

# Earnings management by top Chinese listed firms in response to the global financial crisis

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## Abstract

**Purpose** – The main aim of this study was to examine the earnings management behaviours, including both accrual-based and cash flow-based earnings management, of Chinese firms during the Global Financial Crisis (GFC).

**Design/methodology/approach** – A data set of 1,392 firm-year observations derived from a large sample of China's top listed firms (based on total assets) was constructed and investigated via univariate and ordinary least squares regression analyses.

**Findings** – Two distinct conclusions can be drawn from the results of the study. First, the top Chinese listed firms did engage in earnings management, as indicated by comparisons of the means of the absolute values of both accrual-based and cash flow-based earnings management indicators in the periods before and after 2008 when the GFC started. Second, investigation of earnings management directions revealed that in response to the GFC, the firms from construction-related industries and the airline industry manipulated earnings upwards through either accrual-based and/or cash flow-based earnings management activities. On the other hand, firms in the household durables industry engaged in earnings-reducing activities. These findings reflect the effect of the stimulus package launched by the Chinese Government in an effort to combat the GFC. In addition, the results indicate that firm characteristics such as size, leverage, profitability and growth affected the earnings management behaviours of the firms analysed in the study.

**Originality/value** – The empirically derived findings of this study contribute to the literature pertaining to the effects of the GFC on earnings management practices in China, which has remained relatively scant to date.

**Keywords** Global financial crisis, Discretionary accruals, Chinese firms, Earnings management, Cash flow-based earnings management

**Paper type** Research paper

## 1. Introduction

Earnings management remains an important and popular issue in the financial accounting research literature. The primary objective of this study was to examine the earnings management practices of the top Chinese listed firms (based on total assets from 2007 to 2009) in response to the global financial crisis (GFC). Previous studies have shown that earnings management is used by firms in response to financial crisis (Kim

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and Yi, 2006; Ahmed and Saleh, 2007; Chia *et al.*, 2007; Charoenwong and Jiraporn, 2009). These studies suggest that firms utilise specific accounting procedures to manipulate earnings during financial crisis for various reasons, including meeting market expectations and obtaining favourable treatment and consideration during debt contract renegotiation, and also in an effort to blame the economic recession for their poor performance.

This current study was mainly motivated by the following facts. First, the literature to date has provided limited evidence on firms' earnings behaviours in response to the GFC, particularly with regards to Chinese firms. Second, most previous studies used only one method to detect earnings management either via discretionary accruals (Healy and Wahlen, 1999; Balatbat and Lim, 2003; Kothari *et al.*, 2005; Ahmed and Saleh, 2007; Chen *et al.*, 2009) or the manipulation of real business activities (Ewert and Wagenhofer, 2005; Graham *et al.*, 2005; Roychowdhury, 2006; Gunny, 2010). Third, when investigating the directions of earnings management, previous studies (Guidry *et al.*, 1998; Balatbat and Lim, 2003; Carter *et al.*, 2005; Gunny, 2010) have tended to examine the earnings behaviours of a cross-section of firms together as a group, a strategy which may not be capable of revealing a clear picture for each industrial sector. This is because the different firms in any given sample operate under various different conditions and settings, thus, they are subject to different incentives, and this may result in them engaging in dissimilar earnings behaviours. For example, in response to financial crisis, some firms manipulate earnings upwards, whereas others manipulate them downwards. When a sample of firms is examined as a whole, these two directions of earnings management may offset each other.

To address apparent gaps in the literature, in this study, both accrual-based and cash flow-based earnings management by the top Chinese listed firms in response to the GFC were examined. The sample firms' discretionary accruals and their abnormal levels of cash flow-based earnings management activities were estimated via the Kothari *et al.* (2005) model and the Roychowdhury (2006) model. Comparisons of the means of the absolute values of these earnings management indicators in periods before and after 2008 showed that the firms analysed engaged in earnings management during the crisis period.

For the purpose of investigating the different earnings management behaviours utilised in different industries, each firm in the sample was assigned to 1 of 30 industry groups according to the six-digit Global Industry Classification Standard (GICS) code. The means of the earnings management behaviours in each industry group in the periods before and after 2008 were compared. In response to the GFC, the construction material industry firms analysed manipulated earnings upwards through discretionary accruals and the manipulation of the cost of goods sold (COGS). Firms from the construction and engineering industries engaged in accrual-based income-increasing earnings management. Firms from the construction, farm and industrial machinery industries manipulated both cash flow from operations (CFO) and inventory levels downwards. The airlines industry engaged in income-increasing earnings management through the manipulation of discretionary expenses. Last, the manufacturers of household durables such as domestic appliances, electronics and TVs managed earnings downwards through discretionary accruals. The findings reflect the effect of the stimulus package launched by the Chinese Government in response to the GFC. The analysis also revealed that the magnitudes of accrual-based and cash flow-based

earnings management are influenced by firm characteristics such as firm size, profitability, leverage and growth.

The subsequent sections of this report are structured as follows. Section 2 is a review of the literature pertaining to earnings management. The institutional background in China, including the implementation of the Chinese Government's response to the GFC and the stimulus package, is detailed in Section 3. Section 4 discusses the hypothesis development and empirical methodology of this study. Interpretations of the empirically derived results are provided in Section 5. Last, Section 6 acknowledges the potential limitations of this study, discusses the conclusions that can be drawn from it and suggests possibilities for future research in this area.

## 2. Literature review

Earnings management is an important issue in the field of financial accounting and has been extensively researched. Healy and Wahlen (1999) provided a comprehensive review of the earnings management literature and summarised the major incentives for firms and their management to engage in earnings management[1]. They suggested that earnings management can be influenced by contracting incentives, which mainly involve two types of contracts, the remuneration and bonus contracts between firms and their managers and the lending or debt contracts between firms and their creditors. Managers tend to choose favourable accounting policies to manipulate reported earnings to increase their awards and personal wealth when their remuneration and bonuses are tied to their firm's performance (Watts, 1977; Watts and Zimmerman, 1978; Healy, 1985; Gao and Shrieves, 2002; Carter *et al.*, 2005; Camara and Henderson, 2009)[2]. Firms are also likely to use earnings management as a powerful device to avoid violations of the restrictive covenants in lending or debt contracts; otherwise, violations would impose heavy costs on firms (Defond and Jiambalvo, 1994; Ahmed and Saleh, 2007; Chamberlain *et al.*, 2014).

Firms also engage in earnings management for firm valuation purposes, for example, to influence their stock prices or the book value of their assets prior to acquisitions, buyouts or initial public offerings (Perry and Williams, 1994; Erickson and Wang, 1999; Teoh *et al.*, 1998; Balatbat and Lim, 2003; Whelan, 2004; Beyer, 2005; Scott, 2009; Cheng *et al.*, 2013). In addition, earnings management can be used by firms to minimise the adverse political consequences resulting from violations of governmental or industrial regulations (Wong, 1988; Moyer, 1990; Beatty *et al.*, 1995; Garrod *et al.*, 2007). During management turnover, new management is likely to deliberately manage earnings downwards to blame their predecessors for poor performance, which also allows them to report higher growth during their subsequent term in office (Strong and Meyer, 1987; Elliott and Shaw, 1988; Pourciau, 1993; Godfrey *et al.*, 2003).

