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On Cost Tradeoffs Between Conservative and Market Value Accounting

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Abstract. We identify a cost tradeoff relevant to the comparison of alternative accounting regimes. We compare equilibrium deadweight losses, due to transacting and auditing, across the historical cost, lower-of-cost-or-market, and market value regimes. We provide conditions for *each* of the regimes to dominate the other two. We show that while market-value accounting is likely to prevail in an inflationary setting, it may also be optimal under deflation. Similarly, lower-of-cost-or-market is likely to prevail in a deflationary setting, though it may also be optimal under inflation. Last, historical cost prevails only if the variation in asset prices is sufficiently high.

In this paper, we identify a cost tradeoff relevant to a comparison of the properties of accounting valuation methods in communicating information to investors. The costs involved include transactions costs associated with selling assets and auditing costs of verifying asset values assigned by different accounting methods. Such costs are often overlooked in the debate over the relative merits of methods such as historical cost, lower-of-cost-or-market, and market value. To gain focus on the tradeoff between such costs, we suppress both the motivation for seeking to communicate firm value to investors and the potential signaling content of a choice over accounting methods.

More concretely, we consider a setting in which there is an information asymmetry between firm managers, who are privately informed about end-of-period value (type), and investors who only observe accounting reports of asset sales or audited asset values determined in accordance with a prespecified accounting method. Managers may either incur transaction costs associated with selling assets in order to establish their worth, or incur auditing costs to verify compliance with the accounting valuation method in use. Given a less informative method, the latter choice may mean that the firm becomes pooled with other types indistinguishable under that method by investors in forming their (posterior) beliefs. The manager's decision is governed by an unmodelled objective of maximizing expected value based on those beliefs.

The cost tradeoff depends on the accounting method employed. On one hand, a less informative method raises the prospect of incurring transactions costs of selling assets in order to establish one's worth. On the other hand, a more informative method involves higher

auditing costs of verifying compliance with that method for all reporting parties. Having characterized equilibria under each accounting method, we then address the question of which method dominates in the sense of minimizing these deadweight costs. We present and interpret two sets of conditions. The first set is expressed in terms of the magnitude of the transaction costs relative to the audit costs; the second set is expressed in terms of the parameters of the distribution function governing the process of changes in asset values.

The key insights of the analysis are the following. Under certain conditions, the lower-of-cost-or-market regime involves lower equilibrium deadweight losses compared with *both* the market value and the historical cost regimes. For this to happen, the audit cost under lower-of-cost-or-market should be sufficiently smaller than the audit cost under market value. If these audit costs are sufficiently close, lower-of-cost-or-market *never* emerges as superior: depending on the level of transaction costs, either historical cost or market value accounting involves the lowest deadweight losses.

The second set of insights pertains to the relation between the process governing changes in asset prices and the optimal accounting regime. We find that while market value accounting is likely to prevail in an inflationary setting, it may be optimal even in a deflationary setting. Similarly, while lower-of-cost-or-market is more likely to prevail in a deflationary setting, it may be optimal even in an inflationary setting. Last, surprisingly, for historical cost regime to prevail, the variation in asset prices should be sufficiently high.

The paper is organized as follows. Section 1 provides institutional background and literature review. Section 2 presents the model. The equilibrium analysis is carried out in Section 3, while the alternative accounting regimes are compared in Section 4. Section 5 provides concluding comments.

