Earnings' Quality and Smoothing

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Abstract: We study a model of financial reporting where investors infer lower earnings precision when they see a larger absolute earnings surprise. We show that a credible equilibrium exists where, compared to earnings reported without discretion, better informed managers report smoother earnings by smoothing the transitory component when news is good and report earnings that accentuate the intertemporal differences when news is bad. This policy results in smoother earnings being of higher quality, when quality is defined as a lower deviation from the long run value of the firm. We show that a very similar strategy is optimal when investors are naïve and act as if managers have no discretion. Our results on earnings quality hold because a pooling equilibrium exists when the manager can distinguish only between the first period permanent and transitory earnings components. When the manager cannot distinguish among the components or when he knows the components in both periods, our results fail to hold, as we show that the equilibria in these cases are partially or fully separating ones. Furthermore, our work supports and explains a number of empirical phenomena, including alleged differences between public forecasts, whisper forecast and reported earnings, claims that better firms report higher quality earnings and the assertion that positive earnings surprises are higher quality than negative surprises.

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EARNINGS' QUALITY AND SMOOTHING: 1. INTRODUCTION

The academic literature has numerous definitions of earnings quality, yet few of these have theoretical support. For example, while researchers have advanced informal arguments that suggest smoother earnings are "better," few formal arguments have been made to show when, or if, reporting smoother earnings implies the earnings are more informative or of "higher quality." This is our research objective. More specifically, we first characterize equilibrium disclosure strategies for a manager who has better information about the long run value of the firm. We then analyze when, if ever, the manager will be prompted to report higher quality earnings, where we define higher quality earnings as earnings closer to the long run value of the firm.

We build a multi-period model where cash flows are composed of a permanent and a transitory portion. The permanent cash flow repeats each period, the transitory cash flow is independently distributed each period. Investors value the firm using reported earnings to infer both the level of the permanent cash flows and the precision of the reported earnings. We first characterize the equilibria when manager's can distinguish the permanent from the first period transitory cash flow and show that the level of reported discretionary income depends on if information is good or bad. If the news is "good", the manager smoothes transitory earnings and reports higher quality earnings than he would report if he had no discretion. If the news is bad, then the manager introduces noise into the report, lowering the quality of earnings below the level that would obtain if he had no discretion. We show that the manager adopts a similar reporting strategy whether or not the investors are sophisticated.

Furthermore, we show that our results on earnings quality fail to hold in two natural benchmark cases. If the manager is perfectly informed and knows both first and second period cash flows, a fully separating equilibrium obtains so that investor have the same earnings quality

as in the no discretion regime. If the manager is relatively uninformed and cannot distinguish the permanent from the transitory cash flow components (as, for example, in Kirschenheiter and Melumad, 2002), then no increase or decrease in quality can be shown to hold.

Our result, that a manager with good news will report higher quality earnings via smoothing while a manager with bad news will report lower quality earnings, is intuitively compelling. This immediately suggests two potentially testable empirical hypotheses, that smoother earnings have higher quality and that positive earnings surprises have higher quality than negative ones. Our analysis also provides results that, while perhaps less intuitive, offer other directions to empirical research. We describe three such areas.

First, we show that the manager's strategy is similar whether investors are sophisticated, and correctly infer the strategy adopted by the manager, or are naïve, and act as if the manager has no reporting discretion. This indicates that we cannot infer that managers with reporting discretion will report lower quality earnings if investors lack sophistication. In fact, the opposite may be true. The increase in the quality of earnings may be more pronounced in a naïve equilibrium than in a credible equilibrium, since in a credible equilibrium, the managers are forced to adjust their disclosure strategy to compensate for the inferences of the sophisticated investors. Furthermore, our findings suggest that we need to exercise caution in making inferences about investor sophistication based solely on the reporting behavior of managers.

Second, our results explain how the characteristics of the firm and its management can be expected to affect the manager's reporting strategy. For example, our findings support the arguments that firms with better long run earnings prospects and that managers with longer time horizons are both more likely to be associated with smoother reported earnings. Also we show that the investors in the credible equilibrium infer an average amount of discretion, so that the

inferred and reported amounts differ. This characterization of a credible equilibrium predicts that, under reasonable circumstances, reported earnings would slightly exceed "whisper" forecasts, which in turn would slightly exceed the public forecast. Hence, we provide a theoretical justification for the observed difference between public and “whisper” forecasts issued by financial analysts.

Third, our results indicate that meaningful empirical tests of earnings quality are difficult to construct. While we mentioned one hypothesis that our work supports, that earnings quality are positively associated with positive earnings surprises, our results do not support many other arguments. For example, our results do not support the argument that lower accruals are necessarily associated with higher quality reported earnings, as we have defined them. Instead, we show that higher quality earnings may be associated with high accruals, especially for firms with highly positive long run prospects. In short, our results reinforce the need for a rigorous and theoretically based definition of earnings quality to guide future research.

2. RELATED LITERATURE

We begin our review of the literature by relating earnings quality to accounting's conceptual framework. First, the framework interprets earnings as a measure of the value a firm creates. According to Statement of Financial Accounting Concepts (SFAC) #1 (FASB 1983), “the primary focus of financial reporting is information about an enterprise’s performance provided by measures of earnings and it components” (43). Second, the framework focuses on accrual earnings, not cash flow. According to SFAC #1, “their (investors, creditors and others) interest in an enterprise’s future cash flows leads primarily to an interest in information about its earnings rather than information directly about its cash flows” (43). Third, the conceptual framework

suggests that earnings quality should be measured in terms of it's decision-usefulness to financial statement readers. According to SFAC #1, readers of financial statements use reported earnings in various ways. Four specific examples are provided. Readers use earnings

> "to help them (a) evaluate management's performance, (b) estimate "earnings power" or other amounts they perceive as "representative" of long-term earning ability of an enterprise, (c) predict future earnings, or (d) assess the risk of investing in or lending to an enterprise" (47).

We use these three points to guide how we define "earnings quality."

While the conceptual framework has addressed the issue of how investors use reported earnings, repeated statements by academics indicate that there is no consensus in the academic or professional literature on how to define earnings quality.[2] Instead of a single definition, the accounting literature includes several definitions of earnings quality. Three of the most common used in research were identified by McNichols (2002) as relating to the persistence of earnings, the level of accruals, or earnings that reflect the underlying economic transactions. Of these, the first two seem to be connected to empirical measures, while the last seems to be a theoretical definition. Schipper and Vincent (2003) expand this set. They look explicitly at empirical measures of earnings quality and relate these measures to decision usefulness and an economic-based definition of earnings. They conclude that, in addition to the well-known estimation issues connected with most earnings' quality measures, choice and measurement of the accounting constructs also may affect the earnings' quality measures.

In summary, high quality earnings result from accounting policy choices that generate reported earnings that enable financial statement readers to make better decisions. A single,

2 This lack of consensus seems to hold at least through 2002. Penman and Zhang (2002) preface their definition of "quality of earnings by writing " the academic and professional literature has not yet reached a consensus on the definition of *quality of earnings*" (p. 237). Also, in his introduction to the special issue of *Issues in Accounting Education* on Quality of Earnings, Teets (2002) declines to give a single definition. Instead he notes that quality of

comprehensive measure of earnings informativeness is difficult to create because different financial statement users will use the information to make different decisions, but this is not the only reason. Earnings informativeness will depend on the other accounting information being provided, on the non-financial accounting information of the decision-maker, on the ability of the user to process the information, and on other possible restrictions on the decision making process of the user. Via our modeling assumptions, discussed in Section 3, we address or avoid many of these problems. This leads us to define earnings quality in terms of the long-term value of the firm. While natural and intuitively appealing, our definition has drawbacks, as we discuss in our results section below.

