The Impact of Corporate Reputation on Earnings Management Decisions

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Abstract

This thesis consists of empirical tests and theoretical works exploring how the corporate reputation influences manager’s earnings management decisions. Building and protecting corporate reputation is one of the challenges to CEOs today. Some researchers suggest that corporate reputation is one important factor when investors evaluate a firm. The other scholars indicate that corporate reputation has an impact on manager’s information disclosure and strategies making. Earnings management occurs when managers bias financial reporting or construct transactions strategically to impact the cash flow. I am curious whether the corporate reputation has an effect in earnings management behaviour to mislead investors. Firstly, I test how the corporate reputation affects manager’s earnings management behaviour in both accruals manipulation and real manipulations. I find that firms with worse reputation use more increasing discretionary accruals and intend to manipulate sales. Then, I study the reputation effect on discretionary accruals in a repeated cheap-talk game. I find that for managers in firms without prior good reputation among investors, smoothing earnings is an effective way to alter the investors’ opinion.

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Table of Contents

List of Tables

List of Figures

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Chapter 1: *Introduction*

According to the results of a CEO survey, NYSE Euronext reports that "Succession Planning, Corporate Reputation and Investor Confidence are Top Challenges for Today's CEOs". From the investor's perspective, researchers suggest that corporate reputation is one of the most important quality coefficients when investors evaluate a firm (Graham and Dodd, 2008). Since corporate reputation is important to both managers and investors, several groups publish corporate reputation rankings, either for specific regions, or globally, with focus on different stakeholders. Meanwhile, scholars examine how corporate reputation influences stakeholders' decision-making process and how the stakeholders' decisions impact corporate reputation according to the reputation rankings. Recent empirical studies have found positive correlations between corporate reputation and the firm's earnings quality. Specifically, academics note that firms with better reputation are associated with fewer upward discretionary accruals and smaller magnitude of discretionary accruals. However, these empirical works do not explain how the corporate reputation affects managers' accruals decisions. Moreover, no empirical work has tested how concern for reputation influences managers' decisions in real manipulation through transactions. Further, there is no theoretical work that analyses how reputation impacts managers' earnings management decisions through both discretionary accruals and real transactions.

In their seminal paper of 1982, in which they analyse a chain store game with imperfect information, Kreps and Wilson (1982) suggest that uncertainty about the other player's payoff may lead the first player to take actions to build a reputation. Following their study, some researchers have used the repeated cheap-talk game between information sender and receiver to examine how reputation works. According to Sobel (1985), Benabou and Laroque (1992) and Morris (2001), the information sender will manipulate information when the manipulation cost is low. However, Kim (1996) and Stocken (2000) demonstrate that if the information sender has good prior reputation or is sufficiently patient, he will disclose truthful information to the receiver.

Another stream of economists have studied how corporate reputation could impact managers' behaviour. Fama (1980) suggests that the manager's incentive problem could be solved by the competition in the labour market, as the manager would work hard for his reputation, which may influence his future payoffs. Meyer and Vickers (1997) demonstrate that either comparative performance information or career concern could motivate managers to work hard. However, Holmström (1999) argues that the reputation effect decreases with the manager's increasing age and career development. He believes that reputation effect alone could not provide sufficient incentive for managers to increase their efforts when the market is imperfect. Earnings management has been a popular topic since the 1980s. Several theoretical works utilise game theory to examine the managerial incentives to manage earnings (Lambert, 1983, 1984; Dye, 1988; Trueman and Titman, 1988; Fudenberg and Tirole, 1995; Fischer and Verrecchia, 2000; Ewert and Wagenhofer, 2005). These incentives include compensation plan, debt contract, and concern to stay in the job. Meanwhile, a number of empirical works respond to the positive accounting theory proposed by Watts and Zimmerman (1986) by testing the incentives and consequences of earnings management. However, among these empirical research, very few investigate the relation between corporate reputation and earnings quality. Specifically, only two empirical papers report how corporate reputation relates to earnings management, and these do not explain the role of corporate reputation in managers' earnings management decisions.

The present research will test how corporate reputation affects managers' earnings management behaviour in both discretionary accruals and real manipulations. Following empirical study, I will propose theoretical models to analyse how managers make earnings management decisions with consideration of corporate reputation.

The rest of the thesis is organised as follows. In the second chapter, I review the literature on earnings management and corporate reputation. The review encompasses literature on definitions, incentives, measurement of earnings management and corporate reputation and how they are linked together. I identify the gaps in the literature and propose my hypothesis. Chapter three introduces methodology, data selection and data analysis. The fourth chapter discusses the findings from the empirical work. In the fifth chapter, I review the theoretical literature, using the game theory to explain earnings management and reputation. Then I analyse how managers and investors interact in a simple game and in more complicated games with different assumptions. Later, I develop the formal models to explore the manager's choice regarding discretionary accruals and real earnings management. I consider the manager's accruals manipulation decision in a repeated cheap-talk game with investors, and his real manipulation decision in a repeated two-period game. Finally, I summarise my work and findings in Chapter six.

Chapter 2: *Theoretical Framework and Literature Review*

2.1 INTRODUCTION

Earnings management has captured the attention of academics since the 1980s. While economists have developed theoretical models to explain why managers engage in this behaviour, empirical researchers have tested this phenomenon to find out the causes and consequences of earnings management behaviour. By reviewing the relevant literature, this chapter provides a general understanding on what is meant by earnings management, why managers engage in this behaviour, and how to estimate it. In addition, this chapter discusses the theoretical framework of earnings management. Finally, corporate reputation is reviewed and linked to earnings management.

2.2 DEFINITIONS OF EARNING MANAGEMENT

There is no single accepted definition for the term "earnings management". Researchers' definitions of earnings management can be categorised into three groups: beneficial earnings management, pernicious earnings management and earnings manipulation, which could be either opportunistic or efficiency enhancing. With regard to the first group, scholars consider that earnings management can increase the transparency of reports by taking advantage of the flexibility in account choice to signal the manager's private information on future cash flows (Demski, 1998, Sankar and Subramanyam, 2001). In contrast, researchers who focus on pernicious earnings management argue that earnings management is harmful, as it misrepresents reports and reduces the report transparency (Schipper, 1989, Levitt Jr, 1998, Healy and Wahlen, 1999). Finally, some researchers suggest that earnings management is the use of accounting choices, and can be either opportunistic or economically efficient. This kind of manipulation is within the boundaries of compliance with bright-line standards (Fields et al., 2001, Scott, 2009).

Studies among the three groups, it is pernicious earnings management that is most widely accepted in recent research. Although there is no consensus among researchers in defining earnings management, practitioners and regulators consider this practice to be common and problematical.

The definitions proposed by Schipper (1989) and Healy and Wahlen (1999) are the most frequently cited. According to Schipper (1989), earnings management is "a purposeful intervention in the external financial reporting process, with the intent of obtaining some private gain", and is "accomplished by timing investment or financing decisions to alter reported earnings or some subset of it" (p.92). Healy and Wahlen (1999) are more precise in their definition, providing both the methods and the incentives of earnings management. They suggest that: "Earnings management occurs when managers use judgment in financial reporting and in structuring transactions to alter financial reports to either mislead some stakeholders about the underlying economic performance of the company or to influence contractual outcomes that depend on reported accounting numbers" (Healy and Wahlen, 1999, p.368).

This definition has two notable features. First, it indicates how earnings can be managed. Managers can use 1) discretionary accruals by adopting the flexible accounting choices allowed in Generally Accepted Accounting Procedures to make up reported earnings without changing the underlying cash flows; and/or 2) real earnings management by constructing economic activities to influence cash flow. Second, it suggests why managers engage in earnings management behaviour. Earnings are managed when managers intend either to mislead stakeholders or to influence earnings-based contracts.

This study employs Healy and Wahlen (1999), since it accurately defines earnings management and is the most accepted definition in the previous earnings management literature.

2.3 INCENTIVES FOR EARNINGS MANAGEMENT

The reasons for earnings management can be explained in terms of its incentives. According to Healy and Wahlen (1999) definition, managers manage earnings either to misguide stakeholders or to impact contractual outcome. This section will demonstrate why managers engage in earnings management, which groups of stakeholders they want to mislead and what kind of contract they want to influence. Watts and Zimmerman (1986), who develop positive accounting theory, propose testable hypotheses with regard to three essential earnings management incentives: (1) compensation plans; (2) debt contracts; and (3) political costs. Other theoretical studies have pointed to incentives related to the capital market, production market, job-security concern and other implicit contract. Most of these studies investigate these incentives using game theory, which analyses the conflicts and the interaction between rational decision makers (Myerson, 1991). These incentives have also been tested empirically.

In this section, the first three parts explain the three incentive hypotheses proposed in positive accounting theory. Subsequent parts introduce the incentives from capital market, production market, job-security concern and other implicit contract.

2.3.1 Compensation Plan Hypothesis

Watts and Zimmerman (1986) explain that compensation plans can drive earnings management, mainly due to interest conflicts between managers and firm owners. Managers can manipulate earnings to augment their compensation through their bonus plan associated with reported accounting numbers. This behaviour damages the interest of firm owners.

Two theoretical studies using game theory show how compensation plans encourage managers to smooth income, under the assumption that managers have no access to the capital market. Lambert (1984) models a two-person game between a principal and a risk-averse manager. He illustrates that, in a two-period moral hazard setting, a compensation contract offered by a principal as his optimal decision motivates the manager to smooth income through economic activities (such as making production and investment decisions) in order to influence operation cash flow. Dye (1988) uses an "overlapping generations" model to study earnings management and suggests that both internal and external demands motivate managers to manipulate earnings. The internal demand derives from the expected optimal compensation plan, while the external demand arises from the need of current shareholders to influence the potential investors' perceptions of firm value.

Varies empirical studies on earnings management and compensation plan report conflicting results. Healy (1985) explores managers' accounting choice when their bonuses are earnings-based. He finds that managers do choose income-increasing accounting procedures to increase their compensation, and explains that, in a typical bonus scheme, bonus only increases between bogey and cap of targeted net income. If the reported net income is lower than bogey, managers prefer to shift income from the current period to the next period in order to increase the possibility of receiving a bonus in the next period. If net income is between bogey and cap, managers would rather shift income from the future period to the current period to maximise the current period bonus. If net income is higher than cap, managers prefer to shift the excess income from the current period to the future one to enhance the bonus in the following period. These findings are supported by a number of studies (Hagerman and Zmijewski, 1979, Bowen et al., 1981, Holthausen, 1981, Healy, 1985, Skinner, 1993, Gaver et al., 1995, Holthausen et al., 1995, Guidry et al., 1999). Similarly, Bergstresser and Philippon (2006) find that option-based compensation plans also provide incentives for managers to use discretion to manipulate earnings. They find that the closer the manager's compensation is tied to the stock and option, the more distinct the discretionary accruals manipulation. Some other studies report similar results for equity-based bonus plans (Baker et al., 2003; Burns and Kedia, 2006; Coles et al., 2006; Erickson et al., 2006; Efendi et al., 2007; McAnally et al., 2008; Johnson et al., 2009; Armstrong et al., 2010).

2.3.2 Debt Contract Hypothesis

According to Watts and Zimmerman (1986), debt contract can also induce earnings management. Lenders put restraints in debt covenants to protect their interest, and these restraints are defined by accounting numbers. There are two types of debt covenants using accounting numbers: affirmative covenants and negative covenants. With the affirmative covenants, firms are required to maintain the accounting-based ratios to a specified level. Under the negative covenants, certain investment and financing behaviours are constrained (Smith, 1993). For example, negative covenants can protect lenders by means of restricting managers' actions such as paying dividends if working capital falls below a specific level (Scott, 2009). Any breach of covenants will lead to a default, which enables lenders to take actions such as increasing interest rate or even claiming repayment of the loan. Although some defaults are negotiable, they are costly. The greater the debt/equity ratio of a firm, the higher the possibility the firm may breach a covenant. Consequently, if a firm has higher debt/equity ratio, its managers will desire to increase reported accounting numbers related to the covenants, such as earnings, for the purpose of avoiding defaults.

Healy and Palepu (1990) investigate whether managers use discretion in accounting decisions to avoid breaking dividend constraints in debt covenants. They do not find evidence that managers use flexibility in accounting decisions when the tightness of dividend constraints increases. However, they find that firms cut and even omit dividends when they are approaching dividend constraints. DeAngelo et al. (1994) examine the accounting choice of firms in trouble by employing a sample of firms with persistent loss and dividend reduction. They find that these firms select accounting procedures that reflect their finance difficulties rather than increase income. They suggest that managers in these firms have an incentive to reduce income and negotiate with lenders, unions and government. DeFond and Jiambalvo (1994) investigate the abnormal accruals of firms that have violated debt covenants. They find positive abnormal total and working capital accruals for these companies in the year prior to the violation. Sweeney (1994) finds that managers switch to income-increasing accounting procedures when the firm is close to violating debt covenants. She believes that both the cost of defaulting on the debt covenant and the discretion in accounting choices determine the managers' earnings management behaviour. Later studies also provide evidence that managers are motivated to increase income through accounting flexibility for the purpose of debt-contracting

(Beatty and Weber, 2003; Beatty and Weber, 2006; Ball et al., 2008; Bharath, 2008; Zhang, 2008; Nikolaev, 2010).

2.3.3 Political Cost Hypothesis

Political cost is a main concern of managers in large firms when manipulating earnings. According to Watts and Zimmerman (1978), larger firms tend to lower reported earnings through accounting methods in order to gain benefits in terms of political and regulatory considerations.

Watts and Zimmerman (1986) suggest that, according to the economic theory of regulations, politicians aim to maximise their utility, which indicates that the political process is a competition for wealth transfer. By virtue of protective tariffs, government services, and government-created monopolies, politicians transfer wealth from firms to individuals. In this competition to transfer wealth, politicians may use accounting numbers to facilitate their decision making and policy making, which may disadvantage firms. For example, they may regard large reported earnings as an indication of monopoly, even though such earnings might be due to other reasons. In response to this, managers in large firms have an incentive to adopt accounting choices to prevent potential wealth transfers and consequent losses.

Recent studies provide evidence of earnings management during periods of increased political exposure. Wong (1988) documents that larger firms prefer credit sales to benefit from low tax rates. Jones (1991) notes that managers tend to lower accruals during years of import relief investigation more than in other years. Cahan et al. (1992) study the impact of political cost on earnings management of chemical firms, and find that the firms concerned decreased discretionary accruals when US Congress was considering the legislation that led to the Comprehensive Environmental Response, Compensation, and Recovery Act of 1980. Hall (1993) examines the oil refining industry and suggests that oil refining firms tend to take income-deceasing accruals when the oil price is high and take income-increasing accruals when the oil price is low. Key's (1997) investigation of political costs in the cable television industry during periods of Congressional scrutiny shows that firms which expect regulations to be more harmful have greater income-decreasing accruals. Hall and Stammerjohan (1997) find that oil firms reduce accruals to avoid potential political cost. Han and Wang (1998) investigate the earnings management in oil companies in the period of rapid gasoline price increases during the 1990 Persian Gulf crisis. Their study indicates that petroleum refining companies took income-reducing discretionary accruals to avoid political cost during this politically sensitive period, while crude oil and natural gas companies did not report decreasing accruals. Monem (2003) provides evidence of significant downward earnings management by Australian gold-mining firms, consistent with their attempts to mitigate political costs during a period of intense political scrutiny of the industry. Then, the firms are found to have engaged in upward earnings management to maximise earnings before the introduction of income tax on gold mining. Patten and Trompeter (2003) examine the relation between the level of pre-event environmental disclosure and the extent of earnings management in response to regulatory threat. Their analysis finds that a sample of 40 US chemical firms exhibited significant negative discretionary accruals for 1984. Furthermore, companies with higher levels of pre-event environmental disclosures in their 10-K reports tended to take less negative discretionary accruals.

2.3.4 Capital Market Incentives

In addition to the attention paid to the managerial incentives to engage in earnings management, Dechow and Skinner (2000) propose that academics should focus on incentives from the capital market, where firms use earnings to signal to investors about their financial performance. Firms are motivated to mislead investors on the value of firm, in order to affect market price. This section introduces the influence of capital market incentives for managers' earnings management behaviour.

2.3.4.1 Incentives when Firms Raise Capital

Dechow et al. (2010) suggest that incentives to influence equity market valuations affect firms' accounting choices, especially their accrual choices.

(1) IPO

The initial public offering (IPO) is the first occasion upon which a private company sells its stock to the public. Both small and large firms can raise capital and become publicly traded firms through IPO. IPOs provide firms with opportunities to finance current operations and future growth (Ritter and Welch, 2002). As long as there exists information asymmetry between managers and investors, managers have an opportunity to affect the initial offering price of the firm's stock through earnings management (Aharony et al., 1993).

Different purposes of IPO generate different implications of earnings management for the firm (Ronen and Yaari, 2008). When a firm aims to finance its current operations, IPO is considered as a "cash in" tool, and the firm may amplify earnings to maximise its stock price. Aharony et al. (1993) examine pre-IPO earnings management using the total accruals model. They find weak evidence to support the hypothesis that firms maximise their earnings before IPO, and show that prestigious underwriters and auditors help constrain earnings management. However, they note that small firms and firms with higher leverage ratio appear to be more "aggressive" than average. Friedlan (1994) also investigates the pre-IPO earnings management. Different from Aharony et al. (1993), he employs a simple discretionary method to capture earnings management. He argues that the use of prospectuses by investors to evaluate the issuing firm provides managers with incentives to increase earnings, as managers reasonably expect that both underwriters and investors are not able to detect earnings management. He finds evidence that firms do use income-increasing discretionary accruals before IPO to influence offer prices in order to maximise wealth.

In the case that the firm aims for future growth, IPO is considered as a first step of raising capital from the public, and the manager may prefer to be conservative and cautious. Teoh et al. (1998a) test the accruals in the IPO year and compare stock performance in the following years. They observe poor post-IPO stock performance over a three-year holding period for the firms with abnormal high accruals in the IPO year. Specifically, firms in the first quartile of discretionary accruals experience about 20 percent less post-IPO stock returns than the firms in the last quartile. Furthermore, these most "conservative" firms in the bottom quartile show an enhanced ability to raise capital in the future, as they are more likely to return for a seasoned equity offering. Teoh et al. (1998a) also suggest that IPO firms face unusual legal and possibly reputational scrutiny after IPO, and these firms are under pressure to protect their reputation for reliability. Thus, the consideration of corporate reputation somehow constrains earnings management.

(2) SEO

A seasoned equity offering (SEO) occurs when an existing publicly-traded firm issues new equity. A seasoned offerings may involve shares being sold by existing shareholders (non-dilutive) and/or new shares (dilutive).

Similar to IPOs, researchers document that earnings management can also explain firms' post-SEO underperformance. Rangan (1998) investigates the earnings management around SEO and finds that earnings management during the SEO year can predict both changes in earnings and market-adjusted returns in the next year.

He suggests that the market is not able to predict the issuing firm's earnings management and therefore overvalues the firm. Teoh et al. (1998b) test the pre-SEO discretionary accruals and the post-SEO stock returns. They find that firms which use earnings-increasing accruals before SEO appear to have lower long-term abnormal returns and lower net income afterwards. Consistent with Rangan, they suggest that investors are not aware of the pre-SEO earnings management and do not adjust for the potential earnings manipulation.

Shivakumar (2000) also examines the earnings management around SEO. In line with Rangan (1998) and Teoh et al. (1998b), his findings provide evidence of earnings management around SEO. However, compared to the previous findings that the market and investors' are not able to infer earnings management before SEO, he demonstrates that investors can perceive pre-offering earnings management and adjust their expectation accordingly. He implies that the findings of Rangan and Teoh et al. on naïve investors might be caused by test misspecification. He also suggests that management of earnings around SEO is just a rational response by managers to the forecasted market reactions, but is not aimed at misleading investors.

Cohen and Zarowin (2010) study both accruals management and real earnings management around SEO. They show that both methods of earnings management drive the SEO firms' poor post-event performance, and that real earnings management plays a more important role than discretionary accruals. Their finding is important since this is the first piece of work to examine earnings management through both accounting choices and real economic activities around SEO. They also illustrate that a firm's choice on earnings management methods depends on its ability and the cost of managing accruals.

2.3.4.2 Incentives from Earnings-Based Target

Dechow and Skinner (2000) suggest that earnings benchmarks are a strong capital market incentive for earnings management activities.

Graham et al. (2005) survey more than 400 financial executives from public companies. From 312 responses, they find that earnings benchmarks such as earnings level, analyst forecast and earnings improvement are important to most executives. Among the respondents, more than eighty percent agree that meeting earnings benchmarks helps them to 'build credibility with the capital market' and 'maintain or increase stock price'. Jiang (2008) finds that the reduction in the cost of debt measured by credit ratings is attenuated for those firms that are likely to have used earnings management to beat earnings benchmarks. Habib and Hansen (2008) document firms' earnings management behaviour around three earnings benchmarks: earnings level, earnings improvement and analyst forecast benchmark, and find that both market incentives and compensation incentives drive such earnings management behaviour.

Dechow et al. (2003) examine whether firms with small profits and firms with small losses (loss-avoidance benchmark) have differing levels of discretionary accruals. They find that firms just above the loss-avoidance benchmark do not have discretionary accruals that are significantly different from those of firms just below the benchmark. Ayers et al. (2006) use a different time period than Dechow et al. (2003), and find that firms do not appear to be managing earnings to meet or beat the earnings improvement (earnings changes) benchmark. They report that forward-looking discretionary accruals are higher for firms just above the loss-avoidance benchmark than for firms just below, and that these results are more pronounced than pseudo-benchmarks along the earnings level distribution. Hansen (2010) investigates differences in abnormal accruals between two different time periods and finds that in the period from 2001 to 2002, discretionary accruals appear to be more pronounced just above the loss-avoidance benchmark. He also finds that over the same period, it appears that firms just below the benchmark were not responding to opportunities to meet alternative benchmarks in the same way they did from 1988 to 2000.

2.3.5 Other Incentives

2.3.5.1 Incentives from Production Market

Bagnoli and Watts (2010) adopt a Cournot duopoly model with incomplete information to investigate the interaction between earnings management decisions and product market competition. They suggest that in product market competition, both production costs and the cost of misreporting are private information. Firm A may bias its report to make its competitor believe that its production costs are low. This biased report causes its competitor to evaluate firm A's production as being high and therefore to reduce its own production. However, the rational competitor can realise that the report is biased and adjust its perception of firm A's production costs upward accordingly. Even if the competitor adjusts the perception, firm A's production costs are still undervalued. Similarly, the competitor also misreports its production costs and as a result firm A underestimates its rival's costs. Eventually, without full information, all firms cut their production, which causes the prices of products to increase. Consequently, all firms' profits increase, which provides incentives for firms to misreport. Bagnoli and Watts (2010) also indicate that the levels of bias are higher in more profitable industries.

2.3.5.2 Incentives from Job-security Concern

Concern about job security creates an incentive for managers to manipulate earnings.

Fudenberg and Tirole (1995) generate a game-theoretic model to assume that managers derive 'incumbency rents', a non-monetary private benefit, from running firms, and that they are under risk of being fired when current earnings are low. To secure their jobs, managers whose current performance is poor may use both accounting techniques and operating decisions to "borrow" earnings from the future period. In addition, current earnings are assumed to be more informative than previous earnings in managers' performance evaluation. Similarly, good performance today could not compensate poor performance tomorrow. Thus, when current earnings are relatively high and expected future earnings are relatively low, managers have a desire to "save" current earnings for the future.

2.3.5.3 Incentives from Implicit Contract

Earnings management can also be triggered by the desire to maintain corporate reputation with regard to implicit contract.

Implicit contract arises from the repeated relationships between firms and their stakeholders (shareholders, lenders, suppliers, etc.) and indicates expected behaviour based on previous performance. Scott (2009) argues that if firms develop a corporate reputation for meeting formal contract commitments all the time, they will obtain better terms from suppliers, and lower interest rate from lenders.

Bowen et al. (1995) argue that, since a firm's stakeholders are likely to use the reported accounting numbers to help assess the firm's reputation on the fulfilment of implicit contract (e.g. timely payment to suppliers and creditors, continuing demand for product or service, funds from suppliers/creditors), managers have incentives to increase income in the long run to enhance the stakeholders' confidence in their ability to meet commitments. Moreover, the incentive strength hinges on the intensity of the firm's need for a favourable reputation.

Accordingly, corporate reputation represents another incentive for earnings management. I investigate the issues between corporate reputation and earnings management in the fourth part.

2.4 MEASUREMENTS OF EARNINGS MANAGEMENT

Due to the fact that earnings management cannot be measured directly, researchers in this area have developed a variety of models to detect possible earnings management. Two types of models are investigated in this study: (1) accruals-based models and (2) real earnings management models.

In accruals-based models, the total accruals are divided into discretionary accruals and non-discretionary accruals. The non-discretionary accrual is usually considered as the estimation of total accruals, and the difference between total accruals and non-discretionary accrual is regarded as the discretionary accrual. Discretionary accrual is used to detect the value of earnings management. Most studies adopt accruals-based models to detect earnings manipulation (Healy, 1985; Jones, 1991; Dechow et al., 1995; Kothari et al., 2005).

