DISCRETIONARY ACCOUNTING CHOICES: AN INFORMATION PERSPECTIVE

By:
Pascal Frantz
London Business School

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ABSTRACT

This thesis seeks to explain discretionary accounting choices in a world in which managers have discretion and do exercise discretion when reporting their firms' financial statements. It provides a review of the main perspectives adopted by the accounting literature on the discretionary reporting choices made by managers. It reviews both the papers explaining discretionary disclosures and the papers explaining discretionary accounting choices.

Most of the accounting literature adopts an "opportunistic behaviour" perspective on accounting choices by assuming that managers use their discretion, at best, to attempt to fool outside claimholders on behalf of the existing shareholders, and, at worse, to increase their own welfare at the expense of the existing shareholders. However, a number of scholars have alluded to the potential for discretionary accounting choices to act as signals for the quality of the firm. This thesis provides the accounting literature with a number of signalling models, alluding to an "information perspective" and illustrating how accounting choices may enable the manager to reveal his private information concerning future earnings or cash-flows in a world characterised by an information asymmetry between the manager and the financial market. In each of these models, it is the adoption of conservative accounting policies, that is, the adoption of either income-reducing or balance sheet-weakening policies, which signals strength.

This thesis finally provides a unifying treatment of the common features of the models and an exposition of the empirical implications of these models versus the main alternative categories of discretionary accounting choice models. It offers an interpretation of the implications of the existing empirical work for the relative merit of the various models.

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CHAPTER 1

INTRODUCTION

Empirical evidence suggests that companies do spend considerable resources to provide information to potential claimholders, even when there is no legal requirement to do so. Foster (1986), for instance, reports evidence of firms issuing financial statements at more frequent time intervals than is mandated by the regulatory bodies and of firms releasing considerably more information in their financial statements than is mandated by the regulatory bodies.

With respect to the demand for financial statement information, the accounting literature displays two main perspectives. A first one, developed by financial economists such as Diamond (1985), focuses on the value of information to investors making investment decisions. A second one, developed by financial economists such as Jensen and Meckling, focuses on wider contracting issues. In this perspective, the firm can be described as a:

> "legal fiction which serves as a nexus for a set of contracting relationships among individuals. The firm serves as a focus for a complex process in which the conflicting objectives of individuals, some of whom may represent other organisations, are brought into equilibrium within a framework of contractual relations".

Both external and internal contracting are thus characterised by potential agency problems [Jensen and Meckling (1976), Gjesdal (1981)]. Agency problems may arise between actors with different objective functions. Demand for information in this framework is thus related to its ability to facilitate contracting, including bonding and monitoring.

Managers would appear to have a comparative advantage in supplying information. Healy and Palepu (1993) write that:

> "Top management are hired because they have expertise in managing firms' investment and operating strategies. Managers acquire this expertise through formal education, work experience in the industry, and investment in firm-specific information. It is therefore no surprise that managers are typically better than outside investors in interpreting their firms' current condition, and

forecasting future performance".

Financial reporting is the mechanism used by managers to communicate with outside investors. As stated by Healy and Palepu (1993), financial statements have the potential to convey managers' superior information because accrual accounting not only requires managers to record past events, but also requires them to make forecasts of future effects of these events.

Accounting rules are however imperfect. Managers would appear to enjoy some discretion in the reporting process. They may or may not, for instance, disclose private information such as earnings forecasts. They would appear to enjoy some discretion over the timing of the release of their private information. Managers may also influence the content of the financial reports, which constitute the primary information source of any company's stakeholders, whether shareholders, debtholders, or suppliers. They make choices of accounting policies in such areas as inventory valuation - FIFO versus LIFO -depreciation -accelerated versus straight-line - or the treatment of investment tax credits -flow-through versus deferral. In addition to the selection of accounting methods, managers exercise discretion over intramethod variations, such as the length of amortising periods and the choice of residual values, over the timing of write-downs for recognising asset value impairments, and over the level of anticipated loss reserves.

It has already been established that, in Jensen and Meckling's framework, managers and other stakeholders such as shareholders and debtholders may face different objective functions. The combination of imperfect accounting rules and potential differences in objectives may lead to "distorted" financial statements [Johnson and Revsine (1988)]. Auditing may thus be viewed in this framework as a third-party mechanism whose role is to limit earnings management by managers. As stated by Johnson and Revsine, auditing is however unlikely to fully eliminate it. Concerns by auditors about legal liability may even hamper management's ability to use financial reports to communicate effectively with outside investors.

Empirical evidence suggests that managers may manage potential claimholders' perceptions by disclosing their private information selectively and misrepresenting it. Chambers and Penman (1984) report for instance that late earnings announcements contain on average worse news as compared to early announcements. Healy (1985) provides evidence that firms' accounts are more likely to reveal income-decreasing accruals when the lower and upper bounds of their managers' bonus plans are binding. McNichols and Wilson (1988) report evidence that managers manage earnings by the means of discretionary write-offs and provision for bad debts.

1.1 Managerial Discretion: The Main Types Of Discretion

The accounting literature on managerial discretion in reporting, which deals with *discretionary reporting choices*, distinguishes between two main types of managerial discretion: managerial discretion in deciding whether or not to release information, the information being released having to be truthful, and managerial discretion in deciding which number to report, the manager being assumed to have to disclose his information. The former type of managerial discretion deals with *discretionary disclosures*. The latter type of discretion deals with *discretionary accounting choices*.

Discretionary disclosures include disclosures of earnings forecasts and segmental information. Managerial discretion may be exercised before the manager knows of the realisation taken by the information to report and may be referred to as an ex-ante discretion. In this area, Diamond (1985) shows for instance why managers may want to precommit to releasing public information. This thesis will however not address issues related to ex-ante discretion since most of the accounting literature[1] focuses on the managerial discretion exercised when deciding whether or not to disclose a piece of information once the manager knows whether the information to disclose is good or bad. The latter type of discretion may be referred to as ex-post

[1] Darrough and Stoughton (1990), Dontoh (1989), Dye (1985a), Feltham and Xie (1993), Verrechia (1983) and (1990), Trueman (1986), Wagenhofer (1990).

discretion.

With respect to accounting choices, the function transforming "economic earnings" into "reported earnings" may take potentially any functional form. Two special cases, "smoothing income" and "taking a bath", are however of special interest to the accounting world. A manager is said to smooth income if he reports higher income than was actually incurred when the actual results are poor and if he reports lower income than was actually incurred when the actual results are good. By contrast, a manager is said to take a bath, if in a poor year, he reports even worse results. A number of theoretical papers, such as those published by Dye (1988), Suh (1990), and Trueman and Titman (1988), have shown how income smoothing may arise as rational equilibrium behaviour. Fewer papers, [Healy (1985)], have been published to justify why managers may want to take a bath.

The distinction made by the accounting literature between managerial discretion in deciding whether or not to release information and managerial discretion in deciding which number to report is however somewhat artificial for the following reasons. First, demand for both types of discretion is motivated by similar arguments which are reviewed in the remaining part of this chapter. Second, both types of managerial discretion may enable the manager to achieve the same objectives. Dye (1985b) illustrates this point by showing how the manager may choose a function transforming "economic" into "reported" earnings so as not to reveal some underlying piece of information. Finally, the manager of a firm may actually enjoy both types of discretion at the same time.

1.2 Managerial Discretion: The Consequences

On discretionary accounting choices, the accounting literature offers both "no-effect" and "economic consequences" perspectives. The no-effect perspective, which is embodied in the early literature, asserts that accounting policies have no economic consequences. This accounting irrelevance proposition is analogous to the Miller-Modigliani capital structure and dividend irrelevance propositions in financial

economics [Holthausen and Leftwich (1983)]. Systematic choices of accounting techniques are explained by tradition, folklore, or imitation. The potential agency conflict generated by managerial discretion in reporting earnings is not perceived as being a significant problem. According to Kaplan and Roll (1972), "Earnings manipulation may be fun, but its profitability is doubtful". Such a statement is based on the idea that the investors can see through the reports and undo any manipulation provided the accounting techniques used are disclosed.

Early empirical tests provide some evidence that there is, on average, no abnormal stock price return associated with changes in accounting procedures. It is however difficult to draw conclusions from these early studies because of methodological limitations which have now become apparent [Holthausen and Leftwich (1983), Watts and Zimmerman (1990)].

Economic consequences theories of accounting choices gained favour when Watts and Zimmerman (1978) and Holthausen and Leftwich (1983) applied the work of Coase (1937) and Jensen and Meckling (1976) to the accounting world. Economic consequence theories assert that accounting choices do have economic consequences. According to Holthausen and Leftwich (1983), accounting choices have economic consequences if "changes in the rules used to calculate accounting numbers alter the distribution of firms' cash-flows or the wealth of parties who use these numbers for contracting or decision-making purposes". Under this approach, accounting choices directly affect parties' contractual claims and, hence, the value of these claims. Economic consequence theories are driven by contracting costs. Contracting costs potentially consist of both transaction and agency costs. Transaction costs include negotiation[2] and information search costs. Agency costs include monitoring[3] and bonding costs as well as the residual arising from any dysfunctional behaviour.

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2 Negotiation costs encompass the costs of assessing, negotiating, writing, and, if needed, renegotiating the terms of the contracts.

3 Monitoring costs encompass the costs of becoming informed about performance under contracts, and assessing compliance with the terms of the contracts.

Economic consequences of accounting choices, as analysed in the accounting literature, result from causal links between firms' cash-flows and reported accounting numbers such as management compensation plans, government regulation, lending agreements, and political visibility. Accounting numbers[4] are introduced in management compensation plans in order to minimise any moral hazard problem - hidden action or hidden information - arising from the separation of ownership and control [Watts (1977)]. Utilities are subject to accounting-based rate-of-return regulation [Holthausen and Leftwich (1983)]. Financial institutions are subject to accounting-based capital adequacy ratios [Holthausen and Leftwich (1983)]. Accounting numbers are used in debt contracts in order to reduce the agency costs of debt [Smith and Warner (1979), Leftwich (1983)]. The extent to which a firm is criticised or supported by consumers, employers, unions and politicians, and thus the extent to which the firm is subjected to implicit or explicit taxes, is assumed to be affected by reported accounting numbers [Watts and Zimmerman (1978)].

On discretionary disclosures, the accounting literature only offers "economic consequences" perspectives. Disclosing information involves potentially substantial proprietary costs. These proprietary costs associated with proprietary information include all the costs associated with disclosure, and comprise information collection and processing costs, litigation costs, political costs, competitive disadvantage costs, and any other costs arising from the constraint the disclosure places on management behaviour [Foster (1986)]. Disclosing information furthermore may alter the financial market's expectation of future earnings and cash-flows and may thus result in a new valuation of the firm.

1.3 Managerial Discretion: The Main Research Traditions

On managerial discretion in reporting, the economic consequences literature

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4 Recent papers by Bushman and Indjejikian (1993) and Kim and Suh (1993) show that it may be optimal for the manager's compensation function to include earnings in addition to stock prices, despite the fact that earnings information is impounded into share prices.

comprises two main branches: the positive accounting theory[5] and the economic theory research traditions. Both branches of the accounting literature provide similar frameworks. Discretionary reporting choices arise from the interaction of self-interested actors within an economic context. Both branches of the accounting literature differ however in their emphasis and focus.

The economic theory research tradition comes in two forms: the principal-agent and and adverse selection versions. The principal-agent version of the economic theory research tradition derives optimal accounting systems and compensation contracts, given the allocation of tasks and ownership rights. The agent is assumed to have access to some private information, with respect to either some state of nature or his choice of action, to which the principal cannot costlessly gain access. The agent is also assumed to be risk-averse and work-averse. The principal may however use reported earnings as arguments in contracts. Given these assumptions, each individual's actions are endogenously derived, based on well-specified preferences and beliefs. The optimal contract typically trades off efficient risk sharing and efficient production.

The adverse selection version of the economic research tradition is based on the argument developed by Akerlof (1970). In the area of accounting, it is mainly applied to discretionary disclosures. When applied to discretionary disclosures, the adverse selection argument broadly says that, if a manager is endowed with a piece of non-proprietary information, the information will be disclosed because a lack of disclosure is associated with the worst possible information.

As opposed to the economic theory research tradition, the positive accounting theory research tradition deemphasises the formal derivation of optimal contracts because it assumes that the observed contracts are optimal given transaction costs and the impossibility to write complete contracts. As stated by Baiman (1990),

> "In contrast to the principal-agent version, the Rochester version works with less formal and less explicit models and analysis... In particular, it studies the

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5 This research tradition is also referred to as the Rochester school of thought.

incentives faced by the contracting parties given observed contracts and what factors might have given rise to the observed contracts".

The positive accounting research tradition has a strong empirical focus. As stated by Watts and Zimmerman (1990), "The economic approach we and many others use applies a simple proposition: To predict and explain individual behavior...". Like the principal-agent theory, the positive accounting theory tends to focus on discretionary accounting choices rather than on discretionary disclosures. The positive accounting theory also addresses one of the criticisms made to the principal-agent version of the efficient contracting perspective: debtholders are distinguished from shareholders and the financial markets play a central role.

1.4 Managerial Discretion: The Main Perspectives

Economic consequences theories of managerial discretion in reporting come in four mutually non-exclusive perspectives: the mechanistic, opportunistic behaviour, efficient contracting, and information perspectives. The remaining part of this section reviews each of these perspectives in turn.

The Mechanistic Perspective

A first economic consequence perspective, which will be referred to as the "mechanistic perspective", states that investors respond to reported accounting numbers per se and do not discriminate among accounting numbers generated by different accounting policies. Changes in accounting procedures which increase reported earnings should therefore be associated with increases in share prices. The mechanistic perspective is mainly used as an alternative null perspective to the no-effect perspective in empirical tests of other economic consequence perspectives.

The Opportunistic Behaviour Perspective

A second economic consequence perspective, which has attracted a vast amount of literature, is often referred to as the "opportunistic behaviour perspective". This

perspective recognises that managerial discretion in making accounting choices may cause corporate accounting systems to contribute to agency problems between managers, shareholders, and debtholders.

According to the opportunistic behaviour perspective, discretionary accounting choices may enable shareholders to improve their firm's existing contractual terms with outsiders. Lilien and Pastena (1982) argue that oil and gas firms with high debt to equity ratios elect to use the full cost method instead of the successful efforts method in order to relax any binding debt covenants. Holthausen (1981) develops a model in which managers have an incentive to choose income-increasing accounting procedures in order to relax accounting-based debt covenants. De Angelo (1988) argues that managers of firms subject to proxy fights and takeover battles choose to adopt income-increasing accounting measures.

According to the opportunistic behaviour perspective, managers may also use their discretion over accounting procedures to increase their compensation because accounting numbers are used to evaluate and reward them. Healy (1985), for example, develops a model in which capped accounting-based compensation schemes induce managers to adopt income decreasing accounting procedures if corporate results are extreme and income increasing procedures otherwise. Zmijewski and Hagerman (1981) argue that managers of firms endowed with bonus plans do use income-increasing accounting measures. This type of opportunistic behaviour by managers causes Johnson and Revsine (1988) to call for regulatory intervention.

Ex-post wealth transfers arising from managerial discretion in accounting do however not necessarily generate agency costs. Ex-post wealth transfers arising through the choice of observable accounting procedures such as depreciation policies may be anticipated ex-ante. The compensation contract offered to the manager may thus reflect the expectation that the manager selects accounting policies such as choices of depreciation methods to maximise his compensation. As pointed out by Watts (1988), there is only an agency problem if managers increase their compensation by reducing the total pie available to themselves, shareholders, and

other parties to the firm.

The Efficient Contracting Perspective

A third economic consequence perspective, which will be referred to as the "efficient contracting perspective", asserts that both accounting methods and contracts are selected to minimise the agency costs amongst the various parties of the firm[6]. The efficient contracting perspective comes in two different forms: the "principal-agent" and "positive accounting theory" versions. Both the positive accounting theory and principal-agent branches of the efficient contracting literature share the objective of understanding how agency problems arise and may be mitigated by contractual and organisational design. The focus and emphasis of the two branches do however differ.

Seminal papers alluding to the principal-agent version of the efficient contracting perspective include Dye (1988), Demski, Patell, and Wolfson (1984), and Verrechia (1986). Dye (1988) analyse the demand for earnings management induced by current shareholders' attempts to alter prospective investors' perceptions of the firm value in an overlapping generations model. Demski, Patell, and Wolfson (1984) show that, when the manager is endowed with private information about the firm's production function, shareholders may rationally prefer to delegate the choice of accounting procedures to the manager, even if the manager's compensation depends on his accounting choice. Verrechia (1986) shows that shareholders may be better off allowing managers discretion over the choice of reporting alternatives even if this choice is not observable and thus involves an element of moral hazard.

As in the principal-agent version, accounting is viewed as an integral part of the firm's contracting in the positive accounting theory version of the efficient contracting perspective, in spite of the lack of formal and analytical models. As

6 In contrast, the opportunistic behaviour perspective, takes the firm's observed contracts as given and then determines managers' incentives for accounting choices. As stated by Schipper (1989), "Most earnings management research assumes that the feasible reporting set and the contract set are predetermined".

stated by Ball (1988),

> "The firm's economic function is to minimise contracting costs...The firm is modelled as a specialist contracting intermediary, intermediating between consumers and suppliers of factors of production, exploiting scale economies in repetitive contracting by centralising contracting in one institution... Accounting can be viewed as a specialist function for providing information used in firm's contracting".

In this framework, discretionary accounting choices, such as choices of accounting procedures, are thus made for efficiency reasons.

Early writers, who embraced this perspective, include Watts (1977) and Leftwich (1983). Watts (1977) makes predictions about the likelihood that a company will present financial statements and about the content of the financial statements presented, assuming that the company's objective is to reduce the potential loss arising from the conflicts of interests between managers, shareholders, and bondholders. Leftwich (1983) determines in a study of private corporate lending agreements that the accounting numbers used for contracting purposes often deviate from the set of generally accepted accounting principles (GAAP) with the aim of monitoring more efficiently the conflict of interests between stockholders and bondholders.

More recently, Malmquist (1990) argues that "the choice between full cost and successful efforts accounting in the oil and gas industry is governed by the need to efficiently monitor the contracts among the economic agents of the firm". Mian and Smith (1990) argue that the larger the operating, information, and financial interdependencies between the activities of the parent company and its subsidiary, the more likely the subsidiary's operations will be reported on a consolidated basis. Ball (1989) argues that accounting numbers are used within the firm as a device to guide resource allocations and hypothesises that there is a positive association between accounting depreciation and the firm's product price.

The Information Perspective

A fourth economic consequence perspective, which will be referred to as the

"information perspective", has been suggested as early as 1974 by Gonedes and Dopuch. This perspective comes in different forms, each of them recognising that managers have a comparative advantage in providing information about their firms.

The "adverse selection" version of the information perspective is based on the argument developed by Akerlof (1970). The adverse selection argument assumes that firm value maximising managers are endowed with some private information concerning their firm. Non-disclosure of the information by managers leads the financial markets to believe that the information is bad news. Disclosure of the private information may however hurt the firm's competitive position and thus lead to non-disclosure sets [Darrough and Stoughton (1990), Feltham and Xie (1993), Wagenhofer (1990)].

The "signalling" version of the information perspective is based on the argument developed by Spence (1974). Accounting choices play the same role in this version of the information perspective as dividends in Miller and Rock (1985), capital structure in Ross (1977), and share ownership in Leland and Pyle (1977). Managers are assumed to be endowed with private information about their firm's investment and production activities. This information is further assumed to be prohibitively costly to communicate. Accounting choices are made in order to reveal managers' private information.

Several papers suggest that accounting choices can serve as signals of inside information [Demski, Patell, and Wolfson (1984), Dye (1988), Holthausen (1983), Holthausen (1990), Holthausen and Leftwich (1983), Holthausen (1990), Watts and Zimmerman (1990)]. Few models have however yet been developed in this framework.

Hughes and Schwartz (1988) suggest that the choice of inventory method is used by managers in order to signal their private information about their firms' future expected cash-flows. In this model, the use of FIFO signals good news because it leads to a reduction in cash-flows, and thus to an increase in expected bankruptcy

cost. Hughes, Schwartz, and Thakor (1991) extend this idea and show how firms can combine choices of inventory methods with choices of capital structure to communicate their private information. Jung (1989) and Bar-Yosef, Hughes, and Venezia (1993) show how the choice of inventory method can signal growth in the firm's costs.

Watts and Zimmerman (1990) state that "the information perspective has taught us much about the relation between accounting numbers and stock prices". They also claim that:

> "Except for the choice of inventory methods, the information perspective has not provided hypotheses to predict and explain accounting choices. In particular, the information perspective has not provided hypotheses to explain why entire industries switch from accelerated to straight-line depreciation without changing their tax depreciation methods".

The aim of this thesis is to provide the literature with a number of analytical models alluding to the information perspective and explaining "visible accounting choices".

The opportunistic behaviour, efficient contracting, and information perspectives all agree that there is a positive correlation between accounting choices and cash-flows. They however disagree on the direction of causality. The opportunistic behaviour perspective suggests that managers make accounting choices in order to transfer wealth from other actors. The efficient contracting perspective suggests that managers make accounting choices in order to maximise firm value. Accounting choices thus have a direct effect on the firm's cash-flows in both the opportunistic behaviour and efficient contracting perspectives. The information perspective suggests however that accounting choices provide information about future cash-flows, but may not affect them directly.

All the various economic consequences perspectives described in this paper may be compatible with rational behaviour by investors. Investors' rationality is trivial to establish in the principal-agent version of the efficient contracting perspective. Transaction cost economics enables researchers to establish investors' rationality in the other perspectives [Williamson (1986)]. Investors' behaviour may be optimal

in the Rochester version of the efficient contracting perspective because the observed contracts are assumed to be optimal given transaction costs. Investors' behaviour may be optimal in the signalling version of the information perspective because it is implicitly assumed that the manager cannot directly communicate the private piece of information he is endowed with. Investors' behaviour may also be optimal in the mechanistic and opportunistic behaviour perspectives given the absence of alternative sources of information and large costs of information processing relative to the gains they may capture.

1.5 Outline Of The Thesis

This thesis seeks to explain discretionary accounting choices in a world in which managers have and do exercise discretion when reporting their firms' financial statements. It can be divided into two distinct parts. The first part of this thesis provides a review of the main perspectives adopted by the accounting literature on the discretionary reporting choices made by managers. Chapter 2 reviews the theoretical literature dealing with discretionary disclosures and explaining how leaving the manager with the decision whether or not to release information may arise as rational equilibrium behaviour. Chapter 3 reviews the theoretical literature dealing with discretionary accounting choices and explaining how "earnings management" may arise as rational equilibrium behaviour. Chapter 4 reviews the empirical literature dealing with discretionary accounting choices.

The second part of this thesis provides the accounting literature with a number of signalling models, alluding to an "information perspective" and illustrating how accounting choices may enable the manager to reveal his private information concerning future earnings or cash-flows in a world characterised by an information asymmetry between the manager and the financial market. Chapter 5 introduces a compensation-based signalling model explaining discretionary accounting choices such as changes in accounting procedures. Chapter 6 introduces a debt covenants-based signalling model explaining discretionary accounting choices such as changes in accounting procedures. Chapter 7 introduces a signalling model explaining the

provisions for restructuring and other non-cash provisions reported by managers. Chapter 8 introduces a signalling model explaining the discretionary write-downs, write-offs, and other provisions reported by managers. Chapters 5, 6, 7, and 8 do constitute related but stand-alone papers and therefore contain conscious but unavoidable elements of repetition. Chapter 9 provides a unifying treatment of the common features of the models and an exposition of the empirical implications of these models versus the main alternative categories of discretionary accounting choice models.

The contribution made by this thesis is thus twofold. It provides the accounting literature with the first signalling models, in which it is the adoption of conservative accounting policies, that is, the adoption of either income-reducing or balance sheet-weakening policies, which signals strength. It also provides the accounting literature with a comprehensive review of the literature on managerial discretion in reporting by integrating the literatures on discretionary disclosures and discretionary accounting choices in a common framework.

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CHAPTER 2

DISCRETIONARY DISCLOSURES:
A REVIEW OF THE ECONOMIC THEORY LITERATURE

The early theoretical research on voluntary disclosure by firms deals with ex-ante disclosure choices. A first study undertaken in a general equilibrium framework shows that the release of public information may often make all shareholders worse-off because of adverse risk-sharing effects [Hakansson, Kunkel, and Ohlson (1982)]. A second study provides however a positive theory of voluntary disclosure in which a policy of full disclosure by firms makes all shareholders better off than a policy of no disclosure [Diamond (1985)]. Precommitment to disclosure thus maximises the firm's ex-ante value. Diamond obtains this result by considering the effect of various public disclosure policies on the collection of private information by shareholders.

More recent theoretical research on voluntary disclosure by firms considers ex-post disclosure choices, that is, disclosure choices which are contingent on the content of the information. This chapter reviews a number of seminal papers explaining how ex-post discretion is exercised as *rational equilibrium behaviour* assuming that the firm cannot misrepresent its information[1].

Optimal corporate disclosure policies are affected by the type of information the firm's manager is endowed with. The literature on corporate disclosures mainly distinguishes between proprietary and non-proprietary information. Both proprietary and non-proprietary information, when released, affect potentially the firm's current share price. But, conversely to non-proprietary information, proprietary information may alter upon release the firm's future earnings gross of management's compensation.

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1 Truthful revelation may be induced by threat of litigation.

2.1 Non-Proprietary Information

Most theories of ex-post disclosure conclude that full disclosure of non-proprietary information by firms is optimal if firms cannot precommit not to release any information, but can make credible announcements of their information, and if these firms are not subject to information dissemination costs. Financial economists would expect disclosure of non-proprietary information to occur because of two principles, one called by Dye (1985) the disclosure principle, and one called by Myerson (1979) the revelation principle. The revelation principle simply suggests that optimal contracts can be designed so that each contracting party has no incentive to make distorted claims regarding his private information. The disclosure principle, as stated by Dye, suggests that "If investors know a manager is endowed with one particular bit of non-proprietary, relevant, affable information, the release of which does not alter the management's compensation, and investors can take positions on markets prior to the information release, then this information will be disclosed". The disclosure principle is based on adverse selection arguments: in the absence of disclosure, investors infer that information is the worst possible, revise therefore downwards their demand for shares and cause the firm's share price maximised by the manager to plummet.

Trueman (1986) shows that the manager of the firm may want to disclose noisy and non-proprietary information as soon as he receives it even if the manager maximises the end-of-period value of the firm and perfect information is made available at the end of the period to both the investors and the manager. The reason why the manager is motivated to release earnings forecasts in advance of actual earnings announcements is that the act of release itself provides a positive signal about the firm's expected earnings in subsequent periods. This result is due to the fact that the firm's market value reflects investors' perceptions of the manager's ability to anticipate future changes in the firm's environment and adjust the firm's production plans accordingly.

Trueman's two-period partial-equilibrium model includes a firm, its managers, and

risk-neutral investors. The manager has control of production decisions. His objective function includes a component related to the market value of the firm obtaining at the end of the first period. The firm faces some uncertainty in each period about the unit price it receives for each periods's output. At the beginning of each period, there is no asymmetry of information between the managers and the investors about which state of nature is to occur. Later on during each period, the manager may however observe privately a signal which enables him to revise his expectation of the period's unit price to be received for that period's output. The time of arrival of this information is stochastic. It is generated from a probability distribution which is assumed to be stationary over the two periods. Outside investors do not know the exact probability distribution of the information arrival times. The manager can change the firm's production level upon receipt of information, but with a time lag. The magnitude of this time lag is stochastic and its distribution is known to both the manager and the investors. The investors do however not observe the realisation of the time lag.

Trueman shows that, given costless disclosure, the manager releases an updated earnings forecast in the first period as soon as he gets new information about the end-of-period earnings. The manager releases his information immediately because the investors update their predictive distribution for the stochastic time of arrival of information in the second period from the time of information release. Releasing the private information immediately provides the investors with a more favourable assessment of the manager's ability to anticipate economic changes and to adjust production plans accordingly. Releasing the private information therefore translates into a higher end of period firm value.

Empirical evidence produced by Patell (1976), Penman (1980), and Waymire (1984) would appear to support Trueman's theory. All these papers report positive average share price changes at the time of forecast disclosure. Evidence provided by Ajinkya and Gift (1984) would however suggest that the average price change at the time of forecast disclosure might be insignificantly different from zero.

Empirical evidence would appear not to support the theory that full disclosure by firms of their non-proprietary information is always optimal. It is commonly believed that senior managers are reluctant to disclose non-proprietary information they possess about the firm they run. Monthly updated forecasts of a firm's current year earnings are for instance seldom released. Introducing litigation costs in Trueman's model would limit the frequency of the disclosure of earnings forecasts. One would however have to drop the assumption that managers release only truthful forecasts. Dye (1985) and (1986), Jung and Kwon (1988), and Teoh and Hwang (1991) provide single period partial-equilibrium models showing that partial-disclosure and non-disclosure equilibria can obtain even in the absence of any proprietary costs.

Dye (1986) gives sufficient conditions for the obtention of a partial-disclosure equilibrium in a model in which managers possess a variety of private information, both proprietary and non-proprietary, with known statistical interdependencies. Full disclosure does not occur because the failure to release non-proprietary information does not necessarily cause the value of the firm to plummet since the price of the firm depends on the market's estimates of both the non-proprietary and proprietary components of the manager's information. An announcement of the non-proprietary component of the manager's information may lead to a lower price for the firm than does the absence of any announcement. The revelation principle does not hold because of the inability to make binding commitments to contracts: outside investors would not honour any contract to disregard the information disclosed when determining their demands for shares in the firm.

Jung and Kwon (1988) obtain a partial-disclosure equilibrium in a model in which the risk-neutral investors are unsure whether or not the manager is endowed with private information. The partial-disclosure equilibrium is characterised by a unique threshold end-of-period value of the firm below which the manager withholds his information and above which he discloses it. This threshold value is shown to decrease as the probability that the manager is endowed with private information increases. This implies that unfavourable news should be contained on average in

late announcements if investors believe that managers are more likely to receive information about period earnings as a fiscal year-end is drawing near. The threshold value associated with a density function of prior beliefs - about the end-of-period value of the firm - that is dominated in the sense of first- or second order stochastic dominance by another density function of prior beliefs is also shown to be lower than the threshold value associated with the dominant density function. Then, as stated by Jung and Kwon, "Investors' information acquisition through an independent source may trigger the release of private information which had previously been suppressed due to its unfavourableness but has now become favourable compared to the information that the market has independently acquired". This implies that the release of "bad" news in the financial press may trigger the announcement by the firm of "not so bad news" by the firm.

This equilibrium obtains because investors are unsure in the absence of disclosure whether non disclosure is due to the non-existence of information or to its adverse content. The disclosure principle therefore does not hold. The revelation principle does not hold either because of the inability to make binding commitments to contracts.

Empirical evidence supports the main properties shown to obtain in the paper. Laboratory experiments carried out by King and Wallin (1991) suggest that investors price the asset consistently with the manager's disclosure strategy and that the minimum observed value voluntarily disclosed rises with increases in the ex-ante probability that the manager does not have private information. Patell and Wolfson (1982), Kross and Schroeder (1984), and Chambers and Penman (1984) observe that late earnings announcements contain on average worse news as compared to early announcements.

Dye (1985) gives sufficient conditions for observing non-disclosure equilibria in a model characterised by a moral hazard problem between the manager and the shareholders, the resolution of which is best accomplished by a contract depending on the value of the firm. The manager is endowed with private and perfect

information about the firm's end-of-period value, and can release it at a certain date. The risk-neutral investors receive publicly observable private and noisy information at a later date, and know that the manager is endowed with information. The distributional relationship between the end-of-period value of the firm, the pieces of information observed by the investors, and the action chosen by the manager are such that the average of all the pieces of information observed by the investors is sufficient for all variables with respect to the action chosen by the manager, but the end-of-period value of the firm is never. The manager's contract is based on the firm's value at the date when investors get endowed with information.

Non-disclosure equilibria can obtain in such an environment because the value of the firm contains information that is useful for contracting purposes, and because the informativeness of price is the highest when it incorporates the average value of the investors' pieces of information. Disclosure of information by the manager is non optimal because disclosure destroys other information, thereby exacerbating the principal-agent problem present in the model. The revelation principle does not hold because of the inability to make binding commitments to contracts.

Empirical evidence consistent with this model has been reported by Leftwich, Watts, and Zimmerman (1981). These researchers could not find a relationship between disclosures and other variables interpreted as proxies for the existence of moral hazard problems.

Teoh and Hwang (1991) provide a model in which firms may prefer to withhold favourable non-proprietary information and disclose unfavourable news voluntarily. This equilibrium may obtain because of the presence of a non-disclosable piece of information, the firm's type, about the firm's likelihood of receiving favourable or unfavourable news in the future. The costs and benefits to disclosing early are endogenised and arise from managers trading off current signalling benefits or losses against the gains or losses in credibility at a later date. As stated by Teoh and Hwang, "A firm that has received good news and is confident of further good news at a later date can prove its confidence by waiting until the later date to disclose its

first piece of news. Furthermore, a confident firm with current bad news that it expects to be counteracted by later good news can prove its machismo by disclosing the bad news early. In contrast, a firm that currently possesses good news but is pessimistic about future prospects may prefer to disclose the earlier good news to prove that it is not the worst firm. At worst, a firm may have current bad news and little hope of obtaining good news in the future. Such a firm may withhold the current bad news in the hope of being mistaken initially for a confident withholding firm".

Teoh and Hwang show that other and more traditional equilibria, such as full-disclosure and threshold equilibria, may also obtain. They argue however that these equilibria are somewhat unreasonable in their setting and do not pass standard strategic refinement criteria such as the intuitive criterion designed by Cho-Kreps (1987).

Testable implications of this model include the fact that firms release voluntarily unfavourable information even if the disclosure causes the firm's price to decline. Empirical evidence reported by Ajinkya and Gift (1984), Waymire (1984), and Lev and Penman (1988) confirms that firms disclose both favourable and unfavourable earnings predictions. In contrast to the previous papers, this paper also predicts that firms may elect to disclose information even if it leads to a more adverse price reaction in the short run than would non-disclosure.

2.2 Proprietary information

The existence of partial-disclosure equilibria is easier to establish when the information to be disclosed is proprietary. The non-cohabitation of these equilibria with full-disclosure equilibria would however appear to depend on the degree of completeness of information and on the way proprietary costs are modeled. The proprietary costs associated with proprietary information include all the costs associated with disclosure, and comprise in Foster's terms information collection and processing costs, political costs, competitive disadvantage costs, and any other costs

arising from the constraint disclosure places on management behaviour.

Verrechia (1983) demonstrates the existence of a discretionary disclosure equilibrium in which managers do only release information which is sufficiently favourable. The threshold of disclosure is obtained in an environment in which information disclosure costs are specified exogenously and do not depend on the content of the information disclosed, and managers maximise the present value of their firm and are endowed with some noisy and private information about the firm's liquidating value. The discretionary disclosure equilibrium obtains because investors are unable to interpret unambiguously withheld information as bad news in the presence of proprietary information costs, and therefore cannot discount the value of the firm to the point that the manager is better off disclosing what he knows.

The properties of this discretionary disclosure equilibrium are further analysed in Verrechia (1990a). The threshold level of disclosure is shown to be an increasing function of the proprietary cost of disclosure. It is also shown to increase as the precision of prior beliefs about the firm's payoff increases, and to decrease as the precision of the manager's information increases. Testable implications include the facts that firms in highly competitive industries should disclose less often than firms in less competitive industries, and that firms are better off at some point of time disclosing their information if the proprietary cost is decreasing to zero through time.

In contrast to Verrechia, Wagenhofer (1990) and Darrough and Stoughton (1990) obtain a full-disclosure equilibrium in their respective models which endogenise proprietary costs. Endogenous proprietary costs are obtained in game-theoretical settings comprising a privately informed firm, a 'strategic opponent', and a financial market. Disclosure of favourable financial information leads to a higher market valuation of the firm but can induce the strategic opponent to take an adverse action imposing proprietary costs on the firm. The strategic opponent could be, in Wagenhofer's model, a political agency - that is medias, trade-unions, or a regulator - which can impose costs on the firm, or a rival firm which may choose to enter the market if the firm discloses favourable information. In Darrough and Stoughton's

model, the strategic opponent is restricted to be a potential entrant. A full-disclosure equilibrium obtains in both models because disclosure can result in no proprietary costs if the information disclosed deters the opponent from taking an adverse action, and because non-disclosure can result in proprietary costs since the opponent may take an adverse action based on the information conveyed by non-disclosure.

Darrough and Stoughton obtain in some conditions a partial-disclosure equilibrium in mixed strategies and a non-disclosure equilibrium in addition to their full-disclosure equilibrium. This comes in contrast with Wagenhofer who can only obtain in some conditions a partial-disclosure equilibrium in pure strategies consisting of two distinct non-disclosure sets. This difference obtains because Darrough and Stoughton analyse only binary private information while Wagenhofer deals with a continuum of information.

Wagenhofer claims that the partial-disclosure equilibrium should be expected to occur in situations in which both full- and partial-disclosure equilibria could exist. This claim is made on the ground that the partial-disclosure equilibria are preferred by the firm and can be reached by the uninformed players through dynamic learning processes. This would appear to be consistent with empirical evidence reported by Verrechia (1990b). Verrechia suggests that the potential for full-disclosure is at odds with the fact that we consistently observe delays and withholdings in the dissemination of information.

Dontoh (1989) obtains, in contrast to Wagenhofer and Darrough and Stoughton, a unique discretionary disclosure equilibrium in a one-period model in which the product market is in equilibrium and disclosure costs are determined endogenously. Endogenous proprietary costs are obtained in a game-theoretical setting comprising a financial market and rival firms in an N-firm oligopoly facing uncertain demand and costs. Dontoh's equilibrium is sustained by incomplete information. The model comprises firms of two unobservable types, those of type A maximising their current market values and those of type B maximising their terminal values. During the period, some firms, but not investors, observe a signal about the stochastic parameter

affecting both the demand function and costs. In equilibrium, informed firms of type A disclose their information only when it is sufficiently favourable, while informed firms of type B disclose their information only when they conjecture that the expectations held by their uninformed rivals are more optimistic than their private information indicates as appropriate.

The introduction of exogenous disclosure costs is shown to decrease the likelihood of voluntary disclosures. Dontoh further establishes that, holding other factors constant, the larger the number of informed firms, the lower the incentive to voluntarily release information. An increase in the proportion of type A firms decreases (increases) the disclosure threshold level of type A (B) firms.

Testable implications of this model include the fact that firms release voluntarily unfavourable information even if the disclosure causes the firm's price to decline. Empirical evidence reported by Ajinkya and Gift (1984), Waymire (1984), and Lev and Penman (1988) confirms that firms disclose both favourable and unfavourable earnings predictions, and that in general, favourable (unfavourable) forecasts are positively correlated with share price increases (decreases).

2.3 Summary

This chapter reviewed a number of seminal papers explaining how ex-post disclosure choices may arise as rational equilibrium behaviour. The papers reviewed rely on either proprietary costs identified by Foster (1986) as collection and processing costs, political costs, and competitive disadvantage costs, or on other non-proprietary costs of disclosure. Though most of these models would appear to be quite intuitive, it could be argued that the threat of litigation may also affect disclosure. The next chapter reviews a number of seminal papers showing how discretionary accounting choices may arise as rational equilibrium behaviour.

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CHAPTER 3

DISCRETIONARY ACCOUNTING CHOICES:
A REVIEW OF THE ECONOMIC THEORY LITERATURE

This chapter reviews a number of seminal papers explaining how discretionary accounting choices may arise as *rational equilibrium behaviour*. Most of these papers form part of the principal-agent branch of the economic theory literature. This branch takes the organisation of the firm, including the allocation of ownership rights and management tasks, as given and concentrates on the choices of ex-ante accounting systems and employment compensation contracts. A risk-averse and work-averse firm's manager is typically assumed to have access to some private information, with respect to either some state of nature or his choice of action, to which the principal cannot costlessly gain access. Given these assumptions, each individual's actions are endogenously derived, based on well-specified preferences and beliefs. As stated by Baiman (1990),

> "The literature has focused on the formal analysis of an explicit, internally consistent model of the underlying economic environment in order to understand how the design of the employment relationship affects the efficiency loss from agency problems. This then allows the researcher to derive the optimal employment relationship for the specified environment."

The papers reviewed in this chapter justify earnings management by managers. Earnings management does not fool anyone since all claimholders in the papers reviewed do rationally anticipate the earnings manipulations induced and adjust their actions accordingly. The issue of social desirability of earnings manipulation is however not addressed in this chapter since all the models reviewed do abstract from general equilibrium effects.

Asserting that shareholders may demand earnings management from the managers of their firms may seem at first glance somewhat counter-intuitive. One would expect, other things being equal, that shareholders would prefer unmanaged to managed earnings. The reason why shareholders may prefer managed to unmanaged

earnings is that the implicit assumption that other things are equal may not be tenable. Giving a manager no incentive to manage earnings may for instance require shareholders to amend the manager's compensation package and make it independent of the earnings reported by the manager. This constraint may however change the manager's preferred action choice.

Potential devices for managing earnings, discussed in the literature, include the use of "substantive" investment and production decisions and more "cosmetic" accounting techniques. An illustration of real earnings management, is given by Lambert (1984). Cosmetic manipulations can be generated either by changes in the accounting policies followed by the firm, or by management's discretion over accruals. Managers make choices of accounting policies in such areas as inventory valuation, depreciation, and investment tax credits. Management's discretion over accruals includes management's ability to misrepresent the timing, amount, or intent of transactions, or events in the financial statements, and management's discretion over the timing of expense recognition. This literature review focuses on accounting manipulations rather than on substantive decisions. Conversely to the choice of accruals, the choice of accounting methods can be contracted upon. Management discretion over accruals and management discretion over the choice of accounting procedures will thus be reviewed separately.

3.1 Management Discretion Over Accruals

Dye (1988) distinguishes between two broad reasons, internal and external, for which shareholders may rationally demand accruals-based earnings management. Internal demand arises in an environment characterised by a moral hazard problem between management and shareholders when the expected cost-minimising contract inducing the manager to select the action preferred by the shareholders encourages earnings management. External demand arises if, holding managers' compensation and productive actions fixed, shareholders can improve their firm's contractual terms with outsiders by managing earnings.

Internal Demand

Internal demand has been shown to exist by Dye (1988) in an environment characterised by a moral hazard problem between the firm's manager and shareholders. This basic moral hazard problem is supplemented by a second one. Shareholders do not observe the economic earnings generated by the firm and the manager may report earnings which differ from the ones generated by the firm. Shareholders also do not observe the stochastic parameter defining the feasible reporting set. This parameter is assumed to be prohibitively costly for the manager to report.

Dye (1988) shows that earnings management obtains in the presence of mild regularity conditions, even if the manager incurs personal costs when he does not report the true economic earnings, unless shareholders request the manager to select the action minimising his disutility from effort. Earnings management is optimal in these conditions because the marginal cost to the manager of earnings management is assumed to be close to zero in the neighbourhood of the true economic earnings. In order to avoid earnings management, shareholders cannot therefore use reported earnings for contractual purposes, which induces the manager to choose the action minimising his disutility from effort.

External Demand

External demand for earnings management has been shown to obtain by both Dye (1988) and Trueman and Titman [TT, (1988)]. Demand for earnings management is however motivated by different reasons. In Dye's paper, current shareholders attempt to alter the perception of the firm's value held by outside investors. In TT's paper, current shareholders attempt to lower the perception of the variance of the firm's underlying economic earnings held by potential outside debtholders.

Dye (1988) provides a model with overlapping generations in which the external demand for earnings management is driven by the inability of current shareholders

to report the earnings announcement policy they instruct their management to adopt to future shareholders. This model comprises in each period a firm, whose economic earnings are privately observed by the manager and follow an i.i.d. process, two generations of shareholders who are risk-neutral in consumption and live for two periods, and a manager, who is maximising the value of the firm. The manager is in charge of decisions concerning production. He reports and may potentially misrepresent the economic earnings generated by the firm's production technology, recognising that his announcement has an effect on the market value of the firm. The firm is however incurring some exogenously defined corporate costs of earnings management which are supposed to capture potential phenomena such as bond defeasance which increase reported earnings but potentially reduce the value of the firm. Shareholders are also assumed to have access to an imprecise monitoring technology which allows them to discern whether the earnings reported by the manager have been excessively misrepresented. The firm is sold in each period by the old generation of shareholders to the new generation of shareholders, inclusive of current economic earnings. Earnings announcements may therefore influence the price the young shareholders pay to the current ones.

The paper shows that a truthful earnings announcement policy can never be part of any stationary equilibrium even in the presence of corporate costs of earnings management. As stated by Dye (1988), a stationary equilibrium consists of a pricing function, an earnings announcement policy, and a constant representing the future value of the firm, in which "current shareholders attempt to exploit this informational asymmetry by selecting their earnings announcement policy optimally, taking future shareholders' beliefs, and hence, the functional form of the equilibrium pricing function as given". The intuition behind this result is that earnings management is irresistible to the current shareholders because, conditional on shareholders believing that the earnings reported are true, current shareholders benefit from having the manager of the firm report the highest earnings that can be reported.

Trueman and Titman [TT, (1988)] provide a two-period model in which a manager

of a firm may rationally want to smooth reported income in order to lower the perception of the variance of the firm's underlying economic earnings held by potential outside debtholders. Shareholders find it desirable to modify the perceived volatility of their firms' earnings, and hence the probability of bankruptcy, because they want to sell debt at the end of the second period and want to minimise the cost of raising capital. Income smoothing can affect the perceptions of potential debtholders because only some firms can shift income across periods and firms are unable to signal their types credibly. Income shifting can be achieved, for instance, through the timing of the recognition of pension costs, adjustments to the estimates of assets' useful lives, or adjustments to the write-downs for bad debts.

TT show in their paper that it is always optimal for the manager of the firm to smooth reported income in equilibrium as long as income smoothing is costless. This property is due to the fact that, on average, a shift of income from the second to the first period results in a smoother income stream over the two periods when the first period's economic earnings are poor. Potential investors are thus uncertain whether the smooth income stream is generated by a firm with low volatility that cannot smooth reported income or whether it comes from a firm with high volatility that smoothes reported income. Shareholders are indifferent ex-ante between an accounting system in which income smoothing is allowed and one in which it is precluded, as long as income shifting is costless. Costly income smoothing can also be optimal if the prior probability that the firm's economic earnings are of low variance is sufficiently different from both zero and one.

Internal and External Demand

Dye (1988) provides an overlapping generations model in which he integrates both internal and external sources of demand for earnings management. Dye generates from this model sufficient conditions for both stationary equilibria associated with observable management contracts (OCE) and unobservable management contracts (NCE) to obtain. Observable (Unobservable) management contracts are contracts offered by one generation of shareholders to their manager that are observable (not

observable) by the next generation of shareholders. The sufficient conditions provided by Dye induce the manager to always make the largest possible earnings announcements in both types of equilibria. This earnings announcement policy both maximises the value of the firm and minimises the expected cost of getting the manager to adopt the action preferred by the current shareholders of the firm.

Internal and external demand do not call in general for the same optimal earnings announcement policy. Dye also investigates whether shareholders can gain by giving their manager the opportunity to issue two earnings announcements: one that is privately used to compensate the manager and another that is made public to influence the perception about the value of the firm held by prospective shareholders. He establishes that, when management contracts are observable, no generation of investors obtains any advantage by having managers issue distinct public and private earnings announcements as long as the corporate and management costs of the earnings announcements are a function of the earnings announcements made in private. He further establishes that, when management contracts are observable, investors may demand distinct private and public earnings announcements as long as the corporate costs of earnings management are a function of earnings announcements made in public whereas the management costs of earnings management are a function of earnings announcements made in private.

Dye further asserts that the allocations associated with an OCE generally strictly Pareto-dominate those associated with an NCE. The intuition behind this result is that the current generation of shareholders can be regarded as an agent of the next generation of shareholders who takes the action of choosing his manager's compensation contract. A standard proposition in the principal-agent literature asserts that the principal is typically strictly better off if he can observe the action taken by his agent.

Dye (1988) also developed an overlapping generations model in which he derives sufficient conditions for income-smoothing to obtain. This model is not dissimilar to the one analysed in the previous paragraphs but is now asymmetrical. Managers

are hired in even-numbered periods t for 2 years by shareholders born in period t and have time-separable preferences. The cumulative earnings reported by the manager cannot exceed the sum of the economic earnings generated. Shareholders born in period t+1 have the ownership of period t+1's reported (and not actual) earnings generated by the new manager's action chosen in period t and will never know what the actual level of earnings was. Shareholders born in period t+2 have the ownership of both the economic earnings generated in period t+2 and any earnings undistributed in period t+1, and will know the amount this sum represents subsequently to purchasing the firm.

Dye shows that income-smoothing occurs in every OCE and NCE for a broad class of earnings processes in the absence of personal and corporate costs of earnings management provided that the manager's intertemporal consumption discount rate is close enough to one. To get this proposition, Dye precludes any generation of shareholders to commit subsequent generations of shareholders to adopt previously defined management contracts or to seek to have the firm's manager exert the minimum possible effort level. Some intuition behind this result can be obtained when the time-series process followed by the economic earnings is iid. External demand concerns only preclude income-smoothing from arising if no earnings management arises at the end of the manager's first period in office. But, because the earnings process is iid, both generations of investors require the manager to take the same action if no earnings management occurs in the first period. This implies that both generations of shareholders provide the manager of the firm with the same contract. It can be shown that no generation of shareholders is made worse off by giving the manager a contract that is increasing in his reported earnings for his last period in office if one evaluates contracts in terms of their expected costs of compensation. It can then be shown that the compensation contracts given to the manager generate internal demand for income-smoothing as long as the manager's intertemporal consumption discount rate is close enough to one. The assumption that no income-smoothing does occur leads therefore to a contradiction.

Dye (1988) further shows that income-smoothing can obtain even when the manager

of the firm is allowed to borrow and lend. The intuition behind this result is that the manager can take advantage of the differences in the rates of returns offered by the capital markets and the intertemporal transfers of compensation due to income smoothing.

3.2 Managerial Discretion Over Choices of Accounting Procedures

Theories rationalising managerial discretion in the choice of accounting procedures do so for one of the following reasons. Shareholders are said to have an internal demand for managerial discretion if the expected cost of the contract inducing their manager to select their preferred action is minimised through the choice of an appropriate accounting procedure. Shareholders are said to have an external demand for managerial discretion if, holding managers' compensation and productive action fixed, they can improve their firm's contractual terms with outsiders through the choice of an appropriate accounting procedure.

Internal Demand

Demski, Patell, and Wolfson [DPW, (1984)] provide a first rationale for shareholders to have an internal demand for managerial discretion over the choice of accounting procedures in an environment characterised by a moral hazard problem between the firm's manager and shareholders. DPW show that, when the manager is endowed with private information about the firm's production function, shareholders may rationally prefer to delegate the choice of accounting procedures to the manager, even if the manager's compensation depends on his accounting choice.

This one-period model comprises a risk-neutral principal - the shareholders-, a risk-averse manager, and a firm, whose productive outcome is a function of the manager's action, a primary stochastic state variable, and a secondary state variable characterising the firm's production function. This secondary state variable is privately observed by the manager after he has chosen his action. The principal is

further assumed to have access to a space partition monitoring information system, that is, a basic accounting system.

DPW give necessary conditions for the accounting system to have strictly positive value. They also show that the principal weakly prefers decentralisation of the accounting choice if the manager privately observes the value of the secondary state variable representing the production function as long as the accounting choice can be verified. The latter proposition may seem unintuitive since managers are tempted to take advantage of the situation and choose the accounting methods that are in their self-interest. However, the principal cannot be made worse off because he can force the optimal policy that would prevail in the absence of delegation, the centralised policy, by offering the optimal centralised contract augmented by feasible penalties for any deviations in the accounting choice. The principal can even be made better off in some circumstances because the contract space is expanded when the choice of accounting system is delegated since the manager can make the choice of the accounting system depend on the realisation of his private information about the production function.

DPW also provide a reason why firms may make changes through time in their use of accounting procedures. Changes in the realisation taken by the secondary state variable may induce the manager to choose another reporting procedure.

This model would appear to be consistent with empirical evidence reported by DPW. DPW suggest that "accounting methods are typically chosen by the managers whose performance the owners seek to evaluate" and that "accounting methods are often changed at the end of an accounting period after most of the productive actions have been taken".

Another rationale for shareholders to leave managers with some discretion over the choice of accounting procedures, that is motivated by internal demand, is provided by Verrechia (1986). Verrechia shows that shareholders may be better off allowing managers discretion over the choice of reporting alternatives even if this choice

involves an element of moral hazard. The manager of the firm in Verrechia's model can translate economic earnings into accounting earnings either by using a noisy financial reporting alternative or by taking an unobservable adverse post-outcome action, in conjunction with a given reporting system, which reveals economic earnings perfectly. Accounting earnings reported through the financial reporting alternative have to be smaller than the sum of the economic earnings generated by the firm, a noise realisation observed only by the manager, and a parameter restricting the set of feasible reporting alternatives chosen by the principal. The principal cannot distinguish whether the manager uses the financial reporting or the adverse action alternative. He can however control his manager's behaviour through his choice of both the manager's compensation package and the parameter characterising the financial reporting alternative. By setting the value of this parameter low (high) enough he can induce his manager to always use the adverse action (financial reporting) alternative.

