

# 公司治理是否有效減少亞洲新興市場 公司之盈餘管理？

## Is Corporate Governance Effective in Earnings Management in Asian Emerging Markets?

黃俊閔 Chun-Hung Huang

銘傳大學 資訊管理學系

Department of Information Management, Ming Chuan University

林鳳儀<sup>1</sup> Fengyi Lin

台北科技大學 經營管理系

Department of Business Management, National Taipei University of Technology

吳勝富 Sheng-Fu Wu

國防大學 財務管理學系

Department of Financial Management, National Defense University

黃仁伯 Jen-Bor Huang

銘傳大學 資訊管理學系

Department of Information Management, Ming Chuan University

**摘要：**班佛法則在鑑識會計中已被廣泛應用於識別異常數值。本研究探討公司治理法規的施行如何影響亞洲新興市場企業的盈餘管理行為。研究樣本為1990年至2012年度共122,310筆正盈餘數據，其中中國為79,285筆觀察值，台灣為43,025筆觀察值。實証結果顯示亞洲新興市場中台灣與中國兩國家均存在美化盈餘管理現象，研究結果證實上市公司管理者可能存在將財報數據進位以超過認知參考點的行為。此外，與台灣企業相比，中國的企業管理者相較而言可能有更大的動機去進行盈餘操弄行為。值得注意的是，本研究發現隨著公司治理法規的施行，亞洲新興市場之企業管理者進行盈餘管理行為的程度已有顯著的減少，顯示公司治理的實施對於抑制管理者進行盈餘管理

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<sup>1</sup> Corresponding author: Department of Business Management, National Taipei University of Technology, Taipei City, Email: Linfengyi.tw@gmail.com, fengyi@mail.ntut.edu.tw

行為上扮演一個重要的角色，研究結果對於實施公司治理法規對於降低盈餘管理的有效性提供進一步的証據支持。

**關鍵詞:** 盈餘管理；公司治理；班佛法則；參考點

**Abstract:** In forensic accounting, Benford's Law can be used to identify anomalous numerical data. This paper discusses how implementing corporate governance regulations affect earnings management of emerging markets in Asia. Benford's analysis was employed to evaluate 122,310 instances of positive earnings-79,285 in China and 43,025 in Taiwan-from 1990 to 2012. The empirical results showed that earnings manipulation occurred in Asian emerging markets. Our analyses revealed that the managers of publicly listed firms rounded up earnings to achieve key reference points. Chinese corporate managers seemed to have had stronger incentives to manipulate earnings than Taiwanese corporate managers. In addition, the extent of earnings management was significantly reduced after corporate governance regulations were implemented. The results indicated that implementing corporate governance regulations played a crucial role in reducing earnings manipulation behavior. The findings of this study verify the effectiveness of corporate governance regulations in detecting earnings management.

**Keywords:** Earnings management; Corporate governance; Benford's law; Reference point

## 1. Introduction

Recent earnings management fraud cases among Asia firms have drawn attention to the field of corporate governance. Because investors regard earnings as the most critical item in financial reporting, analysts, boards of directors, corporate executives, and standard-setters have been highly concerned with the way in which companies derive their reported earnings (Burgstahler and Dichev, 1997). To minimize corporate fraud, Asia's emerging markets, including China and Taiwan, have promulgated laws to strengthen their corporate governance

mechanisms. Since the mid-1980s, there has been explosive growth in using accruals to detect earnings management (Sun and Rath, 2010). Numerous studies have shown that an inverse correlation exists between corporate governance and earnings management (Dechow, Sloan and Sweeney, 1995; Peasnell, Pope and Young, 2000; Park and Shin, 2004; Jo and Kim, 2007; Marra, Mazzolab and Prencipea, 2011). The most popular accrual model is the standard Jones and modified Jones model (Islam, Ali and Ahmad, 2011). However, several studies found the accrual models are of low power in detecting earnings management (Beneish, 1997; Thomas and Zhang, 2000; Islam, Ali and Ahmad, 2011).

Our study differs from these studies in that we detect the rounding upward of income in an attempt to address earnings management. Examining the distribution of digits in earnings numbers to identify earnings management has a number of appealing features (Aono and Guan, 2008). First, the researchers can avoid estimating the potentially noisy abnormal accruals (Healy and Wahlen, 1999). Another appealing feature is that the researchers can identify a large set of potential earnings manipulators without invoking specific assumptions about earnings management motivation or methods (Burgstahler and Dichev, 1997).

Benford's law has recently become an accepted tool in the identification of contrived data, both in academic literature and practice (Carslaw, 1988; Thomas, 1989; Herrmann and Thomas, 2005; Lin, Guan and Fang, 2011; Reddy and Sebastin, 2012; Thomas, 2012). Previous studies have separated the critical determinants of earnings management into two major categories. In the first category, zero is adopted as the threshold of earnings management. Hayn (1995) indicated that for firms to avoid reporting a loss, they conduct earnings management, and cross over the zero-earnings thresholds. In the second category, a key reference point, represented by  $n \times 10^k$ , is used as the threshold of earnings management (Herrmann and Thomas, 2005; Guan, He and Yang, 2006; Lin, Guan and Fang, 2011). For example, if the anticipated net income were to be \$70 million but the actual earnings were only \$69 million, managers may have incentive to manipulate the earnings data to allow the net income to achieve the anticipated earnings threshold. Benford's law has been applied widely to financial data to investigate instances of digital rounding.