Scott (2009) classifies earnings management into four major patterns. In the first pattern, "taking a bath", firms experiencing low profits or loss in certain periods use earnings management to reduce their earnings even further (Healy, 1985; DeAngelo, 1988; Murphy and Zimmerman, 1993; Jordan and Clark, 2004). The second pattern, "income minimisation", usually occurs during periods when the profitability of a firm is comparatively high. This earnings management strategy is similar to taking a bath, but earnings are reduced at a moderate rate. After minimising the current period's earnings, the diverted profits are put in reserve, and because of accrual reversal, these earnings can be utilised by management in future periods when the firm experiences low

profitability (Shuto, 2007). “Income maximisation” is the third pattern of earnings management, which can be used by management for purposes such as increasing compensation and personal wealth (Healy, 1985; Guidry *et al.*, 1998). The last pattern, “earnings smoothing” refers to reducing the volatility or fluctuations in reported earnings to maximise the long-term value of a firm or to ensure stable compensation for managers (McNichols and Wilson, 1988; Trueman and Titman, 1988).

There are two major earnings management methods used by firms to realise the four patterns of earnings management: accrual-based and cash flow-based earnings management. According to Healy and Wahlen (1999), earnings management through discretionary accruals occurs when earnings are manipulated through managerial discretions on accruals and accounting choices permitted by accounting standards. Accrual-based earnings management can be detected by using two main proxies: total accruals and discretionary accruals[3]. Most studies use discretionary or unexpected accruals as the proxy for earnings management. Jones (1991) was a pioneer of using discretionary accruals as the proxy for detecting earnings management. Cash flow-based earnings management, or real earnings management activities, was first studied by Ewert and Wagenhofer (2005) and Roychowdhury (2006)[4]. Cohen and Zarowin (2010) argue that the major distinction between accrual-based and cash flow-based earnings management activities is that cash flow-based earnings are manipulated through real business activities, such as increases in sales or reductions in inventories that involve cash transactions. Xu *et al.* (2007) categorise real earnings management activities into operating, investing and financing activities. Further, they suggest that operating and investing activities are mainly based on discretionary expenses (including research and development expenses), sales and general and administrative expenses; and production costs that are the sum costs of goods sold and changes in inventory. Financing activities are mainly based on stock options and financial instruments. Roychowdhury (2006) suggests that managers use real earnings management activities to avoid reporting annual income losses or to increase reported earnings. These managerial activities include:

- increasing price discounts to temporarily increase sales;
- increasing production to lessen the COGS; and
- reducing discretionary expenditures, including research and development costs, sales and distribution expenses and advertising expenses.

The literature provides some empirical evidence on the associations between earnings management and changes in the institutional environment, such as the adoption of accounting standards and changes in economic conditions. Liu *et al.* (2011) reported that the accrual-based earnings management of Chinese listed firms decreased as a result of the adoption of International Financial Reporting Standards in China in 2007. With regards to firms’ reactions to financial crisis by way of earnings management, Kim and Yi (2006) demonstrated that during the 1997 Asian economic recession, Korean publicly listed firms engaged in earnings management to a larger extent than private firms. Listed firms utilised earnings management even more intensely after the crisis to meet market expectations. Ahmed and Saleh (2007) examined the earnings management of financially distressed firms engaged in debt renegotiation during the Asian economic recession. They found that financially distressed firms manipulated earnings

downwards during the 1998 financial crisis in Malaysia. They suggested two arguments that underpin such managerial manipulations. First, the firm managers involved aimed to signal that they were willing to acknowledge the financial problems during debt renegotiation. They tried to convince creditors that the firm had a good prospect of recovery to obtain concessions from banks. Second, firm managers sought to receive favourable considerations and support from the government by constructing credible presentations designed to show that economic conditions posed a serious threat to their firm's viability.

Chia *et al.* (2007) reported that service-oriented firms in Singapore engaged in income-reducing earnings management (or "taking a bath") during the 1997 Asian economic recession. Charoenwong and Jiraporn (2009) examined the reactions of firms in Singapore and Thailand to the 1997 Asian economic recession and reported that firms from these two countries used earnings management to avoid reporting losses and negative income growth. They also demonstrated that earnings management behaviours varied between financial and non-financial firms, between Singaporean and Thai firms and between the periods before and after the 1997 Asian economic recession.

### 3. Institutional background: the global financial crisis in China and China's reactions

The 2008 GFC, which is also known as the subprime mortgage crisis as a result of the bursting of housing bubbles in the USA around 2005 and 2006 (Lahart, 2007), has had a substantial impact on the world economy. This is illustrated by significant reductions in the annualised gross domestic products (GDPs) of some of the world's major economies. At the beginning of 2009, the annualised rates of decline in GDP were 6.8 per cent in the USA, 14.4 per cent in Germany, 15.2 per cent in Japan, 7.4 per cent in the UK and 9.8 per cent in the eurozone (Baily and Elliott, 2009). In addition, some emerging economies with strong economic growth have experienced dramatic slowdowns[5]. Of these, during the period from 2007 to 2009, Cambodia experienced the largest reduction in GDP growth rate, from above 10 per cent to approximately 0 per cent. India's GDP growth rate dropped from 9.2 to 7.4 per cent, Mexico's from 4.8 to 1.3 per cent, Malaysia's from 5.9 to 4.6 per cent and, in Kenya, it dropped from approximately 7.0 to 3.0 per cent.

As the largest developing economy, China was also affected by the GFC[6]. From the second half of 2007, China's economy exhibited a downtrend, which was reflected by declines in several major aspects of the country's economy. The economic growth rate in China had averaged 9.8 per cent annually before the 2008 GFC. However, it dropped to 9.0 per cent in the second half of 2008 and then to 6.1 per cent in early 2009. In 2009, the export growth rate became negative for the first time at -16 per cent, and the total value of exports declined by US\$229.08bn. In the stock market, the composite indices of the Shanghai and Shenzhen stock exchanges decreased significantly by 65 and 62 per cent, respectively, after peaking in 2007.

It has been argued that the adverse effects of the GFC on emerging economies, including China, were mainly caused by a significant drop in their exports to major developed countries (Liu, 2009; te Velde *et al.*, 2009). The major developed countries are the main markets for the emerging economies' exports, and dramatic declines in consumption in those developed countries resulted in reduced demand for the products exported from developing countries. Liu (2009) presented empirical evidence indicating that the impact of the crisis on China was significant. A 1 per cent decline in economic

growth in the USA, the EU and Japan is likely to result in a 0.73 per cent decline in the growth rate of China. A report by *te Velde et al. (2009)* from the Overseas Development Institute suggests that growth rate reductions in developed countries are likely to result from decreases in trade, commodity prices and investment. A report in the *China Digital Times* in 2010 also blamed the crisis in the USA and Europe for the downturn in China's growth. "When the USA and Europe fell into the credit crisis earlier this year, they were forced to cut back on consumption, which fuelled a massive decrease in demand for Chinese imports"[7]. Economic data collected by the National Bureau of Statistics of China are concordant with this assertion.

Besides the influence of external factors, some scholars have argued that the deterioration in China's economy since the second half of 2008 also resulted from internal aspects of China's economy. *Zhang (2009)* suggested that China is bound to pass through another trough in its economic cycle; its national economy would be heated or overheated and cooled or overcooled from time to time every several years, and other internal economic factors contributed to the economic slowdown in China in 2008[8]. Overall, the economic slowdown in China in 2008 and 2009 mainly resulted from the GFC that commenced in 2007, and the situation was exacerbated by internal aspects of China's economy.