1. Institutional Background and Literature Review

Conservatism is a traditional recognition and measurement concept in accounting. Loosely speaking, accounting conservatism means that assets should be reported at the lowest of a range of possible values, whereas liabilities should be reported at the highest of a range of possible values. It also implies that expenses should be recognized sooner rather than later, while the converse is true for revenues. The lower-of-cost-or-market rule for valuing inventories provides a good example of this reasoning: a write-down is required if the market value of inventory dips below its original cost, but no write-up is allowed if the market value rises above original cost. Another example is expensing loan losses as soon as they are probable and estimable, while not recognizing related gains until they are realized. Consistent application of the conservatism principle typically implies that net assets are reported at values below current market values. Because conservatism seriously compromises the information content of financial disclosure, it is interesting to look at some of the ways accounting educators and regulators justify this concept. Kieso and Weygandt (1995) motivate conservatism as follows:

> Conservatism means **when in doubt choose the solution that will be least likely to overstate assets and income** ... All that conservatism does, properly applied,

> is to give the accountant a guide in difficult situations, and then the guide is a very reasonable one: refrain from overstatement of net income and net assets.

FASB, in its *Statements of Financial Accounting Concepts No. 2* (1980), explains the origins of conservatism in financial reporting, and stresses that this concept should not connote deliberate and consistent understatement of net assets and net income.

Notwithstanding the above justifications, critics of conservatism abound. Hendriksen (1982) argues:

> Conservatism is, at best, a very poor method of treating the existence of uncertainty in valuation and income. At its worst, it results in a complete distortion of accounting data. Its main danger is that, because it is a crude method, its effects are capricious. Therefore, conservatively reported data are not subject to proper interpretation even by the most informed readers.

More recently, conservative historical cost accounting has come under attack from the SEC, other regulatory bodies, and users of financial statements, mainly for failing to provide users with accurate information regarding the value of investment portfolios of financial institutions.[1] White (1988) notes that, under historical cost accounting, identical financial assets may be booked at different values (depending on when they were acquired), while different financial assets with different market values may have identical book values. In an interesting discussion about the role of market value accounting in the regulation of insured depository institutions, Beaver, Datar, and Wolfson (1992) (BDW) assess the potential costs and benefits of the market value proposal. They argue that to the extent that the accounting system is a monitoring tool for taxpayers, employees, and owners, the issue of which reporting system is easiest to understand and disseminate is an important one. One of their arguments in favor of market value accounting is that it is probably the easiest form of communication between a firm and its owners, because it reports on the economic values of various assets and liabilities. Historical cost-based financial statements, on the other hand, require an understanding of how the application of various accounting principles impacts the information about the firm's underlying economics.

Given these intuitive arguments against conservatism, it is an intriguing question why conservative historical cost accounting has held its ground for so long. As BDW note:

> This suggests that the costs of market value are perceived to exceed the benefits. Indeed, if the arguments for market value were so compelling, we would expect to observe more demand for it, in the case of banks and thrifts as well as for other industrial organizations.

Possible bases for conservatism are explored in the classic article of Devine (1963). For recent discussions of the different arguments in favor of and against conservatism, see Beaver (1993), Brennan (1993), Demski (1993), Harris (1993), Kahneman and Tetlock (1993), Kinney (1993), Sunder (1993), and Watts (1993).[2] Formal models of conservatism in accounting can be found in Magee (1978), Demski and Sappington (1990), Antle and Lambert (1988), Antle and Nalebuff (1991), and Kirschenheiter (1997).

Magee (1978) examines the impact of alternative accounting systems on the properties of incentive arrangements based on information generated by an accounting system. He

demonstrates that it is possible for a historical cost accounting system to Pareto-dominate a current (market) value accounting system in terms of the resulting incentives.

Demski and Sappington (1990) posit an exogenous stream of net cash flows and realizations of some informative random variable, and demonstrate that the information contained in this stream may well be perfectly conveyed by the institutional accounting structure that measures and reports net cash flow and income. In particular, they show that by computing net income with a probability measure that is conservative with respect to the original measure, it is possible to communicate all available information. Yet, the paper does not establish a "demand" for conservatism.

Antle and Lambert (1988) model the auditee-auditor relationship as a principal-agent relationship, in which an incentive scheme must induce the auditor to expend the necessary effort. Imposing an asymmetric loss function for the auditor (i.e., a heavy penalty for audit failure), they show that the auditor reports conservatively in equilibrium.