This study utilizes Benford's law to observe the real distribution of reported earnings to compare the earnings management phenomenon among Asia's emerging markets. The results indicate that "window dressing" can be observed among both Taiwanese and Chinese firms, and that the second digit of any reported earnings serves as key reference point. Furthermore, the results provide evidence on whether earnings management practices have changed in response to governments' gradual strengthening of corporate governance mechanisms. Our study tries to elucidate the differences between earnings management in China and Taiwan.

## **2. Literature Review**

### **2.1 Earnings Management and Corporate Governance Mechanism**

The agency problem results from the separation of control and ownership. It is possible that managers could pursue their self-interest to maximize their wealth, perhaps at the expense of stakeholders' interests (Jensen, 1986). Corporate governance is intended to efficiently reduce the agency problem between shareholders and inside managers (Gompers, Ishii and Metrick, 2001). John and Senbet (1998) indicated that corporate governance is "deals with mechanisms by which stakeholders of a corporation exercise control over corporate insiders and management such that their interests are protected". According to Man and Wong (2013), an institutional environment that provides robust legal protection can control managers' self-interests to a certain extent. Prior studies have shown that firms with effective governance mechanisms can successfully minimize earnings management behavior (Dechow, Sloan and Sweeney, 1995; Peasnell, Pope and Young, 2000; Liu and Lu, 2007; Shen and Chih, 2007; Zéghal, Chtourou and Sellami, 2011; Marra, Mazzolab and Prencipea, 2011).

Liu and Lu (2007) investigate the relation between earnings management and corporate governance in the Chinese listed companies. They demonstrate that firms with higher corporate governance levels have lower levels of earnings

management. Chang and Sun (2009) find earnings management to be negatively related to the independence of the audit committee and the board of directors after Sarbanes-Oxley Act (SOX). Their findings suggest that the SOX provisions improve the effectiveness of cross-listed foreign firms' corporate-governance functions in monitoring the quality of accounting earnings. Lin (2011) analyzes whether discretionary accruals affects firm value under the corporate governance mechanism. The results show that when managerial ownership is less than 9.67%, managers may engage in opportunistic earnings management. Furthermore, small board has greater impact on efficient earnings management than larger board. Zéghal, Chtourou and Sellami (2011) show a positive influence of external audit quality on reducing earnings management.

Previous studies have shown that institutions with weak investor protection exhibit a high level of earnings management and a low level of reporting of earnings information (DeFond, Hung and Trezevant, 2007; Leuz, Nanda and Wysocki, 2003). Several studies have reported that it is less likely for managers to manipulate earnings when higher levels of legal protection exist (Shleifer and Wolfenzon, 2002; Nenova, 2003). Strong investor protection is associated with effective corporate governance (La Porta *et al.*, 2000). In countries with stronger investor protection laws, managers and controlling shareholders are unlikely to expropriate a firm's resources and are more likely to invest in projects that benefit shareholders (Wurgler, 2000; Shleifer and Wolfenzon, 2002; Bekaert, Harvey and Lundblad, 2011).

Both Taiwan and China belong to the emerging market countries. However, there have significant differences in the degree of investor protection. According to protecting investors ranking for 185 economies, China ranked 100th out of 185, Wilson (2012). In contrast, Taiwan ranked 32th out of 185. It can be considered rational that Taiwan own better investor protection to enterprises than China. Leuz, Nanda and Wysocki (2003) reported that earnings management occurs less frequently in countries with stronger investor protection. Shen and Chih (2007) showed that increasing the level of investor protection could successfully reduce the adverse effects of earnings management. Legal systems could further protect

stakeholders' rights by using on their powers to discipline managers (La Porta *et al.*, 1998; Claessens *et al.*, 2002; Dyck and Zingales, 2004).

Because earnings management anomalies exist, countries such as China and Taiwan have enacted laws to strengthen their corporate governance mechanisms.<sup>2</sup> This study investigates whether the implementation of corporate governance regulations by managers reduces the extent of corporate earnings management in Asia's emerging markets.

## **2.2 Earnings Management and Benford's Law**

Earnings management is the manipulation behavior of financial records within the scope of generally accepted accounting principles (GAAP) (Guan, Lin and Fang, 2008). Earnings management is also known as Earnings Manipulation, which means the use of certain procedures or methods by the managers to adjust the data on financial reports. The major types of earnings management, including the selection of the timing of new accounting principles, the selection of accounting standards, the control of transaction times, and the adjustment of discretionary accruals (Jones, 1991; Dechow, Sloan and Sweeney, 1995; DeGeorge, Patel and Zeckhauser, 1999). Several studies have shown that managers may have motive to manipulate income numbers to reach specific thresholds (Barth, Elliot and Finn, 1999; Skinner and Sloan, 2002; Matsumoto, 2002). Kinnunen and Koskela (2003) define cosmetic earnings management (CEM) by small upward rounding of reported net income that generates more than expected zeros and less than expected nines as second digit of earnings numbers.