In addition to the research on earnings quality, this paper is a continuation in a long line of research on earnings management and, more specifically, earnings smoothing. Our model relates most closely to the earnings management models of Sankar and Subramanyam (2001) and Kirschenheiter and Melumad (2002), henceforth abbreviated as SS and KM, respectively.

SS studies a model of financial reporting in a two period, pure exchange economy where a risk averse manager, who has private information regarding future earnings, is required to issue an earnings report to investors at the end of each period. While the manager cannot directly disclose his private information, he may report with some bias, with the restriction that the bias reported in the first period reverses, at least in part, in the second. They show that, via smoothing, the manager will communicate his private information, so that the market attaches greater weight to reported earnings in this regime than under a regime that allows no discretion.[3] Like SS, we show that smoothing is used to convey the manager's private information. Unlike

earnings is a multidimensional concept affected by multiple decision and decision-makers.

[3] For examples of the latter, see Schipper, (1989), Healy and Palepu, (1993), Subramanyam, (1996), Hunt, Moyer and Shevlin (1996).

SS, the manager's incentive to smooth comes from the impact on the reporting precision, not from an exogenous smoothing demand. Since, in our model, the manager smoothes earnings only if he observes good news, we provide an alternative model that may be empirical distinguishable from the model of SS. Also, we characterize equilibrium under different informational assumptions and assuming different levels of investor sophistication.

KM consider a manager who observes a total cash flow amount in each of two periods composed of a permanent portion that repeats every period and a transitory noise portion that is independent across periods. The manager reports an earnings amount each period that includes discretionary earnings. He chooses this discretionary amount in period one to maximize the expected share price at the end of period two, with the restriction that the discretionary earnings amount fully reverses in the period two reported earnings.

While we consider a model that is closely related to the model in KM, we focus on the strategies of a manager who can distinguish between the permanent and transitory cash flow components in period one. By doing so, we can investigate whether the manager will use his reporting discretion to communicate better information than is communicated in a regime without discretion, an area about which KM is silent. We also investigate how these strategies and the resulting quality of earnings differ from the strategy and earnings' quality of a manager who is omniscient, in that he knows the second period cash flows at date 1. We show that both the equilibrium strategies and the results on earnings quality differ drastically depending on the informational assumptions adopted and sometimes, but not always, differ depending on assumptions concerning the investors' sophistication.

3. MODEL

In our model, a risk neutral manager operates an infinitely lived firm for two periods.[4] Investors value the firm by inferring future cash flows using earnings reported by management. Total cash flow in period n = 1, 2, denoted as Y_n, is the sum of two random variables: permanent cash flow, X, which repeats every period, and transitory cashflow, T_n, which flows only in period n, so that $Y_n = X + T_n$. The variable X is normally distributed with mean μ and precision h_X, so that $X \sim N(\mu, 1/h_X)$, while the T_n variables are independent, identically and normally distributed, with zero mean and an unknown precision. This means that $Y_n \sim N(\mu, 1/H_Y)$, where the mean μ is known, but the precision H_Y is itself a random variable having realization h_Y.[5]

We ask the research question: will a manager utilize reporting discretion to communicate more decision useful information? To address this question, we compare the reports in a regime when discretion is prohibited to the reports issued by a manager with discretion in reporting. We denote this discretionary amount as $\delta \in [\delta_L, \delta_U]$, where $\delta_L < 0 < \delta_U$. We denote the earnings reports issued in period 1 (period 2) as $m_1(m_2)$, respectively. We assume the discretionary earnings reported in the first period reverse in the subsequent period, so the manager cannot over or under-report in aggregate. Formally, this means that a manager who reports $m_1 = y_1 + \delta$ in period one will be restricted to reporting $m_2 = y_2 - \delta$ in period two. Also, we use "Δ" to denote the deviation from the mean for the various variables, so for example, $\Delta y_1 \equiv y_1 - \mu$. We refer to

[4] In order to expedite the presentation, we do not provide many of the formal definitions. A formal statement of the model, together with formal definitions for optimal disclosure strategies and equilibria is available from the authors.

[5] The role of uncertain precision has been studied in various contexts in accounting research. For example, see Freeman and Tse (1992), Penno (1996) and Subramanyam, (1996). Also, we call X, T_n and Y_n cash flow variables, consistent with the terminology in KM. We interpret these as value creation measures, so "cash flow" cannot be taken literally. A richer model that distinguishes between accounting earnings, cash flows and economic earnings goes beyond the scope of this paper.

the deviation from the mean in the first period as the "surprise" amount.

A key element of our model is the assumption regarding the manager's information. We focus primarily on the situation where the manager distinguishes between the permanent and transitory components of the first period earnings. We can interpret this case either as a manager having a high quality information system in place for assessing his operations, or as a manager of a higher type, that is one who better understands the operations of his firm. We compare this case against two benchmark cases. In the first benchmark, we assume the manager cannot distinguish between the cash flow components; this is the case studied in KM. For the second benchmark case, we assume that the manager knows the cash flow components in both the first and second periods. While one may debate the existence of such omniscient managers, we find that studying both benchmark cases add unexpected insights into our analysis.

We simplify the notation slightly, denoting the manager's information variable as $\theta_j \in \Theta_j$ for $j = 1,2,3$. This allows a concise statement of the alternative informational assumptions as follows:

Assumption 1: The manager knows 1st period cash flow components, or $\theta_1 \in \Theta_1 = (X, T_1)$.

Assumption 2: He knows the 1st and 2nd period cash flow components, or $\Theta_2 = (X, T_1, T_2)$.

Assumption 3: He knows only the total cash flow in the 1st period, or $\Theta_3 = Y_1$.

Suppressing the subscript on Θ_j indicates our discussion applies to all information sets. We show how these alternative assumptions affect the manager's objective function and hence, his optimal disclosure strategy, below.

It is possible that the manager's information will affect both what he discloses and what investors infer from this disclosure. To capture the first possible relationship, we distinguish the disclosure strategy, denoted as $\psi(\theta): \Theta \to [\delta_L, \delta_U]$, from the manager's actual discretion amount, denoted as $\delta \in [\delta_L, \delta_U]$. Investors infer the level of discretionary earnings reported using reported earnings, and then use this inferred level of discretionary earnings to infer the amount of the cash flow variable. We let $\psi^S(m_1, m_2) = \delta^S \in [\delta_L, \delta_U]$ denote the shareholders' inferred disclosure strategy and use $y_n^S \in \Re$ to denote the amount of the cash inferred by the investors to flow in period n = 1, 2. Hence, the manager chooses $\psi(\theta) = \delta$, and reports $m_1 = y_1 + \delta$ in period one and $m_2 = y_2 - \delta$ in period 2. Then if investors infer $\psi^S(m_1, m_2) = \delta^S$, they infer cashflows of $y_1^S = m_1 - \delta^S = y_1 + \delta - \delta^S$ for period one and $y_2^S = m_2 + \delta^S = y_2 - \delta + \delta^S$ for period two. At each of the three dates in the model, investors value the firm based on the net present value of the expected cash flows based on the information available at that date. We denote these firm values as the prices (P_0, P_1, P_2) and define the vector of the prices at the three dates as $P \equiv (P_0, P_1, P_2)$.[6]

We assume that, given his information, the manager wishes to maximize the expected change in price from date 0 to date 2. More specifically, we assume that he chooses disclosure strategy ψ to maximize the payoff function denoted as $W(\theta \mid \psi, \psi^S)$ and given as follows.

$$W(\theta \mid \psi, \psi^S) = \int_{Y_2} \int_{H_Y} (\Delta y_1^S + \Delta y_2^S) \left(\frac{M h_Y}{h_Y + h_X} + 1 \right) f(h_Y \mid y_1^S, y_2^S) f(y_2^S \mid \theta, \psi, \psi^S) dh_Y dy_2 \qquad \text{[Eqn 1]}$$

Here we define $M \equiv 1/r$. In writing the payoff or disclosure functions, we will sometimes replace the manager's general information variable with the specific information variables. For example,

[6] As mentioned earlier, due to the complexity of the derivations, we relegate most of the formal structure of the model to a detailed appendix available to the interested reader from the authors.

under assumption 1, we sometimes replace $\psi(\theta)$ with $\psi(x, y_1)$. We explain the intuition behind the payoff equation next.