An example given by Verrechia illustrating this model involves a manager of a firm using LIFO to measure ending inventory, electing to flow the unrealised holding gains into income, by discounting the stocks held in inventory. The principal cannot distinguish whether the manager liquidated the inventory in order to increase the value of the firm or the size of his compensation package.

Verrechia shows that the principal may prefer to let his manager decide about which reporting alternative to use. This may seem surprising since the manager is only tempted to use the adverse action alternative when the realisation of noise in the reporting alternative works to the principal's disadvantage, and the cost of doing so is borne by the principal. The principal is however weakly better off because he can trade-off the benefits provided by the improvement in profits as an indicator of the manager's pre-outcome effort when the manager chooses the adverse action versus the attendant cost of this action.

Verrechia's model also provides reasons why firms may make changes through time in their use of accounting procedures. A first reason for firms to change their

accounting procedures is provided by the optimal choice made by the manager to use the financial reporting or the adverse action alternative depending on the realisation of noise. A second reason for firms to change their accounting procedures arises if the cost generated by the adverse action alternative changes with time. Such changes affect the choice of the parameter characterising the financial reporting alternative which is chosen by the principal.

The last rationale for shareholders to leave managers with some discretion over the choice of accounting procedures is provided by Suh (1990). Delegation of accounting choice to the agent is shown to be equivalent to direct communication, which provides a strict Pareto improvement over no-communication.

Suh considers a firm over two periods. The risk- and work-averse agent obtains, after the first period's production operation, private information concerning the productivity of the firm's assets in the second period. Direct communication Pareto-dominates no-communication in this setting because communication enables the principal to efficiently spread the risks associated with the agent's contract across periods, thereby allowing the agent to achieve signal-contingent interperiod consumption smoothing. As stated by Suh, both the first-period and second-period contracts are a function of the agent's report such that "when unfavourable future productivity is observed, the agent gets less compensation in the first period and more in the second period (compared with the case in which the agent has observed favourable future productivity), thus allowing the agent to smooth his consumption stream across periods". Direct communication and delegation of accounting choice are equivalent as long as the cardinalities of the future productivity set and the image of the agent's accounting choice function are equal.

External Demand

External demand for discretion in accounting procedures is shown to exist by Dye (1985) in a model involving an incumbent firm and a potential rival. The manager of the incumbent firm is assumed to have to report some proprietary information.

External demand for discretion in accounting procedures is motivated, in Foster's (1986) terms, by competitive disadvantage costs which may be imposed on the firm by a "strategic opponent". It is thus motivated by arguments which are similar to those used by Darrough and Stoughton (1990) and Wagenhofer (1990) in the context of discretionary disclosures.

The proprietary nature of the information the manager of the incumbent firm is endowed with is modeled endogenously by assuming that the rival's decision to enter the market depends on the inferences the rival can make about the incumbent's information. The way proprietary information is modeled in Dye's paper is however also compatible with any strategic opponent able to take an adverse action inflicting costs on the incumbent firm.

The manager of the incumbent firm can adopt any reporting procedure within a predefined set of generally accepted accounting principles. The choice of the accounting procedure and the number reported (report) are both assumed to be observable. The accounting procedures present in this set do not necessarily reveal the information completely. This is so because any reported financial statement data may be observationally consistent with many realisations of the manager's piece of information.

An equilibrium in this model consists of a map, transforming any possible realisation of the proprietary information into an accounting procedure and a report, and the rival's decision to enter or to stay out. In equilibrium, the reporting choice made by the manager of the incumbent firm has to be optimal given the rival's equilibrium entry strategy and the rival's entry strategy has to be optimal given the equilibrium map chosen by the manager of the incumbent firm. The incumbent's choice of accounting procedure is motivated by his desire to protect his proprietary information. This model is appealing because it rationalises the fact that the choice of the appropriate accounting procedure is made after the realisation of the information to be reported is observed.

3.3 Summary

This chapter reviewed a number of seminal papers explaining how discretionary accounting choices arise as rational equilibrium behaviour. Most of these papers formed part of the principal-agent branch of the economic theory literature. The main advantage of the papers that were reviewed in this chapter is that they provide through explicit and internally consistent models of the underlying economic environment a coherent and useful framework to study discretionary accounting choices. The principal-agent branch of the literature is however currently facing a number of criticisms. The principal-agent research is criticised for taking a restricted view of the environment in which the firm operates. As stated by Baiman (1990), "The principal-agent model typically ignores the effect of the capital markets by assuming a single owner rather than a group of owners and debtholders". As a consequence of the emphasis on internal consistency, rationality, and the optimality of contracts, the principal-agent research also gives us little insight into the form and shape of managerial compensation contracts [Baker, Jensen, and Murphy (1988)]. It could also be argued that, as a consequence of the lack of insight into the form and shape of the managerial contracts, the principal-agent research gives us limited insight into the form taken by the function linking economic with reported earnings. A final criticism is related to the fact that there has been relatively little direct testing of the principal-agent research. The next chapter reviews a number of seminal papers forming part of the empirically-driven positive accounting theory branch of the accounting literature and explaining discretionary accounting choices.

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CHAPTER 4

DISCRETIONARY ACCOUNTING CHOICES: A REVIEW OF THE POSITIVE ACCOUNTING LITERATURE

This chapter reviews a number of papers explaining discretionary accounting choices from the empirically-driven positive accounting theory branch of the accounting literature. It first describes the main economic hypotheses tested in the accounting literature. It then reviews the empirical evidence supporting these hypotheses. It finally exposes some of the limitations of the methodology used to test these hypotheses.

4.1 The Main Hypotheses

According to the economic perspectives introduced in the introductory chapter to this thesis, accounting choices do matter because they change either the distribution of a firm's expected cash-flows or the claims of various parties to these cash-flows. The main economic hypotheses tested in the accounting literature result from the following linkages between the reported accounting numbers and the cash-flows accruing to various stakeholders of the firm: management compensation plans, lending agreements, government regulation, political visibility, and taxation.

The management compensation hypothesis states that managers' wealth can be affected by discretionary accounting choices. It recognises the possibility of a first moral hazard problem arising from the separation of ownership and control. Accounting numbers are introduced in management compensation contracts in order to reduce the magnitude of this agency problem. The management compensation hypothesis also recognises the fact that financial reporting standards are imperfect, and thus, allow managers to retain some discretion over the numbers conveyed in the financial reports, which in turn, affects their compensation.

The lending agreements hypothesis states that the wealth of both debtholders and shareholders can be affected by discretionary accounting choices made by managers acting on behalf of shareholders. It recognises the possibility that manager may take corporate decisions which may transfer wealth from bondholders to shareholders. Accounting numbers are introduced in bond covenants, which constrain the manager's actions, in order to reduce the magnitude of this agency problem. The lending agreements hypothesis also recognises the fact that financial reporting standards are imperfect, and thus, allow managers to retain some discretion over the numbers conveyed in the financial reports, which in turn, affects the wealth of both debtholders and shareholders.

The political visibility hypothesis[1] states that the probability of firms being imposed political costs such as implicit and explicit taxes or granted subsidies can be affected by discretionary accounting choices made by managers. A related hypothesis, the government regulation hypothesis[2], states that the future profitability of regulated firms can be affected by discretionary accounting choices made by managers. Both the government regulation and political visibility hypotheses recognise that firms and government do not share the same objectives. Accounting numbers are used by government in order to reduce the magnitude of the agency problem. Both the government regulation and political visibility hypotheses recognise the fact that financial reporting standards are imperfect and thus allow managers to retain some discretion over the numbers conveyed which may affect the government's decisions.

The taxation hypothesis states that discretionary accounting choices made by managers are influenced by taxation considerations. It recognises the fact that,

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1 This hypothesis is also sometimes referred to as the political sensitivity hypothesis.

2 The government regulation hypothesis may be considered as a subhypothesis of the political visibility hypothesis.

to some extent[3], the amount of taxes to be paid by a firm is determined by accounting procedures used for financial reporting purposes.

4.2 A Review Of The Empirical Evidence

This section reviews in turn the empirical evidence related to each of the hypotheses introduced in the previous section. It includes any research issue which is specific to a given hypothesis. Research issues which are common to a number of hypotheses are addressed in the next section.

The Management Compensation Hypothesis

The empirical literature provides some evidence that is consistent with the assumptions underlying the management compensation hypothesis. Managers' compensation would indeed appear to depend on accounting numbers conveyed in financial reports. Fox (1980) reports that managers of as many as ninety per cent of the one thousand largest US manufacturing companies are endowed with bonus plans based on accounting earnings. In addition, twenty five per cent of them are endowed with performance plans[4].

Accounting choices would also appear to have an impact on managers' compensation. Collins, Rozeff, and Dhaliwal (1982) report abnormal share price reactions to proposed mandatory changes in accounting for the oil and gas industry that are negatively related to the existence of management compensation plans. Healy, Kang, and Palepu (1987) investigate the effect of accounting policy changes, such as inventory valuation and depreciation method changes, on CEOs' salaries and bonuses and find no evidence that, subsequent to any accounting change, reported earnings are transformed to earnings under the original

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3 This would appear to be the case in some Continental European countries such as Belgium, France, and Germany. In the US, such opportunities are rare and are probably confined to the LIFO/FIFO choice. In the UK, I am not aware of such opportunities.

4 Performance plans are not that dissimilar to bonus plans. The main difference between them is that performance plans specify long-term earnings goals while bonus plans specify annual earnings goals.

accounting method for compensation purposes[5].

Management compensation schemes would also appear to have an impact on the discretionary accounting choices made by managers. Dhaliwal, Salamon, and Smith (1982) observe that manager-controlled firms are more likely to use the straight-line rather than the accelerated depreciation methods[6]. Zmijewski and Hagerman (1981) report evidence that managers of firms endowed with bonus plans are more likely to select income-increasing accounting procedures[7]. Healy (1985) reports evidence that the managers of firms with bonus plan changes do report a higher number of voluntary changes in accounting procedures than those of firms with no changes in bonus plans[8]. Healy (1985) also finds out that firms' accounts are more likely to reveal income-decreasing accruals when their managers' bonus plans upper and lower bounds are binding.

The empirical evidence is thus generally consistent with the management compensation hypothesis. This would appear to be quite surprising since most of the evidence is provided by potentially misspecified cross-sectional studies, which are thus unlikely to constitute powerful tests of the underlying theory. Early cross-sectional studies of the management compensation hypothesis typically assume that the presence of bonus plans does provide managers with incentives to over-report earnings. But, as stated by Watts and Zimmerman (1990), "... A bonus plan does not always give managers incentives to increase earnings. If, in the absence of accounting changes, earnings are below the minimum level required for payment of a bonus, managers have incentive to reduce earnings this year because no bonuses are likely paid". More

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5 They are however unable to reject the hypothesis that the compensation committee nullifies the effect of an accounting change on compensation by modifying the parameters of the compensation plan.

6 Bowen, Noreen, and Lacey (1981) find however that firms with explicit management compensation plans are no more likely to capitalise interest than those without such agreements.

7 Hagerman and Zmijewski (1979) find however no evidence of any association between the existence of accounting-based compensation schemes and companies' methods of recording investment tax credits.

8 Managers would however appear not to change accounting procedures when the bonus plan upper bounds are binding.

sophisticated studies, such as the one published by Healy (1985) and taking into account the incentives faced by managers to defer income from the current to future periods, provide evidence that is consistent with managers manipulating net accruals. These studies fail however to distinguish discretionary from non-discretionary accruals.

The Lending agreements Hypothesis

The empirical literature provides some evidence that is consistent with the assumptions underlying the lending agreements hypothesis. The empirical literature [Smith and Warner (1979), Leftwich (1983)] suggests that contracts between debtholders and owner-managers do contain both negative and affirmative debt covenants. Negative covenants, such as restrictions put on dividends, keep managers from taking actions which do transfer wealth from bondholders to stockholders. Affirmative covenants, such as working capital, current ratio, net worth, and interest coverage covenants, increase the security of the bondholders. The most common accounting-based restrictions, as reported by Press and Weintrop (1990) and Duke and Hunt (1990), do affect leverage, net worth, working capital, dividends, and interest coverage.

Beneish and Press (1993) observe that a majority of default firms do receive waivers following contract renegotiation[9] [10]. Technical default would however appear to be costly even if a waiver is granted. Beneish and Press report that, compared to firms that obtain waivers without any contract renegotiation, the firms that obtain waivers following renegotiation end up with significantly higher interest rates and more debt covenants added to the agreement. Large sample studies confirm that the violation of debt-covenants is costly. Beneish and Press (1993) provide direct evidence about the costs facing firms that violate

9 Out of 91 default firms, 12 firms receive waivers without alteration of their contracts, 53 firms receive waivers following contract renegotiation, 26 firms fail to obtain a waiver from existing lenders, 8 of which obtain financing from new lenders.

10 Chen and Wei (1993) observes that a majority of default firms do not receive any waivers after the violations. Out of a sample of 128 default firms, 57 receive a waiver, 24 for a limited period and 33 permanently.

accounting-based covenants in debt agreements. They estimate that "the average costs[11] range between 1.2 and 2 percent of market value of equity...(or) alternatively...between 4.4 and 7.3 percent of the outstanding balances of the violated debt agreements".

Accounting changes have been shown to affect technical default. Sweeney (1994) carries out a detailed investigation of 22 firms which are about to default. She finds that accounting changes delay technical default for five of these firms[12].

Mandatory changes in accounting procedures would appear to affect the measurement rules defined in restrictive covenants in firms' lending agreements[13]. Leftwich (1981) observes that an unanticipated and mandated income-reducing change in generally accepted accounting principles - the mandatory change in merger accounting rules brought about by APB Opinion No 16 and Opinion No 17 - reduces the value of equity of a firm with debt outstanding, even if the accounting change has no direct effect on a firm's cash-flows. The decline in the value of the firm's equity is furthermore shown to be an increasing function of the amount of the firm's outstanding debt. Lys (1984) observes that the proposed and unanticipated elimination of full-cost accounting (FASB 19) had a negative impact on the security prices of the oil and gas companies which were using the full cost method at that time[14]. The impact of FASB 19 on the firm's accounting numbers, the firm's leverage ratio, and the firm's default risk of the existing debt are furthermore shown to be negatively related to the security price performance. Collins, Rozeff, and

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11 These costs include both refinancing and restructuring costs. Refinancing costs capture the rise in interest rates on notes and loans required by lenders after a violation. Restructuring costs stem from lenders' demands for partial or full repayment and capture the cost of restructuring the firm's debt.

12 Default could have been avoided in four more cases by switching from LIFO to FIFO. This switch would however imposed significant taxation costs on the firms.

13 The evidence presented by Frost and Bernard (1989) is more disturbing. Frost and Bernard find that mandated write-offs of exploration costs caused significant tightness and even some violations in covenant constraints. They cannot however find any significant abnormal market reaction to the adverse effect on the financial statements.

14 As reported by Watts and Zimmerman (1986), the median effect on earnings of the final version of FASB 19 on the 1977 earnings was -27% for the full-cost firms and -13% for the successful-efforts firms. Similarly, the median effect on the 1977 total stockholders' equity was -30% for the full-cost firms and -4% for the successful-efforts firms.

Dhaliwal (1981) reports that both the successful-efforts and the full-cost firms were negatively affected by the introduction of FASB 19. Salakta (1989) observes that the proposed and unanticipated issuance of SFAS No 8, an accounting standard requiring the use of current exchange rates for translation purposes, is associated with significantly negative excess returns. El-Gazzar (1993) observes that the tightening of the conditions, under which a lease can be classified as an operating lease, brought about by SFAS No 13, causes significant increases in the tightness of the debt covenant restrictions. Two of the events leading to the promulgation of SFAS No 13 are associated with negative market returns experienced by the affected lessees. The magnitude of the reduction in market returns is furthermore correlated with the impact of SFAS No 13 on the tightness of the debt covenant restrictions.

Event studies also imply that discretionary changes in accounting procedures do affect the measurement rules defined in restrictive covenants in firms' lending agreements. Holthausen (1981) investigates stock price changes associated with the announcement that a firm is switching back from the accelerated to the straight-line depreciation method for financial reporting purposes. Holthausen observes that the more debt a firm has outstanding, the more negative the abnormal performance at the time of the announcement of the change in depreciation methods[15].

Cross-sectional studies of accounting choices confirm that lending agreements have an impact on the discretionary accounting choices made by managers. Bartov (1993) finds a positive correlation between income from asset sales and debt-equity ratios. Christie (1990) reports that managers of firms with debt-to-equity ratios are more likely to use accounting procedures which shift reported earnings to the current period from future periods. Sweeney (1994) observes that the managers of 130 default firms made 205 accounting changes in the period from five years prior to two years following the year of technical default. In excess of three quarters of these changes were income-increasing. Dhaliwal (1980) reports that the more highly leveraged oil and gas companies did use the income-increasing full-cost method and

15 The average abnormal performance of the switch-back firms is however negative but insignificantly different from zero around the announcement dates of the switches.

did lobby against its elimination. Johnson and Ramanan (1988) report that the firms switching from the successful-efforts to the full-cost method had higher leverage and capital expenditures in the two years leading up to, and in the year of, the accounting change. Richardson and Culumovic (1993) report that managers of Canadian firms endowed with high leverage are more likely to use the temporal method to translate the financial statements of foreign operations, when the Canadian dollar is weakening, and the current rate method, when the Canadian dollar is strengthening. Bowen, Noreen, and Lacey (1981) observe that, prior to 1974[16], interest capitalising firms had financial ratios consistent with being closer to violation of debt covenants than interest expensing firms. Firms endowed with higher debt to equity ratios, lower inventories of payable funds and ratios of earnings to interest expense were more likely to capitalise interest. Daley and Vigeland (1983) observe that research and development capitalising firms have financial ratios consistent with being closer to violation of debt covenants than research and development expensing firms. Firms endowed with higher debt to equity ratios, higher ratios of dividends to inventory of payable funds, lower ratios of earnings to interest expense, and more public debt in their capital structures are more likely to capitalise research and development costs.

Time-series studies of accounting choices present mixed evidence. Healy and Palepu (1990) report that firms do not make accounting changes to respond to increases in the tightness of dividend constraints. DeAngelo, DeAngelo, and Skinner (1994) report that managers' accounting choices reflect acknowledgment of their firms' financial difficulties rather than attempts to relax debt covenants. DeFond and Jiambalvo (1994) however find evidence of significant positive abnormal accruals in the year prior to the violation of the debt covenants. The tests used in these empirical studies are however weakened by the use of either negative covenants such as dividend constraints or accruals. Sweeney (1994) avoids these drawbacks by considering both affirmative covenants such as minimum working capital and net worth constraints and changes in accounting procedures and finds that managers of

16 Prior to 1974, US GAAP left firms free to choose whether to capitalize or expense interest costs associated with capital expenditure

firms approaching default respond with income-increasing accounting changes and that the default costs imposed by lenders and the accounting flexibility available to managers are important determinants of managers' accounting responses.

The evidence reported by the empirical literature, which consists mainly of cross-sectional studies, is thus generally consistent with the lending agreements hypothesis. This would appear to be quite surprising since most cross-sectional empirical studies adopt indirect methods to account for the effect of debt covenants on accounting choices by using the firm's debt to equity ratio as an explanatory variable proxying for the presence of accounting-based debt covenants, the closeness to covenant constraints, and the expected costs to be incurred by shareholders should any breach occur. Recent papers by Duke and Hunt (1990) and Press and Weintrop (1990) provide however evidence that the debt to equity ratio is positively related to both the existence of and closeness to accounting-based debt covenants.

The Political Visibility Hypothesis

The political visibility hypothesis comes in four different versions: the size, concentration, risk, and capital intensity hypotheses. All the versions of the political visibility hypothesis state that accounting choices are influenced by the firm's political sensitivity, that is, the likelihood of seeing relatively large wealth transfers imposed on them. They use however different attributes to proxy for the firm's political sensitivity.

The size hypothesis uses the firm's size as a proxy for the firm's political sensitivity[17]. As stated by Zimmerman (1983), the size hypothesis claims that "Ceteris paribus, the larger the firm, the more likely the manager is to choose accounting procedures that defer reported earnings from current to future periods". The size hypothesis implicitly assumes that large firms are politically more sensitive since, because of information costs, politicians and bureaucrats may not adjust for

17 Zimmerman (1983) reports some evidence suggesting that large firms tend to have higher taxation rates than smaller firms.

size when considering the level of reported earnings.

The empirical evidence as reported by the accounting literature provides strong evidence that the manager's choice of accounting procedures varies with the firm's size. Richardson and Culumovic (1993) report that large firms are more likely than smaller firms to choose the current rate method to translate the financial statements of foreign operations. Lilien and Pastena (1982) observe that larger and more established oil and gas firms are more likely to choose the successful efforts rather than the full costs methods. Zmijewski and Hagerman (1981) observe that the choice of accounting procedures is influenced by the firm's size. But Zmijewski and Hagerman (1981) also observe that, amongst smaller firms, there is no association between portfolio choice and firm's size. Bowen, Noreen, and Lacey (1981) report that, except for the ten largest US oil and gas firms which do all expense interest, other large companies tend to capitalise rather than expense interest. These results are therefore likely to be driven by the oil and gas firms[18].

The concentration hypothesis uses the industry's concentration ratio as a proxy for the firm's political sensitivity. As stated by Zimmerman (1983), the concentration hypothesis claims that "Ceteris paribus, the higher the industry's concentration ratio, the more likely the manager is to choose accounting procedures that defer reported earnings from current to future periods". It implicitly assumes that firms trading in highly concentrated industries are likely to report higher profits and thus to attract attention from anti-trust commissions. It also recognises that, because of information costs, anti-trust commissions do not systematically compute any industry concentration ratios.

The concentration hypothesis has attracted limited empirical support. Zmijewski and Hagerman (1979) suggest that the choices concerning inventory valuation methods, investment tax credits, and the amortisation of past service costs are influenced by the degree of industry concentration. The choices concerning depreciation methods

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18 Daley and Vigeland (1983) however find that the association between the choice of research and development procedures and the firm's size only holds for subsamples of smaller firms.

are however unrelated to the degree of industry concentration.

The risk hypothesis uses the firm's risk as a proxy for the firm's political sensitivity. As stated by Zimmerman (1983), the risk hypothesis claims that "Ceteris paribus, the higher the firm's risk, the more likely the manager is to choose accounting procedures that defer reported earnings from current to future periods". It implicitly assumes that high-risk firms have high variances of earnings changes and thus are more likely to report large profits. It also recognises that, because of information costs, politicians and bureaucrats may not adjust for risk when considering the level of reported earnings.

The risk hypothesis has limited empirical support. Zmijewski and Hagerman (1979) suggest that the choice of depreciation method is influenced by the degree of risk. The choices concerning inventory valuation methods, investment tax credits, and the amortisation of past service costs are however unrelated to the degree of risk.

The capital intensity hypothesis uses the firm's capital intensity as a proxy for the firm's political sensitivity. As stated by Zimmerman (1983), "Ceteris paribus, the higher the firm's capital intensity, the more likely the manager is to choose accounting procedures that defer reported earnings from current to future periods". It implicitly assumes that, because of information costs, politicians and bureaucrats may not adjust for the opportunity cost of capital when considering the level of reported earnings.

The capital intensity hypothesis has attracted limited empirical support. Zmijewski and Hagerman (1979) suggest that the choice of inventory valuation method is influenced by the degree of capital intensity. The choices concerning depreciation methods, investment tax credits, and the amortisation of past service costs are however unrelated to the capital intensity.

The evidence reported by the empirical literature would thus appear to be generally consistent with the political visibility hypothesis where size is used as a proxy for

political sensitivity. The political visibility hypothesis, as tested in the empirical literature, presents however a number of problems. The empirical association between firm's size and accounting choices may be driven by a single industry, the oil and gas industry. The fact that the relationship between the firm's size and taxation rate varies through time and across industries suggests that firm's size may constitute a rather noisy proxy for political sensitivity [Zimmerman (1983)]. Firm size may proxy for other characteristics such as industry membership [Ball and Foster (1982)]. The firm's effective taxation rate may also constitute a rather noisy proxy for political costs. This is due to the fact that empirical studies do not control for the fact that large firms, which incur higher taxation rates, may also receive more political benefits that offset the higher taxation rates.

The Government Regulation Hypothesis

The government regulation hypothesis is relatively untested. The few studies which have been published in the empirical literature tend however to be consistent with the predictions generated by the government regulation hypothesis. Jarrell (1979) reports evidence suggesting that state utility regulation has an impact on asset valuation. Elliott, Hanna, and Shaw (1991), Griffin and Wallach (1991), Madura and McDaniel (1989), and Musumeci and Sinkey (1990) provide evidence suggesting that capital adequacy ratios have an influence on the level of discretionary increases in loan-loss reserves reported by financial institutions. They find out that the US financial institutions which increased their loan-loss reserve levels related to LDC problem loans during 1987 did experience, on average, significant positive abnormal share price returns around the announcement dates[19] [20].

19 Grammatikos and Saunders (1990) found however no evidence of any average abnormal returns associated with additions to bank loan-loss reserves.

20 Griffin (1992) also reports evidence that the British and Irish financial institutions which increased their loan-loss reserve levels during 1987 and 1991, did experience, on average, significant positive abnormal share price returns around the announcement dates. It is however not clear whether or not all these increases in loan-loss reserves are related to third-world loans.

The Taxation Hypothesis

Tests of the taxation hypothesis which can be found in the US empirical literature concentrate on inventory valuation choices. The use of the LIFO valuation method, which provides firms with potential taxation benefits, has been allowed in the United States since before World War II. As reported by Biddle (1980), if inventory accounting choices are determined by taxation considerations, it would thus appear surprising that "many firms have voluntarily paid tens of millions of dollars in additional income taxes by continuing to use FIFO rather than switching to LIFO". One reason for this empirical regularity may be that inventory valuation choices are influenced by managements compensation schemes. Abdel-Khalik (1985) reports that managers of management-controlled firms are more likely to use FIFO than managers of owner-controlled firms. In contrast to Abdel-Khalik, Hunt (1985) finds however that firms using LIFO tend to be more management-controlled, which is contrary to expectations. Another reason for this empirical regularity may be that inventory valuation choices are influenced by lending agreements schemes. Hunt (1985) reports that "non-adopters of LIFO had financial ratios closer to violating restrictions in debt covenants than firms adopting or extending the use of LIFO". By examining the influence of the management compensation, lending agreements, and taxation hypotheses in one study, Dopuch and Pincus (1988) find however that the taxation hypothesis provides the best explanation for the FIFO/LIFO decision. According to Dopuch and Pincus,

> "The long-term FIFO firms in our sample have not been foregoing significant tax savings, in which case remaining on that method is certainly consistent with FIFO being an optimal tax choice, given other considerations. In contrast, long-term LIFO firms would have forgone significant tax savings".

4.3 Research Method Issues[21]

Empirical studies of accounting choices include both accounting choice and stock

[21] This section draws heavily on Watts and Zimmerman (1990).

price tests. A number of stock price tests[22] of mandatory accounting changes reveal abnormal share price reactions. Stock price tests of voluntary accounting changes tend to provide more mixed results. With respect to choices of inventory methods, for instance, Brown (1980), Ricks (1982), and Hand (1991) report evidence that LIFO adoptions are accompanied by negative abnormal returns. But Ball (1972), Sunder (1973), Biddle and Lindhal (1982) report evidence that LIFO adoptions are accompanied by positive abnormal returns. Stock price studies present a number of problems. Cross-correlation in abnormal performance across firms may be induced by the fact that voluntary, and especially mandatory, accounting choices tend to be made for different firms within short periods of time. Abnormal share price reactions may be attributed to the accounting change rather than to the 'economic' factors which induced the accounting change. The effect of concurrent announcements such as the announcement of dividends may not average to zero, even in large samples. Stock price increases or decreases generated by changes in accounting procedures are likely to be small and thus difficult to observe. This issue is highlighted by Holthausen and Leftwich (1983), who hypothesise that "The measured stock price will probably be less than the maximum bound imposed by contracting and monitoring costs because of the expectations problem[23] and the difficulty of identifying event dates". These problems lead Watts and Zimmerman (1986) to argue that stock price studies are weak tests of the theory and call for more accounting choice studies.

Most cross-sectional studies of accounting choices investigate managers' choices of a single procedure. Cross-sectional studies of single accounting choices[24] do provide some evidence that is consistent with the lending agreements and political visibility hypotheses. Cross-sectional tests of single accounting choices tend however

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22 Collins, Rozeff, and Dhaliwal (1981), El-Gazzar (1993), Leftwich (1981), Lys (1981), and Salakta (1989).

23 The expectations problem recognises the fact that investors may anticipate the accounting changes.

24 Bowen, Noreen, and Lacey (1981), Daley and Vigeland (1983), Dhaliwal (1980), Johnson and Ramanan (1988), Lilien and Pastena (1982), and Richardson and Culumovic (1993).

to be less powerful than cross-sectional studies of multiple accounting choices[25]. Managers are not so much concerned with the economic effect of just one particular accounting method than with the economic effect of the portfolio of all accounting methods.

Cross-sectional studies of multiple accounting choices, such as the one published by Zmijewski and Hagerman (1981), do provide some evidence that is consistent with the management compensation, lending agreements, and political visibility hypotheses. These studies tend however to have low predictive power. They typically do not perform better than the naive strategy of adopting the most common strategy in the sample. Their R^2 also do not typically exceed ten percent. As reported by Watts and Zimmerman (1990), this lack of power may be due to model misspecifications, specification problems affecting the dependent and independent variables, and omitted variables.

Cross-sectional studies are potentially misspecified in a number of ways. A first type of misspecification results from ignoring the interaction effects among the different independent variables [Christie (1987)]. As reported by Watts and Zimmerman (1990):

> "Higher earnings impose political costs and so reduce the size of the pie for the contracting parties and at the same time increase the manager's bonus compensation. The manager's increased share of the smaller pie might be larger than a smaller share of the larger pie. The bonus plan and political process effects interact. However, in the empirical models the right-hand-side variables are treated as additive and interaction effects are ignored".

A second type of misspecifications results from the fact that it is costly for firms to switch back and forth between accounting procedures. A firm's current accounting policies then depend not only on the current set of explanatory variables hypothesised to influence accounting policies, but also on past choices and explanatory variables. As stated by Smith (1993) in the context of the debt-equity hypothesis, "Firms that switch accounting methods to delay default are likely to continue to employ income-

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25 Cross-sectional studies of multiple accounting choices are also referred to as cross-sectional studies of portfolios of procedures.

increasing accounting procedures, even if default is no longer likely".

Cross-sectional studies are plagued with specification problems affecting the set of dependent variables, that is, the set of accounting choices. These studies tend to assume that the a given accounting procedure is income-increasing or income-decreasing. Thus the use of some accounting procedures, such as FIFO or straight-line depreciation, is deemed to be income-increasing. But, as stated by Sweeney (1992), "If a firm ... is in a declining-cost industry, then FIFO is income-decreasing". Similarly, the use of the straight-line depreciation method may be income-decreasing if the firm is downsizing. Ranking the effect of various portfolios of accounting procedures on reported income involves further assumptions on the relative effects of the individual accounting choices [Zmijewski and Hagerman (1981), Press and Weintrop (1990)]. Using net accruals to measure the effect of the discretionary accounting choices made by the manager fails to recognise that current net accruals also result from accounting choices made in the past and are thus beyond the manager's discretion at the time of the measurement [Healy (1985)].

Cross-sectional studies may be plagued with specification problems affecting the set of independent variables. It has already been established in the previous section that most empirical studies adopt indirect methods to account for the effect of debt covenants, management compensation schemes, and political sensitivity on accounting choices.

The tests' lack of power may also be due to omitted variables. The omission of an independent variable correlated with included variables may cause the existing independent variables to become surrogates for the omitted variable. This generates biased coefficients of the estimated independent variables, which in turn hampers the interpretation of the empirical evidence. Thus, for instance, it may be the presence of stock option plans which is driving accounting choices if the existence of stock options schemes is correlated with the existence of bonus plans. Tests of a given hypothesis, such as the lending agreements hypothesis, may fail to falsify the theory because no variable representing a rival hypothesis was included.

The final but perhaps most worrying research method issue involves the possibility that the results described in the previous section are not due to the stated hypotheses, but instead, to some unrecognised alternative hypotheses. This issue is highlighted by Watts and Zimmerman (1990): "If the accounting system is part of the efficient set of implicit and explicit contracts, accounting choice is endogenous... Hence, the firm's investment opportunity set is correlated with the firm's financial, dividend, compensation, and accounting policies. Smith and Watts (1986) find significant cross-sectional correlations among firms' investment opportunity sets, financial policies, dividend policies, and compensation policies. The documented correlations between debt/equity and accounting choice and between bonus plans and accounting choice could be due to the correlation between financial and compensation policies and the optimal set of accounting procedures for contracting"[26].

4.4 Summary

This review of the positive accounting theory literature thus provides a body of evidence which is largely consistent with the management compensation, lending agreements, and taxation hypotheses, and to some lesser extent with the political visibility hypothesis. This thesis seeks to provide the accounting literature with a number of signalling models in which the adoption of conservative accounting policies, that is, the adoption of either income-reducing or balance sheet-weakening policies, signals strength. These signalling models are introduce in Chapters 5 to 8. In these models, it is the management compensation and lending agreements hypotheses which provide the linkages between the reported accounting numbers and the cash-flows accruing to various stakeholders of the firm.

[26] A recent study undertaken by Skinner (1993) shows that firms' investment opportunities do affect the nature of their contracts. The management compensation, lending agreements, and political visibility hypotheses are however important even after controlling for the effects of the investment opportunity set.

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CHAPTER 5

DISCRETIONARY ACCOUNTING CHOICES: A COMPENSATION BASED SIGNALLING APPROACH

This paper seeks to explain discretionary accounting choices, such as choices of accounting procedures, made in a world in which managers are endowed with private information about their firms' future earnings. It introduces a basic model in which the manager chooses whether to write down or amortise purchased goodwill recognising that his compensation depends on both current and future reported earnings and firm's equity market values. The financial market values the firm's equity according to the accounting choice made by the manager. This paper provides sufficient conditions for separating and pooling rational expectations equilibria to obtain.

The basic model predicts that, when a separating equilibrium prevails, the firms endowed with purchased goodwill which choose to amortise some goodwill are likely to see higher earnings in the next periods than the firms which choose to write down all their goodwill. It also predicts that the former firms should experience, on average, positive abnormal returns around announcement dates.

The basic model is then extended to deal with a broader range of discretionary accounting choices. In the extended model, the use of income-decreasing accounting choices signals favourable private information while the use of income-increasing accounting choices signals unfavourable private information.

5.1 Introduction

This paper presents a model seeking to explain discretionary accounting choices such as choices of accounting techniques. It has been developed to illustrate the "information perspective" alluded to by Holthausen and Leftwich (1983). The

information perspective states that the choice of an accounting technique reflects management's expectation of future cash-flows. This paper is similar, in spirit, to the model developed by Hughes and Schwartz (1988). But, while Hughes and Schwartz focus on the information content of the LIFO/FIFO choice, this paper offers an explanation for most accounting choices, which do not have a direct effect on cash-flows.

The thesis developed in this paper is illustrated in the context of accounting for purchased goodwill. Purchased goodwill represents the largest intangible asset of most companies. It results from the investment of one company in another and is defined as the excess of the consideration given to over the fair value of the identifiable acquired net assets. American and British practice is to recognise goodwill by default. As much as possible of the purchase price of the investment is allocated to specific "recognised assets", whether tangible or intangible, and the residual part appears as goodwill. The larger the number of assets that can be recognised, the smaller the residual goodwill.

How to account for goodwill remains a contentious subject. This divergence of views reflects a deeper disagreement in relation to the nature of goodwill. Some accountants see goodwill as an asset like any other, which has been acquired at a cost, and which thus needs to be accounted for in the same way as any other asset. These accountants tend to believe that goodwill should be capitalised in the balance sheet and charged to revenue over its economic life. Other accountants see goodwill as a consolidation difference, emerging as part of the accounting process. Those accountants tend to believe that goodwill should be eliminated against reserves in the year of acquisition.

British accounting standards (SSAP 22) leave managers with the choice between writing off any residual goodwill to stockholders' equity and amortising it over a period not exceeding fourty years. As well as permitting two different treatments, SSAP 22 allows the same company to choose between the different methods in

relation to different acquisitions[1]. The amortisation of goodwill is not allowable for taxation purposes.

The first part of this paper introduces the basic model, in which the manager of the firm possesses private information about his firm's future earnings. The firm could be either "good", if the information is favourable, or "bad", if the information is unfavourable. The firm's manager chooses whether or not to amortise goodwill recognising that his compensation depends on both current and future reported earnings and stock prices. The financial market values the firm's equity according to the accounting choice announced by the manager. This paper provides sufficient conditions for separating and pooling rational expectations equilibria to obtain.

This paper shows that, in some conditions, there is a separating equilibrium in which the manager with favourable information chooses to amortise some goodwill and the manager with unfavourable information chooses to write down all goodwill. By choosing to amortise some goodwill, any manager sees the component of his compensation package related to his firm's earnings decrease. The reduction in the accounting-based component of the compensation package of the manager of the good firm is however more than compensated by the increase in the market-based component of his compensation package resulting from the investors' beliefs that the amortisation of goodwill signals favourable information. Conversely, the manager with unfavourable information chooses not to amortise any goodwill because the decrease in his compensation function resulting from amortising some goodwill does not exceed the increase in his compensation function resulting from being recognised as the manager of a good firm.

The basic model predicts that the firms endowed with purchased goodwill which choose to amortise some goodwill are likely to see higher earnings in the next periods than those which choose to write off any residual goodwill. The paper also predicts that the firms which choose to capitalise and amortise some goodwill should

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1 US accounting standards are less flexible and require managers to amortise any residual goodwill over a period not exceeding forty years.

see, on average, positive abnormal returns on the announcement dates of their decisions while those which choose to write off any residual goodwill should see, on average, negative abnormal returns.

The basic model is then extended to deal with a continuum of types of firms. It provides sufficient conditions in which a perfectly revealing equilibrium may obtain. In the latter model, the firm's future earnings, and thus, the firm's abnormal return around the announcement date of the accounting policy, are an increasing function of the amount of goodwill amortised.

The second part of the paper extends the basic model to deal with a broader range of accounting procedures. In the general model, the choice of income-decreasing accounting procedures signals favourable private information while the choice of income-increasing accounting procedures signals unfavourable private information[2]. The models described in this paper are thus compatible with a view generally held by the financial community, which is that the use of conservative accounting measures is good news.

A description of the basic model dealing with purchased goodwill is provided in section 5.2. An extension of the basic model to deal with a broader range of accounting choices can be found in section 5.3. A summary can be found in section 5.4. The derivations supporting the various propositions are provided in Appendix A to E.

5.2 Accounting For Purchased Goodwill

This section introduces a basic model whose focus is on the manager's choice of an accounting method for purchased goodwill in a world of asymmetric information. In this model, the manager has private information about the firm's future earnings and cash-flows and, under certain conditions, may credibly communicate his

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2 The testable implications of this model differ from those of Hughes and Schwartz 1988). In Hughes and Schwartz, it is an income-increasing accounting procedure (FIFO) which signals good news

information to investors through his accounting choice. The model is simplified in order to concentrate on the information content of the accounting choice announced by the manager.

5.2.1 The Basic Model

This model deals with a firm, a manager, and a financial market over one period, from the current date t_0 to t_1, date at which the firm is liquidated. Both the manager and the financial market are assumed to be risk-neutral. The introduction of risk-aversion would generate risk-sharing considerations which are not important in this model. The firm's investment decisions, capital structure, and the resulting distribution of cash-flows are determined exogenously. In order to simplify the analytical derivations contained in this paper, it is assumed that the capital of the firm consists only of equity and that the firm's cash-flows are distributed as they are generated. The propositions developed in this paper would however still obtain if these assumptions were relaxed.

The firm's current cash-flows X_0 and "operational" earnings A_0, at date t_0, are known by both the manager and the financial market[3]. There is however an asymmetry of information between the manager and the financial market about the firm's cash-flows and earnings obtaining at date t_1. The financial market is unsure whether the firm is a bad firm, that is, the firm's future cash-flows X_1 (operational earnings A_1) are low, X_L (A_L), or whether the firm is a good firm, that is, the firm's future cash-flows X_1 (operational earnings A_1) are high, X_H (A_H)[4]. The manager has perfect knowledge about the firm's type. Investors' prior beliefs are that the firm is a good firm with a probability p.

The firm is assumed to have completed the takeover of another firm in the accounting period ending at date t_0. The consideration was C. The fair value of the

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3 Signalling could still obtain if there was an asymmetry of information between the manager of the firm and the financial market about current earnings and cash-flows.

4 The propositions developed in this paper would still obtain with probability distributions.

tangible assets of the acquired firm was T, with $T<C$. Purchased goodwill, G_P, is therefore positive and equal to C-T. At date t_0, the manager of the firm has to take two reporting decisions related to the recent acquisition[5]. The first of these decisions consists in deciding which amount B of non-amortisable intangibles, such as brands, to recognise. The firm may recognise intangibles B up to B_{Max}, where B_{Max} is assumed to be smaller than G_P. The second decision consists in deciding whether to capitalise some residual goodwill G, where $G \leq G_P - B$, and amortise $W=G/2$ at dates t_0 and t_1, or write off any residual goodwill. It is thus clear that $W \leq W_{Max}$, where $W_{Max}=G_P/2$. Neither amortising nor writing down goodwill provides the firm with any taxation benefit.

The manager takes both reporting decisions, recognising that they may affect his utility. He derives utility from his compensation, which is assumed to depend on both the market value of the firm's equity[6] and a concave function of the firm's reported earnings. More formally, he is assumed to maximise the following objective function:

$$I(W)=\alpha f[A_0(W)]+\zeta V_0+\alpha\delta f[A_1(W)]+\zeta\delta V_1 \qquad (1)$$

where:

* $A_0(W)$ and $A_1(W)$ respectively represent the firm's reported earnings at dates t_0 and t_1;
* f(.) is an increasing and concave function of the earnings reported by the manager[7];
* V_0 and V_1 respectively represent the market values of the firm's equity obtaining at dates t_0 and t_1;
* α and ζ are constants, satisfying the following relationships: $0<\alpha<1$ and $0<\zeta<1$;

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5 Managerial discretion in reporting is assumed to be limited to both decisions. The propositions developed in this paper could however still obtain if this constraint was removed as long as the choices made by the manager were observable.

6 The propositions developed in this paper would still obtain if the manager's objective function depended on the market value of the firm.

7 The function f constitutes an extension of the function introduced by Healy (1985).

* δ represents the manager's rate of time preference.

The specific form taken by the manager's objective function is determined exogenously in this model. It would however appear to be compatible with the compensation schedules observed empirically. A substantial proportion of firms provide their directors with both stock-options and bonus schemes based on accounting figures. The manager's objective function may also be justified on more theoretical grounds. The game analysed in this paper may be considered as a sub-game of a larger game involving a moral hazard problem between the firm's manager and shareholders. In such an environment characterised by a separation between ownership and management, the manager's optimal compensation schedule may depend on both stock prices and reported earnings, despite the fact that stock prices impound all available information including earnings [Kim and Suh (1993), Bushman and Indjejikian (1993)]. Even if there is no hidden-action or hidden-information problem, the manager's optimal compensation schedule may still depend on both stock prices and reported earnings as long as the principal is risk-averse, and the process followed by earnings differs from the process followed by stock prices.

By discounting free cash-flows, one may rewrite the objective function introduced in Equation (1) in the following way:

$$I(W)=\alpha f(A_0-W)+\zeta\,[X_0-\alpha f(A_0-W)]+\zeta\,\delta\,E_M[X_1-\alpha f(A_1-W)\,|\,W] \\ +\alpha\,\delta f(A_1-W)+\zeta\,\delta\,[X_1-\alpha f(A_1-W)] \qquad (2)$$

where $E_M[.\,|W]$ represents the financial market's conditional expectation upon observing W.

In order to get non-trivial results, the following two assumptions will be made:

* The cash-flows after managerial compensation generated by the good firm at date t_1 are always higher than those generated by the bad firm at the same date:

$$X_H-\alpha f(A_H)>X_L-\alpha f(A_L-W_{Max}) \qquad (3)$$

* The amortisation of any residual amount of goodwill is costly[8]:

$$\zeta \leq Min \frac{f_I(A_0 - W) + \delta f_I(A_H - W)}{f_I(A_0 - W) + \delta [f_I(A_H - W) + f_I(A_L - W)]} \quad Over \ W \in [0, W_{Max}] \qquad (4)$$

Amortising an amount of goodwill W per period adversely affects reported earnings, and thus, the earnings-related components of the manager's objective function. The first-order effect[9] of goodwill amortisation is thus costly to the managers of both the good and bad firms. Since f is assumed to be concave, amortising an amount of goodwill W is however less costly to the manager of the good firm than it is to the manager of the bad firm. It is the difference in costs associated with the amortisation of goodwill which drives the propositions derived in this paper.

The assumptions made in this simple model enable us to derive a number of propositions which can be found in the next subsection. Proofs are available in Appendix A and B.

5.2.2 Propositions

This subsection provides conditions under which various types of equilibria may obtain. The equilibrium concept used in this paper is a Perfect Bayesian Equilibrium. According to Fudenberg and Tirole (1991), a Perfect Bayesian Equilibrium (PBE) is simply "a set of strategies and beliefs such that, at any stage of the game, strategies are optimal given the beliefs, and the beliefs are obtained from equilibrium strategies and observed actions using Bayes' rule".

The game introduced in the previous section belongs to a class of signalling models referred to by Thakor (1991) as SMIF (Signalling Models with the Informed moving

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8 Proof of this can be found in Appendix A2.

9 There is also a second-order effect: The decrease in the manager's compensation increases the value of the firm's equity, other things being equal

First). It is furthermore monotonic[10]. The main advantage of SMIF is that the sequence of moves, the information sets, and the beliefs can be thoroughly specified. The main disadvantage of SMIF is that a large number of equilibria may potentially obtain. This section therefore contains strategic refinements which attempt to put "sensible" restrictions on beliefs off the equilibrium path.

The propositions derived in this paper are driven by the impact of the manager's accounting choice on the firm's reported earnings. Writing off any residual goodwill is not costly to the managers of either the good or bad firms because it has no impact on reported earnings. Conversely, capitalising and amortising some residual goodwill is costly to any manager because the amount of goodwill amortised reduces the accounting-based bonus components of the manager's objective function obtaining at both t_0 and t_1. Capitalising and amortising some residual goodwill is however less costly to the manager of the good firm than it is to the manager of the bad firm because f is concave and the earnings before amortisation of any residual goodwill to be reported by the manager of the good firm at date t_1 are higher than those to be reported by the manager of the bad firm.

The basic model introduced in the previous section enables us to derive the following propositions:

Proposition 1:[11] No separating PBE in which the amount of goodwill amortised per period by the manager of the bad firm is higher than the amount of goodwill amortised per period by the manager of the good firm may possibly obtain.

Intuition:

No separating equilibrium, in which the amount of goodwill amortised by the manager of the good firm is higher than the amount of goodwill amortised by the manager of the bad firm may possibly obtain. The manager of the bad firm would

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10 According to Cho and Sobel (1990), "A signalling game is said to be monotonic if all sender types have the same preferences over the receiver's mixed strategy best responses".

11 Proof of Proposition 1 can be found in Appendix A1.

find it incentive-compatible to defect from his equilibrium strategy and pool with the manager of the good firm. By defecting from his equilibrium strategy, the manager of the bad firm enjoys the benefits resulting from both higher reported earnings and a higher market valuation.

Proposition 2:[12] Separating PBEs, in which the manager of the good firm capitalises an amount of residual goodwill and amortises W per period and the manager of the bad firm writes off any residual goodwill, will obtain if investors believe that any out-of-equilibrium action is taken by the manager of the bad firm and if the equilibrium amount of residual goodwill W amortised by the manager of the good firm satisfies the following inequations:

$$\begin{aligned} &\zeta\delta[\![X_H - X_L - \alpha[f(A_H - W) - f(A_L)]]\!] \\ &\geq \alpha(1-\zeta)[\![[f(A_0) - f(A_0 - W)] + \delta[f(A_H) - f(A_H - W)]]\!] \end{aligned} \tag{5}$$

and:

$$\begin{aligned} &\zeta\delta[\![X_H - X_L - \alpha[f(A_H - W) - f(A_L)]]\!] \\ &\leq \alpha(1-\zeta)[\![[f(A_0) - f(A_0 - W)] + \delta[f(A_L) - f(A_L - W)]]\!] \end{aligned} \tag{6}$$

It is always possible to find a set of $W \leq W_{Max}$ satisfying simultaneously both inequations as long as:

$$\zeta \leq \zeta_{M2} \tag{7}$$

where ζ_{M2} is defined in Appendix A2;

A continuum of separating equilibria may therefore potentially obtain. In the separating PBE Pareto-dominating all other separating PBEs, the manager of the good firm amortises W^* per period, where:

Intuition:

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12 Proof of Proposition 2 can be found in Appendix A2. The structure of the proof is as follows. In a first part, we derive necessary conditions for the separating equilibria to obtain given the exogenously defined beliefs formed by investors upon observing out-of-equilibrium actions. Separating equilibria may however obtain with more optimistic beliefs. In a second part starting with the word "conversely", it can be checked that these conditions are indeed sufficient for the separating equilibria to obtain.

$$\zeta\delta[\![X_H - X_L - \alpha[f(A_H - W^*) - f(A_L)]]\!]$$
$$= \alpha(1-\zeta)[\![[f(A_0) - f(A_0 - W^*)] + \delta[f(A_L) - f(A_L - W^*)]]\!] \quad (8)$$

A separating equilibrium, in which the manager of the good firm chooses to capitalise and amortise some goodwill and in which the manager of the bad firm chooses to write down any residual goodwill, can only obtain if it is incentive-compatible for both managers to act accordingly. The first equation states that, for the manager of the good firm not to deviate from his equilibrium policy, the marginal gain from deviating, that is, the increase in the earnings-related component of the manager's objective function resulting from choosing to write down any residual goodwill, should be smaller than the marginal cost from deviating, that is, the decrease in the manager's objective function resulting from his firm being identified as a bad firm.

Similarly, the second equation states that, for the manager of the bad firm not to deviate from his equilibrium policy, the marginal gain from deviating, that is, the increase in the manager's objective function resulting from his firm being identified as a good firm, should be smaller than the marginal cost from deviating, that is, the decrease in the earnings-related component of the manager's objective function resulting from choosing to capitalise and amortise some goodwill. These two conditions may be satisfied simultaneously because the marginal cost of choosing to capitalise and amortise some goodwill is higher to the manager of the bad firm than it is to the manager of the good firm.

Proposition 3:[13] Pooling PBEs, in which both the managers of the good and the bad firms choose to capitalise an amount of residual goodwill and amortise W per period, will obtain if investors believe that a firm deviating from its equilibrium strategy is a bad firm and if:

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13 Proof of Proposition 3 can be found in Appendix A3. The structure of the proof is as follows. In a first part, we derive necessary conditions for the pooling equilibria to obtain given the exogenously defined out-of-equilibrium beliefs. Pooling equilibria may however obtain with more optimistic beliefs. In a second part starting with the word "conversely", it can be checked that these conditions are indeed sufficient for the pooling equilibria to obtain.

$$p \geq \frac{\alpha [\![(1-\zeta)[f(A_0)-f(A_0-W)+\delta(f(A_L)-f(A_L-W)]-\zeta\delta[f(A_L)-f(A_L-W)]]\!]}{\zeta\delta [\![X_H-X_L-\alpha[f(A_H-W)-f(A_L-W)]]\!]} \qquad (9)$$

A continuum of pooling PBEs may therefore potentially obtain.

Intuition:

This pooling equilibrium can only obtain if investors' prior beliefs are that any firm is a good firm with a high enough probability. If this was not the case, the marginal benefit accruing to the manager of the bad firm deviating from the pooling equilibrium strategy, that is, the increase in the earnings-based component of the manager's objective function resulting from choosing to write-down any residual goodwill, would exceed the marginal cost associated with it, that is, the decrease in the manager's objective function resulting from his firm being valued as a bad firm by the financial market.

Proposition 4:[14] A pooling PBE in which the managers of both the good and the bad firms write down any residual goodwill will obtain if investors believe that a firm deviating from its equilibrium strategy is a bad firm.

Intuition:

The pooling equilibrium is sustained by pessimistic out-of-equilibrium beliefs imposing costs on any deviating firm. No firm will ever want to deviate since a would-be deviating firm has nothing to gain from any deviation. The manager of any firm, who deviates from his equilibrium strategy and amortises some residual goodwill, is both reporting lower earnings and identified as the manager of a bad firm.

The signalling game analysed in this section thus supports a multitude of equilibria. These equilibria are furthermore sequential. This is not surprising given the structure of the game. The equilibrium concepts used in this paper do not impose

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14 Proof of Proposition 4 can be found in Appendix A4. A pooling equilibrium in which the managers of both the good and bad firms choose to write-down any residual goodwill may however be sustained by more optimistic out-of-equilibrium beliefs.

many constraints on out-of-equilibrium beliefs. It could be argued that a number of these equilibria are supported by quite "unreasonable" or even "outrageous" out-of-equilibrium beliefs. Economic theory provides us with a number of systematic criteria (strategic refinements) for eliminating equilibria which are supported by unreasonable beliefs[15]:

- Intuitive Criterion [Cho and Kreps (1987)]: Using Fudenberg and Tirole's (1991) terminology, a sequential equilibrium is said to satisfy the intuitive criterion if it can be sustained by beliefs having the following property for all possible out-of-equilibrium information sets a_1: If type θ is unwilling to deviate to a_1 whatever player 2's (market) response, then player 2 should not assign any positive weight to type θ at information set a_1.