Benford (1938) demonstrated that the expected distributions of natural existence numbers are skewed toward one for the first digit (because zero can't be

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<sup>2</sup> In 2002, China's government enacted the Code of Corporate Governance for Listed Firms to strengthen the country's corporate governance mechanisms. Similarly, Taiwanese regulatory authorities also implemented programs, including the Corporate Governance Best-Practice Principles (CGBPP) for TWSE/GTSM-Listed Firms, the Market Observation Post System, Corporate Governance Best-Practice Principles for Securities Firms (2003), Corporate Governance Best-Practice Principles for Future Firms, and the Information Disclosure Assessment of Publicly Listed Firms.

a first digit) and zero for the second digit. Benford's law provides the basis for numerical analysis of a sequence of numbers of a similar nature. Actual data deviate from the expected frequencies indicates the existence of manipulation (Thomas, 2012). Benford's law has recently been acknowledged as a technique tool for identifying contrived numerical data, both in academic literature and practice (Carslaw, 1988; Thomas, 1989; Herrmann and Thomas, 2005; Lin, Guan and Fang, 2011; Reddy and Sebastin, 2012; Thomas, 2012).

Rodriguez (2004) showed that corporate earning numbers will expected to follow Benford's law in the absence of earnings management. Durtschi, Hillison and Pacini (2004) further examined the using of Benford's law in detecting accounting fraud by identifying data sets which are expected to follow Benford's law. Thomas (2012) examined the extent to which firms manipulate their financial statement numbers by engaging in cosmetic earnings management in a post-SOX environment. Using 2009 data, Thomas found no evidence of cosmetic earnings management, indicating that the SOX has increased financial statement reliability and reduced earnings management.

He and Guan (2014) documented that the rounding phenomenon of Japanese firms is more serious in reported earnings than reported revenues. Furthermore, they found Japanese publicly listed firms tend to concentrate on short-term performance in the post-bubble era. Lin, Zhao and Guan (2014) examined the window dressing in revenue of U.S. high-tech and low-tech firms. They showed that U.S. high-tech firms more engross in revenue management than low-tech firms in order to atone for the smaller set of accounting choices.

Above summarized studies have shown clear evidence that Benford's law can be used to analyze earnings management behavior. Therefore, this study utilizes Benford's law to investigate the extent of corporate governance effective in detecting earnings management.

### **3. Hypotheses and Mathematical Model**

#### **3.1 Hypotheses**

If earnings management is conducted by achieving the key reference point represented by  $n \times 10^k$ , an abnormal distribution of the digits in the place to the right of the reference point is expected. For example, if the key reference point is the first digit of income numbers and managers simultaneously tend to distort earnings to achieve the key reference point, more zeros and fewer nines are expected in the second place of the earnings numbers. Therefore, our first hypothesis is stated as follows:

***H<sub>1a</sub>: The rounding phenomenon is present in income numbers of publicly listed firms in China.***

***H<sub>1b</sub>: The rounding phenomenon is present in income numbers of publicly listed firms in Taiwan.***

As discussed, corporate governance mechanisms can successfully minimize earnings management behavior (Dechow, Sloan and Sweeney, 1995; Peasnell, Pope and Young, 2000; Park and Shin, 2004; Jo and Kim, 2007; Marra, Mazzolab and Prencipea, 2011). Effective corporate governance mechanisms can substantially reduce incentives for management to manipulate earnings. Since 2002, China and Taiwan have announced corporate governance regulations enacted laws to strengthen the corporate governance mechanism respectively. Cohen, Mashruwala and Zach (2010) demonstrate the corporate governance environment has significantly improved in the Post-Sarbanes-Oxley Era. Chen, Elder and Hsieh (2007) find that the independence of supervisors, financial expertise of independent directors, and voluntary formation of independent directorship are associated with lower likelihood of earnings management. In addition, these findings are stronger after the CGBPP was enacted, suggesting that the implementation of CGBPP has lowered the likelihood of earnings management. We expect that the earnings management level will continue to decline because of the gradual implementation of corporate governance regulations since 2003. To investigate the differences before and after the strengthening of the corporate governance mechanism, the sample was divided

into two periods in this study, using 2003 as the division point. Therefore, our second hypothesis is stated as follows:

***H<sub>2a</sub>: The degree of deviation from Benford's law will be significantly weaker after implementing corporate governance regulations than before implementing corporate governance regulations in Chinese firms.***

***H<sub>2b</sub>: The degree of deviation from Benford's law will be significantly weaker after implementing corporate governance regulations than before implementing corporate governance regulations in Taiwanese firms.***

Man and Wong (2013) consider that an institutional environment which provides robust legal protection can control managers' self-interest. Previous studies have shown that institutions with weak investor protection exhibit a high level of earnings management and a low level of reporting of earnings information (DeFond, Hung and Trezevant, 2007; Leuz, Nanda and Wysocki, 2003). Prior studies show that it is less likely for managers to manipulate earnings when there is greater legal protection (Shleifer and Wolfenzon, 2002; Nenova, 2003). According to a report that ranked investor protection among 185 economies (Wilson, 2012), the degree of investor protection is substantially different between China and Taiwan. In contrast, Taiwan own better investor protection to enterprises than China. Therefore, this study hypothesized that the degree of earnings management of Taiwan is weaker than China. Formally, the third hypothesis is stated as follows:

***H<sub>3</sub>: The degree of deviation from Benford's law of publicly listed firms in China will significantly weaker than firms in Taiwan.***

## **3.2 Methodology**

### **3.2.1 Benford's law**

To test our hypotheses, our study identifies the expected proportions of each of the 10 digits (zero to nine) in each place of the income numbers. The actual

earnings numbers distribution without managerial manipulation cannot publicly observable (Thomas, 1989). Therefore, we adopt the Benford's law as the approximate distribution.

Benford (1938) demonstrated that the expected distributions of natural existence numbers are skewed toward one for the first digit (because zero can't be a first digit) and zero for the second digit. If earnings management is conducted by achieving the key reference point represented by  $n \times 10^k$ , an abnormal distribution of the digits in the place to the right of the reference point is expected. Benford assumed that the expected proportions of a number as the first digit can be approximated by the following equation:

$$\text{proportion}(a \text{ is the first digit}) = \log_{10}(a + 1) - \log_{10}(a). \quad (1)$$

Furthermore, the expected proportion of a given number  $a$  as the first digit and the number  $b$  as the second digit can be inferred with the following equation:

$$\text{proportion}(b \text{ is the second digit}) = \log_{10}\left(a + \frac{b+1}{10}\right) - \log_{10}\left(a + \frac{b}{10}\right). \quad (2)$$

Summing all possible  $a$  values for any  $b$  value can generate the entire expected proportion for  $b$  as the second digit. This equation is as follows:

$$\Sigma(\text{proportion}(b \text{ is the second digit})) = \Sigma\left[\left(\log_{10}\left(a + \frac{b+1}{10}\right) - \log_{10}\left(a + \frac{b}{10}\right)\right)\right]. \quad (3)$$

The expected probability of numbers in the third, fourth digits can be similarly derived.

### 3.2.2 Chi-square Test

The chi-square test has often been used to test for conformity to Benford's law (Nigrini, 2012). The chi-square test is an extension of the z-test, which examines only one digit at once. Comparatively, the chi-square test combines all results of each digit's expected frequency with each digit's actual frequency in one test statistic. If the chi-square test rejects the hypothesis that the probability of all digits conform to the Benford law, then the whole account should further examined. The chi-square test is generally less biased than the z-test (Durtschi, Hillison and Pacini, 2004). The chi-square test is as follows:

$$\chi^2 = \sum_{i=1}^9 \left( \frac{[nP_0 - nP_e]^2}{nP_0} \right) \quad \text{for the first digit} \quad (4)$$

$$\chi^2 = \sum_{i=0}^9 \left( \frac{[nP_0 - nP_e]^2}{nP_0} \right) \quad \text{for the other digit} \quad (5)$$

where  $P_e$  and  $P_0$  are the observed and expected proportions, respectively. The sample size is represented by  $n$ .

### 3.2.3 Z Statistic

If the chi-square is significant, the number that has deviated from Benford's law and the degree of the deviation can be identified by examining the Z statistic on numbers zero to nine. To test the hypothesis, we compare the expected occurrences of the number as predicted by Benford's law to the observed frequency of each number  $X$  in various places. We use the Z statistic to execute a significance test of the observed deviation from the expected proportion.

$$Z = \frac{|P_0 - P_e| - \frac{1}{2n}}{\sqrt{\frac{P_0(1-P_0)}{n}}} \quad (6)$$

The second term in the numerator is a correction term. Only when it is smaller than  $|P_0 - P_e|$ , the correction term will be applied (Thomas, 1989). These Z-statistics reject the hypotheses at the 1%, 5%, and 10% levels if their values exceed 2.57, 1.96, and 1.64, respectively.

### 3.2.4 Cramer's V

Cramer's V was used as a post test to determine the strengths of association after the chi-square test determined significance. The chi-square test demonstrated that a significant relationship existed between variables, but cannot identify the extent to which the significance occurs. Cramer's V is based on adjusting the chi-square significance with not considered sample size. Cramer's V varies between zero and one. When the Cramer's V value closes to one indicates a strong association between the variables. We used Cramer's V to compare the level of

deviation from Benford's law by different groups, and the related equation is as follows:

$$\text{Cramer's } V = \sqrt{\chi^2/n(k-1)} \quad (7)$$

where  $n$  and  $k$  are the sample size and number of variables, respectively.

## 4. Empirical Results

### 4.1 Data

The data were obtained from the Taiwan Economic Journal (TEJ) database. The sample includes quarterly net income of firms listed on the stock exchanges of China and Taiwan from 1990 to 2012. After deleting incomplete data, the final sample consisted of 122,310 positive earnings observations, including 79,285 observations in China and 43,025 observations in Taiwan.