As a benchmark model, Jones (1991) developed a new and effective method to estimate non-discretionary accruals in order to detect earnings management during import relief (e.g. tariff increases and quota reductions). The model employs a variable such as plant, property and equipment to control for the effect of changes in firms' business activities caused by depreciation charge on the non-discretionary accruals, and a variable of the sales revenue to control for the changes of non-discretionary accruals caused by changes in the companies' economic environment. Jones (1991) contributes to the academic research by embedding into the model the dependence of accruals on sales revenue and fixed assets.

Dechow et al. (1995) compare the efficiency of five different models, those by Healy (1985), DeAngelo (1986) and Jones (1991), a modified Jones model and the industry model. They find that the modified Jones model is best for detecting earnings manipulation due to the fact that it can "eliminate the conjectured tendency of the Jones Model to measure discretionary accruals with error when discretion is exercised over revenues" (Dechow et al., 1995) by introducing a variable of changes in receivables into the non-discretionary function. Although both the Jones model and the modified Jones model are widely applied to earnings management study, they have been shown to be severely mis-specified when applied to stratified-random samples of firms (Dechow et al., 1995; Guay et al., 1996).

Kothari et al. (2005) improve the Jones model to emphasise the non-linear relationship between normal accruals and performance through the introduction of a control variable of return-on-assets. When the tested hypothesis does not suggest that earnings management will differ with performance, or where the control firms are not thought to manage earnings, this performance-matched model increases the reliability of the conclusion from earnings management research.

Although most studies detect earnings manipulation through accounting techniques, over the last decade real earnings management through economic decisions has been drawing an increasing amount of attention (Roychowdhury, 2006; Cohen et al., 2008; Cohen and Zarowin, 2010; Gunny, 2010; Zang, 2012). Compared to the accrual-based earnings management, the real earnings management approaches are more costly and harder to reveal (Bagnoli and Watts, 2000), and have direct effects on cash flows (Cohen and Zarowin, 2010).

In a study employing surveys and interviews with more than 400 executives, Graham et al. (2005) suggest that managers prefer to take economic actions (e.g. decreasing discretionary expenditure or capital investment) rather than using accounting choices (e.g. discretionary accruals) to manipulate earnings.

Roychowdhury (2006) develops a more comprehensive method to measure earnings management through sales manipulation, overproduction and discretionary expenditure. Using this method, Cohen et al. (2008) and Cohen and Zarowin (2010) suggest that their empirical results are consistent with Graham et al. (2005), which indicates that manipulation through real activities is even more common than that through accounting techniques.

2.5 GAME THEORY

In the theoretical literature on earnings management, researchers establish models to explain why managers engage in earnings management. Most of these models are built according to game theory, which focuses on the interest conflicts among players. This section introduces the theoretical framework for game theory and discusses how earnings management and corporate reputation interact under this framework.

In a game with information asymmetry, a player's type (payoff) is unknown and his potential action is unpredictable to others. When this game is repeated several times, other players can perceive this player's type based on his previous actions, estimate the probability of his possible actions, and respond accordingly. The other players' perceptions of this player's type shape this player's reputation among other players. Considering the impact of reputation on the reactions of others, this player may take action to influence others' perceptions of his true type to receive higher payoffs. For example, if there are two types of player - A and B, this player receives higher payoffs when the others believe that he is type A than when they believe he is type B. If the game is repeated several times and the player is patient, he will act as if he is type A even if his actual type is B, in order to make others believe his type is A, so that he gets higher payoffs. In other words, he attempts to establish a reputation for being type A. Therefore, all players' actions appear to be affected by this consideration of reputation, which is referred to as "reputation effect" (Kreps et al., 1982; Kreps and Wilson, 1982).

Since Kreps and Wilson's (1982) seminal paper on reputation in repeated games, economists have shown great interest in using economic theory to explain reputation. Kreps (1990) first interprets how reputation can become a tradable asset using a repeated game model. He assumes that there are unforeseen contingencies in various transactions, and argues that the agent can earn reputation rents only if he acquires good reputation from his predecessor; and can sell his own 'good name' only if he honours others' trust. The agent is motivated to honour others' trust, as the costs of losing reputation exceed the benefits of maintaining reputation. Even the short-lived agent in this model does not act myopically. Although Kreps admits that his theory is problematic due to multiple equilibria, he provides new insight in business study through the penetration of game-theory tools.

Put simply, co-operation between players in a game can add value and transform a zero-sum game into a positive-sum game. In order to maximise the total utility over the length of the game, players must be able to predict the other players' actions. One solution to predict the target player's behaviour is reputation (Weigelt and Camerer, 1988). Where the target player has good reputation, other players infer that he will not defect and therefore lower the collective payoffs. A good reputation also encourages future game playing. However, if an alliance player chooses to defect for a short-term gain, his reputation for future games and co-operation will be tarnished.

Tadelis (1999) develops a model of adverse selection to expound how brand name reputation can be traded in the market under the assumption that reputation is the only asset of a firm and clients cannot observe such trading of brand name. Tadelis (2002) extends his previous model by considering moral hazard, and in a later study (Tadelis, 2003) he further develops the model by introducing overlapping generations of the agent. He summarises that reputation as an asset increases after success and decreases after failure.

Other economists show how a firm's reputation affects capital markets. Diamond (1989) demonstrates how firms acquire good reputation in the debt market by repaying their short-term loans. In his model, reputation plays a role in protecting creditors by preventing managers from not paying back. He also indicates that borrowers with good reputation enjoy lower interest rates.

The influence of reputation on players' behaviour is called "reputation effect". According to Mailath (2007, p.4), "reputation effects describe the impact upon the set of equilibria of the introduction of small amounts of incomplete information of a particular form into repeated games (and other dynamic games)."

2.6 OVERALL VIEW OF CORPORATE REPUTATION

A review of the literature on corporate reputation could help to improve our understanding of the importance of positive reputation to a firm. By reviewing relevant literature, this section discusses what corporate reputation is, why it is important to a firm and how to measure it.

2.6.1 Corporate Reputation – Definitions

The definition of corporate reputation is still a primary problem in the literature (Wartick, 2002). In the recent literature, there are 13 different definitions on corporate reputation (Walker, 2010), among which the four most widely used are introduced here. Weigelt and Camerer (1988) suggest that a corporate reputation is a set of attributes ascribed to a firm, inferred from the firm's past actions. Fombrun and Shanley (1990, p.234), within the framework of signalling theory, interpret corporate reputation as "the outcome of a competitive process in which firms signal their key characteristics to constituents to maximize their social status”. Fombrun (1996, p.72) defines corporate reputation as the “perceptual representation of a company’s past actions and future prospects that describes the firm’s overall appeal to all of its key constituents when compared with other leading rivals”. Barnett et al. (2006, p.34) base their definition on a survey of previous studies on this concept, and emphasise assessment but not awareness, whereby corporate reputation can be referred to as “observers’ collective judgments of a corporation based on assessments of the financial, social, and environmental impacts attributed to the corporation over time”.

Based on the above definitions, Walker (2010) summarises that there are five attributes to corporate reputation. First, corporate reputation is based on perceptions. Second, it is the collective perception of stakeholders. Third, the reputation is comparative. Fourth, the corporate reputation can be either positive or negative. Finally, it is temporal. Similarly, Barnett et al. (2006) define corporate reputation as "collective judgements over time", and emphasise that it is perceptional, aggregate, comparable and contemporary. In addition, since a judgement can be evaluated, this definition takes into account the assessment of corporate reputation. Therefore, Barnett et al.'s (2006) definition of corporate reputation is more precise than other definitions, and for that reason it will be employed by this paper.

2.6.2 Importance of Corporate Reputation

There are many reasons why academic researchers and managers consider corporate reputation to be vital. In terms of the literature, it is generally acknowledged that corporate reputation is an essential intangible and strategic asset (Fearnley, 1993; Hall, 1993; Fombrun, 1996; Suh and Amine, 2007). Like most assets, it is subject to risk, obsolescence, and depreciation and it can be enhanced by innovation and investment (Preston, 2004). Reputational capital includes creation of market barriers, customer retention, and strengthened competitive advantages (Schwaiger, 2004). Good reputation gives a company a competitive edge by attracting customers to the company's products and services, investors to its securities, high quality employees to its jobs, suppliers' and distributors' offer of excellent contract terms, and favourable capital access, among other benefits (Fombrun, 1996; Srivastava et al., 1997; Deephouse, 2000; Schwaiger, 2004; Rindova et al., 2005; Dowling, 2006; Suh and Amine, 2007). Therefore, companies with negative reputation may suffer in financial performance, while companies with positive reputation may boost their bottom-line.

Although many top managers agree that reputation has value as a component of intangible and long-term assets, those that are obsessed with short-term profits have essentially lost sight of their reputation by engaging in accounting deceptions. Others tend to compromise ethical and professional standards to accomplish personal or corporate goals (Shaub et al., 2005). In the process of living for today, they lose their most valuable long-term asset, that is, positive reputation.

2.6.3 Measurement of Corporate Reputation

In recent empirical studies, several measures are applied to investigate corporate reputation. Reputation rankings by professional third parties are widely used in research as a proxy for corporate reputation. Other proxies for corporate reputation include content analysis of media data, market share, winning contests, rankings by recruiters, and rankings by students.

There are four main rankings on corporate reputation in the US: the Harris Poll Reputation Quotient (hereafter RQ) by Harris Interactive; America's Most Reputable Companies (hereafter AMRC) by Forbes; America's (World's) Most Admired Companies (hereafter AMAC) by Fortune; and the RepTrak by the Reputation Institute.

The foundation of the RQ is that corporate reputation is based on stakeholders' perceptions. Harris Interactive assess stakeholders' perceptions across six dimensions: products and services, financial performance, workplace environment, social responsibility, vision and leadership and emotional appeal. This survey is based on the perceptions of members of the American general public.

Forbes publishes the AMRC ranking every April with their partner the Reputation Institute. The Reputation Institute conducts online surveys among consumers, aimed at evaluating perceptions towards the 150 largest US companies.

Consumers express their perceptions of four emotional indicators - trust, esteem, admiration and good feeling - for the companies with which they are "somewhat" or "very" familiar. Each company gets a score between 0 and 100 derived from consumers' perceptions, and this score, known as a "RepTrak Pulse", denotes an average degree of consumers' feelings for a company. The Reputation Institute considers this feeling as the reputation of a company.

Besides the RepTrak Pulse ranking, the Reputation Institute also conducts an annual RepTrak survey in 15 countries. The RepTrak is an online-based survey that collects and analyses perceptions from the general public. It employs the RepTrak Pulse indicators, and seven further dimensions of corporate reputation: product/services, innovation, workplace, governance, citizenship, leadership and performance. Although the Reputation Institute claims that their RepTrak System represents the "stakeholders' feel for a company or organisation", the system mainly focuses on the perceptions of consumers, not the whole stakeholder group.

Fortune publishes the AMAC ranking every March with their partner Hay Group. This ranking is based on a survey of about 4,000 business executives, directors and analysts. The 10 largest companies in each industry receive a score based on nine criteria: innovation, people management, use of assets, social responsibility, management quality, financial soundness, long-term investment, product quality and global competitiveness. Most empirical research on corporate reputation use this ranking as a measure of corporate reputation. Walker (2010) suggests that it is the most common reputation measure in research.

Some scholars develop their own variables to estimate corporate reputation. In his study of the automobile industry, Rao (1994) uses winning contests as a proxy for corporate reputation. When a product is awarded the first prize in an event, the organisation develops this first prize product with its definition as a winner. The reputations variable in Rao's (1994) research is the lagged natural logarithm of cumulative winners plus unity. Cable and Graham (2000) examine job seekers' perceptions on corporate reputation. They interview a sample of undergraduates from two universities to investigate the factors that the students (job seekers) take into account when assessing the firm's reputation. Deephouse and Carter (2005) analyse the difference between legitimacy and reputation with a sample of US commercial banks, using media data to capture the general public's perceptions towards a company. Fang (2005) uses market share to capture the corporate reputation for an investment bank when she examines the underwriter's role in bond issuance. Rindova et al. (2005) study organisational reputation using a sample of US business schools with full-time MBA programs. They evaluate the business school reputation by surveying recruiters.

2.7 REPUTATION EFFECT AND EARNINGS QUALITY

2.7.1 Intermediates' Reputation and Issuers' Earnings Management

When a firm goes public for the first time, its value is unknown by the investors due to information asymmetry. If the firm is undervalued, investors may discount the security and the firm's informational cost of capital may increase; if the firm is overvalued, investors may pay extra for their misunderstanding and the firm's informational cost of capital may decrease (Carter and Manaster, 1990). Intermediates such as auditors and underwriters, who stand between the issuers and investors, reduce this information asymmetry to some degree. This implies that a reputable underwriter might influence the investors' perceptions of the issuer's stock price.

According to signalling theory, when investors do not have perfect information about the issuer's true value, the quality of intermediates selected by the issuer provides this information to the market. Several earlier studies report that intermediates' reputation has a positive impact on stock performance, as their quality informs the market about the issuer's true value. In their theoretical study, Titman and Trueman (1986) suggest that a firm with favourable information about its value chooses a more prestigious auditor and underwriter than a firm with less advantageous information. Therefore, higher quality of auditor and underwriter indicates the higher value of the issuer. Empirical work by Carter and Manaster (1990) shows that stocks of initial public offering (hereafter IPO) with reputed underwriters are associated with less under-pricing in the short term and less underperformance in the long term.

However, it has been argued that underperformance after IPO is the result of pre-IPO earnings management. As underwriters can earn economic rents from reputation, their decision making is informed by reputation concern (Fang, 2005), and therefore mitigates the issuer's earnings manipulation (Chen et al., 2013). As a result, the issuers with prestigious underwriters show better post-IPO performance (Sun et al., 2010) and the issuers with less reputable underwriters exhibit higher underperformance (Chang et al., 2010).

2.7.2 Management Reputation and Earnings Quality

There is a debate over the relationship between managerial reputation and earnings quality. Given consideration of reputation, the notion of "efficient contract" suggests that CEOs with favourable reputation have less incentive to engage in earnings management that results in poor earnings quality, as they will suffer from greater loss in their own human capital, and this behaviour will also increase the firm's cost of capital. Conversely, the idea of "rent extraction" suggests that reputable CEOs are more aggressive in earnings management in order to enhance their careers; hence they may use discretion, which gives rise to worse earnings quality (Francis et al., 2008).

Francis et al. (2008) investigate the association of CEO reputation measured by media coverage with earnings quality measured by both a five-year rolling standard deviation of discretionary accruals from the Jones model and the absolute value of abnormal accruals from the performance-matched modified Jones model. They find that prestigious CEOs do manipulate earnings to alter the perceptions of labour and stock markets. Furthermore, they suggest that firms with inherent poor earnings quality always hire reputable CEOs, which may go some way towards explaining why reputable CEOs are associated with poor earnings quality.

However, Lafond (2008) criticises the work of Francis et al. (2008) with regard to how reputable CEOs make accounting decisions, and the proxy used to measure CEO reputation. Demerjian et al. (2013) employ a decile rank of managerial efficiency to approximate managerial ability, and four different methods to assess earnings quality. Consistent with the efficient contract hypothesis, they conclude that managerial ability positively affects the firm’s choices, such as mergers and acquisitions or R&D expenditures.

2.8 CORPORATE REPUTATION AND EARNINGS QUALITY

According to the definition put forward by Dechow et al. (2010, 344): “Higher quality earnings provide more information about the features of a firm’s financial performance that are relevant to a specific decision made by a specific decision-maker.” They suggest that a variety of measures are used as proxy for earnings quality, and that one such proxy, earnings management, is assumed to weaken earnings quality.

2.8.1 Corporate Reputation Impact on Earnings Management / Earnings Quality

Among the studies that investigate the impact of corporate reputation on earnings management/earnings equality, Riahi-Belkaoui (2001) uses a total accruals model and suggests that multinational firms with high reputation use income-decreasing accruals to avoid the potential political cost. Specifically, he hypothesises that managers in high reputation firms use more income-decreasing accruals compared to managers in low reputation firms. This hypothesis is based on the assumption that highly reputed firms are always highly profitable firms, which attract more public attention and face high probability of being regulated. He uses a sample of all the firms included in Forbes' 100 "Most International" American manufacturing and service firms from 1987 to 1990. Then he uses Fortune's "American Most Admired Companies" to distinguish the high-reputation firms from low-reputation firms. Similar to Jones (1991), in the first model Riahi-Belkaoui (2001) regresses total accruals on the change in sales and the total accruals balance. Then, to test reputation effect, an indicator variable is added to form the second model. This variable is assigned to 1 for the high-reputation firms and to 0 for low-reputation firms. Firm size is controlled in the second model and a time indicator is also included. In the results, the reputation variable obtains a negative sign, indicating that high reputation firms use less accruals. He infers that reputed firms use income-decreasing accruals to reduce the possible political cost. In this study, the reputation variable is regressed on total accruals directly. The discretionary accruals are not separated from the non-discretionary accruals. However, the total accruals model could lead to estimation error for discretionary accruals and is not able to measure the earnings management for firms with extreme performance (Dechow et al., 1995).

Tan (2007) investigates the impact of corporate reputation on earnings quality in the Chinese market. He measures earnings quality by persistent profitability compared to the average level of the related industry. He finds positive impact of corporate reputation on earnings quality. However, he does not find evidence that good reputation engenders superior earnings quality. Since enhancing and maintaining reputation is costly, firms with good reputation may experience short-term loss. He also suggests that reputation and firm's financial performance should be interactive, although his empirical work is on the one-way effect.

Luchs et al. (2009) argue that a firm's reputation positively associates with its earnings quality. They assume that the "America's Most Admired Companies" (AMAC) have integrity in accounting practice, and hypothesise that firms with higher reputation have higher earnings quality. In their research earnings quality is measured by the absolute discretionary accruals, and the modified Jones model is employed to detect discretionary accruals. Their sample contains the firms from the 2006 AMAC list. For each sample firm a matching firm from the same industry with closest total assets is picked from outside the AMAC list. A dummy variable is introduced to indicate the firm's reputation category. Sample firms are coded 1, while matching firms are coded 0. Luchs et al. (2009) use this dummy variable as dependent variable together with other control variables to explain the absolute discretionary accruals for the year 2005. They find that AMAC firms have lower absolute discretionary accruals on average than the non-AMAC firms. Therefore, there is a positive association between corporate reputation and earnings quality. However, the survey for AMAC 2006 is conducted from the Autumn of 2005, when the 2005 financial data for most companies had not been reported, and the list for AMAC 2006 was published in Feb/Mar 2006, after the release of most annual reports. Their findings cannot support the hypothesis that corporate reputation contributes to discretionary accruals level.

While Luchs et al. (2009) use earnings management as a proxy of earnings quality, Cao et al. (2012) investigate the impact of corporate reputation on earnings quality using an external indicator, i.e. restatements. As reputation is both time-consuming and complicated to build, and costly to rebuild when it is damaged, firms with different reputation levels may act in diverse ways when considering whether to build or protect their reputation. Hence, Cao et al. (2012) assume that reputable firms are less likely to misstate their financial statements, in order to protect their reputation from sustaining huge damage due to the greater public scrutiny. After controlling for audit fees, corporate governance and potential effects of CEO reputation, they find that firms with high reputation are less likely to restate both their audited and unaudited financial reports.

Olagbemi (2011) investigates whether corporate reputation can mitigate accounting fraud. She employs a qualitative test by surveying accounting professionals. In her research, nearly half of the accounting professionals surveyed think that accounting fraud can be prevented or reduced in reputable companies. Olagbemi argues that since accounting fraud can sully the corporate reputation, earnings and profits gained at the cost of corporate reputation are short-lived.

2.8.2 Earnings Quality Impact on Corporate Reputation

Among those studies that investigate the impact of earnings quality on corporate reputation, Karpoff and Lott (1993) argue that financial reporting fraud leads to reputational penalties. They demonstrate that firms accused of such fraud suffer from significant market-value decline, and suggest that this may be a result of reputation loss as investors adjust their expectation of cost of capital to a higher level due to their expectation of future fraud.

While Karpoff and Lott's (1993) study focuses only on the corporate reputation damage driven by the violation of GAAP, several researchers investigate the corporate reputation damage caused by poor financial quality under GAAP. For example, Riahi-Belkaoui (2001) documents a negative relationship between corporate reputation and total accruals, and concludes that corporate audience might assign lower reputation to firms with higher total accruals when considering earnings management through accruals.

Another group of studies on reputational penalties triggered by poor earnings quality focuses on the managerial reputation penalty. Earnings management may bring short-term benefits to firms and managers, but in the long-run, it seems that managers need to pay more for this behaviour.

Kaplan and Ravenscroft (2004) suggest that earnings management is costly for managers since this behaviour tends to affect their reputation for high ethics, and this in turn can restrict their future career opportunities. Similarly, Kaplan et al. (2007) interview more than 100 MBA students and suggest that managers engaging in earnings management may suffer from potential reputation loss, which has a negative impact on their career. After the trade-off between the short-term benefits and long-term impact on career, personal reputation may be a disincentive for earnings management.

Desai et al. (2006) provide evidence that managers' reputation is damaged by misstating financial reports. They investigate the management turnover and the re-hiring of displaced managers after firms' earnings restatement announcement. They find a higher management turnover rate in firms with restatement, compared to the firms of similar age, size and industry without restatement. Furthermore, more than two thirds of displaced managers are subsequently unable to get a comparable job.

2.9 HYPOTHESIS DEVELOPMENT AND RESEARCH QUESTIONS

This section investigates whether corporate reputation could affect managers' accounting choice with regard to different incentives that encourage earnings management behaviour. Earnings management incentives can be generated from considerations of capital market or political cost, among others. In the sub-sections below, each incentive is considered separately, and the impact of corporate reputation on earnings management behaviour is discussed.

2.9.1 Incentives from Capital Market

Dechow et al. (2010) note that managers' incentives to affect market valuations have an effect on firms' accounting choices. Chaney and Lewis (1995) theoretically prove that earnings management has an effect on firm value under the information asymmetry between managers and investors. In their equilibrium, the opportunistic accounting choices can influence investors' assessments of the firm stock's market value. A large body of empirical research documents earnings management behaviour when firms raise capital and beat earnings benchmarks. Friedlan (1994) argues that managers increase earnings before IPO offering to adjust investors' valuation and influence the offering prices in order to maximise wealth. Rangan (1998) and Teoh et al. (1998) also suggest that firms can be overvalued by the pre-SEO earnings manipulations. Dietrich et al. (2000) indicate that managers employ income-increasing tools before raising new debt. Bagnoli and Watts (2000) also argue that the managers' incentives for earnings management can be driven by the firm’s relative performance comparison within an industry. In a game with information asymmetry, investors and creditors compare a target firm with its competitors’ reported accounting numbers to evaluate the target firm’s relative performance when they make their funds allocation decisions. The target firm may engage in earnings management if it supposes that its rivals also use this method to enhance reported accounting numbers, and if it believes this would be beneficial. In other words, in the game of firm(s) and investors, the purpose of earnings management behaviour is to influence investors' and creditors' perceptions about the firm's value.

Studies on reputation suggest that corporate reputation affects investors’ and creditors’ perceptions towards a firm when they assess firm value and risk. Diamond (1989) shows that when a firm acquires good reputation in the debt market, the interest rate decreases and the present value of rents in the future generated from good reputation increases. In addition, Srivastava et al. (1997) document that good reputation can positively impact firm value by altering investors’ perceptions of the firm’s riskiness measured by Beta. They indicate that under the same return level, investors are willing to accept higher risk for firms with better reputation. According to Diamond (1989) and Srivastava et al. (1997), firms which already have good reputation enjoy lower interest rate from creditors and lower risk perceptions from investors.

In summary, in the capital market, a major incentive for managers' earnings management behaviour is the desire to influence the investors' and debtors' perceptions towards the firm. However, firms with good reputation could enjoy lower interest rates from creditors and lower risk perceptions from investors. Hence, firms which have already established a favourable reputation among investors and creditors have less desire to enhance accounting numbers than do those without favourable reputation. Thus, managers in reputed firms engage less in earnings management.

H1: Higher reputation firms engage less (amount) in earnings-increasing management than do lower reputation firms.

Chapter 3: *Methodology*

3.1 INTRODUCTION

This section presents the methodology used to test the hypotheses in the previous section. First, I explain and justify the sample selection and the time period of the investigation. Then, I outline the definitions and measurements of variables, model specifications, data source and data analysis procedures. Finally, I present a brief summary.