The Chinese Government launched a series of measures to mitigate the impact of the GFC on China's economy and maintain the country's economic growth[9]. The most significant of these was a stimulus package provided by the central government, amounting to US\$580bn (or 4 trillion RMB), which accounted for approximately 14 per cent of 2008's GDP[10]. This stimulus package involved thousands of projects, and more than 60 per cent of it was invested in the construction of infrastructure, including railways, highways and airports. The rest was invested in social and people's-livelihood programmes, such as the "household appliances to the countryside" initiative included in the "San Nong policy". These governmental interventions were swift and decisive, and, thus, they successfully salvaged China's economy in 2009. *Yu (2009)* concluded that these governmental responses were admirable because the slowdown in China's growth did not last more than a quarter, and the Chinese economy rebounded strongly with annual GDP growth of 7.9 per cent in 2008 and more than 8.0 per cent in 2009.

## 4. Hypothesis development and empirical methodology

### 4.1 Hypothesis development

As discussed above in the literature review, previous studies have provided some empirical evidence on firms' reactions to financial crisis in terms of earnings management. *Chia et al. (2007)* reported that service-oriented firms in Singapore utilised income-reducing earnings management via discretionary accruals during the Asian economic recession. Similarly, *Ahmed and Saleh (2007)* suggested that as a response to the 1997 Asian economic recession, firms in Malaysia managed their earnings downwards through significantly negative discretionary accruals.

However, other studies reveal that some firms engage in income-increasing earnings management during financial crisis. *Charoenwong and Jiraporn (2009)* demonstrated that firms in Singapore and Thailand managed earnings upwards to avoid reporting losses and negative income growth during the 1997 Asian economic recession. As discussed earlier, China's economy recovered promptly mainly because of the reactions of the Chinese Government in terms of some major policies, including stimulus packages

(Yu, 2009); China's economy maintained a relatively high growth rate of 8 per cent in 2008 and 2009. Therefore, it is likely that the top Chinese listed firms[11] manipulated reported earnings upwards through both accrual-based and cash flow-based earnings management during the GFC. Thus, the first two hypotheses of this study were:

- H1.* The top Chinese listed firms engaged in income-increasing accrual-based earnings management in response to the GFC.
- H2.* The top Chinese listed firms engaged in income-increasing cash flow-based earnings management in response to the GFC.

As mentioned in the literature review, real or cash flow-based earnings management activities are categorised into the manipulation of CFO, discretionary expenses and production costs (Roychowdhury, 2006; Xu *et al.*, 2007). Discretionary expenses are the sum of research and development costs, sales and distribution expenses, advertising expenses and general and administrative expenses; production costs are defined as the sum costs of goods sold and inventory changes. Therefore, *H2* was subdivided as follows:

- H2a.* The top Chinese listed firms managed reported earnings upwards through the manipulation of discretionary expenses during the GFC.
- H2b.* The top Chinese listed firms managed reported earnings upwards through the manipulation of production costs in terms of both the costs of goods sold and changes in inventory during the GFC.

The literature to date provides limited direct[12] empirical evidence on the relationships between earnings management and firm characteristics such as performance, growth, leverage and size, and most studies in this area have focused on discretionary accruals. According to Defond and Jiambalvo (1994), income-increasing earnings management is utilised by highly leveraged firms to meet debt covenant requirements or to avoid debt covenant violations. Similarly, Waweru and Riro (2013) reported a positive correlation between high leverage and accrual-based earnings manipulation using Kenyan data. Lee and Choi (2001) and Kim *et al.* (2003) explored the relationship between firm size and earnings management. Both reports suggest that firm size can influence earnings management, whereas small firms tended to engage in earnings management to avoid reporting losses, and medium and large firms aimed to avoid reporting reduced earnings. Lee *et al.* (2006) suggested that earnings management is positively associated with firm performance and growth, which indicates that higher profitability and growth rate are likely to result in income-increasing earnings manipulations. From the perspective of audit quality, Krishnan (2003) suggests that auditors have the ability to restrict managers' earnings management activities, which in turn strengthens the quality of reported earnings and market investor protection. On this point, Chia *et al.* (2007) provided empirical evidence that earnings management was significantly constrained in the Singaporean companies audited by the "Big-6" auditing firms during the 1997 Asian economic recession.

In contrast to accrual-based earnings management, limited empirical evidence has been published on associations between firm characteristics and cash flow-based earnings management. Zagers-Mamedova (2009) reported that US listed firms with increasing leverage levels were more likely to use real earnings management to affect

operating cash flow. In the context of a developing market, the results of *Zamri et al. (2013)* demonstrate a significant negative relationship between leverage and real earnings management. Based on these previous studies, it was predicted that earnings management by top Chinese listed firms is associated with their profitability, growth, leverage and size, and the following hypotheses were formulated:

- H3. Earnings management through discretionary accruals by the top Chinese listed firms is significantly associated with the firms' characteristics.
- H4. Earnings management through the manipulation of real business activities by the top Chinese listed firms is significantly associated with the firms' characteristics.

#### 4.2 Earnings management metrics

4.2.1 *Earnings management through discretionary accruals.* The cross-sectional model was used to calculate discretionary accruals as proxies for accrual-based earnings management. For each financial year, a modified Jones model, the *Kothari et al. (2005)* model, was adopted to derive estimates for every industry group as classified by the GICS code. Therefore, this estimation approach could control for the differences between industry groups that may have impacted total accruals during the financial crisis and allow the coefficients to change over the sample period, as suggested by previous studies such as *Defond and Jiambalvo (1994)* and *Cohen and Zarowin (2010)*.

According to *Kothari et al. (2005)*, performance matching based on return on assets (ROA) ratio controls for the effect of differences in performance across a given sample of firms. Discretionary accruals generated by using performance matched measures are likely to yield more reliable conclusions in earnings management studies. The following model was used in this study:

$$\frac{TA_{it}}{Assets_{i,t-1}} = k_1 + k_2 \frac{1}{Assets_{i,t-1}} + k_3 \frac{\Delta Sales_{it}}{Assets_{i,t-1}} + k_4 \frac{PPE_{it}}{Assets_{i,t-1}} + k_5 ROA_{it} + \varepsilon_{it} \quad (1)$$

where, for fiscal year *t* and firm *i*:

$$TA_{it} = \Delta NCCA_{it} - \Delta CL_{it} - DEP_{it} - AMO_{it} \quad (2)$$

where

- $TA_{it}$  = total accruals, which is defined using the balance sheet approach as above;
- $Assets_{i,t-1}$  = beginning total assets;
- $\Delta Sales_{it}$  = the sales changes net of the change in accounts receivables;
- $PPE_{it}$  = net amount of property, plant and equipment;
- $ROA_{it}$  = return on assets ratio, calculated as net income divided by total assets;
- $\Delta NCCA_{it}$  = change in non-cash current assets;
- $\Delta CL_{it}$  = change in current liabilities;
- $DEP_{it}$  = depreciation; and
- $AMO_{it}$  = amortisation.



Next, following previous studies, including Jones (1991) and Cohen and Zarowin (2010), the coefficients estimated from equation (1) were used to estimate non-discretionary accruals:

$$NA_{it} = \hat{k}_1 + \hat{k}_2 \frac{1}{Assets_{i,t-1}} + \hat{k}_3 \frac{\Delta Sales_{it}}{Assets_{i,t-1}} + \hat{k}_4 \frac{PPE_{it}}{Assets_{i,t-1}} + \hat{k}_5 ROA_{it}. \quad (3)$$

Therefore, discretionary accruals were defined as the difference between total accruals and estimated non-discretionary accruals, which is the difference between equations (1) and (3)[13]. In this study, the original and absolute discretionary accrual values are termed K1DA and K1DABS, respectively.