- D1 [Cho and Kreps (1987)]: According to Fudenberg and Tirole (1991), a sequential equilibrium is said to satisfy the D1 criterion if for all possible out-of-equilibrium information sets a_1 it can be sustained by beliefs having the following property: "If the set of player 2's (market) best responses that make type θ willing to deviate to a_1 is strictly smaller than the set of responses that make type θ' willing to deviate, then player 2 should believe that type θ' is infinitely more likely to deviate to a_1 than type θ is".

- Ultimate Divinity [Banks and Sobel (1987)]: Using Fudenberg and Tirole's (1991) terminology, a sequential equilibrium is said to satisfy the ultimate divinity strategic refinement if it can be sustained by beliefs having the following property for all possible out-of-equilibrium information sets a_1: If the set of player 2's (market) best responses that make type θ willing to deviate to a_1 is included in the union of sets of responses that make other types θ' willing to deviate, then player 2 should not assign any positive weight to type θ at the information set a_1.

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15 Strategic stability, as defined by Kohlberg and Mertens (1986), is not applicable in the context of this paper. Strategic stability cannot be used in a game in which either the number of inferred types or their strategies are infinite.

- Never Weak Best Response (NWBR) [Kohlberg and Mertens' (1986)]: Using Fudenberg and Tirole's (1991) terminology, a sequential equilibrium is said to satisfy the NWBR criterion if it can be sustained by beliefs having the following property for all possible out-of-equilibrium information sets a_1: If the set of player 2's (market) best responses that make type θ indifferent between playing his equilibrium strategy and deviating to a_1 is included in the union of sets of responses that make other types θ' willing to deviate, then player 2 should not assign any positive weight to type θ at information set a_1.

It can be shown that the NWBR criterion is stronger than the ultimate divinity criterion which is stronger than the intuitive criterion. Hence the set of equilibria surviving the NWBR criterion is nested in the set of equilibria surviving the ultimate divinity criterion, which is nested in the set of criteria surviving the intuitive criterion. In the context of the signalling game analysed in this chapter, the D1 and ultimate divinity criteria are by definition equivalent since there are only two types of firms. If the set of strategies from which the manager can choose from was not bounded by an upper limit, it could be shown that only one equilibrium, the efficient separating equilibrium, would survive the D1 criterion. This equilibrium would furthermore be the only one to survive the intuitive criterion, the ultimate divinity criterion, or the NWBR criterion. In the context of the signalling model analysed in this chapter, the manager's strategy space is bounded by an upper limit. In these circumstances, only the pooling equilibrium in which both firms amortise W_{Max} per period and the efficient separating PBE do survive the D1 criterion. These equilibria are also the only ones to satisfy the ultimate divinity and NWBR strategic refinements[16].

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16 The intuitive criterion does not have much power in these circumstances. As stated by Thakor (1991), "We can think of applying the Cho-Kreps intuitive criterion in a two-step process. First, we determine whether we can eliminate any type as a potential defector because that type would gain nothing from the defection regardless of the beliefs of the uninformed. Second, we see if there exists some belief concentrated on the remaining types such that no type would wish to defect, given the uninformed's best response associated with that belief. If we cannot eliminate any types in the first step, then the sequential equilibrium always survives the intuitive criterion". In the context of this chapter, this process thus leads us to consider out-of-equilibrium amounts of goodwill amortised per period W_* for which the manager of the bad firm is indifferent between playing his equilibrium strategy and reporting W_* when investors believe that any defector is a good firm with a probability of 1. But, as the set of strategies W is bounded by an upper limit, we may not be allowed to use W_* to eliminate all pooling equilibria.

Proposition 5:[17] Both pooling and separating PBEs are sequential[18] [19]. But only the pooling equilibrium in which both firms amortise W_{Max} per period and the efficient separating PBE do survive the D1 criterion introduced by Cho and Kreps (1987). These equilibria are also the only ones to satisfy Banks and Sobel's (1987) ultimate divinity and Kohlberg and Mertens' (1986) Never Weak Best Response (NWBR) strategic refinements. Furthermore, it can be shown that the efficient separating equilibrium is the only PBE to survive these strategic refinements as long as the following inequation is satisfied:

$$\delta (X_H - X_L) \leq \phi(W_{Max}) \qquad (10)$$

where $\Phi(W_{Max})$ is defined in Appendix A2.

Proposition 6: [20] If a separating equilibrium obtains, then:

* The market reaction to the announcement of goodwill write-downs should be negative;
* The market reaction to the announcement of goodwill amortisation should be positive.

The basic model introduced in this section does not take into account the fact that the manager may recognise amortisable and tax-allowable intangibles such as patents and trademarks. In order to address this issue, the basic model may be extended to deal with three types of firms of ascending quality: the ugly, bad, and good firms. The extended model allows separating equilibria, in which the manager of the ugly firm does not recognise any amortisable intangibles and writes down any residual goodwill, the manager of the bad firm recognises amortisable intangibles and writes

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17 Proofs of Proposition 5 can be found in Appendix B1, B2, and B3.

18 A set of strategies and beliefs is said to form a sequential equilibrium if it is both sequentially rational and consistent. A set is consistent if it is the limit of some sequence of mixed strategies and beliefs, where the beliefs are derived from the application of Bayes' rule.

19 If the manager's set of write-downs was unbounded above, then the only equilibrium to satisfy the intuitive criterion developed by Cho and Kreps (1987) would be the efficient separating equilibrium.

20 Proofs of Proposition 6 can be found in Appendix B4.

down any residual goodwill, and the manager of the good firm recognises amortisable intangibles and capitalises and amortises some residual goodwill, to obtain.

5.2.3 Extension To A Continuum Of Types

The basic model introduced in the previous subsection is extended to cope with a continuum of types of firms. The manager of a firm of type q, with q comprised between 0 and 1, knows that his firm has a probability q of generating cash-flows X_1 (operational earnings A_1) at date t_1 of X_H (A_H) and a probability 1-q of generating cash-flows X_1 (operational earnings A_1) at date t_1 of X_L (A_L)[21] [22]. The type of the firm is unknown to the financial market.

Most of the assumptions made in the previous section are still valid. As in the previous section, the manager may attempt to signal his type by amortising W of goodwill per period, where $W \leq W_{Max}$. He takes his decision, taking into account the impact of the announcement of his decision on his objective function, which is similar to the one introduced in the previous subsection. In order to obtain a closed-form solution, the function f, modelling the bonus plan, is capped above and given the following functional form[23] [24]:

$$f(A_i)=Min[H,A_i-L] \quad For\ i=0,1 \tag{11}$$

where H is a parameter representing the earnings upper bound of the bonus plan and L is a constant. The parameters H and L are assumed to satisfy the following inequations:

The financial market perceives the firm's type q to be a function of the amount W

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21 In another interpretation of the same model, the manager *knows* that the firm will generate: $X_1=q.X_H+(1-q).X_L$.

22 The propositions developed in this paper would still obtain with probability distributions.

23 The specific form taken by the function f has been introduced by Healy (1985).

24 The propositions developed in this paper could obtain as long as the function f was concave [Riley (1979)].

$$\begin{cases} A_0 \leq L+H \\ A_L \leq L+H \leq A_H - W_{Max} \end{cases} \quad (12)$$

of goodwill amortised per period. This function, which is assumed to be differentiable[25], will be referred to as q(W).

The manager thus maximises the following objective function:

$$I(q,W) = I^M(W) + I^D(q,W) \quad (13)$$

with:

$$I^D(q,W) = \alpha A_0(W) + \delta \alpha A_1(q,W) + \delta \zeta [X_1(q) - \alpha A_1(q,W)] \quad (14)$$

and:

$$I^M(W) = \zeta [\![X_0 - \alpha A_0(W) + \delta [X_1(W) - \alpha A_1(W)]]\!] \quad (15)$$

where:

$$\begin{cases} A_0(W) = A_0 - W - L \\ A_1(q,W) = qH + (1-q)(A_L - W - L) \\ A_1(W) = q(W)H + [1-q(W)](A_L - W - L) \\ X_1(q) = qX_H + (1-q)X_L \\ X_1(W) = q(W)X_H + [1-q(W)]X_L \end{cases} \quad (16)$$

$I^D(q,W)$ represents the component of the managerial objective function linked to the manager's information set. Conversely, $I^M(W)$ represents the component of the managerial objective function linked to the information set of the financial market.

The manager of the firm therefore maximises with respect to W the following objective function:

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25 The propositions developed in this paper would still hold if q(W) was differentiable almost anywhere.

$$\begin{aligned}\Pi[q,q(W),W] &= \alpha\,(A_0 - W - L) + \zeta\,[X_0 - \alpha\,(A_0 - W - L)] \\ &+ \zeta\,\delta\,[\![q(W)\,X_H + (1-q(W))\,X_L - \alpha\,[q(W)\,H + (1-q(W))\,(A_L - W - L)]]\!] \\ &+ \delta\,\alpha\,[q\,H + (1-q)\,(A_L - W - L)] \\ &+ \delta\,\zeta\,[\![q\,X_H + (1-q)\,X_L - \alpha\,[q\,H + (1-q)\,(A_L - W - L)]]\!]\end{aligned} \tag{17}$$

Maximising this objective function for any given market valuation schedule q(W) determines an optimal amount of goodwill amortised W^*, which depends on the quality of the firm q:

$$W^* = W^*(q) \tag{18}$$

We are however not interested in any arbitrary market valuation schedule q(W). Rather, we shall restrict our attention to market valuation schedules which have an equilibrium property. A market valuation schedule q(W) is said to be an equilibrium valuation schedule[26] if the quality of the firm q is correctly identified by the market for all values of q. More formally:

$$q[W^*(q)] = q \tag{19}$$

As in the previous subsection, it will be assumed that the amortisation of any residual amount of goodwill is costly. It can be shown that a necessary and sufficient condition for amortisation to be costly is given by the following inequation:

$$\zeta < \frac{1+\delta}{1+2\,\delta} \tag{20}$$

The extended model introduced in this section enables us to derive the following propositions:

Proposition 7: There exists a unique equilibrium valuation schedule q(W). This equilibrium valuation schedule is a strictly increasing function of W. It is implementable, that is, the equilibrium amount of goodwill amortised per period by the best firm does not exceed W_{Max}, as long as ζ is small enough.

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26 This definition of an equilibrium valuation schedule is similar to the one provided by Leland and Pyle (1977).

Proposition 8: The abnormal share price reaction to the announcement of goodwill amortisation is an increasing function of the amount of goodwill W amortised per period.

Proofs of Propositions 7 and 8 are available in Appendix C.

5.3 Extension To Other Accounting Choices

Unlike the choice whether or not to amortise purchased goodwill, most accounting procedures, which are perceived to be income-decreasing in the near future, may not remain income-decreasing in the longer term. For instance, using a high depreciation rate as opposed to a low depreciation rate to depreciate a fixed asset will be income-decreasing in the first years and income-increasing later on. It could thus be argued that there is no such thing as an income-decreasing accounting method. The empirical literature however typically assumes that income-decreasing accounting procedures remain income-decreasing in the future. With respect to the depreciation of fixed assets, it can be shown that this is indeed the case as long as the firm's assets are expanding each year in nominal terms. In fact, as is shown in Chapter 9, most accounting procedures remain income-increasing or income-decreasing under appropriate conditions. The model introduced in the previous section may thus be naturally extended to deal with other accounting choices if these conditions are met. It can also be shown that the model may also be naturally extended to deal with other accounting choices if these conditions were not met as long as the manager's rate of time preference is low enough.

This section introduces a model dealing with income-decreasing accounting procedures which turn out to be income-increasing at some stage in the longer term in which the manager's rate of time preference does not have to be arbitrarily low. As in the model introduced in the previous section, the manager has private information about the firm's future earnings and cash-flows, and, under certain conditions, may credibly communicate his information to investors through his accounting choice. The model is simplified in order to concentrate on the

informative role of the manager's accounting choice.

5.3.1 The Basic Model

This model deals with a firm, a manager, and a financial market over two periods, from the current date t_0, to t_2, date at which the firm is liquidated. Both the manager and the financial market are assumed to be risk-neutral. The introduction of risk-aversion would generate risk-sharing considerations which are not important in this model. The firm's investment decisions, capital structure, and the resulting distribution of cash-flows are determined exogenously. In order to simplify the analytical derivations contained in this paper, it is assumed that the capital of the firm consists only of equity and that the firm's cash-flows are distributed as they are generated. The propositions developed in this paper would however still obtain if these assumptions were relaxed.

The firm's performance, as illustrated by "economic" earnings and cash-flows, is expected to improve dramatically by date t_2. There is however an information asymmetry between the manager of the firm and the financial market about the speed of the turnaround. The firm could be either a "good" or a "bad" firm. The good firm is experiencing a successful turnaround by t_1. The good firm is thus assumed to generate economic earnings A_H and cash-flows X_H at dates t_1[27] and t_2. The bad firm is experiencing a successful turnaround between t_1 and t_2. The bad firm is thus assumed to generate economic earnings A_L and cash-flows X_L at date t_1, and economic earnings A_H and cash-flows X_H at date t_2. Economic earnings A_H and cash-flows X_H are assumed to exceed economic earnings A_L and cash-flows X_L. The manager has perfect knowledge of his firm's type. Investors' prior beliefs are that the firm is a good firm with a probability p.

At date t_0, the manager has to report his firm's results relating to the financial exercise closing at date t_0. The current cash-flows X_0 and economic earnings A_0,

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[27] The propositions developed in this paper would still obtain with probability distributions.

generated at date t_0, are known by both the manager and the financial market[28]. The manager has to choose an accounting procedure to account for the economic earnings generated by the firm at dates t_0, t_1, and t_2. He chooses an accounting procedure from an "authorised set" including an "aggressive" and other more "conservative" accounting procedures, referred to as "income-decreasing accounting procedures W" or more simply as "accounting procedures W", where $W \leq W_{Max}$. The "aggressive" accounting procedure takes economic earnings as reported earnings. An "income-decreasing accounting procedure W" generates reported earnings from economic earnings by transferring earnings of W obtaining at dates t_0 and t_1 to date t_2, where $W \leq W_{Max}$. Managerial discretion in reporting is furthermore assumed to be limited to the choice of this accounting procedure[29].

The manager is rational and chooses an accounting procedure taking into account the impact of the announcement of the accounting choice on his objective function. He derives utility from his compensation, which is assumed to depend on both the market value of the firm's equity[30] and a concave function of the firm's reported earnings. More formally, he is assumed to maximise the following objective function:

$$I(W) = \alpha f[A_0(W)] + \zeta V_0 + \delta \alpha f[A_1(W)] + \delta \zeta V_1 + \delta^2 \alpha f[A_2(W)] + \delta^2 \zeta V_2 \qquad (21)$$

where:

* α and ζ are constants, satisfying the following relationships: $0 < \alpha < 1$ and $0 < \zeta < 1$;
* $A_0(W)$, $A_1(W)$, and $A_2(W)$ respectively represent the earnings reported by the manager of the firm at dates t_0, t_1, and t_2;
* V_0, V_1, and V_2 respectively represent the market value of the firm's equity at

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28 Signalling could still obtain if there was an asymmetry of information between the manager of the firm and the financial market about current earnings or cash-flows.

29 The propositions developed in this paper could however still obtain if this constraint was removed as long as the choices made by the manager were observable.

30 The propositions developed in this paper would still obtain if the manager's objective function depended on the market value of the firm.

dates t_0, t_1, and t_2;

* $f[A_0(W)]$, $f[A_1(W)]$, and $f[A_2(W)]$ respectively represent the accounting-based component of the manager's compensation package prevailing at t_0, t_1, and t_2;
* δ represents the manager's rate of time preference.

By discounting cash-flows, one may rewrite the objective function introduced in Equation (21) in the following way:

$$\begin{aligned} I(W) = {} & \alpha f(A_0 - W) + \zeta [X_0 - \alpha f(A_0 - W)] \\ & + \zeta \delta E_M [\![X_1 - \alpha f(A_1 - W) + \delta [X_2 - \alpha f(A_2 + 2W)] \mid W]\!] \\ & + \delta \alpha f(A_1 - W) + \delta \zeta [\![X_1 - \alpha f(A_1 - W) + \delta [X_2 - \alpha f(A_2 + 2W)]]\!] \\ & + \delta^2 \alpha f(A_2 + 2W) + \delta^2 \zeta [X_2 - \alpha f(A_2 + 2W)] \end{aligned} \qquad (22)$$

where:

* $E_M[. \mid W]$ represents the financial market's conditional expectation upon observing W.
* X_0, X_1, and X_2 respectively represent the cash-flows generated by the firm at dates t_0, t_1, and t_2.
* A_0, A_1, and A_2 respectively represent the economic earnings generated by the firm at dates t_0, t_1, and t_2.

In order to get non-trivial results, the following two assumptions will be made:

* The cash-flows after managerial compensation generated by the good firm at date t_1 are always higher than those generated by the bad firm at the same date:

$$X_H - \alpha f(A_H) > X_L - \alpha f(A_L - W_{Max}) \qquad (23)$$

* The choice of any income-decreasing accounting procedure is costly for all $W \in [0, W_{Max}]$[31]:

[31] Proof of this can be found in Appendix D2

$$\zeta \leq Min \frac{f_I(A_0 - W) + \delta f_I(A_H - W) - 2\delta^2 f_I(A_H + 2W)}{\delta [f_I(A_L - W) - 4\delta f_I(A_H + 2W)] + f_I(A_0 - W) + \delta f_I(A_H - W) - 2\delta^2 f_I(A_H + 2W)} \quad (24)$$

Choosing an income-decreasing accounting procedure W transfers earnings W from t_0 and t_1 to t_2. Since economic earnings are lower at date t_0 than they are at t_2, f is concave, and the manager's rate of time-preference is lower than 1, the choice of an income-decreasing accounting procedure W may thus prove costly to the managers of both the good and bad firms. Such a choice is however less costly to the manager of the good firm than it is to the manager of the bad firm because f is concave and the economic earnings obtaining at t_1 are higher for the good firm than they are for the bad firm. It is this difference in costs which drives the propositions derived in the second half of this paper[32].

The assumptions made in this simple model enable us to derive a number of propositions which can be found in the next subsection. Proofs of Propositions 1 to 4 are available in Appendix D.

5.3.2 Propositions

This subsection provides conditions under which various types of equilibria may obtain. The propositions derived in this subsection are driven by the impact of the manager's choice on the firm's reported earnings. Choosing an income-decreasing accounting procedure W transfers earnings from dates t_0 and t_1 to t_2. Choosing an income-decreasing accounting procedure thus reduces the accounting-based components of the manager's objective function obtaining at both t_0 and t_1, and increases the accounting-based component of the manager's objective function obtaining at t_2. Since economic earnings are lower at date t_0 than they are at t_2, f is concave, and the manager's rate of time-preference is lower than 1, the choice of an

[32] There is however a secondary effect due to the fact that any decrease in the manager's compensation increases the value of the firm's equity, other things being equal.

income-decreasing accounting procedure W may thus prove costly to the managers of both the good and bad firms. Such a choice is however less costly to the manager of the good firm than it is to the manager of the bad firm because f is concave and the economic earnings obtaining at t_1 are higher for the good firm than they are for the bad firm.

As in the previous section, the basic model introduced in the previous subsection enables us to derive the following propositions:

Proposition 1:[33] No separating PBE in which the manager of the bad firm chooses to adopt an income-decreasing accounting procedure while the manager of the good firm abstains from taking any income-decreasing accounting procedure may possibly obtain.

Proposition 2:[34] Separating PBEs, in which the manager of the good firm choose to adopt an income-decreasing accounting procedure W and the manager of the bad firm abstains from adopting any income-decreasing accounting procedure, will obtain if investors believe that any out-of-equilibrium action is taken by the manager of the bad firm and if the following inequations are satisfied:

$$\begin{aligned}&\alpha(1-\zeta)\zeta^{-1}\left[\left[f(A_0)-f(A_0-W)\right]+\delta\left[f(A_H)-f(A_H-W)\right]+\delta^2\left[f(A_H)-f(A_H+2W)\right]\right]\\&-\alpha\delta\left[\left[f(A_L)-f(A_H-W)\right]+2\delta\left[f(A_H)-f(A_H+2W)\right]\right]\leq\delta(X_H-X_L)\end{aligned}\qquad(25)$$

and:

$$\begin{aligned}&\alpha(1-\zeta)\zeta^{-1}\left[\left[f(A_0)-f(A_0-W)\right]+\delta\left[f(A_L)-f(A_L-W)\right]+\delta^2\left[f(A_H)-f(A_H+2W)\right]\right]\\&-\alpha\zeta\delta\left[\left[f(A_L)-f(A_H-W)\right]+2\delta\left[f(A_H)-f(A_H+2W)\right]\right]\geq\delta(X_H-X_L)\end{aligned}\qquad(26)$$

It is always possible to find $W \leq W_{Max}$ satisfying simultaneously both inequations as long as:

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33 Proof of Proposition 1 can be found in Appendix D1.

34 Proof of Proposition 2 can be found in Appendix D2. The structure of the proof is as follows. In a first part, we derive necessary conditions for the separating equilibria to obtain given the exogenously defined beliefs formed by investors upon observing out-of-equilibrium actions. Separating equilibria may however obtain with more optimistic beliefs. In a second part starting with the word "conversely", it can be checked that these conditions are indeed sufficient for the separating equilibria to obtain.

$$\zeta \leq \zeta_{M2} \tag{27}$$

where ζ_{M2} is defined in Appendix D2;

A continuum of separating equilibria may therefore potentially obtain. In the separating PBE Pareto-dominating all other separating PBEs, the manager of the good firm chooses to adopt an income-decreasing accounting procedure W*, where W* is defined in Appendix D2.

Proposition 3:[35] Pooling PBEs, in which both the managers of the good and the bad firms choose to adopt an income-decreasing accounting procedure W, will obtain if investors believe that a firm deviating from its equilibrium strategy is a bad firm and if:

$$p \geq p_2 + p_3 \tag{28}$$

where p_2 and p_3 are defined in Appendix D3. A continuum of pooling PBEs may therefore potentially obtain.

Proposition 4:[36] A pooling PBE in which the managers of both the good and the bad firms choose to abstain from adopting any income-decreasing accounting procedures will obtain if investors believe that a firm deviating from its equilibrium strategy is a bad firm.

Proposition 5:[37] Both pooling and separating PBEs are sequential. But only the pooling equilibrium, in which both types of firms adopt the most income-decreasing accounting procedure, and the efficient separating PBE do survive the D1 criterion introduced by Cho and Kreps (1987). These equilibria are also the only ones to

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35 Proof of Proposition 3 can be found in Appendix D3.

36 Proof of Proposition 4 can be found in Appendix D4. A pooling equilibrium in which the managers of both the good and bad firms choose to abstain from adopting any income-decreasing accounting procedures may however be sustained by more optimistic out-of-equilibrium beliefs.

37 The proof of Proposition 5 is similar to the one which can be found in Appendix B1, B2, and B3 and is thus omitted.

satisfy Banks and Sobel's (1987) ultimate divinity and Kohlberg and Mertens' (1986) Never Weak Best Response (NWBR) strategic refinements. Furthermore, it can be shown that the efficient separating equilibrium is the only PBE to survive these strategic refinements as long as the following relationship is satisfied:

$$\delta (X_H - X_L) \leq \phi(W_{Max}) \qquad (29)$$

where $\Phi(W_{Max})$ is defined in Appendix D2.

Proposition 6:[38] If a separating equilibrium obtains, then:

* The market reaction to the announcement of income-decreasing accounting procedures should be positive;

* The market reaction to the announcement of the aggressive accounting procedure should be negative;

5.3.3 Extension To A Continuum Of Types

The basic model considered previously is extended to cope with a continuum of types of firms. As in the previous subsection, the firm's performance is expected to improve dramatically by date t_2. There is however an information asymmetry between the manager of the firm and the financial market about the speed of the turnaround. A firm of type q, with q comprised between 0 and 1, has a probability q of experiencing a successful turnaround by date t_1 and a probability 1-q of experiencing a successful turnaround between dates t_1 and t_2. At date t_1, a firm of type q thus has a probability q of generating cash-flows (earnings) of X_H (A_H) and a probability 1-q of generating cash-flows (earnings) of X_L (A_L)[39] [40]. At date t_2,

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38 The proof of Proposition 6 is similar to the one which can be found in Appendix B4 and is thus omitted.

39 In another interpretation of the same model, the manager *knows* that the firm will generate $X_1 = q.X_H + (1\ q).X_L$.

40 The propositions developed in this paper would still obtain with probability distributions.

any type of firms is assumed to generate earnings A_H and cash-flows X_H. Earnings A_H and cash-flows X_H are assumed to respectively exceed earnings A_L and cash-flows X_L. The manager has perfect knowledge of his firm's type. The type of the firm is unknown to the financial market. Investors' prior beliefs are that the firm is a good firm with a probability p.

Most of the assumptions made in the previous section are still valid. As in the previous section, the manager may attempt to signal his type by choosing an income-decreasing accounting procedure W, where $W \leq W_{Max}$. He takes his decision, taking into account the impact of the announcement of his decision on his objective function, which is similar to the one introduced in the previous subsection. In order to obtain a closed-form solution, the function f, modelling the bonus plan, is capped above and given the following functional form[41] [42]:

$$f(A_i) = Min[H, A_i - L] \quad For\ i = 0,1,2 \tag{30}$$

where H is a parameter representing the earnings upper bound of the bonus plan and L is a constant. The parameters H and L are assumed to satisfy the following inequations:

$$\begin{cases} A_0 \leq L + H \\ A_L \leq L + H \leq A_H - W_{Max} \end{cases} \tag{31}$$

The financial market perceives the firm's type to be a function of the "degree of conservativeness" characterising the manager's choice of accounting procedure. This function, which is assumed to be differentiable[43], will be referred to as q(W).
The manager thus maximises the following objective function:

$$I(q,W) = I^M(W) + I^D(q,W) \tag{32}$$

where:

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41 The specific form taken by the bonus scheme has been introduced by Healy (1985).

42 The propositions developed in this paper could obtain as long as the function f was concave [Riley (1979)].

43 The propositions developed in this paper would still hold if q(W) was differentiable almost anywhere.

$$\begin{aligned} I^D(q,W) = {} & \alpha f[A_0(W)] + \delta \alpha f[A_1(q,W)] \\ & + \delta \zeta \{ [X_1(q) - \alpha f[A_1(q,W)] + \delta [X_2 - \alpha f[A_2(W)]] \} \\ & + \delta^2 \alpha f[A_2(q,W)] + \delta^2 \zeta [X_2 - \alpha f[A_2(W)]] \\ I^M(W) = {} & \zeta \{ [X_0 - \alpha f[A_0(W)] + \delta [X_1(W) - \alpha f[A_1(W)]] + \delta^2 [X_2 - \alpha f[A_2(W)]] \} \end{aligned} \tag{33}$$

and:

$$\begin{aligned} A_0(W) &= A_0 - W \\ A_1(q,W) &= qH + (1-q)(A_L - W) \\ A_1(W) &= q(W)H + (1-q(W))(A_L - W) \\ X_1(q) &= qX_H + (1-q)X_L \\ X_1(W) &= q(W)X_H + (1-q(W))X_L \\ A_2(W) &= A_H + 2W \\ X_2 &= X_H \end{aligned} \tag{34}$$

$I^D(q,W)$ represents the component of the managerial objective function linked to the manager's information set. Conversely, $I^M(W)$ represents the component of the managerial objective function linked to the information set of the financial market.

The manager of the firm therefore maximises with respect to W the following objective function:

$$\begin{aligned} \Pi[q,q(W),W] = {} & \alpha(A_0 - W - L) + \alpha\zeta[X_0 - \alpha(A_0 - W - L)] \\ & + \zeta\delta[q(W)(X_H - \alpha H) + (1-q(W))(X_L - \alpha(A_L - W - L)] \\ & + \zeta\delta^2[X_H - \alpha H] + \alpha\delta[qH + (1-q)(A_L - W - L)] \\ & + \delta\zeta[q(X_H - \alpha H) + (1-q)(X_L - \alpha(A_L - W - L)] \\ & + \delta\zeta\delta[X_H - \alpha H] + \delta^2\alpha H + \delta^2\zeta[X_H - \alpha H] \end{aligned} \tag{35}$$

Maximising this objective function for any given market valuation schedule q(W) determines an optimal "degree of conservativeness" W^*, which depends on the quality of the firm q:

$$W^* = W^*(q) \tag{36}$$

We are however not interested in any arbitrary market valuation schedule q(W). Rather, we shall restrict our attention to market valuation schedules which have an equilibrium property. A market valuation schedule q(W) is said to be an equilibrium

valuation schedule[44] if the quality of the firm q is correctly identified by the market for all values of q. More formally:

$$q[W^*(q)]=q \tag{37}$$

As in the previous subsection, it will be assumed that the choice of any income-decreasing accounting procedure W is costly. It can be shown that a necessary and sufficient condition for income-decreasing accounting procedures to be costly is given by the following inequation:

$$\zeta<\frac{1+\delta}{1+2\delta} \tag{38}$$

The extended model introduced in this section enables us to derive the following propositions:

Proposition 7: There exists a unique equilibrium valuation schedule q(W). This equilibrium valuation schedule is a strictly increasing function of W. It is implementable, that is, the amount of earnings transferred by the best firm at dates t_0 and t_1 to date t_2 does not exceed W_{Max}, as long as ζ is small enough.

Proposition 8: The abnormal share price reaction to the adoption of the income-decreasing accounting procedure W is an increasing function of W.

Proofs are available in Appendix E.

4. Summary

This paper provides a compensation-based explanation for the discretionary accounting choices made by managers in a world in which managers are endowed with private information about their firms' future earnings. It introduces a first model in which the manager chooses whether to write-down or amortise purchased goodwill recognising that his compensation depends on both current and future

[44] This definition of an equilibrium valuation schedule is similar to the one provided by Leland and Pyle (1977).

reported earnings and firm's equity market values. The financial market values the firm's equity according to the accounting choice made by the manager. This paper provides sufficient conditions for separating and pooling rational expectations equilibria to obtain. This model predicts that, when a separating equilibrium prevails, the firms endowed with purchased goodwill which choose to amortise some goodwill are likely to see higher earnings in the next periods than the firms which choose to write-down all their goodwill. It also predicts that the former firms should experience, on average, positive abnormal returns around announcement dates.

This model is then extended to deal with a broader range of discretionary accounting procedures. In the extended model, the use of income-decreasing accounting measures signals favourable private information while the use of income-increasing accounting measures signals unfavourable private information. These predictions would appear to be consistent with the views displayed by the financial community about conservatism.

The propositions developed in this paper are driven by the concavity of the earnings-related component of the manager's objective function. Concavity of the earnings-related component of the manager's objective function enables us however to capture the "Spence-Mirrlees" sorting condition in a simple framework. The "Spence-Mirrlees" sorting condition could however also obtain in the absence of concavity as long as the firm's manager is risk-averse.

Appendix A

A1 Proposition 1 (Proof)

Let us assume that there exists a separating Perfect Bayesian equilibrium (PBE) in which the manager of the bad firm chooses to amortise an amount of goodwill W per period, and the manager of the good firm chooses to amortise an amount of goodwill $\hat{W}$ per period, where $W \geq \hat{W}$.

The bad firm's manager who is playing the separating equilibrium strategy derives the following utility:

$$I_{BFE}=\alpha f(A_0-W)+\zeta[[X_0-\alpha f(A_0-W)+\delta[X_L-\alpha f(A_L-W)]] +\alpha\delta f(A_L-W)+\zeta\delta[X_L-\alpha f(A_L-W)] \quad (39)$$

The bad firm's manager who is deviating from the separating equilibrium strategy by amortising $\hat{W}$ will derive the following utility:

$$I_{BFD}=\alpha f(A_0-\hat{W})+\zeta[[X_0-\alpha f(A_0-\hat{W})+\delta[X_H-\alpha f(A_H-\hat{W})]] +\alpha\delta f(A_L-\hat{W})+\zeta\delta[X_L-\alpha f(A_L-\hat{W})] \quad (40)$$

Since it has been assumed [Inequality (3)] that the cash-flows after managerial compensation generated by the good firm at date t_1 are always higher than those generated by the bad firm, it can be seen from the above equations that $I_{BFD} > I_{BFE}$. Therefore no separating PBE, in which the manager of the bad firm chooses to amortise an amount of goodwill W which is higher than the amount of goodwill $\hat{W}$ amortised by the manager of the good firm, can possibly obtain.

A2 Proposition 2 (Proof)

In a separating equilibrium, the manager of the bad firm reveals his type by electing to write-down any residual goodwill. If he chose to amortise any goodwill, he would strictly gain by writing it down because the amortisation of goodwill adversely affects his reported earnings. Conversely, the manager of the good financial

institution chooses to amortise an amount of goodwill W per period. If he chose to write down any residual goodwill, the equilibrium would be a pooling rather than a separating one.

Let us therefore consider the following set of strategies and beliefs. The manager of the good firm chooses to amortise an amount of goodwill W per period and the manager of the bad firm writes down any residual goodwill. The financial market holds the following beliefs when faced with the following amounts of goodwill amortised per period:

$$\begin{cases} \mu(GF|\hat{W})=0 \ \ if \ \ \hat{W}\neq W \\ \mu(GF|W)=1 \end{cases} \tag{41}$$

A separating equilibrium can only obtain if $\forall \hat{W}$:

$$\begin{aligned} I_{GFE} &\geq Max\ I_{GFD}(\hat{W}) \\ I_{BFE} &\geq Max\ I_{BFD}(\hat{W}) \end{aligned} \tag{42}$$

The good firm's manager who is playing the separating equilibrium strategy derives the following utility:

$$\begin{aligned} I_{GFE}=&\alpha f(A_0-W)+\zeta[\![X_0-\alpha f(A_0-W)+\delta\,[X_H-\alpha f(A_H-W)]]\!] \\ &+\alpha\delta f(A_H-W)+\zeta\delta\,[X_H-\alpha f(A_H-W)] \end{aligned} \tag{43}$$

The good firm's manager who is deviating from his separating equilibrium strategy by amortising $\hat{W}$ derives the following utility:

$$\begin{aligned} I_{GFD}=&\alpha f(A_0-\hat{W})+\zeta[\![X_0-\alpha f(A_0-\hat{W})+\delta\,[X_L-\alpha f(A_L-\hat{W})]]\!] \\ &+\alpha\delta f(A_H-\hat{W})+\zeta\delta\,[X_H-\alpha f(A_H-\hat{W})] \end{aligned} \tag{44}$$

The bad firm's manager who is playing the separating equilibrium strategy derives the following utility:

$$\begin{aligned} I_{BFE}=&\alpha f(A_0)+\zeta[\![X_0-\alpha f(A_0)+\delta\,[X_L-\alpha f(A_L)]]\!] \\ &+\alpha\delta f(A_L)+\zeta\delta\,[X_L-\alpha f(A_L)] \end{aligned} \tag{45}$$

The bad firm's manager who is deviating from his separating equilibrium strategy

by amortising $\hat{W}$ derives the following utility:

$$I_{BFD}=\alpha f(A_0-\hat{W})+\zeta[\![X_0-\alpha f(A_0-\hat{W})+\delta[X_L-\alpha f(A_L-\hat{W})]\!] \\ +\alpha\delta f(A_L-\hat{W})+\zeta\delta[X_L-\alpha f(A_L-\hat{W})] \tag{46}$$

For I_{GFD} and I_{BFD} to be decreasing in $\hat{W}$, the following condition has to be satisfied[45]:

$$\zeta\leq\zeta_{M1} \tag{47}$$

where:

$$\zeta_{M1}=Min\frac{f_I(A_0-\hat{W})+\delta f_I(A_H-\hat{W})}{f_I(A_0-\hat{W})+\delta[f_I(A_H-\hat{W})+f_I(A_L-\hat{W})]} \tag{48}$$

If the previous condition is satisfied, a separating equilibrium may thus obtain if:

$$\zeta\delta[\![X_H-X_L-\alpha[f(A_H-W)-f(A_L)]\!] \\ \geq\alpha(1-\zeta)[\![[f(A_0)-f(A_0-W)]+\delta[f(A_H)-f(A_H-W)]\!] \tag{49}$$

and:

$$\zeta\delta[\![X_H-X_L-\alpha[f(A_H-W)-f(A_L)]\!] \\ \leq\alpha(1-\zeta)[\![[f(A_0)-f(A_0-W)]+\delta[f(A_L)-f(A_L-W)]\!] \tag{50}$$

Let us define the following expressions:

$$\varphi(W)\equiv\alpha(1-\zeta)\zeta^{-1}[\![[f(A_0)-f(A_0-W)]+\delta[f(A_H)-f(A_H-W)]\!]+\alpha\delta[f(A_H-W)-f(A_L)] \tag{51}$$

and:

$$\phi(W)\equiv\alpha(1-\zeta)\zeta^{-1}[\![[f(A_0)-f(A_0-W)]+\delta[f(A_L)-f(A_L-W)]\!]+\alpha\delta[f(A_H-W)-f(A_L)] \tag{52}$$

Inequalities (49) and (50) are then equivalent to the following inequations:

$$\varphi(W)\leq\delta(X_H-X_L)\leq\phi(W) \tag{53}$$

It is easy to see that:

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45 If this condition is satisfied, I_{GFE} and I_{BFE} will also be decreasing in W.

$$\begin{cases} \phi(0) = \varphi(0) < \delta (X_H - X_L) \\ \varphi(W) \leq \phi(W) \quad \forall W \end{cases} \tag{54}$$

It can also be shown that:

$$\frac{d\phi(W)}{dW} \geq 0 \quad \forall W \in [0, W_{Max}] \tag{55}$$

Inequalities (49) and (50) can thus be simultaneously met for some $W \leq W_{Max}$ as long as:

$$\zeta \leq \zeta_{M2} \tag{56}$$

where:

$$\phi(W_{Max}) = \delta (X_H - X_L) \tag{57}$$

Conversely, let us assume that Inequalities (47) and (56) are satisfied and consider the following set of strategies and beliefs. The manager of the bad firm chooses to write-down any residual goodwill. The manager of the good firm chooses to amortise an amount of goodwill W per period. The financial market holds the following beliefs when faced with the above-described strategies:

$$\begin{cases} \mu(GF \mid \hat{W}) = 0 \quad if \ \hat{W} \neq W \\ \mu(GF \mid W) = 1 \end{cases} \tag{58}$$

It is straightforward to check that this set of actions and beliefs constitutes a PBE. The basic model described in this paper allows therefore a continuum of PBEs, in which the manager of the good firm chooses to amortise an amount of goodwill W per period while the manager of the bad firm chooses to write down any residual goodwill. Furthermore, it is easy to see that, in the separating PBE Pareto-dominating all other separating PBE, the manager of the good financial institution chooses to amortise an amount of goodwill W^* satisfying the following equation:

$$\zeta \delta [\![X_H - X_L - \alpha [f(A_H - W^*) - f(A_L)]]\!] = \alpha (1 - \zeta) [\![[f(A_0) - f(A_0 - W^*)] + \delta [f(A_L) - f(A_L - W^*)]]\!]. \tag{59}$$

A3 Proposition 3 (Proof)

In this set of pooling PBEs, the managers of both the good and bad firms choose to amortise an amount of goodwill W per period. By Bayes' rule, the posterior beliefs held by the financial markets upon observing an amount of goodwill amortised W have to be the same as the prior beliefs. Bayes' rule does however not put any restrictions on the posterior beliefs held by the financial markets upon observing an out-of-equilibrium amount of goodwill amortised $\hat{W}$. The easiest way to support W as a pooling outcome is to assign pessimistic beliefs to any out-of-equilibrium amount amortised $\hat{W}$.

Let us therefore consider the following set of strategies and beliefs. The managers of both the good and bad firms choose to amortise an amount of goodwill W per period and the financial market holds the following beliefs:

$$\begin{cases} \mu(GF|\hat{W})=0 & \text{if } \hat{W}\neq W \\ \mu(GF|W)=p \end{cases} \tag{60}$$

A pooling equilibrium can only obtain if, $\forall\hat{W}$:

$$\begin{cases} I_{GFE} \geq Max\ I_{GFD}(\hat{W}) \\ I_{BFE} \geq Max\ I_{BFD}(\hat{W}) \end{cases} \tag{61}$$

The good firm's manager who is playing his pooling equilibrium strategy derives the following utility:

$$\begin{aligned} I_{GFE} = {} & \alpha f(A_0-W)+\zeta\,[X_0-\alpha f(A_0-W)] \\ & +\zeta\delta\,[\![p X_H+(1-p)X_L-\alpha\,[pf(A_H-W)+(1-p)f(A_L-W)]]\!] \\ & +\alpha\delta f(A_H-W)+\zeta\delta\,[X_H-\alpha f(A_H-W)] \end{aligned} \tag{62}$$

The good firm's manager who is deviating from his pooling equilibrium strategy derives the following utility:

$$I_{GFD}=\alpha f(A_0-\hat{W})+\zeta\{[X_0-\alpha f(A_0-\hat{W})+\delta[X_L-\alpha f(A_L-\hat{W})]\}$$
$$+\alpha\delta f(A_H-\hat{W})+\zeta\delta[X_H-\alpha f(A_H-\hat{W})] \quad (63)$$

The bad firm's manager who is playing the pooling equilibrium strategy derives the following utility:

$$I_{BFE}=\alpha f(A_0-W)+\zeta[X_0-\alpha f(A_0-W)]$$
$$+\zeta\delta\{pX_H+(1-p)X_L-\alpha[pf(A_H-W)+(1-p)f(A_L-W)]\}$$
$$+\alpha\delta f(A_L-W)+\zeta\delta[X_L-\alpha f(A_L-W)] \quad (64)$$

The bad firm's manager who is deviating from his pooling equilibrium strategy derives the following utility:

$$I_{BFD}=\alpha f(A_0-\hat{W})+\zeta\{[X_0-\alpha f(A_0-\hat{W})+\delta[X_L-\alpha f(A_L-\hat{W})]\}$$
$$+\alpha\delta f(A_L-\hat{W})+\zeta\delta[X_L-\alpha f(A_L-\hat{W})] \quad (65)$$

The utility functions of the managers of both the good and bad firms are maximised when $\hat{W}=0$ and take the following values:

$$I_{GFD}=\alpha f(A_0)+\zeta\{[X_0-\alpha f(A_0)+\delta[X_L-\alpha f(A_L)]\}$$
$$+\alpha\delta f(A_H)+\zeta\delta[X_H-\alpha f(A_H)] \quad (66)$$

$$I_{BFD}=\alpha f(A_0)+\zeta\{[X_0-\alpha f(A_0)+\delta[X_L-\alpha f(A_L)]\}$$
$$+\alpha\delta f(A_L)+\zeta\delta[X_L-\alpha f(A_L)] \quad (67)$$

Conditions (61) are thus equivalent to the following inequations:

$$p\geq p_1 \quad (68)$$

where:

$$p_1=\frac{\alpha\{(1-\zeta)[f(A_0)-f(A_0-W)+\delta(f(A_H)-f(A_H-W)]-\zeta\delta[f(A_L)-f(A_L-W)]\}}{\zeta\delta\{X_H-X_L-\alpha[f(A_H-W)-f(A_L-W)]\}} \quad (69)$$

and:

$$p\geq p_2 \quad (70)$$

where:

$$p_2=\frac{\alpha\{(1-\zeta)[f(A_0)-f(A_0-W)+\delta(f(A_L)-f(A_L-W)]-\zeta\delta[f(A_L)-f(A_L-W)]\}}{\zeta\delta\{X_H-X_L-\alpha[f(A_H-W)-f(A_L-W)]\}} \quad (71)$$

Since f is concave, it is clear that p_2 is higher than p_1.

Conversely, it is clear that the set of strategies, in which the managers of both the good and bad firms choose to amortise an amount of goodwill W at dates t_0 and t_1, and the set of beliefs described by Equations (60), where p is higher than or equal to p_2, forms a PBE.

A4 Proposition 4 (Proof)

Let us consider the following set of strategies and beliefs. The managers of both the good and bad firms choose to write down any residual goodwill and the financial market holds the following beliefs:

$$\begin{cases}\mu(GF|\hat{W})=0 & if\ \hat{W}\neq 0\\ \mu(GF|0)=p\end{cases} \quad (72)$$

The good firm's manager who is playing his pooling equilibrium strategy derives the following utility:

$$\begin{aligned}I_{GFE}=&\alpha f(A_0)+\zeta[X_0-\alpha f(A_0)]\\&+\zeta\delta\{pX_H+(1-p)X_L-\alpha[pf(A_H)+(1-p)f(A_L)]\}\\&+\alpha\delta f(A_H)+\zeta\delta[X_H-\alpha f(A_H)]\end{aligned} \quad (73)$$

The good firm's manager who is deviating from his pooling equilibrium strategy derives the following utility:

$$\begin{aligned}I_{GFD}=&\alpha f(A_0-\hat{W})+\zeta\{X_0-\alpha f(A_0-\hat{W})+\delta[X_L-\alpha f(A_L-\hat{W})]\}\\&+\alpha\delta f(A_H-\hat{W})+\zeta\delta[X_H-\alpha f(A_H-\hat{W})]\end{aligned} \quad (74)$$

The bad firm's manager who is playing the pooling equilibrium strategy derives the following utility:

$$I_{BFE}=\alpha f(A_0)+\zeta\,[X_0-\alpha f(A_0)] \\ +\zeta\,\delta\,[[p\,X_H+(1-p)\,X_L-\alpha\,[p f(A_H)+(1-p) f(A_L)]\,]] \\ +\alpha\,\delta\,f(A_L)+\zeta\,\delta\,[X_L-\alpha f(A_L)] \tag{75}$$

The bad firm's manager who is deviating from his pooling equilibrium strategy derives the following utility:

$$I_{BFD}=\alpha f(A_0-\hat{W})+\zeta\,[X_0-\alpha f(A_0-\hat{W})+\delta\,[X_L-\alpha f(A_L-\hat{W})]\,] \\ +\alpha\,\delta\,f(A_L-\hat{W})+\zeta\,\delta\,[X_L-\alpha f(A_L-\hat{W})] \tag{76}$$

From the previous equations, it is clear that, $\forall \hat{W}$:

$$\begin{cases} I_{GFE} \geq Max\ I_{GFD}(\hat{W}) \\ I_{BFE} \geq Max\ I_{BFD}(\hat{W}) \end{cases} \tag{77}$$

The pooling PBE therefore always obtains.

Appendix B

B1 Sequential Equilibrium (Proof)

Fudenberg and Tirole (1991) have shown that any Perfect Bayesian Equilibrium constitutes a Sequential Equilibrium as long as there are only two stages in the game.

B2 D1 Criterion (Proof)

We first prove that no pooling PBE, in which the managers of both the good and bad firms amortise an amount of goodwill W per period, where $0 \leq W < W_{Max}$, survives the D1 strategic refinement designed by Cho and Kreps (1987). Let us therefore assume that such a pooling PBE does obtain and consider an out-of-equilibrium amount amortised $\hat{W}$ in the neighbourhood of W, where $W < \hat{W} < W_{Max}$. We then define ∇_B so as to satisfy the following equation:

$$\begin{aligned} I_{BFE} &= \alpha f(A_0 - W) + \zeta [X_0 - \alpha f(A_0 - W)] \\ &\quad + \zeta\delta [\![p X_H + (1-p) X_L - \alpha [p f(A_H - W) + (1-p) f(A_L - W)]]\!] \\ &\quad + \alpha\delta f(A_L - W) + \zeta\delta [X_L - \alpha f(A_L - W)] \\ &= \alpha f(A_0 - \hat{W}) + \zeta \hat{V}_B + \alpha\delta f(A_L - \hat{W}) + \zeta\delta [X_L - \alpha f(A_L - \hat{W})] \end{aligned} \tag{78}$$

Similarly, we define ∇_G so as to satify the following equation:

$$\begin{aligned} I_{GFE} &= \alpha f(A_0 - W) + \zeta [X_0 - \alpha f(A_0 - W)] \\ &\quad + \zeta\delta [\![p X_H + (1-p) X_L - \alpha [p f(A_H - W) + (1-p) f(A_L - W)]]\!] \\ &\quad + \alpha\delta f(A_H - W) + \zeta\delta [X_H - \alpha f(A_H - W)] \\ &= \alpha f(A_0 - \hat{W}) + \zeta \hat{V}_G + \alpha\delta f(A_H - \hat{W}) + \zeta\delta [X_H - \alpha f(A_H - \hat{W})] \end{aligned} \tag{79}$$

By combining (78) and (79), we obtain the following equation:

$$\zeta(\hat{V}_G - \hat{V}_B) = \alpha\delta(1-\zeta) [\![[f(A_H - W) - f(A_L - W)] - [f(A_H - \hat{W}) - f(A_L - \hat{W})]]\!] \tag{80}$$

From the previous equation, since f is concave and $\hat{W} > W$, it is clear that $\nabla_G < \nabla_B$.

The sets of market responses Ω_B and Ω_G inducing the managers of the bad and good firms to defect from their equilibrium actions are therefore as follows:

$$\begin{cases} \Omega_B =]\hat{V}_B, V_H] \\ \Omega_G =]\hat{V}_G, V_H] \\ V_H = X_0 - \alpha f(A_0 - W_{Max}) + \delta\,[X_H - \alpha f(A_H - W_{Max})] \end{cases} \tag{81}$$

and it is clear that:

$$\Omega_B \subset \Omega_G \tag{82}$$

When faced with the out-of-equilibrium action $\hat{W}$, investors should therefore believe that:

$$\mu(GF\ \hat{W}) = 1 \tag{83}$$

But, these beliefs induce the manager of the good firm to defect from his equilibrium strategy. No pooling equilibrium, in which the managers of both the good and bad firms amortise an amount of goodwill W per period, where $0 \leq W < W_{Max}$, can therefore survive the D1 strategic refinement designed by Cho and Kreps (1987).

We now prove that no non-efficient separating PBE can survive Cho and Kreps' D1 criterion. Let us therefore consider a separating PBE in which the equilibrium amount of goodwill W amortised per period by the manager of the good firm is larger than W^*. Whatever the response of the financial market, no bad firm would ever want to amortise an out-of-equilibrium amount of goodwill $\hat{W}$ per period, where $W^* < \hat{W} < W$. This is so because W^* is the value of the amount of goodwill amortised per period for which the manager of the bad firm is indifferent between playing his equilibrium strategy and being identified as the manager of a bad firm, and amortising W^* and being identified as the manager of a good firm. The manager of the good firm may however find it incentive compatible to amortise $\hat{W}$ per period. Let us define $\hat{V}_G$ to satisfy the following equation:

$$\begin{aligned} I_{GF} &= \alpha f(A_0 - W) + \zeta\,[\![X_0 - \alpha f(A_0 - W) + \delta\,[X_H - \alpha f(A_H - W)]\,]\!] \\ &\quad + \alpha\delta f(A_H - W) + \zeta\delta\,[X_H - \alpha f(A_H - W)] \\ &= \alpha f(A_0 - \hat{W}) + \zeta\,\hat{V}_G + \alpha\delta f(A_H - \hat{W}) + \zeta\delta\,[X_H - \alpha f(A_H - \hat{W})] \end{aligned} \tag{84}$$

The set of market responses Ω_B and Ω_G inducing the managers of the bad and good firms to defect from their equilibrium actions are therefore as follows:

$$\begin{cases} \Omega_B = \varnothing \\ \Omega_G =]\hat{V}_G, V_H] \end{cases} \tag{85}$$

and it is clear that:

$$\Omega_B \subset \Omega_G \tag{86}$$

When faced with the out-of-equilibrium amount of goodwill amortised $\hat{W}$, investors should therefore believe that:

$$\mu(GF|\hat{W}) = 1 \tag{87}$$

But, these beliefs induce the manager of the good firm to defect from his equilibrium strategy. No non-efficient separating PBE can therefore survive Cho and Kreps' D1 criterion.