3.2 SAMPLE SELECTION AND PERIOD OF STUDY

The sample population for this study is the Fortune America's Most Admired Companies. Since the study aims to verify whether corporate reputation impacts managers' earnings management behaviour, a sample where there is a reputation proxy available is needed. Wartick (2002) implies that corporate reputation should be measured as stakeholders' perception rather than factual representation. Similarly, Walker (2010) suggests that perception-based survey is more appropriate as a measure of corporate reputation than objective measures such as market share or winning contests. Among the perception surveys worldwide, Fortune's America's Most Admired Companies (AMAC) is one of the most famous reputation rankings. It has been copied in several countries, including the UK and Germany. Because Hay Group, which conducts the AMAC survey, describes the process in detail, therefore whose perceptions this survey represents is known, while the UK survey provides only selection criteria. Moreover, the US reputation survey offers the largest sample size per year compared to surveys in other countries.

American's Most Admired Companies is an annual ranking of corporate reputation conducted by Hay Group and published by Fortune Magazine. This ranking is selected since it comprises a broader range of industries and more firms, and has a longer period of available data compared to other reputation rankings used in recent reputation literature. The designation starts with the largest US and global companies (measured by revenue). Hay Group sorts the companies by industry and selects between 10 and 15 of the largest companies from each industry. About 4,000 executives, directors, and security analysts are interviewed to rank companies in their own industry. The companies rated in the top half of each industry are categorised as the Most Admired Companies.

The initial sample from the AMAC includes 2,639 firm-year observations for the period 2006 to 2010. From this initial sample, 1,430 firm-year observations are most admired companies and the other observations are contenders. 126 firm-years are excluded because the companies could not be found in Compustat. Since the results may be affected by specific regulations and the unique characteristics of firms from regulated industries and the financial sector, 348 firm-year observations in regulated industries and 283 firm-year observations in the financial sector are excluded from the study. A further 583 firm-year observations are eliminated due to information missing from Compustat. After elimination, the final sample consists of

Table 3.1 Sample Selection and Industry Distribution

Panel A: Sample Selection

	2006	2007	2008	2009	2010	Total
Most Admired Companies	302	306	317	273	232	1430
Contenders	281	281	279	191	177	1209
Firms not Found in Compustat	-56	-37	-31	-2	0	-126
Firms in Regulated Industries (SIC 4400-5000)	-74	-79	-68	-68	-59	-348
Financial Institutions (SIC 6000-6500)	-50	-60	-66	-59	-48	-283
Financial Information Missing from Compustat (_merge==2)	-110	-130	-133	-110	-100	-583
Final Sample	**293**	**281**	**298**	**225**	**202**	**1299**

Panel B: Industry Distribution

	2006	2007	2008	2009	2010	Total
Agricultural Industries (SIC 1-7)	2	2	1	1	1	7
Mineral Industries (SIC 10-19)	17	21	19	9	7	73
Manufacturing Industries (SIC 20-39)	172	157	174	114	107	724
Transportation, Communication and Utilities (SIC 40-43)	13	11	13	11	7	55
Wholesale (SIC 50-51)	10	8	9	9	9	45
Retail (SIC 52-59)	36	37	36	39	31	179
Service (SIC 70-89)	41	43	44	41	39	208
Non-Operating Establishments (SIC 99)	2	2	2	1	1	8
Total	**293**	**281**	**298**	**225**	**202**	**1299**

1,299 firm-year observations. The sample selection procedure and the industry distribution are summarised in Table 3.1.

3.3 SOURCES OF DATA

There are two main sources of data relevant to the study, namely Compustat and Fortune Magazine. Data for reputation variables are collected from the Fortune Magazine website and all the original financial data (un-restated) are downloaded from WRDS Compustat.

3.4 LINEAR REGRESSION MODEL

The object of this research is to test the hypothetical relationship between corporate reputation and earnings management. In order to test this relationship, a linear regression model is proposed as follows:

$$EM_{it} = \beta_0 + \beta_1 Reputation_{it} + \beta_2 SIZE_{it} + \beta_3 LEVERAGE_{it} + \beta_4 ROA_{it} + \beta_5 MTB_{it} + \beta_6 AU\_D_{it} + \beta_7 Year\_dummy + \varepsilon_{it}$$

where

EM_{it} is the earnings management of firm *i* in year *t* after the reputation score is published; both accruals and real activity approaches of earnings management will be measured and tested;

$Reputation_{it}$ is the reputation score published each March for firm *i* in year *t*;

$SIZE_{it}$ is the size of firm *i* in year *t*;

$LEVERAGE_{it}$ is the leverage ratio of firm *i* in year *t*;

ROA_{it} is return on assets of firm *i* in year *t*;

MTB_{it} is market-to-book ratio of firm *i* in year *t*;

AU_D_{it} is a dummy variable for the auditor of firm *i* in year *t*;

$Year\_dummy$ is the dummy variable for year;

ε is the error term.

3.5 DEFINING AND MEASURING VARIABLES OF INTEREST

3.5.1 Reputation Variables

The independent variable in this empirical analysis is corporate reputation, measured by the Fortune list of America's (World's) Most Admired Companies.

Previous studies define corporate finance with different emphasis (Fearnley, 1993; Fombrun, 1996; Dowling, 2004; Hannington, 2004). Barnett et al. (2006) point out that it is necessary to reach a consensus on the definition of corporate reputation. They analyse and summarise the prior definitions to provide a definition with more theoretical clarity (Olagbemi, 2011). According to their definition, corporate reputation is "observers' collective judgements of the financial, social, and environmental impacts attributed to the corporation over time" (Barnett et al., 2006, p.34). They claim that this definition is comprehensive as it comprehends the "judgement" which indicates "estimation", "evaluation" or "assessment".

As noted previously, there are four main rankings on corporate reputation in the US. The Harris Interactive US Reputation Quotient (RQ) surveys members of the American general public; the Forbes America's Most Reputable Companies (AMRC) invites consumers to participate in the survey; the Reputation Institute RepTrak collects and analyses perceptions from different stakeholder groups, while Fortune's America's (World's) Most Admired Companies (AMAC) surveys executives, directors, and security analysts within each industry. When discussing how corporate reputation may impact managers' earnings management behaviour, the investors, creditors and competitors are consider as stakeholders. Therefore, this study cares more about the opinions of investors, creditors and competitors. AMAC provides a better fit for this research since it focuses on the judgement of executives, directors, and security analysts from the same industry, while the other three rankings focus on consumers' perceptions.

The AMAC list is based on a survey of about 4,000 business executives, directors and analysts. They score the 10 largest companies in the same industry on nine criteria: innovation, people management, use of assets, social responsibility, management quality, financial soundness, long-term investment, product quality and global competitiveness. Most empirical research on corporate reputation also use this ranking as a measure of corporate reputation.

3.5.2 Earnings Management Variables

Earnings management is the dependent variable in this empirical analysis. It is measured by both the discretionary accruals and the real activities.

3.5.2.1 Discretionary accruals

Discretionary accruals refer to the use of managers' own discretion in accounting choice to affect accruals level. Managers can use either upward earnings management to increase income or downward earnings management to decrease income. The absolute value of discretionary accruals measures the level of opportunistic earnings management activities and extreme reporting decisions exercised by the managers (Becker et al., 1998).

In order to estimate the discretionary accruals, the total accruals are identified first. There are two methods used to compute the total accruals: the traditional balance sheet approach (e.g. Healy, 1985; Dechow et al., 1995), and the cash flow approach (e.g. Becker et al., 1998; Subramanyam, 1996; Xie et al., 2003). Both approaches are extensively used in the prior literature. However, Hribar and Collins (2002) suggest that the cash flow approach is better than the balance sheet approach when estimating the accruals for earnings management. They claim that the balance sheet approach contains measurement error, which can lead to erroneous conclusion of the existence of earnings management when no such earnings management is detected. Following the argument of Hribar and Collins (2002), the present study employs the cash flow approach in computing the total accruals.

The discretionary accruals are estimated using a cross-sectional variation of the Jones model (1991), the modified Jones model by Dechow et al. (1995) and the performance-adjusted model by Kothari et al (2005). Following DeFond and Jiambalvo (1994), the cross-sectional version is employed as it is more specific than the time version model due to the small sample observations (Subramanyam, 1996). All data are sourced from Compustat.

In the Jones model:

$$\mathrm{TA}_{it} = \beta_0 + \beta_1\left(\frac{1}{\mathrm{Assets}_{it-1}}\right) + \beta_2\left(\frac{\Delta\mathrm{Sales}_{it}}{\mathrm{Assets}_{it-1}}\right) + \beta_3\left(\frac{\mathrm{PPE}_{it}}{\mathrm{Assets}_{it-1}}\right) + \mathrm{u}_{it}$$

where (with reference to COMPUSTAT)

TA_{it} = total accruals of firm i in year t

= (ΔData4 - ΔData1 - ΔData5 + ΔData34 - Data14) / lagged Data6

ΔSales_{it}= sales (Data12) of firm i in year t less sales in year $t-1$;

PPE_{it} = gross property, plant, and equipment (Data7) of firm i in year t;

Assets_{it-1}= total assets (Data 6) of firm i in year $t-1$.

In the modified Jones model:

$$TA_{it} = \beta_0 + \beta_1 \left(\frac{1}{Assets_{it-1}}\right) + \beta_2 \left(\frac{\Delta Sales_{it} - \Delta Rec_{it}}{Assets_{it-1}}\right) + \beta_3 \left(\frac{PPE_{it}}{Assets_{it-1}}\right) + u_{it}$$

where (with reference to COMPUSTAT)

TA_{it} = total accruals of firm i in year t

= (ΔData4 - ΔData1 - ΔData5 + ΔData34 - Data14) / lagged Data6

$\Delta Sales_{it}$= sales (Data12) of firm i in year t less sales in year $t-1$;

ΔRec_{it}= receivables (Data2) of firm i in year t less receivables in year $t-1$;

PPE_{it} = gross property, plant, and equipment (Data7) of firm i in year t;

$Assets_{it-1}$= total assets (Data 6) of firm i in year $t-1$.

In the performance-adjusted Jones model:

$$\text{TA}_{it} = \beta_0 + \beta_1 \left(\frac{1}{\text{Assets}_{it-1}}\right) + \beta_2 \left(\frac{\Delta\text{Sales}_{it}}{\text{Assets}_{it-1}}\right) + \beta_3 \left(\frac{\text{PPE}_{it}}{\text{Assets}_{it-1}}\right)$$

$$+ \beta_4 \text{ROA}_{\text{it}-1} + \text{u}_{it}$$

where (with reference to COMPUSTAT)

TA_{it} = total accruals of firm i in year t

= (ΔData4 - ΔData1 - ΔData5 + ΔData34 - Data14) / lagged Data6

ΔSales_{it}= sales (Data12) of firm i in year t less sales in year $t-1$;

PPE_{it} = gross property, plant, and equipment (Data7) of firm i in year t;

Assets_{it-1}= total assets (Data 6) of firm i in year $t-1$;

$\text{ROA}_{\text{it}-1}$= return on assets (net income divided by total assets (Data6)) of firm i in year $t-1$.

3.5.2.2 Real earnings management

Following Roychowdhury (2006), three methods are used to measure the level of real earnings management: the abnormal cash flow from operations (CFO), production costs, and discretionary expenses. Gunny (2005) and Zang (2012) demonstrate the construct validity of these methods.

(1) Sales manipulation

Managers accelerate sales from the next fiscal year into the current year and/or make extra unsustainable sales by offering “limited-time” price discounts or providing more attractive credit terms. Although such price discounts and relaxed credit terms would boost sales temporarily, the increase in sales volume tends to disappear when the prices and terms revert to what they were before. The temporarily boosted sales will increase the earnings in the current period under the assumption that the margins are positive. However, cash flow in the current period will be lowered as the sales margins decline due to price discounts, and suppliers do not offer relaxed terms (e.g., discounts) to match those the firms offer to customers.

Roychowdhury (2006) suggests that normal cash flow from operations is a linear function of sales and change in sales in the current period. He provides a cross-sectional model to estimate the normal cash flow as follows:

$$\frac{CFO_{it}}{Assets_{it-1}} = \beta_0 + \beta_1\left(\frac{1}{Assets_{it-1}}\right) + \beta_2\left(\frac{Sales_{it}}{Assets_{it-1}}\right) + \beta_3\left(\frac{\Delta Sales_{it}}{Assets_{it-1}}\right) + u_{it}$$

where

CFO_{it}=cash flow from operations (Compustat data item 308) of firm i in year t;

$Assets_{it-1}$= the lagged total asset (Compustat data item 6) of firm i;

$Sales_{it}$= the sales (Compustat data item 12) of current period for firm i;

$\Delta Sales_{it}$= the change in sales of firm i.

To capture the abnormal cash flow for each firm for every year, the model should be run for every year and industry. Then the abnormal cash flow is the actual CFO minus the estimated normal CFO using the coefficients from the industry-year model and the firm-year's variables.

(2) Overproduction to report lower cost of goods sold

Managers can also increase earnings by producing more than necessary. When managers increase production, they can lower the fixed cost per unit as the fixed overhead costs are spread over a larger number of units. If the reduction in average fixed costs is not offset by any increase in average marginal cost, the average total cost falls off. Thus, the cost of goods sold (*COGS*) declines and the reported operating margins increase. On the other hand, other production costs and inventory holding costs incurred will contribute to higher annual production costs relative to sales and lower cash flows from operations, given sales levels.

Roychowdhury (2006) defines production costs as *PROD* = *COGS* + Δ*INV*. To estimate the production cost, he first models the normal *COGS* and Δ*INV* respectively and then estimates the production cost by both industry and year:

$$\frac{\mathrm{COGS}_{\mathrm{it}}}{\mathrm{Assets}_{\mathrm{it-1}}} = \beta_0 + \beta_1\left(\frac{1}{\mathrm{Assets}_{\mathrm{it-1}}}\right) + \beta_2\left(\frac{\mathrm{Sales}_{\mathrm{it}}}{\mathrm{Assets}_{\mathrm{it-1}}}\right) + \mathrm{u}_{\mathrm{it}}$$

$$\frac{\Delta INV_{\mathrm{it}}}{\mathrm{Assets}_{\mathrm{it-1}}} = \beta_0 + \beta_1\left(\frac{1}{\mathrm{Assets}_{\mathrm{it-1}}}\right) + \beta_2\left(\frac{\Delta\mathrm{Sales}_{\mathrm{it}}}{\mathrm{Assets}_{\mathrm{it-1}}}\right) + \beta_3\left(\frac{\Delta\mathrm{Sales}_{\mathrm{it-1}}}{\mathrm{Assets}_{\mathrm{it-1}}}\right) + \mathrm{u}_{\mathrm{it}}$$

$$\frac{PROD_{\mathrm{it}}}{\mathrm{Assets}_{\mathrm{it-1}}} = \beta_0 + \beta_1\left(\frac{1}{\mathrm{Assets}_{\mathrm{it-1}}}\right) + \beta_2\left(\frac{\mathrm{Sales}_{\mathrm{it}}}{\mathrm{Assets}_{\mathrm{it-1}}}\right) + \beta_3\left(\frac{\Delta\mathrm{Sales}_{\mathrm{it}}}{\mathrm{Assets}_{\mathrm{it-1}}}\right) + \beta_4\left(\frac{\Delta\mathrm{Sales}_{\mathrm{it-1}}}{\mathrm{Assets}_{\mathrm{it-1}}}\right) + \mathrm{u}_{\mathrm{it}}$$

where

$\mathrm{COGS}_{\mathrm{it}}$=cost of goods sold (Compustat data item 44) of firm i in year t;

ΔINV_{it}= change in inventory (Compustat data item 3) of firm i in year t;

$PROD_{it}$= the sum of cost of goods sold and changes in inventory of firm i in year t.

(3) Reduction of discretionary expenditures to improve reported margins

Decreasing advertising, R&D, and SG&A expenses will increase earnings in the current period. This will also cause higher cash flows in the current period if the firms normally pay for such expenses in cash, in return for taking the risk of lower future cash flows.

Like COGS, discretionary expenses should also be a linear function of contemporaneous sales:

$$\frac{DISEXP_{it}}{Assets_{it-1}} = \beta_0 + \beta_1\left(\frac{1}{Assets_{it-1}}\right) + \beta_2\left(\frac{Sales_{it-1}}{Assets_{it-1}}\right) + u_{it}$$

But if managers manipulate sales upward to increase earnings, the residuals of the above regression will be unusually low, even if they do not reduce discretionary expenses. Therefore, Roychowdhury (2006) expresses the discretionary expenses as a function of lagged sales and runs the following regression by both industry and year:

$$\frac{DISEXP_{it}}{Assets_{it-1}} = \beta_0 + \beta_1\left(\frac{1}{Assets_{it-1}}\right) + \beta_2\left(\frac{Sales_{it}}{Assets_{it-1}}\right) + u_{it}$$

where

$DISEXP_{it}$=the sum of R&D expense (Compustat data item 46), Advertising expense (Compustat data item 45) and Selling, General and Administrative expenses (Compustat data item 189)[1].

[1] As long as General and Administrative expenses are available, if R&D and Advertising expenses are missing they are set to zero.

3.6 MODEL SPECIFICATION AND RELATED CONTROL VARIABLES

Another concern of managers of large firms with regard to manipulating earnings is the political cost. Larger firms tend to lower reported earnings by choosing accounting methods to gain benefits from the perspective of political and regulatory considerations (Watts and Zimmerman, 1978). For that reason, the larger the firm, the more likely it is that the managers will diminish reported earnings. Zimmerman (1983) studies the hypothesis that larger firms are more politically sensitive than smaller firms and finds that larger firms have large capital transfer due to political cost. Wong (1988) documents that larger firms prefer credit sales to benefit from low tax rate. Jones (1991) suggests that managers tend to lower accruals during years of import relief investigation compared to other years. Several studies on political cost and earnings management obtain similar results (Cahan, 1992; Cahan et al., 1997; Han and Shiing-Wu, 1998; Monem, 2003; Patten and Trompeter, 2003). In our study, firm size (SIZE) is controlled by natural logarithm of total assets (Compustat data item 6).

Debt contracts hypothesis suggests that firms which breach or tend to breach covenant in debt contracts have motivation to adjust earnings to diminish or avoid the constraints of debt covenant contracts (Watts and Zimmerman, 1986). DeFond and Jiambalvo (1994), Sweeney (1994), Dichev and Skinner (2002) and Beatty and Weber (2003) find a positive relationship between earnings management and firm leverage or debt defaults. Jelinek (2007) finds that both the changes and the levels of leverage affect earnings management, which gives support to the debt covenant hypothesis that growth in leverage associates with reduction in earnings management. However, Healy and Palepu (1990), DeAngelo et al. (1994), and Dechow et al. (2008) find no evidence of a relationship between leverage or debt defaults and earnings manipulation. Dechow et al. (1996) indicate that debt default is associated with earnings management only when corporate governance is weak. In my study, leverage (LEV) is calculated as long-term debt scaled by total assets ((Compustat data item 9 + Compustat data item 34) / Compustat data item 6).

Based on the recent literature discussing earnings management, return on assets and market-to-book ratio are also included to control for profitability and growth. Return on assets (ROA) is measured by net income divided by total assets (Compustat data item 172 / Compustat data item 6). Market-to-book ratio (MTB) is calculated as the common share outstanding times the closing price of the fiscal year scaled by booked equity ((Compustat data item 25 * item 199) / Compustat data item 60). Both auditor and year indicators will also be included to control the auditor and year effect. Auditor indicator (AU_D) is coded 1 if the firm is audited by a Big 6 auditor firm, or 0 otherwise.

Chapter 4: *Findings and Discussion*

4.1 INTRODUCTION

This chapter analyses the descriptive statistics, the correlation matrix and the regression results for reputation effect on earnings management with regard to both discretionary accruals and real manipulation. Additional diagnostic tests are also performed in this chapter.

4.2 DESCRIPTIVE STATISTICS

Table 4.1 gives the descriptive statistics of different measures of dependent variable, independent variable and control variables. The measures of earnings management are the discretionary accruals methods of JONES, MJONES, and PJONES; and the real earnings management methods of R_CFO, R_PROD, R_DISEXP, and REM. The independent variable reputation is REP and the control variables include SIZE, LEV, ROA, MTB, and AU_D. The table of descriptive statistics contains the sample mean, median, standard deviation, minimum, maximum, skewness, kurtosis, first quartile and third quartile of the variables stated above. The important descriptive statistics are highlighted below.

The mean (median) of discretionary accruals measured by the Jones model is \$0.0078 million (\$-0.0008 million) for the full sample, \$0.0107 million (\$0.0007 million) for the admired companies and \$0.0041 million (\$-0.0033) for the contenders. When estimated by the Jones model the admired firms have higher average discretionary accruals. The same is true when discretionary accruals are measured by the modified Jones model. As measured by both the Jones model and the modified Jones model, until the 75th percentile the contenders have higher discretionary accruals than the admired firms. In contrast, the performance-adjusted Jones model shows that contenders generally exercise more discretionary accruals than the admired firms in the mean, median and 75th percentile.

Admired companies have an average reputation score of 6.8100, while the contenders' average reputation score is 5.3716. The average score of admired firms is 26.78% higher than that for the contender firms. With regard to the firm size measured by firm's market value, admired companies are larger in size compared to the contenders. The average size for the admired firms is 9.4217, which is 15.06% higher than the contender firms' average size of 8.1885. For the leverage situation, admired companies have an average leverage ratio of 0.2499, 11.92% lower than that of contender firms. In addition, admired companies maintain higher return on assets and higher market-to-book ratio compared to the contenders. The return on assets is 0.0666 for admired companies, more than twice that of contender companies. The market-to-book ratio is 3.3777 for admired companies, 76.74% higher than that for the contenders. Finally, most of these admired firms and contenders are audited by the Big 6 audit firms, with percentages of 99.72% and 98.43% respectively.

