 % level

4 Regression results

4.1 Underpricing

We first examine whether variables documented in the literature are determinants of underpricing in our sample. Then we take these as control variables and introduce a set of accrual variables in the following two models to test our hypotheses.

Model 1 :

$$IR = \alpha_0 + \alpha_1 DA + \alpha_2 NDA + \sum_{i=1}^{n} \gamma_i \cdot CtrlV_i + u \tag{11}$$

Model 2 :

$$IR = \beta_0 + \beta_1 DCA + \beta_2 NDCA + \beta_3 DLA + \beta_4 NDLA + \sum_{i=1}^{n} \gamma_i \cdot CtrlV_i + u \tag{12}$$

where *IR* is initial returns, defined as the percentage difference between the offer price and the closing price on the first trading day, the accrual variables (scaled by total assets at the

beginning of year) are as defined in the previous section, and *CtrlV* is a set of control variables.

We focus on existing empirical studies of Chinese IPOs and employ the determinants of underpricing employed in these such as the time lag between offering and listing, issue size, allocation rates, and the contemporaneous market return for this purpose. The time lag between offering and listing is a relevant factor in explaining underpricing in prior studies such as those of Mok and Hui (1998), Su and Fleisher (1999), and Chan et al. (2004). Issuers in Chinese IPOs normally spend months waiting for approval from the CSRC. The logic is that, the longer the time lag, the more valuation uncertainty involved and thus the greater the underpricing required as compensation on average.[10] Extant studies also document that underpricing is related to issue size or funds raised (Su and Fleisher 1999; Chan et al. 2004; Chi and Padgett 2005). This positive relationship can be justified by valuation uncertainty and information asymmetry proposed by Baron (1982), Rock (1986) and Ritter and Welch (2002) among others. Investors taking increased valuation risks for smaller firms will be compensated in the form of underpricing.

Another salient feature documented in the literature is the overwhelming excess demand for new issues in China (Chi and Padgett 2005; Coakley et al. 2010). Underpricing of IPOs reported in these two studies is negatively related to the rate of allocation as predicted by some classical models such as Rock (1986) and Welch (1992) in which underpricing is used as a positive signal to attract excess investor demand. Finally, we also consider the market return in the period between offering and listing as a potential determinant of IPO underpricing. Chan et al. (2004) find that the underpricing of Chinese IPOs is positively related to the return on the corresponding stock market index between offering and listing.

Table 3 presents the results of regressing IPO underpricing on proxies for earnings management and control variables. The *t* values are calculated using White's (1980) robust standard errors.

In Model 0, the non-accrual determinants of IPO underpricing are examined. We find that only the coefficients on *PROCEEDS* and *IMKTRTN* are statistically significant for both sample groups.[11] Thus we incorporate these two variables in the two underpricing models testing for the presence of investor overreaction.

Model 1 uses discretionary total accruals (*DA*) as a proxy for earnings management. We find a significantly positive relationship between *DA* and IPO underpricing at the 5 % critical value. Model 2 distinguishes the current and long term components in *DA* and non-discretionary total accruals (*NDA*). Here there is a significantly positive relationship between both discretionary current accruals (*DCA*) and discretionary long-term accruals (*DLA*) and underpricing at the 5 and 10 % critical values, respectively. This positive relationship between the discretionary components in accruals and underpricing is consistent with the overreaction hypothesis. This holds that investors subject to cognitive bias(es) do not fully or correctly interpret discretionary accruals such that the initial pricing error on the part of secondary market investors or the observed level of underpricing tends to increase in the use of earnings management. This positive relation obtains not only in the

[10] However, Shen (2007) further examines this relation and find that this relationship is primarily driven by the inclusion of IPOs issued in the early 1990s where exceptionally high levels of underpricing and extremely lengthy time lags were common. When these early issues are excluded, the positive relation between the time lag and underpricing breaks down and no longer holds.

[11] The first group of 506 IPOs is obtained when we use industry information to generate the coefficient of the modified Jones model while the second group of 337 IPOs is smaller in sample size since we use sector information to proceed. There are no appropriate non-IPO benchmarks for some particular sectors so we end up with a smaller group.