Investors use the sum $\left(\Delta y_1^S + \Delta y_2^S\right)$, which is the sum of the inferred cash flow surprises for the two periods, to set the increase in price between dates 0 and 2. We can think of investors pricing this sum based on how it informs the investor about both the long run value of the firm and the transitory cash flow in these two periods. The integral, $\int_{H_Y}\left(\frac{h_Y}{h_Y + h_X}\right) f\left(h_Y \mid y_1^S, y_2^S\right) dh_Y$, represents the confidence that the investor places on what the sum of reported earnings tells her about the long run value of the firm, similar to a signal to noise ratio. The constant $M \equiv 1/r$ acts similar to a price earnings ratio, so that the product of M and the integral represents the change in the long run value of the firm due to the investors revising their expectation of the level of the permanent cash flow amount. The value of the transitory cash flows is just the sum of the cash flow surprises priced at a factor of one (represented by the "1" in Equation 1).

The manager's choice of disclosure discretion has no effect on the actual reported earnings surprise sum, $\left(\Delta m_1 + \Delta m_2\right)$, since any discretion reported in period 1 reverses fully in period 2. Hence, by construction, the sum of the inferred, actual and reported surprise amounts are all equal, that is we have $\left(\Delta y_1^S + \Delta y_2^S\right) = \left(\Delta y_1 + \Delta y_2\right) = \left(\Delta m_1 + \Delta m_2\right)$. So, the manager's discretion choice only affects expected precision $\int_{H_Y}\left(\frac{Mh_Y}{h_Y + h_X}\right) f\left(h_Y \mid \theta, \psi, \psi^S\right) dh_Y$. Also, from the payoff equation, we see that the change in price (and the manager's payoff) is expected to be positive if and only if he expects the sum of the surprise amounts to be positive. We define news as "good" if and only if the manager expects the sum of surprises to be positive. This means $\theta \in \Theta$ is good

if and only if $E[\Delta y_1 + \Delta y_2 \mid \theta] > 0$, otherwise it is defined as bad news. The manager chooses his discretion to maximize (or minimize) the expected precision if the news is good (or bad).

Moving forward, we define a disclosure strategy ψ as optimal if it maximizes his objective function, that is, if given the investors' inferred disclosure strategy ψ^S, then for any ψ', we have $W(\theta \mid \psi, \psi^S) \geq W(\theta \mid \psi', \psi^S)$. We define an equilibrium as a pair, (ψ, ψ^S) where ψ is an optimal disclosure strategy with respect to the investors' inferred disclosure strategy, ψ^S, for a given price vector *P*. We call this equilibrium "naïve" if $\psi^S \equiv 0$ and we call it credible if the investors correctly infer the manager's discretion strategy. We refer to a disclosure strategy, ψ, which supports a credible (naive) equilibrium as a credible (naive) disclosure strategy. The definition of a credible equilibrium is standard in the literature (see Kirschenheiter 1997).

We complete the modeling section of our paper by discussing how we define earnings quality. As we noted in Section 2, we assume the decision-maker of interest is the investor and, as described above, we make explicit our assumptions about the investor's ability to process the information. Also, we ignore the possibility of other information, both financial and non-financial information. In this framework, a natural definition for earnings quality is to use the deviation of reported earnings from the permanent cash flow amount. More specifically, for any earnings report pair, (m_1, m_2), disclosure policy, ψ, and inferred disclosure strategy, ψ^S, we measure earnings quality as the absolute value of the deviation of the inferred cash flow amount from permanent cashflows, or formally as $EQ(x, y_1^S) \equiv \left| x - y_1^S \right|$.

This definition of earnings quality is valuable for a couple reasons. First, it is based on permanent cash flows, which is the variable of most interest to long term investors and the variable upon which they wish to set prices. Also, the permanent cash flow amount is the

unbiased estimate of future "earnings power" so this definition is consistent with examples (b) and (c) provided by the FASB in SFAC #1 quoted in Section 2 above. However, our measure has drawbacks, as we discuss in section 4.4 below. Next we turn to our results.

4. RESULTS

4.1 PRELIMINARY OBSERVATIONS

We begin by stating some preliminary observations that follow almost immediately from the set-up of the model. These results relate to our assumptions, so we discuss these results by discussing the impact of relaxing various of our assumptions.

First, if we relax the assumption that that the precision is unknown, replacing it by assuming a known precision, then there is no demand for discretion by the manager.[7] This follows directly from the observation that the discretion choice has no effect on the sum of the surprise measures, either reported or inferred. Since, it affects the payoff only through its effect on expected precision, it has no effect if the precision is constant.

Second, if we assumed that permanent and transitory cash flows were priced equivalently, that is, if we assumed that $M = 1$, there once again would be no demand for discretion. This result follows once again because discretion affects the payoff only through the expected precision. If transitory and permanent cash flows are priced the same, then there is no additional value to the investor from correctly inferring how much of the total cash flows are permanent and how much are transitory. Put more simply, with $M = 1$, the investors do not bother calculating the expected precision, as they do not need to make inferences about the level of

[7] This result is not new, it was shown to hold in KM, as was the second point that there is no demand for discretion if $M = 1$.

permanent cash flow. This can be seen clearly from substituting $M = 1$ into the payoff function above, as the ratio of precisions then becomes a constant equal to one.

Third, we exogenously impose the payoff function as the change in price between dates 0 and 1. This effectively rules out any role for the date 1 price, especially in conveying additional information. More generally, we restrict the manager to communicate with investors only through reported earnings at dates 1 and 2, but the timing of the reports is not important.[8] We believe the imposition of this payoff function and the restriction on communication channels are useful assumptions for a couple other reasons as well.

The specific assumptions we make add both power and focus to our analysis. We choose to make the manager's payoff dependent solely on the change in price between dates 0 and 2 to reduce the manager's demand for reporting discretion. Putting either a positive or a negative weight on the date 1 price would certainly cause the manager to want reporting discretion in other situations, but this would complicate the analysis without adding or nullifying our current results. Similarly, restricting the manager to reporting only earnings each period enables us to better study the role of bottom line earnings as a conveyor of information about firm value. It is not clear that additional reports can be issued credibly and costlessly; earnings seem to fill a fundamental role. But assuming that additional reports are possible, our analysis provides guidance on when such reports are more valuable and more likely to arise.