Antle and Nalebuff (1991) focus on the negotiation aspect of the auditing process. If management has private information about the firm and is trying to present as favorable a picture as possible, understatements of income by the auditor will be protested, while overstatements will go unchallenged. To correct for this "auditor's curse," the auditor reports conservatively in equilibrium.

Kirschenheiter (1997) presents a model in which a value-maximizing manager can disclose one of two signals about the value of a firm's net assets. Kirschenheiter's model is based on the idea that market value information is more relevant (i.e., has higher correlation with the measured construct), less reliable (i.e., has higher variance), and more costly than historical cost information. He shows that a lower-of-cost-or-market strategy is not credible in an unconstrained environment. For the case where lower-of-cost-or-market is exogenously enforced, he analyzes the impact of relevance and reliability on the optimal disclosure policy.

Recently, Beaver (1993) assessed the existing theoretical research on conservatism in accounting. He remarked that while Antle and Lambert (1988), and Antle and Nalebuff (1991), explain conservatism based on the strategic interaction between management and auditors, much of the conservatism observed in financial reporting is actually induced by the Financial Accounting Standards Board, a regulatory body. Acknowledging that the above models certainly capture important pieces of the conservatism puzzle, Beaver called for more formal modeling of FASB-induced conservative behavior.[3]

2. The Model

We consider the following parsimonious model with N firms. Firms are identical in all respects other than the current net value of their assets, θ, where $\theta \in \{L, C, H\}$. C is interpreted as the original (historical) cost or original value of the assets.[4] The current net value θ could have gone up to high (H), stayed unchanged, or gone down to low (L). The discrete random variable θ has the following distribution:

$$\theta = \begin{cases} L, \text{ with probability } p_L \\ C, \text{ with probability } p_C \\ H, \text{ with probability } p_H. \end{cases} \tag{1}$$

Managers are privately informed about θ. We assume that even though firms are not liquidated at the end of the period, the managers care about their firm's end-of-period value as perceived by interested outsiders. This rather descriptive assumption can be motivated in a number of ways.[5] Here, we adopt the perspective that the single period coincides with the tenure of the firm's manager, which is shorter than the time horizon of the firm. A characterization of the incentives that give rise to this form of short-term behavior is beyond the scope of this paper.

Consider a situation in which managers have no means at their disposal to convey the current net asset value θ to interested outsiders. Under the assumed information asymmetry, the firm will then be valued at

$$\bar{V}_{LCH} \equiv p_L L + p_C C + p_H H. \tag{2}$$

Managers can attempt to influence the market value of the firm through two possible actions. The first action choice is to **transact**; by selling the assets, their value is fully verified.[6] However, transacting entails a cost t.[7] The cost t represents conventional transaction costs, as well as possible tax costs. In addition to the standard direct transaction cost, selling an asset could involve an *opportunity cost*; in conjunction with the specific activities of the firm, an asset would often have a higher value than the amount it can be sold for. It seems, however, that this opportunity cost could often be minimized, if not avoided, by certain "reversal" transactions like leasing back the asset.[8]

Meiklejohn (1990) provides an example from the real estate industry:[9]

> Because of the requirements of book value accounting practices, many corporations and partnerships overlook the value of their real estate assets ... The role of the astute asset manager is to make companies and stockholders aware of the true value of real estate, using a variety of techniques ... The value of the asset will be fully recognized by the sale ... In most cases, the sale of the appreciated asset will trigger a gain for tax purposes ... Other negatives of the sale are loss of asset control, asset use, and potential appreciation.