Table 3 IPO underpricing and proxies for earnings management

Model	506 IPOs			337 IPOs		
	0	1	2	0	1	2
Intercept	1482.12	1420.30	1385.82	1483.06	1422.97	1445.16
	(11.73)***	(9.96)***	(10.81)***	(9.70)***	(7.45)***	(7.60)***
DA		34.65			47.34	
		(2.06)**			(2.39)**	
NDA		95.53			46.16	
		(1.53)			(2.01)**	
DCA			36.46			53.06
			(2.12)**			(2.54)**
NDCA			8.85			64.20
			(0.11)			(2.10)**
DLA			35.47			30.71
			(1.85)*			(1.48)
NDLA			145.98			15.64
			(1.50)			(0.54)
PROCEEDS	−158.78	−150.17	−146.37	−160.83	−152.14	−154.94
	(−10.61)***	(−9.16)***	(−9.89)***	(−8.81)***	(−6.91)***	(−7.07)***
TIMELAG	0.33			0.39		
	(1.06)			(1.01)		
ALLOC	1.22			1.44		
	(1.17)			(1.37)		
IMKTRTN	2.11	2.10	2.12	1.67	1.64	1.61
	(4.63)***	(4.72)***	(4.67)***	(3.69)***	(3.86)***	(3.76)***
Adjusted R^2	0.3058	0.2879	0.2884	0.3253	0.2890	0.2903

This table presents some results of multivariate analysis for underpricing. *IR* is the initial return, defined as the percentage difference between the offer price and the closing price on the first day of trading; *PROCEEDS* is the natural logarithm of the issuing size in monetary units; *TIMELAG* is the time elapsed between offering and listing; *ALLOC* is the rate of allocation in an oversubscribed IPO; *IMKTRTN* is the return on general market index during the period between offering and listing; *DA* is discretionary total accruals scaled by total assets at the beginning of year; *NDA* is non-discretionary total accruals estimated from the fitted coefficients generated from benchmarks; *DCA* is discretionary current accruals scaled by total assets at the beginning of year; *NDCA* is non-discretionary current accruals estimated from the fitted coefficients generated from benchmarks; *DLA* is discretionary long term accruals scaled by total assets at the beginning of year; *NDLA* is non-discretionary long term accruals estimated from the fitted coefficients generated from benchmarks. The following equations are estimated:

$$IR = \gamma_0 + \gamma_1 PROCEEDS + \gamma_2 TIMELAG + \gamma_3 ALLOC + \gamma_4 IMKTRTN + e$$

$$IR = \alpha_0 + \alpha_1 DA + \alpha_2 NDA + \sum_{i=1}^{n} \gamma_i \cdot CtrlV_i + u$$

$$IR = \beta_0 + \beta_1 DCA + \beta_2 NDCA + \beta_3 DLA + \beta_4 NDLA + \sum_{i=1}^{n} \gamma_i \cdot CtrlV_i + u$$

* Significance at the 10 % level

** Significance at the 5 % level

*** Significance at the 1 % level

sample of 506 IPOs with the 13 SIC (standard industry classification) codes but also in a smaller sample of 337 IPOs when we use the 91 sector specifications. The coefficients on total discretionary accruals (*NDA*) and discretionary current accruals (*DCA*) are both significant at 5 % significance level.

The idea that investors are inclined to overprice IPOs is not new. Puranandam and Swaminathan (2004) find the pricing ratios of US IPO offer prices tend to exceed comparable benchmarks, but then underwriters play a much more active role in the US market. Our study looks instead at a sample where the offer prices are in effect mechanically set, and this enables us to identify earnings management as an important source of IPO overpricing also in the aftermarket. A recent study by Coakley et al. (2010) attributes underpricing and subsequent underperformance to demand. IPO underpricing is driven by high initial investor demand, some of which spills over into the immediate aftermarket to cause price bubbles which subsequently fade in the long run. Earnings management may be a factor driving such demand.

Finally, overreaction to some particular type of information may not be the only aspect about which investors are less than fully rational. The latter also includes a particular type of sentiment called "errors around the mean" described by Stein (1996, p. 431) as "systematic errors in forming expectations so that stocks can become significantly over- or undervalued at particular points in time." Loughran and Ritter (1995) argue that firms take advantage of windows of opportunity by issuing stock when equities are substantially overvalued. Baker and Wurgler (2002) propose that managers tend to exploit temporary fluctuations in investor sentiment, issuing equity when market valuations are high and repurchasing shares otherwise. Successful market timing enables issuers to sell their IPOs at higher prices, closing the gap between the offer price and the market price. This particular argument does not apply to the Chinese IPOs studied here, as there is more incentive for managers to take advantage of "windows of opportunity" to maximize the IPO offer price (which is linked to earnings) rather than the market price in the secondary market.