### 4.2 Test of Hypothesis 1

Table 1 and Table 2 list the distributions of each number (zero to nine) appearing in the first through fourth places of positive earnings of Chinese firms and Taiwanese firms, respectively. As shows in Table 1 "Distribution of first through fourth digits in quarterly net incomes of companies in China from 1990 to 2012", the results of a chi-square test of the first through fourth places were 123.66, 157.48, 112.7 and 10.38, respectively. The chi-square values are significant except for fourth places. This result indicates that China managers have strong incentives to manipulate income numbers by exaggerating the earnings numbers.

The distribution of first digits of the Chinese firms reveals that number two to five was observed more frequently than expected, suggesting that firms are more likely rounding numbers when these numbers are set as the first digit. In addition, number one, seven and nine was observed less frequently than expected.

The lack of number one, seven and nine as the first digit means that firms are more likely to round when the first digit is one, seven and nine.<sup>3</sup>

Moreover, consistent with our expectations, significantly more zeros (or ones) and fewer nines (or eights) occurred in the second and third places, suggesting that firms may use the first and second digits as reference points. The proportion of zeros as the second digit, expected to be 11.97% of the sample, was actually 11.03% higher, and the Z statistic was 11.49. The number nine exhibited a rate of deviation of -4.94% and a Z statistic of 4.23. This indicates that firms are likely to use the number zero as the key reference point for the second digit, causing the anomaly of more zeros than nines. Similarly, the proportion of zeros, ones and twos as the third digit was higher than expected.<sup>4</sup>

Prior studies find that emerging markets have fewer investor protection and more earnings management (DeFond, Hung, and Trezevant, 2007; Leuz, Nanda and Wysocki, 2003). Our empirical results support the findings of prior studies. In addition, we found similar earnings management manipulation in Taiwan, one of Asia's emerging markets. Table 2 exhibits the results of a chi-square test of the first through fourth places were 27.56, 53.19, 23.64 and 9.07, respectively, suggesting that managers in the Taiwan also have strong incentives to manipulate earnings by exaggerating the earnings numbers. There are significantly more zeros and fewer nines occurred in the second and third places. The proportion of zeros as the second and third digits was 6.52% and 5.89% higher than expected, respectively (The Z statistics was 5.02 and 4.10). The proportion of nines as the second was 8.12% lower than expected (The Z statistics was 5.14). This result concurs with prior studies (Carlsaw, 1988; Thomas, 1989; Herrmann and Thomas, 2005; Lin, Guan and Fang, 2011). Given this result, we would be inclined to support the null hypothesis 1a and 1b. We would conclude, based on the evidence, that *window dressing* is a pervasive phenomenon both in China and Taiwan.

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<sup>3</sup> The cosmetic earnings management behavior of Taiwanese enterprises are mainly concentrated in the fourth quarter, in contrast, it happen at each quarter in China.

<sup>4</sup> The phenomenon of earnings manipulation still exists in companies with negative earnings. There are significantly more nines and fewer zeros occurred in the second or third places. This result concurs with prior studies (Thomas, 1989; Guan, Lin and Fang, 2008).

### 4.3 Test of Hypothesis 2

Since 2002, both China and Taiwan have enacted laws to strengthen their corporate governance mechanisms. We anticipate that the degree of earnings management would have declined because of the gradual implementation of corporate governance regulations since 2003. Therefore, we divided our sample period into two groups, 1990-2002 and 2003-2012, to further examine whether differences existed in earnings management behavior between these periods (Tables 3 and 4). For China, the first through third places of the positive earnings for both periods show significant chi-square results. Significantly more zeros (or ones) and fewer nines (or eights) are evident in the second and third places, regardless of period, indicating that managers continued to manipulate the reported earnings after 2003.

In contrast, the fourth place was manipulated less frequently. Cramer's V was used to control for the effect of inconsistency among the number of samples among the various groups. The results show that the first through fourth places of the pre-2003 samples obtained higher Cramer's V results (0.0186, 0.0202, 0.0192, and 0.0133, respectively) than the post-2003 samples (0.0139, 0.0148, 0.0122, and 0.0044). The empirical results therefore support  $H_{2a}$ , indicating that the degree of earnings management improved significantly in China after the implementation of corporate governance regulations.

Table 4 shows that similar earnings management manipulation occurred in Taiwan. The first through second digits of the pre-2003 samples and the first through third digits the post-2003 samples show that the chi-square values are significant. This result indicates that managers in Taiwan also continued to manipulate their reported earnings after 2003. After comparing the Cramer's V results for these two periods, we observed higher Cramer's V results in all places before 2003 (0.0161, 0.0158, 0.0099, and 0.0083, for the first, second, third and

**Table 1**  
**Distribution of First Through Fourth Digits on Quarterly Net Incomes of Companies in China From 1990 to 2012**