The second action choice is to **subject the asset to an audit**. The auditor's task is to attest that the reported value of θ is stated in accordance with the prevailing accounting regime. Auditing involves an audit fee a_r, where a_r depends on the specific accounting regime r considered (denoted by hc, lcm, or mv). Throughout the analysis, we assume a given regulated reporting environment and mandatory auditing.[10,11] Thus, when a firm does not sell its asset, its default choice is to have the auditor audit the value of the asset.[12]

Auditors are assumed to be non-strategic and perfect (i.e., if hired, the auditor will always identify the appropriate reported value of the asset in question under the prevailing accounting regime). Clearly, this simplifying assumption entails loss of generality. However, as will become apparent, the model is sufficiently rich to illustrate the cost tradeoff we are studying. Further, we can show that, under certain conditions, allowing audit errors would leave the results of Section 4 qualitatively unchanged.[13]

Having discussed the manager's objective of market-value maximization, as well as the possible actions he can take to achieve that objective, we now turn to the nature of the financial reporting environment. The analysis is based on the idea that the institutional

details of the accounting regime determine the informational properties of the financial reports. Since these reports impact the value of the firm as perceived by outsiders, the accounting regime will possibly influence the manager's actions, and hence the level of incurred costs. The accounting regimes we examine differ in the way in which asset values are accounted for. Specifically, we consider *historical cost accounting, lower-of-cost-or-market accounting*, and *market value accounting*. Lower-of-cost-or-market is the special brand of accounting conservatism analyzed in this paper.

The need to engage in costly *transactions* or *auditing* to verify the value of the firm's assets is a direct consequence of the assumed information asymmetry, and the associated costs are considered socially wasteful. The focus of this analysis will be on the comparison of these deadweight losses across accounting regimes.[14] A more general model should include the differential benefits provided by these alternative regimes, in terms of the allocational efficiency achieved by investors. In the present setting, however, we focus entirely on the cost side of the cost-benefit equation.

We assume that the cost involved in auditing asset values reported under lower-of-cost-or-market is *lower* than that involved in auditing market values, and *higher* than that associated with auditing values established based on historical cost. (As will become apparent, these audit cost differences need not be "large.") We normalize the cost of auditing original (historical) values to zero. That is,

$$0 < a_{lcm} < a_{mv}. \tag{3}$$

A number of authors in the professional literature have pointed out that market value accounting is likely to be more costly than either historical cost or lower-of-cost-or-market accounting. To illustrate this point, consider the case of buildings and land. If we were to apply lower-of-cost-or-market to real estate, it would necessitate appraisal reports.[15] Suppose that under lower-of-cost-or-market the auditor receives a few appraisals with high variation, but all establish the value to be in excess of historical cost (after depreciation). In that case, the auditor could be sufficiently certain that historical cost is the appropriate representation under lower-of-cost-or-market. Next, consider market value accounting. Here, high variation in the appraisal reports would probably lead to further (costly) appraisals before the auditor could arrive at an appropriate point estimate of the current value of the asset.[16,17]

We also assume that

$$a_{mv} < t, \tag{4}$$

and

$$a_{mv} < \min\{C - \bar{V}_{LC},\ H - \bar{V}_{CH}\} \tag{5}$$

where, $\bar{V}_{LC} \equiv \frac{p_L L + p_C C}{p_L + p_C}$, $\bar{V}_{CH} \equiv \frac{p_C C + p_H H}{p_C + p_H}$.[18]

The assumption in (4) implies that it is less expensive to fully reveal value via market value accounting, than it is to sell the asset. While this assumption need not hold in all instances, we find it descriptive of a large number of potential transactions (note that if this assumption does not hold, market value accounting will certainly be inferior to the other

regimes). The assumption in (5) assures that the audit cost in the market value regime is not "too high" in the sense that it is at least possible that a firm of type C and/or H will find it worthwhile to be audited in a market value regime rather than transact in order to be separated from their average valuations with lower types.[19] Assumptions (4) and (5) enable us to restrict the analysis to a strict subset of more interesting cases.

To summarize, the sequence of moves in the game, and the definition of equilibrium, are as follows.

1. Each firm privately observes the current value of its asset (which was purchased at a cost C).

2. Each firm, correctly anticipating investors' beliefs, strategically decides whether to transact or subject the asset to an audit.