We now prove that the efficient separating PBE survives Cho and Kreps' D1 strategic refinement. To do this, we have to consider two potential types of defections $\hat{W}$:

i) $0 < \hat{W} < W^*$

ii) $W^* < \hat{W}$

i) Let us first consider a defection $\hat{W}$, where $0 < \hat{W} < W^*$. We already know that, in equilibrium, the manager of the bad firm is indifferent between his equilibrium action and that of the manager of the good firm. More formally,

$$\begin{aligned} I_{BFE} &= \alpha f(A_0) + \zeta [\![X_0 - \alpha f(A_0) + \delta [X_L - \alpha f(A_L)]]\!] \\ &\quad + \alpha\delta f(A_L) + \zeta\delta [X_L - \alpha f(A_L)] \\ &= \alpha f(A_0 - W^*) + \zeta [\![X_0 - \alpha f(A_0 - W^*) + \delta [X_H - \alpha f(A_H - W^*)]]\!] \\ &\quad + \alpha\delta f(A_L - W^*) + \zeta\delta [X_L - \alpha f(A_L - W^*)] \end{aligned} \tag{88}$$

Let us define ∇_G so as to satisfy the following equation:

$$
\begin{aligned}
I_{GFE} &= \alpha f(A_0 - W^*) + \zeta [\![X_0 - \alpha f(A_0 - W^*) + \delta [X_H - \alpha f(A_H - W^*)]]\!] \\
&\quad + \alpha\delta f(A_H - W^*) + \zeta\delta [X_H - \alpha f(A_H - W^*)] \\
&= \alpha f(A_0 - \hat{W}) + \zeta \hat{V}_G + \alpha\delta f(A_H - \hat{W}) + \zeta\delta [X_H - \alpha f(A_H - \hat{W})]
\end{aligned}
\tag{89}
$$

Similarly, let us define ∇_B so as to satisfy the following equation:

$$
\begin{aligned}
I_{BFE} &= \alpha f(A_0) + \zeta [\![X_0 - \alpha f(A_0) + \delta [X_L - \alpha f(A_L)]]\!] \\
&\quad + \alpha\delta f(A_L) + \zeta\delta [X_L - \alpha f(A_L)] \\
&= \alpha f(A_0 - \hat{W}) + \zeta V_B + \alpha\delta f(A_L - \hat{W}) + \zeta\delta [X_L - \alpha f(A_L - \hat{W})]
\end{aligned}
\tag{90}
$$

By combining (88), (89), and (90), we obtain:

$$
\zeta(\hat{V}_G - \hat{V}_B) = \alpha\delta(1-\zeta)[\![[f(A_H - W^*) - f(A_L - W^*)] - [f(A_H - \hat{W}) - f(A_L - \hat{W})]]\!] \tag{91}
$$

From the previous equation, it is clear that $\nabla_G > \nabla_B$ since f is concave and $W^* > \hat{W}$. The sets of market responses Ω_B and Ω_G inducing the managers of the bad and good firms to defect from their equilibrium actions are therefore as follows:

$$
\begin{cases}
\Omega_B =]\hat{V}_B, V_H] \\
\Omega_G =]\hat{V}_G, V_H]
\end{cases}
\tag{92}
$$

and it is clear that:

$$
\Omega_G \subset \Omega_B \tag{93}
$$

When faced with an out-of-equilibrium amount of goodwill amortised $\hat{W}$, investors should therefore believe that:

$$
\mu(BF \mid \hat{W}) = 1 \tag{94}
$$

But, given these beliefs, no manager wishes to defect from his equilibrium strategy.

ii) Alternatively, let us consider a defection $\hat{W}$, where $W^* < \hat{W}$. Even if investors believe with probability one that the defector is a good firm, no firm will ever wish to defect.

It has been shown that no firm will ever wish to defect. The efficient PBE thus satisfies Cho and Kreps' D1 strategic refinement.

B3 Ultimate Divinity and NWBR (Proof)

Cho and Sobel (1990) show that, for any monotonic signalling game, criteria D1 and NWBR are equivalent to universal divinity.

B4 Proposition 6 (Proof)

Let us assume that a separating PBE obtains at t_0. Prior to t_0, the market value V_{0P} of a given firm satisfies the following equation:

$$V_{0P}=p\,V_G+(1-p)\,V_B \tag{95}$$

where:

$$\begin{cases} V_G \equiv X_0-\alpha f(A_0-W)+\delta\,[X_H-\alpha f(A_H-W)] \\ V_B \equiv X_0-\alpha f(A_0)+\delta\,[X_L-\alpha f(A_L)] \end{cases} \tag{96}$$

The good firm's market value V_{0G} prevailing at t_0, on the announcement date of the accounting choice, is V_G. Similarly, the bad firm's market value V_{0B} prevailing at t_0, on the announcement date of the accounting choice, is V_B.

The market reactions to the announcement are therefore as follows:

$$\begin{cases} V_{0G}-V_{0P}=(1-p)(V_G-V_B)>0 \\ V_{0B}-V_{0P}=p(V_B-V_G)<0 \end{cases} \tag{97}$$

Appendix C

C1 Proposition 7 (Proof)

The First Order Condition can be written as:

$$\left.\frac{dI[q,q(W),W]}{dW}\right|_{W=W^*} = -\alpha(1-\zeta)+\zeta\delta\left.\frac{dq(W)}{dW}\right|_{W=W^*}[X_H-X_L-\alpha(H-A_L+L+W^*)] +\alpha\zeta\delta[1-q(W^*)]-\alpha\delta(1-q)+\alpha\delta\zeta(1-q) =0 \quad (98)$$

But, in equilibrium,

$$q[W^*(q)]=q \quad (99)$$

The First Order Condition may thus be rewritten as:

$$-A+(C-DW)\frac{dq(W)}{dW}+Bq(W)=0 \quad (100)$$

where:

$$\begin{cases} A=\alpha(1-\zeta)(1+\delta)-\alpha\zeta\delta \\ B=\alpha\delta(1-2\zeta) \\ C=\zeta\delta[X_H-X_L-\alpha(H-A_L+L)] \\ D=\alpha\zeta\delta \end{cases} \quad (101)$$

Let us assume, for a moment, that the following Inequalities are satisfied:

$$\begin{cases} C-DW>0 \quad \forall W\in[0,W_{Max}] \\ A-Bq>0 \quad \forall q\in[0,1] \end{cases} \quad (102)$$

Equation (100) is therefore equivalent to the following one:

$$\frac{dq(W)}{A-Bq(W)}=\frac{dW}{C-DW} \quad (103)$$

If B differs from 0, solutions to this differential equation may be written as:

$$-\frac{1}{D}\ln(C-DW)=-\frac{1}{B}\ln(A-Bq(W))+Cte \quad (104)$$

The particular equlibrium valuation schedule q(W) which Pareto-dominates all others is the one which has the following property:

$$q(0)=0 \tag{105}$$

This boundary condition implies that:

$$Cte=\ln(A^{\frac{1}{B}})-\ln(C^{\frac{1}{D}}) \tag{106}$$

The equilibrium schedule q(W) is therefore as follows:

$$q(W)=\frac{A}{B}[1-(1-\frac{D}{C}W)^{\frac{B}{D}}] \tag{107}$$

Equivalently,

$$W(q)=\frac{C}{D}[1-(1-\frac{B}{A}q)^{\frac{D}{B}}] \tag{108}$$

W(q) and q thus satisfy Inequalities (102) as long as[46]:

$$\zeta<\frac{1+\delta}{1+2\delta} \tag{109}$$

It can furthermore be shown that W(q) is implementable, that is, $\forall q\ W(q) \leq W_{Max}$ as long as ζ is small enough. This follows from the following derivation:

$$\lim_{\zeta \to 0} W(q) = 0 \tag{110}$$

Before concluding that the equilibrium schedule q(W) meets our requirements, we have however still to check whether it maximises rather than minimises I. In order to check whether this condition is met, we check the Second Order Condition. The first derivative of I with respect to W can be rewritten as:

$$\frac{dI[q,q(W),W]}{dW}=-A+(C-DW)\frac{dq(W)}{dW}-Dq(W)+(B+D)q \tag{111}$$

---

46 The propositions developed in this section can be extended to deal with B=0 by taking the limits of q(W) and W(q) when B tends toward 0.

By differentiating again with respect to W, one obtains the following equation:

$$\frac{d^2\Pi[q,q(W),W]}{dW^2}=(C-D\,W)\frac{d^2q(W)}{dW^2}-2D\frac{dq(W)}{dW} \tag{112}$$

But:

$$q(W)=\frac{A}{B}[1-(1-\frac{D}{C}W)^{\frac{B}{D}}] \tag{113}$$

$$\frac{dq(W)}{dW}=\frac{A}{C}(1-\frac{D}{C}W)^{\frac{B}{D}-1} \tag{114}$$

$$\frac{d^2q(W)}{dW^2}=-\frac{A}{C^2}(B-D)(1-\frac{D}{C}W)^{\frac{B}{D}-2} \tag{115}$$

By doing the appropriate substitutions, one obtains the following equation:

$$\frac{d^2\Pi[q,q(W),W]}{dW^2}=-\frac{A}{C}(B+D)(1-\frac{D}{C}W)^{\frac{B}{D}-1} \tag{116}$$

The equilibrium valuation schedule q(W) thus maximises the manager's objective function since:

$$B+D>0 \tag{117}$$

and:

$$\frac{d^2\Pi[q,q(W),W]}{dW^2}\leq 0 \tag{118}$$

C2 Proposition 8 (Proof)

By differentiating V_0 with respect to W, we can see that:

$$\begin{aligned}\frac{dV_0[q(W),W]}{dW} &= \frac{\partial V_0}{\partial W}+\frac{\partial V_0}{\partial q}\frac{dq(W)}{dW} \\ &= \alpha+\delta\,[X_H-X_L-\alpha\,(H-A_L+L+W)]\frac{dq(W)}{dW} \\ &\quad +\alpha\,\delta\,[1-q(W)] \\ &> 0\end{aligned} \tag{119}$$

Proposition 8 thus obtains.

Appendix D

D1 Proposition 1 (Proof)

The bad firm's manager who is playing the separating equilibrium strategy derives the following utility:

$$\begin{aligned} I_{BFE} = \; & \alpha f(A_0 - W) + \zeta [X_0 - \alpha f(A_0 - W)] \\ & + \zeta \delta [X_L - \alpha f(A_L - W)] + \zeta \delta^2 [X_H - \alpha f(A_H + 2W)] \\ & + \delta \alpha f(A_L - W) + \delta \zeta [[X_L - \alpha f(A_L - W)] + \delta [X_H - \alpha f(A_H + 2W)]] \\ & + \delta^2 \alpha f(A_H + 2W) + \delta^2 \zeta [X_H - \alpha f(A_H + 2W)] \end{aligned} \tag{120}$$

The bad firm's manager who deviates from the separating equilibrium strategy derives the following utility:

$$\begin{aligned} I_{BFD} = \; & \alpha f(A_0) + \zeta [X_0 - \alpha f(A_0)] \\ & + \zeta \delta [X_H - \alpha f(A_H)] + \zeta \delta^2 [X_H - \alpha f(A_H)] \\ & + \delta \alpha f(A_L) + \delta \zeta [[X_H - \alpha f(A_L)] + \delta [X_H - \alpha f(A_H)]] \\ & + \delta^2 \alpha f(A_H) + \delta^2 \zeta [X_H - \alpha f(A_H)] \end{aligned} \tag{121}$$

Since it has been assumed [Inequality (23)] that the cash-flows after managerial compensation generated by the good firm at date t_1 are always higher than those generated by the bad firm, it can be seen from the above equations that $I_{BFD} > I_{BFE}$. Therefore no separating PBE, in which the manager of the bad firm chooses any income-decreasing accounting procedure W and the manager of the good firm abstains from choosing an income-decreasing accounting procedure, can possibly obtain.

D2 Proposition 2 (Proof)

In a separating equilibrium, the manager of the bad firm reveals his type and chooses therefore not to take any income-decreasing measure. If he chose to act otherwise, he would strictly gain by abstaining from taking an income-decreasing measure because the income-decreasing measure adversely affects the component of his objective function which depends on earnings. Conversely, the manager of the good

firm chooses to take an income-decreasing measure. If he chose not to take an income-decreasing measure, the equilibrium would be a pooling rather than a separating one.

Let us therefore consider the following set of strategies and beliefs. The manager of the good firm adopts an income decreasing measure W and the manager of the bad firm abstains from adopting any income-decreasing measure. The financial market holds the following beliefs when faced with the manager's choice of accounting procedure:

$$\begin{cases} \mu(GF|\hat{W})=0 & \text{if } \hat{W}\neq W \\ \mu(GF|W)=1 \end{cases} \tag{122}$$

The good firm's manager who is playing the separating equilibrium strategy derives the following utility:

$$\begin{aligned} I_{GFE}= \quad & \alpha f(A_0-W)+\zeta\,[X_0-\alpha f(A_0-W)] \\ & +\zeta\delta\,[X_H-\alpha f(A_H-W)]+\zeta\delta^2[X_H-\alpha f(A_H+2W)] \\ & +\delta\alpha f(A_H-W)+\delta\zeta\{[X_H-\alpha f(A_H-W)]+\delta\,[X_H-\alpha f(A_H+2W)]\} \\ & +\delta^2\alpha f(A_H+2W)+\delta^2\zeta\,[X_H-\alpha f(A_H+2W)] \end{aligned} \tag{123}$$

The good firm's manager who deviates from the separating equilibrium strategy by taking an income-decreasing accounting procedure $\hat{W}$, where $\hat{W}\neq 0$, derives the following utility:

$$\begin{aligned} I_{GFD}(\hat{W})= \quad & \alpha f(A_0-\hat{W})+\zeta\,[X_0-\alpha f(A_0-\hat{W})] \\ & +\zeta\delta\,[X_L-\alpha f(A_L-\hat{W})]+\zeta\delta^2[X_H-\alpha f(A_H+2\hat{W})] \\ & +\delta\alpha f(A_H-\hat{W})+\delta\zeta\{[X_H-\alpha f(A_H-\hat{W})]+\delta\,[X_H-\alpha f(A_H+2\hat{W})]\} \\ & +\delta^2\alpha f(A_H+2\hat{W})+\delta^2\zeta\,[X_H-\alpha f(A_H+2\hat{W})] \end{aligned} \tag{124}$$

The good firm's manager who deviates from the separating equilibrium strategy by abstaining from taking an income-decreasing measure derives the following utility:

$$
\begin{aligned}
I_{GFD}(0) = \quad & \alpha f(A_0) + \zeta [X_0 - \alpha f(A_0)] \\
& + \zeta\delta [X_L - \alpha f(A_L)] + \zeta\delta^2 [X_H - \alpha f(A_H)] \\
& + \delta\alpha f(A_H) + \delta\zeta [[X_H - \alpha f(A_H)] + \delta [X_H - \alpha f(A_H)]] \\
& + \delta^2\alpha f(A_H) + \delta^2\zeta [X_H - \alpha f(A_H)]
\end{aligned}
\tag{125}
$$

The bad firm's manager who is playing the separating equilibrium strategy derives the following utility:

$$
\begin{aligned}
I_{BFE} = \quad & \alpha f(A_0) + \zeta [X_0 - \alpha f(A_0)] \\
& + \zeta\delta [X_L - \alpha f(A_L)] + \zeta\delta^2 [X_H - \alpha f(A_H)] \\
& + \delta\alpha f(A_L) + \delta\zeta [[X_L - \alpha f(A_L)] + \delta [X_H - \alpha f(A_H)]] \\
& + \delta^2\alpha f(A_H) + \delta^2\zeta [X_H - \alpha f(A_H)]
\end{aligned}
\tag{126}
$$

The bad firm's manager who deviates from the separating equilibrium strategy by taking an income-decreasing accounting procedure W derives the following utility:

$$
\begin{aligned}
I_{BFD}(W) = \quad & \alpha f(A_0 - W) + \zeta [X_0 - \alpha f(A_0 - W)] \\
& + \zeta\delta [X_H - \alpha f(A_H - W)] + \zeta\delta^2 [X_H - \alpha f(A_H + 2W)] \\
& + \delta\alpha f(A_L - W) + \delta\zeta [[X_L - \alpha f(A_L - W)] + \delta [X_H - \alpha f(A_H + 2W)]] \\
& + \delta^2\alpha f(A_H + 2W) + \delta^2\zeta [X_H - \alpha f(A_H + 2W)]
\end{aligned}
\tag{127}
$$

The bad firm's manager who deviates from the separating equilibrium strategy derives the following utility by taking an income-decreasing accounting procedure $\hat{W}$:

$$
\begin{aligned}
I_{BFD}(\hat{W}) = \quad & \alpha f(A_0 - \hat{W}) + \zeta [X_0 - \alpha f(A_0 - \hat{W})] \\
& + \zeta\delta [X_L - \alpha f(A_L - \hat{W})] + \zeta\delta^2 [X_H - \alpha f(A_H + 2\hat{W})] \\
& + \delta\alpha f(A_L - \hat{W}) + \delta\zeta [[X_L - \alpha f(A_L - \hat{W})] + \delta [X_H - \alpha f(A_H + 2\hat{W})]] \\
& + \delta^2\alpha f(A_H + 2\hat{W}) + \delta^2\zeta [X_H - \alpha f(A_H + 2\hat{W})]
\end{aligned}
\tag{128}
$$

A separating equilibrium can only obtain if the following condition is satisfied, $\forall \hat{W} \in [0, W_{Max}]$:

$$
\begin{cases}
I_{GFE} \geq Max\ I_{GFD}(\hat{W}) \\
I_{BFE} \geq Max\ I_{BFD}(\hat{W})
\end{cases}
\tag{129}
$$

For $I_{GFD}(\hat{W})$ and $I_{BFD}(\hat{W})$ to be decreasing in $\hat{W}$, the following condition has to be

satisfied:

$$\zeta \leq \zeta_{M1} \tag{130}$$

where:

$$\zeta_{M1} = Min \frac{f_I(A_0 - W) + \delta f_I(A_H - W) - 2\delta^2 f_I(A_H + 2W)}{\delta [f_I(A_L - W) - 4\delta f_I(A_H + 2W)] + f_I(A_0 - W) + \delta f_I(A_H - W) - 2\delta^2 f_I(A_H + 2W)} \tag{131}$$

If Inequality (130) is satisfied, a separating equilibrium can thus only exist if $I_{GFE} \geq I_{GFD}(0)$ and $I_{BFE} \geq I_{BFD}(W)$. A separating equilibrium can therefore only exist if:

$$\begin{aligned} &\alpha(1-\zeta)\zeta^{-1}[[f(A_0) - f(A_0 - W)] + \delta[f(A_H) - f(A_H - W)] + \delta^2[f(A_H) - f(A_H + 2W)]] \\ &-\alpha\delta[[f(A_L) - f(A_H - W)] + 2\delta[f(A_H) - f(A_H + 2W)]] \leq \delta(X_H - X_L) \end{aligned} \tag{132}$$

and:

$$\begin{aligned} &\alpha(1-\zeta)\zeta^{-1}[[f(A_0) - f(A_0 - W)] + \delta[f(A_L) - f(A_L - W)] + \delta^2[f(A_H) - f(A_H + 2W)]] \\ &-\alpha\delta[[f(A_L) - f(A_H - W)] + 2\delta[f(A_H) - f(A_H + 2W)]] \geq \delta(X_H - X_L) \end{aligned} \tag{133}$$

Let us define the following expressions:

$$\begin{aligned} \varphi(W) \equiv\ &\alpha(1-\zeta)\zeta^{-1}[[f(A_0) - f(A_0 - W)] + \delta[f(A_H) - f(A_H - W)] + \delta^2[f(A_H) - f(A_H + 2W)]] \\ &-\alpha\delta[[f(A_L) - f(A_H - W)] + 2\delta[f(A_H) - f(A_H + 2W)]] \end{aligned}$$

and:

$$\begin{aligned} \phi(W) \equiv\ &\alpha(1-\zeta)\zeta^{-1}[[f(A_0) - f(A_0 - W)] + \delta[f(A_L) - f(A_L - W)] + \delta^2[f(A_H) - f(A_H + 2W)]] \\ &-\alpha\delta[[f(A_L) - f(A_H - W)] + 2\delta[f(A_H) - f(A_H + 2W)]] \end{aligned}$$

Inequalities (132) and (133) are then equivalent to the following inequations:

$$\varphi(W) \leq \delta(X_H - X_L) \leq \phi(W) \tag{136}$$

It is easy to see that:

$$\begin{cases} \varphi(0) = \phi(0) < \delta(X_H - X_L) \\ \varphi(W) \leq \phi(W) \quad \forall W \end{cases} \tag{137}$$

It can also be shown that:

$$\frac{d\phi(W)}{dW} \geq 0 \quad \forall W \in [0, W_{Max}] \tag{138}$$

Inequalities (132) and (133) can thus be simultaneously met for a given $W \leq W_{Max}$ as long as:

$$\zeta \leq \zeta_{M2} \tag{139}$$

where ζ_{M2} satisfies the following equation:

$$\phi(W_{Max}) = \delta (X_H - X_L) \tag{140}$$

Conversely, let us assume that Inequalities (129) and (138) are satisfied and consider the following set of strategies and beliefs. The manager of the bad firm chooses to abstain from taking any income-decreasing measure. The manager of the good firm chooses to take an income-decreasing accounting measure. The financial market holds the beliefs described in Equation (122). It is straightforward to check that this set of actions and beliefs constitutes a PBE. The basic model described in this paper allows therefore a continuum of PBEs, in which the manager of the good firm chooses to take an income-decreasing measure while the manager of the bad firm chooses to abstain from taking any such measure.

Furthermore, it is easy to see that, in the separating PBE Pareto-dominating all other separating PBE, the manager of the good firm chooses to take a measure decreasing reported income by W^* at t_0 and t_1, where W^* satisfies the following equation:

$$\phi(W^*) = \delta (X_H - X_L) \tag{141}$$

D3 Proposition 3 (Proof)

In this set of pooling PBEs, the managers of both the good and bad firms choose an

income-decreasing accounting procedure W. By Bayes' rule, the posterior beliefs held by the financial markets upon observing the choice of the income-decreasing accounting procedure W have to be the same as the prior beliefs. Bayes' rule does however not put any restrictions on the posterior beliefs held by the financial markets upon observing an out-of-equilibrium accounting procedure $\hat{W}$. The easiest way to support W as a pooling outcome is to assign pessimistic beliefs to any out-of-equilibrium accounting procedure $\hat{W}$.

Let us therefore consider the following set of strategies and beliefs. The managers of both the good and bad firms choose an income-decreasing accounting procedure W and the financial market holds the following beliefs:

$$\begin{cases} \mu(GF|\hat{W})=0 & if\ \hat{W}\neq W \\ \mu(GF|W)=p \end{cases} \tag{142}$$

The good firm's manager who is playing the pooling equilibrium strategy derives the following utility:

$$\begin{aligned} I_{GFE}= \quad & \alpha f(A_0-W)+\zeta[X_0-\alpha f(A_0-W)] \\ & +\zeta\delta\{p[X_H-\alpha f(A_H-W)]+(1-p)[X_L-\alpha f(A_L-W)]\} \\ & +\zeta\delta^2[X_H-\alpha f(A_H+2W)]+\delta\alpha f(A_H-W) \\ & +\delta\zeta\{[X_H-\alpha f(A_H-W)]+\delta[X_H-\alpha f(A_H+2W)]\} \\ & +\delta^2\alpha f(A_H+2W)+\delta^2\zeta[X_H-\alpha f(A_H+2W)] \end{aligned} \tag{143}$$

The good firm's manager who deviates from the pooling equilibrium strategy by choosing an income-decreasing accounting procedure $\hat{W}$ derives the following utility:

$$\begin{aligned} I_{GFD}(\hat{W})= \quad & \alpha f(A_0-\hat{W})+\zeta[X_0-\alpha f(A_0-\hat{W})] \\ & +\zeta\delta[X_L-\alpha f(A_L-\hat{W})]+\zeta\delta^2[X_H-\alpha f(A_H+2\hat{W})] \\ & +\delta\alpha f(A_H-\hat{W})+\delta\zeta\{[X_H-\alpha f(A_H-\hat{W})]+\delta[X_H-\alpha f(A_H+2\hat{W})]\} \\ & +\delta^2\alpha f(A_H+2\hat{W})+\delta^2\zeta[X_H-\alpha f(A_H+2\hat{W})] \end{aligned} \tag{144}$$

The bad firm's manager who is playing the pooling equilibrium strategy derives the following utility:

$$
\begin{aligned}
I_{BFE} = \quad & \alpha f(A_0 - W) + \zeta [X_0 - \alpha f(A_0 - W)] \\
& + \zeta \delta \{ p [X_H - \alpha f(A_H - W)] + (1-p) [X_L - \alpha f(A_L - W)] \} \\
& + \zeta \delta^2 [X_H - \alpha f(A_H + 2W)] + \delta \alpha f(A_L - W) \\
& + \delta \zeta \{ [X_L - \alpha f(A_L - W)] + \delta [X_H - \alpha f(A_H + 2W)] \} \\
& + \delta^2 \alpha f(A_H + 2W) + \delta^2 \zeta [X_H - \alpha f(A_H + 2W)]
\end{aligned}
\tag{145}
$$

The bad firm's manager who deviates from the pooling equilibrium strategy by choosing an income-decreasing accounting procedure $\hat{W}$ derives the following utility:

$$
\begin{aligned}
I_{BFD}(\hat{W}) = \quad & \alpha f(A_0 - \hat{W}) + \zeta [X_0 - \alpha f(A_0 - \hat{W})] \\
& + \zeta \delta [X_L - \alpha f(A_L - \hat{W})] + \zeta \delta^2 [X_H - \alpha f(A_H + 2\hat{W})] \\
& + \delta \alpha f(A_L - \hat{W}) + \delta \zeta \{ [X_L - \alpha f(A_L - \hat{W})] + \delta [X_H - \alpha f(A_H + 2\hat{W})] \} \\
& + \delta^2 \alpha f(A_H + 2\hat{W}) + \delta^2 \zeta [X_H - \alpha f(A_H + 2\hat{W})]
\end{aligned}
\tag{146}
$$

A pooling equilibrium can only obtain if, $\forall \hat{W} \in [0, W_{Max}]$:

$$
\begin{cases}
I_{GFE} \geq Max\ I_{GFD}(\hat{W}) \\
I_{BFE} \geq Max\ I_{BFD}(\hat{W})
\end{cases}
\tag{147}
$$

For I_{GFD} and I_{BFD} to be decreasing in $\hat{W}$, the following condition has to be satisfied:

$$
\zeta \leq \zeta_{M1} \tag{148}
$$

where:

$$
\zeta_{M1} = Min \frac{f_I(A_0 - W) + \delta f_I(A_H - W) - 2\delta^2 f_I(A_H + 2W)}{\delta [f_I(A_L - W) - 4\delta f_I(A_H + 2W)] + f_I(A_0 - W) + \delta f_I(A_H - W) - 2\delta^2 f_I(A_H + 2W)} \tag{149}
$$

If Inequality (148) is satisfied, a pooling equilibrium can therefore only exist if:

$$
p \geq p_1 + p_3 \tag{150}
$$

where:

$$
p_1 = \frac{\alpha (1-\zeta) \{ [f(A_0) - f(A_0 - W)] + \delta [f(A_H) - f(A_H - W)] + \delta^2 [f(A_H) - f(A_H + 2W)] \}}{\zeta \delta \{ X_H - X_L - \alpha [f(A_H - W) - f(A_L)] \}} \tag{151}
$$

and:

$$p_3=\frac{-\alpha\zeta\delta\{[f(A_L)-f(A_L-W)]-2\delta[f(A_H+2W)-f(A_H)]\}}{\zeta\delta\{X_H-X_L-\alpha[f(A_H-W)-f(A_L)]\}} \quad (152)$$

and:

$$p\geq p_2+p_3 \quad (153)$$

where:

$$p_2=\frac{\alpha(1-\zeta)\{[f(A_0)-f(A_0-W)]+\delta[f(A_L)-f(A_L-W)]+\delta^2[f(A_H)-f(A_H+2W)]\}}{\zeta\delta\{X_H-X_L-\alpha[f(A_H-W)-f(A_L)]\}} \quad (154)$$

Since f is concave, it is clear that $p_2>p_1$.

Conversely, it is clear that the set of strategies, in which the managers of both the good and bad firms choose income-decreasing accounting procedures W at dates t_0, and the set of beliefs described by Equations (142), where p is higher than or equal to p_2+p_3, forms a PBE.

D4 Proposition 4 (Proof)

Let us consider the following set of strategies and beliefs. The managers of both the good and bad firms abstain from choosing any income-decreasing accounting procedure W and the financial market holds the following beliefs:

$$\begin{cases}\mu(GF|\hat{W})=0 & if\ \hat{W}\neq 0\\ \mu(GF|0)=p\end{cases} \quad (155)$$

The good firm's manager who is playing the pooling equilibrium strategy derives the following utility:

$$\begin{aligned}I_{GFE}= \quad & \alpha f(A_0)+\zeta[X_0-\alpha f(A_0)]\\ & +\zeta\delta\{p[X_H-\alpha f(A_H)]+(1-p)[X_L-\alpha f(A_L)]\}+\zeta\delta^2[X_H-\alpha f(A_H)]\\ & +\delta\alpha f(A_H)+\delta\zeta\{[X_H-\alpha f(A_H)]+\delta[X_H-\alpha f(A_H)]\}\\ & +\delta^2\alpha f(A_H)+\delta^2\zeta[X_H-\alpha f(A_H)]\end{aligned} \quad (156)$$

The good firm's manager who deviates from the pooling equilibrium strategy derives the following utility:

$$\begin{aligned} I_{GFD} = \quad & \alpha f(A_0 - \hat{W}) + \zeta [X_0 - \alpha f(A_0 - \hat{W})] \\ & + \zeta\delta [\![X_L - \alpha f(A_L - \hat{W}) + \delta [X_H - \alpha f(A_H + 2\hat{W})]]\!] \\ & + \delta\alpha f(A_H - \hat{W}) + \delta\zeta [\![[X_H - \alpha f(A_H - \hat{W})] + \delta [X_H - \alpha f(A_H + 2\hat{W})]]\!] \\ & + \delta^2\alpha f(A_H + 2\hat{W}) + \delta^2\zeta [X_H - \alpha f(A_H + 2\hat{W})] \end{aligned} \tag{157}$$

The bad firm's manager who is playing the pooling equilibrium strategy derives the following utility:

$$\begin{aligned} I_{BFE} = \quad & \alpha f(A_0) + \zeta [X_0 - \alpha f(A_0)] \\ & + \zeta\delta [\![p [X_H - \alpha f(A_H)] + (1-p) [X_L - \alpha f(A_L)]]\!] + \zeta\delta^2 [X_H - \alpha f(A_H)] \\ & + \delta\alpha f(A_L) + \delta\zeta [\![[X_L - \alpha f(A_L)] + \delta [X_H - \alpha f(A_H)]]\!] \\ & + \delta^2\alpha f(A_H) + \delta^2\zeta [X_H - \alpha f(A_H)] \end{aligned} \tag{158}$$

The bad firm's manager who deviates from the pooling equilibrium strategy derives the following utility:

$$\begin{aligned} I_{BFD} = \quad & \alpha f(A_0 - \hat{W}) + \zeta [X_0 - \alpha f(A_0 - \hat{W})] \\ & + \zeta\delta [\![X_L - \alpha f(A_L - \hat{W}) + \delta [X_H - \alpha f(A_H + 2\hat{W})]]\!] \\ & + \delta\alpha f(A_L - \hat{W}) + \delta\zeta [\![[X_L - \alpha f(A_L - \hat{W})] + \delta [X_H - \alpha f(A_H + 2\hat{W})]]\!] \\ & + \delta^2\alpha f(A_H + 2\hat{W}) + \delta^2\zeta [X_H - \alpha f(A_H + 2\hat{W})] \end{aligned} \tag{159}$$

From the previous equations, it is clear that, if Inequality (155) is satisfied, then, $\forall \hat{W}$:

$$\begin{cases} I_{GFE} \geq Max\ I_{GFD}(\hat{W}) \\ I_{BFE} \geq Max\ I_{BFD}(\hat{W}) \end{cases} \tag{160}$$

The pooling PBE therefore always obtains.

Appendix E

E1 Proposition 7 (Proof)

The First Order Condition can be written as:

$$\left.\frac{dI[q,q(W),W]}{dW}\right|_{W=W^*} = -\alpha(1-\zeta)+\zeta\delta\left.\frac{dq(W)}{dW}\right|_{W=W^*}[X_H-X_L-\alpha(H-A_L+L+W^*)] +\alpha\zeta\delta[1-q(W^*)]-\alpha\delta(1-q)+\alpha\delta\zeta(1-q) \quad (161)$$

$$=0$$

But, in equilibrium,

$$q[W^*(q)]=q \quad (162)$$

The First Order Condition may thus be rewritten as:

$$-A+(C-DW)\frac{dq(W)}{dW}+Bq(W)=0 \quad (163)$$

where:

$$\begin{cases} A=\alpha(1-\zeta)(1+\delta)-\alpha\zeta\delta \\ B=\alpha\delta(1-2\zeta) \\ C=\zeta\delta[X_H-X_L-\alpha(H-A_L+L)] \\ D=\alpha\zeta\delta \end{cases} \quad (164)$$

Let us assume, for a moment, that the following Inequalities are satisfied:

$$\begin{cases} C-DW>0 & \forall W\in[0,W_{Max}] \\ A-Bq>0 & \forall q\in[0,1] \end{cases} \quad (165)$$

Equation (163) is therefore equivalent to the following one:

$$\frac{dq(W)}{A-Bq(W)}=\frac{dW}{C-DW} \quad (166)$$

If B differs from zero, solutions to this differential equation may be written as:

$$-\frac{1}{D}\ln(C-DW)=-\frac{1}{B}\ln(A-Bq(W))+Cte \quad (167)$$

The particular equlibrium valuation schedule q(W) which Pareto-dominates all others is the one which has the following property:

$$q(0)=0 \tag{168}$$

This boundary condition implies that:

$$Cte=\ln(A^{\frac{1}{B}})-\ln(C^{\frac{1}{D}}) \tag{169}$$

The equilibrium schedule q(W) is therefore as follows:

$$q(W)=\frac{A}{B}[1-(1-\frac{D}{C}W)^{\frac{B}{D}}] \tag{170}$$

Equivalently,

$$W(q)=\frac{C}{D}[1-(1-\frac{B}{A}q)^{\frac{D}{B}}] \tag{171}$$

W(q) and q thus satisfy Inequalities (165) as long as[47]:

$$\zeta<\frac{1+\delta}{1+2\delta} \tag{172}$$

It can furthermore be shown that W(q) is implementable, that is, $\forall q\ W(q)\leq W_{Max}$, as long as ζ is small enough. This follows from the following derivation:

$$\lim_{\zeta \to 0} W(q) = 0 \tag{173}$$

Before concluding that the equilibrium schedule q(W) meets our requirements, we have however still to check whether it maximises rather than minimises I. In order to check whether this condition is met, we check the Second Order Condition. The first derivative of I with respect to W can be rewritten as:

$$\frac{d\Pi[q,q(W),W]}{dW}=-A+(C-DW)\frac{dq(W)}{dW}-Dq(W)+(B+D)q \tag{174}$$

---

47 The propositions developed in this section can be extended to deal with B=0 by taking the limits of q(W) and W(q) when B tends toward 0.

By differentiating again with respect to W, one obtains the following equation:

$$\frac{d^2\Pi[q,q(W),W]}{dW^2}=(C-DW)\frac{d^2q(W)}{dW^2}-2D\frac{dq(W)}{dW} \tag{175}$$

But:

$$q(W)=\frac{A}{B}[1-(1-\frac{D}{C}W)^{\frac{B}{D}}] \tag{176}$$

$$\frac{dq(W)}{dW}=\frac{A}{C}(1-\frac{D}{C}W)^{\frac{B}{D}-1} \tag{177}$$

$$\frac{d^2q(W)}{dW^2}=-\frac{A}{C^2}(B-D)(1-\frac{D}{C}W)^{\frac{B}{D}-2} \tag{178}$$

By doing the appropriate substitutions, one obtains the following equation:

$$\frac{d^2\Pi[q,q(W),W]}{dW^2}=-\frac{A}{C}(B+D)(1-\frac{D}{C}W)^{\frac{B}{D}-1} \tag{179}$$

The equilibrium valuation schedule q(W) thus maximises the manager's objective function since:

$$B+D>0 \tag{180}$$

and:

$$\frac{d^2\Pi[q,q(W),W]}{dW^2}\leq 0 \tag{181}$$

E2 Proposition 8 (Proof)

By differentiating V_0 with respect to W, we can see that:

$$\begin{aligned}\frac{dV_0[q(W),W]}{dW} &= \frac{\partial V_0}{\partial W}+\frac{\partial V_0}{\partial q}\frac{dq(W)}{dW} \\ &= \alpha+\delta[X_H-X_L-\alpha(H-A_L+L+W)]\frac{dq(W)}{dW} \\ &\quad +\alpha\delta[1-q(W)] \\ &> 0\end{aligned} \tag{182}$$

Proposition 8 thus obtains.

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CHAPTER 6

DISCRETIONARY ACCOUNTING CHOICES:
A DEBT-COVENANTS BASED SIGNALLING APPROACH

Abstract

This paper seeks to explain the discretionary accounting choices made by managers in a world in which managers are endowed with private information about their firms' future earnings. It introduces a basic model in which the manager of a firm has to select a depreciation method, recognising that the firm has some debt outstanding and that his objective function depends on both the true and the market-based valuation of his firm's equity. This paper provides sufficient conditions for the manager to credibly communicate his private information about the firm's future earnings through his choice of depreciation method.

This paper predicts that, when a separating equilibrium prevails, the firms which choose the accelerated depreciation method are likely to see higher earnings in the next periods than the firms which choose the straight-line depreciation method. It also predicts that the former firms should experience, on average, positive abnormal returns around announcement dates.

This model may be extended to deal with a variety of discretionary accounting procedures. In the extended model, the use of income-increasing or balance-sheet strengthening accounting procedures signals unfavourable private information while the use of income-decreasing or balance-sheet weakening accounting procedures signals favourable private information.

6.1 Introduction

This paper presents a model seeking to explain discretionary accounting choices. The model has been developed to illustrate the "information perspective" alluded to

by Holthausen and Leftwich (1983) and is similar, in spirit, to the model developed by Hughes and Schwartz (1988). The information perspective states that the choice of an accounting technique reflects management's expectation of future earnings and cash-flows. But, while Hughes and Schwartz focus on the information content of the LIFO/FIFO choice, this paper offers an explanation for other accounting choices made by managers.

This paper recognises that debt covenants are included in debt contracts in order to reduce agency costs resulting from potential conflicts of interest between shareholders and debtholders[1]. Negative covenants, such as the restrictions put on dividends, keep managers from taking actions which do transfer wealth from bondholders to stockholders. Affirmative covenants, such as working capital, current ratio, net worth, and interest coverage covenants, increase the security of the bondholders. Accounting-based constraints are often found in both negative and affirmative debt covenants. The most common accounting-based restrictions, reported by Press and Weintrop (1990) and Duke and Hunt (1990), do affect leverage, net worth, working capital, dividends, and interest coverage.

Both negative and affirmative covenants typically restrict the ability of the firm's manager to issue more debt, pay dividends, and give the debtholders the right to demand early repayment of the debt issue if they become binding. Binding covenants can be costly to the firm either because of the actions they prohibit or because of the costs incurred when repaying or renegotiating the debt issue to remove the covenant. The model introduced in this paper relies on the costs incurred by the firm if it breaches its accounting-based debt covenants.

This paper is motivated by an investigation of "depreciation switch-back" firms carried out by Holthausen (1981). The use of accelerated depreciation for financial reporting purposes was allowed in the USA by the 1954 taxation law. A large proportion of firms initially adopted the accelerated depreciation method.

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1 The potential conflict of interests between stockholders and bondholders has been investigated by Jensen and Meckling (1976).

Depreciation switch-backs refer to a wave of changes in depreciation methods from accelerated to straight-line depreciation made during the 60s. Holthausen (1981) hypothesises that managers change depreciation methods in order to relax binding accounting-based constraints found in bond indentures. The switch from accelerated to straight-line depreciation is assumed in the accounting literature to reduce the depreciation expensed, thereby decreasing the gearing ratio by increasing both net tangible assets and shareholders' equity, and increasing the interest cover. The depreciation switch-back thus increases the firm's ability to issue new debt, pay dividends, merge, lease, or be construed to be in default through the leverage restriction in bond indentures. According to Holthausen (1983), the common stock of a firm switching back from the accelerated to the straight-line depreciation method should therefore experience positive abnormal performance at the time of the announcement of the change. The positive abnormal performance experienced at the time of the announcement should furthermore be an increasing function of the firm's leverage.

The investigation of the information content of depreciation switch-backs carried out by Holthausen (1981) provides however evidence which is inconsistent with Holthausen's hypothesis. A first test provides evidence that the average abnormal performance of the switch-back firms is negative but insignificantly different from zero around the announcement dates of the switches in depreciation methods. This test provides however no control for surprises in current earnings. A second test, which controls for surprises in earnings, provides evidence that the more debt a firm has outstanding, the more negative the abnormal performance at the time of the announcement of the change in depreciation methods.

Holthausen (1981) recognises that his empirical results may be consistent with an information perspective. He writes that:

> "One hypothesis consistent with the observed results is that firms switch depreciation methods because the covenants of bond indenture agreements are expected to become binding. The change in turn, conveys information to the market concerning managers' expectations of future investment opportunities and earnings. If the leverage of the firm is proxying for the restrictiveness of the covenants, then the observed negative coefficient on leverage could be

due to the market's expectation that firms with more restrictive leverage and dividend constraints will have greater costs imposed on them because of the poor future earnings[2]".

Leftwich (1981), Rusbarski (1988), Duke and Hunt (1990), and Press and Weintrop (1990), provide some support for Holthausen's interpretation. Leftwich (1981) reports evidence that changes in generally accepted accounting principles do affect the equity values of firms by altering the accounting numbers defined in the restrictive covenants in the firms' lending agreements. Rusbarsky (1988) finds that the firms that switched from accelerated to straight-line depreciation in 1968 and 1969 had significantly higher debt-equity ratios than firms that continued using the accelerated method. The empirical evidence reported by Duke and Hunt (1990) and Press and Weintrop (1990) suggests that leverage is indeed related to the existence of, and closeness to, accounting-based debt covenants.

This paper introduces a model which is consistent with Holthausen's interpretation of the empirical evidence. The conceptual basis of the paper is that the manager of the firm possesses private information about his firm's future earnings. The firm has some debt outstanding. The manager selects a depreciation method, recognising that his compensation depends on both current and future market values of his firm's equity. The financial market values the firm's equity according to the accounting choice announced by the manager. This paper provides sufficient conditions for separating and pooling equilibria to obtain.

This paper shows that, in the separating equilibrium, the manager with favourable information chooses the accelerated depreciation method and the manager with unfavourable information chooses the straight-line depreciation method. The manager with favourable information increases the probability of seeing his firm breach its covenants by choosing the accelerated depreciation method. The reduction in the market value of the firm resulting from the increase in the expected costs of breaching the covenants is however more than compensated by the increase in the

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2 The firm's deviation from its dividend constraint does not however appear to become smaller around the depreciation change.

market value of the firm resulting from the investors' beliefs that the use of the accelerated depreciation method signals favourable information. Conversely, the manager with unfavourable information chooses to adopt the straight-line depreciation method because the benefits resulting from lower expected costs of breaching the covenants exceed the cost of being recognised as the manager of a bad firm.

Empirical evidence reported by Bowen, Noreen, and Lacey (1981), Daley and Vigeland (1983), and Zmijewski and Hagerman (1981) suggests that constraints on key accounting variables written into debt arrangements may partially explain management's choice among other accounting alternatives[3]. Bowen, Noreen, and Lacey (1981) find that companies which do capitalise interest rates have financial ratios consistent with being closer to violation of their debt covenants. The empirical study undertaken by Daley and Vigeland (1983) shows that firms which do capitalise research and development costs are more highly leveraged and have a higher ratio of dividends to unrestricted retained earnings than firms which do expense research and development costs. Zmijewski and Hagerman (1981) find a significant association between the choice of a firm's income strategy and the firm's total debt to total asset ratio.

This model may be extended to deal with a variety of discretionary accounting procedures. In the extended model, the use of income-increasing or balance-sheet strengthening accounting procedures signals unfavourable private information while the use of income-reducing or balance-sheet weakening accounting procedures signals favourable private information.

The basic model is described in section 6.2. The main propositions and the intuition behind these propositions can be found in section 6.3. An extension to a continuum of types of firms can be found in section 6.4. A summary is provided in section

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3 Healy and Palepu (1990) find however little evidence that firms which are close to their dividend covenants do change accounting methods to increase earnings. But Begley (1990) argues that the power of the test used by Healy and Palepu is limited.

6.5. The derivations supporting the various propositions can be found in Appendix A to C.

6.2 The Basic Model

This section introduces a simple model whose focus is on the manager's choice of a depreciation method for his firm's stock of fixed assets in a world of asymmetric information. In this model, the manager has private information about the firm's future earnings and cash-flows and, under certain conditions, may credibly communicate his information to investors through the choice of a depreciation method. The model is simplified in order to concentrate on the informative role of the depreciation method announced by the manager.

This model deals with a firm, a manager, and a financial market over one period. The firm's capital structure, investment decisions, and the resulting distribution of cash-flows are determined exogenously. Both the manager and the financial market are assumed to be risk-neutral. The introduction of risk-aversion would generate risk-sharing considerations which are not important in this model.

The firm's current cash-flows X_0 and earnings (before depreciation) A_0 at date t_0 are known by both the manager and the financial market[4]. There is however an asymmetry of information between the manager and the financial market about the firm's future cash-flows and earnings (before depreciation). The financial market is unsure whether the firm is a 'good' firm or a 'bad' firm. The cash-flows and earnings of both the good and bad firms follow i.i.d. distributions[5] from t_1 to t_n, dates at which the firms are liquidated. The distributions of the two types of firms' earnings and cash-flows differ only in their expected values. The cumulative distribution functions of the good firm's earnings and cash-flows are assumed to stochastically dominate in the first-order sense the cumulative distribution functions

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4 Signalling could still obtain if there was an asymmetry of information between the manager of the firm and the financial manager about current earnings or cash-flows.

5 The specific form taken by the earnings or cash-flow density functions may be quite general.

of the bad firm's earnings and cash-flows. Firms with the higher expected earnings (before depreciation) μ_G will be referred to as good firms and firms with the lower expected earnings (before depreciation) μ_B will be referred to as bad firms. The manager has perfect knowledge of the firm's type. Investors' prior beliefs are that the firm is a good firm with a probability p.

The firm's capital structure consists of both debt and equity. The debtholders are owed both interest payments I at dates t_0, t_1 and t_2, and repayment of the principal P at date t_2. Debtholders are protected by accounting-based debt covenants, which may or may not be breached at date t_1[6]. The probability with which the firm breaches its debt covenants is assumed not to exceed 0.5. These accounting-based debt covenants may consist, for instance, of a minimum interest cover or a maximum leverage ratio. The specific form taken by these covenants is not critical to the success of this model as long as it is common knowledge. A breach of these accounting-based covenants imposes exogenously defined costs C on the firm.

At time t_0, the manager has to report the results incurred by his firm in the period ending at date t_0. In the process, he has to choose a depreciation method for the firm's fixed assets[7]. He may elect to use either the straight-line or the accelerated depreciation method. Any choice of depreciation method made at date t_0 cannot be undone at date t_1. If reneging on the depreciation method choice was allowed, signalling by the means of this accounting choice would no more be credible and would therefore not occur.

The manager is assumed to protect the interests of his firm's shareholders and to maximise shareholders' wealth[8]. As in Ross (1977), Miller and Rock (1985), and

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6 The fact that the debt covenants can only be broken at one date t_1 is not crucial to the model.

7 Managerial discretion in reporting is assumed to be limited to the choice of depreciation methods. The propositions developed in this paper could still obtain if this constraint was removed as long as the choices made by the manager were observable.

8 The propositions contained in this paper would still obtain if the manager was maximising the total value of the firm instead of the value of the firm's equity.

Hughes and Schwartz (1988), the manager's objective function is assumed to depend on both the firm's equity value at t_0 as inferred by the financial market and on the firm's intrinsic equity value at t_0 as known by the manager. More formally, the manager of the firm chooses an accounting procedure so as to maximise the following objective function[9]:

$$I=E_M(V_0)+\alpha E_D(V_0) \tag{1}$$

where:

* $E_M(V_0)$ represents the value of the firm's equity as inferred by the financial market at time t_0;
* $E_D(V_0)$ represents the intrinsic value of the firm's equity as known by the manager of the firm at time t_0;
* α represents a strictly positive constant.

The manager's objective function may be rewritten as:

$$I=E^M[V_{ij}|j]+\alpha V_{ij} \tag{2}$$

where:

$$\forall i,j \quad V_{ij}=V_i-C_{ij} \tag{3}$$

and:

* i=B, B for Bad, or G, G for Good, represents the type of the firm;
* j=A and j=S respectively represent the choice of the accelerated and straight-line depreciation method;
* V_i represents the intrinsic equity value of a firm of type i if the accounting-based covenants could not be breached;
* C_{ij} represents the expected cost of breaching the debt covenants for a firm of type i choosing depreciation method j.

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9 This objective function is equivalent to the following one: $k.E_M(V_0)+(1-k).E_D(V_0)$, where k is strictly positive and represents the weight put by the manager on the shareholders who do sell their shares at time t_0.

In order to get non-trivial results, we will assume that the intrinsic equity value of the good firm's equity using the accelerated depreciation method is higher than the intrinsic value of the bad firm's equity using the straight-line depreciation method. More formally,

$$V_G - C_{GA} > V_B - C_{BS} \tag{4}$$

As in the accounting literature, accelerated depreciation is assumed to exceed straight-line depreciation. The switch from the straight-line to the accelerated depreciation method increases therefore both the probability that the firm, whatever its type, will breach its debt covenants at date t_1 and the ex-ante expected costs associated with breaching the covenants. The expected costs associated with the switch is however higher to the bad firms than they are to the good firms since the cumulative distribution function of the earnings (before depreciation) generated by the good firm stochastically dominates the cumulative distribution function of the earnings (before depreciation) generated by the bad firm. This difference in expected costs is critical to the existence of any separating equilibrium.

The conditions under which separating and pooling equilibria do obtain are determined in the following section. Proofs are available in Appendix A to B.

6.3 Propositions

This section provides conditions under which various types of equilibria may obtain. The equilibrium concept used in this paper is a Perfect Bayesian Equilibrium (PBE). According to Fudenberg and Tirole (1991), a PBE is simply "a set of strategies and beliefs such that, at any stage of the game, strategies are optimal given the beliefs, and the beliefs are obtained from equilibrium strategies and observed actions using Bayes' rule".

The propositions developed in this paper obtain because the adoption of the accelerated depreciation method is costly to the managers of both the good and bad

firms and because it is less costly to the manager of the good firm than it is to the manager of the bad firm. Adopting the accelerated depreciation method is costly to any manager because it shifts the earnings distribution of any firm to the left, increases the probability that the firm will breach its accounting-based debt covenants and therefore increases the expected costs associated with the breach of these covenants. Adopting the accelerated depreciation method is however less costly to the manager of the good firm than it is to the manager of the bad firm because the cumulative distribution function of the good firm's earnings (before depreciation) first-order stochastically dominates the cumulative distribution function of the bad firm's earnings (before depreciation).

The basic model introduced in the previous section enables us to derive the following propositions:

Proposition 1:[10] No separating PBE, in which the managers of the bad and good firms respectively choose the accelerated and the straight-line depreciation methods, can possibly obtain.

Intuition:
No separating equilibrium, in which the managers of the good and bad firms respectively choose the straight-line and accelerated depreciation methods, can obtain. The manager of the bad firm would find it incentive-compatible to defect from his equilibrium strategy and pool with the manager of the good firm. By defecting from his equilibrium strategy, the manager of the bad firm enjoys the benefits resulting from both lower expected costs of breaching the debt covenants and a higher market valuation.

Proposition 2:[11] A separating PBE, in which the manager of the good firm chooses

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10 Proof of Proposition 1 can be found in Appendix A1.

11 Proof of Proposition 2 can be found in Appendix A2. The structure of the proof is as follows. In a first part, we derive necessary conditions for a separating equilibrium to obtain given the exogenously defined beliefs formed by investors upon observing out-of-equilibrium actions. A separating equilibrium may however obtain with more optimistic beliefs. In a second part starting with the word "conversely", it can be checked that these conditions are

the accelerated depreciation method and the manager of the bad firm chooses the straight-line depreciation method, will obtain if:

$$\frac{(V_G-C_{GA})-(V_B-C_{BS})}{C_{BA}-C_{BS}} \leq \alpha \leq \frac{(V_G-C_{GA})-(V_B-C_{BS})}{C_{GA}-C_{GS}} \qquad (5)$$

Intuition:

A separating equilibrium, in which the manager of the good firm adopts the accelerated depreciation method and the manager of the bad firm adopts the straight-line depreciation method, can only obtain if it is incentive compatible for both managers to act accordingly. The inequation on the right states that, for the manager of the good firm not to deviate from his equilibrium policy, the marginal gain from deviating, that is, the decrease in the expected costs of breaching the debt covenants resulting from adopting the straight-line depreciation method, should be smaller than the marginal cost from deviating, that is, the decrease in the manager's objective function resulting from his firm being identified as a bad firm.

Similarly, the inequation on the left states that, for the manager of the bad firm not to deviate from his equilibrium policy, the marginal gain from deviating, that is, the increase in the manager's objective function resulting from his firm being identified as a good firm, should be smaller than the marginal cost from deviating, that is, the increase in the expected costs of breaching the debt covenants resulting from adopting the accelerated depreciation method. These two conditions can be satisfied simultaneously because the marginal cost of adopting the accelerated depreciation method is higher to the manager of the bad firm than it is to the manager of the good firm.

Proposition 3:[12] A pooling PBE, in which both the managers of the good and the

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indeed sufficient for a separating equilibrium to obtain.

12 Proof of Proposition 3 can be found in Appendix A3. The structure of the proof is as follows. In a first part, we derive necessary conditions for a pooling equilibrium to obtain given the exogenously defined out-of-equilibrium beliefs. A pooling equilibrium may however obtain with more optimistic beliefs. In a second part starting with the word "conversely", it can be checked that these conditions are indeed sufficient for a pooling equilibrium to obtain.

bad firms choose the accelerated depreciation method, will obtain if investors believe that a firm deviating from its equilibrium strategy is a bad firm and:

$$p \geq \frac{(C_{BA}-C_{BS})+\alpha\,(C_{BA}-C_{BS})}{(V_G-C_{GA})-(V_B-C_{BA})} \qquad (6)$$

Intuition:

The choice of the accelerated depreciation method is more costly to the manager of the bad firm than it is to the manager of the good firm. It would thus appear to be reasonable for any firm deviating from the pooling equilibrium strategy, in which the managers of both the good and bad firms adopt the accelerated depreciation method, to be perceived to be a bad firm by the financial market.