4.2 Long term performance

Teoh et al.'s (1998b) study of the US market reports that the accruals variables in the regression model exhibit satisfactory explanatory power for post-issue long term performance with the following control variables: *MKTRTN*, a contemporaneous 3-year market return from the exchange that listed the IPO; *PROCEEDS*, the natural logarithm of the issue size in monetary units; *ΔCapExp*, the asset-scaled change in capital expenditure; *ΔNetIncome*, the asset-scaled change in net income; and *IR*, the underpricing variable. Chan et al. (2004) study the stock performance of Chinese IPOs for the three post-issue years and find that the changes in several operating performance proxies around the offerings can be used to explain the long-term performance of IPOs. These operating performance variables include *ΔROA*, the change in operating profits on assets, *ΔCFOA*, the change in operating cash flows on assets, *ΔSalesG*, the change in sales growth, *ΔCapExp*, the change in capital expenditure, and *ΔATO*, is the change in asset turnover. All such variables are scaled by the total assets at the beginning of year.

We consider all these potential control variables (*CtrlV*) for inclusion in our regression model alongside the accrual variables.

Model 3 :

$$BHAR = \alpha_0 + \alpha_1 DA + \alpha_2 NDA + \sum_{i=1}^{n} \gamma_i \cdot CtrlV_i + u \tag{13}$$

Model 4 :

$$BHAR = \beta_0 + \beta_1 DCA + \beta_2 NDCA + \beta_3 DLA + \beta_4 NDLA + \sum_{i=1}^{n} \gamma_i \cdot CtrlV_i + u \tag{14}$$

where *BHAR* is the 3-year post-issue buy-and-hold abnormal return calculated starting four months after the first fiscal year-end, following Teoh et al. (1998b), to allow for the reporting lag.[12]

Table 4 presents the results for regressions of long-term performance on proxies for earnings management and control variables. The *t* values are calculated using White's (1980) robust standard errors.

Model 3 uses *DA* to proxy for earnings management while Model 4 further distinguishes between the current and long term components of *DA* and non-discretionary total accruals (*NDA*) to proxy for the use of earnings management.

There is a significantly negative relation between total discretionary accruals (*DA*) and *BHAR* in Model 3. In Model 4, the coefficients on discretionary current (*DCA*) and long term accruals (*DLA*) are both statistically significant at the 5 % critical value. They are also significant in economic terms with coefficients of −0.48 and −0.49, respectively. Teoh et al. (1998b) is the first study among others which reports a negative relation between long term performance and the discretionary components of accruals.[13] Their interpretation is that investors do not fully understand the information contained in accruals due to their initial over-optimism about the growth prospects of new issues. We find similar evidence for China as Teoh et al. (1998b) do for the US IPO market.

Finally, we find an inverse relation between *BHAR* and *IR* which is significant at the 1 % critical value in both models 3 and 4.[14] Ritter (1991) is the first to study the long-term stock performance of IPOs. He finds that there is a tendency for firms with high adjusted initial returns to have the worst aftermarket performance. We complement Ritter (1991) by providing a behavioural explanation for this relation. Consistent with our overreaction hypothesis, this evidence suggests that the decline in long run stock performance is related to biased market beliefs about managed accruals on the part of investors in the secondary market. When additional information becomes available, little by little these investors become aware of two factors. One is that the new issues are not as good as they appear to be. This is supported by the negative relation between *BHAR* and *DCA* and *DLA*, holding constant underpricing. This is a case in point where short-term earnings management is bad for long run wealth! The other aspect is that investors in the secondary market pay too much for shares and the long run reversal of prices is increasing in this initial pricing error. The market tends to overprice discretionary accruals and thus exacerbate underpricing and so discretionary accruals are good predictors of long term performance.

[12] The Chinese listed companies are required to release their audited annual reports by the end of the following April.

[13] See also Subramanyam (1996) and Xie (2001) among others.

[14] In the unreported regression which does not include any accrual variable, the coefficient on *IR* is negative (−0.12) with a *t*-value of −4.19.