Number		0	1	2	3	4	5	6	7	8	9	Chi -square
First Digit (n=79,285)	Observed Proportion	-	29.04	17.88	13.19	9.98	8.40	6.61	5.60	5.08	4.22	123.66***
	Expected Proportion	-	30.10	17.61	12.49	9.69	7.92	6.70	5.80	5.12	4.58	
	Deviation Rate	-	-3.52	1.53	5.60	2.99	6.06	-1.34	-3.45	-0.78	-7.86	
	Z-statistics	-	6.53***	2.03**	5.94***	2.78***	5.03***	0.96	2.43**	0.45	4.84***	
Second Digit (n=79,279)	Observed Proportion	13.29	11.51	10.89	10.34	9.65	9.70	9.05	8.83	8.65	8.08	157.48***
	Expected Proportion	11.97	11.39	10.88	10.43	10.03	9.67	9.34	9.04	8.76	8.50	
	Deviation Rate	11.03	1.05	0.09	-0.86	-3.79	0.31	-3.10	-2.32	-1.26	-4.94	
	Z-statistics	11.49***	1.08	0.08	0.87	3.55***	0.30	2.73***	1.97**	1.11	4.23***	
Third Digit (n=79,178)	Observed Proportion	10.92	10.64	10.34	10.03	9.84	9.82	9.75	9.82	9.65	9.18	112.7***
	Expected Proportion	10.18	10.14	10.10	10.06	10.02	9.98	9.94	9.90	9.86	9.83	
	Deviation Rate	7.27	4.93	2.38	-0.30	-1.80	-1.60	-1.91	-0.81	-2.13	-6.61	
	Z-statistics	6.89***	4.72***	2.29**	0.28	1.69*	1.44	1.79*	0.73	1.98**	6.11***	
Fourth Digit (n=77,800)	Observed Proportion	10.13	10.04	10.13	10.02	10.05	10.14	9.81	10.00	9.90	9.78	10.38
	Expected Proportion	10.02	10.01	10.01	10.01	10.00	10.00	9.99	9.99	9.99	9.98	
	Deviation Rate	1.10	0.30	1.20	0.10	0.50	1.40	-1.80	0.10	-0.90	-2.00	
	Z-statistics	1.07	0.23	1.10	0.08	0.45	1.33	1.73*	0.09	0.80	1.85*	

Notes: The observed, expected proportion and deviation rate are measured as the percentage of the sample.

The deviation rate=(observed proportion- expected proportion) / (expected proportion).

\*, \*\*, and \*\*\* denote significance at the 10 percent, 5 percent, and 1 percent levels, respectively (two-tailed test).

**Table 2**  
**Distribution of First Through Fourth Digits on Quarterly Net Incomes of Companies in Taiwan From 1990 to 2012**

	Number	0	1	2	3	4	5	6	7	8	9	Chi -square
First Digit (n=43,025)	Observed Proportion	-	29.85	17.02	12.73	9.88	8.14	6.88	5.89	5.29	4.31	27.56***
	Expected Proportion	-	30.10	17.61	12.49	9.69	7.92	6.70	5.80	5.12	4.58	
	Deviation Rate	-	-0.83	-3.35	1.92	1.96	2.78	2.69	1.55	3.32	-5.90	
	Z-statistics	-	1.13	3.20***	1.47	1.29	1.73*	1.56	0.77	1.66*	2.59***	
Second Digit (n=43,020)	Observed Proportion	12.75	11.47	11.10	10.50	10.00	9.72	9.24	8.81	8.60	7.81	53.19***
	Expected Proportion	11.97	11.39	10.88	10.43	10.03	9.67	9.34	9.04	8.76	8.50	
	Deviation Rate	6.52	0.70	2.02	0.67	-0.30	0.52	-1.07	-2.54	-1.83	-8.12	
	Z-statistics	5.02***	0.55	1.47	0.46	0.24	0.33	0.68	1.64	1.16	5.14***	
Third Digit (n=42,958)	Observed Proportion	10.78	10.28	10.24	9.94	9.82	10.00	9.87	9.77	9.65	9.64	23.64***
	Expected Proportion	10.18	10.14	10.10	10.06	10.02	9.98	9.94	9.90	9.86	9.83	
	Deviation Rate	5.89	1.38	1.39	-1.19	-2.00	0.20	-0.70	-1.31	-2.13	-1.93	
	Z-statistics	4.10***	0.98	0.99	0.81	1.33	0.14	0.48	0.88	1.45	1.31	
Fourth Digit (n=42,464)	Observed Proportion	10.21	10.20	10.10	10.09	9.82	10.04	9.86	9.82	10.06	9.79	9.07
	Expected Proportion	10.02	10.01	10.01	10.01	10.00	10.00	9.99	9.99	9.99	9.98	
	Deviation Rate	1.90	1.90	0.90	0.80	-1.80	0.40	-1.30	-1.70	0.70	-1.90	
	Z-statistics	1.30	1.28	0.63	0.59	1.23	0.29	0.91	1.19	0.53	1.32	

Notes: The observed, expected proportion and deviation rate are measured as the percentage of the sample.

The deviation rate=(observed proportion- expected proportion)/ (expected proportion).

\*, \*\*, and \*\*\* denote significance at the 10 percent, 5 percent, and 1 percent levels, respectively (two-tailed test).

fourth places, respectively) than after 2003 (0.0073, 0.0118, 0.0084, 0.0062). Accordingly, these results support  $H_{2b}$ , indicating that the degree of earnings management improved significantly after corporate governance regulations implementing in Taiwan. In summary, earnings management has decreased significantly following the implementation of corporate governance regulations in Asia's markets such as China and Taiwan.