Table 4.1 Descriptive Statistics

Panel A: The Full Sample N=1299

Variable	Mean	SD	Min	25%	Median	75%	Max	Skewness	Kurtosis
JONES	0.0078	0.1157	-0.3869	-0.0392	-0.0008	0.0450	0.4440	0.5521	6.7700
MJONES	0.0072	0.1114	-0.3795	-0.0380	-0.0019	0.0416	0.4422	0.5103	6.9762
PJONES	-0.0075	0.1030	-0.3170	-0.0538	-0.0114	0.0268	0.4387	0.8694	7.6858
R_CFO	0.0555	0.1141	-0.2120	-0.0094	0.0410	0.1007	0.5748	1.5040	8.0767
R_PROD	-0.0121	0.2131	-0.5506	-0.1400	-0.0304	0.0870	0.7492	0.7538	4.7162
R_DISX	-0.0252	0.2972	-0.8047	-0.1875	-0.0554	0.1004	1.2030	1.0577	6.5938
REM	1.4041	2.0158	0.0610	0.5712	0.8687	1.3750	12.5048	4.2870	22.1559
REP	6.1755	0.9970	3.5800	5.4700	6.2100	6.8800	8.2300	-0.2099	2.6390
SIZE	8.8777	1.6314	4.2600	7.8013	8.9424	10.0358	12.1910	-0.2686	2.9451
LEV	0.2648	0.1610	0.0020	0.1480	0.2440	0.3573	0.7496	0.6668	3.2025
ROA	0.0506	0.0766	-0.2926	0.0260	0.0562	0.0920	0.2071	-1.5984	8.2247
MTB	2.7308	4.2191	-23.2088	1.4086	2.2537	3.7128	18.4747	-1.6803	20.3893
AU_D	0.9915	0.0917	0.0000	1.0000	1.0000	1.0000	1.0000	-10.7284	116.0994

Panel B: The Admired Companies N=726

Variable	Mean	SD	Min	25%	Median	75%	Max	Skewness	Kurtosis
JONES	0.0107	0.1111	-0.3869	-0.0343	0.0007	0.0388	0.4440	0.9007	7.9173
MJONES	0.0112	0.1109	-0.3795	-0.0318	-0.0002	0.0399	0.4422	0.6906	7.7446
PJONES	-0.0093	0.0998	-0.3170	-0.0522	-0.0128	0.0214	0.4387	1.1506	8.9280
R_CFO	0.0627	0.1132	-0.2120	-0.0003	0.0517	0.1092	0.5748	1.5536	8.7152
R_PROD	-0.0386	0.2077	-0.5506	-0.1628	-0.0472	0.0598	0.7492	0.6398	4.7939
R_DISX	-0.0303	0.2910	-0.8047	-0.1901	-0.0635	0.1062	1.2030	0.9317	6.1262
REM	1.3464	1.9641	0.0610	0.5631	0.8410	1.2157	12.5048	4.4223	23.4871
REP	6.8100	0.6799	4.4500	6.3500	6.7900	7.2800	8.2300	-0.0420	2.7703
SIZE	9.4217	1.4484	4.2600	8.4081	9.5531	10.4449	12.1910	-0.2649	2.9247
LEV	0.2499	0.1470	0.0020	0.1424	0.2402	0.3418	0.7496	0.4913	3.0188
ROA	0.0666	0.0642	-0.2926	0.0396	0.0660	0.0998	0.2071	-1.4387	9.5823
MTB	3.3777	3.6349	-23.2088	1.7444	2.7368	4.2532	18.4747	-0.5244	21.8982
AU_D	0.9972	0.0525	0.0000	1.0000	1.0000	1.0000	1.0000	-18.9737	361.0028

Panel C: The Contenders N=573

Variable	Mean	SD	Min	25%	Median	75%	Max	Skewness	Kurtosis
JONES	0.0041	0.1213	-0.3869	-0.0456	-0.0033	0.0536	0.4440	0.2259	5.6036
MJONES	0.0020	0.1120	-0.3795	-0.0473	-0.0042	0.0444	0.4422	0.2933	5.9958
PJONES	-0.0052	0.1070	-0.3170	-0.0547	-0.0102	0.0371	0.4387	0.5696	6.4589
R_CFO	0.0463	0.1147	-0.2120	-0.0175	0.0280	0.0894	0.5748	1.4753	7.4150
R_PROD	0.0215	0.2153	-0.5506	-0.1132	-0.0123	0.1157	0.7492	0.8976	4.5615
R_DISX	-0.0187	0.3051	-0.8047	-0.1842	-0.0478	0.0854	1.2030	1.1900	7.0283
REM	1.4772	2.0788	0.0610	0.5912	0.9111	1.5224	12.5048	4.1342	20.6921
REP	5.3716	0.7151	3.5800	4.9200	5.4300	5.8900	6.9400	-0.3850	2.7994
SIZE	8.1885	1.5903	4.2600	7.2024	8.2308	9.1968	12.1910	-0.1522	3.0189
LEV	0.2837	0.1754	0.0020	0.1549	0.2539	0.3903	0.7496	0.7067	2.9822
ROA	0.0302	0.0858	-0.2926	0.0060	0.0418	0.0731	0.2071	-1.5043	6.7376
MTB	1.9111	4.7374	-23.2088	1.0459	1.7873	2.9286	18.4747	-2.1789	17.9019
AU_D	0.9843	0.1244	0.0000	1.0000	1.0000	1.0000	1.0000	-7.7899	61.6826

Table 4.2 Correlation Matrix

	JONES	MJONES	PJONES	R_CFO	R_PROD	R_DISX	REM	REP	SIZE	LEV	ROA	MTB	AU_D
JONES	1												
MJONES	0.947	1											
PJONES	0.7399	0.7084	1										
R_CFO	0.2093	0.1635	0.0394	1									
R_PROD	-0.0385	-0.0186	-0.0229	-0.3487	1								
R_DISX	-0.0335	-0.005	-0.0859	-0.177	0.7115	1							
REM	0.1323	0.076	0.0905	0.4011	0.0668	0.0161	1						
REP	0.0122	0.0207	-0.0502	0.1274	-0.1726	-0.0052	-0.0411	1					
SIZE	0.0546	0.0486	0.0075	0.3224	-0.309	-0.1018	0.0799	0.5149	1				
LEV	-0.0726	-0.0823	-0.0028	-0.1597	-0.1096	-0.1293	-0.1239	-0.1807	-0.2925	1			
ROA	0.3191	0.3345	0.2302	0.3188	-0.2593	-0.0746	0.0695	0.3378	0.4982	-0.303	1		
MTB	0.0566	0.0505	-0.0054	0.1595	-0.1733	-0.0824	0.0649	0.2129	0.2546	-0.0727	0.3066	1	
AU_D	0.0376	0.0438	0.0052	0.0258	0.0116	0.0298	0.0267	0.0827	0.0962	0.0077	0.0573	-0.0038	1

4.3 Correlation Matrix

Table 4.2 presents the correlation matrix for all the variables. The high correlations among the discretionary accruals estimated by the Jones model, modified Jones model and performance-adjusted Jones model are expected, since they all use similar methods to approximate discretionary accruals. However, the high correlation between overproduction and reduction in discretionary expenditures is unexpected.

Reputation score is positively correlated with the discretionary accruals measured by the Jones model and modified Jones model but negatively correlated with discretionary accruals in the performance-adjusted Jones model. The sales manipulation is positively correlated to corporate reputation, while both overproduction and reduction in discretionary expenditures are negatively correlated with reputation score.

Considering the control variables, reputation is negatively correlated with firm's leverage level and positively correlated with the firm's size, return on assets and market-to-book ratio.

4.4 Analysis I: Discretionary Accruals

4.4.1 Multivariate Regression

Table 4.3 demonstrates the results for the reputation effects on earnings management for three different measures of discretionary accruals. The F-statistics for all models are significant at $p<0.001$, indicating that these models are statistically valid. The adjusted R-squared for the Jones, modified Jones and performance-adjusted Jones models are 13.02%, 14.35% and 9.22% respectively.

As expected, the REP is significantly and negatively related to the discretionary accruals for all models. Reputation has a significant negative impact on discretionary accruals at 5% level for the Jones model and modified Jones model and at 1% level for the performance-matched Jones model. This suggests that with a decrease in reputation score, the managers are more likely to manage discretionary accruals upward. This result is consistent with our hypothesis that the managers in firms with lower reputation use increasing discretionary accruals more. One of the main purposes of earnings management is to mislead stakeholders about a firm's financial status. Graham and Dodd (2008) suggest that investors normally make their investment decision upon reputation. When the firm does not have a favourable reputation among investors, the manager has an incentive to adjust the investors' perceptions by increasing earnings. Another explanation might be the reputation concern for reputable firms. Cao et al. (2012) suggest that reputable firms experience more severe public scrutiny and may wish to maintain higher earnings quality to protect their reputation. Due to higher public scrutiny, reputable firms experience a higher probability of being caught out in earnings management. Once a firm is found to be misleading stakeholders, the reputation will be damaged, and it will be difficult and costly to rebuild. Considering the time and monetary cost of reputation rebuilding, managers may be motivated to use less discretionary accruals. That is, good reputation helps to mitigate the level of discretionary accruals.

Firm size has significant negative relations with discretionary accruals across all models at 1%, 0.1% and 5% levels respectively. This means that managers in smaller firms use more increasing discretionary accruals than managers in larger firms. This is consistent with the political cost hypothesis, which suggests that larger firms are more politically sensitive and managers in larger firms tend to decrease discretionary accruals (Watts and Zimmerman, 1986).

Prior literature suggests that firms with higher leverage ratio may use increasing discretionary accruals to avoid breaking debt covenants. However, I find significant impact only when the discretionary accruals are measured by the performance-matched Jones model. The impact is insignificant when the discretionary accruals are measured by the Jones model and there is no impact when measured by the modified Jones model.

Return on assets has significant positive associations with discretionary accruals at 0.1% level. This significant impact appears in all three measures of discretionary accruals, including the performance-matched Jones model in which ROA has already been controlled. Bowen et al. (2008) explain this positive association as an expectation of future performance rather than opportunism.

This study does not find evidence that specialist auditors mitigate the discretionary accruals more than non-specialist auditors. Krishnan (2003) finds that firms audited by Big 6 auditors report lower absolute discretionary accruals than the firms audited by non-specialist auditors. He suggests that Big 6 auditors help diminish discretionary accruals and therefore influence the earnings quality. Auditor is used as a dummy variable to test whether the Big 6 auditors help to reduce discretionary accruals. However, the result is not significant, regardless of whether testing the impact on discretionary accruals or absolute discretionary accruals.

Note that there is a significant difference in discretionary accruals between year 2010 and the other years.

Table 4.3 The Results of Multivariate Regression for Discretionary Accruals Models

$$DA = \alpha_0 + \beta_1 REP + \beta_2 SIZE + \beta_3 LEV + \beta_4 ROA + \beta_5 MTB + \beta_6 AU_D + YEAR\_DUMMY$$

Variable	Jones	mJones	pJones
	(1)	(2)	(3)
Reputation	-0.009	-0.007	-0.010
	[0.016]**	[0.038]**	[0.002]***
Size	-0.007	-0.008	-0.005
	[0.003]***	[0.000]***	[0.000]
Leverage	0.006	0.000	0.038
	[0.757]	[0.993]	[0.164]
ROA	0.598	0.612	0.445
	[0.000]***	[0.000]***	[0.000]***
MTB	-0.001	-0.001	-0.002
	[0.315]	[0.181]	[0.064]*
AU_D	0.039	0.046	0.001
	[0.233]	[0.148]	[0.976]
2007	0.007	0.002	0.017
	[0.429]	[0.853]	[0.096]*
2008	-0.016	-0.015	-0.015
	[0.086]*	[0.091]*	[0.685]
2009	-0.014	-0.015	-0.006
	[0.153]	[0.093]*	[0.063]*
2010	-0.038	-0.039	-0.021
	[0.000]***	[0.000]***	[0.003]***
CONS	0.066	0.064	0.075
	[0.089]*	[0.083]*	[0.317]
N	1299	1299	1299
F	20.43	22.74	14.18
Prob F	[0.000]***	[0.000]***	[0.000]***
R-squared	13.69%	15.01%	9.92%
Adj R-squared	13.02%	14.35%	9.22%

4.4.2 The Diagnostic Tests and Additional Analyses

This section diagnoses the regression specification by testing the results obtained in the primary analysis. The purpose of additional analyses is to provide reasonable assurance that the main findings are robust to the specifications of various models.

4.4.2.1 Heteroscedasticity and multicollinearity tests

In OLS estimation, the variance of the errors is assumed to be constant. When the variance of errors is constant, the errors are homoscedastic, otherwise they are heteroscedastic. If OLS is used in the presence of heteroscedasticity, the OLS estimators will still be unbiased, but they will be inefficient, since there exist other unbiased estimators with smaller variances.

Table 4.4 Heteroscedasticity Test

Breusch-Pagan / Cook-Weisberg test for heteroscedasticity
Ho: Constant variance
Variables: fitted values of JONES, MJONES, PJONES

	JONES	MJONES	PJONES
chi2(1)	22.10	23.98	43.77
Prob > chi2	0.00	0.00	0.00

Table 4.4 presents the results of the heteroscedasticity tests based on different dependent variables. According to the Breusch-Pagan / Cook-Weisberg test, all models have a significant p-value, indicating the presence of heteroscedasticity. To cure heteroscedasticity, robust regression is applied to each dependent variable. White (1980) suggests that the standard errors obtained from

robust regression are asymptotically valid. This method does not need additional information and it can be applied to any situation. Simple at the expense of efficiency, it is the most widely used method to correct heteroscedasticity in empirical research. It obtains the same results as OLS but with different errors.

Table 4.5 presents the robust regression results of reputation effects on earnings management for three different measures of discretionary accruals.

Table 4.5 The Results of Robust Regression for Discretionary Accruals Models

$$DA = \alpha_0 + \beta_1 REP + \beta_2 SIZE + \beta_3 LEV + \beta_4 ROA + \beta_5 MTB + \beta_6 AU_D + YEAR\_DUMMY$$

Variable	Jones (1)	mJones (2)	pJones (3)
Reputation	-0.009	-0.007	-0.010
	[0.009]***	[0.022]**	[0.001]***
Size	-0.007	-0.008	-0.005
	[0.004]***	[0.000]***	[0.035]**
Leverage	0.006	0.000	0.038
	[0.750]	[0.993]	[0.040]**
ROA	0.598	0.612	0.445
	[0.000]***	[0.000]***	[0.000]***
MTB	-0.001	-0.001	-0.002
	[0.415]	[0.291]	[0.080]*
AU_D	0.039	0.046	0.001
	[0.057]*	[0.034]**	[0.943]
2007	0.007	0.002	0.017
	[0.490]	[0.868]	[0.081]*
2008	-0.016	-0.015	-0.015
	[0.076]*	[0.083]*	[0.053]*
2009	-0.014	-0.015	-0.006
	[0.103]	[0.077]*	[0.446]
2010	-0.038	-0.039	-0.021
	[0.000]***	[0.000]***	[0.005]***
CONS	0.066	0.064	0.075
	[0.028]**	[0.033]***	[0.009]***
N	1299	1299	1299
F	15.59	17.85	9.15
Prob F	[0.000]***	[0.000]***	[0.000]***
R-squared	13.69%	15.01%	9.92%

Another concern in OLS regression is multicollinearity. Multicollinearity happens when two or more independent variables are highly correlated. It does not shrink the predictive power and reliability of the model as a whole, but it affects individual predictors. In this research, multicollinearity is tested by variance inflation factor (VIF). Table 4.6 presents the result of multicollinearity test. The VIF values for all variables are between 1 and 2, which indicates that there is no problem of multicollinearity.

Table 4.6 Multicollinearity Test

Variable	VIF	1/VIF
Reputation	1.46	0.685196
Size	1.71	0.583324
Leverage	1.15	0.869738
ROA	1.48	0.67545
MTB	1.14	0.876255
AU_D	1.02	0.984567
fyear		
2007	1.54	0.648137
2008	1.63	0.613121
2009	1.49	0.671485
2010	1.45	0.688582
Mean VIF	1.41	

4.4.2.2 Endogeneity test

Another assumption under OLS is exogeneity. That is, the independent variable is uncorrelated with the error term in the regression. If the problem of endogeneity occurs, the OLS estimation is biased. Sims (1972) points out that a necessary condition for X to be exogenous of Y is that X fails to Granger-cause Y. Table 4.7 shows the results of Granger-causality test. The H0 is rejected for all three discretionary models. That is, reputation is exogenous of discretionary accruals.

Table 4.7 Granger-causality Test for Reputation

Discretionary Accruals	JONES	MJONES	PJONES
F(2, 566) =	0.1	0.01	0.36
Prob > F =	0.9053	0.9933	0.6975

4.5 Analysis II: Real Earnings Management

4.5.1 Multivariate Regression

Table 4.8 presents the results for the reputation effects on earnings management for real earnings management. The F-statistics for all models are significant at p<0.001, suggesting that these models are statistically valid. The adjusted R-squared for the R_CFO, R_PROD, R_DISEXP, and REM models are 15.4%, 17.3%, 4.5% and 6.4% respectively.

The signs of the reputation impact on real earnings management are mixed. Reputation has significant negative impact on sales manipulation at 1% level. The negative sign on sales manipulation suggests that less reputable firms have a greater tendency to speed up sales by accelerating the timing of sales and/or providing more price discounts or more favourable credit terms to customers. Reputation has a significant positive impact on the discretion in expenses at 5% level. The positive sign on abnormal discretionary expenses indicates that less reputable firms have lower abnormal discretionary accruals. One explanation is that less reputable firms reduce discretionary expenses more in order to increase earnings. Both impacts are consistent with our hypothesis that less reputable firms have more incentives to increase reported earnings. However, there is no evidence that less reputable firms are likely to lower production cost by overproduction.

Firm size has significant positive impact on abnormal cash flow and significant negative impact on abnormal production cost and abnormal discretionary expenditures. That is, larger firms are likely to improve cash flow by accelerating sales, reducing production cost by overproduction and reducing discretionary expenditures.

Leverage has significant negative associations with abnormal discretionary expenses. That is, firms with higher leverage ratio tend to reduce discretionary expenditures more in order to increase earnings. This is consistent with the findings in prior research that high leveraged firms have an incentive to increase earnings to avoid breaking debt covenants.

Return on assets has significant positive impact on abnormal discretionary expenditures, indicating that less profitable firms reduce discretionary expenditures to boost earnings.

Table 4.8 The Results of Multivariate Regression for Real Earnings Management Models

$$REM = \alpha_0 + \beta_1 REP + \beta_2 SIZE + \beta_3 LEV + \beta_4 ROA + \beta_5 MTB + \beta_6 AU\_D + YEAR\_DUMMY$$

Variable	REM_CFO	REM_PROD	REM_DISEXP
	(1)	(2)	(3)
Reputation	-0.011	0.002	0.022
	[0.002]***	[0.769]	[0.022]**
Size	0.018	-0.038	-0.028
	[0.000]***	[0.000]***	[0.000]***
Leverage	-0.027	-0.324	-0.334
	[0.164]	[0.000]***	[0.000]***
ROA	0.288	-0.520	-0.259
	[0.000]***	[0.000]***	[0.043]**
MTB	0.001	-0.004	-0.004
	[0.064]*	[0.008]***	[0.063]**
AU_D	-0.001	0.121	0.142
	[0.976]	[0.040]**	[0.108]
2007	0.015	0.009	-0.027
	[0.096]*	[0.568]	[0.264]
2008	-0.004	-0.039	-0.038
	[0.685]	[0.017]**	[0.123]
2009	-0.017	-0.017	0.010
	[0.063]*	[0.322]	[0.706]
2010	-0.029	-0.008	-0.015
	[0.003]***	[0.648]	[0.572]
CONS	-0.038	0.324	0.073
	[0.317]	[0.000]***	[0.488]
N	1299	1299	1299
F	24.64	28.07	7.15
Prob F	[0.000]***	[0.000]***	[0.000]***
R-squared	16.06%	17.89%	5.26%
Adj R-squared	15.41%	17.25%	4.52%

4.5.2 The Additional Analyses and Robustness Tests

4.5.2.1 Heteroscedasticity and multicollinearity tests

Table 4.9 presents the results of the heteroscedasticity tests based on different dependent variables. According the Breusch-Pagan / Cook-Weisberg test, all models have a significant p-value, indicating the presence of heteroscedasticity. To cure heteroscedasticity, robust regression is applied to each dependent variable. As stated above in section 4.4.2.1, White (1980) suggests that the standard errors obtained from robust regression are asymptotically valid. This method does not need additional information and it can be applied to any situation. Simple at the expense of efficiency, it is the most widely used method to correct heteroscedasticity in empirical research. It obtains the same results as OLS but with different errors.

Table 4.9 Heteroscedasticity Test

Breusch-Pagan / Cook-Weisberg test for heteroscedasticity
Ho: Constant variance
Variables: fitted values of R_CFO, R_PROD, R_DISX

	R_CFO	R_PROD	R_DISX
chi2(1)	70.27	56.69	69.30
Prob > chi2	0.00	0.00	0.00

Table 4.10 presents the robust regression results of reputation effects on earnings management for three different measures of real earnings management.

Table 4.10 The Results of Multivariate Regression for Real Earnings Management Models

$$REM = \alpha_0 + \beta_1 REP + \beta_2 SIZE + \beta_3 LEV + \beta_4 ROA + \beta_5 MTB + \beta_6 AU\_D + YEAR\_DUMMY$$

Variable	REM_CFO (1)	REM_PROD (2)	REM_DISEXP (3)
Reputation	-0.011	0.002	0.022
	[0.001]***	[0.764]	[0.019]**
Size	0.018	-0.038	-0.028
	[0.000]***	[0.000]***	[0.000]***
Leverage	-0.027	-0.324	-0.334
	[0.190]	[0.000]***	[0.000]***
ROA	0.288	-0.520	-0.259
	[0.000]***	[0.000]***	[0.030]**
MTB	0.001	-0.004	-0.004
	[0.173]	[0.011]**	[0.026]**
AU_D	-0.001	0.121	0.142
	[0.971]	[0.000]***	[0.065]*
2007	0.015	0.009	-0.027
	[0.172]	[0.599]	[0.305]
2008	-0.004	-0.039	-0.038
	[0.663]	[0.011]**	[0.105]
2009	-0.017	-0.017	0.010
	[0.032]**	[0.283]	[0.689]
2010	-0.029	-0.008	-0.015
	[0.003]***	[0.656]	[0.562]
CONS	-0.038	0.324	0.073
	[0.293]	[0.000]***	[0.453]
N	1299	1299	1299
F	24.98	22.57	6.64
Prob F	[0.000]***	[0.000]***	[0.000]***
R-squared	16.06%	17.89%	5.26%

Another concern in OLS regression is multicollinearity. Multicollinearity happens when two or more independent variables are highly correlated. It does not shrink the predictive power and reliability of the model as a whole, but it affects individual predictors. In this research, multicollinearity is tested by variance inflation factor (VIF). Since the independent variables remain the same as in multivariate regressions for discretionary accruals, the test is the same and Table 4.6 presents the result. The VIF values for all variables are between 1 and 2, which indicates that there is no problem of multicollinearity.

4.5.2.2 Endogeneity test

Another assumption under OLS is exogeneity. That is, the independent variable is uncorrelated with the error term in the regression. If the problem of endogeneity occurs, the OLS estimation is biased. Sims (1972) points out that a necessary condition for X to be exogenous of Y is that X fails to Granger-cause Y. Table 4.11 shows the results of Granger-causality test. The H0 is rejected for all three real earnings management models. That is, reputation is exogenous of discretionary accruals.

Table 4.11 Granger-causality Test for Reputation

Real Earnings Management	R_CFO	R_PROD	R_DISX
F(2, 566) =	1.2	3.61	1.8
Prob > F =	0.3026	0.0275	0.1667

4.6 SUMMARY

The main purpose of this research is to provide empirical evidence regarding the implications of corporate reputation on earnings management. This study differentiates itself from previous research on corporate reputation and earnings management and provides two main contributions to the existing literature. First, this research examines whether corporate reputation impacts managers' earnings management behaviour.

It is argued in this chapter that the managers in firms with worse reputation manage earnings upwards more than do managers in firms with better reputation. One of the main incentives of earnings management is to mislead stakeholders, especially investors. Investors make investment decisions based upon firms' reputation and reported earnings (Graham and Dodd, 2008). Therefore, firms with worse reputation may have stronger incentives to inflate earnings. Table 4.3 shows that firms with worse reputation do make greater use of increasing accruals than do more reputable firms. This result is robust with three different measures of discretionary accruals.

Second, this research empirically examines earnings management according to both discretionary accruals and real activities approaches. According to Healy and Wahlen (1999), there are two approaches for managers to manage earnings: through accounting choice and through structuring real transactions. Recent research provide evidence that firms engage in earnings management through real activities (Graham et al., 2005; Roychowdhury, 2006 and Zang, 2012), and evidence that firms choose between the two approaches (Cohen et al., 2008; Cohen and Zarowin, 2010 and Badertscher, 2011). Current research on corporate reputation and earnings management focuses only on the earnings management through discretionary accruals. From Table 4.8, it can be inferred that less reputable firms do manipulate sales and discretionary expenditures to increase earnings, while they also use discretionary accruals.

Chapter 5: Game Models

5.1 INTRODUCTION

Game theory is a bag of analytical tools designed to help us understand the phenomena that we observe when decision-makers interact. The basic assumptions underlying the theory are that decision-makers pursue well-defined exogenous objectives (they are rational) and take into account their knowledge or expectations of other decision-makers' behaviour (they reason strategically).

In the early 19^{th} century, when the French economist Cournot analysed duopoly by studying the quantity competition between two firms, he suggested that market demand determines the price corresponding to a given level of sum total of output. Cournot’s work is considered the first application of game theory to the analysis of an economic problem, and what he computed is now called the Nash equilibrium of the game.

Later, with the wish to “find the mathematically complete principles which define `rational behaviour' for the participants in a social economy and to derive from them the general characteristics of that behaviour”, Von Neumann and Morgenstern (1944, p31) introduced two-person zero-sum games and proved that there exists an equilibrium in such games. They also described games in extensive forms and discussed the cooperation and coalition in these games.

Nash (1950a) identified the idea of an n-person finite game and an equilibrium point of such a game, where the equilibrium point is a set of strategies which contains the best strategy for each player in response to the other players' strategies. He also proved that there is at least one equilibrium point for each n-person game, by developing the two-person zero-sum game with multiple players and arbitrary payoffs. In other related papers, Nash (1950b, 1953) identified the two-person bargaining problem, delivered a cooperative theory for two-person non-zero-sum games and offered an axiomatic solution led by this theory. The particular axiomatic approach initiated by Nash is frequently used in more applied research and is still the main benchmark in this area.

By the 1960s, many economists and game theorists had realised that most economic theory was based on a fantastic assumption of symmetric/complete information. Prior to the three seminal papers by Akerlof (1970), Spence (1976) and Rothschild and Stiglitz (1976), which try to figure out the asymmetric information problem, Harsanyi and Selten had already developed most of the relative game-theoretic tools.

Before Harsanyi (1967, 1968a, 1968b), economists worked with models with either objective probability distributions describing the commonly shared view of the underlying uncertainty, or absolutely no uncertainty. That is to say, researchers rarely investigated the situations in which one agent is more informed than others. It is not implausible for economists to discover situations where one agent knows something that others do not; however, it is difficult to develop a coherent modelling device for such situations (Güth, 1994). In a sequence of three papers studying the model, the equilibrium points and the probability distribution of games with incomplete information played by "Bayesian" players, Harsanyi proposed a method to specify all layers of consistent information, for example what A knows about what B knows, and what A knows about what B knows about what A knows.

Aumann (1960) introduced the concept of an infinitely repeated game, the "supergame". Selten (1965) analysed the theory of entry deterrence, defining the sub-game perfection which indicated the weakness of the then existing views on entry deterrence and arguing that the sub-game perfect Nash equilibria are the only relevant equilibria for all dynamic games. Sub-game perfection is important for understanding credible threat and the dynamic interaction on incentives.

In recognition of the importance of the contributions of Nash, Harsanyi and Selten to non-cooperative game theory in equilibrium, asymmetric information and credibility respectively, in 1994 they were awarded the Nobel Prize in economics.