This pooling equilibrium can only obtain if investors' prior beliefs are that the firm is a good firm with a high enough probability. If this was not the case, the marginal benefit accruing to the manager of a bad firm deviating from the pooling equilibrium strategy, that is, the decrease in the expected costs of breaching the debt covenants resulting from adopting the straight-line depreciation method, would exceed the marginal cost associated with it, that is, the decrease in the manager's objective function resulting from his firm being valued as a bad firm by the financial market.

Proposition 4:[13] A pooling PBE, in which both the managers of the good and the bad firms choose the straight-line depreciation method, will obtain if investors believe that a firm deviating from its equilibrium strategy is a good firm and:

$$p \geq \frac{(V_G-C_{GA})-(V_B-C_{BS})+\alpha\,(C_{GS}-C_{GA})}{(V_G-C_{GS})-(V_B-C_{BS})} \qquad (7)$$

Intuition:

The choice of the accelerated depreciation method is less costly to the manager of

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13 Proof of Proposition 4 can be found in Appendix A4. A pooling PBE in which the managers of both types of firms choose the straight-line depreciation method may however also obtain without any restrictions on the prior probability p if investors believe that a firm deviating from its equilibrium strategy is a bad firm.

the good firm than it is to the manager of the bad firm. It would thus appear to be reasonable for any firm deviating from the pooling equilibrium strategy, in which the managers of both the good and bad firms adopt the straight-line depreciation method, to be perceived to be a good firm by the financial market.

This pooling equilibrium can only obtain if investors' prior beliefs are that the firm is a good firm with a high enough probability. If this was not the case, the marginal benefit accruing to the manager of the good firm deviating from the pooling equilibrium strategy, that is, the increase in the manager's objective function resulting from being perceived unambiguously as the manager of a good firm, would exceed the marginal cost associated with it, that is, the increase in the expected costs of breaching the debt covenants resulting from adopting the accelerated depreciation method.

The previous propositions provide sufficient conditions for various pooling and separating equilibria to obtain. The following propositions deal with price reactions to the adoption of the straight-line and accelerated depreciation methods:

Proposition 5:[14] If, prior to t_0, both good and bad firms are pooled - the managers of both of them choosing the accelerated depreciation method -, the financial market expects that a separating equilibrium is to obtain after t_0, and if, after t_0, a separating equilibrium does indeed obtain, then:

* The market reaction to the firms staying with the accelerated depreciation method should be positive;
* The market reaction to the firms choosing the straight-line depreciation method should be negative.

Proposition 6:[15] If, prior to t_0, both good and bad firms are pooled - the managers of both of them choosing the straight-line depreciation method -, and if, after t_0, a

14 Proof of Proposition 5 can be found in Appendix A5.

15 Proof of Proposition 6 can be found in Appendix A5.

separating equilibrium obtains, then:

* The market reaction to the firms switching to the accelerated depreciation method should be positive;
* The market reaction to the firms staying with the straight-line depreciation method should be negative.

Intuition:

The market reaction to the announcement that a firm stays with the accelerated depreciation method after t_0 is positive in the separating equilibrium obtaining after t_0 because the manager of the good firm would have no incentive to play the equilibrium strategy otherwise. The positive market reaction more than compensates for higher expected costs of breaching the accounting-based debt covenants associated with the adoption of the accelerated depreciation method.

The following proposition introduces a comparative statics result which constitutes a "core result" of Holthausen (1981). In accordance with Kalay (1979) and Holthausen (1981), it will be assumed that the size of the exogenously imposed costs C on firms breaching their debt covenants is a strictly increasing function of the level of debt a firm is endowed with.

Proposition 7:[16] If, prior to t_0, both good and bad firms are pooled - the managers of both of them choosing the accelerated depreciation method -, and if, after t_0, a separating equilibrium obtains, the abnormal share price reaction to the announcement of a change in depreciation method is negatively related to leverage as long as the probability of bankruptcy is small enough.

The model presented in the previous section belongs to a class of signalling models referred to by Thakor (1991) as SMIF (Signalling Models with the Informed moving First). The main advantage of SMIF is that the sequence of moves, the information sets, and the beliefs can be thoroughly specified. The main disadvantage of SMIF

[16] Proof of Proposition 7 can be found in Appendix A5.

is that a large number of equilibria may potentially obtain. Furthermore, a number of these equilibria may be sustained by "unreasonable" beliefs off the equilibrium path. Strategic refinements are typically used in order to put "sensible restrictions" on beliefs off the equilibrium path. The specific form taken by the model introduced in the previous section is motivated by Holthausen (1981). Some characteristics exhibited by the strategic space do however not allow for the effective use of most strategic refinements[17]. In order to introduce these techniques, one would need to expand the strategic space.

In the remaining part of this section, we introduce a model related to the one introduced in the previous section, in which the strategic space is expanded. In the "original model", the manager could choose the depreciation method used to depreciate the firm's fixed assets. In the "amended model", the manager may choose a depreciation rate to depreciate the firm's fixed assets. The depreciation rate ν has to be chosen from the interval $[\nu_{Min},\nu_{Max}]$. The probability of seeing the firm breach its debt covenants is furthermore assumed to be a strictly increasing function of the depreciation rate ν. The other assumptions made in the previous section do still apply here. These assumptions enable us to derive the following proposition[18]:

Proposition 8:[19] A continuum of both pooling and separating PBEs may potentially obtain. In the separating equilibria, the manager of the bad firm chooses to depreciate the fixed assets of his firm at the lowest depreciation rate ν_{Min} while the manager of the good firm chooses to depreciate the fixed assets of his firm at a strictly higher depreciation rate.

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17 All the equilibria derived in this section are sequential. Furthermore, all of them may survive the intuitive criterion designed by Cho and Kreps (1987), the D1 criterion designed by Cho and Kreps (1987), the universal divinity criterion designed by Banks and Sobel (1987), and the NWBR criterion designed by Kohlberg and Mertens (1986).

18 The demonstration of the first part of the proposition is similar to the demonstration of Propositions 1 to 4 and is thus omitted.

19 Proofs of Proposition 8 can be found in Appendix B1, B2, and B3.

Both pooling and separating PBEs are sequential[20] [21]. But the efficient separating equilibrium and the pooling equilibrium, in which the managers of both the good and bad firms choose to depreciate their fixed assets at the highest depreciation rate ν_{Max}, are the only equilibria to survive the D1[22] criterion introduced by Cho and Kreps (1987). These equilibria are also the only ones to satisfy Banks and Sobel's (1987) ultimate divinity[23] and Kohlberg and Mertens' (1986) Never Weak Best Response (NWBR)[24] strategic refinements. Furthermore, it can be shown that the efficient separating equilibrium is the only PBE to survive these strategic refinements as long as there exists a depreciation rate ν in the interval $[\nu_{Min}, \nu_{Max}]$ satisfying the following relationship:

$$V_G - C_G(\nu_{Max}) + \alpha [V_B - C_B(\nu_{Max})] < V_B - C_B(\nu_{Min}) + \alpha [V_B - C_B(\nu_{Min})] \quad (8)$$

6.4 Extension To A Continuum Of Types

The basic model introduced previously is extended to deal with a continuum of types of firms. The type of the firm is captured by q, where q is comprised between q_l and q_h and $q_l < q_h$. Firms of types q and q', with $q \neq q'$, differ only in the expected cash-flows and earnings generated from t_1 to t_n, date at which the firms are liquidated.

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20 A set of strategies and beliefs is said to form a sequential equilibrium if it is both sequentially rational and consistent. A set is consistent if it is the limit of some sequence of mixed strategies and beliefs, where the beliefs are derived from the application of Bayes' rule.

21 If the manager's set of write-downs was unbounded above, then the only equilibrium to satisfy the intuitive criterion developed by Cho and Kreps (1987) would be the efficient separating equilibrium.

22 According to Fudenberg and Tirole (1991), a sequential equilibrium is said to satisfy the D1 criterion if it can be sustained by beliefs satisfying the following property: "If the set of player 2's (market) best responses that make type θ willing to deviate to a_1 is strictly smaller than the set of responses that make type θ' willing to deviate, then player 2 should believe that type θ' is infinitely more likely to deviate to a_1 than type θ is".

23 Using Fudenberg and Tirole's (1991) terminology, a sequential equilibrium is said to satisfy the ultimate divinity strategic refinement if it can be sustained by beliefs satisfying the following property: If the set of player 2's (market) best responses that make type θ willing to deviate to a_1 is included in the union of sets of responses that make other types θ' willing to deviate, then player 2 should not assign any positive weight to type θ at the information set a_1.

24 Using Fudenberg and Tirole's (1991) terminology, a sequential equilibrium is said to satisfy the NWBR criterion if it can be sustained by beliefs satisfying the following property: If the set of player 2's (market) best responses that make type θ indifferent between playing his equilibrium strategy and deviating to a_1 is included in the union of sets of responses that make other types θ willing to deviate, then player 2 should not assign any positive weight to type θ at information set a_1.

It will be assumed that, the higher q, the higher the expected cash-flows and earnings, and thus the higher the value of the firm's equity. The manager has perfect knowledge of the firm's type. The firm's type is however unknown to the financial market.

Most of the assumptions made in the previous section are still valid. The firm's capital structure consists of both debt and equity. Debtholders are protected by accounting-based debt covenants. A breach of these covenants imposes exogenously defined costs C on the firm. As in the previous section, the manager may attempt to signal the type of his firm through his accounting choice related to fixed assets. The manager has to choose a depreciation rate[25] ν, with $\nu \geq \nu_{Min}$. The financial market perceives the firm's type q to be a function of the level of the depreciation rate ν. This function, which is assumed to be differentiable[26], will be referred to as $q(\nu)$.

The expected costs of breaching the debt covenants for a firm of type q choosing a depreciation rate ν, $C(q,\nu)$, are assumed to satisfy the following condition:

$$\frac{dC(q,\nu)}{d\nu} > 0 \quad \forall \nu \geq \nu_{Min} \tag{9}$$

Furthermore, if as is assumed in the previous section the probability with which a firm of any type breaches its debt covenants does not exceed 0.5, the following sorting condition then holds:

$$\frac{\partial^2 C(q,\nu)}{\partial q \partial \nu} > 0 \quad \forall \nu \geq \nu_{Min} \tag{10}$$

The manager of the firm is assumed to maximise the following objective function with respect to ν:

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25 The propositions developed in this paper would still obtain if the depreciation rate ν was bounded above by ν_{Max} as long as α is large enough.

26 The propositions developed in this paper would still hold if q(W) was differentiable almost anywhere.

$$I(q,\nu) = I^{M}(\nu) + \alpha I^{D}(q,\nu) \tag{11}$$

where $I^{D}(q,\nu)$ and $I^{M}(\nu)$ respectively represent the components of the managerial objective function linked to the information sets of the manager and the financial market. More specifically:

$$I^{M}(\nu) = V[q(\nu)] - C[q(\nu),\nu] \tag{12}$$

and:

$$I^{D}(q,\nu) = V(q) - C(q,\nu) \tag{13}$$

where V(q) represents the intrinsic value of the firm of type q's equity if the accounting-based covenants could not be breached.

The objective function maximised by the manager of the firm with respect to ν can thus be rewritten as:

$$I[q,q(\nu),\nu] = V[q(\nu)] - C[q(\nu),\nu] + \alpha\,[V(q) - C(q,\nu)] \tag{14}$$

Maximising this objective function for any given market valuation schedule $q(\nu)$ determines an optimal depreciation rate ν^*, which depends on the type of the firm q:

$$\nu^* = \nu^*(q) \tag{15}$$

We are however not interested in any arbitrary market valuation schedule $q(\nu)$. Rather, we shall restrict our attention to market valuation schedules which have an equilibrium property. A market valuation schedule $q(\nu)$ is said to be an equilibrium valuation schedule[27] if the quality of the firm q is correctly identified by the market for all values of q. More formally:

$$q[\nu^*(q)] = q \tag{16}$$

The extended model introduced in this section enables us to derive the following

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27 This definition of an equilibrium valuation schedule is similar to the one provided by Leland and Pyle (1977).

propositions:

Proposition 9: There exists a unique equilibrium valuation schedule $q(\nu)$. This equilibrium valuation schedule is furthermore a strictly increasing function of the depreciation rate ν.

Proposition 10: The abnormal share price reaction to the announcement of a choice of depreciation rate is a strictly increasing function of the choice of depreciation rate ν.

Proofs are available in Appendix C.

4. Summary

This paper provides a debt covenants-based explanation for the discretionary accounting choices such as the choices of accounting procedures made by managers in a world in which managers are endowed with private information about their firms' future earnings. It introduces a basic model in which the manager of a firm has to select a depreciation method, recognising that the firm has some debt outstanding and that his objective function depends on both the true and the market-based valuation of his firm's equity. This paper provides sufficient conditions for the manager to credibly communicate his private information about the firm's expected future earnings through his choice of depreciation method.

This paper predicts that, when a separating equilibrium prevails, the firms which choose the accelerated depreciation method are likely to see higher earnings in the next periods than the firms which choose the straight-line depreciation method. It also predicts that the former firms should experience, on average, positive abnormal returns around announcement dates. The empirical predictions generated by this paper are furthermore broadly consistent with the empirical evidence reported by Holthausen (1981).

This model may be extended to deal with a variety of discretionary accounting procedures. In the extended model, the use of income-increasing or balance-sheet strengthening accounting procedures signals unfavourable private information while the use of income-decreasing or balance-sheet weakening accounting measures signals favourable private information.

Appendix A

A1 Proposition 1 (Proof)

No separating PBE, in which the managers of the good and bad firms respectively choose the straight-line and accelerated depreciation methods, can obtain. The manager of the bad firm would find it incentive-compatible to defect from his equilibrium strategy and pool with the manager of the good firm. By defecting from his equilibrium strategy, the manager of the bad firm enjoys the benefits resulting from both lower expected costs of breaching the covenants and a higher market valuation.

More formally, the objective function of the manager of the bad firm who plays his equilibrium strategy takes the following value:

$$I_{BFE}=(V_B-C_{BA})+\alpha(V_B-C_{BA}) \quad (17)$$

The objective function of the manager of the bad firm who deviates from his equilibrium strategy takes the following value:

$$I_{BFD}=(V_G-C_{GS})+\alpha(V_B-C_{BS}) \quad (18)$$

It is easy to see that, since $V_G > V_B$ and $C_{GS} < C_{BS} < C_{BA}$, $I_{BFD} > I_{BFE}$, which establishes Proposition 1.

A2 Proposition 2 (Proof)

Let us assume that there exists a separating equilibrium in which the manager of the good firm chooses to adopt the accelerated depreciation method while the manager of the bad firm chooses to adopt the straight-line depreciation method.

The objective function of the manager of the good firm who plays his equilibrium strategy takes then the following value:

$$I_{GFE}=(V_G-C_{GA})+\alpha(V_G-C_{GA}) \tag{19}$$

The objective function of the manager of the good firm who deviates from his equilibrium strategy takes the following value:

$$I_{GFD}=(V_B-C_{BS})+\alpha(V_G-C_{GS}) \tag{20}$$

The objective function of the manager of the bad firm who plays his equilibrium strategy takes the following value:

$$I_{BFE}=(V_B-C_{BS})+\alpha(V_B-C_{BS}) \tag{21}$$

The objective function of the manager of the bad firm who deviates from his equilibrium strategy takes the following value:

$$I_{BFD}=(V_G-C_{GA})+\alpha(V_B-C_{BA}) \tag{22}$$

A separating equilibrium can only obtain if $I_{GFE} \geq I_{GFD}$ and $I_{BFE} \geq I_{BFD}$. This set of conditions is equivalent to the following one:

$$V_G-V_B \geq (1+\alpha)C_{GA}-C_{BS}-\alpha C_{GS} \tag{23}$$

$$V_G-V_B \leq C_{GA}+\alpha C_{BA}-(1+\alpha)C_{BS} \tag{24}$$

Since $C_{BA}-C_{BS} \geq C_{GA}-C_{GS}$ and $V_G-C_{GA} \geq V_B-C_{BS}$, there will always be a range of values of α for which the above-located inequalities will be satisfied:

$$\frac{(V_G-C_{GA})-(V_B-C_{BS})}{C_{BA}-C_{BS}} \leq \alpha \leq \frac{(V_G-C_{GA})-(V_B-C_{BS})}{C_{GA}-C_{GS}} \tag{25}$$

Conversely, it is clear that the set of strategies, in which the manager of the good firm chooses to adopt the accelerated depreciation method and the manager of the bad firm chooses to adopt the straight-line depreciation method, constitutes a PBE as long as Inequalities (25) are satisfied.

A3 Proposition 3 (Proof)

Let us assume that there exists a pooling equilibrium in which both the good and the bad firms choose to adopt the accelerated depreciation method and in which investors believe that any firm deviating from the equilibrium strategy is a bad firm.

The objective function of the manager of the good firm who plays his equilibrium strategy takes then the following value:

$$I_{GFE}=[p(V_G-C_{GA})+(1-p)(V_B-C_{BA})]+\alpha(V_G-C_{GA}) \quad (26)$$

The objective function of the manager of the good firm who deviates from his equilibrium strategy takes the following value:

$$I_{GFD}=(V_B-C_{BS})+\alpha(V_G-C_{GS}) \quad (27)$$

The objective function of the manager of the bad firm who plays his equilibrium strategy takes the following value:

$$I_{BFE}=[p(V_G-C_{GA})+(1-p)(V_B-C_{BA})]+\alpha(V_B-C_{BA}) \quad (28)$$

The objective function of the manager of the bad firm who deviates from his equilibrium strategy takes the following value:

$$I_{BFD}=(V_B-C_{BS})+\alpha(V_B-C_{BS}) \quad (29)$$

A pooling equilibrium can only obtain if $I_{GFE} \geq I_{GFD}$ and $I_{BFE} \geq I_{BFD}$. The first of these conditions implies that:

$$p \geq p_1 \quad (30)$$

where:

$$p_1=\frac{(C_{BA}-C_{BS})+\alpha(C_{GA}-C_{GS})}{(V_G-C_{GA})-(V_B-C_{BA})} \quad (31)$$

The second of these conditions implies that:

$$p \geq p_2 \tag{32}$$

where:

$$p_2 = \frac{(C_{BA} - C_{BS}) + \alpha (C_{BA} - C_{BS})}{(V_G - C_{GA}) - (V_B - C_{BA})} \tag{33}$$

Since $p_2 > p_1$, a necessary condition for the pooling equilibrium to obtain is thus that:

$$p \geq \frac{(C_{BA} - C_{BS}) + \alpha (C_{BA} - C_{BS})}{(V_G - C_{GA}) - (V_B - C_{BA})} \tag{34}$$

Conversely, it is clear that the set of strategies - the managers of both the bad and good firms choose to adopt the accelerated depreciation method - , and beliefs - any firm deviating from the equilibrium strategy is a bad firm - constitutes a pooling PBE as long as Inequality (34) is satisfied.

A4 Proposition 4 (Proof)

Let us assume that there exists a pooling equilibrium in which both the good and the bad firms choose to adopt the straight-line depreciation method and in which investors believe that any firm deviating from the equilibrium strategy is a good firm.

The objective function of the manager of the good firm who plays his equilibrium strategy takes then the following value:

$$I_{GFE} = [p(V_G - C_{GS}) + (1-p)(V_B - C_{BS})] + \alpha (V_G - C_{GS}) \tag{35}$$

The objective function of the manager of the good firm who deviates from his equilibrium strategy takes the following value:

$$I_{GFD} = (V_G - C_{GA}) + \alpha (V_G - C_{GA}) \tag{36}$$

The objective function of the manager of the bad firm who plays his equilibrium strategy takes the following value:

$$I_{BFE}=[p(V_G-C_{GS})+(1-p)(V_B-C_{BS})]+\alpha(V_B-C_{BS}) \quad (37)$$

The objective function of the manager of the bad firm who deviates from his equilibrium strategy takes the following value:

$$I_{BFD}=(V_G-C_{GA})+\alpha(V_B-C_{BA}) \quad (38)$$

A pooling equilibrium can only obtain if $I_{GFE} \geq I_{GFD}$ and $I_{BFE} \geq I_{BFD}$. The first of these conditions implies that:

$$p \geq p_3 \quad (39)$$

where:

$$p_3=\frac{[(V_G-C_{GA})-(V_B-C_{BS})]+\alpha(C_{GS}-C_{GA})}{(V_G-C_{GS})-(V_B-C_{BS})} \quad (40)$$

The second of these conditions implies that:

$$p \geq p_4 \quad (41)$$

where:

$$p_4=\frac{[(V_G-C_{GA})-(V_B-C_{BS})]+\alpha(C_{BS}-C_{BA})}{(V_G-C_{GS})-(V_B-C_{BS})} \quad (42)$$

Since $p_3 > p_4$, a necessary condition for the pooling equilibrium to obtain is thus that:

$$p \geq \frac{[(V_G-C_{GA})-(V_B-C_{BS})]+\alpha(C_{GS}-C_{GA})}{(V_G-C_{GS})-(V_B-C_{BS})} \quad (43)$$

Conversely, it is clear that the set of strategies - the managers of both the bad and good firms choose to adopt the straight-line depreciation method - , and beliefs - any firm deviating from the equilibrium strategy is a good firm - constitutes a pooling PBE as long as Inequality (43) is satisfied.

A5 Propositions 5, 6, and 7 (Proof)

Let us assume that, prior to t_0, all firms are pooled - the managers of both types of firms using either the accelerated or straight-line depreciation methods. Let us also assume, that after t_0, a separating equilibrium, in which the managers of the good firms choose the accelerated depreciation method and the managers of the bad firms choose the straight-line depreciation method, obtains.

If, prior to t_0, the financial market expects that a separating equilibrium is to obtain, the market value of a pooled firm is given by:

$$V_{0P}=p(V_G-C_{GA})+(1-p)(V_B-C_{BS}) \tag{44}$$

After t_0, the market values of the good and bad firms are as follow:

$$\begin{aligned} V_{0G}&=V_G-C_{GA} \\ V_{0B}&=V_B-C_{BS} \end{aligned} \tag{45}$$

The market reaction to the news that a given firm stays with the accelerated depreciation method is therefore as follows:

$$V_{0G}-V_{0P}=(1-p)[(V_G-C_{GA})-(V_B-C_{BS})]>0 \tag{46}$$

In the separating equilibrium, the market reaction to the accelerated depreciation announcement is therefore always positive.

Similarly, the market reaction to the news that a given firm switches to the straight-line depreciation method is therefore as follows:

$$V_{0B}-V_{0P}=-p[(V_G-C_{GA})-(V_B-C_{BS})]<0 \tag{47}$$

In the separating equilibrium, the market reaction to the news that that a given firm switches to the straight-line depreciation method is therefore negative.

Moreover, it is clear that:

$$\frac{d(V_B - V_{0P})}{dD} = p\left[\frac{d(C_{GA} - C_{BS})}{dD} - \frac{d(V_G - V_B)}{dD}\right] \qquad (48)$$
$$< 0$$

as long as the size of the exogenously imposed costs C of breaching the debt covenants is a strictly increasing function of the level of debt and the probability of bankruptcy is small enough.

Appendix B

B1 Sequential Equilibrium (Proof)

Fudenberg and Tirole (1991) have shown that any Perfect Bayesian Equilibrium constitutes a Sequential Equilibrium as long as there are less than two stages in the game.

B2 D1 Criterion (Proof)

We first prove that no pooling equilibrium, in which the managers of both the good and bad firms choose to depreciate their fixed assets at ν, where $\nu < \nu_{Max}$, survives the D1 strategic refinement designed by Cho and Kreps (1987). Let us therefore assume that such a pooling PBE does obtain and consider an out-of-equilibrium depreciation rate ν_d in the neighbourhood of ν, where $\nu < \nu_d < \nu_{Max}$. We then define $\hat{V}_G$ so as to satisfy the following equation:

$$\begin{aligned} I_{GF} &= \hat{V}_G + \alpha [V_G - C_G(\nu_d)] \\ &= p[V_G - C_G(\nu)] + (1-p)[V_B - C_B(\nu)] + \alpha [V_G - C_G(\nu)] \end{aligned} \quad (49)$$

Similarly, we define $\hat{V}_B$ so as to satify the following equation:

$$\begin{aligned} I_{BF} &= \hat{V}_B + \alpha [V_B - C_B(\nu_d)] \\ &= p[V_G - C_G(\nu)] + (1-p)[V_B - C_B(\nu)] + \alpha [V_B - C_B(\nu)] \end{aligned} \quad (50)$$

By combining (49) and (50), we obtain the following equation:

$$\hat{V}_G - \hat{V}_B = \alpha [[C_G(\nu_d) - C_G(\nu)] - [C_B(\nu_d) - C_B(\nu)]] \quad (51)$$

From the previous equation, it is clear that $\hat{V}_G < \hat{V}_B$. The set of market responses Ω_B and Ω_G inducing the managers of the bad and good firms to defect from their equilibrium actions are therefore as follows:

$$\begin{cases} \Omega_B =]\hat{V}_B, V_G] \\ \Omega_G =]\hat{V}_G, V_G] \end{cases} \tag{52}$$

and it is clear that:

$$\Omega_B \subset \Omega_G \tag{53}$$

When faced with the out-of-equilibrium depreciation rate ν_d, investors should therefore believe that:

$$\mu(GF|\nu_d)=1 \tag{54}$$

But, these beliefs induce the manager of the good firm to defect from his equilibrium strategy. No pooling PBE, in which the managers of both the good and bad firms choose to depreciate their fixed assets at ν, where $\nu < \nu_{Max}$, can therefore survive the D1 strategic refinement designed by Cho and Kreps (1987).

We now prove that no non-efficient separating PBE can survive Cho and Kreps' D1 strategic refinement. Let us therefore consider a separating PBE in which the depreciation rate ν chosen by the manager of the good firm is larger than ν^*. Whatever the response of the financial market, the manager of the bad firm would never want to choose an out-of-equilibrium depreciation rate ν_d, where $\nu^* < \nu_d < \nu$. This is so because ν^* is the value taken by the depreciation rate for which the manager of the bad firm is indifferent between playing his equilibrium strategy and being identified as the manager of a bad firm, and choosing ν^* and being identified as the manager of a good firm. The manager of the good firm may however find it incentive compatible to report ν_d. Let us define ∇_G to satisfy the following equation:

$$\begin{aligned} I_{GF} &= [V_G - C_G(\nu)] + \alpha [V_G - C_G(\nu)] \\ &= \hat{V}_G + \alpha [V_G - C_G(\nu_d)] \end{aligned} \tag{55}$$

The set of market responses Ω_B and Ω_G inducing the managers of the bad and good firms to defect from their equilibrium actions are therefore as follows:

$$\begin{cases} \Omega_B = \varnothing \\ \Omega_G =]\hat{V}_G, V_G] \end{cases} \tag{56}$$

and it is clear that:

$$\Omega_B \subset \Omega_G \tag{57}$$

When faced with the out-of-equilibrium write-off ν_d, investors should therefore believe that:

$$\mu(GF|\nu_d) = 1 \tag{58}$$

But, these beliefs induce the manager of the good firm to defect from his equilibrium strategy. No non-efficient separating PBE can therefore survive Cho and Kreps' D1 strategic refinement.

We now prove that the efficient separating PBE survives Cho and Kreps' D1 strategic refinement. To do this, we have to consider two potential types of defections ν_d:

i) $0 < \nu_d < \nu^*$

ii) $\nu^* < \nu_d$

i) Let us first consider a defection ν_d, where $0 < \nu_d < \nu^*$. We already know that, in equilibrium, the manager of the bad firm is indifferent between his equilibrium action and that of the manager of the good firm. More formally,

$$\begin{aligned} I_{BF} &= [V_B - C_B(\nu_{Min})] + \alpha [V_B - C_B(\nu_{Min})] \\ &= [V_G - C_G(\nu^*)] + \alpha [V_B - C_B(\nu^*)] \end{aligned} \tag{59}$$

Let us define $\tilde{\nu}_G$ so as to satisfy the following equation:

$$\begin{aligned} I_{GF} &= [V_G - C_G(\nu^*)] + \alpha [V_G - C_G(\nu^*)] \\ &= \hat{V}_G + \alpha [V_G - C_G(\nu_d)] \end{aligned} \tag{60}$$

Similarly, let us define $\tilde{\nu}_B$ so as to satisfy the following equation:

$$I_{BF} = [V_B - C_B(\nu_{Min})] + \alpha [V_B - C_B(\nu_{Min})] \\ = \hat{V}_B + \alpha [V_B - C_B(\nu_d)] \quad (61)$$

By replacing (60) and (61) into (59), we obtain:

$$\hat{V}_G - \hat{V}_B = \alpha [[C_B(\nu^*) - C_G(\nu^*)] - [C_B(\nu_d) - C_G(\nu_d)]] \quad (62)$$

From the previous equation, it is clear that $V_G > V_B$ since $\nu^* > \nu_d$. The set of market responses Ω_B and Ω_G inducing the managers of the bad and good firms to defect from their equilibrium actions are therefore as follows:

$$\begin{cases} \Omega_B =]\hat{V}_B, V_G] \\ \Omega_G =]\hat{V}_G, V_G] \end{cases} \quad (63)$$

and it is clear that:

$$\Omega_G \subset \Omega_B \quad (64)$$

When faced with an out-of-equilibrium depreciation rate ν_d, investors should therefore believe that:

$$\mu(BF|\nu_d) = 1 \quad (65)$$

But, given these beliefs, no manager wishes to defect from his equilibrium strategy.

ii) Alternatively, let us consider a defection ν_d, where $\nu^* < \nu_d$. Even if investors believe with probability one that the defector is a good firm, no firm will ever wish to defect.

It has been shown that no firm will ever wish to defect. The efficient PBE thus survives Cho and Kreps' D1 strategic refinement.

B3 Ultimate Divinity and NWBR (Proof)

Cho and Sobel (1990) show that, for any monotonic signalling game, the universal divinity and NWBR criteria are equivalent to the D1 criterion.

Appendix C

C1 Riley Conditions (Proof)

Riley (1979) provides a number of conditions guaranteeing both the existence and the unicity of an equilibrium valuation schedule. The purpose of this section is to check that the model described in this paper meets the six assumptions stated by Riley. Since the manager's objective function may be written as follows,

$$I(q,\nu,I^M) = I^M + \alpha I^D(q,\nu) \tag{66}$$

Riley's assumptions may be rewritten as follows:

C.1.1 The unobservable parameter q is distributed on a closed interval according to a strictly increasing distribution function;

C.1.2 The functions I(.) and I^D(.) are infinitely differentiable in all variables;

C.1.3 $I_3 > 0$;

C.1.4 $I^D(q,\nu) > 0$, $I^D_q(q,\nu) > 0$;

C.1.5 The partial derivative of $-I_2/I_3$ with respect to q is negative;

C.1.6 I [q, ν, $I^D(q,\nu)$] has a unique maximum over ν.

Assumptions C.1.1 to C.1.4 are trivially satisfied. Assumption C.1.5 is satisfied because:

$$\begin{aligned}\frac{\partial}{\partial q}\left(-\frac{I_2}{I_3}\right) &= \frac{\partial}{\partial q}\left[\alpha \frac{\partial C}{\partial \nu}(q,\nu)\right] \\ &= \alpha \frac{\partial^2 C}{\partial q \partial \nu}(q,\nu) \\ &< 0\end{aligned} \tag{67}$$

Assumption C.1.6 is satisfied since $\nu = \nu_{Min}$ is the only maximum of I [q, ν, $I^D(q,\nu)$].

As Riley's conditions are satisfied, there exists a unique equilibrium valuation schedule $q(\nu)$. This unique equilibrium valuation schedule is characterised in Appendix C2.

C2 Characterisation (Proof)

The First Order Condition states that the following condition has to be satisfied at $\nu=\nu^*$:

$$\frac{dI[q,\nu,I^M(q,\nu)]}{d\nu} = \underbrace{\left[\frac{dV}{dq}[q(\nu)] - \frac{\partial C}{\partial q}[q(\nu),\nu]\right]}_{=0}\frac{dq(\nu)}{d\nu} - \frac{\partial C}{\partial \nu}[q(\nu),\nu] - \alpha\frac{\partial C}{\partial \nu}(q,\nu) \quad (68)$$

But:

$$q[\nu^*(q)]=q \quad (69)$$

The valuation schedule q(ν) thus satisfies the following relation:

$$\frac{dq(\nu)}{d\nu} = \frac{(1+\alpha)\frac{\partial C}{\partial \nu}[q(\nu),\nu]}{\frac{dV}{dq}[q(\nu)] - \frac{\partial C}{\partial q}[q(\nu),\nu]} \quad (70)$$

The quality of the firm is thus a strictly increasing function of the level of the depreciation rate ν.

The unique equilibrium valuation schedule thus satisfies Equation (70). Since in equilibrium the manager of the worst firm reveals the quality of his firm through his choice of depreciation rate, the equilibrium valuation schedule also satisfies the following condition:

$$q(\nu_{Min}) = q_l \quad (71)$$

Conversely, the equilibrium valuation schedule q(ν) is the only valuation schedule satisfying Equations (70) and (71).

C3 Proposition 10 (Proof)

By differentiating $I^M[q(\nu),\nu]$ with respect to ν, we can see that:

$$\begin{aligned}\frac{dI^M}{d\nu}[q(\nu),\nu] &= [\![\frac{dV}{dq}[q(\nu)]-\frac{\partial C}{\partial q}[q(\nu),\nu]]\!]\frac{dq}{d\nu}(\nu)-\frac{\partial C}{\partial \nu}[q(\nu),\nu] \\ &= \alpha\frac{\partial C}{\partial \nu}(q,\nu) \\ &> 0\end{aligned} \tag{72}$$

Proposition 8 thus obtains.

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CHAPTER 7

DISCRETIONARY PROVISIONS:
A SIGNALLING APPROACH

Abstract

This paper introduces a model seeking to explain the discretionary provisions and other write-downs and write-offs of non-depreciable assets reported by managers of firms in difficulty. It introduces a firm, its manager, and a financial market. The firm is currently undergoing a crisis. The manager is endowed with some private information about the firm's likely recovery. He chooses whether or not to report a provision, recognising that his compensation depends on both current and future reported earnings and firm's equity market values. The financial market values the firm according to the accounting choice made by the manager. This paper provides sufficient conditions for separating and pooling rational expectations equilibria to obtain.

This paper predicts that, when a separating equilibrium prevails, the firms which do report discretionary provisions are likely to see higher cash-flows and (fiscal) earnings in the next periods than the firms which do not report any. It also predicts that the former firms should experience, on average, positive abnormal returns around the announcement dates of the provisions. These testable implications differ from those derived from Healy (1985) and are consistent with journalistic accounts and casual empiricism.

7.1 Introduction

The increasing number of asset write-downs, write-offs, and other restructuring provisions has captured the attention of the financial community. According to Strong and Meyer (1987), American corporations have taken after-tax write-offs of over $10 billion over the five years from 1982 to 1987. Accountants have been increasingly concerned that these disclosures often occur significantly after the

related asset impairment, tend be reported late in the fiscal year, and are frequently in excess of the reduction needed to reflect the new, lower market values of the impaired assets. This paper presents a model seeking to explain the discretionary provisions and other write-downs and write-offs of non-depreciable assets reported by managers of firms in difficulty.

According to the accounting literature, as illustrated by Zucca and Campbell (1992), discretionary provisions, write-offs, and other write-downs may be motivated by earnings management, be it income-smoothing or income-bathing. Dye (1988) and Trueman and Titman (1988) propose various theories explaining how income-smoothing may arise as rational equilibrium behaviour. Fewer papers explain why managers may engage in income-bathing. Healy (1985) develops a model in which managers may rationally want to take a bath when they are rewarded with capped accounting bonus schemes. Managers are shown to have the incentive to further reduce the current earnings of their firms as long as they are not in a position to get a bonus whatever the accounting procedures they select. DeAngelo (1988) hypothesises that "dissidents elected in proxy fights tend to take an immediate earnings bath which they typically blame on the poor decisions of prior management and which enables them to report an earnings turnaround the following year".

Journalistic accounts and casual empiricism do suggest that provisions, write-offs, and other write-downs are "good news". According to Elliott and Shaw (1988), "The financial press frequently treats (these) write-offs as though they are viewed favourably by the securities market". According to Zucca and Campbell (1990), "Several articles indicated that the stock market reacts positively to asset writedowns. A Wall Street Journal article indicated that the stock price for five large companies rose 4-7% three days after the announcement of write-downs. Another article indicated that a $500 million write-down recorded by Warner Lambert in 1985 resulted in a 12% stock increase. Unfortunately, none of these articles examines whether there may be a similar number of writedowns which resulted in stock price decreases".

Existing empirical work in this area remains partial and inconclusive. So far, few empirical studies have been published in academic journals[1]. The few which have been published tend furthermore to disagree on most counts. A first empirical study based on both accounting and market returns published by Elliott and Shaw (1988) and focusing on large write-downs suggests that write-downs are "bad news". Elliott and Shaw find that, throughout the three years which preceded the announcements of the write-downs, both the accounting and share price returns were below industry median. They report significant one- and two-day negative share price returns on average around the write-down disclosure dates. Write-down firms are furthermore shown to underperform their industries during the eighteen months following the announcement dates.

A second empirical study based on both accounting and market returns published by Zucca and Campbell (1989) provides evidence that is more difficult to interpret. Zucca and Campbell find that firms disclosing write-downs are not as financially healthy as firms in the same industry classification which did not write down any impaired assets. They do not find evidence of significant excess returns around the announcement dates of the write-downs. They do however report that differences in performance between the small (large) write-down group and the control group become smaller (larger) as time passes after the write-down.

A third empirical study based on both accounting and market returns published by Strong and Meyer (1987) reports some evidence suggesting that write-downs may serve as signals for future earnings. It provides evidence of positive abnormal share price reactions to write-downs. The larger the write-down, the greater the announcement period excess return.

These differences in empirical results led the accounting community to call for more theory. As of 1988, Waymire already reports that:

"Much of the (conference) discussion focused on how alternative write-offs

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1 Elliott and Shaw (1988), Strong and Meyer (1987), Zucca and Campbell (1992)

> may differ, and, in turn, lead to differences in earnings or stock price performance...In my opinion, the primary concern underlying the conference discussion is the failure to identify and consider managers' economic incentives in making decisions to affect income via large write-offs".

This paper focuses on discretionary provisions (involving no cash) and other write-downs and write-offs of non-depreciable assets reported by managers of firms in difficulty and which will be referred to in the remaining part of this paper as (discretionary) provisions. It identifies managerial compensation plans as the economic incentive for reporting provisions. It introduces a basic model adopting the "information perspective" alluded to by Holthausen and Leftwich (1983). It considers a firm undergoing a crisis in a one-period economy consisting of a manager, a firm, and a financial market. The firm is currently assumed not to be in a tax-paying position. The firm's manager is assumed to have taken a number of actions to lead his firm out of its current crisis and is endowed with private information concerning the outcome of his actions, that is, the likelihood of his firm experiencing a successful turnaround, that is, high cash-flows, high earnings, and taxable profits.

The first part assumes that the manager knows whether his firm is a good or a bad firm, a good firm being more likely to experience a successful turnaround by the end of the period. At the current date, the manager has to decide *whether or not* to report a discretionary provision. If the manager abstains from reporting a provision at the current date, he does not have to report one at the later date. The manager makes his choice, recognising that his compensation depends on both current and future reported earnings and stock prices. The financial market values the firm according to the reporting choice announced by the manager. The paper provides sufficient conditions for separating and pooling rational expectations equilibria to obtain.

Reporting a provision reduces current earnings, and thus, the accounting-based component of the manager's objective function. Reporting a provision may however provide the manager with deferred benefits. If the firm generates

(enough) taxable profits at the end of the period, its manager will be able to recognise for *financial reporting purposes* the taxation credit associated with the provision, which will increase the end-of-period accounting-based component of the manager's objective function. Reporting a provision is thus less costly to a manager, whose firm is more likely to be in a tax-payable position at the end of the period. Reporting a provision may thus enable the manager to signal his private information concerning his firm's recovery.

The model predicts that, amongst the firms which go through a crisis and are making fiscal losses for fiscal purposes, those which do report discretionary provisions are more likely to see higher earnings in the next periods than those which do not report any. The model also predicts that, amongst the firms which go through a crisis and are making losses for fiscal purposes, those which do report discretionary provisions should see, on average, positive abnormal returns on the announcement date of their decisions.

The second part of the paper extends the basic model to deal with a continuum of types of firms. The manager of a firm of type q believes that his firm has a probability q of experiencing a successful turnaround. In this model, the manager finds it incentive-compatible to report a discretionary provision as long as the probability q is strictly positive. The higher the probability, the larger the provision. The abnormal share price reaction to the announcement of the discretionary provision is furthermore an increasing function of the size of the provision.

A description of the basic model dealing with two types of firms is developed in section 7.2. The main propositions and the intuition behind them can be found in section 7.3. The extension of the basic model to deal with a continuum of types of firms is provided in section 7.4. A summary is provided in section 7.5. The derivations supporting the various propositions are contained in Appendix.

7.2 The Basic Model

This section introduces a simple model focusing on the manager's choice of discretionary provisions and other write-downs of non-depreciable assets in a world of asymmetric information. In this model, the manager has private information about the firm's future earnings and cash-flows, and, under certain conditions, may credibly communicate his information to investors through his choice of provisions. The model is simplified in order to concentrate on the informative role of the manager's provision policy.

This model deals with a firm, a manager, and a financial market over one period, from the current date t_0 to t_1, date at which the firm is liquidated. Both the manager and the financial market are assumed to be risk-neutral. The introduction of risk-aversion would generate risk-sharing considerations which are not important in this model. The firm's investment decisions, capital structure, and the resulting distribution of cash-flows are determined exogenously. In order to simplify the analytical derivations contained in this paper, it is assumed that the capital of the firm consists only of equity and that the firm's cash-flows are distributed as they are generated. The propositions developed in this paper would however still obtain if these assumptions were relaxed.

The firm is assumed to go through a crisis. The cash-flows X_0 and the earnings before any discretionary provisions A_0 to be announced by the manager for financial reporting purposes at the current date, t_0, do reflect this situation. The firm is furthermore making losses E_0 for taxation purposes. The firm's current cash-flows X_0, financial earnings A_0, and fiscal losses E_0 are assumed to be known by both the manager and the financial market[2].

The manager has taken some actions prior to t_0 to head his firm out of the crisis

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2 This assumption is made to simplify the analytical derivations contained in this paper. Signalling could still obtain if there was an asymmetry of information between the manager of the firm and the financial manager about X_0, A_0, or E_0.

it currently finds itself to be in. There is however an information asymmetry between the manager of the firm and the financial market about the outcome of these actions. The good firm has a probability p_H of generating cash-flows X_1, financial earnings A_1, and fiscal profits E_1 at date t_1 of X_H, A_H, and E_H, and a probability $1\text{-}p_H$ of generating cash-flows X_1, financial earnings A_1, and fiscal losses E_1 at date t_1 of X_L, A_L, and E_L. The bad firm has a probability p_L of generating cash-flows X_1, financial earnings A_1, and fiscal profits E_1 at date t_1 of X_H, A_H, and E_H, and a probability $1\text{-}p_L$ of generating cash-flows X_1, financial earnings A_1, and fiscal losses E_1 at date t_1 of X_L, A_L, and E_L[3]. X_H, A_H, and p_H are assumed to exceed X_L, A_L, and p_L. Similarly, A_0 is assumed to be smaller than A_H. The manager has perfect knowledge of his firm's type. Investors' prior beliefs are that the firm is a good firm with a probability p.

At date t_0, the manager has to report his firm's results relating to the financial exercise closing at date t_0. The manager of the firm is assumed to be able to report a discretionary "restructuring" provision W, where $W \leq W_{Max}$, which has *no "direct" impact on future income and does not involve any cash expenditures.* If the manager abstains from taking a provision at date t_0, he does not have to take it at date t_1. This "stylised" provision models any general provision or any write-down or write-off of non-depreciable assets. It is assumed not to be allowable for *taxation* purposes[4] [5]. Since there are currently no taxable profits, it is also assumed that the taxation credit associated with the provision cannot be recognised for *financial reporting* purposes at date t_0[6] [7]. Managerial discretion

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3 The same propositions would obtain had probability distributions rather than discrete probabilities been used.

4 This assumption is a feature of most Anglo-Saxon GAAPs. In the UK and US, general provisions are typically not tax-allowable.

5 The propositions derived in this paper would however still obtain if provisions were tax-allowable.

6 This is consistent with UK practice. It is also consistent with US standards and practice prevailing in the US during the 80s. Under APB 11, the tax effects are not recognised because there is no assurance that they will be realised. There is only one exception to not recognising the effects of a loss carryforward The tax effects of a loss carryforward may be realised in the book of accounts providing that the realisation is assured beyond any realisable doubt.

in reporting is furthermore assumed to be limited to the choice of whether or not to report the discretionary provision W[8].

The manager is rational and decides whether or not to report a discretionary provision W taking into account the impact of the provision on his objective function. His objective function is assumed to depend on both the equity value[9] of his firm and the financial earnings reported both at dates t_0 and t_1. The component of the manager's objective function which depends on financial earnings reflects the fact that the manager may derive some utility from both fixed compensation, bonus plans, and perquisites. This component is further assumed to be an increasing function of reported earnings. It could be either linear or concave[10]. The component of the manager's objective function which depends on the firm's market value reflects the fact that the manager derives some utility from stock participation plans and other stock options.

The specific form taken by the manager's objective function is determined exogenously in this model. It would however appear to be compatible with the compensation schedules observed empirically. A substantial proportion of firms provide their directors with both stock-options and bonus schemes based on accounting figures. The manager's objective function may also be justified on more theoretical grounds. The game analysed in this paper may be considered as a sub-game of a larger game involving a moral hazard problem between the firm's manager and shareholders. In such an environment characterised by a separation between ownership and management, the manager's optimal

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7 It is implicitly assumed that the past periods did not see enough taxable profits to enable the firm to carry-back the provision.

8 The propositions developed in this paper could however still obtain if this constraint was removed as long as the choices made by the manager were observable.

9 The propositions developed in this paper would still obtain if the manager's objective function depended on the firm's total market value.

10 The propositions developed in this paper could still obtain if this function was convex. Linearity or concavity enables us however to capture the "Spence-Mirrlees" sorting condition in a simple framework.

compensation schedule may depend on both stock prices and reported earnings, despite the fact that stock prices impound all available information including earnings [Kim and Suh (1993), Bushman and Indjejikian (1993)]. Even if there is no hidden-action or hidden-information problem, the manager's optimal compensation schedule may still depend on both stock prices and reported earnings as long as the principal is risk-averse, and the process followed by earnings differs from the process followed by stock prices.

More formally, the manager of the firm is assumed to maximize I(W), the conditional expected value of the following objective function:

$$\alpha f[A_0(W)] + \zeta V_0 + \delta \alpha f[A_1(W)] + \delta \zeta V_1 \qquad (1)$$

where:

* α and ζ are constants, satisfying the following relationships: $0<\alpha<1$ and $0<\zeta<1$;
* $A_0(W)$ and $A_1(W)$ respectively represent the earnings - after the effect of any discretionary provision W - reported by the manager of the firm at dates t_0 and t_1;
* V_0 and V_1 respectively represent the market value of the firm's equity at dates t_0 and t_1;
* $f[A_0(W)]$ and $f[A_1(W)]$ respectively represent the accounting-based component of the manager's compensation package prevailing at t_0 and t_1;
* δ represents the manager's rate of time preference.

By discounting free cash-flows, one may rewrite the manager's objective function introduced earlier as:

$$\begin{aligned} I(W) = \; & \alpha f[A_0(W)] + \zeta [X_0 - \alpha f[A_0(W)]] + \zeta r^* E_M[X_1 - \alpha f[A_1(W)] \mid W] \\ & + \delta E_D[\alpha f[A_1(W)] + \zeta [X_1 - \alpha f(A_1(W))]] \end{aligned} \qquad (2)$$

where:

* $E_M[. \mid W]$ represents the financial market's conditional expectation upon

observing W;

* $E_D[.]$ represents the manager's expectation;

In order to get non-trivial results, one further assumption is made. The cash-flow after managerial compensation obtaining at time t_1 is assumed to be higher for the good firm than for the bad firm:

$$X_H - \alpha f(A_H + W_{Max} T_C) > X_L - \alpha f(A_L) \qquad (3)$$

The first-order effect[11] of a provision W is to reduce t_0's earnings by W and thus the t_0 earnings-related component of the manager's objective function by $\alpha.[f(A_0)-f(A_0-W)]$. The manager of any firm may however derive deferred benefits from the provision W made at date t_0. With a probability p_H (p_L), the good (bad) firm sees taxable profits at date t_1 and the manager is thus able to recognise for *financial reporting purposes* the taxation credit associated with the provision W. With a probability p_H (p_L), the manager of the good (bad) firm thus sees earnings at date t_1 increase by $W.T_C$ and the accounting-based component of his objective function related to t_1 increase by $\delta\alpha[f(A_H+W.T_C)-f(A_H)]$, where T_C is the corporation tax rate prevailing in the economy.

The conditions under which separating or pooling equilibria do obtain are determined in the following subsection. Proofs are available in the attached Appendix.

7.3 Propositions

This subsection provides conditions under which various types of equilibria may obtain. The equilibrium concept used in this paper is a Perfect Bayesian Equilibrium. According to Fudenberg and Tirole (1991), a Perfect Bayesian

11 There is also a second-order effect: The decrease in the manager's compensation increases the value of the firm's equity, other things being equal.

Equilibrium (PBE) is simply "a set of strategies and beliefs such that, at any stage of the game, strategies are optimal given the beliefs, and the beliefs are obtained from equilibrium strategies and observed actions using Bayes' rule".

The game introduced in the previous section belongs to a class of signalling models referred to by Thakor (1991) as SMIF (Signalling Models with the Informed moving First). It is furthermore monotonic[12]. The main advantage of SMIF is that the sequence of moves, the information sets, and the beliefs can be thoroughly specified. The main disadvantage of SMIF is that a large number of equilibria may potentially obtain. This section therefore contains strategic refinements which attempt to put "sensible" restrictions on beliefs off the equilibrium path.

The effect of any provision W is to reduce earnings reported at date t_0 by W and, thus, the accounting-based component of the manager's objective function by $\alpha[f(A_0)-f(A_0-W)]$. The manager of any firm may however derive deferred benefits from the provision W made at date t_0. With a probability p_H (p_L), the good (bad) firm sees taxable profits at date t_1 and the manager is thus able to recognise for *financial reporting purposes* the taxation credit associated with the provision W. With a probability p_H (p_L), the manager of the good (bad) firm thus sees earnings at date t_1 increase by $W.T_C$ and the accounting-based component of his objective function related to t_1 increase by $\delta\alpha[f(A_H+W.T_C)-f(A_H)]$, where T_C is the corporation tax rate prevailing in the economy. Reporting a discretionary provision W is thus costly to any manager. It is however less costly to the manager of the good firm than it is to the manager of the bad firm.

The basic model introduced in the previous section enables us to derive the following propositions:

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12 According to Cho and Sobel (1990), "A signalling game is said to be monotonic if all sender types have the same preferences over the receiver's mixed strategy best responses".

Proposition 1:[13] No separating PBE, in which the manager of the bad firm chooses to report a provision and in which the manager of the good firm chooses not to report a provision, may possibly obtain[14].

Intuition:

No separating equilibrium in which bad firms report provisions and good firms do not report provisions can obtain because the managers of the bad firms would find it incentive-compatible to defect from their equilibrium strategies. The manager of the bad firm would find it incentive-compatible to defect from his equilibrium strategy and pool with the manager of the good firm. By defecting from his equilibrium strategy, the manager of the bad firm enjoys the benefits resulting from both higher reported earnings and a higher market valuation.

Proposition 2:[15] For any given set of α and ζ, a separating PBE, in which the manager of the good firm reports a discretionary provision W and the manager of the bad firm abstains from reporting any discretionary provision, will obtain as long as investors believe that any deviating firm is a bad firm and the discretionary provision W satisfies the following inequations:

$$\begin{aligned}\delta\zeta(p_H-p_L)(X_H-X_L)\geq\ & \alpha(1-\zeta)[[f(A_0)-f(A_0-W)]+\delta p_H[f(A_H)-f(A_H+WT_C)]] \\ & -\ \delta\alpha\zeta[p_L f(A_H)-p_H f(A_H+WT_C)+(p_H-p_L)f(A_L)]\end{aligned} \quad (4)$$

and if:

$$\begin{aligned}\delta\zeta(p_H-p_L)(X_H-X_L)\leq\ & \alpha(1-\zeta)[[f(A_0)-f(A_0-W)]+\delta p_L[f(A_H)-f(A_H+WT_C)]] \\ & -\ \delta\alpha\zeta[p_L f(A_H)-p_H f(A_H+WT_C)+(p_H-p_L)f(A_L)]\end{aligned} \quad (5)$$

There will always exist a set of equilibrium provisions W, where W is smaller than

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13 Proof of Proposition 1 can be found in Appendix A1.

14 A more general proposition obtains: There cannot be any separating equilibrium in which the manager of the bad firm chooses to report a larger provision than the manager of the bad firm.