#### 4.4 Test of Hypothesis 3

In this section, we compared the earnings management behavior of companies in China and Taiwan based on the Cramer's V results from different periods. The results indicate that the degree of deviation among firms in China was greater than that of Taiwanese firms (Table 5). The first through third digits of the reported earnings among Chinese firms yielded higher Cramer's V results (0.0140, 0.0149, and 0.0126, respectively) than the Taiwanese firms (0.0089, 0.0117, and 0.0078) throughout the entire sample period. Comparing different periods, we obtained similar results. For example, the first through third digits of the earnings figures among Chinese firms yielded higher Cramer's V results (0.0139, 0.0148, and 0.0122, respectively) than the Taiwanese firms (0.0073, 0.0118, and 0.0084) from 2003 to 2012. Our results show that a weaker investor protection country, such as China, appears to exhibit more "window dressing" behavior than Taiwan, regardless of the period. This result supports H3 and is similar to prior research findings (Shleifer and Wolfenzon, 2002; Leuz, Nanda and Wysocki, 2003; Nenova, 2003; DeFond, Hung and Trezevant, 2007).

### 5. Conclusions

The results of this study show that the majority of firms have tended to manipulate their financial statements in both Taiwan and China from 1990 to 2012, and that the results for both Taiwan and China were similar. Substantially more zeros (or ones) and fewer nines (or eights) are evident in the second and third places for both periods. The empirical results show that the phenomenon of earnings manipulation occurred in Asia's emerging markets. Our analyses show direct evidence of the managers of publicly listed firms publishing reported earnings that were rounded up to attain key reference points.

Corporate governance has attracted a considerable amount of public interest because of increased instances of corporate fraud over the last two decades. Many countries have enacted laws to strengthen their corporate governance mechanisms.

**Table 3**  
**Distribution of First Through Fourth Digits on Quarterly Net Incomes of Companies in China at Different Periods**

	Period	Number	0	1	2	3	4	5	6	7	8	9	Chi-square	Cramer's V
First Digit (n=79,285)	1990~2002	Deviation Rate	-	-4.75	5.08	8.23	4.43	-2.11	-1.83	-5.51	1.66	-8.67	22.73***	0.0186
	(n=8,231)	Z-statistics	-	2.82***	2.12**	2.80***	1.30	0.54	0.42	1.22	0.32	1.70*		
	2003~2012	Deviation Rate	-	-3.40	1.15	5.28	2.86	7.06	-1.22	-3.26	-0.97	-7.76	109.74***	0.0139
	(n=71,054)	Z-statistics	-	5.94***	1.41	5.31***	2.49**	5.51***	0.86	2.15**	0.59	4.52***		
Second Digit (n=79,279)	1990~2002	Deviation Rate	13.81	0.07	-6.10	-2.17	0.42	2.18	2.03	-0.08	-7.87	-6.08	30.28***	0.0202
	(n=8,230)	Z-statistics	4.60***	0.01	1.91*	0.65	0.11	0.63	0.57	0.00	2.19**	1.66*		
	2003~2012	Deviation Rate	10.76	1.19	0.81	-0.76	-4.26	0.12	-3.62	-2.48	-0.51	-4.80	140.21***	0.0148
	(n=71,049)	Z-statistics	10.57***	1.13	0.75	0.69	3.79***	0.09	3.09***	2.08**	0.41	3.90***		
Third Digit (n=79,178)	1990~2002	Deviation Rate	7.44	7.27	0.95	3.17	3.82	1.05	-6.26	-0.62	-6.77	-10.63	27.31***	0.0192
	(n=8,221)	Z-statistics	2.25**	2.19**	0.27	0.94	1.14	0.30	1.87	0.17	2.01**	3.16***		
	2003~2012	Deviation Rate	7.26	4.73	2.60	-0.70	-2.45	-1.85	-1.42	-0.81	-1.60	-6.12	95.84***	0.0122
	(n=70,966)	Z-statistics	6.50***	4.23***	2.32**	0.62	2.17**	1.63	1.25	0.71	1.40	5.38***		
Fourth Digit (n=77,800)	1990~2002	Deviation Rate	2.95	4.84	2.29	-6.30	0.40	0.81	-0.63	-8.00	4.02	-0.39	12.85	0.0133
	(n=8,106)	Z-statistics	0.87	1.43	0.67	1.87*	0.10	0.22	0.17	2.38**	1.19	0.10		
	2003~2012	Deviation Rate	0.95	-0.27	1.06	0.84	0.51	1.51	-2.01	1.04	-1.43	-2.18	12.02	0.0044
	(n=69,694)	Z-statistics	0.83	0.24	0.92	0.73	0.44	1.32	1.76*	0.91	1.25	1.91*		

Notes: The observed, expected proportion and deviation rate are measured as the percentage of the sample.

The deviation rate=(observed proportion- expected proportion)/ (expected proportion).

\*, \*\*, and \*\*\* denote significance at the 10 percent, 5 percent, and 1 percent levels, respectively (two-tailed test).