4.2.2 *Cash flow-based earnings management activities.* This study used the Roychowdhury (2006) model to investigate real earnings manipulations by examining patterns in CFO, discretionary expenses and production costs. In accordance with Roychowdhury (2006), CFO was defined as the amount reported in the firm's statement of cash flows; discretionary expenses were defined as the sum of:

- research and development (R&D) expenses;
- advertising expenses; and
- selling, general and administrative expenses; and production costs were defined as the sum costs of goods sold and changes in inventory.

Cohen and Zarowin (2010) described three real earnings manipulation methods:

- (1) increasing current sales through more lenient sales policies in terms of increased price discounts and credit terms; this is likely to boost current sales volume and earnings, and positive margins are assumed;
- (2) increasing production to lower the COGS; as more units of products are produced, fixed overheads can be spread over a larger number of units, and the reported fixed costs per unit can be reduced; and
- (3) reducing discretionary expenses.

Managers have discretion on reporting such costs, and when they are reduced, the current period's income will increase. Five equations estimating the normal levels of CFO, production costs and discretionary expenses are presented below.

$$\frac{CFO_{it}}{Assets_{i,t-1}} = k_1 + k_2 \frac{1}{Assets_{i,t-1}} + k_3 \frac{Sales_{it}}{Assets_{i,t-1}} + k_4 \frac{\Delta Sales_{it}}{Assets_{i,t-1}} + \varepsilon_{it}, \quad (4)$$

where  $\Delta Sales_{it}$  is the change in sales defined as  $\Delta Sales_{it} = Sales_{it} - Sales_{i,t-1}$ . For each firm-year, the abnormal CFO is the actual CFO minus the normal level of CFO calculated using the coefficient estimations from equation (4).

The normal level of COGS is estimated by model (5) below:

$$\frac{COGS_{it}}{Assets_{i,t-1}} = k_1 + k_2 \frac{1}{Assets_{i,t-1}} + k_3 \frac{Sales_{it}}{Assets_{i,t-1}} + \varepsilon_{it}. \quad (5)$$

Following Dechow *et al.* (1998) and Roychowdhury (2006), the normal level of inventory change is estimated using the regression equation below:

$$\frac{\Delta INV_{it}}{Assets_{i,t-1}} = k_1 + k_2 \frac{1}{Assets_{i,t-1}} + k_3 \frac{\Delta Sales_{it}}{Assets_{i,t-1}} + k_4 \frac{\Delta Sales_{i,t-1}}{Assets_{i,t-1}} + \varepsilon_{it} \quad (6)$$

where  $\Delta INV_{it}$  is the change in inventory for firm  $i$  in year  $t$ .

As production costs are defined as the sum of the COGS and changes in inventory, normal production costs are estimated using the following regression equation:

$$\frac{PROD_{it}}{Assets_{i,t-1}} = k_1 + k_2 \frac{1}{Assets_{i,t-1}} + k_3 \frac{Sales_{it}}{Assets_{i,t-1}} + k_4 \frac{\Delta Sales_{it}}{Assets_{i,t-1}} + k_5 \frac{\Delta Sales_{i,t-1}}{Assets_{i,t-1}} + \varepsilon_{it} \quad (7)$$

where  $PROD_{it}$  is the production costs.

In accordance with Roychowdhury (2006) and Cohen and Zarowin (2010), the normal level of discretionary expenses was estimated using lagged sales rather current sales, because if managers manipulate sales upwards to increase reported earnings, regression calculated using the current period's sales would generate low residuals, even when discretionary expenses have not been manipulated.

$$\frac{DISEXP_{it}}{Assets_{i,t-1}} = k_1 + k_2 \frac{1}{Assets_{i,t-1}} + k_3 \frac{Sales_{i,t-1}}{Assets_{i,t-1}} + \varepsilon_{it} \quad (8)$$

where  $DISEXP_{it}$  is the discretionary expenses.

In this study, the original and absolute values of the abnormal levels of the cash flow-based earnings management activities, including CFO, change in inventory, COGS, production costs and discretionary expenses, are referred to via the terms defined in Table I below.

#### 4.3 Sample selection and data collection

The data in this study were derived from 1,392 firm-year observations from 232 firms for the period from 2004 to 2009. This sampling period allowed for comparisons between

Abbreviated terms	Definitions
RCFO	The original value of the abnormal level of cash flow from operations
RCINV	The original value of the abnormal level of the change in inventory
RCOGS	The original value of the abnormal level of the cost of goods sold
RPROD	The original value of the abnormal level of production costs
RDISE	The original value of the abnormal level of discretionary expenses
RCFOABS	The absolute value of the abnormal level of cash flow from operations
RCINVABS	The absolute value of the abnormal level of the change in inventory
RCOGSABS	The absolute value of the abnormal level of the cost of goods sold
RPRODABS	The absolute value of the abnormal level of production costs
RDISEABS	The absolute value of the abnormal level of discretionary expenses

**Table I.** Abbreviated terms used to refer to the original and absolute values of the abnormal levels of cash flow-based earnings management activities

the earnings management behaviours of the firms before and after 2008, when the GFC started, thus facilitating the investigation of whether firms engaged in earnings management in response to the economic crisis.

The data were collected from the OSIRIS and ThomsonONE databases and were winsorized at the 1st and 99th percentiles to reduce the potential influence of outliers on the results. The sample selection procedure is illustrated in Table II below. First, a total of 2,383 Chinese firms were identified from the OSIRIS database. Firms from ten specific industry groups were then selected according to their four-digit GICS codes, reducing the sample to 1,822 firms. Last, the top 200 firms based on total assets from each fiscal year from 2007 to 2009 were selected from the sample of 1,822 firms. As some firms did not operate in certain financial years, the final sample included 232 firms. The financial data derived from these 232 firms were collected from the OSIRIS database for a sample period of six years from 2004 to 2009, thus, a data set of 1,392 firm-year observations was established.

## 5. Empirically derived accrual-based and cash flow-based earnings management results

### 5.1 Descriptive statistics

Descriptive statistics for the main measures of earnings management and the control variables used in this study are shown below in Table III. The mean of total accruals was  $-0.089$ , and the median was  $-0.071$ . The means and medians of the original values of

#### Sample selection process

*Firm-year observations were selected from the OSIRIS database*

Chinese firms in OSIRIS database	2,383	<u>2,383</u>
Firms selected from ten industries by four-digit GICS codes	1,822	<u>1,822</u>
Top 200 selected based on total assets from 2007 to 2009	232	<u>232</u>
Sample period from 2004 to 2009	1,392	<u>1,392</u>
Final sample		<u>1,392</u>

Distribution of firms in the sample by GICS Codes	Four-digit GICS codes	Frequency	(%) of firms
<i>Industry</i>			
Energy	1,010	114	8.19
Materials	1,510	456	32.76
Capital goods	2,010	360	25.86
Transportation	2,030	186	13.36
Automobiles and components	2,510	96	6.90
Consumer durables and apparel	2,520	60	4.31
Household and personal products	3,020	48	3.45
Healthcare equipment	3,510	12	0.86
Pharmaceuticals, biotechnology and life sciences	3,520	24	1.72
Technology hardware and equipment	4,520	36	2.59
Total		1,392	100