Table 4 BHAR and proxies for earnings management

	Model 3		Model 4	
	Coefficient	(t value)	Coefficient	(t value)
Intercept	0.4180	(0.53)	0.7323	(0.87)
DA	−0.4615	(−2.12)**		
NDA	−0.1127	(−0.26)		
DCA			−0.4786	(−2.19)**
NDCA			0.4553	(0.97)
DLA			−0.4885	(−2.18)**
NDLA			−0.4973	(−0.99)
PROCEEDS	−0.0253	(−0.28)	−0.0613	(−0.65)
MKTRTN	0.2905	(3.53)***	0.2627	(3.13)***
ΔNetIncome	1.6291	(3.21)***	1.7249	(3.09)***
ΔROA	0.2885	(0.79)	0.2075	(0.55)
ΔCFOA	0.3308	(1.60)	0.3374	(1.61)
ΔSalesG	−0.0059	(−0.35)	−0.0070	(−0.41)
ΔCapExp	0.0474	(0.92)	0.0570	(1.09)
ΔATO	−0.1193	(−1.21)	−0.1141	(−1.16)
IR	−0.1178	(−4.19)***	−0.1185	(−3.97)***
Adjusted R^2	0.2053		0.2076	

This table presents some results of multivariate analysis for underperformance. *BHAR* is the 3-year buy-and-hold abnormal return; *DA* is discretionary total accruals scaled by total assets at the beginning of year; *NDA* is non-discretionary total accruals estimated from the fitted coefficients generated from benchmarks; *DCA* is discretionary current accruals scaled by total assets at the beginning of year; *NDCA* is non-discretionary current accruals estimated from the fitted coefficients generated from benchmarks; *DLA* is discretionary long term accruals scaled by total assets at the beginning of year; *NDLA* is non-discretionary long term accruals estimated from the fitted coefficients generated from benchmarks. *MKTRNT* is the contemporaneous 3 years buy-and hold market return; *PROCEEDS* is the natural logarithm of the issuing size in monetary units; *ΔNetIncome* is the asset scaled change in net income; *ΔROA* is the change in operating profits on assets; *ΔCFOA* is the change in operating cash flows on assets; *ΔSalesG* is the change in sales growth; *ΔCapExp* is the change in capital expenditure; *ΔATO* is the change in asset turnover; *IR* is the initial return, defined as the percentage difference between the offer price and the closing price on the first day of trading. The following models are estimated:

$$BHAR = \alpha_0 + \alpha_1 DA + \alpha_2 NDA + \sum_{i=1}^{n} \gamma_i \cdot CtrlV_i + u$$

$$BHAR = \beta_0 + \beta_1 DCA + \beta_2 NDCA + \beta_3 DLA + \beta_4 NDLA + \sum_{i=1}^{n} \gamma_i \cdot CtrlV_i + u$$

* Significance at the 10 % level

** Significance at the 5 % level

*** Significance at the 1 % level

4.3 Robustness checks

This subsection reports on aspects that could potentially affect the validity of our findings: the choice of benchmarks, proxies for earnings management, accrual models, and of robust standard errors when calculating t values. Our results do not change qualitatively when we

Table 5 Robustness checks with Jones (1991) model

Model	The modified Jones (1991)		The original Jones (1991)	
	1	2	1	2
Intercept	1420.30	1385.82	1437.33	1454.92
	(9.96)***	(10.81)***	(9.78)***	(9.71)***
DA	34.65		37.08	
	(2.06)**		(2.23)**	
NDA	95.53		32.99	
	(1.53)		(0.73)	
DCA		36.46		39.81
		(2.12)**		(2.33)**
NDCA		8.85		−15.95
		(0.11)		(−0.25)
DLA		35.47		35.23
		(1.85)*		(1.79)*
NDLA		145.98		42.17
		(1.50)		(0.84)
PROCEEDS	−150.17	−146.37	−152.31	−154.51
	(−9.16)***	(−9.89)***	(−9.00)***	(−8.93)***
IMKTRTN	2.10	2.12	2.12	2.15
	(4.72)***	(4.67)***	(4.72)***	(4.71)***
Adjusted R^2	0.2879	0.2884	0.2866	0.2853