Relaxing these assumptions would likely change our analysis, but it would also shift the

[8] In effect, since only period two price matters, if no discretion is allowed, one can interpret our model as one where the manager discloses the two earnings reports at date 2, as if the two reports were repeated draws from the same sample. An immediate observation is that, in this case, the earnings reports at both dates are valuable in setting the date 2 price. This is still true when the manager has reporting discretion, as we show in the equilibria that we derive. We are grateful to an anonymous referee for directing us to this observation.

focus onto questions that are not our primary focus. We model a situation where the manager may have information that the investors want to help themselves price the firm. Our model captures what we believe to be important aspects of real world accounting, such as the focus on a single measure of wealth creation and on the reversing nature of most accounting related manipulations of earnings. The key to many of our results concerns whether the investors can infer the manager's information from the reported earnings. Put concisely, we want to know whether the investors can identify and invert the disclosure strategy, $\psi(\theta)$, chosen by the manager under the various alternative informational assumptions and assumptions concerning investor naivete. Endogenizing the compensation function may allow us to address questions relating to optimal contracting. Expanding the set of communication channels may allows us to address questions concerning the optimal level of aggregation. While these are important questions that we hope future research will address, they are not the focus of the current paper.

4.2 EQUILIBRIUM RESULTS

We begin the discussion of the equilibrium results by characterizing a set of credible equilibria when the manager is assumed to be able to distinguish between the permanent and transitory components of cashflows in the first period. (See the appendix for all proofs.)

Theorem 1: Under assumption 1 (of if $\Theta_1 = (X, T_1)$) then there exists a set of credible equilibria described as follows. For good news, the manager chooses his discretion to smooth the inferred cash flow, if he is unconstrained in reporting. For bad news, he over or under reports the maximum, depending on the levels of the transitory and permanent cash flows.

Theorem 1 characterizes credible equilibria where investors distinguish between reports that produce positive inferred cashflows from those that produce negative inferred cashflows. The investors' inferred disclosure strategy is just the expected level of disclosure conditional on the earnings reported, while the manager's disclosure strategy depends on his expectation of the average amount of discretion that investors are inferring will take place.

The manager wishes to increase inferred precision for good news and decrease it for bad news. Recognizing this, the investors calculate two different levels of average discretion, one when the inferred cash flow surprise is positive and one when the cashflow surprise is inferred to be negative, denoted as $\delta_{Pos}^{S}(m_1)$ and $\delta_{Neg}^{S}(m_1)$, respectively. The manager uses these average levels of discretion to determine his optimal disclosure strategy, as shown in Figure 1.

<<Insert Figure 1 about here>>

For good news, the manager wants investors to infer the same level of cash flow each period, so he shifts half the transitory component into the second period, after adjusting for the discretion inferred by investors. Hence, the manager chooses $\psi_{Cred}(x,t_1)=\delta_{Pos}^{S}(m_1)-\frac{t_1}{2}$ when unconstrained in reporting. When reporting constrained, he moves as much of the transitory component as possible to the second period. For bad news, the manager over-reports or under-reports the maximum as transitory cashflow is high or low, respectively.

Having characterized and explained a set of credible equilibrium disclosure strategie, we next turn to s the unique naïve disclosure strategy. Since most theoretical work focuses on credible equilibrium strategies, not naïve ones; we first provide justification for devoting time to the study of the naïve equilibrium.

Studying naïve disclosure strategies is useful for at least three reasons. First, much of the

empirical work on earnings management presumes at least the possibility of myopia or naiveté on the part of investors. Given this presumption, it is important that we clarify what can be justified as theoretically consistent with these arguments. Second, there is a presumption that investor sophistication may improve the quality of earnings. While it may be true that greater investor sophistication results in higher quality earnings being reported, this statement needs theoretical justification. Third, prior work has shown the similarity between the credible and naïve equilibrium disclosure strategy, suggesting that the study of both strategies may be useful. As we show in our results below, similarities continue to hold.

Corollary 1.1: Under assumption 1 (if $\Theta_1 = (X, T_1)$), there exists a unique naïve equilibrium where for good news, the manager chooses discretion to perfectly smooth the transitory portion, unless he is constrained in his reporting discretion. For bad news, he under reports the maximum unless the transitory component is sufficiently high; in which case he over reports the maximum.

Corollary 1.1 characterizes the unique naïve equilibrium where the manager smoothes good news by under or over reporting as the transitory cash flow is high or low. For bad news, he reverses this policy, attempting to introduce noise into the reported earnings. This is analogous to his strategy with sophisticated investors, except the limits on reporting with sophisticated investors reflect the inferences of the investors. This is also exactly analogous to earlier results (see Corollary 1 in KM), with the important difference being how good news is defined. Recall that we define $\theta \in \Theta$ as good news if $E[\Delta y_1 + \Delta y_2 \mid \theta] > 0$. Under assumption 1, news is good if $2\Delta x + t_1 > 0$, or as long as transitory cash flow is not sufficiently negative relative to permanent cash flow. Under assumption 3 (which KM adopted), news is good if total cash flow is positive,

or if $\Delta y_1 > 0$. The similarity between the naïve and credible disclosure strategies of Corollary 1.1 and Theorem 1 strengthens and extends a similar result shown in prior literature (see KM).

Additional insights can be gleaned by comparing the strategies of Theorem 1 to the strategies derived when the manager cannot distinguish between the cash flow components. In the latter case, it was shown that while no fully separating equilibrium exists, a partially separating equilibrium does exist where the investors perfectly infer the manager's information for many of the credible earnings reports. Theorem 1 shows that if the manager distinguishes between the first period cash flow components, the non-existence of a fully separating equilibrium continues to hold and, further, numerous credible equilibria exist.[9] However, contrary to the prior literature, there is no separation in any of these potential credible equilibria, as the following corollary stipulates.

Corollary 1.2: An investor can never perfectly infer the level of discretionary earnings reported by the manager under the disclosure strategies specified in Theorem 1.

Corollary 1.2 tells us that when managers distinguish between the cash flow components in the first period, investors cannot infer perfectly from the earnings reports the level of discretionary income the manager has chosen, even though investors know perfectly the disclosure strategy of the manager. This contrasts with the situation where managers knew only the total cashflow for the first period, since in that case the investors could infer the level of discretion, for at least some earning reports. The intuition for this difference is clarified by

9 One such equilibrium is one that I identical to that given in theorem 2, with the additional restriction that $\delta^S_{Pos}(m_1) = \delta^S_{Neg}(m_1)$. While simpler, we decided not to focus on this equilibrium as the equilibrium

considering how the manager defines good news in each case.

As noted earlier, the manager defines good news as positive total first period cash flow when he cannot distinguish the components. As a result, the manager's optimal reporting policy is to under-report the maximum if he observes a sufficiently high or low first period cash flow. Knowing this, the investors use this fact to perfectly infer the manager's strategy for reported earnings that are sufficiently high or low. When the manager can distinguish the cash flow components, he distinguishes good news from bad news based on the relative levels of permanent and transitory cash flows. For the equilibria in Theorem 1, there does not exist a level of total cashflows sufficiently high (or low) such that the manager wishes to under-report for realization above (or below) these levels. Instead, the manager's reporting preferences depend on the relative levels of the permanent and transitory components, not their sum. Described in this manner, the result does not seem surprising. The manager uses his better information in distinguishing good from bad news and in deciding whether to over or under report and by how much. Since we constrain the manager to report a single value, the investors find themselves unable to use this single report to perfectly infer the manager's information.

Corollary 1.2 showed that the manager's better information resulted in the investors losing their ability to infer the manager's discretionary income choice. Since the investors' ability to infer the manager's information decreased as the manager became better informed, one might think that the lack of a fully separating would continue to hold as the manager's information increases. However, this not true, as Corollary 1.3 shows.