**Table II.**  
Summary of sample selection and GICS code distribution

**Note:** Numbers underlined indicate the total number of observations in the final sample

Variables	Full sample of 1,392 firm-year observations with 232 firms				SD
	Mean	Median	Maximum	Minimum	
<i>Accrual-based earnings management indicators based on Kothari et al. (2005)</i>					
TA	-0.089	-0.071	2.519	-3.767	0.250
K1DA	0.000	0.000	0.719	-0.509	0.116
NONDA	-0.089	-0.081	2.517	-3.682	0.221
TABS	0.134	0.089	3.767	0.000	0.229
K1DABS	0.081	0.061	0.719	0.000	0.083
NONDABS	0.118	0.089	3.682	0.001	0.207
<i>Cash flow-based earnings management indicators based on Roychowdhury, (2006)</i>					
RCFO	0.000	0.000	0.709	-0.414	0.078
RCINV	0.000	0.000	1.613	-0.412	0.085
RCOGS	0.000	0.000	0.442	-0.747	0.097
RDISE	0.000	0.001	1.829	-5.677	0.341
RPROD	0.000	0.000	1.557	-0.881	0.111
RCFOABS	0.047	0.029	0.709	0.000	0.063
RCINVABS	0.033	0.005	1.613	0.000	0.079
RCOGSABS	0.058	0.036	0.747	0.000	0.077
RDISEABS	0.134	0.047	5.677	0.000	0.313
RPRODABS	0.053	0.016	1.557	0.000	0.097
<i>Control variables used in the regression models</i>					
AUDIT	0.001	0.000	0.031	0.000	0.002
CFO	0.103	0.088	1.805	-0.298	0.137
LEV	0.603	0.620	0.965	0.171	0.175
MB	0.451	0.000	1.000	0.000	0.498
ROA	0.055	0.049	0.483	-0.394	0.065
SIZE	14.221	14.097	17.636	12.173	0.888

**Notes:** TA: total accruals, calculated via the balance sheet approach as the change in non-cash current assets minus the change in current liabilities, total depreciation and amortisation expenses, scaled by lagged total assets; K1DA and NONDA: discretionary and non-discretionary accruals, respectively, generated via the Kothari et al. (2005) model for each industry group in each observation year, where non-discretionary accruals are defined as total accruals minus discretionary accruals; TABS, K1DABS and NONDABS: absolute values of the total accruals, discretionary and non-discretionary accruals, respectively, generated via the Kothari et al. (2005) model; RCFO, RCINV, RCOGS, RDISE and RPROD: abnormal levels of CFO, change in inventory, COGS, discretionary expenses and production costs, generated via the Roychowdhury (2006) model; RCFOABS, RCINVABS, RCOGSABS, RDISEABS and RPRODABS refer to the absolute values of the abnormal levels of cash flow-based earnings management indicators defined above; AUDIT: total auditor remuneration deflated by the opening total assets; CFO: cash flow from operations divided by the beginning total assets; LEV: leverage, calculated by dividing current total liabilities by current total assets; MB: market-to-book ratio; ROA: return on assets ratio, calculated as net income divided by current total assets; and SIZE: natural log of current total assets

**Table III.** Descriptive statistics for the major earnings management indicators and control variables used in the regression analysis ( $n = 1,392$ )

discretionary accruals (K1DA) and cash flow-based earnings management measures, including RCFO, RCINV, RCOGS, RPROD and RDISE, were all found to be 0. Thus, no sensible conclusion could be drawn from the average descriptive statistics of these earnings management indicators, and instead the absolute values were used to

investigate whether earnings management changed significantly after the GFC started.

As shown above in Table III, three of the six control variables, AUDIT, CFO and SIZE, were deflated by beginning total assets. AUDIT refers to the total remuneration of auditors, and the results show that on average, audit fees accounted for approximately 0.1 per cent of the total assets of the previous year. The average leverage ratio was 60.3 per cent, indicating that the top Chinese listed firms were highly leveraged. The average market-to-book (MB) ratio of 45.1 per cent and the average ROA ratio of 5.5 per cent indicate that the top Chinese listed firms exhibited relatively low accounting performance, and almost half of them were growth firms.

The correlation matrices for the variables investigated are shown in Tables IV and V below. Table IV presents the correlations between the variables for accrual-based earnings management, including total accruals, the original and absolute values of discretionary accruals and the control variables. There was a negative correlation of  $-0.151$  between total accruals and audit fees, implying that audit quality may have the expected effects on earnings quality, as firms with higher audit expenses have lower levels of accruals. CFO was negatively correlated with total accruals ( $-0.397$ ) and discretionary accruals ( $-0.196$ ), which implies that firms with large CFO are less likely to manipulate earnings through discretionary accruals. The leverage ratio was positively correlated with both the absolute value of discretionary accruals and audit fees, which may be because highly leveraged firms tend to engage in accrual-based earnings management to minimise the possibility of violating debt contract covenants. There was also a negative correlation between the MB ratio and the absolute value of discretionary accruals. This suggests that mature firms may be more likely to use accrual-based earnings management.

Table V shows the correlations between the abnormal levels of cash flow-based activities (both the original and absolute values) and control variables. The results show that firms with higher audit fees tended to manipulate changes in inventory and discretionary expenses to manage earnings. The significant and positive correlations between the leverage ratio and the four measures of cash flow-based earnings management indicate that highly leveraged firms may be more likely to manipulate earnings through cash flow-based activities. The negative correlations between MB ratio and abnormal levels of production costs (including both change in inventory and COGS) imply that mature firms are more likely to manipulate earnings through production costs. Last, the correlation results indicate that firms of a smaller size and with lower profitability are more likely to engage in cash flow-based earnings management.

### *5.2 Earnings management by the top Chinese listed firms in response to the global financial crisis*

Table VI shows the results of comparisons between the means of the major indicators of both accrual-based and cash flow-based earnings management in the pre-GFC and post-GFC periods. The average absolute values of discretionary accruals for the sample as a whole increased significantly, from 0.024 to 0.055, after 2008; the means of the abnormal levels of CFO, COGS, changes in inventory, production costs and discretionary expenses changed significantly. The mean RCFOABS increased from 0.041 to 0.060, the mean RCOGSABS increased from 0.053 to 0.069 and the mean RCINVABS increased from 0.022 to

Correlation	TA	KIDA	KIDABS	AUDIT	CFO	LEV	MB	ROA	SIZE
TA	1.000								
KIDA	0.388***	1.000							
KIDABS	-0.052	0.092*	1.000						
AUDIT	-0.151***	-0.007	0.071	1.000					
CFO	-0.397***	-0.196***	0.003	0.144***	1.000				
LEV	-0.085	-0.023	0.145***	0.090*	-0.065	1.000			
MB	-0.018	0.052	-0.098*	-0.118***	0.058	-0.028	1.000		
ROA	0.086	-0.020	0.014	0.019	0.309***	-0.324***	-0.201***	1.000	
SIZE	-0.029	-0.035	0.073	-0.144***	0.072	0.015	0.204***	0.080	1.000

**Notes:** \* $p < 0.10$ ; \*\* $p < 0.05$ ; \*\*\* $p < 0.01$ ; TA: total accruals, calculated via the balance sheet approach as the change in non-cash current assets minus the change in current liabilities, total depreciation and amortisation expenses, scaled by lagged total assets; KIDA: discretionary accruals generated via the Kothari *et al.* (2005) model; KIDABS: absolute value of discretionary accruals generated via the Kothari *et al.* (2005) model; AUDIT: total auditor remuneration deflated by the opening total assets; CFO: cash flow from operations divided by beginning total assets; LEV: leverage, calculated by dividing current total liabilities by current total assets; MB: a dummy variable that takes the value of 1 if current market-to-book ratio is below 1, and 0 otherwise; ROA: return on assets ratio, calculated as current net income divided by current total assets; and SIZE: natural log of current total assets

**Table IV.**  
Pearson correlations for total accruals, discretionary accruals, the absolute values of discretionary accruals and control variables