3. Investors form their beliefs regarding the value of the asset (firm) based on the firm's decision (in step 2) and the reported asset value. These beliefs, together with the firm's decision, give rise to the firm's valuation.

An equilibrium is defined as a pure-strategy profile which assigns an action (sell the asset, or verify its valuation in accordance with the specified accounting method) to each type conditional on investor beliefs, and which ensures that those beliefs are consistent with the information available to investors under that profile.

In the next section, we analyze the equilibria that exist in the different accounting regimes. The equilibrium analysis is central to our objective of comparing deadweight losses across accounting regimes.

3. Equilibrium Analysis

Below, we use a triple vector to denote a strategy profile (or an equilibrium), where the first, second, and third elements represent, respectively, the choices of the L, C, and H types; e.g., *aat* denotes an equilibrium where L and C choose not to transact and subject the asset to an audit, and H chooses to transact. For simplicity, we confine our attention to pure-strategy equilibria. Although we could identify a number of mixed-strategy equilibria, they do not offer substantial insights beyond those offered by the pure-strategy equilibrium analysis.

3.1. Historical Cost Regime

In this regime, net assets are always reported at the original value, C, regardless of their current value. Horngren, Sundem and Elliot (1996) point out:

> Under historical-cost accounting, land is carried indefinitely at its original cost. After many years of persistent inflation, its carrying amount is likely to be far below its current market value. Should land acquired and held since 1936 be placed on a 1996 balance sheet at cost expressed in 1936 dollars? Accountants do exactly that.

> For example, Weyerhaeuser lists 5.9 million acres of land at $125 million (only $21 per acre).

The following proposition presents the pure-strategy equilibria for this regime.[20]

Proposition 1.1 *The following equilibria exist in the* ***historical cost*** *regime.*

1. *(Pooling) For* $t > H - \bar{V}_{LCH}$, *no type transacts, all are audited and valued at* $\bar{V}_{LCH}$. *No deadweight loss is incurred.*

2. *(Partial Separation) For* $t \in (C - \bar{V}_{LC}, H - \bar{V}_{LC})$, *only* H *transacts and is valued at* $H - t$. C *and* L *are audited and valued at* $\bar{V}_{LC}$. *Total deadweight loss is* $p_H N t$.

3. *(Full Separation) For* $t < C - L$, *both* H *and* C *transact and are valued at* $H - t$ *and* $C - t$, *respectively.* L *is audited and valued at* L. *Total deadweight loss is* $(1 - p_L)Nt$.

Proof: Proofs appear in the Appendix. ■

When the cost of transacting is higher than the benefit to H of being separated from the average valuation, no type finds it worthwhile to transact. Since the accounting regime does not discriminate between different net asset values, all types are therefore valued at the average $\bar{V}_{LCH}$. In an intermediate range, partially overlapping with the high range, only H finds it worthwhile to transact. Full separation occurs in the low range of t, which overlaps with the intermediate range.

Note that in the range $t \in (H - \bar{V}_{LCH}, H - \bar{V}_{LC})$, we have two pure-strategy equilibria. If investors believe, for instance, that the information that the firm was audited is equally likely to have originated from all three types, then the relevant choice for H is between transacting (and bearing the associated cost t) and receiving the average valuation. Not transacting will dominate transacting when $t > H - \bar{V}_{LCH}$.[21] If, on the other hand, investors believe that the information that the firm was audited and reported C can only come from L or C, the relevant choice for H is between transacting and receiving the valuation $\bar{V}_{LC}$. Here, transacting will dominate not transacting if $t < H - \bar{V}_{LC}$. In both cases, investors' beliefs are confirmed by firms' optimal actions. Both equilibria can therefore prevail in this region. We will return to this issue in Section 4 below.

3.2. Lower-of-Cost-or-Market Regime

One of the manifestations of conservatism in financial accounting is the so-called lower-of-cost-or-market rule. Kieso and Weygandt (1995) explain:

> The general rule is that the historical cost principle is abandoned when the future utility (revenue-producing ability) of the asset is no longer as great as its original cost. A departure from cost is justified on the basis that a loss of utility should be reported as a charge against the revenues in the period in which it occurs.