Corollary 1.3: Under Assumption 2 (i.e., if $\Theta_2 = (X, T_1, T_2)$), there exists a fully separating

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shown in theorem 2 induces greater separation.

credible equilibrium. Further, the same strategy that supports this equilibrium also supports a fully separating equilibrium if the manager knows only the total cash flow in each period.

Corollary 1.3 makes two points. First, it shows that, unlike the credible equilibria found when the manager had less information, we obtain full separation when the manager has all the relevant information. The reason is that the investors know that the managers are perfectly informed about current and future cashflows. They use this knowledge to induce the manager to report so as to make his constraint on discretion binding. In this manner, they are able to perfectly distinguish between current and future cashflows. If the knowledge that the managers are perfectly informed is missing, this strategy breaks down, as Theorem 1 showed.

The second point concerns how the manager uses his information when he is perfectly informed. The manager uses the information about permanent cash flow component under assumption 1. One might conclude from this result that the manager would continue to use the component information when he becomes perfectly informed (assumption 2); the latter part of Corollary 2 demonstrates that this fails to be true. The reason is because some of the manager information goes unused. In effect, when the manager knows the total cashflows for each period, knowing the components of earnings becomes superfluous information.

4.3 RESULTS ON EARNINGS QUALITY

We begin our analysis of earnings quality by considering the case where the manager is better but not completely informed. The focus of our research is on whether allowing reporting discretion increase or decreases quality. In turns out to be a mixed bag, as our first result in this area demonstrates.

Theorem 2: Under the equilibria supported by the credible strategy specified in Theorem 1 and the unique naïve disclosure strategy in Corollary 1.1, the following are true relative to the earnings quality of earnings reported under the no-discretion regime:

a. Earnings quality is higher if the manager observes good news and transitory cash flow is non-zero.
b. Earnings quality is strictly lower if the manager observes bad news,.

Part a) of Theorem 2 supports the claim that reporting discretion allows managers that are better informed to convey their private information; a point that we noted has generated controversy. Under good news, the manager chooses to smooth the transitory portion, in effect reporting earnings that are more informative relative to the total cashflow amount that is reported in the no-discretion reporting regime. Part b) of theorem 3 clarifies that when news is bad, discretion lowers earnings quality. The areas of higher and lower quality earnings can be seen graphically by reference to Figure 2.

<<Insert Figure 2 about here>>

Figure 2 reproduces the credible equilibrium strategy of Theorem 1 in a manner analogous to Figure 1. The areas highlighted in Figure 2 are exactly analogous to the areas in Figure 1, so that good and bad news are distinguished in an analogous fashion, but with slightly different cut-offs for where the manager switches his disclosure strategy. Figure 2 answers one question posed earlier, it tells us that sophistication does not necessarily lead to higher quality earnings. Areas 2.D and 2.E represent points that produce negative inferred cash flows with higher quality earnings and positive inferred cash flows with lower quality earnings, respectively. Hence, even

sophisticated investors cannot perfectly distinguish good from bad quality reports.

We complete our analysis be considering earnings quality under assumption 2 and 3. While discretion appears to play a positive role under assumption 1 when the manager has good news, changing our informational assumptions destroys this result, as our final set of results show.

Corollary 2.1: In general, under assumptions 2 or 3, it cannot be said unambiguously how earnings quality is affected. In particularly earnings quality in the no discretion regime

a) is the same as in the credible equilibrium of Corollary 1.3, and
b) is the same as in the credible equilibrium under assumption 3 for sufficiently high or low reported earnings. For intermediate values of reported earnings, we cannot ascertain the relative level of earnings quality under the two regimes.

Corollary 2.1 shows that, in general, the result that managers use reporting discretion to increase earning quality requires managers be better informed, but not omniscient. Part a) shows there is no difference in earnings quality between the no discretion regime and the case of sophisticated investors under assumption 2; investor sophistication induces full separation in this case. The fact that the investor knows that the manager is fully informed allows investors to induce a fully separating equilibrium is informational identical to the situation without discretion. Part b) shows that a similar result holds for reported earnings that are sufficiently high or low with less well-informed manager (assumption 3). Separation occurs at these points and the preceding argument applies. However, the argument does not hold for intermediate values of reported earnings, since separation does not occur for these reports.

When investors are naïve, or when full separation fails to hold, the relative level of earnings

quality cannot be ascertained. We are unable to determine the effect of discretion on earnings quality for different reasons depending on the informational status of the managers and investors.

First, suppose investors are sophisticated but separation fails (i.e. the equilibrium is a pooling equilibrium). While the earnings report is of lower quality than the no discretion earnings report for some cashflows in the set generating the pooled report, it is higher for others. It may at first seem counter-intuitive that a pooled report, even a credible pooled report, can be of higher quality than earnings reported with discretion prohibited. However, this is possible because the no discretion report will almost always contain some noise. Under the no discretion strategy, the manager always reports the observed total cashflow honestly. However, what the investors seek are the cash flow components, and in particular the permanent level of cashflows. While the earnings reported under the credible strategy also deviate from the permanent earnings amount, this deviation from "truth" differs from the deviation that occurs under the no discretion strategy. Sometimes the first deviation is smaller; sometimes the second is smaller.

Next, suppose investors are naïve. In this case, the area over which the quality of earnings cannot be ranked extends to the entire range of possible cashflows. Investor naivete insures that investors cannot invert the report earnings and perfectly infer the total cashflows for extreme earnings reports. However, this lack of inability to perfectly infer the cashflow realization once again does not insure that the earnings report will produce lower quality earnings. What Corollary 2.1 does show is that the clear improvement in earnings quality characterized in Theorem 2 depends on the manager being better, but not completely, informed.

4.4 IMPLICATIONS FOR EMPIRICAL RESEARCH

Our results bear directly on questions raised in current empirical research. In particular, our

results provide support for and direction to empirical research related to earnings forecasts, investor sophistication and the role that firm and managerial characteristics play in how manager's choose to report earnings. We discuss each of these in turn.

First, in Theorem 1 above we characterize a credible disclosure strategy that relies on investors inferring an average level of discretion when they observe positive earnings surprises, which we denoted as $\delta^S_{Pos}(m_1)$. This means investors infer the "true" report is the report reduced by $\delta^S_{Pos}(m_1)$. Recent empirical work (see Bagnoli, Beneish and Watts, 1999) suggests that "whisper" forecasts exist that are closer to what analysts actually expect the earnings to be, and that these whisper forecasts usually slightly exceed the public forecasts. Theorem 2 suggests a theoretical interpretation for this difference. Suppose we interpret the unconditional average for the total cashflows, $E[x]=\mu$, as the public earnings forecast, and interpret $\mu-\delta^S_{Pos}(m_1)$, as the whisper forecast. Then the difference between the public and whisper forecasts has a natural role: it represents the average amount of under or over reporting that investors expect the managers to do. One would expect more positive transitory earnings, on average, given that a positive earnings surprise is reported, so that manager wishes to underreport. If so, it seems likely that $\delta^S_{Pos}(m_1)<0$ holds for most reports, and this then provides theoretical justification for the fact that whisper forecasts will exceed the public forecasts. If in addition we have managers reporting $\psi_{Cred}(t_1,x)=\delta^S_{Pos}(m_1)-\frac{t_1}{2}$, then we have $\mu<\mu-\delta^S_{Pos}(m_1)\le m_1$, so that reported earnings exceed the whisper forecast which exceeds the public forecast.[10]

[10] Although this interpretation is intuitively appealing, we need to exercise caution in laying too much weight on it. It seems likely that managers will manipulate the forecast as well as the earnings report. The difference between the whisper and public forecasts is likely to depend on the analysts' inferences about both types of manipulations.