**Table V.**  
Pearson correlation  
for cash flow-based  
management  
indicators and  
control variables

Correlation	RCINVABS	RCINV	RCOGS	RCOGSABS	RDISE	RDISEABS	RPROD	RPRODABS	AUDIT	CFO	LEV	MB	ROA	SIZE
RCINVABS	1.000													
RCINV	0.086**	1.000												
RCOGS	-0.020	-0.061	1.000											
RCOGSABS	0.124***	-0.007	-0.368***	1.000										
RDISE	-0.179***	-0.210***	0.119***	-0.114***	1.000									
RDISEABS	0.247***	0.175***	-0.067	0.172***	-0.698***	1.000								
RPROD	0.055	0.641***	0.541***	-0.263***	0.089**	0.089**	1.000							
RPRODABS	0.629***	0.085**	-0.272***	0.437***	-0.165***	0.167***	-0.135***	1.000						
AUDIT	0.044	0.105***	-0.022	-0.025	-0.185***	0.195***	0.066	0.003	1.000					
CFO	-0.086**	-0.058	-0.393***	0.237***	0.016	-0.019	-0.269***	0.069*	0.050	1.000				
LEV	0.204***	0.022	0.206***	-0.086**	-0.072*	0.090**	0.181***	0.081**	0.139***	-0.156***	1.000			
MB	-0.114***	0.036	0.079*	-0.113***	-0.010	-0.080*	0.028	-0.173***	-0.131***	-0.023	-0.102**	1.000		
ROA	-0.037	0.034	-0.539***	0.233***	0.039	0.003	-0.302***	0.232***	-0.061	0.417***	-0.335***	-0.211***	1.000	
SIZE	-0.013	0.104**	-0.114***	-0.032	-0.016	-0.222***	0.023	0.050	-0.149***	0.067	0.068*	0.217***	0.067*	1.000

**Notes:** \*  $p < 0.10$ ; \*\*  $p < 0.05$ ; \*\*\*  $p < 0.01$ ; RCINV, RPROD, RDISE: original values of the four indicators of cash flow-based earnings management, which are the abnormal levels of COGS and change in inventory, production costs and discretionary expenses; RCOGSABS, RCINVABS, RPRODABS and RDISEABS are the absolute values of the five indicators of cash flow-based earnings management, which are the abnormal levels of COGS and change in inventory, production costs and discretionary expenses; AUDIT: total auditor remuneration deflated by the opening total assets; CFO: cash flow from operations divided by beginning total assets; LEV leverage, calculated by dividing current total liabilities by current total assets; MB: a dummy variable that takes the value of 1 if current market-to-book ratio is below 1, and 0 otherwise; ROA: return on assets ratio, calculated as current net income divided by current total assets; and SIZE: natural log of current total assets

0.055. As production costs are the sum of COGS and changes in inventory, the mean RPRODABS also increased, from 0.040 to 0.081. Last, the mean RDISEABS decreased from 0.157 to 0.088. These changes are all statistically significant at the 1 per cent level of significance. Based on these results, it can be concluded that the Chinese top listed firms did engage in earnings management through both discretionary accruals and cash flow-based business activities in response to the 2008 GFC.

In the investigation of the directions of earnings management behaviours, such as whether firms manipulated earnings upwards or downwards, the sample was further divided into 30 industry groups based on six-digit GICS codes. The means of the original values of the earnings management indicators from each industry group were then compared before and after 2008. The results are shown below in Table VII.

Firms from the construction materials industry (GICS code 151020) exhibited both accrual-based and cash flow-based earnings management. The mean original value of discretionary accruals (K1DA) increased significantly from 0.020 to 0.079 after 2008, and the mean original value of abnormal COGS (RCOGS) decreased significantly from 0.006 to  $-0.033$ . This indicates that these firms engaged in income-increasing earnings management via the manipulation of discretionary accruals and COGS. The mean K1DA of firms from the construction and engineering industries (GICS code 201030) increased significantly from  $-0.005$  to 0.051. This implies that these firms managed their earnings upwards through discretionary accruals in response to the 2008 GFC. Firms from the machinery industry (GICS code 201060) manipulated their reported earnings upwards via cash flow-based earnings management, and the mean original values of abnormal CFO and change in inventory decreased significantly during the sample period. The mean RCFO decreased from 0.033 to  $-0.005$ , and the mean RCINV decreased from  $-0.007$  to  $-0.059$ . The firms from the airlines industry (GICS code 203020) also evidently managed earnings upwards via cash flow-based earnings management, as there was a significant decrease in their mean abnormal discretionary expenses (RDISE), from 0.038 to 0.005. Last, firms from the household durables industry

Groups	Mean		SD		<i>p</i> -value
	Pre-GFC	Post-GFC	Pre-GFC	Post-GFC	
Full sample of 1,392 firm-year observations with 232 firms					
<i>Absolute values of discretionary accruals</i>					
K1DABS	0.024	0.055	0.057	0.080	0.000***
<i>Absolute values of cash flow-based earnings management indicators</i>					
RCFOABS	0.041	0.060	0.064	0.058	0.000***
RCOGSABS	0.053	0.069	0.078	0.075	0.000***
RCINVABS	0.022	0.055	0.056	0.107	0.000***
RPRODABS	0.040	0.081	0.083	0.115	0.000***
RDISEABS	0.157	0.088	0.369	0.141	0.000***

**Notes:** \*\*\* $p < 0.01$ ; K1DABS: absolute value of the total residual generated via the Kothari *et al.* (2005) model, which is the indicator of accrual-based earnings management; and RCFOABS, RCOGSABS, RCINVABS, RPRODABS, RDISEABS: absolute values of the five indicators of cash flow-based earnings management, which are the abnormal levels of CFO, COGS, change in inventory, production costs and discretionary expenses

**Table VI.**  
Comparison of the pre-GFC and post-GFC mean differences in residuals generated via the Kothari *et al.* (2005) model and Roychowdhury (2006) model



Industry groups and earnings management indicators	Mean		SD		<i>p</i> -value
	Pre-GFC	Post-GFC	Pre-GFC	Post-GFC	
<i>Sample firms from the construction materials industry (GICS code 151020)</i>					
K1DA	0.002	0.079	0.077	0.078	0.0123**
RCOGS	0.006	-0.033	0.046	0.041	0.0107**
<i>Sample firms from the Construction and engineering industry (GICS code 201030)</i>					
K1DA	-0.005	0.051	0.056	0.162	0.0508*
<i>Sample firms from the machinery<sup>a</sup> industry (GICS code 201060)</i>					
RCFO	0.033	-0.005	0.124	0.084	0.0849*
RCINV	-0.007	-0.059	0.081	0.127	0.0178**
<i>Sample firms from the airlines<sup>b</sup> industry (GICS code 203020)</i>					
RDISE	0.038	0.005	0.051	0.027	0.0750*
<i>Sample firms from the household durables<sup>c</sup> industry (GICS code 252010)</i>					
K1DA	0.016	-0.050	0.032	0.064	0.0194**

**Notes:** \* $p < 0.10$ ; \*\* $p < 0.05$ ; <sup>a</sup>the machinery industry includes the manufacturers of construction and farm machinery and heavy trucks, as well as industrial machinery; <sup>b</sup>firms in the airlines industry primarily provide passenger air transportation; <sup>c</sup>firms in the household durables industry include manufacturers of consumer electronics such as TVs and videocassette recorders (VCRs), home furnishings and household appliances such as power and hand tools, and homewares, as well as residential construction firms; K1DA: discretionary accruals, generated via the [Kothari et al. \(2005\)](#) model; RCOGS, RCFO, RCINV and RDISE: abnormal levels of COGS, CFO, change in inventories and discretionary expenses, generated via the [Roychowdhury \(2006\)](#) model

**Table VII.**  
The directions of earnings management by firms from key industries during the GFC

(GICS code 252010) engaged in income-reducing earnings management through discretionary accruals, with the average K1DA decreasing from 0.016 to -0.050. All the changes described above were statistically significant at either the 5 or 10 per cent level of significance.