This table presents some results of robustness checks. *IR* is the initial return, defined as the percentage difference between the offer price and the closing price on the first day of trading; *PROCEEDS* is the natural logarithm of the issuing size in monetary units; *IMKTRTN* is the return on general market index during the period between offering and listing; *DA* is discretionary total accruals scaled by total assets at the beginning of year; *NDA* is non-discretionary total accruals estimated from the fitted coefficients generated from benchmarks; *DCA* is discretionary current accruals scaled by total assets at the beginning of year; *NDCA* is non-discretionary current accruals estimated from the fitted coefficients generated from benchmarks; *DLA* is discretionary long term accruals scaled by total assets at the beginning of year; *NDLA* is non-discretionary long term accruals estimated from the fitted coefficients generated from benchmarks. The following equations are estimated:

$$IR = \alpha_0 + \alpha_1 DA + \alpha_2 NDA + \sum_{i=1}^{n} \gamma_i \cdot CtrlV_i + u$$

$$IR = \beta_0 + \beta_1 DCA + \beta_2 NDCA + \beta_3 DLA + \beta_4 NDLA + \sum_{i=1}^{n} \gamma_i \cdot CtrlV_i + u$$

* Significance at the 10 % level

** Significance at the 5 % level

*** Significance at the 1 % level

use the Fama–French 12-industry classification instead of the Chinese standard industry codes and when we consider operating income as an alternative to earnings.[15]

The main analysis relies on the modified Jones model (Dechow et al. 1995) to identify accrual components. Here we use the original Jones (1991) model to see if the results are robust to this alternative model specification. The difference between the original and

[15] Detailed results are available from the authors upon request.

Table 6 Robustness checks with Jones (1991) model

	Model 3		Model 4	
	Coefficient	(t value)	Coefficient	(t value)
Intercept	0.2543	(0.32)	0.2129	(0.26)
DA	−0.4652	(−2.16)**		
NDA	0.2012	(0.63)		
DCA			−0.4925	(−2.31)**
NDCA			0.5492	(1.30)
DLA			−0.4963	(−2.27)**
NDLA			0.0679	(0.22)
PROCEEDS	−0.0076	(−0.08)	−0.0012	(−0.01)
MKTRTN	0.2791	(3.46)***	0.2616	(3.19)***
ΔNetIncome	1.6275	(3.20)***	1.6564	(3.21)***
ΔROA	0.3024	(0.83)	0.3350	(0.88)
ΔCFOA	0.3241	(1.57)	0.3389	(1.66)
ΔSalesG	−0.0057	(−0.36)	−0.0060	(−0.36)
ΔCapExp	0.0681	(1.33)	0.0631	(1.22)
ΔATO	−0.1160	(−1.19)	−0.1118	(−1.13)
IR	−0.1142	(−4.08)***	−0.1149	(−4.02)***
Adjusted R^2	0.2142		0.2140	

This table presents some results of multivariate analysis for underperformance. *BHAR* is the 3-year buy-and-hold abnormal return; *DA* is discretionary total accruals scaled by total assets at the beginning of year; *NDA* is non-discretionary total accruals estimated from the fitted coefficients generated from benchmarks; *DCA* is discretionary current accruals scaled by total assets at the beginning of year; *NDCA* is non-discretionary current accruals estimated from the fitted coefficients generated from benchmarks; *DLA* is discretionary long term accruals scaled by total assets at the beginning of year; *NDLA* is non-discretionary long term accruals estimated from the fitted coefficients generated from benchmarks. *MKTRNT* is the contemporaneous 3 years buy-and hold market return; *PROCEEDS* is the natural logarithm of the issuing size in monetary units; *ΔNetIncome* is the asset scaled change in net income; *ΔROA* is the change in operating profits on assets; *ΔCFOA* is the change in operating cash flows on assets; *ΔSalesG* is the change in sales growth; *ΔCapExp* is the change in capital expenditure; *ΔATO* is the change in asset turnover; *IR* is the initial return, defined as the percentage difference between the offer price and the closing price on the first day of trading. The following models are estimated:

$$BHAR = \alpha_0 + \alpha_1 DA + \alpha_2 NDA + \sum_{i=1}^{n} \gamma_i \cdot CtrlV_i + u$$

$$BHAR = \beta_0 + \beta_1 DCA + \beta_2 NDCA + \beta_3 DLA + \beta_4 NDLA + \sum_{i=1}^{n} \gamma_i \cdot CtrlV_i + u$$

* Significance at the 10 % level

** Significance at the 5 % level

*** Significance at the 1 % level

modified Jones model lies in the estimation of the non-discretionary component. The latter subtracts the changes in accounts receivable (*ARec*) from the changes in sales while the former does not. Advocates contend that this modification is to accommodate sales manipulation in many scenarios, for example, when credit policies are relaxed to achieve high sales prior to the offering. Tables 5 and 6 present regression results for the underpricing and long-term performance models respectively using the original Jones model (1991). The t values are calculated using White's (1980) robust standard errors.