Next, as we discussed prior to Corollary 1.1, there are a number of reasons one wishes to analyze a manager's reporting strategy assuming naïve investors, including the fact that many empirical study implicitly assume investors are naïve. Our results raise the question of whether or not it matters if investors are naïve. On the one hand, managers may report the same regardless of investor sophistication: a comparison of Theorem 1 and Corollary 1.1 shows this. On the other hand, it seems that being sophisticated is not such a deterrent to earnings manipulation as one might at first think. Corollary 1.2 provides support for the belief that sophisticated investors cannot unravel most earnings manipulation. Our results suggest that we need to be more explicit about how investor sophistication relates to what investors are inferring, and how it relates to whether it reports earnings are of higher or lower quality. Further, as we argue below, investor sophistication may actually impede the reporting process if managers use their reporting discretion to move reported earnings further from the long run firm value.

Third, it is often argued that smoother earnings are associated with certain characteristics of the firm or the management of the firm whose earnings are being smoothed. An analysis of Theorem 2 and a comparison of Figures 3 and 4 offer direction for this research.

The proof of part a) of Theorem 2 provides support for arguments concerning the types of firms that smooth. First, it shows that better firms (those with higher permanent earnings) smooth more often, and this smoothing raises earnings quality. This is in contrast to some of the current findings (for example, Chaney and Lewis [1995]), but is consistent with popular press accounts that the market reacts favorable to earnings smoothing. Second, it suggests that the longer a manager's horizon, the closer is his report to the permanent earnings that he observes. The manager chooses a discretionary amount equal to the transitory portion divided by two because there are two periods in the model. Although not shown formally, the proof of the

theorem suggests if we increase number of periods in the model, the manager would smooth the transitory portion over the increased number of periods. Part b) of Theorem 2 makes clear that reporting discretion is not always utilized by better informed managers to provide higher quality earnings. Despite this fact, the points made in the preceding paragraphs provide a positive interpretation for reporting discretion, and especially, for earnings smoothing. We believe these points are made more interesting by the fact that they also hold in the naïve equilibrium.

It is typical to argue that smoothing will hurt investors more if they are naïve. Yet as Theorem 2 shows, assuming investors are naïve does not insure that smoothing behavior by managers produces adverse effects on the reporting environment. On the contrary, naïveté on the part of investors may actually enhance the beneficial aspect of the reporting behavior by managers. To see this point, compare the disclosure strategies under good news when investors are naïve to when they are sophisticated; the main difference between these strategies is the cut-offs where the manager switches his reporting strategy. For good news, the manager under reports the maximum for $t_1 \geq -2\delta_L$, over reports the maximum for $t_1 \leq -2\delta_U$, and smoothes otherwise. The cut-offs for his credible strategy with sophisticated investors are just the same as these, except that we add $2\delta_{Pos}^{S}(m_1)$ to them (see Figure 2). Investor sophistication cause the area of smoothing to shift up or down by the same amount, depending on whether $\delta_{Pos}^{S}(m_1) > 0$ or $\delta_{Pos}^{S}(m_1) < 0$. While we cannot say higher earnings quality changes using our current definition, it seems clear that investor naiveté may actually increase earnings quality.

While we believe our characterization of the equilibrium disclosure strategies and the definition of earnings quality to which this characterization led offer valuable insights into the earnings reporting process, caution is warranted. Our definition is based on a single period, ex-

post realization of reported earnings; we need to consider definitions based both on ex-ante measures and measures for multiple periods in order to assess the role of investor sophistication. Further, at least two other obvious criticisms of our definition of earnings quality exist.

First, we define quality in terms of the deviation of the inferred cashflow from the actual level of permanent cashflows. Neither of these two constructs is verifiable to the researcher, making the testing of the model more difficult. While permanent cashflows may be estimated, we anticipate that the inferred level of cashflows would be particularly difficult to determine. However, this points to an important insight. Our model clarifies that a manager who uses discretion to increase the decision usefulness of reported earnings would report so that the decision usefulness of the inferred amount, not the reported amount, increases. Insofar as our empirical research on earnings quality focuses on the reported earnings, and not the inferred level, we will be mis-estimating the quality of the earnings reported.

Second, we define earnings quality in terms of the earnings constructs, not the corresponding pricing. While statements concerning earnings quality using the earnings constructs of our model will likely extend to statements about the related pricing, this still needs to be shown as it is not immediately clear that this will be the case. Insofar as the results on earnings quality may differ from results on pricing quality, these differences need to be characterized and analyzed. While addressing these latter two points goes beyond the scope of the current paper, these points are important and suggest areas for future research, as we discuss further in our summary.

5. Summary

Our research objective was two-fold. First, we sought to characterize and analyze the naïve

and credible equilibria that exist when a manager is "better" informed. Better informed means he can distinguish between the permanent and transitory cashflow components in the first period. Second, we wished to determine whether managers employ discretion in reporting to increase the quality of earnings reported and, if so, what characteristics of the management or firm affect this behavior.

We characterized both the unique naïve and a credible equilibrium for a better-informed manager, demonstrating that these are quite similar to each other, consistent with prior research. In these equilibria, the manager's disclosure strategy depends on whether he observes good or bad news. If the news is good, he uses his discretion to smooth the transitory component, reporting earnings that are more informative, i.e. closer to the permanent level. When the news is bad, he reports higher in the period when cashflows are expected to be higher in order to introduce additional noise into the precision inferred by investors, thereby lowering the quality of earnings. Also, while we could not assess the effect of investor sophistication on earnings quality in an unambiguous manner, the equilibria we characterize suggest that investor naivete may actually result in a higher quality of reported earnings.

We also investigated the naïve and credible strategies when the manager is "completely" informed, that is, he knows the second period cashflow. We found first, that the manager follows the same strategy regardless of whether or not he can distinguish between the cashflow components, indicating that knowledge of the components is superfluous when the manager is "completely" informed. Further, unlike when the manager knows only the first period cash flow components, we found that a fully separating credible equilibrium exists in the manager was completely informed. No change in quality occurs for this equilibrium, since a separating strategy insures that the quality of earnings is identical to the quality obtained without discretion.

Last, we showed that our results on earnings quality could not be shown to hold when the manager cannot distinguish between the first period components. Hence, extending the model to the case with better-informed manager produced drastically different, and initially unexpected, results on earnings quality.

Besides helping us to better understand the manager's disclosure decision and how discretion affects the quality of reported earnings, these results provide insight into other empirically observed phenomena. First, as discussed above, our results provide support for the belief that smoother reported earnings and positive earnings surprises are both associated with higher quality. Second, our characterization of the credible equilibrium with a better-informed manager offers a theoretical justification for differences between public forecasts, whisper forecasts and reported earnings. Third, it suggests that better firms and firms where managers have a longer horizon are likely to smooth more often and produce higher quality earnings. Fourth, as indicated above, they suggest that investor sophistication may play less of a role in improving the informativeness of earnings than earlier thought.

While suggestive, caution must be exercised in interpreting these results due to the model's simplicity. Also, as we discussed earlier, earnings quality is a more complicated notion than is implied by our study. Additional work that relaxes some of the assumptions concerning the type of firms considered and that extends how earnings quality is defined is clearly warranted.

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Earnings Quality and Smoothing

Appendix – Outline of Proofs of Main Results

In this appendix, we provide an outline of the main results presented in the text. Detailed proofs are available upon request from the authors.