These findings provide empirical evidence of the effects of the stimulus package launched by the Chinese Government in response to the 2008 GFC. More than 60 per cent of the stimulus package of 4 trillion RMB was invested in the construction of infrastructure, including railways, highways and airports. The firms from the first three industry groups mentioned above are from the construction industry, or related to it. These firms were barely affected or less affected than the other firms by the 2008 GFC, as they had strong support from the Chinese Government. Thus, they engaged in income-increasing earnings management to further boost their earnings, for the possible purposes of maintaining China's GDP growth and affirming the value of the Chinese Government's response to the GFC, because most of these sampled firms are state-owned enterprises. The stimulus package also covered the "San Nong" policy, which included the "household appliances to the countryside" initiative. Therefore, the sampled firms from the household durables industry also engaged in earnings management. One potential reason for them engaging in income-reducing earnings management is that they may have sought to obtain further governmental subsidies via the stimulus package.

### 5.3 Firm characteristics and the sample firms' earnings management

In this study, a series of regression models were developed to investigate the relationships between firm characteristics and earnings management behaviour, as well as the influence of the 2008 GFC on these relationships. First, the following regression model was developed to examine the relationship between firm characteristics and accrual-based earnings management:

$$ACC_{it} = k_1 + k_2POST + \sum_{i=1}^6 k_i CONTROL_{it} + \sum_{i=1}^6 k_i INTERACTION_{it} + k_{15}YEAR_{it} + k_{16}INDUSTRY_{it} + k_{17}\varepsilon_{it} \quad (9)$$

where

- $ACC_{it}$  = the indicator of accrual-based earnings management, specifically the discretionary accruals generated via the [Kothari et al. \(2005\)](#) model;
- $POST_{it}$  = a dummy variable indicating the period after 2008 when the GFC started;
- $CONTROL_{it}$  = the six control variables representing firm characteristics, CFO, AUDIT (current audit fees deflated by beginning total assets), LEV (leverage ratio), MB (market-to-book ratio), ROA ratio and SIZE (the natural log of current total assets);
- $INTERACTION_{it}$  = the six interaction variables developed by multiplying POST by the six control variables;
- $YEAR_{it}$  = the year dummy variable; and
- $INDUSTRY_{it}$  = the industry dummy variable, based on the firms' GICS codes.

The relationships between the sample firms' characteristics and their cash flow-based earnings management were investigated via the following regression model:

$$CFO_{it} = k_1 + k_2POST + \sum_{i=1}^6 k_i CONTROL_{it} + \sum_{i=1}^6 k_i INTERACTION_{it} + k_{15}YEAR_{it} + k_{16}INDUSTRY_{it} + k_{17}\varepsilon_{it} \quad (10)$$

where CFO represents the original values of the measures of cash flow-based earnings management, and all other variables are as described for equation (9) above.

Table VIII shows the results generated by regression models [equations (9) and (10)]. CFO was negatively associated with the original values of discretionary accruals (K1DA), implying that the firms with less operating cash flow may have tended to manipulate earnings via discretionary accruals. The positive correlation between the interaction variables  $POST \times CFO$  and K1DA suggests that the negative relationship between CFO and K1DA was strengthened by the influence of the GFC. For the dependent variable K1DA, the coefficient of ROA ratio was positive, indicating that the sample firms with higher profitability may have been more likely to engage in accrual-based earnings management. This relationship was evidently weakened during the GFC, however, as indicated by the negative coefficient of  $POST \times ROA$  ratio.

**Table VIII.**  
Effects of firm characteristics on earnings management

Variables	KIDA Coefficient	RCINV Coefficient	RCOGS Coefficient	RPROD Coefficient	RDISE Coefficient
Constant	-0.010 (0.916)	-0.086 (0.290)	0.256 (0.006***)	-0.019 (0.865)	0.785 (0.047**)
POST	0.062 (0.646)	-0.371 (0.001***)	0.050 (0.702)	-0.316 (0.041**)	-0.336 (0.541)
CFO	-0.266 (0.000***)	-0.104 (0.031**)	-0.308 (0.000***)	-0.285 (0.000***)	-0.110 (0.636)
AUDIT	1.738 (0.334)	3.160 (0.037**)	-3.012 (0.083*)	0.716 (0.729)	-20.777 (0.005***)
LEV	-0.010 (0.766)	0.073 (0.010***)	0.029 (0.372)	0.119 (0.002***)	-0.068 (0.619)
MB	0.002 (0.883)	-0.006 (0.531)	-0.003 (0.811)	-0.024 (0.067*)	-0.022 (0.639)
ROA	0.328 (0.005***)	0.063 (0.515)	-0.939 (0.000***)	-0.473 (0.000***)	0.478 (0.309)
SIZE	0.001 (0.833)	0.003 (0.581)	-0.012 (0.070*)	0.000 (0.994)	-0.049 (0.073*)
POST × CFO	0.200 (0.002***)	0.056 (0.316)	0.191 (0.003***)	0.177 (0.020**)	0.088 (0.744)
POST × AUDIT	-10.263 (0.048**)	-0.620 (0.887)	4.958 (0.322)	2.652 (0.656)	17.691 (0.403)
POST × LEV	-0.004 (0.917)	-0.039 (0.272)	0.046 (0.267)	-0.026 (0.596)	-0.090 (0.604)
POST × MB	0.013 (0.419)	0.026 (0.052*)	0.002 (0.870)	0.034 (0.057*)	-0.035 (0.579)
POST × ROA	-0.344 (0.014**)	0.109 (0.354)	0.389 (0.004***)	0.258 (0.108)	-0.495 (0.386)
POST × SIZE	-0.003 (0.715)	0.024 (0.002***)	-0.009 (0.317)	0.018 (0.093*)	0.034 (0.383)
YEAR	Yes	Yes	Yes	Yes	Yes
INDUSTRY	Yes	Yes	Yes	Yes	Yes
R <sup>2</sup>	0.095	0.228	0.444	0.279	0.260
Adjusted R <sup>2</sup>	0.024	0.168	0.400	0.223	0.203

**Notes:** *p* values are reported in parentheses below each coefficient; \**p* < 0.10; \*\**p* < 0.05; \*\*\**p* < 0.01; KIDA: original values of discretionary accruals, generated via the Kothari *et al.* (2005) model; POST is a dummy variable representing the post-GFC period; AUDIT: the total auditor remuneration deflated by the opening total assets; CFO: cash flow from operations divided by beginning total assets; LEV: leverage, calculated by dividing current total liabilities by current total assets; MB: a dummy variable that takes the value of 1 if current market-to-book ratio is below 1, and 0 otherwise; ROA: return on assets ratio, calculated as current net income divided by current total assets; SIZE: the natural log of current total assets; RCOGS, RCINV, RPROD and RDISE: original values of the abnormal levels of COGS, change in inventory, production costs and discretionary expenses, generated via the Roychowdhury (2006) model; INDUSTRY: a dummy variable indicating the sample firms' industry groups, established based on GICS codes

Table VIII below shows the effects of firm characteristics on earnings management indicators. The coefficients of POST for the dependent variables RCINV (change in inventory) and RPROD (production costs) were both negative, indicating that in the sample period after 2008, the firms as a whole tended to have higher levels of abnormal changes in inventory and production costs. For the dependent variables RCINV, RCOGS and RPROD, the coefficients of CFO were all negative, implying that during the sample period, the firms with larger operating cash flows may have tended to manipulate production costs (defined as the sum of change in inventory and COGS) downwards to boost earnings. This correlation was evidently strengthened by the influence of the 2008 GFC, as indicated by the positive coefficients of  $POST \times CFO$ . For RCINV and RPROD, the positive coefficients (0.073 and 0.119) of LEV suggest that highly leveraged firms were more likely to manipulate changes in inventory and production costs, and such correlations did not change during the GFC. The coefficient of  $-0.024$  for MB suggests that mature firms tended to manage their production costs to manipulate earnings, and the GFC strengthened this association. Last, the negative coefficients of ROA ratio and SIZE indicate that firms with lower profitability and of smaller size were more likely to manipulate COGS, production costs and discretionary expenses. In addition, the 2008 GFC strengthened the negative correlation between ROA ratio and COGS.