Game theory remains an active area of research. Gibbons (1997) divides games into four categories: static games with complete information, dynamic games with complete information, static games with incomplete information and dynamic games with incomplete information, and suggests that they can be solved by Nash equilibrium (Nash, 1950a), sub-game perfect Nash equilibrium (Selten, 1965), Bayesian Nash equilibrium (Harsanyi, 1967) and perfect Bayesian equilibrium

(Kreps and Wilson, 1982a) respectively. Games with incomplete information are also known as Bayesian games, and the final category, dynamic Bayesian games, has been applied widely in economics, finance, accounting, law, marketing and political science.

Kreps et al. (1982) demonstrate that in a finitely repeated prisoners' dilemma, just a small amount of appropriate private information at the beginning could contribute to cooperation in all but the last few periods. Conversely, under complete information, backward-induction suggests that as the knowledge that cooperation will break down in the last round will lead to breakdown in the penultimate round, and so on back to the first round, then, equilibrium cooperation cannot occur in any round of a finitely repeated prisoners' dilemma.

Kreps and Wilson (1982b) re-examine the finitely repeated chain store game (Selten, 1978) under imperfect information about players' payoffs, and find that imperfect information brings the reputation effect that players naturally expect.

Bagnoli and Watts (2000) model earnings management using a game theoretic approach. They suggest that firms may manage earnings first of all because they wish to obtain competitive relative performance, as the investors and creditors often compare the financial performance of competing firms when deciding their fund allocation. A second reason to manage earnings is that relative performance may influence executive compensation. The authors consider the problem of earnings management as a non-cooperative game among a group of rival firms who seek competitive advantages from their accounting numbers. They assume that asymmetric information makes the investors and creditors unable to discover earnings management; that investors and creditors make inter-firm comparisons when they evaluate the firm; and that firms care about both their fundamental value and market value. In their model, each player of a group of rival firms chooses a level of earnings management in each of a potentially infinite number of periods. There is some probability that each player will exit at some point but the final ending time is uncertain. Their results imply that firms may manipulate their earnings due to the multi-firm-comparison, as they expect other firms to do so. Therefore, very little earnings management may be needed to emerge in the Nash equilibrium, and the equilibrium amount for earnings management depends on the method of earnings management and on the components of stockholders.

Scott (2009) states that earnings management can also be motivated by implicit contracts, which arise from the repeated relationships between a firm and its stakeholders (shareholders, lenders, suppliers, customers, employees, etc.) and indicate expected actions based on their previous behaviour. For example, firms and their managers with better reputation for always meeting formal contract commitments will enjoy lower interest rates from lenders, and better terms from suppliers. They act as if such favourable contracts exist and must trust each other sufficiently to play the cooperative solution (sub-game perfect Nash equilibrium) rather than the Nash equilibrium.

According to game theory, firms can benefit from good reputation among stakeholders. It is argued that stakeholders are likely to use the reported accounting numbers to help assess the firm's reputation to fulfil the implicit contracts. Hence, managers have incentives to increase income, and the strength of this incentive depends on the intensity of the firm's need for a favourable reputation (Bowen et al., 1995).

5.2 MOTIVATION AND LITERATURE REVIEW

5.2.1 Theoretical Literature on Incentives for Earnings Management

Several theoretical papers examine the managerial incentives for earnings management from a game theory perspective. Some studies build models to reveal that explicit contract frictions can induce earnings management aimed at impacting the opinions of internal and external contract designers.

Lambert (1983, 1984)[2] analyses the connection between moral hazard and real earnings smoothing with a principle-agent setting. First, he demonstrates that in an optimal long-term incentive contract, although production function and utilities functions are separable, the manager's current compensation would depend on his current and prior performance. Further, he uses a two-period model to illustrate that the income smoothing behaviour through real transactions is an optimal equilibrium

[2] Lambert's (1983, 1984) studies are based on his PhD thesis.

behaviour with the optimal compensation plan, assuming that both the principle and the manager are rational. That is, the optimal incentive plan induces the manager's real smoothing as this is the optimal behaviour to maximise his compensation.

Dye (1988) examines the internal and external demand for earnings management using an overlapping generation model. He argues that while the principle-agent relationship between the firm's owners and the managers create incentives to manage earnings, the external demand resulting from the valuation needs of the capital market generate another such incentive.

While Lambert (1983, 1984) and Dye (1988) use principle-agent games to model earnings management incentives, Trueman and Titman (1988) explain the manager's incentive in a market setting. They describe how a manager's desire to lower borrowing cost by reducing the earnings variability makes him smooth earnings. This incentive is not to influence the outcome of existing contract, but to influence the design of future contract, which can be referred to implicit contract.

Fudenberg and Tirole (1995) demonstrate how implicit contracts affect managers' earnings management decision. They generate a model to illustrate that managers obtain "incumbency rents" from their managerial work. However, when current earnings performance is bad, they face a risk of being fired. For this reason, managers with poor current performance may "borrow" earnings from the future period by using accounting techniques and/or operating decisions. In addition, while evaluating a manager, the current earnings performance is supposed to be more informative than previous earnings. Correspondingly, tomorrow's poor performance could not be balanced by today's good performance. Therefore, managers have a desire to "save" current earnings for the future when current earnings are relatively high and expected future earnings are relatively low.

Fischer and Verrecchia (2000) investigate the manager's reporting strategy with a market setting with incomplete information. That is, they relax the assumption that the manager's reporting object is known to the market. They suggest that the manager may bias the financial reporting to influence the market's valuation of the firm and this bias reduces the value relevance of the financial report. They argue that the value relevance of the reports drops when the cost of bias decreases and the uncertainty of manager's utility increases. Moreover, they show that the manager will be better off with biased reporting when this bias cannot be perfectly adjusted by the market.

Ewert and Wagenhofer (2005) develop a model with rational expectations equilibrium and find that tighter standards help to reduce discretionary accruals. However, this advantage is offset by other after effects. For instance, real earnings management increases due to the increased managerial benefit brought by the reduced discretionary accruals. Additionally, the expected total earnings management and the expected total cost of earnings management increases with tighter standards.

Ronen and Yaari (2008) suggest that the penetration of game-theory tools provides new insights into accounting on the theoretical front.

5.2.2 Theoretical Literature on Reputation Effect from an Economic Theory Perspective

Fama (1980) makes the pioneering suggestion that managers' incentive problems can be solved by competition in the managerial labour market. He proves that implicit incentives can work as an incomplete alternative to explicit incentives under the complete market mechanism. In the long term, the managers can be motivated by the reputation effect even without the explicit incentive contract. They will work hard to enhance their reputation, hence increase their future human capital in the labour market.

Holmström (1999) studies how the agent's future career concern impacts the reputation effect, and argues that Fama's conclusion is correct only under some tight assumptions. He assumes the agent's performance depends on his effort, talent and stochastic noise, models the reputation effect on a risk-neutral agent without discounting and explicit contracts, and proves that the reputation alone cannot provide sufficient incentives to the agent. In addition, he finds that the reputation effect diminishes with increase in age and career development. According to Holmström (1999), reputation effect cannot provide enough incentives when the market is imperfect.

Meyer and Vickers (1997) analyse the dynamic effects of comparative performance information (CPI) on explicit incentives, implicit incentives and overall welfare. They develop a model of implicit rewards based on Holmström (1982). They suggest that the manager's current effort has an impact on the market's estimation of his ability, and hence may impact the future market-based rewards. Although neither the manager's current effort nor his ability can be observed directly in the future periods, the market can use the managerial output information which reflects his current effort and ability. Therefore, the manager has an incentive to increase effort in his early career as this effort may enhance future market estimates and, hence, future rewards. They also demonstrate that when there are career concerns, CPI may not be desirable.

Tadelis (2002) regards corporate reputation as a tradable asset. Under the assumptions of risk-neutral agent and no discount, he formulates a dynamic general equilibrium model considering both moral hazard and adverse selection in a repeated game.

Milbourn (2003) considers CEO reputation as a signal of his ability that is observable to shareholders. He develops an optimal CEO contract model based on the stock price and finds a positive relationship between stock-based pay-sensitivities and CEO reputation.

5.2.3 Theoretical Literature on Reputation Effect from a Cheap-Talk Game Perspective

Sobel (1985) analyses the reputation building in information provision. He uses a repeated game model to demonstrate that if an information sender (who is supposed to be imperfectly credible at the beginning) can establish a reputation for some consistent quality, then the information receiver (who is imperfectly informed) can make more accurate conclusions about the options available to them from the content of a signal whose truthfulness cannot otherwise be easily established. Once the sender delivers a message that differs from the receiver's expectation, he discloses his true type. Therefore the sender's reputation is lost for the remaining sub-games and there would be no more communications.

Benabou and Laroque (1992) extend Sobel's model by assuming the sender perceives noisy information of a binary random variable. They study a manager's effort to influence the firm's stock price by releasing strategically distorted messages. Since the sender observes a noisy signal, he is able to manipulate the stock price without revealing his type. The receiver cannot infer whether he is an honest sender who always reveals truthful information or a strategic sender who distorts private information, as the information the sender observes is noisy. Consequently, the strategic sender's credibility will not diminish and he can send information indefinitely although the information is manipulated with some positive probability.

Based on Benabou and Laroque's model, Morris (1998) examines two types of senders who distort their information strategically. He assumes that one type of sender shares the same preferences with the receiver and the other type expects the receiver to take as high an action as possible. He suggests that in an infinite repeated game, even if the sender's discount factor is close to one, telling the truth is not an equilibrium.

Kim (1996) also studies a repeated cheap-talk game. However, different from the three studies above, Kim assumes that the sender's type is not fixed. In his game, the sender's type is a random variable drawn independently in each sub-game. The sender's type can be confirmed by the receiver at some cost to both players. He finds that if the game is played only once, no communication occurs, while in a repeated setting communication does occur. In general, complete information transmission does not occur. However, if the sender has a good reputation, he may have concern about the information he delivers, as any benefits from current opportunistic behaviour may be exhausted by the future loss from damaged reputation.

Stocken (2000) also models an infinitely repeated stage game between a manager and an investor and supposes both of them are long-run, risk-neutral players. Similar to Kim, Stocken suggests that no communication occurs in the single game. However, when the manager is sufficiently patient, he will report truthfully in a repeated game; therefore, the information he discloses is useful for the evaluators.

5.2.4 A Simple Game by Scott (2009)

Scott (2009) gives a simple example of the conflict between managers and investors with a single stage non-cooperative game. His game is similar to the prisoner's dilemma. The manager can either be honest or can distort in his financial reporting. The investor can choose either to buy the stock of the firm the manager serves or not to buy. The investor prefers to invest if the manager is honest. But if the manager distorts, the investor will refuse to buy. The manager would like the investor to invest in his firm and is willing to commit to be honest to induce the favourable choice by the investor.

Figure 5.1 Utility Payoffs between Manager and Investor in a Non-Cooperative Game

		Manager	
		Honest (H)	**Distort (D)**
Investor	**Buy (B)**	60 , 40	20 , 80
	Refuse to buy (R)	35 , 20	35 , 30

Under Scott’s assumption, each player has complete information about the other. That is, the manager knows the investor's payoff of each strategy and the investor knows the manager's payoff of each strategy.

This is a game in which there are gains from cooperation; the best outcome for the players is that the manager chooses to be honest and investors buy their stocks. In a simultaneous move game, however, the manager’s choice cannot be observed before the investor makes his investment decision. If the investor chooses to buy, the manager will choose to distort, since "distort" yields higher payoff. Similarly, if the investor refuses to buy, the manager will still choose to distort. That is, distort is a dominant strategy for the manager. The other player - the investor - prefers to refuse to buy, as no matter what strategy the manager chooses, "buy" will be ruled out as it yields lower payoff. Thus, this stage game has a unique Nash equilibrium (Distort, Refuse to buy) and this is the predicted outcome of the game.

In Scott's game, both players can be better off if the manager chooses to be honest and the investor chooses to buy. Let us consider the manager as a long-lived player and the investor as a succession of short-lived investors instead of a single investor. Suppose the game is played infinitely. The long-lived manager's payoff is the sum of the payoffs in each stage with a discount factor. Each short-lived investor plays the game only once and therefore cares only about the payoff of the current stage. In other words, the short-lived investors are believed to be myopic. Suppose the game is played infinitely with perfect monitoring and the information is complete and perfect, that is, each fresh short-lived investor knows the manager's payoff and choices in prior games. Provided that the manager is patient enough and he understands that the future investors will refuse to invest if he distorts at the current stage, then he will be deterred from taking the immediate payoff. Consequently, there is an equilibrium in this repeated game where in each period the manager chooses to be honest and the investor chooses to invest.

5.3 THE MANAGER-INVESTOR GAME

To study the game between the manager and investors, a simple game similar to Scott's (2009) game is constructed and is analysed following Mailath and Samuelson (2006).

Figure 5.2 Utility Payoffs between Manager and Investor

		Investor	
		Buy (*b*)	**Refuse to buy (*r*)**
Manager	**Truthful (*T*)**	2 , 3	0 , 2
	Misleading (*M*)	3 , 0	1 , 1

Suppose there are two players (*n*=2) in the game. Player 1, the manager, is a long-lived player and is assumed to be farsighted. Player 2 is a succession of short-lived investors instead of a single investor and is assumed to be myopic. To avoid confusion, suppose the manager is a male and the investor is a female. The manager (He) can choose his report strategy from a strategy set A_1 of truthful report or misleading report. The manager who reports truthfully is considered as an honest type and the manager who provides misleading reports is considered as a dishonest type. The investor (She) chooses whether to invest in the shares of the firm from a strategy set A_2. Their payoffs are given by Figure 5.2.

If the game is played only once, the manager will choose to provide a misleading report and the investor will refuse to invest since *Mr* is the Nash equilibrium of this game. To find the opportunities of cooperation, first, consider the game is repeated infinitely with incomplete information.

In the manager-investor game, investors do not always know the manager's payoff. Suppose that the investors are not completely sure about the manager's type. They may assign a high probability to the manager providing a misleading report and a small probability to the manager having some characteristics that make him report truthfully. Provided that the manager is sufficiently patient, his payoff must be arbitrarily close to 2 in any Nash equilibrium of this repeated game. This result holds no matter how the investors assign the probability to the manager's possible types, although the dishonest manager requires more patience than the honest manager.

To analyse this result, suppose that there is a candidate equilibrium where the dishonest manager receives a payoff less than 2-ε. Then both the dishonest and honest managers must consider taking different action in this repeated game, because an equilibrium in which they act identically would prompt the investors to invest and would yield a payoff of 2. At the moment, one opportunity available for the dishonest manager is to mimic the behaviour of the honest type. If the dishonest manager behaves like an honest manager over an adequate period of time, then the short-lived investors may consider that the manager is the honest type and choose to invest, as they expect the dishonest manager to behave differently. Once the investor chooses to buy the stocks of the firm, the manager could earn a payoff of 2 afterwards. It may take a while for the investors to be convinced that the manager is honest, and the manager has to sustain lower payoffs during this period, but these initial payoffs are not important if the manager is patient. As long as the manager has sufficient patience, he has a strategy available that ensures a payoff arbitrarily close to 2. The initial hypothesis, that the manager's payoff falls below 2-ε, must have been mistaken. Any equilibrium must provide the sufficiently patient dishonest manager with a payoff above 2-ε.

A common explanation for this argument is that the dishonest manager can obtain and maintain a reputation for behaving like the honest type. This opportunity of reputation building may appear to be a special case, as it rejects many equilibrium outcomes of the complete-information game. Next, different results will be developed beyond the special structure of this manager-investor game.

5.3.1 Repeated Game with Imperfect Public Monitoring

In every stage game, the manager observes the true earnings and chooses a reporting strategy. Investors cannot observe the true earnings but they can get information from the manager's reported earnings. Let Y denote the space of public signals and $y_1 \in \{\underline{y}, \overline{y}\}$ denote the public signal of the manager's action. Investors interpret $\overline{y}$ as meaning the firm is powerful in generating returns and $\underline{y}$ as meaning the firm does not deserve their investments. The actions of the short-lived investors are public and the set of public signals is $Y \equiv \left\{\underline{y}, \overline{y}\right\} \times A_2$. Let a denote the stage action for pure strategy and a_i denote the pure strategy profile for player i. The distribution of y_1 is given by

$$\rho_1(\overline{y}|a) = \begin{cases} p, & if\ a_1 = T \\ q, & if\ a_1 = M \end{cases} \tag{5.3.1}$$

with $0 < q < p < 1$. The joint distribution ρ over Y is given by $\rho(y_1 y_2|a) = \rho_1(y_1|a)$ if $y_2 = a_2$, and 0 otherwise.

Let α denote the stage action for mixed strategy and α_i denote the mixed strategy profile for player *i*. For a mixed profile α in the stage game, let $\alpha^T = \alpha_1(T)$ and $\alpha^b = \alpha_2(b)$. Denote a mixed action for the manager by α^T and for the investor by α^b. Then the profile set of the short-lived investor is

$$\mathbf{B} = \left\{(\alpha^T, r): \alpha^T \le \tfrac{1}{2}\right\} \cup \left\{(\alpha^T, b): \alpha^T \ge \tfrac{1}{2}\right\} \cup \{\left(\tfrac{1}{2}, \alpha^b\right): \alpha^b \in [0,1]\}.$$

Let v denote the payoff vector; the manager's payoff is bounded by $\underline{v}_1$ and $\overline{v}_1$[3]. That is, interval $[1,2]$ is the set of possible PPE payoffs for the manager. Let the manager's maximum PPE[4] payoff be $v^* \geq 1$[5].

First analyse the pure profiles in **B,** that is, *Tb* and *Mr*. *Mr* is enforceable using a constant continuation γ since it is the Nash equilibrium of the stage-game. Denote the manager's payoff maximum pure strategy PPE by v^{*p}. The manager's payoff must lie in the interval $[1, v^{*p}]$, therefore the set of payoffs decomposed by *Mr* on $[1, v^{*p}]$, $\mathcal{W}^{Mr}$, is given by

$$v \in \mathcal{W}^{Mr} \Leftrightarrow \exists \gamma \in [1, v^{*p}] \text{ such that } v = (1-\delta) + \delta\gamma.$$

where δ is the common discount factor.

[3] The constraints on the manager's payoff are explained in appendix.
[4] Perfect Public Equilibrium.
[5] Since the manager is the only long-lived player, the subscript on his payoff is dropped.

Therefore,

$$\mathcal{W}^{Mr} = [1,1 + \delta(v^{*p} - 1)].$$

If $v^{*p} > 1$, then $v^{*p} \notin \mathcal{W}^{Mr}$.

The continuations $\gamma: \{\underline{y}, \overline{y}\} \times A_2 \longrightarrow [1, v^{*p}]$ enforce *Tb* if

$$2(1-\delta) + \delta\left\{p\gamma(\overline{y}b) + (1-p)\gamma(\underline{y}b)\right\} \geq 3(1-\delta) + \delta\left\{q\gamma(\overline{y}b) + (1-q)\gamma(\underline{y}b)\right\},$$

That is,

$$\gamma(\overline{y}b) \geq \gamma(\underline{y}b) + \frac{(1-\delta)}{\delta(p-q)} \tag{5.3.2}$$

Therefore, the payoff with the good signal $\overline{y}$ must surpass the payoff of the bad signal $\underline{y}$ by the difference $(1-\delta)/[\delta(p-q)]$. This payoff difference decreases as the discount factor increases, and thus the incentive of a current deviation shrinks, and as $p-q$ increases, the signal is more responsive to the manager's choices.

Denote $\mathcal{W}^{Mr}$ as the set of payoffs that can be decomposed by *Tb* on $[1, v^{*p}]$.

Then,

$v \in \mathcal{W}^{Mr} \Leftrightarrow \exists\gamma(\overline{y}b), (\underline{y}b) \in [1, v^{*p}]$ satisfying (5.3.2) such that

$$v = V(Tb, \gamma) = (1-\delta)2 + \delta\left\{p\gamma(\overline{y}B) + (1-p)\gamma(\underline{y}B)\right\}.$$

By fixing $\gamma(\overline{y}b) = v^{*p}$ and having (5.3.2) hold with equality, the maximum value of $\mathcal{W}^{Mr}$ can be obtained. Then (if $v^{*p} > 1$)

$$v^{*p} = max\mathcal{W}^{Mr} = (1-\delta)2 - \frac{(1-\delta)(1-p)}{(p-q)} + \delta v^{*p}$$

Solving for v^{*p} gives

$$v^{*p} = 2 - \frac{(1-p)}{(p-q)} < 2 = \bar{v}$$

Now I turn to verify that $v^{*p} > 1$, that is equivalent to $(1-p) < (p-q)$, which is $2p - q > 1$. Otherwise, if $v^{*p} \leq 1$, namely $2p - q \leq 1$, then the only PPE pure strategy is *Mr* in every stage game.

Inefficiency Due to Binding Moral Hazard

Definition:

The manager is subject to binding moral hazard if for all a_{-i}, for all a_i, a_i', $\text{supp}\rho\big(y\big|(a_i, a_{-i})\big) = \text{supp}\rho\big(y\big|(a_i', a_{-i})\big)$, and for any $\alpha \in \mathbf{B}$ satisfying $u_i(\alpha) = \bar{v}_i$, α_i is not a best reply to α_{-i}.

Proposition:

Suppose the manager is subject to binding moral hazard, and A is finite. Then $k^*(e_i) < \bar{v}_i$. Consequently, there exists $\kappa > 0$ s.t. for all δ and all $v \in \mathcal{E}(\delta)$, $v_i \leq \bar{v}_i - \kappa$.

If the manager is subject to binding moral hazard, all PPE are inefficient. For large δ, all PPE in this game are bounded away from efficiency.

Intuitively, the imperfection monitoring indicates that the manager must face low continuations with positive probability on the equilibrium path. Since the investor is short-lived, using inter-temporal transfers of payoffs to maintain efficiency is impossible, while still providing incentives.

The minimum value of $\mathcal{W}^{Tb}$ is acquired by setting $\gamma(\underline{y}b) = 1$ and having (5.3.2) hold with equality. Hence

$$min\mathcal{W}^{Tb} = 1 + \frac{(1-\delta)(2p-q)}{(p-q)}$$

The set of payoffs $[1,\ v^{*p}]$ is self-generating using pure strategies if $\mathcal{W}^{Mr} \cup \mathcal{W}^{Tb} \supset [1, v^{*p}]$, which is indicated by

$$\min\mathcal{W}^{Tb} \leq \max\mathcal{W}^{Mr}.$$

Replacing and solving for the bound on δ provides

$$\frac{(2p-q)}{(4p-2q-1)} \leq \delta \tag{5.3.3}$$

The bound $2p - q > 1$ indicates the left side is less than 1.

When $\mathcal{W}^{Mr} \cup \mathcal{W}^{Tb} \supset [1, v^{*p}]$, v^{*p} can be realised in a pure strategy equilibrium, because the continuation ensures $\gamma(\overline{y}b)$ and $\gamma(\underline{y}b)$ decomposing v^{*p} using Tb are components of $\mathcal{W}^{Mr} \cup \mathcal{W}^{Tb}$, and the continuation ensures supporting $\gamma(\overline{y}b)$ and $\gamma(\underline{y}b)$ are themselves in $\mathcal{W}^{Mr} \cup \mathcal{W}^{Tb}$, and so on.