**Table 4**  
**Distribution of First Through Fourth Digits on Quarterly Net Incomes of Companies in Taiwan at Different Periods**

	Period	Number	0	1	2	3	4	5	6	7	8	9	Chi-square	Cramer's V
First digit (n=43,025)	1990~2002	Deviation Rate	-	-2.89	-5.42	2.38	4.31	1.98	9.12	4.77	6.25	-5.51	24.34***	0.0161
	(n=11,703)	Z-statistics	-	2.04**	2.70***	0.96	1.51	0.61	2.63***	1.26	1.55	1.28		
	2003~2012	Deviation Rate	-	-0.06	-2.57	1.70	1.01	3.18	0.48	0.31	2.43	-5.81	13.44*	0.0073
	(n=31,322)	Z-statistics	-	0.07	2.09**	1.13	0.57	1.64*	0.21	0.12	0.98	2.24**		
Second digit (n=43,020)	1990~2002	Deviation Rate	5.28	-1.67	0.87	4.06	2.18	6.72	-3.78	-3.49	-3.36	-10.19	26.39***	0.0158
	(n=11,698)	Z-statistics	2.09**	0.63	0.31	1.48	0.77	2.36**	1.29	1.17	1.11	3.34***		
	2003~2012	Deviation Rate	7.05	1.65	2.48	-0.61	-1.30	-1.82	-0.02	-2.15	-1.23	-7.38	39.58***	0.0118
	(n=31,322)	Z-statistics	4.59***	1.04	1.52	0.36	0.76	1.05	0.00	1.19	0.67	3.97***		
Third digit (n=42,958)	1990~2002	Deviation Rate	6.31	1.31	-0.99	0.17	0.56	0.18	0.05	-0.78	-0.40	-6.66	10.25	0.0099
	(n=11,654)	Z-statistics	2.28**	0.46	0.34	0.04	0.19	0.05	0.00	0.26	0.13	2.36**		
	2003~2012	Deviation Rate	5.74	1.46	2.35	-1.69	-2.87	0.23	-0.98	-1.48	-2.78	-0.17	19.79**	0.0084
	(n=31,304)	Z-statistics	3.41***	0.86	1.38	0.99	1.69*	0.13	0.57	0.86	1.62	0.09		
Fourth digit (n=42,464)	1990~2002	Deviation Rate	-1.95	0.72	3.82	3.25	0.23	-3.15	-3.29	-1.58	2.93	-0.98	7.11	0.0083
	(n=11,422)	Z-statistics	0.68	0.24	1.35	1.14	0.06	1.11	1.15	0.55	1.03	0.33		
	2003~2012	Deviation Rate	3.32	2.30	-0.14	0.00	-2.54	1.75	-0.62	-1.81	0.00	-2.28	10.77	0.0062
	(n=31,042)	Z-statistics	1.94*	1.34	0.07	0.00	1.48	1.02	0.36	1.05	0.00	1.33		

Notes: The observed, expected proportion and deviation rate are measured as the percentage of the sample.

The deviation rate=(observed proportion- expected proportion)/ (expected proportion).

\*, \*\*, and \*\*\* denote significance at the 10 percent, 5 percent, and 1 percent levels, respectively (two-tailed test).

**Table 5**  
**The Cramer's V of First Through Fourth Digits at Different Periods**

Period	Country	First Digit	Second Digit	Third Digit	Fourth Digit
All	China	0.0140	0.0149	0.0126	0.0038
	Taiwan	0.0089	0.0117	0.0078	0.0049
1990~2002	China	0.0186	0.0202	0.0192	0.0133
	Taiwan	0.0161	0.0158	0.0099	0.0083
2003~2012	China	0.0139	0.0148	0.0122	0.0044
	Taiwan	0.0073	0.0118	0.0084	0.0062

By comparing the Cramer's V results of different periods, we have shown that the degree of earnings management has been improving substantially since implementing corporate governance regulations in both Taiwan and China. Our results provide evidence that the implementation of corporate governance regulations has reduced the incidence of earnings management among publicly listed firms in Asia's emerging markets. Overall, earnings management of financial statements has become more difficult for public firms after implementing corporate governance regulations. The findings add more evidence to the ongoing debate about the effectiveness of corporate governance regulations in preventing earnings management.

In addition, we compared the earnings management behavior of companies in China and Taiwan based on the Cramer's V results from different periods. Our results show that the degree of deviation among Chinese firms was greater than that of Taiwanese firms. Furthermore, our results show that a greater degree of investor protection reduces the probability of earnings being manipulated by corporate managers. This study provides empirical evidence that corporate managers in China, which is regarded as a weaker country regarding investor protection, have stronger incentives to manipulate earnings by exaggerating their reported earnings.

This result indicates that the implementation of corporate governance regulations plays a crucial role in reducing earnings manipulation behavior. These findings have implications for supervisory authorities and investors. Supervisory authorities should further improve their corporate governance regulations to minimize earnings management. For international investors, this study recommends that investors should focus on the accuracy of financial statements when investing in China. In the field of forensic accounting, Benford's law has proven to be a useful tool through detect the changes in the distribution of accounting numbers. Future researchers can further adopting Benford's law in the field of behavioral finance, such as price, volume and other issues.

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