15 Proof of Proposition 2 can be found in Appendix A2. The structure of the proof is as follows. In a first part, we derive necessary conditions for a separating equilibrium to obtain given the exogenously defined beliefs formed by investors upon observing out-of-equilibrium actions. A separating equilibrium may however obtain with more optimistic beliefs. In a second part starting with the word "conversely", it can be checked that these conditions are indeed sufficient for a separating equilibrium to obtain.

W_{Max}, if ζ is small enough[16]. A continuum of separating equilibria may therefore potentially obtain. In the separating equilibrium Pareto-dominating all other separating PBEs, the manager of the good firm reports therefore a provision W^*, where:

$$\delta\zeta(p_H-p_L)(X_H-X_L) = \alpha(1-\zeta)[[f(A_0)-f(A_0-W^*)]+\delta p_L[f(A_H)-f(A_H+W^*T_C)]] - \delta\alpha\zeta[p_L f(A_H)-p_H f(A_H+W^*T_C)+(p_H-p_L)f(A_L)] \quad (6)$$

Intuition:

A separating PBE in which good firms report provisions and bad firms do not report provisions can only obtain if it is incentive-compatible for both the managers of the good and bad firms to act accordingly. The first equation states that for the manager of the good firm not to deviate from his equilibrium policy, the marginal gain from deviating, that is the increase in the manager's compensation resulting from abstracting from reporting a provision, should be smaller than the decrease in the manager's compensation accruing from the depreciation in the market value of the firm.

Similarly, the second equation states that for the manager of the bad firm to deviate from his equilibrium policy, the marginal gain from deviating, that is, the increase in the manager's compensation resulting from the appreciation in the firm's market value, should be smaller than the marginal cost due to the decrease in the manager's compensation resulting from the impact of the provision on the firm's reported earnings.

Proposition 3: [17] A pooling PBE, in which the managers of both types of firms

16 The precise threshold value can be found in Appendix A2

17 Proof of Proposition 3 can be found in Appendix A3. The structure of the proof is as follows. In a first part, we derive necessary conditions for a pooling equilibrium to obtain given the exogenously defined out-of-equilibrium beliefs. A pooling equilibrium may however obtain with more optimistic beliefs. In a second part starting with the word "conversely", it can be checked that these conditions are indeed sufficient for a pooling equilibrium to obtain.

choose to report a discretionary provision W, will obtain if investors believe that a firm deviating from a provision policy is a bad firm, and if the prior probability p is large enough. A continuum of pooling PBEs may therefore potentially obtain.

Intuition:
Provisions are more costly to the managers of bad firms than they are to the managers of the good firms. Any firm deviating from the pooling equilibrium strategy which consists of reporting provisions will therefore be perceived to be a bad firm by the financial markets.

A pooling equilibrium in which firms of all types report provisions can therefore only obtain if investors' prior beliefs are that the firm is a good firm with a high enough probability. If this was not the case, the marginal benefit accruing to the manager of a bad firm deviating from the equilibrium strategy, that is, the increase in the manager's compensation resulting from abstracting from reporting provisions, would exceed the marginal cost resulting from being valued as bad firm.

Proposition 4:[18] A pooling PBE in which the managers of both types of firms do abstain from reporting any discretionary provisions will obtain if investors believe that a firm deviating from its equilibrium strategy is a bad firm.

Intuition:
Provisions are less costly to the managers of good firms than they are to the managers of the bad firms. Any firm deviating from the pooling equilibrium strategy which consists of abstracting from reporting provisions will therefore be perceived to be a good firm by the financial markets.

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18 Proof of Proposition 4 can be found in Appendix A4. A pooling equilibrium in which the managers of both the good and bad firms choose to abstain from reporting any write-downs may however be sustained by more optimistic out-of-equilibrium beliefs.

Proposition 5:[19] Both pooling and separating PBEs are sequential[20] [21]. But only the pooling equilibrium in which both firms report provisions amounting to W_{Max} and the efficient separating PBE do survive the D1[22] criterion introduced by Cho and Kreps (1987). These equilibria are also the only ones to satisfy Banks and Sobel's (1987) ultimate divinity[23] and Kohlberg and Mertens' (1986) Never Weak Best Response (NWBR)[24] strategic refinements. Furthermore, it can be shown that the efficient separating equilibrium is the only PBE to survive these strategic refinements as long as there exists W satisfying the following relationship:

$$\begin{aligned} \delta\zeta(p_H-p_L)(X_H-X_L) \leq\ & \alpha(1-\zeta)[[f(A_0-W)-f(A_0-W_{Max})] \\ & + \delta p_L[f(A_H+WT_C)-f(A_H+W_{Max}T_C)]] \\ & - \delta\alpha\zeta[p_L f(A_H+WT_C)-p_H f(A_H+W_{Max}T_C)+(p_H-p_L)f(A_L)] \end{aligned} \tag{7}$$

Proposition 6:[25] If a separating equilibrium obtains, then:

* The market reaction to the announcement of a discretionary provision should be positive;

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19 Proofs of Proposition 5 can be found in Appendix B1 and B2.

20 A set of strategies and beliefs is said to form a sequential equilibrium if it is both sequentially rational and consistent. A set is consistent if it is the limit of some sequence of mixed strategies and beliefs, where the beliefs are derived from the application of Bayes' rule.

21 If the manager's set of write-downs was unbounded above, then the only equilibrium to satisfy the intuitive criterion developed by Cho and Kreps (1987) would be the efficient separating equilibrium.

22 According to Fudenberg and Tirole (1991), a sequential equilibrium is said to satisfy the D1 criterion if it can be sustained by beliefs satisfying the following property: "If the set of player 2's (market) best responses that make type θ willing to deviate to a_1 is strictly smaller than the set of responses that make type θ' willing to deviate, then player 2 should believe that type θ is infinitely more likely to deviate to a_1 than type θ is".

23 Using Fudenberg and Tirole's (1991) terminology, a sequential equilibrium is said to satisfy the ultimate divinity strategic refinement if it can be sustained by beliefs satisfying the following property: If the set of player 2's (market) best responses that make type θ willing to deviate to a_1 is included in the union of sets of responses that make other types θ willing to deviate, then player 2 should not assign any positive weight to type θ at the information set a_1.

24 Using Fudenberg and Tirole's (1991) terminology, a sequential equilibrium is said to satisfy the NWBR criterion if it can be sustained by beliefs satisfying the following property: If the set of player 2's (market) best responses that make type θ indifferent between playing his equilibrium strategy and deviating to a_1 is included in the union of sets of responses that make other types θ' willing to deviate, then player 2 should not assign positive weight to type θ at information set a_1.

25 Proof of Proposition 6 can be found in Appendix B3.

* The market reaction to the lack of announcement of a discretionary provision should be negative.

7.4 Extension To A Continuum Of Firms

The simplified model considered previously is extended to deal with a continuum of firms. It introduces a firm of type q, where q is comprised between 0 and 1, which has a probability q of experiencing a successful turnaround by t_1, date at which the firm is liquidated. The manager of a firm of type q knows that his firm has a probability q of generating cash-flows X_1, financial earnings A_1, and fiscal profits E_1 at date t_1 of X_H, A_H, and E_H, and a probability 1-q of generating cash-flows X_1, financial earnings A_1, and fiscal losses E_1 at date t_1 of X_L, A_L, and E_L[26]. X_H, A_H, and p_H are assumed to exceed X_L, A_L, and p_L. A_0 is also assumed to be lower than A_H. The manager of the firm has perfect knowledge of his firm's type. The type of the firm is unknown to the financial market. Investors' prior beliefs are that the firm is a good firm with a probability p.

Most of the assumptions made in the previous section are still valid. As in the previous section, the manager may attempt to signal the type of his firm by reporting a discretionary provision W. He decides whether or not to report a provision taking into account the impact of the announcement on his objective function, which is similar to the one introduced in the previous subsection. The function f is assumed to take a linear form[27] [28]. The financial market perceives the firm's type q to be a function of the size of the write-down W. This function, which is assumed to be differentiable[29], will be referred to as q(W).

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26 The same propositions would obtain had probability distributions rather than discrete probabilities been used.

27 This particular functional form has been chosen to obtain a closed-form solution.

28 It can be checked from the Riley conditions that the propositions derived in this paper would still obtain if f was concave.

29 The propositions developed in this paper do still hold if q(W) is differentiable almost anywhere.

The manager of the firm is assumed to maximise the following objective function with respect to W:

$$I(q,W)=I^{D}(q,W)+I^{M}(W) \tag{8}$$

with:

$$I^{D}(q,W)=\alpha\,[A_0(W)+H_0]+\delta\,\alpha\,[A_1(q,W)+H_1]+\delta\,\zeta\,[X_1(q)-\alpha\,(A_1(q,W)+H_1)] \tag{9}$$

and:

$$I^{M}(W)=\zeta\,[\![[X_0-\alpha\,(A_0(W)+H_0)]+r^{*}\,[X_1(W)-\alpha\,(A_1(W)+H_1)]]\!] \tag{10}$$

where:

$$\begin{cases} A_0(W)=A_0-W \\ A_1(q,W)=q\,(A_H+WT_C)+(1-q)\,A_L \\ A_1(W)=q(W)\,(A_H+WT_C)+(1-q(W))\,A_L \\ X_1(q)=q\,X_H+(1-q)\,X_L \\ X_1(W)=q(W)\,X_H+(1-q(W))\,X_L \end{cases} \tag{11}$$

$I^{D}(q,W)$ represents the component of the managerial objective function linked to the information set of the manager. Conversely, $I^{M}(W)$ represents the component of the managerial objective function linked to the information set of the financial market.

The objective function maximised by the manager of the firm with respect to W can be rewritten as:

$$\begin{aligned} I(q,q(W),W)= \quad & \alpha\,(A_0-W+H_0)+\zeta\,[X_0-\alpha\,(A_0-W+H_0)] \\ + \quad & \delta\,\zeta\,[q(W)\,X_H+(1-q(W))\,X_L] \\ - \quad & \delta\,\alpha\,\zeta\,[q(W)\,(A_H+WT_C+H_1)+(1-q(W))\,(A_L+H_1)] \\ + \quad & \delta\,\alpha\,[q\,(A_H+WT_C+H_1)+(1-q)\,(A_L+H_1)] \\ + \quad & \delta\,\zeta\,[\![q\,X_H+(1-q)\,X_L-\alpha\,[q\,(A_H+WT_C+H_1)+(1-q)\,(A_L+H_1)]]\!] \end{aligned} \tag{12}$$

Maximising this objective function for any given market valuation schedule q(W) determines an optimal provision W^{*}, which depends on the quality of the firm q:

$$W^* = W^*(q) \tag{13}$$

We are however not interested in any arbitrary market valuation schedule q(W). Rather, we shall restrict our attention to market valuation schedules which have an equilibrium property. A market valuation schedule q(W) is said to be an equilibrium valuation schedule[30] if the quality of the firm q is correctly identified by the market for all values of q. More formally:

$$q[W^*(q)] = q \tag{14}$$

The extended model introduced in this subsection enables us to derive the following propositions:

Proposition 7: There exists a unique equilibrium valuation schedule q(W). This equilibrium valuation schedule is a strictly increasing function of W. It is implementable, that is, the equilibrium provision reported by the manager of the best firm does not exceed W_{Max}, as long as ζ is small enough.

Proposition 8: The abnormal share price reaction to the announcement of a provision is an increasing function of the size of the provision reported.

Proofs of Propositions 7 and 8 are available in Appendix C.

7.5 Summary

This paper introduces a model seeking to explain the discretionary provisions and other write-downs and write-offs of non-depreciable assets reported by managers of firms in difficulty. It introduces a firm, its manager, and a financial market. The firm is currently undergoing a crisis. The manager of the firm is endowed with some private information about the likelihood of recovery from the crisis. He chooses *whether or not* to report a provision, recognising that his

30 This definition of an equilibrium valuation schedule is similar to the one provided by Leland and Pyle (1977).

compensation depends on both current and future reported earnings and firm's equity market values. The financial market values the firm according to the accounting choice made by the manager. This paper provides sufficient conditions for separating and pooling rational expectations equilibria to obtain.

The model predicts that, when a separating equilibrium prevails, the firms which do report discretionary provisions are likely to see higher cash-flows and earnings in the next periods than the firms which do not report any provisions. It also predicts that the former firms should experience, on average, positive abnormal returns around the announcement dates of the provisions. The testable implications derived from this paper are thus consistent with journalistic accounts and casual empiricism.

The model introduced in this paper deals with the decision whether or not to report a discretionary provision. It can however be extended to deal with a world in which the manager *must* report a provision (or any write-down, or write-off of any depreciable assets), but may exercise some discretion over the *timing* of recognition of the provision.

Appendix A

A1 Proposition 1 (Proof)

No separating equilibrium in which bad firms report provisions and good firms do not report provisions can obtain because the managers of the bad firms would find it incentive-compatible to defect from their equilibrium strategies. Bad firms would pool with good firms.

More formally, let us assume that there exists a separating PBE in which the manager of the bad firm reports a provision W and in which the manager of the good firm abstains from reporting a provision.

The bad firm's manager who is playing the separating equilibrium strategy derives the following utility:

$$\begin{aligned} I_{BFE} = \; & \alpha f(A_0 - W) + \zeta [X_0 - \alpha f(A_0 - W)] \\ & + \zeta\delta [\![p_L [X_H - \alpha f(A_H + WT_C)] + (1-p_L)[X_L - \alpha f(A_L)]]\!] \\ & + \delta\alpha [p_L f(A_H + WT_C) + (1-p_L) f(A_L)] \\ & + \delta\zeta [\![p_L [X_H - \alpha f(A_H + WT_C)] + (1-p_L)[X_L - \alpha (A_L)]]\!] \end{aligned} \tag{15}$$

The bad firm's manager who deviates from the separating equilibrium strategy derives the following utility:

$$\begin{aligned} I_{BFD} = \; & \alpha f(A_0) + \zeta [X_0 - \alpha f(A_0)] \\ & + \zeta\delta [\![p_H [X_H - \alpha f(A_H)] + (1-p_H)[X_L - \alpha f(A_L)]]\!] \\ & + \delta\alpha [p_L f(A_H) + (1-p_L) f(A_L)] \\ & + \delta\zeta [\![p_L [X_H - \alpha f(A_H)] + (1-p_L)[X_L - \alpha (A_L)]]\!] \end{aligned} \tag{16}$$

But,

$$\begin{aligned} & p_H [X_H - \alpha f(A_H)] + (1-p_H)[X_L - \alpha f(A_L)] \\ \geq \; & p_H [X_H - \alpha f(A_H + WT_C)] + (1-p_H)[X_L - \alpha f(A_L)] \\ \geq \; & p_L [X_H - \alpha f(A_H + WT_C)] + (1-p_L)[X_L - \alpha f(A_L)] \end{aligned} \tag{17}$$

Proposition 1 thus obtains.

A2 Proposition 2 (Proof)

In a separating equilibrium, the manager of the bad firm reveals his type and chooses therefore not to report any provision. If he chose to report a provision, he would strictly gain by abstaining from reporting a provision because reporting a provision decreases reported earnings. Conversely, the manager of the good firm chooses to report a provision W. If he chose not to report a provision, the equilibrium would be a pooling rather than a separating one.

Let us therefore consider the following set of strategies and beliefs. The manager of the bad firm chooses to abstain from reporting any provision. The manager of the good firm chooses to report a provision W. The financial market believes that any firm reporting a provision $\hat{W} \neq W$ is a bad firm.

The good firm's manager who is playing his separating equilibrium strategy derives the following utility:

$$\begin{aligned} I_{GFE} = \; & \alpha f(A_0 - W) + \zeta [X_0 - \alpha f(A_0 - W)] \\ & + \zeta\delta \{ p_H [X_H - \alpha f(A_H + WT_C)] + (1 - p_H)[X_L - \alpha f(A_L)] \} \\ & + \delta\alpha [p_H f(A_H + WT_C) + (1 - p_H) f(A_L)] \\ & + \delta\zeta \{ p_H [X_H - \alpha f(A_H + WT_C)] + (1 - p_H)[X_L - \alpha (A_L)] \} \end{aligned} \tag{18}$$

The good firm's manager who deviates from his separating equilibrium strategy by abstaining from reporting any provision derives the following utility:

$$\begin{aligned} I_{GFD} = \; & \alpha f(A_0) + \zeta [X_0 - \alpha f(A_0)] \\ & + \zeta\delta \{ p_L [X_H - \alpha f(A_H)] + (1 - p_L)[X_L - \alpha f(A_L)] \} \\ & + \delta\alpha [p_H f(A_H) + (1 - p_H) f(A_L)] \\ & + \delta\zeta \{ p_H [X_H - \alpha f(A_H)] + (1 - p_H)[X_L - \alpha (A_L)] \} \end{aligned} \tag{19}$$

The bad firm's manager who is playing his separating equilibrium strategy derives the following utility:

$$
\begin{aligned}
I_{BFE} = \quad & \alpha f(A_0) + \zeta [X_0 - \alpha f(A_0)] \\
+ \quad & \zeta\delta [\![p_L [X_H - \alpha f(A_H)] + (1-p_L)[X_L - \alpha f(A_L)]]\!] \\
+ \quad & \delta\alpha [p_L f(A_H) + (1-p_L) f(A_L)] \\
+ \quad & \delta\zeta [\![p_L [X_H - \alpha f(A_H)] + (1-p_L)[X_L - \alpha (A_L)]]\!]
\end{aligned}
\tag{20}
$$

The bad firm's manager who deviates from his separating equilibrium strategy derives the following utility:

$$
\begin{aligned}
I_{BFD} = \quad & \alpha f(A_0 - W) + \zeta [X_0 - \alpha f(A_0 - W)] \\
+ \quad & \zeta\delta [\![p_H [X_H - \alpha f(A_H + WT_C)] + (1-p_H)[X_L - \alpha f(A_L)]]\!] \\
+ \quad & \delta\alpha [p_L f(A_H + WT_C) + (1-p_L) f(A_L)] \\
+ \quad & \delta\zeta [\![p_L [X_H - \alpha f(A_H + WT_C)] + (1-p_L)[X_L - \alpha (A_L)]]\!]
\end{aligned}
\tag{21}
$$

A separating equilibrium can only exist if $I_{GFE} \geq I_{GFD}$ and $I_{BFE} \geq I_{BFD}$. A separating equilibrium can therefore only exist if:

$$
\begin{aligned}
\zeta\delta (p_H - p_L)(X_H - X_L) \geq \quad & \alpha (1-\zeta) [\![[f(A_0) - f(A_0 - W)] + \delta p_H [f(A_H) - f(A_H + WT_C)]]\!] \\
- \quad & \alpha\zeta\delta [p_L f(A_H) - p_H f(A_H + WT_C) + (p_H - p_L) f(A_L)]
\end{aligned}
\tag{22}
$$

and:

$$
\begin{aligned}
\zeta\delta (p_H - p_L)(X_H - X_L) \leq \quad & \alpha (1-\zeta) [\![[f(A_0) - f(A_0 - W)] + \delta p_L [f(A_H) - f(A_H + WT_C)]]\!] \\
- \quad & \alpha\zeta\delta [p_L f(A_H) - p_H f(A_H + WT_C) + (p_H - p_L) f(A_L)]
\end{aligned}
\tag{23}
$$

Let us define the following expressions:

$$
\begin{aligned}
\varphi(W) \equiv \quad & \alpha (1-\zeta)\zeta^{-1} [\![[f(A_0) - f(A_0 - W)] + \delta p_H [f(A_H) - f(A_H + WT_C)]]\!] \\
& - \alpha\delta [p_L f(A_H) - p_H f(A_H + WT_C) + (p_H - p_L) f(A_L)]
\end{aligned}
\tag{24}
$$

and:

$$
\begin{aligned}
\phi(W) \equiv \quad & \alpha (1-\zeta)\zeta^{-1} [\![[f(A_0) - f(A_0 - W)] + \delta p_L [f(A_H) - f(A_H + WT_C)]]\!] \\
& - \alpha\delta [p_L f(A_H) - p_H f(A_H + WT_C) + (p_H - p_L) f(A_L)]
\end{aligned}
\tag{25}
$$

Inequalities (22) and (23) are then equivalent to the following Inequalities:

$$
\varphi(W) \leq \delta (p_H - p_L)(X_H - X_L) \leq \phi(W) \tag{26}
$$

It is easy to see that:

$$\begin{cases} \varphi(0)=\phi(0)<\delta\,(p_H-p_L)(X_H-X_L) \\ \varphi(W)<\phi(W) \;\; \forall W \\ \dfrac{d\phi(W)}{dW}\geq 0 \;\; \forall W \end{cases} \tag{27}$$

Inequalities (26) can be simultaneously met for some W smaller or equal to W_{Max} as long as:

$$\zeta \leq \zeta_{Max} \tag{28}$$

where ζ_{Max} satisfies the following Equation:

$$\phi(W_{Max}) = \delta\,(p_H-p_L)(X_H-X_L) \tag{29}$$

Conversely, let us assume that Inequality (28) is satisfied and consider the following set of strategies and beliefs. The manager of the bad firm chooses to abstain from reporting any provision. The manager of the good firm chooses to report a provision W satisfying Inequalities (22) and (23). The financial market holds the following beliefs when faced with the above-described strategies:

$$\begin{cases} \mu(GF|\hat{W})=0 \quad if\ \hat{W}\neq W \\ \mu(GF|W)=1 \end{cases} \tag{30}$$

It is straightforward to check that this set of actions and beliefs constitutes a PBE. The basic model described in this paper allows therefore a continuum of PBEs, in which the manager of the good firm chooses to report a provision W while the manager of the bad firm chooses to abstain from reporting any write down.

A3 Proposition 3 (Proof)

In this set of pooling PBEs, the managers of both the good and bad firms do report a provision W. By Bayes' rule, the posterior beliefs held by the financial markets upon observing W have to be the same as their prior beliefs. Bayes' rule does however not put any restrictions on the posterior beliefs held by the

financial markets upon observing an out-of-equilibrium provision $\hat{W}$. The easiest way to support W as a pooling outcome is then to assign pessimistic beliefs to any out-of-equilibrium provision $\hat{W}$.

Let us therefore consider the following set of strategies and beliefs. The managers of both the good and bad firms do report a provision W. The financial market holds the following beliefs when faced with provisions:

$$\begin{cases} \mu(GF|\hat{W})=0 \ \textit{if} \ \hat{W}\neq W \\ \mu(GF|W)=p \end{cases} \tag{31}$$

A pooling equilibrium can only obtain if $\forall\hat{W}$, $I_{GFE} \geq \text{Max } I_{GFD}$ and $I_{BFE} \geq \text{Max } I_{BFD}$. The good firm's manager who is playing his pooling equilibrium strategy derives the following utility:

$$\begin{aligned} I_{GFE}= \ & \alpha f(A_0-W)+\zeta[X_0-\alpha f(A_0-W)] \\ & + \zeta\delta p[\![p_H[X_H-\alpha f(A_H+WT_C)]+(1-p_H)[X_L-\alpha f(A_L)]]\!] \\ & + \zeta\delta(1-p)[\![p_L[X_H-\alpha f(A_H+WT_C)]+(1-p_L)[X_L-\alpha f(A_L)]]\!] \\ & + \delta\alpha[p_H f(A_H+WT_C)+(1-p_H)f(A_L)] \\ & + \delta\zeta[\![p_H[X_H-\alpha f(A_H+WT_C)]+(1-p_H)[X_L-\alpha f(A_L)]]\!] \end{aligned} \tag{32}$$

The good firm's manager who deviates from his pooling equilibrium strategy derives the following utility:

$$\begin{aligned} I_{GFD}= \ & \alpha f(A_0-\hat{W})+\zeta[X_0-\alpha f(A_0-\hat{W}T_C)] \\ & + \zeta\delta[\![p_L[X_H-\alpha f(A_H+\hat{W}T_C)]+(1-p_L)[X_L-\alpha f(A_L)]]\!] \\ & + \delta\alpha[p_H f(A_H+\hat{W})+(1-p_H)f(A_L)] \\ & + \delta\zeta[\![p_H[X_H-\alpha f(A_H+\hat{W}T_C)]+(1-p_H)[X_L-\alpha(A_L)]]\!] \end{aligned} \tag{33}$$

The bad firm's manager who is playing his pooling equilibrium strategy derives the following utility:

$$
\begin{aligned}
I_{BFE} = \; & \alpha f(A_0 - W) + \zeta [X_0 - \alpha f(A_0 - W)] \\
& + \zeta\delta p [\![p_H [X_H - \alpha f(A_H + WT_C)] + (1-p_H)[X_L - \alpha f(A_L)]]\!] \\
& + \zeta\delta (1-p) [\![p_L [X_H - \alpha f(A_H + WT_C)] + (1-p_L)[X_L - \alpha f(A_L)]]\!] \\
& + \delta\alpha [p_L f(A_H + WT_C) + (1-p_L) f(A_L)] \\
& + \delta\zeta [\![p_L [X_H - \alpha f(A_H + WT_C)] + (1-p_L)[X_L - \alpha f(A_L)]]\!]
\end{aligned}
\tag{34}
$$

The bad firm's manager who deviates from his pooling equilibrium strategy derives the following utility:

$$
\begin{aligned}
I_{BFD} = \; & \alpha f(A_0 - \hat{W}) + \zeta [X_0 - \alpha f(A_0 - \hat{W})] \\
& + \zeta\delta [\![p_L [X_H - \alpha f(A_H + \hat{W}T_C)] + (1-p_L)[X_L - \alpha f(A_L)]]\!] \\
& + \delta\alpha [p_L f(A_H + \hat{W}T_C) + (1-p_L) f(A_L)] \\
& + \delta\zeta [\![p_L [X_H - \alpha f(A_H + \hat{W}T_C)] + (1-p_L)[X_L - \alpha (A_L)]]\!]
\end{aligned}
\tag{35}
$$

The utility functions of the managers of both the good and bad firms who deviates from their equilibrium strategies are maximised when $\hat{W}=0$. They then take the following values:

$$
\begin{aligned}
I_{GFD} = \; & \alpha f(A_0) + \zeta [X_0 - \alpha f(A_0)] \\
& + \zeta\delta [\![p_L [X_H - \alpha f(A_H)] + (1-p_L)[X_L - \alpha f(A_L)]]\!] \\
& + \delta\alpha [p_H f(A_H) + (1-p_H) f(A_L)] \\
& + \delta\zeta [\![p_H [X_H - \alpha f(A_H)] + (1-p_H)[X_L - \alpha (A_L)]]\!]
\end{aligned}
\tag{36}
$$

$$
\begin{aligned}
I_{BFD} = \; & \alpha f(A_0) + \zeta [X_0 - \alpha f(A_0)] \\
& + \zeta r^* [\![p_L [X_H - \alpha f(A_H)] + (1-p_L)[X_L - \alpha f(A_L)]]\!] \\
& + \delta\alpha [p_L f(A_H) + (1-p_L) f(A_L)] \\
& + \delta\zeta [\![p_L [X_H - \alpha f(A_H)] + (1-p_L)[X_L - \alpha (A_L)]]\!]
\end{aligned}
\tag{37}
$$

For any pooling equilibrium to obtain, the following conditions need thus to be met:

$$
p \geq p_1 \tag{38}
$$

where:

$$p_1=\frac{\alpha(1-\zeta)\left[\left[f(A_0)-f(A_0-W)\right]-\delta p_H\left[f(A_H+WT_C)-f(A_H)\right]\right]+\alpha\zeta r^* p_L\left[f(A_H+WT_C)-f(A\right.}{\zeta r^*(p_H-p_L)\left[\left[X_H-X_L-\alpha\left[f(A_H+WT_C)-f(A_L)\right]\right]\right.} \tag{39}$$

The second of these conditions implies that:

$$p \geq p_2 \tag{40}$$

where:

$$p_2=\frac{\alpha(1-\zeta)\left[\left[f(A_0)-f(A_0-W)\right]-\delta p_L\left[f(A_H+WT_C)-f(A_H)\right]\right]+\alpha\zeta r^* p_L\left[f(A_H+WT_C)-f(A\right.}{\zeta r^*(p_H-p_L)\left[\left[X_H-X_L-\alpha\left[f(A_H+WT_C)-f(A_L)\right]\right]\right.} \tag{41}$$

From the previous equations, it is clear that:

$$p_2 > p_1 \tag{42}$$

A necessary condition for the pooling equilibrium to obtain is therefore that:

$$p \geq \frac{\alpha(1-\zeta)\left[\left[f(A_0)-f(A_0-W)\right]-\delta p_L\left[f(A_H+WT_C)-f(A_H)\right]\right]+\alpha\zeta r^* p_L\left[f(A_H+WT_C)-f(A_L\right.}{\zeta r^*(p_H-p_L)\left[\left[X_H-X_L-\alpha\left[f(A_H+WT_C)-f(A_L)\right]\right]\right.} \tag{43}$$

This condition can always be met if:

$$\alpha \leq \alpha_{Max} \tag{44}$$

where α_{Max} satisfies the following Equation:

$$p_2(\alpha=\alpha_{Max}, W=W_{Max})=1 \tag{45}$$

Conversely, let us assume that Inequality (44) is satisfied. It is then clear that the set of strategies, in which the managers of both the good and bad firms choose to report a provision W, and beliefs described by Equations (31), where p is higher than or equal to p_2, forms a PBE.

A4 Proposition 4 (Proof)

Let us consider the following set of strategies and beliefs. The managers of both the good and bad firms choose not to report any provision while the financial market holds the following beliefs:

$$\begin{cases} \mu(GF|\hat{W})=0 \ \text{if} \ \hat{W}\neq 0 \\ \mu(GF|0) = p \end{cases} \tag{46}$$

The good firm's manager who is playing his pooling equilibrium strategy derives the following utility:

$$\begin{aligned} I_{GFE} = \ & \alpha f(A_0)+\zeta[X_0-\alpha f(A_0)] \\ & + \zeta\delta p[p_H[X_H-\alpha f(A_H)]+(1-p_H)[X_L-\alpha f(A_L)]] \\ & + \zeta\delta(1-p)[p_L[X_H-\alpha f(A_H)]+(1-p_L)[X_L-\alpha f(A_L)]] \\ & + \delta\alpha[p_H f(A_H)+(1-p_H)f(A_L)] \\ & + \delta\zeta[p_H[X_H-\alpha f(A_H)]+(1-p_H)[X_L-\alpha f(A_L)]] \end{aligned} \tag{47}$$

The good firm's manager who deviates from his pooling equilibrium strategy derives the following utility:

$$\begin{aligned} I_{GFD} = \ & \alpha f(A_0-\hat{W})+\zeta[X_0-\alpha f(A_0-\hat{W})] \\ & + \zeta\delta[p_L[X_H-\alpha f(A_H+\hat{W}T_C)]+(1-p_L)[X_L-\alpha f(A_L)]] \\ & + \delta\alpha[p_H f(A_H+\hat{W}T_C)+(1-p_H)f(A_L)] \\ & + \delta\zeta[p_H[X_H-\alpha f(A_H+\hat{W}T_C)]+(1-p_H)[X_L-\alpha(A_L)]] \end{aligned} \tag{48}$$

The bad firm's manager who is playing his pooling equilibrium strategy derives the following utility:

$$\begin{aligned} I_{BFE} = \ & \alpha f(A_0)+\zeta[X_0-\alpha f(A_0)] \\ & + \zeta\delta p[p_H[X_H-\alpha f(A_H)]+(1-p_H)[X_L-\alpha f(A_L)]] \\ & + \zeta\delta(1-p)[p_L[X_H-\alpha f(A_H)]+(1-p_L)[X_L-\alpha f(A_L)]] \\ & + \delta\alpha[p_L f(A_H)+(1-p_L)f(A_L)] \\ & + \delta\zeta[p_L[X_H-\alpha f(A_H)]+(1-p_L)[X_L-\alpha f(A_L)]] \end{aligned} \tag{49}$$

The bad firm's manager who deviates from his pooling equilibrium strategy derives the following utility:

$$
\begin{aligned}
I_{BFD} = \quad & \alpha f(A_0 - \hat{W}) + \zeta [X_0 - \alpha f(A_0 - \hat{W})] \\
+ \quad & \zeta \delta [\![p_L [X_H - \alpha f(A_H + \hat{W} T_C)] + (1 - p_L)[X_L - \alpha f(A_L)]]\!] \\
+ \quad & \delta \alpha [p_L f(A_H + \hat{W} T_C) + (1 - p_L) f(A_L)] \\
+ \quad & \delta \zeta [\![p_L [X_H - \alpha f(A_H + \hat{W} T_C)] + (1 - p_L)[X_L - \alpha (A_L)]]\!]
\end{aligned}
\tag{50}
$$

It is clear from the previous equations that $I_{GFE} \geq I_{GFD}$ and that $I_{BFE} \geq I_{BFD}$.

The set of strategies and beliefs considered in Appendix A4 thus constitutes a pooling PBE.

Appendix B

B1 Sequential Equilibrium (Proof)

Fudenberg and Tirole (1991) have shown that any Perfect Bayesian Equilibrium constitutes a Sequential Equilibrium as long as there are only two stages in the game.

B2 D1 Criterion (Proof)

We first prove that no pooling equilibrium, in which both the managers of the good and bad firms do report a provision W, where $0 \leq W < W_{Max}$, satisfies the D1 strategic refinement designed by Cho and Kreps (1987). Let us therefore assume that such a pooling PBE does obtain and consider an out-of-equilibrium provision $\hat{W}$ in the neighbourhood of W, where $W < \hat{W} < W_{Max}$. We then define $\hat{V}_G$ so as to satisfy the following equation:

$$\begin{aligned} I_{GF} = \; & \alpha f(A_0 - \hat{W}) + \zeta \hat{V}_G + \delta\alpha [p_H f(A_H + \hat{W}T_C) + (1-p_H) f(A_L)] \\ & + \delta\zeta [\![p_H [X_H - \alpha f(A_H + \hat{W}T_C)] + (1-p_H)[X_L - \alpha f(A_L)]]\!] \\ = \; & \alpha f(A_0 - W) + \zeta [X_0 - \alpha f(A_0 - W)] \\ & + \zeta\delta p [\![p_H [X_H - \alpha f(A_H + WT_C)] + (1-p_H)[X_L - \alpha f(A_L)]]\!] \\ & + \zeta\delta (1-p) [\![p_L [X_H - \alpha f(A_H + WT_C)] + (1-p_L)[X_L - \alpha f(A_L)]]\!] \\ & + \delta\alpha [p_H f(A_H + WT_C) + (1-p_H) f(A_L)] \\ & + \delta\zeta [\![p_H [X_H - \alpha f(A_H + WT_C)] + (1-p_H)[X_L - \alpha f(A_L)]]\!] \end{aligned} \tag{51}$$

Similarly, we define $\hat{V}_B$ so as to satify the following equation:

$$\begin{aligned} I_{BF} = \; & \alpha f(A_0 - \hat{W}) + \zeta \hat{V}_B + \delta\alpha [p_L f(A_H + \hat{W}T_C) + (1-p_L) f(A_L)] \\ & + \delta\zeta [\![p_L [X_H - \alpha f(A_H + \hat{W}T_C)] + (1-p_L)[X_L - \alpha f(A_L)]]\!] \\ = \; & \alpha f(A_0 - W) + \zeta [X_0 - \alpha f(A_0 - W)] \\ & + \zeta\delta p [\![p_H [X_H - \alpha f(A_H + WT_C)] + (1-p_H)[X_L - \alpha f(A_L)]]\!] \\ & + \zeta\delta (1-p) [\![p_L [X_H - \alpha f(A_H + WT_C)] + (1-p_L)[X_L - \alpha f(A_L)]]\!] \\ & + \delta\alpha [p_L f(A_H + WT_C) + (1-p_L) f(A_L)] \\ & + \delta\zeta [\![p_L [X_H - \alpha f(A_H + WT_C)] + (1-p_L)[X_L - \alpha f(A_L)]]\!] \end{aligned} \tag{52}$$

By combining (51) and (52), we obtain the following equation:

$$\zeta(\hat{V}_G-\hat{V}_B)=\delta\alpha(1-\zeta)(p_H-p_L)[f(A_H+WT_C)-f(A_H+\hat{W}T_C)] \tag{53}$$

From the previous equation, it is clear that $\nabla_G<\nabla_B$ since $\hat{W}>W$. The sets of market responses Ω_B and Ω_G inducing the managers of the bad and good firms to defect from their equilibrium actions are therefore as follows:

$$\begin{cases}\Omega_B=]\hat{V}_B,V_H] \\ \Omega_G=]\hat{V}_G,V_H]\end{cases} \tag{54}$$

where:

$$V_H\equiv X_0-\alpha f(A_0-W)+\delta[\![p_H[X_H-\alpha f(A_H+WT_C)]+(1-p_H)[X_L-\alpha f(A_L)]]\!] \tag{55}$$

and it is clear that:

$$\Omega_B\subset\Omega_G \tag{56}$$

When faced with the out-of-equilibrium provision $\hat{W}$, investors should therefore believe that:

$$\mu(GF|\hat{W})=1 \tag{57}$$

But, these beliefs induce the manager of the good firm to defect from his equilibrium strategy. No pooling PBE, in which both good and bad firms do report a provision $W<W_{Max}$, can therefore survive Cho and Kreps' D1 criterion.

We now prove that no non-efficient separating PBE can survive Cho and Kreps' D1 strategic refinement. Let us therefore consider a separating PBE in which the equilibrium provision reported by the manager of the good firm is larger than W^*. Whatever the response of the financial market, no bad firm would ever want to report an out-of-equilibrium provision $\hat{W}$, where $W^*<\hat{W}<W$. This is so because W^* is the value of the provision for which the manager of the bad firm is indifferent between playing his equilibrium strategy and being identified as the manager of a bad firm, and reporting W^* and being identified as the manager of a good firm. The manager of the good firm may however find it incentive compatible to report $\hat{W}$.

Let us define $\hat{V}_G$ to satisfy the following equation:

$$\begin{aligned} I_{GF} = \; & \alpha f(A_0-\hat{W})+\zeta \hat{V}_G+\delta\alpha[p_H f(A_H+\hat{W}T_C)+(1-p_H)f(A_L)] \\ & + \delta\zeta[\![p_H[X_H-\alpha f(A_H+\hat{W}T_C)]+(1-p_H)[X_L-\alpha f(A_L)]]\!] \\ = \; & \alpha f(A_0-W)+\zeta[X_0-\alpha f(A_0-W)] \\ & + \zeta\delta[\![p_H[X_H-\alpha f(A_H+WT_C)]+(1-p_H)[X_L-\alpha f(A_L)]]\!] \\ & + \delta\alpha[p_H f(A_H+WT_C)+(1-p_H)f(A_L)] \\ & + \delta\zeta[\![p_H[X_H-\alpha f(A_H+WT_C)]+(1-p_H)[X_L-\alpha f(A_L)]]\!] \end{aligned} \tag{58}$$

The sets of market responses Ω_B and Ω_G inducing the managers of the bad and good firms to defect from their equilibrium actions are therefore as follows:

$$\begin{cases} \Omega_B=\varnothing \\ \Omega_G=]\hat{V}_G, V_H] \end{cases} \tag{59}$$

and it is clear that:

$$\Omega_B \subset \Omega_G \tag{60}$$

When faced with the out-of-equilibrium provision $\hat{W}$, investors should therefore believe that:

$$\mu(GF|\hat{W})=1 \tag{61}$$

But, these beliefs induce the manager of the good firm to defect from his equilibrium strategy. No non-efficient separating PBE can therefore survive Cho and Kreps' D1 strategic refinement.

We now prove that the efficient separating PBE survives Cho and Kreps' D1 strategic refinement. To do this, we have to consider two potential types of defections $\hat{W}$:

i) $0<\hat{W}<W^*$

ii) $W^*<\hat{W}$

i) Let us first consider a defection $\hat{W}$, where $0<\hat{W}<W^*$. We already know that, in equilibrium, the manager of the bad firm is indifferent between his equilibrium action and that of the manager of the good firm. More formally,

$$
\begin{aligned}
I_{BF} = \;& \alpha f(A_0) + \zeta [X_0 - \alpha f(A_0)] \\
& + \zeta\delta [\![p_L [X_H - \alpha f(A_H)] + (1-p_L)[X_L - \alpha f(A_L)]]\!] \\
& + \delta\alpha [p_L f(A_H) + (1-p_L) f(A_L)] \\
& + \delta\zeta [\![p_L [X_H - \alpha f(A_H)] + (1-p_H)[X_L - \alpha f(A_L)]]\!] \\
= \;& \alpha f(A_0 - W^*) + \zeta [X_0 - \alpha f(A_0 - W^*)] \\
& + \zeta\delta [\![p_H [X_H - \alpha f(A_H + W^* T_C)] + (1-p_H)[X_L - \alpha f(A_L)]]\!] \\
& + \delta\alpha [p_L f(A_H + W^* T_C) + (1-p_L) f(A_L)] \\
& + \delta\zeta [\![p_L [X_H - \alpha f(A_H + W^* T_C)] + (1-p_L)[X_L - \alpha f(A_L)]]\!]
\end{aligned}
\tag{62}
$$

Let us define ∇_G so as to satisfy the following equation:

$$
\begin{aligned}
I_{GF} = \;& \alpha f(A_0 - \hat{W}) + \zeta \hat{V}_G + \delta\alpha [p_H f(A_H + \hat{W} T_C) + (1-p_H) f(A_L)] \\
& + \delta\zeta [\![p_H [X_H - \alpha f(A_H + \hat{W} T_C)] + (1-p_H)[X_L - \alpha f(A_L)]]\!] \\
= \;& \alpha f(A_0 - W^*) + \zeta [X_0 - \alpha f(A_0 - W^*)] \\
& + \zeta\delta [\![p_H [X_H - \alpha f(A_H + W^* T_C)] + (1-p_H)[X_L - \alpha f(A_L)]]\!] \\
& + \delta\alpha [p_H f(A_H + W^* T_C) + (1-p_H) f(A_L)] \\
& + \delta\zeta [\![p_H [X_H - \alpha f(A_H + W^* T_C)] + (1-p_H)[X_L - \alpha f(A_L)]]\!]
\end{aligned}
\tag{63}
$$

Similarly, let us define ∇_B so as to satisfy the following equation:

$$
\begin{aligned}
I_{BF} = \;& \alpha f(A_0 - \hat{W}) + \zeta \hat{V}_B + \delta\alpha [p_L f(A_H + \hat{W} T_C) + (1-p_L) f(A_L)] \\
& + \delta\zeta [\![p_L [X_H - \alpha f(A_H + \hat{W} T_C)] + (1-p_L)[X_L - \alpha f(A_L)]]\!] \\
= \;& \alpha f(A_0) + \zeta [X_0 - \alpha f(A_0)] \\
& + \zeta\delta [\![p_L [X_H - \alpha f(A_H)] + (1-p_L)[X_L - \alpha f(A_L)]]\!] \\
& + \delta\alpha [p_L f(A_H) + (1-p_H) f(A_L)] \\
& + \delta\zeta [\![p_L [X_H - \alpha f(A_H)] + (1-p_L)[X_L - \alpha f(A_L)]]\!]
\end{aligned}
\tag{64}
$$

By replacing (63) and (64) into (62), we obtain:

$$
\zeta(\hat{V}_G - \hat{V}_B) = \delta\alpha(1-\zeta)(p_H - p_L)[f(A_H + W^* T_C) - f(A_H + \hat{W} T_C)] \tag{65}
$$

From the previous equation, it is clear that $V_G > V_B$ since $W^* > \hat{W}$. The sets of market responses Ω_B and Ω_G inducing the managers of the bad and good firms to defect from their equilibrium actions are therefore as follows:

$$\begin{cases} \Omega_B =]\hat{V}_B, V_H] \\ \Omega_G =]\hat{V}_G, V_H] \end{cases} \tag{66}$$

where:

$$V_H \equiv X_0 - \alpha f(A_0 - W^*) + \delta [\![p_H [X_H - \alpha f(A_H + W^* T_C)] + (1 - p_H)[X_L - \alpha f(A_L)]]\!] \tag{67}$$

and it is clear that:

$$\Omega_G \subset \Omega_B \tag{68}$$

When faced with an out-of-equilibrium provision $\hat{W}$, investors should therefore believe that:

$$\mu(BF \mid \hat{W}) = 1 \tag{69}$$

But, given these beliefs, no manager wishes to defect from his equilibrium strategy.

ii) Alternatively, let us consider a defection $\hat{W}$, where $W^* < \hat{W}$. Even if investors believe with probability one that the defector is a good firm, no firm will ever wish to defect.

It has been shown that no firm will ever wish to defect. The efficient PBE thus survives Cho and Kreps' D1 strategic refinement.

B3 Ultimate Divinity and NWBR (Proof)

Cho and Sobel (1990) show that, for any monotonic signalling game, criteria D1 and NWBR are equivalent to universal divinity.

B4 Proposition 6 (Proof)

Let us assume that a separating equilibrium obtains at t_0. Prior to t_0, the market value of a given firm satisfies the following equation:

$$V_{0P}=p\,V_H+(1-p)\,V_L \tag{70}$$

where:

$$\begin{cases} V_H \equiv [X_0-\alpha f(A_0-W)]+\delta\{p_H[X_H-\alpha f(A_H+WT_C)]+(1-p_H)[X_L-\alpha f(A_L)]\} \\ V_L \equiv [X_0-\alpha f(A_0)]+\delta\{p_L[X_L-\alpha f(A_H)]+(1-p_L)[X_L-\alpha f(A_L)]\} \end{cases} \tag{71}$$

The good firm's market value V_{0G} prevailing at t_0, on the announcement date of the accounting choice, is V_H. Similarly, the bad firm's market value V_{0B} prevailing at t_0, on the announcement date of the accounting choice, is V_L.

The market reactions to the announcement are therefore as follows:

$$\begin{cases} V_{0G}-V_{0P}=(1-p)(V_H-V_L)>0 \\ V_{0B}-V_{0P}=p(V_L-V_H)<0 \end{cases} \tag{72}$$

Appendix C

C1 Proposition 7 (Proof)

The First Order Condition can be written as:

$$\left.\frac{dI[q,q(W),W]}{dW}\right|_{W=W^*} = -\alpha(1-\zeta) + \delta\zeta\left.\frac{dq(W)}{dW}\right|_{W=W^*}[X_H-X_L-\alpha(A_H-A_L+W^*T_C)] - \delta\zeta\alpha q(W^*)T_C+\delta\alpha(1-\zeta)qT_C = 0 \quad (73)$$

But, in equilibrium,

$$q[W^*(q)] = q \quad (74)$$

The First Order Condition may thus be rewritten as:

$$-A+(C-DW)\frac{dq(W)}{dW}+Bq(W)=0 \quad (75)$$

where:

$$\begin{cases} A=\alpha(1-\zeta) \\ B=\delta\alpha(1-2\zeta)T_C \\ C=\delta\zeta[(X_H-X_L)-\alpha(A_H-A_L)] \\ D=\delta\alpha\zeta T_C \end{cases} \quad (76)$$

Let us assume, for a moment, that the following Inequalities are satisfied:

$$\begin{cases} C-DW>0 \quad \forall W\in[0,W_{Max}] \\ A-Bq>0 \quad \forall q\in[0,1] \end{cases} \quad (77)$$

Equation (75) is therefore equivalent to the following one:

$$\frac{dq(W)}{A-Bq(W)} = \frac{dW}{C-DW} \quad (78)$$

If B differs from zero, solutions to this differential equation may be written as:

$$-\frac{1}{D}\ln(C-D\,W) = -\frac{1}{B}\ln(A-B\,q(W))+Cte \tag{79}$$

The particular equilibrium valuation schedule q(W) which Pareto-dominates all others (the efficient one) is the one which has the following property:

$$q(0)=0 \tag{80}$$

The boundary condition implies that:

$$Cte=\ln(A^{\frac{1}{B}})-\ln(C^{\frac{1}{D}}) \tag{81}$$

The efficient equilibrium valuation schedule q(W) is therefore as follows:

$$q(W)=\frac{A}{B}[1-(1-\frac{D}{C}W)^{\frac{B}{D}}] \tag{82}$$

Equivalently,

$$W(q)=(\frac{C}{D})[1-(1-\frac{B}{A}q)^{\frac{D}{B}}] \tag{83}$$

W(q) and q thus satisfy Inequalities (77). It can furthermore be shown that W(q) is implementable, that is, $\forall q\ W(q)\leq W_{Max}$, as long as ζ is small enough[31]. This follows from the following derivation:

$$\lim_{\zeta \to 0} W(q) = 0 \tag{84}$$

Before concluding that the equilibrium valuation schedule q(W) meets our requirements, we have however still to show that it maximises rather than minimises I. In order to check whether this condition is met, we check the Second-Order Condition.

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31 The propositions developed in this section can be extended to deal with B=0 by taking the limits of q(W) and W(q) when B tends toward 0.

The first derivative of I with respect to W can be rewritten as:

$$\frac{dI[q,q(W),W]}{dW} = -A+(C-DW)\frac{dq(W)}{dW}-Dq(W)+(B+D)q=0 \tag{85}$$

The second derivative of I with respect to W can thus be written as:

$$\frac{d^2I[q,q(W),W]}{dW^2} = -(C-DW)\frac{d^2q(W)}{dW^2}-2D\frac{dq(W)}{dW} \tag{86}$$

But:

$$q(W)=\frac{A}{B}[1-(1-\frac{D}{C}W)^{\frac{B}{D}}] \tag{87}$$

$$\frac{dq(W)}{dW} = \frac{A}{C}(1-\frac{D}{C}W)^{\frac{B}{D}-1} \tag{88}$$

$$\frac{d^2q(W)}{dW^2} = -\frac{A}{C^2}(B-D)(1-\frac{D}{C}W)^{\frac{B}{D}-2} \tag{89}$$

By doing the appropriate substitutions, one can write that:

$$\frac{d^2I[q,q(W),W]}{dW^2} = -A(B+D)C^{-\frac{B}{D}}(C-DW)^{\frac{B}{D}-1} \tag{90}$$

The equilibrium valuation schedule W(q) maximises the manager's utility function since:

$$B+D>0 \tag{91}$$

and:

$$\frac{d^2I[q,q(W),W]}{dW^2} \leq 0 \tag{92}$$

C2 Proposition 8 (Proof)

By differentiating V_0 with respect to W, we can see that:

$$\begin{aligned} \frac{dV_0[q(W),W]}{dW} &= \frac{\partial V_0}{\partial W}+\frac{\partial V_0}{\partial q}\frac{dq(W)}{dW} \\ &= \alpha\zeta[1-\delta q(W)T_C]+\delta[X_H-X_L-\alpha(A_H-A_L+WT_C)]\frac{dq(W)}{dW} \\ &> 0 \end{aligned} \tag{93}$$

Proposition 8 thus obtains.

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CHAPTER 8

DISCRETIONARY WRITE-DOWNS: A SIGNALLING APPROACH

Abstract

This paper introduces a model seeking to explain the write-downs, write-offs, and other provisions reported by managers. It introduces a firm, its manager, and a financial market. The manager of the firm is endowed with some private information about the firm's future earnings. He chooses whether or not to report a discretionary write-down, recognising that his compensation depends on both current and future reported earnings and firm's equity market values. The financial market values the firm's equity according to the accounting choice made by the manager. This paper provides sufficient conditions for separating and pooling rational expectations equilibria to obtain.

This paper predicts that, when a separating equilibrium prevails, the firms which do report discretionary write-downs are likely to see higher earnings in the next periods than the firms which do not report any discretionary write-downs. It also predicts that the former firms should experience, on average, positive abnormal returns around the announcement dates of the discretionary write-downs. These testable implications differ from those generated by Healy (1985) and are generally consistent with the evidence reported by the empirical literature.

8.1 Introduction

The increasing number of asset write-downs, write-offs, and other restructuring provisions has captured the attention of the financial community. According to Strong and Meyer (1987), American corporations have taken after-tax write-offs of over $10 billion over the five years from 1982 to 1987. Accountants have been increasingly concerned that these disclosures often occur significantly after the

related asset impairment, tend be reported late in the fiscal year, and are frequently in excess of the reduction needed to reflect the new, lower market values of the impaired assets. This paper presents a model seeking to explain the discretionary write-offs, write-downs, and other non-recurring charges which may or may not have been consciously increased beyond their correct but unobservable level, and which will be referred to in the remaining part of this paper as write-downs.

According to the accounting literature, as illustrated by Zucca and Campbell (1992), discretionary write-downs may be motivated by earnings management, be it income-smoothing or income-bathing. Dye (1988) and Trueman and Titman (1988) propose various theories explaining how income-smoothing may arise as rational equilibrium behaviour. Fewer papers explain why managers may engage in income-bathing. Healy (1985) develops a model in which managers may rationally want to take a bath when they are rewarded with capped accounting bonus schemes. Managers are shown to have the incentive to further reduce the current earnings of their firms as long as they are not in a position to get a bonus whatever the accounting procedures they select. DeAngelo (1988) hypothesises that "dissidents elected in proxy fights tend to take an immediate earnings bath which they typically blame on the poor decisions of prior management and which enables them to report an earnings turnaround the following year".

The few empirical studies that have been published disagree however on most counts. A first empirical study based on both accounting and market returns published by Elliott and Shaw (1988) and focusing on large write-downs suggests that write-downs are "bad news". Elliott and Shaw find that, throughout the three years which preceded the announcements of the write-downs, both the accounting and share price returns were below industry median. They report significant one- and two-day negative share price returns on average around the write-down disclosure dates. Write-down firms are furthermore shown to underperform their industries during the eighteen months following the announcement dates[1].

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1 Elliott and Shaw attribute this result to the fact that a focus on large write-offs will identify extreme cases which are likely to be worse than expected.