A strategy profile that accomplishes the payoff v^{*p} can be structured as follows. First, set $\gamma(v) = (v - (1-\delta))/\delta$ (the constant continuation decomposing v using Mr), and let $\gamma^{\bar{y}}, \gamma^{\underline{y}}: [0, v^{*p}] \longrightarrow \mathbb{R}$ be the functions solving $v = \mathrm{V}\left(Tb, \left(\gamma^{\bar{y}}(v), \gamma^{\underline{y}}(v)\right)\right)$ when (5.3.2) holds with equality:

$$\gamma^{\bar{y}} = \frac{v}{\delta} - \frac{2(1-\delta)}{\delta} + \frac{(1-p)(1-\delta)}{\delta(p-q)},$$

and

$$\gamma^{\underline{y}} = \frac{v}{\delta} - \frac{2(1-\delta)}{\delta} + \frac{p(1-\delta)}{\delta(p-q)}.$$

Let $\mathcal{H}$ be the histories. Define $\zeta: \mathcal{H} \longrightarrow [1, v^{*p}]$ as follows: $\zeta(\phi) = v^{*p}$ and for $h^t \in \mathcal{H}^t$,

$$\zeta(h^t, y_1 a_2) = \begin{cases} \gamma^{\bar{y}}\left(\zeta(h^t)\right), & \text{if } y_1 = \bar{y} \text{ and } \zeta(h^t) \in \mathcal{W}^{Tb}, \\ \gamma^{\underline{y}}\left(\zeta(h^t)\right), & \text{if } y_1 = \underline{y} \text{ and } \zeta(h^t) \in \mathcal{W}^{Tb}, \\ \gamma\left(\zeta(h^t)\right), & \text{if } \zeta(h^t) \in \mathcal{W}^{Mr} \backslash \mathcal{W}^{Tb}. \end{cases}$$

The strategies are then given by

$$\sigma_1(\phi) = T, \ \ \sigma_2(\phi) = b,$$

$$\sigma_1(h^t) = \begin{cases} T, & \text{if } \zeta(h^t) \in \mathcal{W}^{Tb}, \\ M, & \text{if } \zeta(h^t) \in \mathcal{W}^{Mr} \backslash \mathcal{W}^{Tb}. \end{cases}$$

and

$$\sigma_2(h^t) = \begin{cases} B, & \text{if } \zeta(h^t) \in \mathcal{W}^{Tb}, \\ R, & \text{if } \zeta(h^t) \in \mathcal{W}^{Mr} \backslash \mathcal{W}^{Tb}. \end{cases}$$

Therefore, every history of signals h^t is associated with a continuation payoff $\zeta(h^t)$. In this continuation payoff, an action is allowed to associate with the history, either Tb or Mr, based on whether the continuation payoff sits in the set $\mathcal{W}^{Tb}$ or $\mathcal{W}^{Mr} \backslash \mathcal{W}^{Tb}$. Then, connect the signals continuation payoffs which break the current continuation payoff with the currently prescribed action payoff and a new continuation payoff. When the currently prescribed action is Mr, this breakdown is unimportant, as the current payoff is 1 and there is no incentive to be created. Then the continuation payoff can be simplified as $(\zeta(h^t) - (1-\delta))/\delta$. If the currently prescribed action is Tb, the continuation payoffs are assigned according to the functions $\gamma^{\bar{y}}$ and $\gamma^{\underline{y}}$, which allow the payoffs to be enforced in the set $\mathcal{W}^{Tb}$.

There is still a chance that where the players use mixed strategies the manager is able to attain a higher PPE payoff or get additional PPE payoffs for lower discount factor δ. In the following, v^* is the maximum manager PPE payoff, allowing for mixed strategies, and therefore $v^* \geq v^{*p}$. Consider the mixed profile $\alpha = \left(\frac{1}{2}, \alpha^b\right)$ for fixed $\alpha^b \in [0,1]$. Since both actions for the manager are played with strictly positive probability, the continuations γ must satisfy

$$v = \alpha^b \left[(1-\delta)2 + \delta\left\{p\gamma(\overline{y}b) + (1-p)\gamma\left(\underline{y}b\right)\right\}\right]$$

$$+ (1-\alpha^b)\left[(1-\delta)\times 0 + \delta\left\{p\gamma(\overline{y}r) + (1-p)\gamma\left(\underline{y}r\right)\right\}\right]$$

$$= \alpha^b \left[(1-\delta)3 + \delta\left\{q\gamma(\overline{y}b) + (1-q)\gamma\left(\underline{y}b\right)\right\}\right] + (1-\alpha^b)\left[(1-\delta) + \delta\left\{q\gamma(\overline{y}r) + (1-q)\gamma\left(\underline{y}r\right)\right\}\right],$$

where the first expression is the expected payoff from *T* and the second expression is the expected payoff from *b*. By simplifying, the continuation needs to satisfy the following requirement:

$$(1-\delta) = \delta(p-q)[\alpha^b\gamma(\overline{y}b) + (1-\alpha^b)\gamma(\overline{y}r) - \left\{\alpha^b\gamma\left(\underline{y}b\right) + (1-\alpha^b)\gamma\left(\underline{y}r\right)\right\}]. \quad (5.3.4)$$

Let $\gamma^{\overline{y}}(\alpha^b) = \alpha^b\gamma(\overline{y}b) + (1-\alpha^b)\gamma(\overline{y}r)$

and $\gamma^{\underline{y}}(\alpha^b) = \alpha^b\gamma\left(\underline{y}b\right) + (1-\alpha^b)\gamma\left(\underline{y}r\right)$,

The requirement (5.3.4) can be rearranged as

$$\gamma^{\overline{y}}(\alpha^b) = \gamma^{\underline{y}}(\alpha^b) + \frac{(1-\delta)}{\delta(p-q)} \quad (5.3.5)$$

If $\gamma(y_1y_2) \in [1, v^*]$ can be selected to satisfy this constraint, then α is enforceable on $[1, v^*]$. A sufficient condition is

$$\frac{(1-\delta)}{\delta(p-q)} \leq v^{*p} - 1$$

Since $v^{*p} \leq v^*$, the inequality above is indicated by

$$\frac{1}{(2p-q)} \leq \delta \tag{5.3.6}$$

If α is enforceable on $[1, v^*]$, the set of payoffs decomposed by $\alpha = (1/2\,, \alpha^b)$ on $[1, \mathrm{v}^*]$, $\mathcal{W}^{\alpha}$, is given by

$v \in \mathcal{W}^{\alpha} \Leftrightarrow \exists \gamma(y_1 y_2) \in [1, v^*]$ satisfying (5.3.5)

$$\text{s.t.} \quad \begin{aligned} v &= \mathrm{V}(\alpha, \gamma) \\ &= 2\alpha^b(1-\delta) + \delta\{p\gamma^{\overline{y}}(\alpha^b) + (1-p)\gamma^{\underline{y}}(\alpha^b b)\}. \end{aligned}$$

Therefore,

$$\mathcal{W}^{\alpha} = [2\alpha^b(1-\delta) + \delta + \frac{p(1-\delta)}{(p-q)}, 2\alpha^b(1-\delta) + \delta v^* - \frac{(1-p)(1-\delta)}{(p-q)}]$$

which is nonempty if (5.3.6) holds.

Now, v^* can be determined: Since $v^* = \sup_{\alpha} \max \mathcal{W}^{\alpha}$, and the supremum is attained by $\alpha^b = 1$, it is easy to verify $v^* = v^{*p}$. Therefore, under (5.3.6),

$$\cup_{\{\alpha:\alpha^b \in [0,1]\}} \mathcal{W}^{\alpha} = [1, v^*] = [1, v^{*p}],$$

and the payoff set $[1, v^*]$ and the maximal set of PPE payoffs are self-generating for all δ satisfying (5.3.6). In addition, this lower bound on δ is lower than the bound for self-generating of $[1, v^*]$ under pure strategy in (5.3.3).

5.3.2 Reputation with Short-Lived Players

5.3.2.1 The Adverse Selection Approach to Reputation

Adverse selection is introduced by Akerlof (1970) in his study of the market mechanism with reference to the automobile market. He argues that the existence of information asymmetry allows sellers to sell low quality products to buyers. In the used car market, only the sellers know the actual quality of the cars they sell. Therefore, they may sell poor cars at the price of good cars. Although the buyers do not know the real quality of the cars, they know the average quality and wish to pay only the average price. Hence, the cars with better quality than average exit from the market. Then, the buyers lower their expectation on the average car quality. Again, the cars with better quality than the buyers' new expectation exit from the market recursively until there are only poor quality cars left in the market. The trading volume is smaller than the equilibrium. This problem is called adverse selection and it can also be found in the insurance industry.

The adverse selection approach to reputation begins with the assumption that a player is uncertain about key aspects of his opponent. For example, the investor may not know the manager's payoffs or may be uncertain about what constraints the manager faces on his ability to choose various actions. This incomplete information is a device that introduces an intrinsic connection between past behaviour and expectations of future behaviour. Because incomplete information about players' characteristics can have dramatic effects on the set of equilibrium payoffs, reputation in this approach does not describe certain equilibrium but places constraints on the set of possible equilibria.

Consider the manager-investor game in Figure 5.2 is infinitely repeated with perfect monitoring. The manager is long-lived and the investor is a succession of short-lived players. Every payoff in the interval [1,2] is a sub-game perfect equilibrium for a sufficiently patient manager.

The manager is required to report truthfully (playing *T*) frequently for the high payoffs, thus the investor will play her best response of *T*. Can the manager develop a "reputation" for truthful reporting by doing this persistently? If the investor is not convinced immediately that the manager reports truthfully, she will refuse to invest and it may be costly for the manager at the start. However, for a sufficiently patient manager, it is worthwhile for the subsequent payoff.

Intuitively, if the manager constantly reports truthfully, the investor will be convinced that the manager is the honest type and she will expect the manager to report truthfully in the future. However, repeated games do not capture this intuition. Repeated games have a recursive structure; the continuation game following any history is identical to the original game. In the theory of repeated game with complete information, no matter how many times the manager has reported truthfully, there is no reason for the investor to trust that the manager reports truthfully in the current stage game with more probability than at the beginning of the game.

The adverse selection approach to reputations allows the investor to entertain the possibility that the manager may be committed to reporting truthfully. Suppose the investor thinks the manager is most likely to be a dishonest type and assigns some (small) probability $\hat{u} > 0$ to the manager being a commitment (honest) type who always reports truthfully. The necessary relationship between the manager's previous action and the investor's expectation of his future action can be introduced by a small probability $\hat{u}$ of his being a commitment type. Over the repeated game, this small probability can have large effect.

Suppose this manager-investor game is played twice, with the manager's payoffs added over the two periods. In the perfect monitoring game of complete information, *Mr* in both periods is the unique equilibrium outcome. Suppose now the investor assigns some (small) probability $\hat{u} > 0$ to the manager being a commitment type who always reports truthfully, and assigns probability $1 - \hat{u}$ to him being a dishonest type. The game still has perfect monitoring, so period 0 choices are observed before period 1 choices are made. Consider the profile where the normal type of manager plays *M* in both periods. The investor plays R in period 0 (because $\hat{u}$ is small). In the first period, after observing *T*, the investor assumes that the manager is a commitment type and her best response is *b*. Conversely, if the manager plays *M*, the investor assumes that the manager is a normal type and her best response is *r*. This profile is not an equilibrium. If the normal type manager mimics the commitment type in period 0, he can get 1 in current payoff and increase to 2 in the next period. The two-period game does not have a pure strategy equilibrium.

How to reconcile the finding with the non-trivial bounds on ex ante payoffs, bounds that may push the manager outside the set of equilibrium payoffs in the complete information game? There may well be a long period of time during which the investor is uncertain of the manager's type and in which play does not resemble an equilibrium of the complete information game. The length of this period will depend on the discount factor, being longer for larger discount factors, and in general being long enough to have a significant effect on the manager's payoffs. Eventually, however, such behaviour must give way to a regime in which the investor is (correctly) convinced of the manager's type.

Thus there is an order of limits calculation. For any prior probability $\hat{u}$ that the long-run player is the commitment type and for any $\varepsilon > 0$, there is a discount factor δ sufficiently large that the manager's expected payoff is ε-close to the commitment type payoff. This holds no matter how small $\hat{u}$ is. As a result, it is tempting to think that even as the game is played and the posterior probability of the commitment type falls, there should be a period, think of it as the beginning of the game, and apply the standard reputation argument to conclude that uncertainty about the manager's type still has a significant effect. However, for any fixed δ and in any equilibrium, there is a time at which the posterior probability attached to the commitment type has dropped below the corresponding critical value of $\hat{u}$, becoming too small (relative to δ) for reputation effects to operate. The next is to revealing the manager's type.

Which should command our interest, the ability of reputation to impose bounds on ex ante payoffs, or the fact that such effects eventually disappear? These results reflect different views of a common model. Their relative importance depends on the context in which the model is applied rather than arguments that can be made within the model. Sometimes strategic interactions from a well-defined beginning, focusing attention on ex ante payoffs is observed. In addition, ongoing interactions whose beginnings are difficult to identify, making long-run equilibrium properties a potentially useful guide to behaviour are often encountered. If one's primary interest is the long-lived player, then ex ante payoffs may again be paramount. One may instead take the view of a social planner who is concerned with the continuation payoffs of the long-run player and with the fate of all short-run players, even those in the distant future, directing attention to long-run properties. Finally, if one is interested in the steady state of a model with incomplete information, long-run properties are important.

The finding is viewed that reputations are temporary as an indication that a model of long-run reputations should incorporate some mechanism by which the uncertainty about types is continually replenished. For example, Holmström (1999), Mailath and Samuelson (2001) assume that the type of the long-lived player is governed by a stochastic process rather than being determined once and for all at the beginning of the game. In such a situation, reputations can indeed have long-run implications.

The reputation results in this chapter exploit the sharp asymmetry between players, with the manager being long-lived and arbitrarily patient and the investor being short-lived and hence myopic. In particular, short-lived investors allow us to move directly from the fact that the investor believes the manager is playing like the commitment type to the conclusion that the investor plays a best response to the commitment type.

5.3.2.2 Commitment Types

Let's consider the case of one long-lived manager and one short-lived investor, with the latter representing either a succession of investors who live for one period or a continuum of small and anonymous infinitely lived investors. The type of manager is unknown to investor. A possible type of manager is denoted by $\xi \in \Xi$, where Ξ is a finite or countable set. The investor's prior belief about the manager's type is given by the distribution μ, with support Ξ.

Divide the set of types into payoff types, Ξ_1, and commitment types, $\Xi_2 \equiv \Xi \backslash \Xi_1$. Payoff types maximise the average discounted value of payoffs, which depend on their type and which may be non-stationary,

$$u_1 : A_1 \times A_2 \times \Xi_1 \times \mathbb{N}_0 \to \mathbb{R}.$$

Type $\xi_0 \in \Xi_1$ is the normal type of manager, who happens to have a stationary payoff function, given by the stage game in the benchmark game of complete information,

$$u_1(a, \xi_0, t) = u_1(a) \ \forall a \in A, \forall t \in \mathbb{N}_0.$$

It is standard to think of the prior probability $\mu(\xi_0)$ as being relatively large, so the games of incomplete information are a seemingly small departure from the underlying game of complete information, although there is no requirement that this be the case.

Commitment types (also called action types) do not have payoffs and simply play a specified repeated game strategy. For any repeated game strategy from the complete information game, $\hat{\sigma}_1 : \mathcal{H}_1 \to \Delta(A_1)$, where $\mathcal{H}_1$ is the set of histories observed by the manager, denote by $\xi(\hat{\sigma}_1)$ the commitment type committed to the strategy $\hat{\sigma}_1$. In general, a commitment type of manager can be committed to any strategy in the repeated game. If the strategy in question plays the same (pure or mixed) stage-game action in every period, regardless of history, refer to that type as a simple commitment type. For example, one simple commitment type is a manager who always reports honestly. Let $\xi(a_1)$ denote the (simple commitment) type that plays the pure action a_1 in every period and $\xi(\alpha_1)$ denote the type that plays the mixed action α_1 in every period. Commitment types who randomise are important because they can imply a higher lower bound on the manager's payoff.

Other manager commitment types are committed to more complicated sequences of actions. For example, the manager can play tit-for-tat, report truthfully in every period up to and including t and then mislead, or report honestly in prime-numbered periods and mislead otherwise.

(1) Payoff or Commitment Types

The distinction between payoff and commitment types is not clear-cut. For example, pure simple commitment types are easily modelled as payoff types. The type $\xi(a_1)$ for pure stage-game action a_1 can be interpreted as the payoff type for whom playing a_1 in every period is strictly dominant in the repeated game by specifying

$$u_1(a,\xi(a_1'),t) = \begin{cases} 1, & \text{if } a_1 = a_1', \\ 0, & \text{otherwise.} \end{cases}$$

The commitment type ξ' who plays a_1 in every period up to and including *t*, and then switches to a_1'', is the payoff type with payoffs

$$u_1(a,\xi',\tau) = \begin{cases} 1, & \text{if } a_1 = a_1' \text{ and } \tau \le t, \\ & \text{or } a_1 = a_1'' \text{ and } \tau > t, \\ 0, & \text{otherwise.} \end{cases}$$

A payoff type for whom an action a_1 is a dominant action in the stage game is typically not equivalent to a commitment type who invariably plays the action a_1. To recast the latter as a payoff type, the constant play of the action a_1 is needed to be a dominant strategy in the repeated game, a more demanding requirement. For example, *Mr* is a dominant strategy set in the stage game but is not a dominant strategy in the repeated game.

Fudenberg and Levine (1992) explain mixed commitment types as payoff types. However, in addition to associated technical complications, interpreting mixed commitment types as payoff types requires an uncountable type space if the commitment type's strategy is to be strictly dominant in the repeated game.

It is personal preference to choose between payoff and commitment types. The theoretical advantage of only considering payoff types is that all types are expected to maximize their utility. On the other side, the belief that players may uncertain about the other players' types forms the interest in reputation games. Simply considering the player may behave irrational or "abnormal" may be more plausible than expecting maximizing utility, and in fact a lot of literature use the language of irrational or "abnormal". Otherwise, understanding that the games are models of a more complex strategic interaction, the uncertainty about a player's type may induce the probability that the player models the strategic interaction quite differently, leading to payoffs that have no expected utility representation in the game in question. Then the player may be completely rational but best represented as a commitment type.

In this study, the commitment type interpretation for $\xi(a_1)$ is maintained, so that by assumption, a commitment type plays the specified strategy.

The manager's pure-action Stackelberg payoff is defined as

$$v_1^* = \sup_{a_1 \in A_1} \max_{\alpha_2 \in B(a_1)} u_1(a_1, \alpha_2) \qquad (5.3.7)$$

where $B(a_1)$ is the set of investor myopic best replies to a_1. If the supremum is achieved by some action a_1^*, that action is an associated Stackelberg action,

$$a_1^* \in \arg\max_{a_1 \in A_1} \min_{\alpha_2 \in B(a_1)} u_1(a_1, \alpha_2)$$

This is a pure action to which a manager would commit if he had the chance to do so (hence the name Stackelberg action), given that such a commitment induces a best response from the investor. If there is more than one such action for the manager, one arbitrarily can be chosen. The (pure-action) Stackelberg type of manager plays a_1^* and is denoted by $\xi(a_1^*) \equiv \xi^*$.

When the investor is short-lived, any bound on the manager's ex ante payoffs that can be obtained using commitment types can be obtained using simple commitment types only.

(2) Mixed-action Stackelberg Types

While studying perfect monitoring, simple commitment types who choose pure actions are main discussed. As seen in previous section, commit to a mixed action is beneficial for a player in some games. In this manager-investor game, for example, a commitment by the manager to mix between reports truthfully and misleadingly, with slightly larger probability on reports truthfully, induces the investor to choose to buy and gives the manager a larger payoff than a commitment to report truthfully. In effect, a manager who always report truthfully spends too much to induce response "buy" from the investor. Accordingly, define the mixed-action Stackelberg payoff as

$$\sup_{\alpha_1 \in \Delta(A_1)} \max_{\alpha_2 \in B(\alpha_1)} u_1(\alpha_1, \alpha_2) \tag{5.3.8}$$

where $B(\alpha_1)$ is the set of investor's best responses to α_1. Typically, the supremum is not achieved by any mixed action, so there is no mixed-action Stackelberg type. However, there are mixed commitment types which, if the investor is convinced she is facing such a type, will yield payoffs arbitrarily close to the mixed-action Stackelberg payoff.

In perfect-monitoring games, it is simpler to verify the lower bound on equilibrium payoffs implied by commitments to pure (rather than mixed) actions. In the former case, only need analyse the updating of the short-lived players' beliefs on one path of informative actions, the path induced by the Stackelberg commitment type. In contrast, commitments to mixed actions require consideration of belief evolution on all histories that arise with positive probability. This consideration involves the same issues that arise when studying reputations in imperfect monitoring games.

5.3.2.3 Perfect Monitoring Games

This section examines reputations in repeated games of perfect monitoring. Assuming that the action set A_2 is finite, as usual, when any player has a continuum action space, only behaviour in which that player is playing a pure strategy will be considered.

In this manager-investor game, there is equilibria with “high” payoffs for a long-lived manager facing short-lived investors. The basic reputation result is a lower bound on equilibrium payoffs for the normal long-lived manager, in the game of incomplete information in which the short-lived investor is uncertain about the type of the long-lived manager.

The set of histories in the complete information game, $\mathcal{H}$, is the set of public histories in the incomplete information game and is also the set of investor histories in the incomplete information game. A history for manager in the incomplete information game is an element of $\Xi \times \mathcal{H}$, specifying manager’s type as well as the public history. A behaviour strategy for manager in the incomplete information game, using the notation on commitment types from section 5.3.2.2, is

$$\sigma_1 : \mathcal{H} \times \Xi \longrightarrow \Delta(A_1)$$

such that, for all commitment types $\xi(\hat{\sigma}_1) \in \Xi_2$,

$$\sigma_1\left(h^t, \xi(\hat{\sigma}_1)\right) = \hat{\sigma}_1(h^t) \quad \forall h^t \in \mathcal{H}$$

A behaviour strategy for investor is, as in the beginning of 5.3, a map $\sigma_2 : \mathcal{H} \longrightarrow \Delta(A_2)$.

Given a strategy profile σ, $U_1(\sigma, \xi)$ denotes the type ξ long-lived manager’s payoff in the repeated game. As is familiar, a Nash equilibrium is a collection of mutual best responses:

A strategy profile $(\tilde{\sigma}_1, \tilde{\sigma}_2)$ is a Nash equilibrium of the reputation game with perfect monitoring if for all $\xi \in 1$, $\tilde{\sigma}_1$ maximises $U_1(\sigma_1, \tilde{\sigma}_2, \xi)$ over manager's repeated game strategies, and if for all t and all $h^t \in \mathcal{H}$ that have positive probability under $(\tilde{\sigma}_1, \tilde{\sigma}_2)$ and μ,

$$E[u_2(\tilde{\sigma}_1(h^t, \xi), \tilde{\sigma}_2(h^t)|h^t)] = \max_{a_2 \in A_2} E[u_2(\tilde{\sigma}_1(h^t, \xi), a_2|h^t)]$$

Existence of equilibrium:

The existence of Nash equilibria when Ξ is finite follows by observing that every finite-horizon truncation of the game has a Nash equilibrium, and by applying standard limiting arguments to obtain an equilibrium of the infinite horizon game (see, for example, Fudenberg and Levine 1983). When Ξ is countable infinite, existence is again an implication of Fudenberg and Levine (1983) if every finite-horizon truncation of the game has an ε–Nash equilibrium. To prove that the finite-horizon truncation of the game has an ε–Nash equilibrium, arbitrarily fix the behaviour of all but a finite number of types of manager (because Ξ is countable, the set of types whose behaviour is not fixed can be chosen so that its ex ante probability is close to 1). Then, in the finite-truncation game, all the short-lived investors are maximising while manager is ε–maximising (because he is free to choose behaviour for all but a small probability set of types).

If A_1 is a continuum, these arguments may not yield an equilibrium in pure strategies. Concerning with lower bounds on equilibrium payoffs, the existing results assure that a nonempty set is bounded. Allowing for mixing by manager when A_1 is a continuum introduces some tedious details to the definition of equilibrium, but does not alter the nature of the bounds calculated.

(1) Sequential Equilibrium

Because the lower bound on manager's payoff applies to all Nash equilibria, stronger equilibrium concepts are not considered. The counterpart of a sequential equilibrium in this context is straightforward. Only manager has private information, and therefore sequential rationality for manager is immediate: after all histories, the continuation strategy of manager (of any type) should maximise his continuation payoffs. For investor, after histories that have zero probability under the equilibrium and involve a deviation by manager, her action would simply be required to be optimal, given some beliefs over Ξ, with subsequent investor's updating the same beliefs when possible.

The consistency condition of sequential equilibrium has a powerful implication in the presence of commitment types. Should investor ever see an action that is not taken by a commitment type, then investor must thereafter attach probability zero to that commitment type, regardless of what she subsequently observes. This follows immediately from the fact that no disturbed strategies can generate such an outcome from the commitment type. The same is not the case with a payoff commitment type.

Continue with the manager-investor game. The pure Stackelberg type of manager chooses *T*, with Stackelberg payoff 2. Suppose $\Xi = \{\xi_0, \xi^*, \xi(M)\}$. For

$\delta \geq 1/2$, the grim trigger strategy profile of always playing *Tb*, with deviations punished by Nash reversion, is a sub-game perfect equilibrium of the complete information game. Consider the following adaptation of this profile in the incomplete information game:

$$\sigma_1(h^t, \xi) = \begin{cases} T, & \text{if } \xi = \xi^*, \\ & \text{or } \xi = \xi_0 \text{ and } a^\tau = Tb \text{ for all } \tau < t, \\ M, & \text{otherwise.} \end{cases}$$

and

$$\sigma_2(h^t) = \begin{cases} b, & \text{if } a^\tau = Hh \text{ for all } \tau < t, \\ r, & \text{otherwise.} \end{cases}$$

In other words, investor and the normal type of manager follow the strategies from the Nash-reversion equilibrium in the complete information game, and the commitment types ξ^* and $\xi(M)$ play their actions.