Outline for proof of Theorem 1: There are two major steps in the proof of Theorem 1. As we know from the discussion in the paper, the manager chooses his reporting strategy based on how it affects the inferred precision level. For the first step, we start the proof by proving a lemma (Lemma 1), in which we derive the manager's optimal disclosure strategy in a general setting. We will show that he wants to increase inferred precision if he observes or expects to report good news and decrease it if he observes bad news, where the definition of good and bad news changes depending on the manager's information. We will also show that the manager maximizes precision by smoothing the two inferred earnings reports and minimizes it by reporting in a way that maximizes the difference between the cash flows inferred in each period by the investors.

More specifically, in Lemma 1 we derive the manager's optimal disclosure strategy for any conjectured second period cash flow variable, denoted as y_2^C, where the first and second cash flow variables are distributed as multivariate normal variables. This result is a generalization of the main results in KM. Lemma 1 shows that, if the pair $\left(y_1, y_2^C\right)$ are bi-variate normal random variable, and letting $\left(\Delta y_1, \Delta y_2^C\right)$ denote the deviations from the means, then the manager's optimal disclosure strategy depends on whether or not the sum, $\left(\Delta y_1 + \Delta y_2^C\right)$, is positive or negative; if it is positive, we call it good news, if it is negative, we call it bad news.

In the proof of Lemma 1, we show that for bad news, the manager wants to introduce noise into the report so that the investor infers low precision. The manager does this by either over or under-reporting the maximum, depending on whether the difference, $\left(y_1 - y_2^C - 2\delta^S\right)$, is high or low and where δ^S is

the investors inferred level of discretion. If it is high, then the first period inferred cash flow will be higher than the second period inferred cash flow and the manager over-reports the maximum in the first period to exacerbate the difference. If this difference is low, then the reverse holds, the first period inference is lower and the manager under-reports the maximum to again exacerbate the difference between the inferred cash flows in each period. We then show that the manager chooses a strategy that is exactly the opposite when the news is good. If $\left(\Delta y_1 + \Delta y_2^C\right) > 0$, the manager wants to smooth the inferred cash flows, and he can do this for intermediate levels of $\left(y_1 - y_2^C - 2\delta^S\right)$ by choosing the strategy $\psi\left(y_1, y_2^C\right) = \left(\frac{y_2^C - y_1}{2} + \delta^S\right)$. However, the constraints on the manager's reporting discretion become binding if $\left(y_1 - y_2^C - 2\delta^S\right)$ is too high or too low. The manager under-reports the maximum if $\left(y_1 - y_2^C - 2\delta^S\right)$ is sufficiently high and over-reports the maximum if $\left(y_1 - y_2^C - 2\delta^S\right)$ is sufficiently low. Proving Lemma 1 substantially completes the first step in the proof of Theorem 1, as we can show that under each of the manager's information assumptions, he will infer that the second period conjectured cash flow will be a normally distributed random variable. Also, Lemma 1 is useful later; for example, Corollary 1.1 follows immediately from Lemma 1.

In the formal statement of Theorem (included in the detailed proofs available from the authors), we specify that the equilibrium disclosure strategy depends on the two inferred levels of discretion of $\delta_{Pos}^S\left(m_1\right)$ and $\delta_{Negs}^S\left(m_1\right)$ if $\Delta m_1 - \delta_{Pos}^S\left(m_1\right) \geq 0$ and if $\Delta m_1 - \delta_{Pos}^S\left(m_1\right) < 0$, respectively. For the second step of the proof, the most demanding task is to show the existence of the inferred disclosure strategies; basically we need to show that investors will infer these amounts when the manager reports under the disclosure strategy specified in the Theorem. The key element in proving existence of the inferred disclosure strategy is to use a fixed point argument (Brouwer's fixed point theorem, Corollary 6.6 on page 29 of Border 1985) to show that the two inferred disclosure levels do indeed exist. While the first step in the proof generalizes prior research, this second step is completely new.

Outline of proofs for Corollaries 1.1 to 1.3: Corollary 1.1 follows immediately from Lemma 1 described above. Corollary 1.2 follows immediately once we observe that, when the manager follows the disclosure strategy of either Theorem 1 or the naïve strategy of Corollary 1.1, then each level of permanent earnings can be associated with every possible report. The proof of Corollary 1.3 using another lemma, this one derives the optimal disclosure strategies (both naïve and credible) under informational assumption 2. This new lemma builds off of Lemma 1discussed above, with additional work being required to set the limits of discretion. The equilibrium strategies derived in this new lemma are shown to depend only on the total cash flow each period, completing the proof of Corollary 1.3.

Outline of proofs for Theorem 2 and Corollary 2.1: The proofs of Theorem 2 and Corollary 2.1, on earnings quality, follow almost immediately from the characterizations of the equilibrium disclosure strategies derived in proving Theorem 1 and Corollaries 1.2 and 1.3. In particular, the result on earnings quality under informational assumption 1 follow form the fact that the manager is choosing to report so as to raise precision for good news and lower it under bad news coupled with the fact (from Corollary 1.2) that the equilibrium is a fully pooling one. The results on earnings quality under informational assumptions 2 and 3 (Corollary 2.1) follow from the fact that under assumption 2, the credible equilibrium is fully separately (Corollary 1.3), while under assumption 3, it is fully separating for extreme earnings reports.