Table 7 Robustness checks with Newey-West HAC standard errors

Model	White (1980)		Newey-West (1987)	
	1	2	1	2
Intercept	1420.30	1385.82	1420.30	1385.82
	(9.96)***	(10.81)***	(9.79)***	(10.40)***
DA	34.65		34.65	
	(2.06)**		(2.00)**	
NDA	95.53		95.52	
	(1.53)		(1.55)	
DCA		36.46		36.46
		(2.12)**		(2.01)**
NDCA		8.85		8.85
		(0.11)		(0.11)
DLA		35.47		35.47
		(1.85)*		(1.86)**
NDLA		145.98		145.98
		(1.50)		(1.47)
PROCEEDS	−150.17	−146.37	−150.17	−146.37
	(−9.16)***	(−9.89)***	(−8.99)***	(−9.52)***
IMKTRTN	2.10	2.12	2.10	2.12
	(4.72)***	(4.67)***	(4.72)***	(4.67)***
Adjusted R^2	0.2879	0.2884	0.2879	0.2884

This table presents some results of robustness checks. *IR* is the initial return, defined as the percentage difference between the offer price and the closing price on the first day of trading; *PROCEEDS* is the natural logarithm of the issuing size in monetary units; *IMKTRTN* is the return on general market index during the period between offering and listing; *DA* is discretionary total accruals scaled by total assets at the beginning of year; *NDA* is non-discretionary total accruals estimated from the fitted coefficients generated from benchmarks; *DCA* is discretionary current accruals scaled by total assets at the beginning of year; *NDCA* is non-discretionary current accruals estimated from the fitted coefficients generated from benchmarks; *DLA* is discretionary long term accruals scaled by total assets at the beginning of year; *NDLA* is non-discretionary long term accruals estimated from the fitted coefficients generated from benchmarks. The following equations are estimated:

$$IR = \alpha_0 + \alpha_1 DA + \alpha_2 NDA + \sum_{i=1}^{n} \gamma_i \cdot CtrlV_i + u$$

$$IR = \beta_0 + \beta_1 DCA + \beta_2 NDCA + \beta_3 DLA + \beta_4 NDLA + \sum_{i=1}^{n} \gamma_i \cdot CtrlV_i + u$$

* Significance at the 10 % level

** Significance at the 5 % level

*** Significance at the 1 % level

We find that the main results do not change qualitatively. The positive relation between underpricing and the discretionary accrual components remains significant at the 5 % level and the negative relation between 3-year *BHAR* and discretionary accrual components becomes more significant, at the 1 % level. Our results are robust to the choice of accrual model.

Finally, we use White's (1980) robust standard errors to calculate *t* values throughout the paper. In addition to heteroskedasticity, the results might be affected by the presence of serial correlation. We examine this issue by using Newey-West (Newey and West 1987)

Table 8 Robustness checks with Newey-West HAC standard errors

	Model 3		Model 4	
	Coefficient	(*t*-value)	Coefficient	(*t*-value)
Intercept	0.4180	(0.52)	0.7323	(0.88)
DA	−0.4615	(−2.12)**		
NDA	−0.1127	(−0.26)		
DCA			−0.4786	(−2.18)**
NDCA			0.4553	(0.99)
DLA			−0.4885	(−2.16)**
NDLA			−0.4973	(−1.00)
PROCEEDS	−0.0253	(−0.28)	−0.0613	(−0.65)
MKTRTN	0.2905	(3.67)***	0.2627	(3.15)***
ΔNetIncome	1.6291	(3.12)***	1.7249	(3.21)***
ΔROA	0.2885	(0.78)	0.2075	(0.52)
ΔCFOA	0.3308	(1.61)	0.3374	(1.60)
ΔSalesG	−0.0059	(−0.36)	−0.0070	(−0.42)
ΔCapExp	0.0474	(1.03)	0.0570	(1.23)
ΔATO	−0.1193	(−1.17)	−0.1141	(−1.13)
IR	−0.1178	(−4.42)***	−0.1185	(−4.17)***
Adjusted R^2	0.2053		0.2076	