A second empirical study based on both accounting and market returns published by Zucca and Campbell (1989) provides evidence that is more difficult to interpret. Zucca and Campbell find that firms disclosing write-downs are not as financially healthy as firms in the same industry classification which did not write down any impaired assets. They do not find evidence of significant excess returns around the announcement dates of the write-downs. They do however report that differences in performance between the small (large) write-down group and the control group become smaller (larger) as time passes after the write-down.

A third empirical study based on both accounting and market returns published by Strong and Meyer (1987) reports some evidence suggesting that write-downs may serve as signals for future earnings. It provides evidence of positive abnormal share price reactions to write-downs. The larger the write-down, the greater the announcement period excess return. It also lends some support for the notion that, although write-down firms are not the best performers in their industries, they are also not the worse and tend to cluster in the middle quintiles.

These differences in empirical results led the accounting community to call for more theory. As of 1988, Waymire already reports that:

> "Much of the (conference) discussion focused on how alternative write-offs may differ, and, in turn, lead to differences in earnings or stock price performance...In my opinion, the primary concern underlying the conference discussion is the failure to identify and consider managers' economic incentives in making decisions to affect income via large write-offs".

This paper identifies managerial compensation plans as the economic incentive for reporting discretionary write-downs. It adopts the "information perspective" alluded to by Holthausen and Leftwich (1983). It considers a one-period economy consisting of a manager, a firm, and a financial market, in which the manager is endowed with some private information about the firm's future earnings, and hence, the likelihood of the firm getting in difficulty by the end of the period.

The first part of the paper considers two types of firms: a good and a bad firm. A good firm is less likely to get in difficulty than a bad firm. The type of the firm is

known to the manager only. The manager chooses whether or not to report a discretionary write-down recognising that his compensation depends on both current and future reported earnings and stock prices. The earnings-related component of the manager's objective function is assumed to be capped below. The financial market values the firm's equity according to the reporting choice announced by the manager. The paper provides sufficient conditions for separating and pooling rational expectations equilibria to obtain.

The effect of any discretionary write-down consists in transferring expenses from the end-of-period date, t_1, to the current date, t_0. The effect of any discretionary write-down on the earnings-related component of the manager's objective function thus consists in both a reduction in the earnings-based compensation component related to t_0 and in a potential increase in the earnings-based compensation component related to t_1. The likelihood of this increase depends on the type of the firm. The good firm is less likely to get in difficulty by the end of the period, and the end-of-period earnings generated are thus more likely to exceed the lower bound of the earnings-related component of the manager's objective function. The manager of the good firm is thus more likely to benefit at date t_1 from any write-down reported at date t_0. Reporting a discretionary write-down W is costly to any manager. It is however less costly to the manager of the good firm than it is to the manager of the bad firm. The reporting decision concerning write-downs may thus enable the manager to signal his private information.

This paper predicts that, when a separating equilibrium prevails, the firms which do report discretionary write-downs are likely to see higher earnings in the next periods than the firms which do not report any write-downs. The paper also predicts that the former firms should experience, on average, positive abnormal returns around the announcement dates of the discretionary write-downs while those which choose not to report any write-downs should experience, on average, negative abnormal returns.

The testable implications generated by this paper may explain why write-downs are

"good news" in Strong and Meyer (1987) and "not so good news" in Elliott and Shaw (1988) and Zucca and Campbell (1989). Strong and Meyer report that, although the write-down firms are not the best performers in their industry, they are not in the bottom quintile either, but tend to cluster in the middle quintiles. Strong and Meyer write-down firms are thus similar to the ones modelled in this paper. Elliott and Shaw and Zucca and Campbell however report that write-down firms experienced lower earnings when compared to industry medians. Write-downs are unlikely to be costly to the managers of firms reporting already low earnings. This paper thus does not predict positive abnormal share price reactions, on average, around the announcement dates of this type of firms' write-downs.

The second part of the paper extends the previous model to deal with a continuum of types. The manager of a firm of type q believes that his firm is a good firm with a probability q. In this model, the manager finds it incentive-compatible to report a discretionary write-down as long as the probability q is strictly positive. The higher the probability, the larger the write-down. The abnormal share price reaction to the announcement of the discretionary write-down is furthermore an increasing function of the size of the write-down.

A description of the basic model dealing with two types of firms is developed in section 8.2. The main propositions and the intuition behind them can be found in section 8.3. An extension of the basic model to a continuum of types of firms is provided in section 8.4. A summary is provided in section 8.5. The derivations supporting the various propositions are contained in Appendix A to C.

8.2 The Basic Model

This section introduces a simple model focusing on the manager's choice of write-downs in a world of asymmetric information. In this model, the manager has private information about the firm's future earnings and cash-flows, and, under certain conditions, may credibly communicate his information to investors through his choice of write-downs. The model is simplified in order to concentrate on the

informative role of the manager's write-down policy.

This model deals with a firm, a manager, and a financial market over one period, from the current date t_0, to t_1, date at which the firm is liquidated. Both the manager and the financial market are assumed to be risk-neutral. The introduction of risk-aversion would generate risk-sharing considerations which are not driving the propositions derived in this model. The firm's investment decisions, capital structure, and the resulting distribution of cash-flows are determined exogenously. In order to simplify the analytical derivations contained in this paper, it is assumed that the capital of the firm consists only of equity and that the firm's cash-flows are distributed as they are generated. The propositions developed in this paper would however still obtain if these assumptions were relaxed.

The firm's current operational cash-flows X_0 and earnings A_0, at date t_0, are assumed to be known by both the manager and the financial market[2]. There is however an asymmetry of information between the manager and the financial market about the firm's future earnings and cash-flows. The financial market is unsure whether the firm is a good or a bad firm. The firm is said to be a good firm if t_1's cash-flows (earnings) X_1 (A_1) are expected to be high, X_H (A_H), with a probability p_H, and low, X_L (A_L), with a probability $1-p_H$. The firm is said to be a bad firm if t_1's cash-flows (earnings) X_1 (A_1) are expected to be high, X_H (A_H), with a probability p_L, and low, X_L (A_L), with a probability $1-p_L$. The probability p_H is assumed to exceed the probability p_L. The manager has perfect knowledge of his firm's type. Investors' prior beliefs are that the firm is a good firm with a probability p.

At date t_0, the manager has to report his firm's results relating to the financial exercise closing at date t_0. The manager of the firm is assumed to be able to report a discretionary write-down W, $(1-T_C).W$ after corporate taxes, where $W \leq W_{Max}$. Managerial discretion in reporting is furthermore assumed to be limited to the choice

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2 Signalling could still obtain if there was an asymmetry of information between the manager of the firm and the financial market about current earnings or cash-flows.

of whether or not to report this discretionary write-down W[3].

The manager is rational and decides whether or not to report a discretionary write-down W taking into account the impact of the announcement on his objective function. His objective function is assumed to depend on both the equity value[4] of his firm and the earnings reported both at dates t_0 and t_1. The component of the manager's objective function which depends on reported earnings reflects the fact that the manager may derive some utility from both fixed compensation and a bonus plan. This component is furthermore assumed to be capped below and linearly increasing in the firm's reported earnings when earnings exceed a given threshold. The component of the manager's objective function which depends on the market value of the firm's equity reflects the fact that the manager derives some utility from stock participation plans and other stock options.

The specific form taken by the manager's objective function is determined exogenously in this model. It would however appear to be compatible with the compensation schedules observed empirically. A substantial proportion of firms provide their directors with both stock-options and bonus schemes based on accounting figures. The manager's objective function may also be justified on more theoretical grounds. The game analysed in this paper may be considered as a sub-game of a larger game involving a moral hazard problem between the firm's manager and shareholders. In such an environment characterised by a separation between ownership and management, the manager's optimal compensation schedule may depend on both stock prices and reported earnings, despite the fact that stock prices impound all available information including earnings [Kim and Suh (1993), Bushman and Indjejikian (1993)]. Even if there is no hidden-action or hidden-information problem, the manager's optimal compensation schedule may still depend on both stock prices and reported earnings as long as the principal is risk-averse, and

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3 The propositions developed in this paper could still obtain if this constraint was removed as long as the choices made by the manager were observable.

4 The propositions developed in this paper would still obtain if the manager's objective function depended on the firm's total market value.

the process followed by earnings differs from the process followed by stock prices.

More formally, the manager of the firm is assumed to maximise I(W), the conditional expected value of the following objective function:

$$\alpha f[A_0(W)] + \zeta V_0 + \delta \alpha f[A_1(W)] + \delta \zeta V_1 \qquad (1)$$

where:

* α and ζ are constants, satisfying the following relationships: $0 < \alpha < 1$ and $0 < \zeta < 1$;
* $A_0(W)$ and $A_1(W)$ respectively represent the earnings - after the effect of any discretionary write-down W - reported by the manager of the firm at dates t_0 and t_1;
* V_0 and V_1 respectively represent the market value of the firm's equity at dates t_0 and t_1;
* $f[A_0(W)]$ and $f[A_1(W)]$ respectively represent the accounting-based component of the manager's compensation package prevailing at t_0 and t_1;
* δ represents the manager's rate of time preference.

The function f is assumed to take the following functional form[5] [6]:

$$f[A_i(W)] = Max[L, A_i(W) + H_i] \quad For\ i = 0,1 \qquad (2)$$

where:

* L represents the lower bound of f;
* H_i (i=0,1) represent constants.

The parameters L and H_i are assumed to satisfy the following inequations:

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5 The specific form taken by the function f is similar to the one introduced by Healy (1985).

6 The linearity of f is not required. It has been assumed to capture the idea of convexity of the manager's objective function in a simple framework.

$$\left[\begin{array}{l} L \le A_O - W(1-T_C) + H_0 \\ L \le A_H + W(1-T_C) + H_1 \\ L \ge A_L + W(1-T_C) + H_1 \\ \forall W \in [0, W_{Max}] \end{array}\right. \tag{3}$$

By discounting free cash-flows, one may rewrite the manager's objective function in the following way:

$$\begin{aligned} I(W) = \; & \alpha [A_0 - W(1-T_C) + H_0] + \zeta [\![X_0 - \alpha [A_0 - W(1-T_C) + H_0]]\!] \\ & + \delta \zeta E_M [\![X_1 - \alpha Max[L, A_1 + W(1-T_C) + H_1] \,|\, W]\!] \\ & + \delta \alpha E_D [\![Max[L, A_1 + W(1-T_C) + H_1]]\!] \\ & + \delta \zeta E_D [\![X_1 - \alpha Max[L, A_1 + W(1-T_C) + H_1]]\!] \end{aligned} \tag{4}$$

where:

* $E_M[.|W]$ is a function representing the financial market's conditional expectation given W;
* $E_D[.]$ represents the manager's expectation;

In order to get non-trivial results, one further assumption is made. The cash-flows after managerial compensation obtaining at date t_1 are assumed to be higher when earnings and cash-flows before managerial compensation are higher:

$$X_H - \alpha [A_H + W_{Max}(1-T_C) + H_1] > X_L - \alpha L \quad \forall W \in [0, W_{Max}] \tag{5}$$

The effect of any discretionary write-down W reported at date t_0 on reported earnings thus consists in transferring earnings of $W.(1-T_C)$ from t_0 to t_1. The first-order effect of a write-down W on the manager's objective function thus consists in both a reduction in the earnings-based compensation component related to date t_0 $[\alpha.W.(1-T_C)]$ and in an increase in the earnings-based compensation component related to date t_1. The magnitude of this increase depends on the type of the firm. The manager of the good firm obtains an increase of $\alpha.p_H.W.(1-T_C)$ while the manager of the bad firm obtains an increase of $\alpha.p_L.W.(1-T_C)$. Reporting a discretionary write-down W is thus costly to any manager. It is however less costly to the manager of the good firm than it is to the manager of the bad firm.

The stylised assumptions introduced in this section enable us to derive the conditions under which separating and pooling equilibria do obtain. These propositions are driven by the fact that the earnings-related component of the manager's objective function is capped below. Signalling could however still obtain with the introduction of risk-aversion, non-linearity of the earnings-related component of the manager's objective function in reported earnings, and distributions of cash-flows and earnings.

8.3 Propositions

This section provides conditions under which various types of equilibria may obtain. The equilibrium concept used in this paper is a Perfect Bayesian Equilibrium. According to Fudenberg and Tirole (1991), a Perfect Bayesian Equilibrium (PBE) is simply "a set of strategies and beliefs such that, at any stage of the game, strategies are optimal given the beliefs, and the beliefs are obtained from equilibrium strategies and observed actions using Bayes' rule".

The game introduced in the previous section belongs to a class of signalling models referred to by Thakor (1991) as SMIF (Signalling Models with the Informed moving First). It is furthermore monotonic[7]. The main advantage of SMIF is that the sequence of moves, the information sets, and the beliefs can be thoroughly specified. The main disadvantage of SMIF is that a large number of equilibria may potentially obtain. This section therefore contains strategic refinements which attempt to put "sensible" restrictions on beliefs off the equilibrium path.

The propositions developed in this paper obtain because, though any discretionary write-down W reported at date t_0 is costly to any manager, it is less costly to the manager of the good firm than it is to the manager of the bad firm. The first-order effect of a write-down W is to reduce earnings reported at date t_0 by $W.(1-T_C)$ and to increase earnings reported at date t_1 by the same amount. The first-order effect of a discretionary write-down W on the earnings-related component of the manager's

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7 According to Cho and Sobel (1990), "A signalling game is said to be monotonic if all sender types have the same preferences over the receiver's mixed strategy best responses".

objective function thus consists in both a reduction in the earnings-based compensation component related to date t_0 [$\alpha.W.(1-T_C)$] and in an increase in the earnings-based compensation component related to date t_1. The magnitude of this increase depends on the type of the firm. The manager of the good firm obtains an increase of $\alpha.p_H.W.(1-T_C)$ while the manager of the bad firm obtains an increase of $\alpha.p_L.W.(1-T_C)$. At date t_1, the manager of the good firm thus derives higher benefits from the discretionary write-down W reported at date t_0 than the manager of the bad firm.

The basic model introduced in the previous section enables us to derive the following propositions:

Proposition 1:[8] No separating PBE, in which the manager of the bad firm chooses to report a discretionary write-down and in which the manager of the good firm chooses not to report a discretionary write-down, may possibly obtain[9].

Intuition:
No separating equilibrium, in which the manager of the bad firm reports a discretionary write-down while the manager of the good firm abstains from reporting any discretionary write-down, can obtain because the manager of the bad firm would find it incentive-compatible to defect from his equilibrium strategy. By defecting from his separating equilibrium strategy and pooling with the manager of the good firm, the manager of the bad firm enjoys the benefits resulting from an increase in both the component of his objective function related to earnings and the component of his objective function related to the firm's equity market value.

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8 Proof of Proposition 1 can be found in Appendix A1.

9 A more general proposition obtains: There cannot be any separating equilibrium in which the manager of the bad firm chooses to report a larger write-down than the manager of the bad firm.

Proposition 2:[10] For any given set of α and ζ, a separating PBE, in which the manager of the good firm reports a discretionary write-down W and the manager of the bad firm abstains from reporting any discretionary write-down, will obtain as long as investors believe that any deviating firm is a bad firm and the discretionary write-down W satisfies the following inequations:

$$\delta\zeta(p_H-p_L)[(X_H-X_L)-\alpha(A_H+H_1-L)]\geq\alpha W(1-T_C)[(1-\zeta)(1-\delta p_H)+\delta\zeta p_H] \qquad (6)$$

and:

$$\delta\zeta(p_H-p_L)[(X_H-X_L)-\alpha(A_H+H_1-L)]\leq\alpha W(1-T_C)[(1-\zeta)(1-\delta p_L)+\delta\zeta p_H] \qquad (7)$$

There always exists a set of equilibrium write-downs W, where W is smaller than W_{Max}, if the set of α and ζ satisfies the following relationship:

$$\zeta\leq\frac{\alpha(1-\delta p_L)(1-T_C)W_{Max}}{\delta(p_H-p_L)[(X_H-X_L)-\alpha(A_H+H_1-L)]+\alpha(1-T_C)[1-\delta(p_L+p_H)]W_{Max}} \qquad (8)$$

A continuum of separating equilibria may therefore potentially obtain. In the separating equilibrium Pareto-dominating all other separating equilibria, the manager of the good firm reports therefore a write-down W*, where:

$$W^*=\frac{\delta\zeta(p_H-p_L)[(X_H-X_L)-\alpha(A_H+H_1-L)]}{[\alpha(1-\zeta)(1-\delta p_L)+\delta p_H]} \qquad (9)$$

Intuition:

A separating PBE, in which the manager of the good firm reports a discretionary write-down while the manager of the bad firm abstains from reporting a discretionary write-down, can only obtain if it is incentive-compatible for both the managers of the good and bad firms to act accordingly. The first equation states that for the manager of the good firm not to deviate from his equilibrium policy, the marginal gain from deviating, that is, the increase in the earnings-based component of the manager's

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10 Proof of Proposition 2 can be found in Appendix A2. The structure of the proof is as follows. In a first part, we derive necessary conditions for a separating equilibrium to obtain given the exogenously defined beliefs formed by investors upon observing out-of-equilibrium actions. A separating equilibrium may however obtain with more optimistic beliefs. In a second part starting with the word "conversely", it can be checked that these conditions are indeed sufficient for a separating equilibrium to obtain.

objective function resulting from abstaining from reporting a discretionary write-down, should be smaller than the marginal cost from deviating, that is, the decrease in the manager's objective function resulting from his firm being identified as a bad firm.

Similarly, the second equation states that for the manager of the bad firm to deviate from his equilibrium policy, the marginal gain from deviating, that is, the increase in the manager's objective function resulting from the appreciation in the firm's market value, should be smaller than the marginal cost from deviating, that is, the decrease in the earnings-based component of the manager's objective function resulting from the impact of the write-down on the firm's reported earnings.

Proposition 3:[11] A pooling PBE, in which the managers of both types of firms choose to report a discretionary write-down W, will obtain if investors believe that a firm deviating from a write-down policy is a bad firm, and if:

$$p \geq \frac{\alpha(1-T_C)[(1-\zeta)(1-\delta p_L)+\delta\zeta p_L]W}{\delta\zeta(p_H-p_L)[(X_H-X_L)-\alpha(A_H+(1-T_C)W+H_1-L)]} \qquad (10)$$

A continuum of pooling PBEs may therefore potentially obtain.

Intuition:

A pooling equilibrium, in which firms of both types report write-downs, can only obtain if investors' prior beliefs are that the firm is a good firm with a high enough probability. If this was not the case, the marginal benefit accruing to the manager of a bad firm deviating from his equilibrium strategy and abstaining from reporting any discretionary write-down, that is, the increase in the earnings-based component of the manager's objective function resulting from abstaining from reporting any discretionary write-down, would exceed the marginal cost resulting from being valued as the manager of a bad firm.

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11 Proof of Proposition 3 can be found in Appendix A3. The structure of the proof is as follows. In a first part, we derive necessary conditions for a pooling equilibrium to obtain given the exogenously defined out-of-equilibrium beliefs. A pooling equilibrium may however obtain with more optimistic beliefs. In a second part starting with the word "conversely", it can be checked that these conditions are indeed sufficient for a pooling equilibrium to obtain.

Proposition 4:[12] A pooling PBE, in which the managers of both types of firms do abstain from reporting any discretionary write-downs, will obtain if investors believe that a firm deviating from its equilibrium strategy is a bad firm.

Intuition:

This pooling equilibrium is sustained by pessimistic out-of-equilibrium beliefs imposing costs on any deviating firm. No firm will ever want to deviate since a would-be deviating firm has nothing to gain from any deviation. The manager of any firm, who deviates from his equilibrium strategy by reporting a discretionary write-down W, suffers from a decrease in both the component of his objective function related to earnings and the component of his objective function related to the firm's equity market value.

Proposition 5:[13] Both pooling and separating PBEs are sequential[14] [15]. But only the pooling equilibrium, in which both firms write down W_{Max}, and the efficient separating equilibrium do survive the D1[16] criterion introduced by Cho and Kreps (1987). These equilibria are also the only ones to satisfy Banks and Sobel's (1987)

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12 Proof of Proposition 4 can be found in Appendix A4. A pooling equilibrium in which the managers of both the good and bad firms choose to abstain from reporting any write-downs may however be sustained by more optimistic out-of-equilibrium beliefs.

13 Proofs of Proposition 5 can be found in Appendix B1, B2, and B3.

14 A set of strategies and beliefs is said to form a sequential equilibrium if it is both sequentially rational and consistent. A set is consistent if it is the limit of some sequence of mixed strategies and beliefs, where the beliefs are derived from the application of Bayes' rule.

15 If the manager's set of write-downs was unbounded above, then the only equilibrium to satisfy the intuitive criterion developed by Cho and Kreps (1987) would be the efficient separating equilibrium.

16 According to Fudenberg and Tirole (1991), a sequential equilibrium is said to satisfy the D1 criterion if it can be sustained by beliefs satisfying the following property: "If the set of player 2's (market) best responses that make type θ willing to deviate to a_i is strictly smaller than the set of responses that make type θ willing to deviate, then player 2 should believe that type θ is infinitely more likely to deviate to a than type θ is".

ultimate divinity[17] and Kohlberg and Mertens' (1986) Never Weak Best Response (NWBR)[18] strategic refinements. Furthermore, it can be shown that the efficient separating equilibrium is the only PBE to survive these strategic refinements as long as there exists W satisfying the following relationship:

$$\delta\zeta(p_H-p_L)[(X_H-X_L)-\alpha(A_H+H_1-L)]\leq\alpha(W_{Max}-W)(1-T_C)[(1-\zeta)(1-\delta p_L)+\delta\zeta p_H] \quad (11)$$

Proposition 6:[19] If a separating equilibrium obtains, then:

* The market reaction to the announcement of a discretionary write-down should be positive;
* The market reaction to the lack of announcement of a discretionary write-down should be negative.

8.4 Extension To A Continuum Of Types

The basic model considered previously is extended to deal with a continuum of types of firms. The manager of a firm of type q, where q is comprised between 0 and 1, knows that his firm has a probability q of generating cash-flows X_1 and earnings A_1 at date t_1 of X_H and A_H, and a probability 1-q of generating cash-flows X_1, and earnings A_1 at date t_1 of X_L and A_L. The type of the firm is unknown to the financial market.

Most of the assumptions made in the previous section are still valid. As in the

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17 Using Fudenberg and Tirole's (1991) terminology, a sequential equilibrium is said to satisfy the ultimate divinity strategic refinement if it can be sustained by beliefs satisfying the following property: If the set of player 2's (market) best responses that make type θ willing to deviate to a_1 is included in the union of sets of responses that make other types θ' willing to deviate, then player 2 should not assign any positive weight to type θ at the information set a_1.

18 Using Fudenberg and Tirole's (1991) terminology, a sequential equilibrium is said to satisfy the NWBR criterion if it can be sustained by beliefs satisfying the following property: If the set of player 2's (market) best responses that make type θ indifferent between playing his equilibrium strategy and deviating to a_1 is included in the union of sets of responses that make other types θ' willing to deviate, then player 2 should not assign any positive weight to type θ at information set a_1.

19 Proof of Proposition 6 can be found in Appendix B4.

previous section, the manager may attempt to signal the type of his firm by reporting a discretionary write-down W, $(1-T_C).W$ after corporate taxes, where $W \leq W_{Max}$. He takes his decision, taking into account the impact of the announcement of his decision on his objective function, which is similar to the one introduced in the previous section. As in the previous section[20], the component of the manager's objective function which depends on earnings is again assumed to be capped below and linearly increasing in the firm's reported earnings when earnings exceed a given threshold. The financial market perceives the firm's type q to be a function of the size of the write-down W. This function, which is assumed to be twice differentiable[21], will be referred to as q(W).

The manager of the firm is assumed to maximise the following objective function with respect to W:

$$I(q,W)=I^D(q,W)+I^M(W) \tag{12}$$

where:

$$I^D(q,W)=\alpha A_0(W)+\delta\alpha A_1(q,W)+\delta\zeta[X_1(q)-\alpha A_1(q,W)] \tag{13}$$

and:

$$I^M(W)=\zeta[\![X_0-\alpha A_0(W)+\delta[X_1(W)-\alpha A_1(W)]]\!] \tag{14}$$

with:

$$\begin{cases} A_0(W) = A_0-W(1-T_C)+H_0 \\ A_1(q,W) = q[A_H+W(1-T_C)+H_1]+(1-q)L \\ A_1(W) = q(W)[A_H+W(1-T_C)+H_1]+[1-q(W)]L \\ X_1(q) = qX_H+(1-q)X_L \\ X_1(W) = q(W)X_H+[1-q(W)]X_L \end{cases} \tag{15}$$

$I^D(q,W)$ represents the component of the managerial objective function linked to the

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20 The linearity of f is not required. It has been assumed to capture the idea of convexity in a simple framework. It also enables us to derive a closed-form solution.

21 The propositions developed in this paper would still hold if q(W) was differentiable almost anywhere.

information set of the manager. Conversely, $I^M(W)$ represents the component of the managerial objective function linked to the information set of the financial market.

The objective function maximised by the manager of the firm with respect to W can be rewritten as:

$$\begin{aligned} \Pi[q,q(W),W] = \; & \alpha[A_0 - W(1-T_C) + H_0] + \zeta[X_0 - \alpha[A_0 - W(1-T_C) + H_0]] \\ + \; & \delta\zeta[q(W)X_H + (1-q(W))X_L] \\ - \; & \delta\zeta\alpha[q(W)(A_H + W(1-T_C) + H_1) + (1-q(W))L] \\ + \; & \delta\alpha[q[A_H + W(1-T_C) + H_1] + (1-q)L] \\ + \; & \delta\zeta[qX_H + (1-q)X_L - \alpha[q(A_H + W(1-T_C) + H_1) + (1-q)L]] \end{aligned} \tag{16}$$

Maximising this objective function for any given market valuation schedule q(W) determines an optimal write-down W^*, which depends on the quality of the firm q:

$$W^* = W^*(q) \tag{17}$$

We are however not interested in any arbitrary market valuation schedule q(W). Rather, we shall restrict our attention to market valuation schedules which have an equilibrium property. A market valuation schedule q(W) is said to be an equilibrium valuation schedule[22] if the quality of the firm q is correctly identified by the market for all values of q. More formally:

$$q[W^*(q)] = q \tag{18}$$

The extended model introduced in this section enables us to derive the following propositions:

Proposition 7: There exists a unique equilibrium valuation schedule q(W). This equilibrium valuation schedule is a strictly increasing function of W. It is implementable, that is, the equilibrium write-down reported by the manager of the best firm does not exceed W_{Max}, as long as ζ is small enough.

Proposition 8: The abnormal share price reaction to the announcement of a write-

22 This definition of an equilibrium valuation schedule is similar to the one provided by Leland and Pyle (1977).

down is a strictly increasing function of the size of the write-down reported.

Proofs are available in Appendix C.

8.5 Summary

This paper introduces a model seeking to explain the discretionary write-downs, write-offs, and other provisions reported by managers. The model introduces a firm, whose current performance may be subpar, but could also be potentially much worse. The model predicts that, when a separating equilibrium prevails, the firms which do report discretionary write-downs are likely to see higher earnings in the next periods than the firms which do not report any discretionary write-downs. It also predicts that the former firms should experience, on average, positive abnormal returns around the announcement dates of the discretionary write-downs. The testable implications derived from this paper are thus consistent with the evidence provided by the financial press[23].

The testable implications generated by this paper may also explain why write-downs are "good news" in Strong and Meyer (1987) and "not so good news" in Elliott and Shaw (1988) and Zucca and Campbell (1989). Strong and Meyer report that, although the write-down firms are not the best performers in their industry, they are not in the bottom quintile either, but tend to cluster in the middle quintiles. Strong and Meyer write-down firms are thus similar to the ones modelled in this paper. Elliott and Shaw and Zucca and Campbell however report that write-down firms experience lower earnings when compared to industry medians. Write-downs are unlikely to be costly to the managers of firms reporting already low earnings. This paper thus does not predict positive abnormal share price reactions, on average,

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23 According to Elliott and Shaw (1988), "The financial press frequently treats (these) write-offs as though they are viewed favourably by the securities market". According to Zucca and Campbell (1990), "Several articles indicated that the stock market reacts positively to asset writedowns. A Wall Street Journal article indicated that the stock price for five large companies rose 4-7% three days after the announcement of write-downs. Another article indicated that a $500 million write-down recorded by Warner Lambert in 1985 resulted in a 12% stock increase. Unfortunately, none of these articles examines whether there may be a similar number of writedowns which resulted in stock price decreases".

around the announcement dates of this type of firms' write-downs.

The propositions derived in this model are driven by the convexity of the function modelling the earnings-related component of the manager's objective function. Convexity of the manager's objective function with respect to earnings may however be obtained in other ways. For instance, the same propositions would still obtain if, for instance, the manager was to be replaced if reported earnings did not exceed a given threshold.

Appendix A

A1 Proposition 1 (Proof)

No separating equilibrium, in which bad firms report discretionary write-downs while good firms do not report any discretionary write-downs, can obtain because the managers of the bad firms would find it incentive-compatible to defect from their equilibrium strategies. Bad firms would pool with good firms.

More formally, let us assume that there exists a separating PBE, in which the manager of the bad firm reports a discretionary write-down W and in which the manager of the good firm abstains from reporting a discretionary write-down.

The bad firm's manager who is playing the separating equilibrium strategy derives the following utility:

$$\begin{aligned} I_{BFE} = \; & \alpha[A_0 - W(1-T_C) + H_0] + \zeta[X_0 - \alpha(A_0 - W(1-T_C) + H_0)] \\ & + \delta\zeta[\![p_L X_H + (1-p_L)X_L - \alpha[p_L(A_H + W(1-T_C) + H_1) + (1-p_L)L]]\!] \\ & + \delta\alpha[\![p_L[A_H + p_L W(1-T_C) + H_1] + (1-p_L)L]\!] \\ & + \delta\zeta[\![p_L X_H + (1-p_L)X_L - \alpha[p_L(A_H + W(1-T_C) + H_1) + (1-p_L)L]]\!] \end{aligned} \tag{19}$$

The bad firm's manager who deviates from the separating equilibrium strategy derives the following utility:

$$\begin{aligned} I_{BFD} = \; & \alpha(A_0 + H_0) + \zeta[X_0 - \alpha(A_0 + H_0)] \\ & + \delta\zeta[\![p_H X_H + (1-p_H)X_L - \alpha[p_H(A_H + H_1) + (1-p_H)L]]\!] \\ & + \delta\alpha[p_L(A_H + H_1) + (1-p_L)L] \\ & + \delta\zeta[\![p_L X_H + (1-p_L)X_L - \alpha[p_L(A_H + H_1) + (1-p_L)L]]\!] \end{aligned} \tag{20}$$

But,

$$\begin{aligned} & p_H[X_H - \alpha(A_H + H_1)] + (1-p_H)[X_L - \alpha L] \\ > \; & p_L[X_H - \alpha(A_H + H_1)] + (1-p_L)[X_L - \alpha L] \\ > \; & p_L[X_H - \alpha(A_H + W(1-T_C) + H_1] + (1-p_L)[X_L - \alpha A_L] \end{aligned} \tag{21}$$

Proposition 1 thus obtains.

A2 Proposition 2 (Proof)

In a separating equilibrium, the manager of the bad firm reveals his type and chooses therefore not to report any discretionary write-down. If he chose to report a write-down, he would strictly gain by abstaining from reporting a write-down because reporting a write-down decreases the earnings-related component of his objective function. Conversely, the manager of the good firm chooses to report a discretionary write-down W. If he chose not to report a write-down, the equilibrium would be a pooling rather than a separating one.

Let us therefore consider the following set of strategies and beliefs. The manager of the bad firm chooses to abstain from reporting any discretionary write-down. The manager of the good firm chooses to report a discretionary write-down W. The financial market holds the following beliefs when faced with discretionary write-downs:

$$\begin{cases} \mu(GF \mid \hat{W}) = 0 & \text{if } \hat{W} \neq W \\ \mu(GF \mid W) = 1 \end{cases} \tag{22}$$

The good firm's manager who is playing the separating equilibrium strategy thus derives the following utility:

$$\begin{aligned} I_{GFE} = \; & \alpha [A_0 - W(1-T_C) + H_0] + \zeta [X_0 - \alpha (A_0 - W(1-T_C) + H_0)] \\ & + \delta \zeta [\![p_H X_H + (1-p_H) X_L - \alpha [p_H (A_H + W(1-T_C) + H_1) + (1-p_H) L]]\!] \\ & + \delta \alpha [\![p_H [A_H + W(1-T_C) + H_1] + (1-p_H) L]\!] \\ & + \delta \zeta [\![p_H X_H + (1-p_H) X_L - \alpha [p_H (A_H + W(1-T_C) + H_1) + (1-p_H) L]]\!] \end{aligned} \tag{23}$$

The good firm's manager who deviates from the separating equilibrium strategy by abstaining from reporting any write-down derives the following utility:

$$\begin{aligned} I_{GFD} = \; & \alpha (A_0 + H_0) + \zeta [X_0 - \alpha (A_0 + H_0)] \\ & + \delta \zeta [\![p_L X_H + (1-p_L) X_L - \alpha [p_L (A_H + H_1) + (1-p_L) L]]\!] \\ & + \delta \alpha [p_H (A_H + H_1) + (1-p_H) L] \\ & + \delta \zeta [\![p_H X_H + (1-p_H) X_L - \alpha [p_H (A_H + H_1) + (1-p_H) L]]\!] \end{aligned} \tag{24}$$

The bad firm's manager who is playing the separating equilibrium strategy derives the following utility:

$$\begin{aligned} I_{BFE} = \; & \alpha (A_0 + H_0) + \zeta [X_0 - \alpha (A_0 + H_0)] \\ & + \delta \zeta [\![p_L X_H + (1-p_L) X_L - \alpha [p_L (A_H + H_1) + (1-p_L) L]]\!] \\ & + \delta \alpha [p_L (A_H + H_1) + (1-p_L) L] \\ & + \delta \zeta [\![p_L X_H + (1-p_L) X_L - \alpha [p_L (A_H + H_1) + (1-p_L) L]]\!] \end{aligned} \tag{25}$$

The bad firm's manager who deviates from the separating equilibrium strategy derives the following utility:

$$\begin{aligned} I_{BFD} = \; & \alpha [A_0 - W(1-T_C) + H_0] + \zeta [X_0 - \alpha (A_0 - W(1-T_C) + H_0)] \\ & + \delta \zeta [\![p_H X_H + (1-p_H) X_L - \alpha [p_H (A_H + W(1-T_C) + H_1) + (1-p_H) L]]\!] \\ & + \delta \alpha [\![p_L [A_H + W(1-T_C) + H_1] + (1-p_L) L]\!] \\ & + \delta \zeta [\![p_L X_H + (1-p_L) X_L - \alpha [p_L (A_H + W(1-T_C) + H_1) + (1-p_L) L]]\!] \end{aligned} \tag{26}$$

A separating equilibrium can only exist if $I_{GFE} \geq I_{GFD}$ and $I_{BFE} \geq I_{BFD}$. A separating equilibrium can therefore only exist if:

$$\delta \zeta (p_H - p_L) [(X_H - X_L) - \alpha (A_H + H_1 - L)] \geq \alpha W (1-T_C) [(1-\zeta)(1-\delta p_H) + \delta \zeta p_H] \tag{27}$$

and:

$$\delta \zeta (p_H - p_L) [(X_H - X_L) - \alpha (A_H + H_1 - L)] \leq \alpha W (1-T_C) [(1-\zeta)(1-\delta p_L) + \delta \zeta p_H] \tag{28}$$

Inequalities (27) and (28) can be simultaneously met for some W smaller or equal to W_{Max} as long as:

$$\zeta \leq \zeta_{Max} \tag{29}$$

where:

$$\zeta_{Max} = \frac{\alpha (1-\delta p_L)(1-T_C) W_{Max}}{\delta (p_H - p_L) [(X_H - X_L) - \alpha (A_H + H_1 - L)] + \alpha (1-T_C) [1 - \delta (p_L + p_H)] W_{Max}} \tag{30}$$

Conversely, let us assume that Inequality (29) is satisfied and consider the following set of strategies and beliefs. The manager of the bad firm chooses to abstain from reporting any discretionary write-down. The manager of the good firm chooses to report a discretionary write-down W satisfying Inequalities (27) and (28). The

financial market holds the beliefs described in Equations (22). It is straightforward to check that this set of actions and beliefs constitutes a PBE.

The basic model described in this paper allows therefore a continuum of PBEs, in which the manager of the good firm chooses to report a discretionary write-down W while the manager of the bad firm chooses to abstain from reporting any discretionary write-down. In the separating equilibrium Pareto-dominating all other separating equilibria, the manager of the good firm reports therefore a write-down W^*, where:

$$W^* = \frac{\delta\zeta(p_H - p_L)[(X_H - X_L) - \alpha(A_H + H_1 - L)]}{[\alpha(1-\zeta)(1-\delta p_L) + \delta p_H]} \tag{31}$$

A3 Proposition 3 (Proof)

In this set of pooling PBEs, the managers of both the good and bad firms do report a discretionary write-down W. By Bayes' rule, the posterior beliefs held by the financial markets upon observing W have to be the same as their prior beliefs. Bayes' rule does however not put any restrictions on the posterior beliefs held by the financial market upon observing an out-of-equilibrium write-down $\hat{W}$. The easiest way to support W as a pooling outcome is then to assign pessimistic beliefs to any out-of-equilibrium write-down $\hat{W}$.

Let us therefore consider the following set of strategies and beliefs. The managers of both the good and bad firms do report a write-down W. The financial market holds the following beliefs when faced with write-downs:

$$\begin{cases} \mu(GF \mid \hat{W}) = 0 \ \text{if} \ \hat{W} \neq W \\ \mu(GF \mid W) = p \end{cases} \tag{32}$$

A pooling equilibrium can only obtain if $\forall \hat{W}$, $I_{GFE} \geq \text{Max } I_{GFD}$ and $I_{BFE} \geq \text{Max } I_{BFD}$. The good firm's manager who is playing the pooling equilibrium strategy derives the following utility:

$$
\begin{aligned}
I_{GFE} = \quad & \alpha[A_0 - W(1-T_C) + H_0] + \zeta[X_0 - \alpha(A_0 - W(1-T_C) + H_0)] \\
+ \quad & \delta\zeta[\![p[p_H X_H + (1-p_H)X_L] + (1-p)[p_L X_H + (1-p_L)X_L]]\!] \\
- \quad & \delta\alpha\zeta[\![[pp_H + (1-p)p_L][A_H + W(1-T_C) + H_1] + [p(1-p_H) + (1-p)(1-p_L)]L]\!] \\
+ \quad & \delta\alpha[\![p_H[A_H + W(1-T_C) + H_1] + (1-p_H)L]\!] \\
+ \quad & \delta\zeta[\![p_H X_H + (1-p_H)X_L - \alpha[p_H(A_H + W(1-T_C) + H_1) + (1-p_H)L]]\!]
\end{aligned} \tag{33}
$$

The good firm's manager who deviates from the pooling equilibrium strategy derives the following utility:

$$
\begin{aligned}
I_{GFD} = \quad & \alpha[A_0 - \hat{W}(1-T_C) + H_0] + \zeta[X_0 - \alpha(A_0 - \hat{W}(1-T_C) + H_0)] \\
+ \quad & \delta\zeta[\![p_L X_H + (1-p_L)X_L - \alpha[p_L(A_H + \hat{W}(1-T_C) + H_1) + (1-p_L)L]]\!] \\
+ \quad & \delta\alpha[\![p_H[A_H + \hat{W}(1-T_C) + H_1] + (1-p_H)L]\!] \\
+ \quad & \delta\zeta[\![p_H X_H + (1-p_H)X_L - \alpha[p_H(A_H + \hat{W}(1-T_C) + H_1) + (1-p_H)L]]\!]
\end{aligned} \tag{34}
$$

The bad firm's manager who is playing the pooling equilibrium strategy derives the following utility:

$$
\begin{aligned}
I_{BFE} = \quad & \alpha[A_0 - W(1-T_C) + H_0] + \zeta[X_0 - \alpha(A_0 - W(1-T_C) + H_0)] \\
+ \quad & \delta\zeta[\![p[p_H X_H + (1-p_H)X_L] + (1-p)[p_L X_H + (1-p_L)X_L]]\!] \\
- \quad & \delta\alpha\zeta[\![[pp_H + (1-p)p_L][A_H + W(1-T_C) + H_1] + [p(1-p_H) + (1-p)(1-p_L)]L]\!] \\
+ \quad & \delta\alpha[\![p_L[A_H + W(1-T_C) + H_1] + (1-p_L)L]\!] \\
+ \quad & \delta\zeta[\![p_L X_H + (1-p_L)X_L - \alpha[p_L(A_H + W(1-T_C) + H_1) + (1-p_L)L]]\!]
\end{aligned} \tag{35}
$$

The bad firm's manager who deviates from the pooling equilibrium strategy derives the following utility:

$$
\begin{aligned}
I_{BFD} = \quad & \alpha[A_0 - \hat{W}(1-T_C) + H_0] + \zeta[X_0 - \alpha(A_0 - \hat{W}(1-T_C) + H_0)] \\
+ \quad & \delta\zeta[\![p_L X_H + (1-p_L)X_L - \alpha[p_L(A_H + \hat{W}(1-T_C) + H_1) + (1-p_L)L]]\!] \\
+ \quad & \delta\alpha[\![p_L[A_H + \hat{W}(1-T_C) + H_1] + (1-p_L)L]\!] \\
+ \quad & \delta\zeta[\![p_L X_H + (1-p_L)X_L - \alpha[p_L(A_H + \hat{W}(1-T_C) + H_1) + (1-p_L)L]]\!]
\end{aligned} \tag{36}
$$

The utility functions of the managers of both the good and bad firms who deviates from their pooling equilibrium strategies are maximised when $\hat{W}=0$. They then take the following values:

$$
\begin{aligned}
I_{GFD} = \quad & \alpha(A_0+H_0)+\zeta[X_0-\alpha(A_0+H_0)] \\
+ \quad & \delta\zeta[\![p_L X_H+(1-p_L)X_L-\alpha[p_L(A_H+H_1)+(1-p_L)L]]\!] \\
+ \quad & \delta\alpha[p_H(A_H+H_1)+(1-p_H)L] \\
+ \quad & \delta\zeta[\![p_H X_H+(1-p_H)X_L-\alpha[p_H(A_H+H_1)+(1-p_H)L]]\!]
\end{aligned}
\tag{37}
$$

$$
\begin{aligned}
I_{BFD} = \quad & \alpha(A_0+H_0)+\zeta[X_0-\alpha(A_0+H_0)] \\
+ \quad & \delta\zeta[\![p_L X_H+(1-p_L)X_L-\alpha[p_L(A_H+H_1)+(1-p_L)L]]\!] \\
+ \quad & \delta\alpha[p_L(A_H+H_1)+(1-p_L)L] \\
+ \quad & \delta\zeta[\![p_L X_H+(1-p_L)X_L-\alpha[p_L(A_H+H_1)+(1-p_L)L]]\!]
\end{aligned}
\tag{38}
$$

For any pooling equilibrium to obtain, the following conditions need thus to be met:

$$p \geq p_1 \tag{39}$$

where:

$$p_1=\frac{\alpha(1-T_C)[(1-\zeta)(1-\delta p_H)+\delta\zeta p_L]W}{\delta\zeta(p_H-p_L)[(X_H-X_L)-\alpha(A_H+(1-T_C)W+H_1-L)]} \tag{40}$$

The second of these conditions implies that:

$$p \geq p_2 \tag{41}$$

where:

$$p_2=\frac{\alpha(1-T_C)[(1-\zeta)(1-\delta p_L)+\delta\zeta p_L]W}{\delta\zeta(p_H-p_L)[(X_H-X_L)-\alpha(A_H+(1-T_C)W+H_1-L)]} \tag{42}$$

From the previous equations, it is clear that:

$$p_2 > p_1 \tag{43}$$

A necessary condition for the pooling equilibrium to obtain is therefore that:

$$p \geq \frac{\alpha(1-T_C)[(1-\zeta)(1-\delta p_L)+\delta\zeta p_L]W}{\delta\zeta(p_H-p_L)[(X_H-X_L)-\alpha(A_H+(1-T_C)W+H_1-L)]} \tag{44}$$

This condition can always be met if:

$$\alpha \leq \alpha_{Max} \tag{45}$$

where:

$$\alpha_{Max}=\frac{\delta\zeta(p_H-p_L)(X_H-X_L)}{(1-T_C)[(1-\zeta)(1-\delta p_L)+\delta\zeta p_L]W_{Max}+\delta\zeta(p_H-p_L)(A_H+W_{Max}(1-T_C)+H_1-L)} \tag{46}$$

Conversely, let us assume that Inequality (44) is satisfied. It is then clear that the set of strategies, in which the managers of both the good and bad firms choose to report a discretionary write-down W, and beliefs described by Equations (32), where p is higher than or equal to p_2, forms a PBE.

A4 Proposition 4 (Proof)

Let us consider the following set of strategies and beliefs. The managers of both the good and bad firms choose not to report any discretionary write-down while the financial market holds the following beliefs:

$$\begin{cases}\mu(GF|\hat{W}) = 0 & if\ \hat{W}\neq 0\\ \mu(GF|0) = p\end{cases} \tag{47}$$

The good firm's manager who is playing the pooling equilibrium strategy derives the following utility:

$$\begin{aligned} I_{GFE}= \quad & \alpha(A_0+H_0)+\zeta[X_0-\alpha(A_0+H_0)] \\ & + \delta\zeta[\![p[p_H X_H+(1-p_H)X_L]+(1-p)[p_L X_H+(1-p_L)X_L]]\!] \\ & - \delta\alpha\zeta[\![[pp_H+(1-p)p_L](A_H+H_1)+[p(1-p_H)+(1-p)(1-p_L)]L]\!] \\ & + \delta\alpha[p_H(A_H+H_1)+(1-p_H)L] \\ & + \delta\zeta[\![p_H X_H+(1-p_H)X_L-\alpha[p_H(A_H+H_1)+(1-p_H)L]]\!] \end{aligned} \tag{48}$$

The good firm's manager who deviates from the pooling equilibrium strategy derives the following utility:

$$\begin{aligned} I_{GFD} = \; & \alpha[A_0 - \hat{W}(1-T_C) + H_0] + \zeta[X_0 - \alpha(A_0 - \hat{W}(1-T_C) + H_0)] \\ & + \delta\zeta[\![p_L X_H + (1-p_L)X_L - \alpha[p_L(A_H + \hat{W}(1-T_C) + H_1) + (1-p_L)L]]\!] \\ & + \delta\alpha[\![p_H[A_H + \hat{W}(1-T_C) + H_1] + (1-p_H)L]\!] \\ & + \delta\zeta[\![p_H X_H + (1-p_H)X_L - \alpha[p_H(A_H + \hat{W}(1-T_C) + H_1) + (1-p_H)L]]\!] \end{aligned} \tag{49}$$

The bad firm's manager who is playing the pooling equilibrium strategy derives the following utility:

$$\begin{aligned} I_{BFE} = \; & \alpha(A_0 + H_0) + \zeta[X_0 - \alpha(A_0 + H_0)] \\ & + \delta\zeta[\![p[p_H X_H + (1-p_H)X_L] + (1-p)[p_L X_H + (1-p_L)X_L]]\!] \\ & - \delta\alpha\zeta[\![[pp_H + (1-p)p_L](A_H + H_1) + [p(1-p_H) + (1-p)(1-p_L)]L]\!] \\ & + \delta\alpha[p_L(A_H + H_1) + (1-p_L)L] \\ & + \delta\zeta[\![p_L X_H + (1-p_L)X_L - \alpha[p_L(A_H + H_1) + (1-p_L)L]]\!] \end{aligned} \tag{50}$$

The bad firm's manager who deviates from the pooling equilibrium strategy derives the following utility:

$$\begin{aligned} I_{BFD} = \; & \alpha[A_0 - \hat{W}(1-T_C) + H_0] + \zeta[X_0 - \alpha(A_0 - \hat{W}(1-T_C) + H_0)] \\ & + \delta\zeta[\![p_L X_H + (1-p_L)X_L - \alpha[p_L(A_H + \hat{W}(1-T_C) + H_1) + (1-p_L)L]]\!] \\ & + \delta\alpha[\![p_L[A_H + \hat{W}(1-T_C) + H_1] + (1-p_L)L]\!] \\ & + \delta\zeta[\![p_L X_H + (1-p_L)X_L - \alpha[p_L(A_H + \hat{W}(1-T_C) + H_1) + (1-p_L)L]]\!] \end{aligned} \tag{51}$$

It is clear from the previous equations that $\forall \hat{W}$, $I_{GFE} \geq I_{GFD}$ and $I_{BFE} \geq I_{BFD}$.
The pooling PBE therefore always obtains.

Appendix B

B1 Sequential Equilibrium (Proof)

Fudenberg and Tirole (1991) have shown that any Perfect Bayesian Equilibrium constitutes a Sequential Equilibrium as long as there are less than two stages in the game.

B2 D1 Criterion (Proof)

We first prove that no pooling equilibrium, in which the managers of both the good and bad firms do report a discretionary write-down W where $0 \leq W < W_{Max}$, satisfies the D1 strategic refinement designed by Cho and Kreps (1987). Let us therefore assume that such a pooling PBE does obtain and consider an out-of-equilibrium write-down $\hat{W}$ in the neighbourhood of W, where $W < \hat{W} < W_{Max}$. We then define ∇_G so as to satisfy the following equation:

$$\begin{aligned} I_{GF} = {} & \alpha[A_0 - \hat{W}(1-T_C) + H_0] + \zeta \hat{V}_G + \delta\alpha[\![p_H[A_H + \hat{W}(1-T_C) + H_1] + (1-p_H)L]\!] \\ & + \delta\zeta[\![p_H X_H + (1-p_H)X_L - \alpha[p_H(A_H + \hat{W}(1-T_C) + H_1) + (1-p_H)L]]\!] \\ = {} & \alpha[A_0 - W(1-T_C) + H_0] + \zeta[\![X_0 - \alpha[A_0 - W(1-T_C) + H_0]]\!] \\ & + \delta\zeta[\![p[p_H X_H + (1-p_H)X_L] + (1-p)[p_L X_H + (1-p_L)X_L]]\!] \\ & - \delta\alpha\zeta[\![[pp_H + (1-p)p_L][A_H + W(1-T_C) + H_1] + [p(1-p_H) + (1-p)(1-p_L)]L]\!] \\ & + \delta\alpha[\![p_H[A_H + W(1-T_C) + H_1] + (1-p_H)L]\!] \\ & + \delta\zeta[\![p_H X_H + (1-p_H)X_L - \alpha[p_H(A_H + W(1-T_C) + H_1) + (1-p_H)L]]\!] \end{aligned} \tag{52}$$

Similarly, we define ∇_B so as to satisfy the following equation:

$$\begin{aligned} I_{BF} = {} & \alpha[A_0 - \hat{W}(1-T_C) + H_0] + \zeta \hat{V}_B + \delta\alpha[\![p_L[A_H + \hat{W}(1-T_C) + H_1] + (1-p_L)L]\!] \\ & + \delta\zeta[\![p_L X_H + (1-p_L)X_L - \alpha[p_L(A_H + \hat{W}(1-T_C) + H_1) + (1-p_L)L]]\!] \\ = {} & \alpha[A_0 - W(1-T_C) + H_0] + \zeta[\![X_0 - \alpha[A_0 - W(1-T_C) + H_0]]\!] \\ & + \delta\zeta[\![p[p_H X_H + (1-p_H)X_L] + (1-p)[p_L X_H + (1-p_L)X_L]]\!] \\ & - \delta\alpha\zeta[\![[pp_H + (1-p)p_L][A_H + W(1-T_C) + H_1] + [p(1-p_H) + (1-p)(1-p_L)]L]\!] \\ & + \delta\alpha[\![p_L[A_H + W(1-T_C) + H_1] + (1-p_L)L]\!] \\ & + \delta\zeta[\![p_L X_H + (1-p_L)X_L - \alpha[p_L(A_H + W(1-T_C) + H_1) + (1-p_L)L]]\!] \end{aligned} \tag{53}$$

By combining (52) and (53), we obtain the following equation:

$$\zeta(\hat{V}_G-\hat{V}_B)=\alpha\delta(1-\zeta)(p_H-p_L)(W-\hat{W})(1-T_C) \tag{54}$$

From the previous equation, it is clear that $\nabla_G<\nabla_B$ since $\hat{W}>W$. The sets of market responses Ω_B and Ω_G inducing the managers of the bad and good firms to defect from their equilibrium actions are therefore as follows:

$$\begin{cases}\Omega_B=]\hat{V}_B, V_H] \\ \Omega_G=]\hat{V}_G, V_H]\end{cases} \tag{55}$$

where:

$$\begin{aligned}V_H\equiv\ & X_0-\alpha[A_0-W_{Max}(1-T_C)+H_1] \\ +\ & \delta[\![p_H X_H+(1-p_H)X_L-\alpha[p_H(A_H+W_{Max}(1-T_C)+H_1)+(1-p_H)L]]\!]\end{aligned} \tag{56}$$

and it is clear that:

$$\Omega_B\subset\Omega_G \tag{57}$$

When faced with the out-of-equilibrium write-down $\hat{W}$, investors should therefore believe that:

$$\mu(GF|\hat{W})=1 \tag{58}$$

But, these beliefs induce the manager of the good firm to defect from his equilibrium strategy. No pooling PBE, in which both good and bad firms do report a discretionary write-down $W<W_{Max}$, can therefore survive Cho and Kreps' D1 criterion.