This is a Nash equilibrium for $\delta \geq 1/2$ and $\mu(\xi(M)) < 1/2$. The restriction on $\mu(\xi(M))$ ensures that investor finds *b* optimal in period 0. Should investor ever observe *M*, then Bayes' rule causes her to place probability 1 on type $\xi(M)$ (if *M* is observed in the first period) or the normal type (if *M* is first played in a subsequent period), making her participation in Nash reversion optimal. The restriction on δ ensures that Nash reversion provides sufficient incentive to make *T* optimal for the normal manager. After observing $a_0^1 = T$ in period 0, investor assigns zero probability to $\xi = \xi(M)$. However, the posterior probability that 2 assigns to the Stackelberg type does not converge to 1. In period 0, the prior probability is $\mu(\xi^*)$. After one observation of *T*, the posterior increases to $\mu(\xi^*)/[\mu(\xi^*) + \mu(\xi_0)]$, after which it is constant.

Of more interest is the possibility of a Nash equilibrium with a low payoff for the normal manager. This contrasts with the game of complete information, where playing *Mr* in every period is a sub-game perfect equilibrium with a payoff of 1 to the normal manager. It is an implication of section 5.3.2.3(3) The Reputation Bound that there is no Nash equilibrium of the incomplete information game with a payoff to the normal manager near 1. Here it is argued that, if $\mu(\xi^*) < 1/3$ and $\mu(\xi(M)) < 1/3$, the normal manager's payoff in any pure strategy Nash equilibrium is bounded below by 2δ and above by 2. The bounds on $\mu(\xi^*)$ and $\mu(\xi(M))$ imply that in any pure strategy Nash equilibrium outcome, the normal manager and investor choose either *Tb* or *Mr* in each period, and so 2 is the upper bound on 1's payoff. Fix a pure strategy Nash equilibrium, and let *t* be the first period in which the normal manager chooses *M*. If $t = \infty$ (i.e., 1 never chooses *M* in equilibrium), then the normal manager's payoff is 2. Suppose $t < \infty$. If the normal manager chooses *T* in period t and every subsequent period, then investor will choose *b* in period $t + 1$ and every subsequent period, having concluded in period t that manager is the Stackelberg type and then having received no evidence to the contrary. Hence, a lower bound on the normal manager's payoff is

$$2(1-\delta^t) + 0 \times (1-\delta)\delta^t + 2\delta^{t+1} = 2 - 2(1-\delta)\delta^t \geq 2 - 2(1-\delta) = 2\delta$$

Figure 5.3 A Payoff Type of Manager for whom T is dominant
in the stage game (left panel) and in the repeated game (right panel)

		Investor				Investor	
		Buy (b)	**Refuse to buy (r)**			**Buy (b)**	**Refuse to buy (r)**
Manager	**Truthful (T)**	3 , 3	1 , 2	Manager	**Truthful (T)**	3 , 3	3 , 2
	Misleading (M)	2 , 0	0 , 1		**Misleading (M)**	2 , 0	0 , 1

Payoff types:

Continuing with the investment game, now consider the set of types $\Xi = (\xi_0, \xi_1)$, where ξ_1 is the payoff type with payoffs described in the left panel of figure 5.3. The lower bound from previous example no longer holds, even though investor puts positive probability on manager being a type ξ_1 for whom the Stackelberg action is strictly dominant in the stage game. It is possible, even for δ arbitrarily close to 1, to construct sequential equilibria in which both types of manager receive a payoff arbitrarily close to their minmax values of 1. For example, first consider the profile in which, in the absence of a deviation by manager, both types of manager reports misleadingly in even periods and reports truthfully in odd periods, and investor refuses to buy in even periods and buy in odd periods. Deviations by investor are ignored, and any deviation by manager results in investor concluding that manager is the normal type ξ_0 (and never subsequently revising her belief) and refuses to buy in every subsequent period. After any deviation by manager, the normal type always plays *M* (while ξ_1 plays *T*), so the profile is sequential. Profiles with lower payoffs can be constructed by increasing the frequency of *Mr* on the path of play (the result is still an equilibrium provided δ is large enough and the average payoff to manager of both types exceeds 1). Figure 5.3

also presents the payoffs for a payoff type who finds it a dominant strategy to report truthfully after every history in the repeated game. This type is equivalent to the Stackelberg type.

(2) Building a Reputation

The first step toward the reputation result is to demonstrate that when investor assigns some probability to the simple type $\xi(a_1') = \xi'$, if the normal manager persistently plays action a_1', then investor must eventually place high probability on that action being played. Of course, it may take a while to build such a reputation for playing a_1', and doing so may be quite costly in the meantime. However, this cost will be negligible if manager is sufficiently patient. If this action is the Stackelberg action a_1^*, when manager is sufficiently patient, the resulting lower bound on manager's payoff is close to his Stackelberg payoff v_1^*.

Let $\Omega = \Xi \times (A_1 \times A_2)^{\infty}$ be the space of outcomes. An outcome $\omega \in \Omega$ takes the form $\omega = (\xi, a_1^0 a_2^0, a_1^1 a_2^1, a_1^2 a_2^2, \dots)$, specifying the type of manager and the actions chosen in each period. Associated with any outcome ω is the collection of period *t* public histories, one for each *t*, with $h^t = h^t(\omega) = (a_1^0(\omega)a_2^0(\omega), a_1^1(\omega)a_2^1(\omega), \dots, a_1^{t-1}(\omega)a_2^{t-1}(\omega)) \in \mathcal{H}^t$.

A profile of strategies (σ_1, σ_2), along with the prior probability over types μ (with support Ξ), induces a probability measure on the set of outcomes, denoted by $\mathrm{P} \in \Delta(\Omega)$. Denote by the event that the action a_1 is chosen in every period, that is,

$$\Omega' = \{\omega: a_1^t(\omega) = a_1' \ \forall t\} \subset \Omega = \Xi \times (A_1 \times A_2)^\infty$$

The event contains a multitude of outcomes, differing according to the type of manager and actions of investor. For example, the action a_1' in every period is consistent with manager being the simple type $\xi(a_1')$, but also with manager being the normal type, as well as with a variety of other types and investor behaviour.

Let q^t be the probability that the action a_1' is chosen in period *t*, conditional on the public history $h^t \in \mathcal{H}^t$; that is,

$$q^t \equiv \mathbf{P}(a_1^t = a_1' | h^t) \tag{5.3.9}$$

Note that q^t is a random variable, being a function of the form $q^t: \Omega \to [0,1]$. Specifically, $q^t(\omega) = \mathbf{P}(a_1^t = a_1' | h^t(\omega))$. Because q^t depends on ω through $h^t(\omega)$, $q^t(h^t)$ will often be written rather than $q^t(\omega)$. Because q^t is conditioned on the public history, it provides a description of investor's beliefs about manager's play, after any history.

The normal manager receives a payoff of at least $\min_{a_2 \in B(a_1')} u_1(a_1', a_2)$ in any period *t* in which q^t is sufficiently large that investor chooses a best response to a_1', and manager in fact plays a_1'. The normal manager has the option of always playing a_1', so his payoff in any Nash equilibrium must be bounded below by the payoff generated by always playing a_1'. If there is a bound on the number of periods in which, after always observing a_1', investor's period *t* beliefs assign low probability to a_1', then there is a lower bound on the normal manager's equilibrium payoff.

Hence, the behaviour of q^t on the set Ω' is interested.

q^t may decrease on Ω'

Consider the manager-investor game with $a_1' = T$ ($= a_1^*$, the Stackelberg action). Let $\tilde{\xi}_t$ describe a commitment type who reports truthfully in every period $\tau < t$, and reports misleadingly thereafter, independently of history. In particular, $\tilde{\xi}_0$ is $\xi(M)$, the simple commitment type that plays *M* in every period, and $\tilde{\xi}_t$ is a nonsimple commitment type for $t \geq 1$. Let $\hat{\xi}$ denote the type that reports truthfully in period 0 and reports truthfully thereafter if and only if investor buy in period 0; and otherwise reports misleadingly. The set of types is given by $\Xi = \{\xi_0, \xi^*, \hat{\xi}, \tilde{\xi}_0, \tilde{\xi}_1, \tilde{\xi}_2, \ldots\}$, with prior μ.

Consider first the strategy profile in which the normal type manager always reports truthfully and investor always choose to buy. Recall that the set Ω' is the set of all outcomes in which manager always reports truthfully. Then, $q^0 = 1 - \mu(\tilde{\xi}_0)$ because all types except $\tilde{\xi}_0$ report truthfully in period 0. There are two period 1 histories consistent with Ω', *Tb* and *Tr*, but *Tr* has zero probability under P (because investor always choose to buy). Applying Bayes' rule,

$$q^1(Tb) = \frac{1 - \mu(\tilde{\xi}_0) - \mu(\tilde{\xi}_1)}{1 - \mu(\tilde{\xi}_0)}$$

Because $q^0 < q^1(Tb)$ if and only if $\mu(\tilde{\xi}_0)\left(1 - \mu(\tilde{\xi}_0)\right) > \mu(\tilde{\xi}_1)$, q^t need not be monotonic on Ω' in t.

If the short-run players are playing pure strategies, then the conditional belief q^t is constant on a full-measure subset of Ω' (i.e., $q^t(\omega) = q^t(\omega')$ for all ω, $\omega' \in \Omega^*$ with $\mathrm{P}(\Omega^*) = \mathrm{P}(\Omega')$), because there is then only one positive probability period t history h^t consistent with Ω'. If the short-lived investors are randomising, however, then h^t may be a nondegenerate random variable on Ω' and (because σ_1^t is a function of the short-lived players' actions in early periods) so q^t may also be.

q^t can vary with h^t on Ω'

Consider now a profile in which the normal type of manager always reports truthfully and investor chooses to buy with probability ½ and refuses to buy with probability ½ in the first period, and then always chooses to buy. Although calculation of q^0 is unchanged, others are very different in period 1. Now, both period 1 histories consistent with Ω', *Tb* and *Tr*, receive positive probability. So,

$$q^1(Tb) = \frac{1 - \mu(\tilde{\xi}_0) - \mu(\tilde{\xi}_1)}{1 - \mu(\tilde{\xi}_0)}$$

and

$$q^1(Tr) = \frac{1 - \mu(\tilde{\xi}) - \mu(\tilde{\xi}_0) - \mu(\tilde{\xi}_1)}{1 - \mu(\tilde{\xi}_0)}$$

Consequently, for fixed t, q^t need not be constant as a function of h^t on a full-measure subset of Ω'.

Define: $n_\zeta: \Omega \to \mathbb{N}_0 \cup \{\infty\}$ to be the number of random variables q^t (t=0,1,…) for which $q^t \leq \zeta$. That is, for each $\omega \in \Omega$, $n_\zeta(\omega) = |\{t: q^t(\omega) \leq \zeta\}|$ is the number of terms in the sequence of conditional probabilities $\{q^t(\omega)\}_{t=1}^{\infty}$ that do not exceed ζ. Denote the event that manager is type ξ', $\{\xi'\} \times (A_1 \times A_2)^\infty$

Lemma: Fix $\zeta \in [0,1)$. Suppose $\mu\big(\xi(a_1')\big) \in [\mu^*, 1)$ for some $\mu^* > 0$ and $a_1' \in A_1$. For any profile (σ_1, σ_2),

$$\mathbf{P}\left\{n_\zeta > \frac{\ln \mu^*}{\ln \zeta}\middle|\Omega'\right\} = 0$$

and for any outcome $\omega \in \Omega'$ such that all histories $\{h^t(\omega)\}_{t=1}^{\infty}$ have positive probability under $\mathbf{P}, \mathbf{P}\big(\xi(a_1')\big|h^t(\omega)\big)$ is non-decreasing in *t*.

Thus, whenever investor observes ever longer strings of action a_1', eventually she must come to expect action a_1' to be played with high probability.

The restriction to histories $\{h^t(\omega)\}_{t=1}^{\infty}$ that have positive probability under P precludes outcomes ω that are impossible under strategy profile σ.

An important feature of this lemma is that the bound on n_ζ is independent of P, allowing to bound manager's payoff in any equilibrium. Denote $\xi(a_1')$ by ξ'. This result does not assert $P(\xi'|h^t) \to 1$ as $t \to \infty$, that is, that the posterior probability attached to the simple type ξ' converges to unity. Instead, it leaves open the possibility that manager is normal but plays like that simple type, as in the equilibrium in section 5.3.2.3(1).

The key idea behind the proof is the following. Suppose that under some history h^t, previous play is consistent with the simple type ($a_1^\tau = a_1'$ for all $\tau <$ t) and the current expectation is that the action a_1' need not appear ($q^t < 1$). This can only happen if some probability is attached to the event that manager is not the simple type ξ' and will not play the action a_1'. Then, observing the action a_1' in period *t* results in a posterior that must put increased weight on ξ' and therefore (with all else equal) must increase q^t in the future.

Proof:

Let $\Omega'' \equiv \{\omega: \mathbf{P}(h^t(\omega)) > 0, a_1^t(\omega) = a_1' \ \forall t\}$, that is, Ω'' is the set of outcomes ω such that all histories $h^t(\omega)$ have positive probability and a_1' is always played.

Note that $\Omega'' \subset \Omega'$ and $\mathbf{P}(\Omega'') = \mathbf{P}(\Omega')$.

Step 1. The first step is to show that, for $\omega \in \Omega''$,

$$\mathbf{P}\left(\xi' \middle| h^t(\omega)\right) = \frac{\mathbf{P}\left(\xi' \middle| h^{t-1}(\omega)\right)}{q^{t-1}}$$

This would be an immediate implication of Bayes' rule if only manager's behaviour were observed in period *t*-1. Establishing the result requires confirmation that observing investor's behaviour as well does not confound the inference. Applying Bayes' rule,

$$\mathbf{P}\big(\xi'\big|h^t(\omega)\big) = \frac{\mathbf{P}\big(h^t(\omega)\big|\xi', h^{t-1}(\omega)\big)\mathbf{P}\big(\xi'\big|h^{t-1}(\omega)\big)}{\mathbf{P}\big(h^t(\omega)\big|h^{t-1}(\omega)\big)} \tag{5.3.10}$$

Reformulate the denominator by using the independence of any period *t* randomisation of manager and investor to obtain (suppressing ω),

$$\mathbf{P}(h^t|h^{t-1}) = \mathbf{P}(a_1^t a_2^t|h^{t-1}) = \mathbf{P}(a_1^t|h^{t-1})\mathbf{P}(a_2^t|h^{t-1})$$

$$= \mathbf{P}(h^t(1)|h^{t-1})\mathbf{P}(a_2^t|h^{t-1})$$

where $h^t(i)$ is the period *t* history of i's actions. Using the three observations that investor's choice at *t* depends on manager's play only through h^{t-1}, $\omega \in \Omega''$ (so that $a_1^t = a_1'$), and $\mathbf{P}(\xi'|h^{t-1}) > \mathbf{0}$,

$$\mathbf{P}(a_2^t|h^{t-1}) = \mathbf{P}(a_2^t|\xi', h^{t-1}) = \mathbf{P}(h^t(2)|\xi', h^{t-1})$$

Turning to the numerator into (5.3.10), using the second observation again, $\mathbf{P}(a_1^t|\xi', h^{t-1}) = 1$, so

$$\mathbf{P}(h^t|\xi', h^{t-1}) = \mathbf{P}(h^t(2)|\xi', h^{t-1})$$

Substituting these calculations into (5.3.10),

$$\mathbf{P}(\xi'|h^t) = \frac{\mathbf{P}(h^t(2)|\xi', h^{t-1})\mathbf{P}(\xi'|h^{t-1})}{\mathbf{P}(h^t(1)|h^{t-1})\mathbf{P}(h^t(2)|\xi', h^{t-1})} \tag{5.3.11}$$

$$= \frac{\mathbf{P}(\xi'|h^{t-1})}{\mathbf{P}(h^t(1)|h^{t-1})} = \frac{\mathbf{P}(\xi'|h^{t-1})}{\mathbf{P}(a_1^t = a_1'|h^{t-1})}$$

$$= \frac{\mathbf{P}(\xi'|h^{t-1})}{q^{t-1}}$$

because $q^t \leq 1$, $\mathbf{P}(\xi'|h^t)$ is non-decreasing.

Step 2. Next, because $\mu(\xi') \geq \mu^* > 0$, (5.3.11) can be used to calculate that for all t,

$$0 < \mu^* \leq \mathbf{P}(\xi'|\emptyset) = q^0\mathbf{P}(\xi'|h^1) = q^0q^1\mathbf{P}(\xi'|h^2) = \cdots = \left(\prod_{\tau=0}^{t-1} q^\tau\right)\mathbf{P}(\xi'|h^t)$$

and as $\mathbf{P}(\xi'|h^t) \leq 1$ for all t,

$$\prod_{\tau=0}^{t-1} q^\tau \geq \mu^*$$

Taking limits,

$$\prod_{\tau=0}^{\infty} q^\tau \geq \mu^*$$

That is, for all $\omega \in \Omega''$,

$$\prod_{\tau=0}^{\infty} q^\tau(\omega) \geq \mu^*$$

and so (using the observation at the beginning of the proof that $\mathbf{P}(\Omega'') = \mathbf{P}(\Omega')$.),

$$\mathbf{P}\left\{\omega \in \Omega'' : \prod\nolimits_{\tau=0}^{\infty} q^\tau \geq \mu^*\right\} = \mathbf{P}(\Omega'') = \mathbf{P}(\Omega')$$

Because $\mathbf{P}(\Omega') \geq \mathbf{P}(\xi') \geq \mu^* > 0$ where ω has again been suppressed),

$$\mathbf{P}\{\prod\nolimits_{\tau=0}^{\infty} q^\tau \geq \mu^* | \Omega'\} = 1$$

But

$$\prod_{\tau=0}^{\infty} q^{\tau} = \prod_{\{\tau:q^{\tau}\leq\zeta\}} q^{\tau} \prod_{\{\tau:q^{\tau}>\zeta\}} q^{\tau} < \prod_{\{\tau:q^{\tau}\leq\zeta\}} q^{\tau} < \zeta^{n_{\zeta}}$$

and so

$$\mathbf{P}\{\zeta^{n_{\zeta}} \geq \mu^* | \Omega'\} = 1$$

or

$$\mathbf{P}\{n_{\zeta} \ln \zeta \geq \ln \mu^* \,|\Omega'\} = 1$$

which give the result

$$\mathbf{P}\{n_{\zeta} \ln \zeta \geq \ln \mu^* \,|\Omega'\} = \mathbf{P}\left\{n_{\zeta} > \frac{\ln \mu^*}{\ln \zeta} \middle| \Omega'\right\} = 0$$

(3) The Reputation Bound

In the stage (or one-off) game, manager can secure the payoff

$$v_1^*(a_1) \equiv \min_{a_2 \in B(a_1)} u_1(a_1, a_2) \tag{5.3.12}$$

by committing to action a_1. Now refer to $v_1^*(a_1)$ as the one-shot bound from a_1. Let $\underline{v}_1(\xi_0, \mu, \delta)$ be the infimum over the set of the normal manager's payoff in any (pure or mixed) Nash equilibrium, given the distribution μ over types and discount factor δ. The basic reputation result establishes a lower bound on the equilibrium payoff of manager.

Proposition:

Suppose A_2 is finite and $\mu(\xi_0) > 0$. Suppose a_1' is a finite subset of A_1 with $\mu(\xi(a_1)) > 0$ for all $a_1 \in A_1'$. Then there exists k such that

$$\underline{v}_1(\xi_0, \mu, \delta) \geq \delta^k \max_{a_1 \in A_1'} v_1^*(a_1) + (1 - \delta^k) \min_{a \in A} u_1(a)$$

Proof:

Let a_1' be a best type in A_1', that is

$$a_1' \in \arg\max_{a_1 \in A_1'} \min_{a_2 \in B(a_1)} u_1(a_1, a_2)$$

By hypothesis, the simple type $\xi' = \xi(a_1')$ is assigned positive probability by μ.

Because A_2 is finite, there exists $\zeta \in (0,1)$ such that if $\alpha_1(a_1') > \zeta$,

$$B(\alpha_1) \subset B(a_1')$$

In other words, as long as investor attaches sufficiently high probability to manager's action a_1', investor will choose a best response to a_1'.

Fix a Nash equilibrium (σ_1, σ_2) and let P be the distribution on Ω induced by (σ_1, σ_2) and μ. Then, for all h^t such that $q^t(h^t) > \zeta$, $B\left(E(\sigma_1^t | h^t)\right) \subset B(a_1')$. Letting $\widehat{\mathcal{H}}^t \equiv \{h^t : q^t(h^t) > \zeta\}$, just argued that $\sigma_2^t(h^t) \in B(a_1')$ for all $h^t \in \widehat{\mathcal{H}}^t$.

Set $k = \ln \mu(\xi') / \ln \zeta$. From lemma in section 5.3.2.3(2), conditional on Ω' (i.e., conditional on 1 playing a_1' in every period), $q^t \leq \zeta$ for no more than k periods with P probability 1. Suppose now that the normal type plays according to the strategy "always play a_1'" (which may not be σ_1). This induces a probability measure P' on Ω that generates the same distribution over public histories as does P conditional on ξ', that is, $\mathrm{P}'(\mathrm{C}) = \mathrm{P}(\mathrm{C}|\xi')$ for all $\mathrm{C} \subset (A_1 \times A_2)^{\infty}$. Hence $q^t \leq \zeta$ for no more than k periods with P' probability 1. The inequality for $\underline{v}_1(\xi_0, \mu, \delta)$ now follows from the observation that the normal type's equilibrium payoff must be no less than the payoff from this strategy, which is at least the payoff from receiving the worst possible payoff for the first *k* periods, after which a payoff of at least $\max_{a_1 \in A_1'} v_1^*(a_1)$ is received.

If the set of possible commitment types is sufficiently rich, the lower bound on the normal manager's payoff is the Stackelberg payoff.

Corollary:

Suppose μ assigns positive probability to some sequence of simple types $\{\xi(a_1^k)\}_{k=0}^{\infty}$ with $\{a_1^k\}_k$ satisfying

$$v_1^* = \lim_{k \to \infty} v_1^*(a_1^k)$$

For all $\varepsilon > 0$, there exists $\underline{\delta}' \in (0,1)$ such that for all $\delta \in (\underline{\delta}', 1)$,

$$\underline{v}_1(\xi_0, \mu, \delta) \geq v_1^* - \varepsilon$$

Proof:

Fix $\varepsilon > 0$ and choose a_1^k such that $v_1^*(a_1^k) > v_1^* - \varepsilon/2$. The result now follows from proposition 5.3.11, taking $A_1' = \{a_1^k\}$.

(4) Stackelberg Bound

If there is a Stackelberg action, and the associated Stackelberg type has positive probability under μ, then the hypotheses of corollary in section 5.3.2.3(3) are trivially satisfied. In that case, the normal manager effectively builds a reputation for playing like the Stackelberg type, receiving a payoff (when patient) no less than the payoff v_1^*. Importantly, the normal manager builds this reputation despite the fact that there are many other possible commitment types. However, this result tells very little about manager's equilibrium strategy. In particular, it does not imply that it is optimal for the normal manager to choose the Stackelberg action in each period, which is in general not the case.

(5) Complete Information Games

Reputation effects from pure-action commitment types in perfect monitoring games yield a lower bound on equilibrium payoffs for manager that can be quite high. However, unlike mixed-action commitment types, or more generally imperfect monitoring games, they do not introduce the possibility of new payoffs. More precisely, for any pure action a $a_1' \in A_1$, there exists $\underline{\delta} \in (0,1)$, such that for all $\delta \in (\underline{\delta}, 1)$ the complete information game has an equilibrium with manager payoffs at least $v_1^*(a_1')$. This is immediate if there is a stage-game Nash equilibrium with manager payoffs at least $v_1^*(a_1')$. If not, then Nash reversion can, for patient manager, be used to support 1's choice of a_1' in every period.

Diffuse beliefs:

If A_1 is a continuum, then the hypotheses of corollary in section 5.3.2.3(3) are satisfied if A_1 has a countably dense subset $\{a_1^m\}_{m=1}^{\infty}$ with the property that for $\mu\big(\xi(a_1^m)\big) > 0$ all m.

5.3.2.4 Imperfect Monitoring Games

This section examines reputations with imperfect monitoring in the manager-investor game. Again, suppose the manager is long-lived player and the investor is short-lived player, focusing on the manager's payoff. The stage game of the benchmark complete information game is the game with private monitoring and with finite or continuum action spaces, A_i, and finite signal spaces, Z_i. This includes public monitoring as a special case, and thus includes stage games with a non-trivial extensive form. Although the seminal study of reputations with imperfect monitoring (Fudenberg and Levine 1992) restricted attention to public monitoring games (section 5.3.2.4(1)), this is unnecessary.

The distribution over private signals $z = (z_1, z_2)$ for each action profile a is denoted by $\pi(z|a)$, with π_i being player i's marginal distribution. As usual, the ex post payoffs of the normal type of manager and investor, after the realisation

(z, a), are given by $u_i^*(z_i, a_i)$ $(i = 1,2)$. If an action space is a continuum, it is assumed that, $\pi: Z \times A \to [0,1]$ is continuous, and u_i^* is continuous in all arguments and quasi-concave in a_i. Ex ante stage game payoffs are given by $u_i(a) \equiv \sum_z u_i^*(z_i, a_i)\pi(z|a)$.