Figure 1: Credible Disclosure Strategy

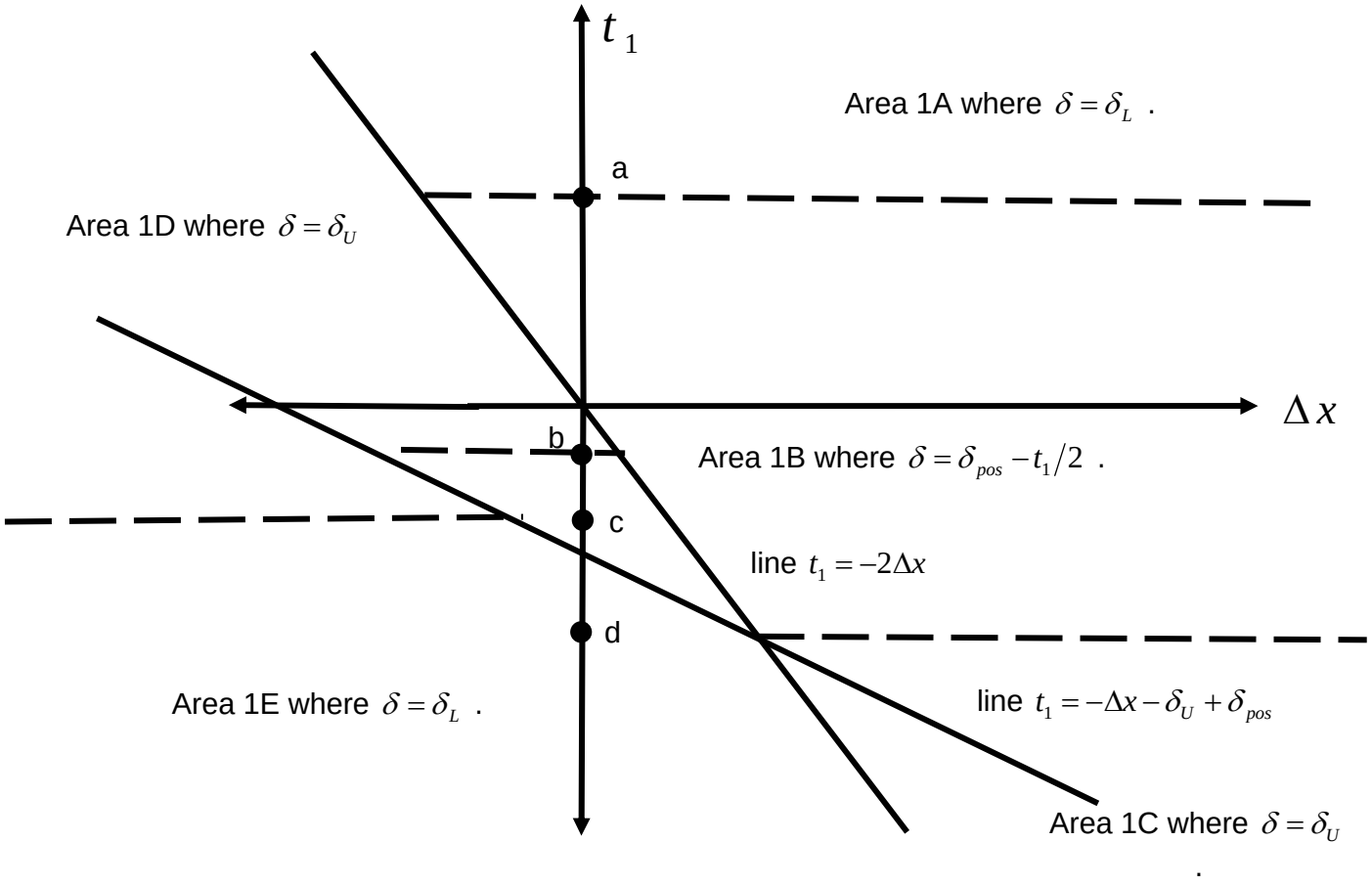

Figure 1 depicts the credible strategy of Theorem 1 in terms of 4 cut-off points that depend on two inferred disclosure amounts, δ^S_{Pos} and δ^S_{Neg}, period one earnings report and assume $\delta^S_{Pos} > \delta^S_{Neg}$ for expositional purposes. The points are $a = -2\left(\delta_L - \delta^S_{Pos}\right)$, $b = \delta^S_{Neg} + \delta^S_{Pos} - \left(\delta_L + \delta_U\right)$, $c = 2\delta^S_{Neg} - \left(\delta_L + \delta_U\right)$, and $d = -2\left(\delta_U - \delta^S_{Pos}\right)$. For good news, $\psi_{Cred}\left(y_1, x\right) = \delta^S_{Pos}\left(m_1\right) - \frac{t_1}{2}$ if $a > t_1 > d$ (area 1B). For higher (lower) transitory cash flow, the manager under (over) reports the maximum (areas 1A and 1C). For bad news, he over reports the maximum if $t_1 > b$ and $t_1 > c$ (area 1D) as investors infer non-negative cash flows and negative cash flows, respectively. Investors infer positive or negative cash flows according to the line $t_1 = -\Delta x - \delta_U + \delta^S_{Pos}$.

Figure 2: Earnings Quality in a Credible Equilibrium

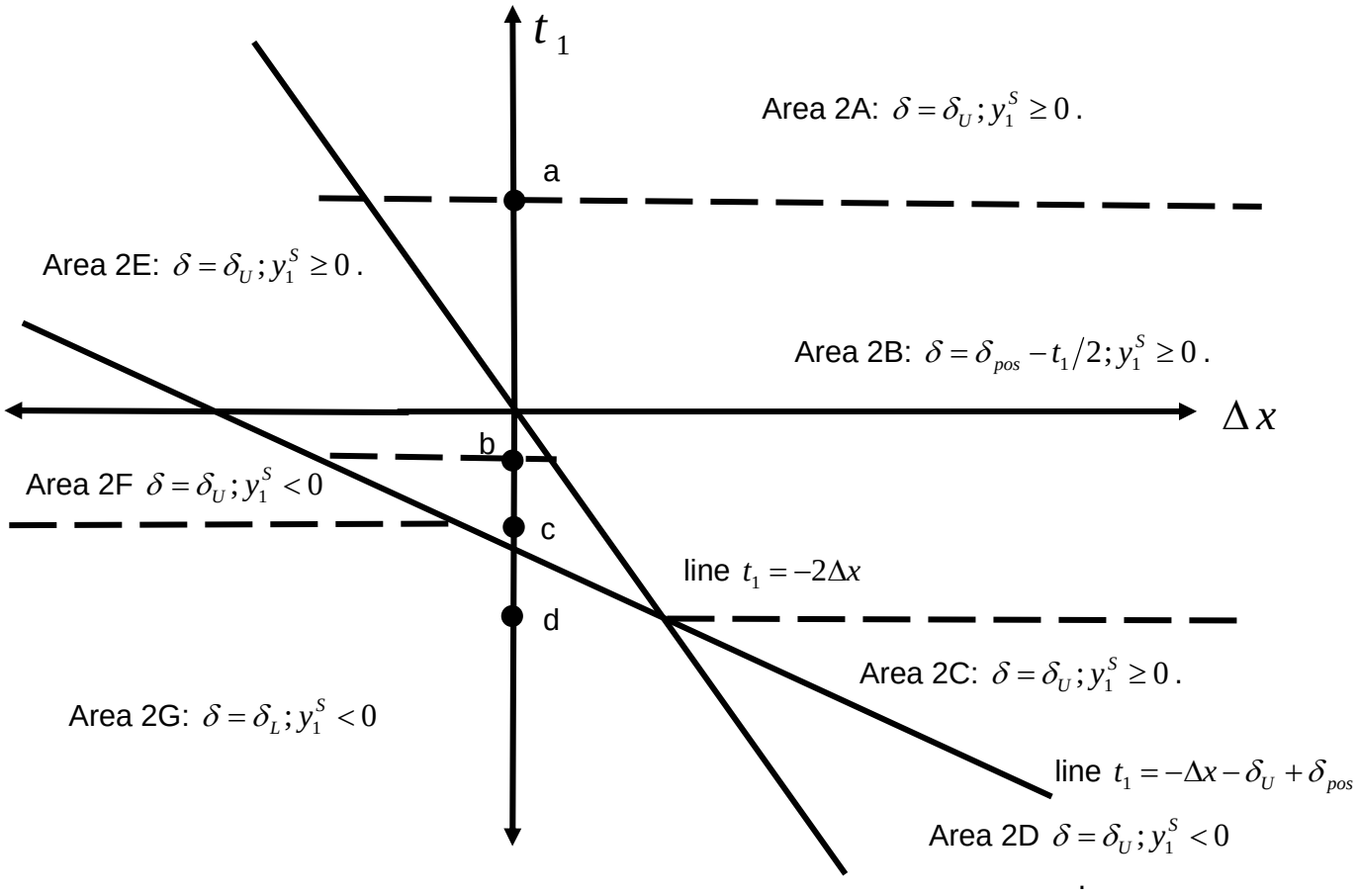

Figure 2 divides the $(\Delta x, t_1)$ plane into areas in terms of the increase and decrease in quality of earnings reported under the credible equilibrium of Theorem 1 relative to earnings reported without discretion. Line $t_1 = -2\Delta x$ divides the plane according to whether the news is good or bad. Areas 2.A, 2.B, 2.C and 2.D indicate realizations for which the manager reports higher quality earnings, while areas 2.E, 2.F and 2.G indicate realizations for which the manager reports lower quality earnings. The line $t_1 = -2\Delta x - \delta_U + \delta_{Pos}$ divides the plane according to whether investors infer that the first period cash flows are positive (areas 2.A, 2.B, 2.C and 2.E) or negative (areas 2.D, 2.F and 2.G).