We now prove that no non-efficient separating PBE can survive Cho and Kreps' D1 criterion. Let us therefore consider a separating PBE in which the equilibrium write-down reported by the manager of the good firm is larger than W^*. Whatever the response of the financial market, no bad firm would ever want to report an out-of-equilibrium write-down $\hat{W}$ in the neighbourhood of W, where $W^*<\hat{W}<W$. This is so because W^* is the value of the write-down for which the manager of the bad firm is indifferent between playing his equilibrium strategy and being identified as

the manager of a bad firm, and reporting W^* and being identified as the manager of a good firm. The manager of the good firm may however find it incentive compatible to report $\hat{W}$. Let us define $\hat{V}_G$ to satisfy the following equation:

$$\begin{aligned} I_{GF} = & \alpha[A_0 - \hat{W}(1-T_C) + H_0] + \zeta \hat{V}_G + \delta\alpha[\![p_H[A_H + \hat{W}(1-T_C) + H_1] + (1-p_H)L]\!] \\ & + \delta\zeta[\![p_H X_H + (1-p_H)X_L - \alpha[p_H(A_H + \hat{W}(1-T_C) + H_1) + (1-p_H)L]]\!] \\ = & \alpha[A_0 - W(1-T_C) + H_0] + \zeta[\![X_0 - \alpha[A_0 - W(1-T_C) + H_0]]\!] \\ & + \delta\zeta[\![p_H X_H + (1-p_H)X_L - \alpha[p_H(A_H + W(1-T_C) + H_1) + (1-p_H)L]]\!] \\ & + \delta\alpha[\![p_H[A_H + W(1-T_C) + H_1] + (1-p_H)L]\!] \\ & + \delta\zeta[\![p_H X_H + (1-p_H)X_L - \alpha[p_H(A_H + W(1-T_C) + H_1) + (1-p_H)L]]\!] \end{aligned} \tag{59}$$

The sets of market responses Ω_B and Ω_G inducing the managers of the bad and good firms to defect from their equilibrium actions are therefore as follows:

$$\begin{cases} \Omega_B = \varnothing \\ \Omega_G =]\hat{V}_G, V_H] \end{cases} \tag{60}$$

and it is clear that:

$$\Omega_B \subset \Omega_G \tag{61}$$

When faced with the out-of-equilibrium write-down $\hat{W}$, investors should therefore believe that:

$$\mu(GF|\hat{W}) = 1 \tag{62}$$

But, these beliefs induce the manager of the good firm to defect from his equilibrium strategy. No non-efficient separating PBE can therefore survive Cho and Kreps' D1 strategic refinement.

We now prove that the efficient separating PBE survives Cho and Kreps' D1 criterion. To do this, we have to consider two potential types of defections $\hat{W}$:

i) $0 < \hat{W} < W^*$

ii) $W^* < \hat{W}$

i) Let us first consider a defection $\hat{W}$, where $0 < \hat{W} < W^*$. We already know that, in equilibrium, the manager of the bad firm is indifferent between his equilibrium

action and that of the manager of the good firm. More formally:

$$
\begin{aligned}
I_{BF} = \;& \alpha(A_0+H_0)+\zeta[X_0-\alpha(A_0+H_0)] \\
&+ \delta\zeta[[p_L X_H+(1-p_L)X_L-\alpha[p_L(A_H+H_1)+(1-p_L)L]] \\
&+ \delta\alpha[p_L(A_H+H_1)+(1-p_L)L] \\
&+ \delta\zeta[[p_L X_H+(1-p_L)X_L-\alpha[p_L(A_H+H_1)+(1-p_L)L]] \\
=\;& \alpha[A_0-W^*(1-T_C)+H_0]+\zeta[[X_0-\alpha[A_0-W^*(1-T_C)+H_0]] \\
&+ \delta\zeta[[p_H X_H+(1-p_H)X_L-\alpha[p_H(A_H+W^*(1-T_C)+H_1)+(1-p_H)L]] \\
&+ \delta\alpha[[p_L[A_H+W^*(1-T_C)+H_1]+(1-p_L)L]] \\
&+ \delta\zeta[[p_L X_H+(1-p_L)X_L-\alpha[p_L(A_H+W^*(1-T_C)+H_1)+(1-p_L)L]]
\end{aligned}
\tag{63}
$$

Let us define ∇_G so as to satisfy the following equation:

$$
\begin{aligned}
I_{GF} = \;& \alpha[A_0-\hat{W}(1-T_C)+H_0]+\zeta\hat{V}_G+\delta\alpha[[p_H[A_H+\hat{W}(1-T_C)+H_1]+(1-p_H)L]] \\
&+ \delta\zeta[[p_H X_H+(1-p_H)X_L-\alpha[p_H(A_H+\hat{W}(1-T_C)+H_1)+(1-p_H)L]] \\
=\;& \alpha[A_0-W^*(1-T_C)+H_0]+\zeta[[X_0-\alpha[A_0-W^*(1-T_C)+H_0]] \\
&+ \delta\zeta[[p_H X_H+(1-p_H)X_L-\alpha[p_H(A_H+W^*(1-T_C)+H_1)+(1-p_H)L]] \\
&+ \delta\alpha[[p_H[A_H+W^*(1-T_C)+H_1]+(1-p_H)L]] \\
&+ \delta\zeta[[p_H X_H+(1-p_H)X_L-\alpha[p_H(A_H+W^*(1-T_C)+H_1)+(1-p_H)L]]
\end{aligned}
\tag{64}
$$

Similarly, let us define ∇_B so as to satisfy the following equation:

$$
\begin{aligned}
I_{BF} = \;& \alpha[A_0-\hat{W}(1-T_C)+H_0]+\zeta\hat{V}_G+\delta\alpha[[p_L[A_H+\hat{W}(1-T_C)+H_1]+(1-p_L)L]] \\
&+ \delta\zeta[[p_L X_H+(1-p_L)X_L-\alpha[p_L(A_H+\hat{W}(1-T_C)+H_1)+(1-p_L)L]] \\
=\;& \alpha(A_0+H_0)+\zeta[X_0-\alpha(A_0+H_0)] \\
&+ \delta\zeta[[p_L X_H+(1-p_L)X_L-\alpha[p_L(A_H+H_1)+(1-p_L)L]] \\
&+ \delta\alpha[p_L(A_H+H_1)+(1-p_L)L] \\
&+ \delta\zeta[[p_L X_H+(1-p_L)X_L-\alpha[p_L(A_H+H_1)+(1-p_L)L]]
\end{aligned}
\tag{65}
$$

By replacing (64) and (65) into (63), we obtain:

$$
\zeta(\hat{V}_G-\hat{V}_B)=\delta\alpha(1-\zeta)(1-T_C)(p_H-p_L)(W^*-\hat{W}) \tag{66}
$$

From the previous equation, it is clear that $\nabla_G > \nabla_B$ since $W^* > \hat{W}$. The sets of market responses Ω_B and Ω_G inducing the managers of the bad and good firms to defect from their equilibrium actions are therefore as follows:

$$\begin{cases} \Omega_B =]\hat{V}_B, V_H] \\ \Omega_G =]\hat{V}_G, V_H] \end{cases} \tag{67}$$

where:

$$\begin{aligned} V_H \equiv \quad & X_0 - \alpha [A_0 - W_{Max}(1-T_C) + H_1] \\ + \quad & \delta [\![p_H X_H + (1-p_H) X_L - \alpha [p_H (A_H + W_{Max}(1-T_C) + H_1) + (1-p_H) L]]\!] \end{aligned} \tag{68}$$

and it is clear that:

$$\Omega_G \subset \Omega_B \tag{69}$$

When faced with an out-of-equilibrium write-down $\hat{W}$, investors should therefore believe that:

$$\mu(BF \mid \hat{W}) = 1 \tag{70}$$

But, given these beliefs, no manager wishes to defect from his equilibrium strategy.

ii) Alternatively, let us consider a defection $\hat{W}$, where $W^* < \hat{W}$. Even if investors believe with probability one that the defector is a good firm, no firm will ever wish to defect.

It has been shown that no firm will ever wish to defect. The efficient PBE thus satisfies Cho and Kreps' D1 strategic refinement.

B3 Ultimate Divinity and NWBR (Proof)

Cho and Sobel (1990) show that, for any monotonic signalling game, criteria D1 and NWBR are equivalent to universal divinity. The equivalence between D1 and universal divinity is trivial to establish in games comprising two types of players, since with two types of players the definitions of the D1 and universal divinity

criteria do not differ. For illustration purposes only, we shall prove the equivalence of the D1 and NWBR in the context of our model.

We first prove that no pooling PBE, in which the managers of both the good and bad firms do report a discretionary write-down W where $W < W_{Max}$, satisfies the NWBR strategic refinement designed by Kohlberg and Mertens (1986). Let us therefore assume that such a pooling PBE does obtain and consider an out-of-equilibrium write-down $\hat{W}$ in the neighbourhood of W, where $W < \hat{W} < W_{Max}$. Let us consider ∇_B, as defined by Equation (53) and representing the financial market's valuation of the bad firm for which the manager of the bad firm would be indifferent between playing his pooling equilibrium strategy and deviating to the out-of-equilibrium write-down $\hat{W}$. It is clear that ∇_B is included in Ω_G, the set of market responses for which the manager of the good firm would be willing to play the out-of-equilibrium write-down $\hat{W}$. When faced with an out-of-equilibrium write-down $\hat{W}$, the financial market should thus believe that any defector is a good firm. But these beliefs do induce the manager of the good firm to defect from his equilibrium strategy when $\hat{W}$ is close enough to W. No pooling PBE, in which both good and bad firms do report a discretionary write-down $W < W_{Max}$, can therefore survive Kohlberg and Mertens' NWBR criterion.

We now prove that no non-efficient separating PBE can survive Kohlberg and Mertens' NWBR criterion. Let us therefore consider a separating PBE in which the equilibrium write-down reported by the manager of the good firm is larger than W^*. Let us also consider the out-of-equilibrium write-down $\hat{W}$, where $\hat{W} = W^*$. We then consider ∇_B representing the financial market's valuation of the bad firm for which the manager of the bad firm would be indifferent between playing his separating equilibrium strategy and deviating to the out-of-equilibrium write-down $\hat{W}$. It is clear that $\nabla_B = V_H$ is included in Ω_G, the set of market responses for which the manager of the good firm would be willing to play the out-of-equilibrium write-down $\hat{W}$. When faced with an out-of-equilibrium write-down $\hat{W}$, the financial market should thus believe that any defector is a good firm. But these beliefs do induce the manager of the good firm to defect from his equilibrium strategy. No non-efficient

separating PBE can therefore survive Kohlberg and Mertens' NWBR criterion.

We now prove that the efficient separating PBE survives Kohlberg and Mertens' NWBR criterion. To do this, we have to consider two potential types of defections $\hat{W}$:

i) $0 < \hat{W} < W^*$

ii) $W^* < \hat{W}$

i) Let us first consider a defection $\hat{W}$, where $0 < \hat{W} < W^*$. From Equation (66), it is clear that ∇_G representing the financial market's valuation of the good firm, for which the manager of the good firm would be indifferent between playing his separating equilibrium strategy and deviating to the out-of-equilibrium write-down $\hat{W}$, exceeds ∇_B representing the financial market's valuation of the bad firm, for which the manager of the bad firm would be indifferent between playing his separating equilibrium strategy and deviating to the out-of-equilibrium write-down $\hat{W}$. ∇_G is therefore included in Ω_B, the set of market responses for which the manager of the bad firm would be willing to play the out-of-equilibrium write-down $\hat{W}$. When faced with an out-of-equilibrium write-down $\hat{W}$, the financial market should thus believe that any defector is a bad firm. But, given these beliefs, no manager wishes to defect from his equilibrium strategy.

ii) Alternatively, let us consider a defection $\hat{W}$, where $W^* < \hat{W}$. Even if investors believe with probability one that the defector is a good firm, no firm will ever wish to defect.

It has been shown that no firm will ever wish to defect. The efficient PBE thus survives Kohlberg and Mertens' NWBR strategic refinement.

B4 Proposition 6 (Proof)

Let us assume that a separating equilibrium obtains at t_0. Prior to t_0, the market value of a given firm satisfies the following equation:

$$V_{0P}=p\,V_G+(1-p)\,V_B \tag{71}$$

where:

$$\begin{cases} V_G\equiv & X_0-\alpha\,[A_0-W(1-T_C)+H_0] \\ & +\ \delta\,[\![p_H X_H+(1-p_H)X_L-\alpha\,[p_H(A_H+W(1-T_C)+H_1)+(1-p_H)L]]\!] \\ V_B\equiv & X_0-\alpha\,(A_0+H_0)+\delta\,[\![p_L X_H+(1-p_L)X_L-\alpha\,[p_L(A_H+H_1)+(1-p_L)L]]\!] \end{cases} \tag{72}$$

The good firm's market value V_{0G} prevailing at t_0, on the announcement date of the accounting choice, is V_G. Similarly, the bad firm's market value V_{0B} prevailing at t_0, on the announcement date of the accounting choice, is V_B.

The market reactions to the announcement are therefore as follows:

$$\begin{cases} V_{0G}-V_{0P}=(1-p)(V_G-V_B)>0 \\ V_{0B}-V_{0P}=p(V_B-V_G)<0 \end{cases} \tag{73}$$

Appendix C

C1 Proposition 7 (Proof)

The First Order Condition can be written as:

$$\left.\frac{d\Pi[q,q(W),W]}{dW}\right|_{W=W^*} = -\alpha(1-\zeta)(1-T_C) + \delta\zeta\left.\frac{dq(W)}{dW}\right|_{W=W^*}[(X_H-X_L)-\alpha[A_H+W^*(1-T_C)+H_1-L]] - \delta\alpha\zeta(1-T_C)q(W^*)+\delta\alpha(1-\zeta)(1-T_C)q = 0 \quad (74)$$

But, in equilibrium,

$$q[W^*(q)]=q \quad (75)$$

The First Order Condition may thus be rewritten as:

$$-A+(C-DW)\frac{dq(W)}{dW}+Bq(W)=0 \quad (76)$$

where:

$$\begin{cases} A\equiv\alpha(1-\zeta)(1-T_C) \\ B\equiv\delta\alpha(1-2\zeta)(1-T_C) \\ C\equiv\delta\zeta[(X_H-X_L)-\alpha(A_H+H_1-L)] \\ D\equiv\delta\alpha\zeta(1-T_C) \end{cases} \quad (77)$$

Let us assume, for a moment, that the following Inequalities are satisfied:

$$\begin{cases} C-DW>0 & \forall W\in[0,W_{Max}] \\ A-Bq>0 & \forall q\in[0,1] \end{cases} \quad (78)$$

Equation (76) is therefore equivalent to the following one:

$$\frac{dq(W)}{A-Bq(W)}=\frac{dW}{C-DW} \quad (79)$$

If B differs from zero, solutions to this differential equation are as follows:

$$-\frac{1}{D}\ln(C-D\,W)=-\frac{1}{B}\ln(A-Bq(W))+Cte \tag{80}$$

The particular equilibrium valuation schedule q(W) which Pareto-dominates all others (the efficient one) is the one which has the following property:

$$q(0)=0 \tag{81}$$

The boundary condition implies that:

$$Cte=\ln(A^{\frac{1}{B}})-\ln(C^{\frac{1}{D}}) \tag{82}$$

The efficient equilibrium valuation schedule q(W) is therefore as follows:

$$q(W)=\frac{A}{B}[1-(1-\frac{D}{C}W)^{\frac{B}{D}}] \tag{83}$$

Equivalently,

$$W(q)=(\frac{C}{D})[1-(1-\frac{B}{A}q)^{\frac{D}{B}}] \tag{84}$$

W(q) and q thus satisfy Inequalities (78). It can furthermore be shown that W(q) is implementable, that is, $\forall q\ W(q)\leq W_{Max}$, as long as ζ is small enough[24]. This follows from the following derivation:

$$\lim_{\zeta \to 0} W(q) = 0 \tag{85}$$

Before concluding that the equilibrium valuation schedule q(W) meets our requirements, we have however still to show that it maximises rather than minimises I. In order to check whether this condition is met, we check the Second-Order Condition.

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[24] The propositions developed in this section can be extended to deal with B=0 by taking the limits of q(W) and W(q) when B tends toward 0.

The first derivative of I with respect to W can be rewritten as:

$$\frac{dI[q,q(W),W]}{dW} = -A + (C - D\,W)\frac{dq(W)}{dW} - D\,q(W) + E\,q = 0 \tag{86}$$

where:

$$\begin{cases} A \equiv \alpha\,(1-\zeta)(1-T_C) \\ C \equiv \delta\,\zeta\,[(X_H - X_L) - \alpha\,(A_H + H_1 - L)] \\ D \equiv \delta\,\alpha\,\zeta\,(1-T_C) \\ E \equiv \delta\,\alpha\,(1-\zeta)(1-T_C) \end{cases} \tag{87}$$

The second derivative of I with respect to W can thus be written as:

$$\frac{d^2I[q,q(W),W]}{dW^2} = (C - D\,W)\frac{d^2q(W)}{dW^2} - 2\,D\frac{dq(W)}{dW} \tag{88}$$

But:

$$q(W) = \frac{A}{B}\left[1 - \left(1 - \frac{D}{C}\,W\right)^{\frac{B}{D}}\right] \tag{89}$$

$$\frac{dq(W)}{dW} = \frac{A}{C}\left(1 - \frac{D}{C}\,W\right)^{\frac{B}{D}-1} \tag{90}$$

$$\frac{d^2q(W)}{dW^2} = -\frac{A}{C^2}(B-D)\left(1 - \frac{D}{C}\,W\right)^{\frac{B}{D}-2} \tag{91}$$

By doing the appropriate substitutions, one can write that:

$$\frac{d^2I[q,q(W),W]}{dW^2} = -A\,(B+D)\,C^{-\frac{B}{D}}(C - D\,W)^{\frac{B}{D}-1} \tag{92}$$

The equilibrium valuation schedule W(q) thus maximises the manager's utility function since:

$$B+D>0 \tag{93}$$

and:

$$\frac{d^2\Pi[q,q(W),W]}{dW^2} \leq 0 \tag{94}$$

C2 Proposition 8 (Proof)

By differentiating V_0 with respect to W, we can see that:

$$\begin{aligned} \frac{dV_0[q(W),W]}{dW} &= \frac{\partial V_0}{\partial W}+\frac{\partial V_0}{\partial q}\frac{dq(W)}{dW} \\ &= \alpha(1-T_C)[1-\delta q(W)]+\delta[\![X_H-X_L-\alpha[A_H+W(1-T_C)+H_1-L]]\!]\frac{dq(W}{dW} \\ &> 0 \end{aligned} \tag{95}$$

Proposition 8 thus obtains.

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CHAPTER 9

DISCRETIONARY ACCOUNTING CHOICES: A UNIFYING FRAMEWORK

The previous chapters introduce a number of models seeking to explain discretionary accounting choices in a world in which there is an asymmetry of information between the manager and the financial markets about the firm's future earnings and cash-flows. The aim of this chapter is to bring together and assess the relative merits of the various signalling mechanisms introduced in this thesis. The first part of this chapter introduces necessary conditions for accounting choices to act as signals. It then provides a non-exhaustive list of accounting choices which may be used by managers to signal their private information. The second part of this chapter provides a comparative analysis of a number of signalling mechanisms including the one developed by Hughes and Schwartz (1988) and those introduced in the previous chapters. It associates each signalling mechanism with accounting choices which may potentially be used as signals. These potential signals may then be used to test the various models discussed in this chapter. The third and last part of this chapter provides testable implications of these models versus the main alternative categories of discretionary accounting choice models and offers an interpretation of the implications of the existing empirical work for the relative merit of the various models.

9.1 Discretionary Accounting Choices As Signals

The existing empirical literature on discretionary accounting choices focuses on choices related to depreciation, interest, inventory valuation, investment tax credits, oil and gas exploration costs, and unfunded pension liabilities. Managers do indeed make choices of accounting policies in such areas as inventory valuation, FIFO versus LIFO; depreciation, accelerated versus straight-line; or the treatment of investment tax credits, flow-through versus deferral. In addition to the selection of accounting methods, managers may also exercise discretion over intramethod variations, such as the length of amortising periods and the choice of residual values,

over the timing of write-downs for recognising asset value impairments, and over the level of anticipated loss reserves. Last but not least managers may exercise some discretion over the timing of recognition of both revenue and costs.

For accounting choices to serve as signals, changes must be "visible". Investors must be able to infer from the financial statement that a change took place. Investors must also be able to quantify the effect of a change. Changes in accounting methods meet these requirements both in the UK and in the US. US accounting standards, APB Opinion No 20, call for the use of the current effort method in order to account for changes in accounting policies. The use of the current effort method requires that pro-forma data on income and earnings per share be displayed for all prior periods presented. APB Opinion No 20 permits in a limited number of circumstances the use of the retroactive method. The use of the retroactive method requires the restatement of the financial statements of all prior periods presented and the disclosure in the year of change of the effect on net income and earnings per share for all prior periods presented. UK accounting standards, SSAP 2, require that prior year adjustments be made with respect to changes in accounting policies. In any case, investors are provided with information on the effect of a change in accounting policy.

Material changes in estimates do also pass the "visibility test". US accounting standards (APB Opinion No 20) explicitly state that "Disclosures should be made in current period financial statements of the effects of a change in an accounting estimate on income before extraordinary items, net income, and earnings per share data. If a change in an accounting estimate affects future periods, the effect should be disclosed on income before extraordinary items, net income, and earnings per share data in the income statement".

For accounting choices to serve as signals, they must also be discretionary. The conceptual accounting framework does indeed allow the rule of preferability to supersede the principle of consistency. In other words, consistency does not constrain change in the presence of a preferred accounting choice. The presumption

in both the UK (SSAP 6) and US (APB Opinion No 20) conceptual accounting frameworks is that an accounting procedure or an intramethod variation should not be changed once it has been accepted. This presumption is sustained by the pervasive principle of consistency. An accounting procedure or intramethod variation may however be changed if the alternative procedure is preferable, that is, if the alternative procedure possesses a higher degree of representative faithfulness. Measuring the degree of representative faithfulness exhibited by a given accounting procedure or intramethod variation is however not an easy task. This problem of measurability provides managers with some discretion and enables them to change a given accounting procedure. They would however not be allowed to reverse their decisions in the subsequent periods.

The Appendix to this chapter reviews some selected areas in which managers may exercise some discretion over "visible" accounting choices such as choices of accounting procedures both in the United Kingdom and the United States. For each of these discretionary accounting choices, it specifically describes the effect of the choice on reported income and some key accounting variables used in debt covenants.

This section introduced a number of accounting choices which may be considered as income-decreasing under "mild" regularity conditions. Most of these income-decreasing accounting choices are also balance-sheet weakening. Exceptions include the capitalisation and amortisation of goodwill, the recognition of specifically identifiable intangible fixed assets, and the revaluation of depreciable fixed assets, which are income-decreasing and balance-sheet strengthening. The use of one of these income-decreasing accounting choices, the FIFO inventory valuation method, has furthermore a positive effect on cash-flows.

9.2 A Comparative Summary Of The Existing Signalling Mechanisms

In both the signalling models presented in the last chapters and the signalling model introduced by Hughes and Schwartz (1988), there is an information asymmetry

between the manager and the financial market about the firm's future performance. The manager of the firm has some inside information about future earnings and cash-flows, but cannot directly communicate it without moral hazard. It is the choice of an accounting procedure or intramethod variation which enables the manager to credibly reveal his private information.

In the model presented by Hughes and Schwartz [HS,(1988)], the manager of the firm has to choose between the FIFO and LIFO methods of valuing inventory. He takes his decision, recognising that his compensation function depends on both the current and future market value of his firm. In the separating equilibrium, firms with good prospects can signal their quality by choosing FIFO. The mechanism by which these firms identify themselves is that they forego the tax benefits associated with LIFO. This, in turn, makes it more likely that they will be unable to meet their debt repayment requirements and incur bankruptcy costs.

Hughes, Schwartz, and Thakor [HST,(1991)] extend HS to cope with a continuum of types of firms by allowing managers to communicate the quality of their firms by using both capital structure and inventory accounting methods as signalling devices. When allowed to use both capital structure and accounting methods as signals, managers select the most efficient signalling mechanisms with which to reveal their quality by trading off the costs of FIFO with the costs of debt. As stated by HST, "Managers of high quality firms who find signalling with debt under LIFO to be too costly - because they must employ very high debt levels to discourage mimicry - may find it optimal to impair firm value with FIFO so that signalling can be achieved with lower debt".

In both HS and HST, there is no uniqueness of the FIFO signal. The FIFO choice is not more effective than other means of impairing the firm's value. Bar-Yosef, Hughes, and Venezia [BHV,(1993)] provide the accounting literature with a model offering both a unique signalling explanation for the use of the FIFO accounting choice and an extension of HS to a continuum of types. In this model, the choice of FIFO signals low growth of nominal production costs. The manager of a firm

with low growth of nominal production costs chooses FIFO because the tax advantage from using LIFO is smaller for his firm than it is for less efficient firms.

In all the models derived from Hughes and Schwartz (1988) - that is, HS, HST, and BHV - the choice of FIFO as a method of valuing inventory is essentially a decision to reduce cash-flows. The effect of the accounting choice on the firm's financial statement is not relevant. Conversely, in the models introduced in the previous chapters of this thesis, the accounting choice is essentially a decision to affect the firm's reported income or balance sheet. The accounting choice has no direct effect on the firm's cash-flow. In contrast to the HS, HST, and BHV, it is the adoption of conservative accounting policies which signals strength in each of the models introduced in the previous chapters. The adoption of conservative accounting policies may be interpreted in the context of this thesis as the adoption of either earning-reducing or balance sheet weakening policies. This interpretation is broadly in line with the meaning of conservative accounting used in the accounting jargon. Generally Accepted Accounting Practices (GAAP) recommend that directors recognise immediately all potential costs and liabilities and defer the recognition of revenue until revenue accrues.

In the model presented in Chapter 5, which will be referred to as *Model A*, signalling is driven by either *the concavity of managers' compensation plans* such as bonus plans or *risk-aversion*. The manager of the firm must select an accounting procedure to account for the firm's economic earnings. He takes his decision, recognising that his decision affects his compensation which is assumed to depend on both the firm's stock price and reported earnings. Selecting an income-decreasing accounting is costly to the manager of any firm because of the adverse impact of the accounting choice on reported earnings, and thus, on the manager's compensation. Selecting an income-decreasing accounting is however less costly to the manager of a firm expecting higher economic earnings in the future than it is to the manager of a firm expecting lower economic earnings in the future because of the concavity of managers' compensation plans such as bonus plans or risk-aversion. In a separating equilibrium, the manager of a firm with good prospects may thus signal the quality

of his firm by selecting an income-decreasing accounting procedure.

In the model presented in Chapter 6, which will be referred to as *Model B*, signalling is driven by *costs of breaching debt covenants*. Chapter 6 introduces a firm whose capital structure includes some debt. Debtholders are protected by accounting-based debt covenants. As in Chapter 5, the manager of the firm must select an accounting procedure to account for the firm's economic earnings. The accounting procedure chosen by the manager may or may not be conservative, a conservative accounting procedure being income-decreasing or balance-sheet weakening. The manager takes his decision, recognising that his objective function depends on both the intrinsic and market values of his firm's equity. Selecting a conservative accounting procedure is costly to the manager of any firm because of its adverse impact on the probability of seeing his firm breach its accounting-based debt covenants. Selecting a conservative accounting procedure is however less costly to the manager of a firm expecting higher economic earnings in the future than it is to the manager of a firm expecting lower economic earnings in the future as long as the probability of seeing the firm breach its debt covenants does not exceed 0.5. In a separating equilibrium, the manager of a firm with good prospects may thus signal the quality of his firm by selecting conservative accounting procedures.

In the model presented in Chapter 7, which will be referred to as *Model C*, signalling is driven by *rules governing the recognition for financial reporting purposes of the taxation credit associated with provisions*. Chapter 7 introduces a firm undergoing a crisis and finding itself in a non-tax paying position. The manager may report a provision, write-down or write-off of a non-depreciable asset, which will be referred to as a discretionary provision. If the manager abstains from reporting a discretionary provision at the current date, he does not have to report one at a later date. The manager takes his decision, recognising that his decision affects his compensation which is assumed to depend on both the firm's stock price and reported earnings. Reporting a discretionary provision is costly to the manager of any firm because of the adverse effect of the provision on reported earnings, and thus, on the manager's compensation. Reporting a discretionary provision is

however less costly to the manager of a firm expecting higher earnings in the future than it is to the manager of a firm expecting lower earnings in the future because the manager of the firm expecting higher earnings is more likely to see taxable profits in the future and is thus more likely to benefit from a deferred benefit associated with the discretionary provision. This deferred benefit consists of the recognition for financial reporting purposes of the taxation credit associated with the discretionary provision. In a separating equilibrium, the manager of a firm with good prospects may thus signal his quality by reporting discretionary provisions.

In the model presented in Chapter 8, which will be referred to as *Model D*, signalling is driven by the fact that the recognition of expenses at a later date rather than at the current date is more beneficial to managers of firms expecting poorer future earnings. This property may for instance be induced by managers' bonus plans which are capped below. In this model, the manager of the firm must decide whether or not to report a write-down, write-off, or any other provision, which will be referred to as a discretionary write-down. If he abstains from reporting this write-down at the current date, he will have to report it at a later date. The manager takes his decision, recognising that his decision affects his compensation which is assumed to depend on both the firm's stock price and reported earnings. Reporting a discretionary write-down is costly to the manager of any firm because it consists in transferring earnings from the current date, date at which marginal earnings make a positive contribution to the manager's compensation, to a later date, date at which marginal earnings may not make a positive contribution to the manager's compensation. Reporting a discretionary write-down is however less costly to the manager of a firm expecting higher earnings in the future than it is to the manager of a firm expecting lower earnings in the future because the manager of a firm expecting higher earnings in the future is more likely to benefit from incremental earnings obtaining at later dates. In a separating equilibrium, the manager of a firm with good prospects may thus signal the quality of his firm by reporting a discretionary write-down.

9.3 Testable Implications

The signalling models derived from Hughes and Schwartz (1988) explain why some firms continue to use the FIFO inventory valuation procedure, foregoing significant tax savings. These same models predict that firms switching to the LIFO inventory valuation procedure should see lower cash-flows in the subsequent periods than those continuing to use the FIFO inventory valuation procedure. These same models thus predict that LIFO adoptions should be accompanied by negative stock price changes[1].

In the signalling models derived from Hughes and Schwartz (1988), it is the use of LIFO, a conservative inventory valuation procedure, which conveys bad news to the financial market. In contrast to Hughes and Schwartz (1988), it is the use of conservative accounting procedures which conveys good news to the financial market in the signalling models introduced in the previous chapters.

Model A explains why some firms switch to income-decreasing accounting procedures. Model A predicts that firms switching to income-decreasing (income-increasing) accounting procedures should see higher (lower) earnings and cash-flows in the subsequent periods than those continuing to use more income-increasing (income-decreasing) accounting procedures. This same model thus predicts that switches to income-decreasing (income-increasing) accounting procedures should be accompanied by positive (negative) stock price changes. The more income-decreasing or income-increasing the accounting procedure, the larger the price change.

Model B explains why some firms switch to more conservative, that is, to income-increasing or balance-sheet weakening, accounting procedures. Model A predicts that firms switching to more (less) conservative accounting procedures should see

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1 Hughes and Schwartz (1988) claim that LIFO adoptions could also be accompanied by positive stock price changes. Positive stock price changes may however only occur if the separating equilibrium was not anticipated by investors.

higher (lower) earnings and cash-flows in the subsequent periods than those continuing to use less (more) conservative accounting procedures. This same model thus predicts that switches to more (less) conservative accounting procedures should be accompanied by positive (negative) stock price changes. The more conservative the accounting procedure, the larger the price change.

Model C explains why some firms undergoing difficulties report discretionary (non-cash) provisions. Model C predicts that firms which do report discretionary provisions should see higher earnings and cash-flows in the subsequent periods than those who do not report any discretionary provisions. This same model thus predicts that discretionary provisions should be accompanied by positive stock price changes. The larger the discretionary provision, the larger the price change.

Model D explains why some firms, whose earnings are neither abnormally low nor abnormally high, report discretionary write-downs, write-offs, and other provisions. Model D predicts that firms which do report discretionary write-downs should see higher earnings and cash-flows in the subsequent periods than those who do not report any discretionary write-downs. This same model thus predicts that discretionary write-downs should be accompanied by positive stock price changes. The larger the discretionary write-down, the larger the price change.

9.4 Empirical Evidence

Most empirical studies provide tests of the opportunistic behaviour perspective. These studies take the firm's observed contracts as given and then determine managers' incentives for accounting choices. Managers are thus assumed to choose accounting methods to transfer wealth to themselves or to existing shareholders at the expense of another party to the firm or the economy. In the management compensation hypothesis, managers are assumed to choose income-increasing accounting procedures to increase the present value of their bonuses. In the lending agreements hypothesis, managers are assumed to choose income-increasing accounting procedures to relax debt constraints and reduce the expected costs of

technical default. In the political visibility hypothesis, managers are assumed to choose income-decreasing accounting procedures to minimise any present or future political costs that could be imposed on them.

A number of recent empirical studies, such as Malmquist (1990) and Mian and Smith (1990), do however provide tests of the efficient contracting perspectives. But, as reported by Watts and Zimmerman (1990), "No study to date has explained both the ex-ante choice of the accepted set (of accounting methods) and the ex-post choice of accounting methods from within the accepted set". Distinguishing empirically between the opportunistic behaviour and the efficient contracting perspectives then turns out to be difficult[2]. Few, if any, of these empirical studies do succeed in determining which of these two competing perspectives is more consistent with the reported empirical evidence. This issue is highlighted by Holthausen (1990) in the context of the lending agreements hypothesis. Malmquist (1990), for instance, claims that:

> "Besides the issue of negative equity, the active monitoring of debt covenants can be problematic for both the lender and the borrower if the accounting values being monitored contain large components of white noise variation relative to variation in the underlying values of these phenomena. False signals of financial distress can cause unnecessary default and costly renegotiation proceedings that are better avoided...".

Malmquist (1990) then observes that firms with high debt to equity ratios will tend to present exaggerated variance in this variable under the successful efforts method and hypothesises that "Ceteris paribus, the higher the debt to equity ratio, the greater the likelihood that a firm will choose full cost". For similar reasons, Malmquist (1990) hypothesises that "Ceteris paribus, the greater the proportion of a firm's resources devoted to drilling and exploration, the greater the likelihood it will choose full cost". Holthausen (1990) states however that:

> "Lilien and Pastena (1982)...take the opportunistic behaviour perspective for at least some of their predictions... They argue that (oil and gas) firms with

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2 It could even be argued that it is impossible to distinguish between the opportunistic behaviour and the efficient contracting perspectives since the opportunistic behaviour perspective may be considered as a sub-perspective of the efficient contracting perspective. The reason for this is that, in a principal-agent framework, the set of equilibrium (optimal) strategies may require from the agent that he behaves opportunistically.

> high debt to equity ratios are closer to default and will thus want to relax those constraints by choosing full cost. Moreover, they argue for similar reasons that firms with more explanatory risk will be more likely to choose full-cost. While Malmquist (1990) and Lilien and Pastena (1982) do not use precisely the same measures of explanatory risk and debt-to-equity ratios, the predictions of the two papers with respect to the association between accounting method choice and these variables are identical. Moreover, both find evidence consistent with their hypotheses. Unfortunately, since the predictions of the Malmquist and Lilien and Pastena papers are identical, there is no way to determine which of these competing, but not mutually exclusive hypotheses is more consistent with the data".

Casual empiricism and journalistic accounts provide some support to the signalling version of the information perspective. In a discussion of the mechanistic perspective, Kieso and Weygandt (1992) state, for instance, that:

> "In fact, research in this area reports just the opposite. One study showed that companies that switched from accelerated to straight-line experienced declines in stock value after the change [Kaplan and Roll, (1972)]. Others have noted that switches to more liberal accounting policies have resulted in lower stock market performance. One rationale is that such changes signal that the company is in trouble and also leads to skepticism about management's attitudes and behaviour [Hawkins and Campbell (1978), Harrison (1977)]".

Kieso and Weygandt's comments may reflect casual empiricism and journalistic accounts. Their interpretation of the evidence provided by the papers quoted in the above paragraph may however be challenged. The problem with their interpretation is that, although these empirical papers do indeed provide evidence of negative share price reactions to switches to more liberal accounting policies, the negative share price reactions tend to occur weeks after the announcements. These empirical studies present furthermore a few problems, one of the most important being the fact that they do not control for surprises in current earnings.

Few empirical studies provide direct tests of the signalling version of the information perspective. Most of those which do provide direct tests of the signalling version of the information perspective deal either with discretionary write-downs or with choices of inventory valuation procedures. Empirical tests of choices of inventory valuation procedures provide some support to the models derived from Hughes and Schwartz (1988) [Dopuch and Pincus (1988)]. Empirical tests of discretionary write-

downs would also appear to provide Model D with some support [Elliott and Shaw (1988), Strong and Meyer (1987), and Zucca and Campbell (1992)].

It can furthermore be argued that the evidence reported in the empirical literature is at least "weakly" consistent with the signalling version of the information perspective. In the context of the management compensation hypothesis, early cross-sectional studies, such as the one published by Zmijewski and Hagerman (1981), show that managers of firms endowed with bonus plans are more likely to select income-increasing accounting procedures. This evidence is consistent with the predictions of Model A. In Model A, the manager of the bad firm, that is, the manager of the firm expecting low earnings in the future, only chooses income-increasing accounting procedures. The manager of the good firm, that is, the manager of the firm expecting high earnings in the future, chooses a portfolio of income-increasing and income-decreasing accounting procedures, the proportion of income-decreasing procedures being the minimum required to differentiate himself from the manager of the bad firm. More recent cross-sectional studies, such as the one published by Healy (1985), also provide evidence which is consistent with Model A. Healy (1985) finds out that firms' accounts are more likely to reveal income-decreasing accruals when their managers' bonus plans upper and lower bounds are binding. Managers are however shown not to change accounting procedures to decrease earnings when the bonus plan upper or lower bounds are binding. This would appear to be consistent with Model A, which predicts that managers expecting abnormally high earnings may switch to more conservative accounting procedures in periods in which earnings are neither abnormally high nor abnormally low[3].

In the context of the lending agreements hypothesis, cross-sectional studies show that managers of firms with high debt to equity ratios tend to use income-increasing accounting procedures. This piece of evidence is consistent with the predictions generated by Model B. In Model B, for a given level of debt-to-equity ratio,

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3 Healy offers alternative explanations for the empirical regularity. It may be more costly for managers to transfer earnings between periods by changing accounting procedures than by changing accruals. The effect of a procedure change on the accounting numbers may also not proxy for the effect of a procedure change present value of the managers' bonus awards.

managers of bad firms, that is, managers of firms expecting low earnings in the future, choose more income-increasing accounting methods than managers of bad firms, that is, managers of firms expecting high earnings in the future. But, over time, lower earnings translate into higher debt-to-equity ratios. Thus, over time, managers of firms endowed with high debt-to-equity ratios tend to use income-increasing accounting procedures. The evidence reported by Beneish and Press (1993) and Holthausen (1981) would furthermore appear to favour the signalling version of the information perspective. Beneish and Press (1993) claim that "Relative to the 300 firms in Zmijewski and Hagerman (1981) or the 83 firms in Press and Weintrop (1990), violators choose accounting policies that are significantly more income-increasing in both the year preceding and five years prior to technical violation. Although violators' actions are consistent with the positive theory prediction of choosing income-increasing accounting techniques to reduce the likelihood of violation [Watts and Zimmerman (1986)], the evidence in year -5 shows that violators made such choices well before violation". Holthausen (1981) observes that the more debt a firm has outstanding, the more negative the abnormal performance at the time of the announcement of the change in depreciation methods.

9.5 Summary and Suggestions For Further Research

This thesis introduces a number of models seeking to explain discretionary accounting choices from an information perspective. In these models, discretionary accounting choices are used by managers to reveal their private information concerning future earnings and cash-flows in a world characterised by an information asymmetry between managers and investors. These models differ from prior models in a number of ways. First, the set of potential signals is not restricted to the choice of an inventory valuation method. Second, accounting choices are essentially decisions to affect the firm's reported income or balance sheet and not cash-flows. Third, it is the adoption of conservative accounting policies which signals strength.

The models introduced in this thesis rely on either the management compensation or on the lending agreements hypothesis. A review of the positive accounting theory

literature carried out in Chapter 4 provides evidence which is largely consistent with these hypotheses. With a few exceptions, academic studies fail however to distinguish amongst the competing hypotheses. This is due to the fact that most empirical studies of accounting choices are potentially ill-specified cross-sectional studies. These cross-sectional studies, which are typically used to explain accounting choices from contemporaneous variables proxying for managerial compensation plans, closeness to violation of debt covenants, and political sensitivity, are potentially misspecified in the following ways. First, if it is costly for firms to switch back and forth between accounting procedures, a firm's current accounting policies then depend not only on the current set of explanatory variables hypothesised to influence accounting policies, but also on past choices and explanatory variables. Second, most cross-sectional studies adopt indirect methods to account for the effect of debt covenants, management compensation schemes, and political sensitivity on accounting choices. Third, a potential misspecification results from ignoring the interaction effects amongst the different independent variables. Fourth, most cross-sectional studies just assume that a given accounting procedure is income-increasing (or income-decreasing). A given accounting procedure may however be income-increasing in one type of situation and income-decreasing in a second-type of situation.

The models introduced in this thesis would appear to be consistent with casual empiricism and journalistic accounts. With a few exceptions, academic studies fail however to distinguish amongst the competing perspectives and do not provide direct tests of the information perspective. This is due again to the fact that most empirical studies of accounting choices are cross-sectional studies. Cross-sectional studies of accounting choices consider the correlation of accounting choices with contemporaneous explanatory variables such as current economic earnings and closeness to violation of debt covenants. The information perspective, as introduced in this thesis, predicts a correlation between accounting choices and future explanatory variables such as future economic earnings and cash-flows.

Empirical studies combining event studies and time-series studies of discretionary

accounting choices should stand a better chance of distinguishing amongst the competing perspectives. The information perspective, as embodied in the models introduced in this thesis, have stock price implications which differ from those implied by other perspectives: in the information perspective, the adoption of conservative accounting policies signals high earnings and cash-flows in the future and should thus be associated with positive abnormal share price returns. The information perspective, as embodied in the models introduced in this thesis, also differs from other perspectives in terms of the timing of declaration of provisions (or write-downs) and changes in accounting procedures. The tests carried out in both event studies and time-series studies may furthermore benefit from the use of variables used in the relevant contracts instead of proxies.

There would also appear to be a role for more qualitative research. Individual case studies may provide us both insights on the decision process used by managers. This information may then be used to design more powerful tests. This information may also be useful for equilibrium selection purposes.

Appendix

This section reviews some selected areas in which managers may exercise some discretion over "visible" accounting choices such as choices of accounting procedures both in the United Kingdom and the United States. For each of these discretionary accounting choices, it specifically describes the effect of the choice on reported income and some key accounting variables used in debt covenants.

Accounting For Tangible Fixed Assets

With respect to tangible fixed assets, there are no UK accounting standards specifying how they should be valued. The 1985 Companies Act is however more restrictive. It allows tangible fixed assets to be recorded on the balance sheet at their historical cost, current cost, or market value. US accounting standards (APB Opinion No 6) are even more restrictive. APB Opinion No 6 states that "Property, plant, and equipment should not be written up to reflect appraisal, market, or current values which are above cost". US accounting standards (APB Opinion No 6) thus prohibit companies from revaluing their fixed assets in the financial statements. In the UK, the ASC encourages however revaluations of tangible assets because they give "useful and relevant information to users of accounts".

UK accounting standards (SSAP 12) require provisions to be made for any permanent impairment in value of any fixed asset. The book value of the impaired asset is to be written down to its estimated recoverable amount. In contrast to UK accounting standards, US accounting standards (APB Opinion No 4) do not directly address issues relating to permanent diminutions in value. APB Opinion No 4 leaves however some room for managers to recognise any permanent impairment of value.

The impact of a firm's fixed assets revaluation on net assets is trivial: it increases net assets and decreases the book value of leverage. Similarly, a firm's fixed assets write-down or write-off decreases net assets and increases the book value of leverage. The impact on reported earnings is more ambiguous. The revaluation of

non-depreciable assets has no impact on earnings while the revaluation of depreciable assets results in lower reported earnings. The write-down or write-off of a firm's assets always results in lower current reported earnings. The write-down or write-off of a firm's depreciable assets however results in higher future reported earnings. The revaluation of a firm's assets thus relaxes some debt covenants related to leverage or net assets and may tighten others such as the one related to interest coverage. The write-down or write-off of a firm's assets tightens the same debt covenants related to leverage or net assets and may relax others such as the one related to interest coverage.

UK (SSAP 12) and US (APB Opinion No 6 and APB Opinion No 12) accounting standards require tangible fixed assets to be depreciated over some period. Both UK and US accounting standards leave managers with some discretion over the choice of depreciation method. SSAP 12 merely states that "the depreciation methods used should be the ones which are the most appropriate having regard to the type of asset and their use in the business". In addition, UK accounting standards companies leave managers with some discretion over the decision whether or not to depreciate property.

With respect to depreciation, the accelerated depreciation method typically results in higher reported earnings, at least in the short-term, than the straight-line depreciation method. The accelerated depreciation method also typically increases net assets and thus decreases the book value of leverage. Though any asset must be fully depreciated over its life, both earnings and net assets may always be higher under the accelerated than under the straight-line depreciation method as long as the firm's assets are expanding nominally each year and their expected lives exceed three years.

Accounting For Goodwill

With respect to goodwill, UK accounting standards (SSAP 22) leave managers with the choice between writing it off against reserves and capitalising and amortising it.

As well as permitting two different treatments, SSAP 22 allows the same company to choose between the different methods in relation to different acquisitions. US accounting standards are less flexible and require managers to amortise any residual goodwill over a period not exceeding fourty years. The choice of the period of amortisation is thus largely discretionary.

With respect to goodwill, the write-off choice has no impact on reported earnings. It however adversely affects shareholders' equity, net assets, and leverage. Conversely, the amortisation choice results in a decrease in reported earnings. Its impact on shareholders' equity, net assets, and leverage is however less adverse. The effect of the write-off choice is thus to tighten some debt covenants related to shareholders' equity, net assets, and leverage, and relax others related to interest coverage.

Accounting For Borrowing Costs

With respect to borrowing costs, there is still no UK accounting standards. The Companies Act enables managers to either expense or capitalise borrowing costs. US accounting standards have however become less flexible. SFAS 34 requires managers to capitalise interest for certain assets "requiring a period of time to get them ready for their intended use".

The capitalisation of interest typically results in an increase in both reported earnings and net assets, at least in the short-term. Any interest capitalised in any period must eventually be expensed in future periods. Furthermore, reported earnings and net assets measured under a policy of capitalising interest will always exceed reported earnings and net assets measured under a policy of expensing interest as long as the firm's assets are expanding nominally each year and interest rates do not decline.

Accounting For Oil And Gas Exploration Costs

With respect to oil and gas exploration costs, US accounting standards leave

managers with a choice between the use of the full-cost and successful-efforts costing methods. Under full-cost accounting, the costs related to both successful and unsuccessful exploration activities are capitalised. Under successful-efforts costing, the only exploration costs to be capitalised are the ones that are directly related to successful projects.

The use of the full cost method always yields higher book asset values, and thus lower leverage ratios, than the use of the successful efforts method. Sunder (1976) shows that net income is higher under full cost when exploration costs are sufficiently large relative to production costs, and is lower when this is not the case. Sunder also shows that the full cost method tends to reduce the variability of reported income.

Accounting For Research And Development Costs

With respect to research and development costs, UK accounting standards (SSAP 13) require expenditures on pure and applied research to be written off in the year in which they are incurred. Development expenditure may however be deferred to future periods in a number of circumstances. US accounting standards (SFAS 2) are less flexible and call for all research and development costs to be expensed as incurred.

The capitalisation of research and development costs typically results in an increase in both reported earnings and net assets, at least in the short-term. Furthermore, reported earnings and net assets measured under a policy of capitalising research and development costs will always exceed reported earnings and net assets measured under a policy of expensing research and development costs as long as research and development costs are expanding nominally each year.

Accounting For Other Intangible Fixed Assets

Any specifically identifiable intangible fixed assets other than goodwill may be

recognised in a company's balance sheet. UK (ED52) and US (APB Opinion No 17) accounting standards also require these intangible assets to be amortised over their useful lives. In the case where intangible assets have indeterminable useful lives, APB Opinion No 17 requires them to be amortised over a period not exceeding fourty years. The choice of the period of amortisation is thus largely discretionary.

The recognition of intangibles results in an increase in shareholders' equity and net assets and in a decrease in leverage. The amortisation of those intangible assets which have been recognised has however an adverse effect on reported earnings. The effect of the recognition of intangibles is thus to relax some debt covenants related to shareholders' equity, net assets, and leverage, and tighten others related to interest coverage.

Accounting For Leases

With respect to leases, UK (SSAP 21) and US (SFAS 13) accounting standards provide clear guidelines for deciding whether a lease should be considered as a financial or an operational lease. Managers may however still avoid to capitalise their leases provided that a number of conditions are met.

Capitalisation consists in recording them both as assets and liabilities. It has the effect of increasing the debt-to-equity ratio of the lessee. It may further adversely affect the lessee's reported income because, early in the lease life, the sum of the initial interest and depreciation expenses reported under the capitalisation method tend to be larger than the rental expense reported under the capitalisation method. Later in the life of the lease, the interest expense on the capitalised lease diminishes. However, if leasing activities grow through time on a nominal basis, the value of new leases should more than compensate for the decrease in value of the older leases. The income advantage provided by the operating procedure should thus persist in the presence of inflation or growth in the firm's leasing activities.

Accounting For Inventory Valuation

With respect to inventory valuation, both UK (SSAP 9) and US (Accounting Research Bulletin No 43) accounting standards require inventory to be valued at cost or market, whichever is the lowest. UK and US accounting standards leave however managers with some discretion over the choice of methods to be used in allocating costs to stocks. Stocks may be stated using FIFO, LIFO, weighted average, or any other method that is appropriate to the circumstances of the company. In contrast to the US, the Inland Revenue (UK) does not permit the use of LIFO for taxation purposes.

The use of the LIFO method typically generates higher "costs of good sold" and thus lower reported profits than the use of the FIFO method in the presence of inflation. Similarly, the use of the LIFO method typically has a negative impact on both net assets and leverage. In the US, the use of the LIFO method has however a positive effect on the firm's cash since it is allowable for taxation purposes. The effect of the LIFO method is thus to tighten some debt covenants related to leverage, net assets, and interest coverage, and relax others related to working capital.

Accounting For Investment Tax Credits

With respect to investment tax credits, the SEC (US) has issued a statement leaving managers with a choice between the use of the flow-through and deferral methods. The flow-through method calls for a direct reduction of the provision for taxes in the year in which they arise. The deferral method calls for the amortisation of the tax credit over the life of the asset.

The use of the flow-through method tends to generate higher reported earnings than the use of the deferral method. The use of the flow-through method tends also to inflate shareholders' equity and net assets and depress leverage. These effects always obtain as long as the firm's investment tax credits, and thus qualifying fixed assets, expand each year in nominal terms.

Accounting For Foreign Currency Translation

With respect to foreign currency, UK accounting standards (SSAP 20) call for the use of either the closing rate or the temporal methods for translation of the financial statements of foreign company - subsidiaries, associate companies, and branches. The closing rate method requires that the net assets of the foreign company should be translated at the balance sheet using the rate of exchange in force at that time. The temporal method requires that the net assets of the foreign company should be translated at the rate of exchange which ruled on the date of the transaction. In contrast to UK standards, US GAAP do not leave managers with any discretion over the choice of translation methods. SFAS 52, which was issued in 1981, calls for the use of the closing rate method.

Under the temporal method, any translation adjustment is reported as a gain or loss on the income statement. Under the current rate method, any translation adjustment is reported as a separate account in shareholders' equity, and thus does not affect reported income. The use of the temporal method thus adds a level of fluctuations in income. The use of the temporal method is also, in general, expected to produce a smaller translation adjustment, and thus have a smaller impact on shareholders' equity, net assets, and leverage[4] [5] [Bartov and Bodnar (1992)].

Summary

This section identified a number of accounting choices which may be considered as income-decreasing under "mild" regularity conditions. Most of these income-decreasing accounting choices are also balance-sheet weakening. Exceptions include the capitalisation and amortisation of goodwill, the recognition of specifically

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4 As reported by Richardson and Culumovic (1993), the magnitude of the translation adjustment typically differs between the two methods because it depends upon the accounting exposure, which is determined by the balance sheet items that are translated at the current rate. The accounting exposure is net assets under the current rate method and the net balance of assets and liabilities recorded at current or future values under the temporal method".

5 The translation adjustment has a positive (negative) effect on shareholders' equity if the currency, into which the firm's foreign currency financial statements are translated, is expected to weaken (strengthen).

identifiable intangible fixed assets, and the revaluation of depreciable fixed assets, which are income-decreasing and balance-sheet strengthening. The use of one of these income-decreasing accounting choices, the FIFO inventory valuation method, has furthermore a positive effect on cash-flows.

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