#### 5.4 Sensitivity tests

A variety of supplementary tests were performed during the course of the current study to assess the robustness of the results. First, total accruals were recalculated as the difference between net income and cash flow from operating activities. In separating total accruals into discretionary and non-discretionary accruals, Jones' (1991) model and a modified Jones model were used as alternative methods. The results generated by running these two cross-sectional models and those generated using total accruals defined as net income minus CFO were consistent with the results generated using the Kothari *et al.* (2005) model in the main test. The results suggest that the sample firms did manage their earnings through accrual-based earnings management in response to the 2008 GFC, but to a lesser extent. In addition, models [equations (9) and (10)] were re-run using the absolute values of accrual-based and cash flow-based earnings management indicators. The results arising from these analyses also supported the previously identified relationships between firm characteristics and earnings management.

## 6. Summary and conclusion

Earnings management continues to be an important issue in the field of financial accounting, but the literature to date has only provided limited evidence on firms' earnings behaviours in response to the GFC, particularly with regards to developing countries such as China. This study used both accrual-based and cash flow-based earnings management measures to investigate whether the top Chinese listed firms engaged in earnings management in response to the GFC. The comparisons of the mean absolute values of earnings management indicators in periods before and after 2008 performed in this study showed that the top Chinese listed firms analysed did engage in earnings management during the GFC period.

In response to the GFC, firms from the construction material industry manipulated earnings upwards through discretionary accruals and COGS, whereas firms from the construction and engineering industries engaged in accrual-based income-increasing

earnings management. Firms from the construction, farm and industrial machinery industries manipulated both CFO and changes in inventory downwards, whereas firms in the airlines industry engaged in income-increasing earnings management through the manipulation of discretionary expenses. Last, the manufacturers of household durables, such as domestic appliances, electronics and TVs managed earnings downwards via discretionary accruals. The findings reflect the effects of the stimulus package launched by the Chinese Government to combat the GFC. This current study also generated empirical evidence that firms' earnings behaviours are affected by their characteristics.

There are some limitations to the current study. First, the sample firms were selected from export-oriented industries only, however, other industries were also likely to have been affected by the GFC. A more diverse sample could be established by selecting firms from various industries, which could help to generate a more comprehensive representation of the earnings management strategies used by Chinese firms in response to the GFC. Second, although the GFC started in 2008, it has not yet finished; thus, some of the longer-term reactions to it may remain unidentified by this current study. Future research could be extended in these respects.

#### Notes

1. Wang *et al.* (2010) also summarised three incentives of earnings management: "the need to avoid reporting losses, the need to report increases in earnings, and the need to meet analysts' expectations for earnings" (p. 239). They provided evidence on the first incentive using data from Taiwan.
2. In addition, Hu *et al.* (2015) reported an inverted U-shaped relationship between managerial tenure and earnings management using data from the Chinese stock market. Managers are likely to utilise conservative earnings management during the early stage of top executive positions and then become more aggressive in later periods. They also tend to revert to being conservative again when the maximum level of earnings manipulations has been reached.
3. Total accruals are defined as the differences between net income and CFO, and some studies use total accruals as the main surrogate for earnings management (Leuz *et al.*, 2003; Tendeloo and Vanstraelen, 2005; Jones *et al.*, 2007; Chen *et al.*, 2009).
4. According to Ewert and Wagenhofer (2005), managers use real earnings management that changes the timing or structuring of business transactions to manage reported earnings. Further, real earnings management is defined by Roychowdhury (2006) as deviations from normal business activities, and such deviations allow managers to achieve certain reporting goals but do not necessarily enhance firm value.
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6. China Statistical Yearbook, 2010, National Bureau of Statistics of China, [www.stats.gov.cn/tjsj/ndsj/2010/indexeh.htm](http://www.stats.gov.cn/tjsj/ndsj/2010/indexeh.htm)
7. China Digital Times, 2010, China 2008: The Global Financial Crisis, Paragraph 3, <http://chinadigitaltimes.net/2008/12/2008-financial-crisis-and-china/>
8. Zhang (2009) argues that troughs are inescapable in the course of a country's economic operations and growth. China's GDP growth rate reached peaks in 1978 at 11.7 per cent, in 1984 at 15.2 per cent, in 1992 at 14.2 per cent and in 2007 at 11.4 per cent. China's economy was

overcooled in 1981, 1990, 1999 and 2008, as the GDP growth rates approached the troughs in these years. If calculated by the peak years, in this 30-year period, China's economy completed three economic cycles with an average length of 9.66 years. When calculated by trough years, the average length of the economic cycles is approximately 9.33 years. Overall, China completed an economic cycle every 9.55 years. Therefore, after passing through another peak in 2007, these trends suggested that China's economy would start to shrink from 2008. Relevant internal economic factors include: after 8 years of high-speed growth from 2000 to 2007, China's economic growth was seriously restricted by natural resources; inflation commencing in 2007 directly increased prices, reducing consumer purchasing ability and increasing manufacturers' investment costs; and the Chinese Government launched a series of policies to cool the overheated economy in 2007. All these internal factors contributed to the economic downturn in China.

9. According to a report on the work of the Chinese Government by the then Prime Minister, Wen Jiabao, these measures include fiscal and monetary policies, as well as other taxation and financial policies such as increased government expenditure and increased export rebate rate, the "San Nong" policy with the abolishment of taxation on agriculture, increased grain purchase prices and direct subsidies to farmers for the purchase of household appliances, agricultural machinery and tools.
10. On 5 November 2008, this stimulus package was announced by the then Prime Minister, Wen (2009), during an executive meeting of the State Council. *People's Daily*, <http://finance.people.com.cn/GB/1037/8306806.html>
11. In this study, the top Chinese listed firms are defined by year-end total assets.
12. Most empirical earnings management studies report findings based on correlations between earnings management and firm characteristics by including firm characteristics such as ROA ratio, audit quality, growth (MB ratio) and leverage as control variables (Roychowdhury, 2006; Ahmed and Saleh, 2007; Cohen and Zarowin, 2010; Gunny, 2010; Hu *et al.*, 2015). The results of these studies suggest that firm characteristics have significant impact on earnings management behaviour.
13. Similar to previous studies such as Kothari *et al.* (2005) and Ahmed and Saleh (2007), the variables in these equations, including total accruals, change in sales, property, plant and equipment and ROA ratio, are based on the beginning total assets. Also, a constant has been incorporated into the model. The reason for making these two adjustments is to control for heteroskedasticity. White (1980) suggested that deflation helps to alleviate heteroskedasticity in residuals. Further, Kothari *et al.* (2005) suggested that including a constant in the estimation equation provides an additional control for heteroskedasticity that is not mitigated by the deflation of the beginning total assets.

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