The space of types Ξ is as described in section 5.3.2.2, with ξ_0 being the normal type. When A_1 is finite, it is allowed for simple commitment types that are committed to a mixed action.

The set of private histories for manager (excluding his type) is

$$\mathcal{H}_1 \equiv \cup_{t=0}^{\infty} (A_1 \times Z_1)^t$$

and a behaviour strategy for manager is, using the notation on commitment types from section 5.3.2.2,

$$\sigma_1: \mathcal{H}_1 \times \Xi \to \Delta(A_1)$$

Such that, for all $\xi(\hat{\sigma}_1) \in \Xi_2$,

$$\sigma_1\left(h_1^t, \xi(\hat{\sigma}_1)\right) = \hat{\sigma}_1(h_1^t) \quad \forall h_1^t \in \mathcal{H}_1$$

The set of private histories for the short-lived investors is

$$\mathcal{H}_2 \equiv \cup_{t=0}^{\infty} (\mathrm{A}_2 \times Z_2)^t$$

and a behaviour strategy for the short-lived investors is

$$\sigma_2: \mathcal{H}_2 \to \Delta(A_2) \tag{5.3.13}$$

When considering infinite action sets, convention of restricting attention to pure strategies is maintained throughout.

As before, given a strategy profile σ, $\mathrm{U}_1(\sigma,\xi)$ denotes the type ξ long-lived manager's payoff in the repeated game.

Definition (5.3.2.4):

A strategy profile $(\tilde{\sigma}_1,\tilde{\sigma}_2)$ is a Nash equilibrium of the reputation game with imperfect monitoring if for all $\xi \in \Xi_1$, $\tilde{\sigma}_1$ maximises $U_1(\sigma_1,\tilde{\sigma}_2,\xi)$ over manager's repeated game strategies, and if for all t and all $h_2^t \in \mathcal{H}_2$ that have positive probability under $(\tilde{\sigma}_1,\tilde{\sigma}_2)$ and μ,

$$E\left[u_2\left(\tilde{\sigma}_1(h_1^t,\xi),\tilde{\sigma}_2(h_2^t)\right)|h_2^t\right] = \max_{a_2\in A_2} E[u_2(\tilde{\sigma}_1(h_1^t,\xi),a_2)|h_2^t]$$

(1) Public Monitoring

The analysis requires only minor modifications when the signals are public and short-lived investors do not observe the actions of previous short-lived investors. It is referred to the game with public signals and short-lived investor's actions not observed by subsequent short-lived investors (i.e., $H_2 \equiv \cup_{t=0}^{\infty} Y^t$) as the canonical public monitoring game, because it is often the most natural specification.

This is the game studied in Fudenberg and Levine (1992), and is to be distinguished from the case when the signal is public and short-lived investor's actions are observed by subsequent short-lived investors (a special case of the private monitoring game).

A special case of the canonical public-monitoring game has public short-lived investor actions (and finite A_2, so as to preserve our assumption of a finite signal space). There is a space of signals Y_1 and a public-monitoring distribution ρ1, so that the complete space of public signals is $Y = Y_1 \times Y_2$ with probability distribution given by

$$\rho\big((y_1, a_2')\big|a\big) = \begin{cases} \rho_1(y_1|a), & \text{if } a_2' = a_2 \\ 0, & \text{otherwise.} \end{cases}$$

(2) Stackelberg Payoffs

As in the case of perfect monitoring, the normal manager has an incentive to induce particular beliefs in the short-lived investors in order to elicit beneficial best replies. However, because monitoring is imperfect, the best responses that can be elicited by α_1 are not simply those actions in $B(\alpha_1)$.

First consider the set of possible investor best responses when manager is almost certain to play some mixed action α_1. A (potentially mixed) action α_2 is an ε-confirmed best response to α_1 if there exists α_1' such that

$$\alpha_2(a_2) > 0 \Rightarrow a_2 \in \arg\max_{\alpha_2'} u_2(\alpha_1', \alpha_2')$$

and

$$|\pi_2(\cdot\,|\alpha_1, \alpha_2) - \pi_2(\cdot\,|\alpha_1', \alpha_2)| \leq \varepsilon$$

Note that it is possible that a mixed action α_2 is an ε-confirmed best response to α_1, while at the same time no action in the support of α_2 is an ε-

confirmed best response. Denote the set of ε-confirmed best response to α_1 by $B_\varepsilon(\alpha_1)$. Note that if there are different strategies α_1 and α_1' with $\pi_2(\cdot\,|\alpha_1,\alpha_2) = \pi_2(\cdot\,|\alpha_1',\alpha_2)$, then $B_0(\alpha_1)$ may contain strategies not in $B(\alpha_1)$, the set of best replies to α_1.

The private monitoring and the canonical public monitoring game differ in the information that short-lived investors have about preceding short-lived investor's choices, leading to different constraints on optimal investor behaviour.

For the private monitoring game, define

$$B_\varepsilon^*(\hat{\alpha}_1) \equiv \{\alpha_2 : \mathrm{supp}(\alpha_2) \subset B_\varepsilon(\hat{\alpha}_1)\} \tag{5.3.14}$$

For the canonical public monitoring game, define $B_\varepsilon^*(\hat{\alpha}_1) \equiv B_\varepsilon(\hat{\alpha}_1)$.

This section proves that if investor assigns strictly positive probability to a simple type $\xi(\alpha_1')$, then a patient normal manager's payoff in every Nash equilibrium can be (up to an $\varepsilon > 0$ approximation) no lower than $\underline{v}_1(\alpha_1')$, where

$$\underline{v}_1(\alpha_1') \equiv \min_{\alpha_2 \in B_0^*(\alpha_1')} \mathrm{u}_1(\alpha_1',\alpha_2) \tag{5.3.15}$$

Taking the supremum over α_1' yields the payoff

$$v_1^{**} \equiv \sup_{\alpha_1'} \min_{\alpha_2 \in B_0^*(\alpha_1')} \mathrm{u}_1(\alpha_1',\alpha_2) \tag{5.3.16}$$

In the manager-investor game, with the ex ante stage game payoffs in figure 5.2, manager's action is not public. As in section 5.3, there is a public signal with two possible values, $\underline{y}$ and $\overline{y}$, and distribution

$$\rho(\overline{y}|a) = \begin{cases} p, & \text{if } a_1 = T, \\ q, & \text{if } a_1 = M, \end{cases}$$

where $0 < q < p < 1$. Investor's actions are public. Let $\hat{\alpha}_1$ denote manager's mixed action which randomises equally between *T* and *M*. Then, for all $\varepsilon \geq 0$, $B_\varepsilon(\hat{\alpha}_1)$ contains every pure or mixed action for investor, and hence $\min_{\alpha_2 \in B_0(\alpha_1')} u_1(\alpha_1', \alpha_2) = 1/2$. However, for any mixture α_1 under which *T* is more likely than *M*, for sufficiently small ε, $B_0(\alpha_1) = \{h\}$. As a result, $v_1^{**} = 5/2$. This payoff is the mixed-action Stackelberg payoff, and exceeds the upper bound on manager's payoff in the corresponding public monitoring game of complete information, shown in section 5.3 to be

$$2 - \frac{1-p}{p-q} < 2$$

New possibilities even for perfect monitoring:

As observed in section 5.3.2.3(5) that reputation effects from pure-action commitment types in perfect monitoring games cannot introduce new payoff possibilities. Taking $\hat{\alpha}_1 = H$ in section 5.3.2.4(1) shows that pure commitment types in imperfect-monitoring games can introduce new possibilities in terms of equilibrium payoffs. Similarly, mixed-action commitment types in perfect monitoring games can introduce new possibilities. A game with perfect monitoring is a special case of a game with imperfect monitoring, where the set of signals *Z* is the set of pure-action profiles *A*, and $\pi(z|a) = 1$ if and only if $z = a$. Consequently, for perfect monitoring games, $B_0^* = B_0 = B$ and v_1^{**} is the mixed-action Stackelberg payoff, (section 5.3.2.2(2)). This section thus extends the reputation result for perfect monitoring games of section 5.3.2.4(1) to mixed commitment types. In the process, a stronger bound on payoffs is obtained, as the mixed-action Stackelberg payoff can exceed the pure-action Stackelberg payoff. The pure and mixed Stackelberg payoffs for the manager-investor game are given by:

$$v_1^* = \max_{a_1} \min_{\alpha_2 \in B(a_1)} u_1(a_1, \alpha_2) = 2$$

and

$$v_1^{**} = \sup_{\alpha_1} \min_{\alpha_2 \in B(\alpha_1)} u_1(\alpha_1, \alpha_2) = 2\tfrac{1}{2}$$

The lower bound on manager's payoff can be strictly higher than what manager could achieve in the perfect monitoring game of complete information. In the beginning of section 5.3, examining games of complete information in which a long-lived manager faces short-lived opponents, the upper bound $\overline{v}_1$ (cf. (5.3.1)) on manager's payoff is introduced. In the manager-investor game,

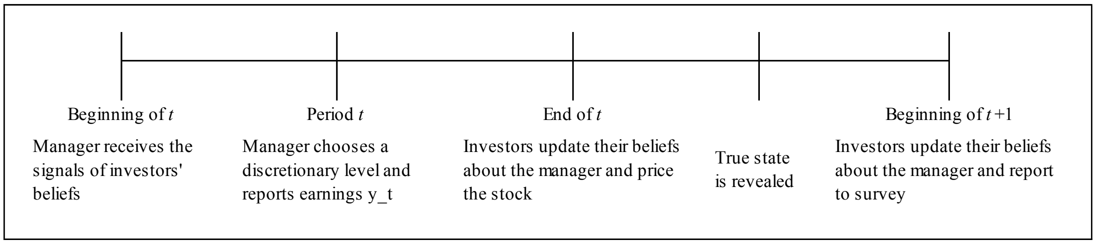
$$\overline{v}_1 = \max_{\alpha \in B} \min_{a_1 \in \mathrm{supp}(\alpha_1)} \mathrm{u}_1(a_1, \alpha_{-1}) = 2$$

the bound $\underline{v}_1(\alpha_1')$ differs from $\min_{\alpha_2 \in B(\alpha_1')} u_1(\alpha_1', \alpha_2)$ in allowing investor's action to be a minimiser from the set $B_0^*(\alpha_1')$ rather than $B(\alpha_1')$. In general, this difference can yield a bound that is even lower than the pure-action Stackelberg payoff.

5.4 THE FORMAL GAME FOR DISCRETIONARY ACCRUALS

5.4.1 The Cheap-Talk Model of Discretionary Accruals

Figure 5.4 Timeline of events in the model



In this section, the behaviour of the manager who considers whether to make up the earnings through accounting choices is studied following Du (2012).

At the beginning of each stage game, the manager observes the reputation of his firm among analysts. Then he observes the real earnings θ of the current period privately. The real earnings can be either high (H) or low (L), i.e., $\theta_t \in \{\theta_H, \theta_L\} \equiv \Theta$, for each period *t*. After observing the real earnings, the manager chooses a level a of earnings management from the strategy set $\mathrm{A} \subset \mathbb{R}$ that is continuous. Then he reports the earnings $y_t \in \{\theta_H, \theta_L\}$, which is the sum of real earnings θ and the discretionary accruals $a_t \in \{A, 0, -A\}$, where $A \equiv \theta_H - \theta_L$.

$$y_t = \theta_t + a_t$$

Usually, investors associate the firm's current reported earnings with its ability to generate future returns. That is, the probability of a firm generating desired returns is a function of current earnings: $\alpha_{t+1} = V(y_t)$. A firm with high earnings (y_H) is interpreted as a powerful firm with probability α_H of generating desired returns, while a firm with low earnings (y_L) is interpreted as a poor firm with probability α_L of generating desired returns, where $0 < \alpha_L < \alpha_H < 1$. Investors are risk neutral and offer a price equal to their willingness to pay.

The choice of discretionary accruals a requires a utility cost $C(a)$ and brings more probability ya of cooperation in the following stages if it is not revealed. The incentive rate y is yielded from perceptions of investors from prior stages.

The accumulated total of discretionary accruals is

$$x_t = x_{t-1} + a_t$$

Investor expectations:

Graham and Dodd (2008) suggest that investors evaluate a common stock mainly based on the earnings and a quality coefficient of the company. This quality coefficient includes, for example, the company size, reputation, financial position, and prospects. For simplification, assuming that the investors' expectation on a stock is a function of the company's reported earnings and reputation. Suppose the investor would like to pay a high price p_H for the stock that generates desired return, and a low price p_L for the stock that does not. (Let r be the investors' belief that the reported earnings is reliable.) Then, the stock price which reflects the investor's expectation is set by

$$p_t = \frac{1}{1+\delta} E_t[p_{t+1} + \theta_{t+1} | y_t]$$

where δ is investors' discount rate.

The manager's optimisation problem:

Suppose the manager understands the investor's utility function, and he chooses a discretionary accruals level a_t to report y_t which maximises his utility

$$h_t = \max_{y_t \in \{\theta_H, \theta_L\}} E_t \left[\sum_{s=0}^{\infty} \beta^s \ln(p_{t+s}) - C(a_{t+s}) \right]$$

where β is the manager's discount rate and p_t is the stock price at the end of period *t*.

That is, when the manager chooses the reporting earnings (discretionary accruals level), he is concerned about the stock price series from the current period and the cost of using discretionary accruals. The earnings management decision in the current period has future effect on both the manager's flexibility in discretionary accruals and the investor's expectations.

The following section will discuss how the manager's earnings management is affected by the different investor expectations.

5.4.2 Investor's Rational Expectation

First, suppose the investors have rational expectations on manager's discretionary choice. Under this rational expectation, investors have perfect information on manager's utility function and are able to anticipate manager's reporting strategy. That is, investors can predict the manager's earnings management behaviour through discretionary accruals and update their expectations according to their prediction.

With the investors' rational expectations, the manager considers the reporting strategies on the real earnings θ_t and the accumulated accrual level at the end of previous period x_{t-1}. The space of possible strategies is given by $S \equiv \Theta \times X = \{\theta_H, \theta_L\} \times \{-A, 0, A\}$. Let λ be a probability measure on S. With the discrete values of earnings and accruals, λ is a simple 6×1 vector corresponding to the probabilities of the six possible situations.

Definition 5.4.1. A stationary rational expectation equilibrium is a set of decision rules $y(\theta_t, x_{t-1})$, a price function $p(y_t)$, and a probability measure on the state space $\lambda: S \to R$ such that

(i) Reporting strategy is a solution to the manager's optimisation problem, i.e., $y(\theta_t, x_{t-1})$ solves the following problem:

$$\mathrm{v}(\theta_t, x_{t-1}) = \max_{y_t \in \{\theta_H, \theta_L\}} \{ln\big(p(y_t)\big) - C(a_t) + \beta E_t[v(\theta_{t+1}, x_t)]\} \tag{5.4.1}$$

(ii) Investors' expectations are the same as λ and $y(\cdot)$; stock price reflects investors' expectations.

(iii) The probability measurement λ is a stationary, i.e.,

$$\lambda' = \lambda' P \tag{5.4.2}$$

where P is the 6×6 transition matrix implied by the model.

The discreteness of state variables allows for a reformulation of the Bellman equation in terms v_{ij} where $i \in \{\mathrm{H}, \mathrm{L}\}$ and $j \in \{-, 0, +\}$ correspond to $\theta \in \{\theta_H, \theta_L\}$ and $x_{t-1} \in \{-A, 0, A\}$. For example, v_{H-} is the value function when $\theta = \theta_H$ and $x_{t-1} = -A$. Apply this notation rule to y_{ij} and λ_{ij}. Let $y = [y_{H-}, y_{L-}, y_{\mathrm{H}0}, y_{L0}, y_{H+}, y_{L+}]$, and $\lambda = [\lambda_{H-}, \lambda_{L-}, \lambda_{\mathrm{H}0}, \lambda_{L0}, \lambda_{H+}, \lambda_{L+}]$ denote the vectors of decision rules and probability distribution. The Bellman equation (5.4.1) can be represented by six equations of v_{ij}, where $i \in \{\mathrm{H}, \mathrm{L}\}$ and $j \in \{-, 0, +\}$,

$$v_{H-} = \ln(p_H) + \beta[\pi v_{H-} + (1-\pi) v_{L-}]$$

$$v_{L-} = \max\{\ln(p_H) + \beta[(1-\pi) v_{H0} + \pi v_{L0}], \ln(p_L) + \beta[(1-\pi) v_{H-} + \pi v_{L-}]\}$$

$$v_{\mathrm{H}0} = \max\{\ln(p_H) + \beta[\pi v_{H0} + (1-\pi) v_{L0}], \ln(p_L) + \beta[\pi v_{H-} + (1-\pi) v_{L-}]\}$$

$$v_{L0} = \max\{\ln(p_H) + \beta[(1-\pi) v_{H+} + \pi v_{L+}], \ln(p_L) + \beta[(1-\pi) v_{H0} + \pi v_{L0}]\}$$

$$v_{H+} = \max\{\ln(p_H) + \beta[\pi v_{H+} + (1-\pi)v_{L+}], \ln(p_L) + \beta[\pi v_{H0} + (1-\pi)v_{L0}]\}$$

$$v_{L+} = \ln(p_L) + \beta[(1-\pi)v_{H+} + \pi v_{L+}]$$

The first equation suggests that when the real earnings are high and the accumulated accruals are negative, there is no room for earnings management through discretionary accruals, the current choice is $a = 0$, and the value function is the utility function from truthful reporting (v_{H-}). Conversely, the last equation suggests that when the real earnings are high and the accumulated accruals are positive, the manager's only choice for discretionary accruals is $a = 0$ and the value function is the utility function from truthful reporting (v_{L+}). In other situations, the manager can choose an action from $a \in \{-A, 0, A\}$ to maximise his expected utility.

5.4.3 Solution

In a stationary rational expectation equilibrium, the investors' expectations do not depend on the manager's earnings management strategy and the probability distribution of the state vector.

In a stationary rational expectation equilibrium, the price function (investors' expectations) is given by

$$p(y_t) = \left[\left(I - \frac{1}{1+\delta}\Pi\right)^{-1}\bar{\theta}\right]_j \qquad 5.4.3$$

where $\Pi = [\pi, 1-\pi; 1-\pi, \pi]$, $\overline{\theta} = [\theta_H, \theta_L]'$, I is a 2×2 identity matrix, $j = 1$ if $y_t = \theta_H$, and $j = 2$ if $y_t = \theta_L$.

The stationary expectation equilibria will be solved by a "guess and verify" method. First, a possible strategy for discretionary accruals will be stated, then the stationary probability distributions associated with this strategy will be derived and the situations which are incentive-compatible will be verified.

Proposition 5.4.1: There exist the following stationary rational expectation equilibria, where the stock price is given by (5.4.3), $y = [y_{H-}, y_{L-}, y_{\mathrm{H}0}, y_{L0}, y_{H+}, y_{L+}]$, and probability distribution $\lambda = [\lambda_{H-}, \lambda_{L-}, \lambda_{\mathrm{H}0}, \lambda_{L0}, \lambda_{H+}, \lambda_{L+}]$ are given by:

(i) $y = [\theta_H, \theta_H, \theta_{\mathrm{H}}, \theta_H, \theta_L, \theta_L]$, and $\lambda = [0,0,\frac{\pi}{2},\frac{1-\pi}{2},\frac{1-\pi}{2},\frac{\pi}{2}]$, for $\pi \in (\underline{\pi}_1, \overline{\pi}_1)$;

(ii) $y = [\theta_H, \theta_L, \theta_{\mathrm{H}}, \theta_H, \theta_L, \theta_L]$, and $\lambda = [\omega, \omega, \frac{\pi}{2}(1-2\omega), \frac{1-\pi}{2}(1-2\omega), \frac{1-\pi}{2}(1-2\omega), \frac{\pi}{2}(1-2\omega)]$, where $\omega \in [0, \frac{1}{2}]$, for $\pi \in (\underline{\pi}_2, 1]$;

(iii) $y = [\theta_H, \theta_H, \theta_{\mathrm{H}}, \theta_H, \theta_L, \theta_L]$, and $\lambda = [0,0,\frac{\pi}{2},\frac{1-\pi}{2},\frac{1-\pi}{2},\frac{\pi}{2}]$, for $\pi \in (\underline{\pi}_3, \overline{\pi}_3)$;

where $(\underline{\pi}_1, \overline{\pi}_1, \underline{\pi}_2, \underline{\pi}_3, \overline{\pi}_3)$ are constants between 0.5 and 1.

Possible states in the equilibrium are determined by the stationary distribution λ. If all possible states with non-zero probabilities are characterised by earnings management, the equilibrium is an earnings management equilibrium. Otherwise, it is a truthful reporting equilibrium. In the equilibria above, equilibrium (i) and equilibrium (ii) are earnings management equilibria while (iii) is a truthful reporting equilibrium. Thus, both reporting strategies are possible in the stationary expectations equilibria. The properties of the underlying real earnings process determine the selection of equilibrium.

5.5 SUMMARY

This chapter begins with a literature review of game theory. Then, the theoretical literature on incentives for earnings management is reviewed.

Next, a simple game is considered to illustrate how reputation appears to influence decision makers in repeated games. In this part, the game is analysed under different assumptions of the game.

Finally, a cheap-talk game is proposed to analyse the manager's decision making for the discretionary accruals. It is found that in the equilibrium, when the real earnings are low, reporting strategically is the expected outcome for the firms, especially for those firms with lower reputation.

Chapter 6: Concluding Remarks

6.1 Main Findings of This Thesis

This thesis provides empirical evidence and theoretical analysis regarding the corporate reputation on earnings management. Specifically, it presents not only the empirical tests investigating the relationship between the characteristics of the corporate reputation and the manager's earnings management behaviour including discretionary accruals and real manipulation, but also the theoretical analysis examining how the manager reacts with discretionary accruals to the investors' response. This study differentiates itself from previous ones on corporate reputation and earnings management based on three main contributions to the existing literature.

First, this research examines whether corporate reputation impacts managers' earnings management behaviour through discretionary accruals. It is argued that managers in firms with worse reputation manipulate more discretionary accruals than managers in firms with better reputation. One of the main incentives of earnings management is to mislead stakeholders, especially investors. Investors make investment decisions based upon firms' reputation and reported earnings (Graham and Dodd, 2008). Bagnoli and Watts (2000) suggest that firms have incentives to manage earnings to influence investors' and creditors' perceptions about the firm's value. Therefore, firms with worse reputation may have stronger incentives to inflate earnings. By using the financial data from WRDS, I estimate the discretionary accruals by Jones model, modified Jones model and performance-adjusted Jones model. Together with the reputation data from Fortune's America's Most Admired Companies, I find that firms with worse reputation do make greater use of increasing accruals than do more reputable firms. The results are robust with three different measures of discretionary accruals.

Second, in addition to using discretionary accruals, this study also investigates the relationship between corporate reputation and earnings management using real activities as the approach of how to manage earnings. Healy and Wahlen (1999) suggest that there are two approaches for managers to manage earnings: (1) accounting choice and (2) structuring real transactions. Graham et al. (2005) suggest that managers prefer to engage in real earnings management rather than using discretionary accruals to manipulate earnings. Cohen et al. (2008) and Cohen and Zarowin (2010) indicate that manipulation through real activities is even more common than that through discretionary accurals. However, with regard to the relationship between corporate reputation and earnings management, existing studies focus only on the earnings management through accounting choice i.e. discretionary accruals. I test the real earnings management in sales manipulation, overproduction and discretionary expenditures, and find that, compared with reputable firms, firms with poor reputation tend to manipulate more sales and discretionary expenditures to increase earnings.

Third, our theoretical analysis examines a game between the investors and the manager based on different situations, which implies that firms with poor reputation among investors intend to increase earnings in order to mimic the firm with better financial potentials. In the equilibrium, when the real earnings are low, reporting strategically is the expected outcome for the firms, especially for those firms with lower reputation. That is, managers in less reputable firms do have intense incentives to manage earnings upwards compared to the managers in reputable firms. The empirical results is consistent with this theoretical prediction.

6.2 Limitations of The Study and Future Research

There are several potential limitations in this thesis. First the sample for the American's Most Admired Companies is drawn from a selection of the largest U.S. firms and the sample for the empirical tests in this study excludes the regulated industries. Therefore, the results of the study may not be applicable to smaller firms or to regulated firms. However, our findings are generally consistent with previous evidence offered by existing literature. Second, some variables may possibility be subject to some measurement error. The discretionary accruals measures may be criticised due to the potential misclassification of discretionary and non-discretionary accruals.

For future research, there are several directions to extend this study. First, this study only uses one measure for corporate reputation. Future research may use other reputation measures to test how the corporate reputation affects the manager's decision making. Second, different expectations on investors' rationality may be taken account into the theoretical analysis. With the development of behavioural finance, several theoretical research argue that the investors are not fully rational. Learning process may be incorporated into the repeated game analysis. As different expectations may lead to different equilibrium, future studies may model how the managers response to the different investors' expectations in the repeated games.

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