This table presents some results of multivariate analysis for underperformance. *BHAR* is the 3-year buy-and-hold abnormal return; *DA* is discretionary total accruals scaled by total assets at the beginning of year; *NDA* is non-discretionary total accruals estimated from the fitted coefficients generated from benchmarks; *DCA* is discretionary current accruals scaled by total assets at the beginning of year; *NDCA* is non-discretionary current accruals estimated from the fitted coefficients generated from benchmarks; *DLA* is discretionary long term accruals scaled by total assets at the beginning of year; *NDLA* is non-discretionary long term accruals estimated from the fitted coefficients generated from benchmarks. *MKTRNT* is the contemporaneous 3 years buy-and hold market return; *PROCEEDS* is the natural logarithm of the issuing size in monetary units; *ΔNetIncome* is the asset scaled change in net income; *ΔROA* is the change in operating profits on assets; *ΔCFOA* is the change in operating cash flows on assets; *ΔSalesG* is the change in sales growth; *ΔCapExp* is the change in capital expenditure; *ΔATO* is the change in asset turnover; *IR* is the initial return, defined as the percentage difference between the offer price and the closing price on the first day of trading. The following models are estimated:

$$BHAR = \alpha_0 + \alpha_1 DA + \alpha_2 NDA + \sum_{i=1}^{n} \gamma_i \cdot CtrlV_i + u$$

$$BHAR = \beta_0 + \beta_1 DCA + \beta_2 NDCA + \beta_3 DLA + \beta_4 NDLA + \sum_{i=1}^{n} \gamma_i \cdot CtrlV_i + u$$

* Significance at the 10 % level

** Significance at the 5 % level

*** Significance at the 1 % level

heteroskedastic and autocorrelation (HAC) consistent standard errors which adjust for both problems in Tables 7 and 8.

The results for the underpricing and underperformance models respectively suggest that our findings are not affected by the use of HAC standard errors. Both the positive relation between discretionary accruals and IPO underpricing, and the negative relation between discretionary accruals and long term stock performance remain significant.

5 Conclusions

We develop a parsimonious pricing model incorporating the overreaction hypothesis and empirically test its predictions for a sample of 506 IPOs in China issued during the 1998–2003 period. The offer price is set as a multiple of earnings by the authorities and so earnings management mechanically inflates the offer price in this unique framework. This generates a threshold above which we can measure the degree to which secondary market investors overreact by taking accounting accruals at face value. Discretionary current accruals boost the reported earnings of the sample Chinese IPOs by almost 15 %.

The empirical results offer support for the three predictions of the overreaction hypothesis. First, they show that the initial underpricing of IPOs and discretionary accruals are positively related. Second, the regression results indicate a negative relationship between the 3-year buy-and-hold abnormal return (BHAR) and discretionary accruals. This is similar to the findings of the seminal study of Teoh et al. (1998b). The accounting accrual effects are reversed in the long run, thus leading to a flow of bad news for the firms with a larger component of accruals in reported earnings at the IPO stage. Finally, the results also show an inverse relationship between the BHAR and underpricing. Investors in the secondary market seem to overreact to managed accruals by buying shares at prices up to the first-day closing price. These findings suggest that earnings management generates a pattern where the stock prices of IPO firms tend to be inflated by overreaction in the secondary market but subsequently adjust towards their fundamental levels. Our study offers new insights into IPO underpricing in China.

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Appendix: Accruals estimation procedure

Following previous research, we use discretionary accruals as a proxy for earnings management.[16] As adjustments to cash flows, total accruals (AC) in a given year are defined as reported earnings or net income in excess of operating cash flow:

$$AC \equiv \text{Net Income} - \text{Operating Cash Flow} \tag{15}$$

Since issuers may have a preference for discretion over short- and long-term accruals (Guenther 1994), we distinguish between the current and long-term components of total accruals and evaluate them separately. Current accruals (CA) are defined as the change in non-cash current assets minus the change in operating current liabilities,

$$\begin{aligned} CA \equiv\ & \Delta[\text{Current assets} - \text{cash and cash equivalents}] \\ & - \Delta[\text{Current liabilities} - \text{current maturity of long} - \text{term debts}] \end{aligned} \tag{16}$$

Some accrual adjustments are appropriate and necessary given the business conditions typically faced by firms in their industry. Without information on actual economic events

[16] For example, Jones (1991), Dechow et al. (1995), Subramanyam (1996), Teoh et al. (1998a) and (1998b), Rangan (1998), Hribar and Collins (2002), Kim and Park (2005).

and the timing of inflows and outflows, it is difficult for investors to infer the extent to which accruals are adjusted. In event studies, we use benchmarks to define abnormal returns. Likewise we need benchmarks further to decompose accruals into two parts, one described by firm and industry conditions and the other presumed to be managed by issuers.

We use the modified Jones cross-sectional model (Dechow et al. 1995) for this purpose.[17] "The cross-sectional approach automatically adjusts for the effects of fluctuating industry-wide economic conditions that influence accruals independent of any earnings management in each year." (Teoh et al. 1998b: 1940) Generally, current accruals are regressed on the change in sales in a cross-sectional regression using non-IPO benchmarks in the same industry j on a yearly basis. Non-IPO firms with at least 2 years of trading records in the market are used as benchmarks. All variables in the regression are scaled by the firm's total assets (TA) at the beginning of each fiscal year t.

$$\frac{CA_{j,t}}{TA_{j,t-1}} = \alpha_0\left(\frac{1}{TA_{j,t-1}}\right) + \alpha_1\left(\frac{\Delta Sales_{j,t}}{TA_{j,t-1}}\right) + \varepsilon_{j,t} \tag{17}$$

The fitted current accruals of the issuers i in a given year t are calculated using the estimated coefficients from the regression and the change in sales net of the change in accounts receivable. The change in accounts receivable ($ARec$) is subtracted from the change in sales to allow for the possibility of sales manipulation. Fitted current accruals are considered to be the level necessary to support the firm's sales increase and are termed non-discretionary current accruals ($NDCA$).

$$NDCA_{i,t} \equiv \widehat{\alpha_0}\left(\frac{1}{TA_{i,t-1}}\right) + \widehat{\alpha_1}\left(\frac{\Delta Sales_{i,t} - \Delta \mathrm{ARec_{i,t}}}{TA_{i,t-1}}\right) \tag{18}$$

The regression residual is presumed to be that part of accruals that is not to be dictated by firm and industry conditions but instead to have been managed. It is termed discretionary current accruals (DCA):

$$DCA_{i,t} \equiv \frac{CA_{i,t}}{TA_{i,t-1}} - NDCA_{i,t} \tag{19}$$

To obtain discretionary and non-discretionary long-term accruals, we first estimate discretionary and non-discretionary total accruals. The discretionary total accrual (DAC) for firm i for year t is calculated in a manner similar to the current accrual except now the total accrual is used as the dependant variable and the regression includes gross property, plant, and equipment (PPE) as an additional explanatory variable.

$$\frac{AC_{j,t}}{TA_{j,t-1}} = \beta_0\left(\frac{1}{TA_{j,t-1}}\right) + \beta_1\left(\frac{\Delta Sales_{j,t}}{TA_{j,t-1}}\right) + \beta_2\left(\frac{PPE_{j,t}}{TA_{j,t-1}}\right) + \varepsilon_{j,t} \tag{20}$$

Non-discretionary total accruals (NDA) and discretionary total accruals (DA) calculated as:

$$NDA_{i,t} \equiv \widehat{\beta_0}\left(\frac{1}{TA_{i,t-1}}\right) + \widehat{\beta_1}\left(\frac{\Delta Sales_{i,t} - \Delta \mathrm{ARec_{i,t}}}{TA_{i,t-1}}\right) + \widehat{\beta_2}\left(\frac{PPE_{i,t}}{TA_{i,t-1}}\right) \tag{21}$$

[17] We do not use other models such as Dechow and Dichev (2002) as the data before companies go public are not readily available for our sample of Chinese IPOs.

$$DA_{i,t} \equiv \frac{AC_{i,t}}{TA_{i,t-1}} - NDA_{i,t} \tag{22}$$

Non-discretionary long-term accruals (*NDLA*) are defined as the difference between non-discretionary total accruals and non-discretionary current accruals. Discretionary long-term accruals (*DLA*) are the difference between asset-scaled long-term accrual and non-discretionary long-term accruals.

$$NDLA_{i,t} \equiv NDA_{i,t} - NDCA_{i,t} \tag{23}$$

$$DLA_{i,t} \equiv \frac{AC_{i,t} - CA_{i,t}}{TA_{i,t-1}} - NDLA_{i,t} \tag{24}$$

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