In the present context, the lower-of-cost-or-market rule implies that through an audit, C and H could possibly be separated from L.[22] The following proposition presents the equilibrium for this regime.

Proposition 1.2 *The following equilibria exist in the* ***lower-of-cost-or-market*** *regime.*

1. *(Partial Separation) For* $t > H - \bar{V}_{CH} + a_{lcm}$, *no type transacts. C and H are valued at the average value* $\bar{V}_{CH} - a_{lcm}$, *while L is valued at* $L - a_{lcm}$. *Total deadweight loss is* Na_{lcm}.
2. *(Full Separation) For* $t < H - C + a_{lcm}$, *only H transacts and is valued at* $H - t$. *C and L are audited and valued at* $C - a_{lcm}$ *and L at* $L - a_{lcm}$. *Total deadweight loss is* $p_H Nt + (1 - p_H)Na_{lcm}$.

In this regime, no type finds it worthwhile to sell its assets when the difference between the cost of transacting and the cost of being audited is higher than the benefit to H of getting separated from C. As intuition suggests, the att equilibrium cannot prevail in this regime. No matter how low the cost of transacting, C will always prefer the less expensive auditing alternative, since auditing will now separate it from L.

3.3. Market Value Regime

When assets are reported at market values, and auditing is mandatory, there is full separation of types.

Proposition 1.3 *The only equilibrium that exists in the market value regime is one in which each type* θ *is audited and valued at* $\theta - a_{mv}$. *Total deadweight loss is* Na_{mv}.

3.4. Non-Monotonicity of the Deadweight Loss Function

A side result of the previous analysis is the non-monotonicity of the equilibrium deadweight loss as a function of t, in the historical cost and lower-of-cost-or-market regimes.[23] When t is low, the prevailing equilibria are those in which C and/or H transact; as t increases, total deadweight loss increases. On the other extreme, when t is sufficiently high, no type transacts, and the total deadweight loss decreases. Figures 1 and 2 illustrate the deadweight loss as a function of t, under a historical cost and a lower-of-cost-or-market regimes.

Corollary to Proposition 1 *In both the historical cost and lower-of-cost-or-market regimes, the equilibrium deadweight loss is a non-monotonic function of the transaction cost t.*

4. Comparison of Reporting Regimes

Having presented the different equilibria in our setting, we are now in a position to make statements about how the three accounting regimes compare in terms of the deadweight

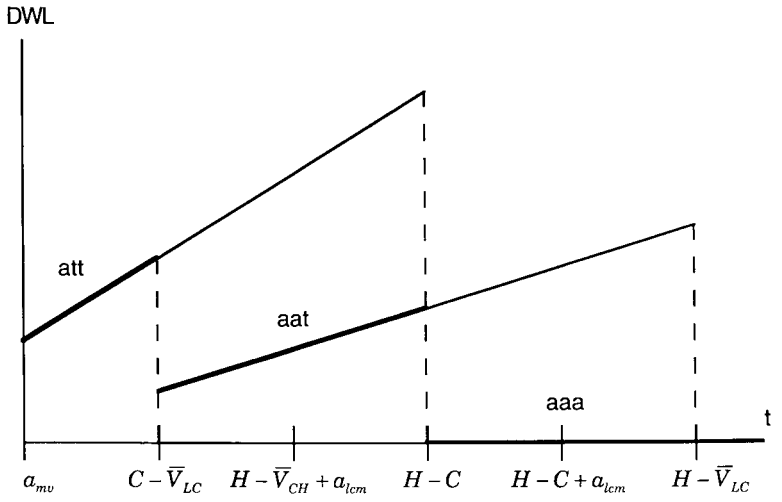

Figure 1. Total deadweight loss (DWL) as a function of t under historical cost.

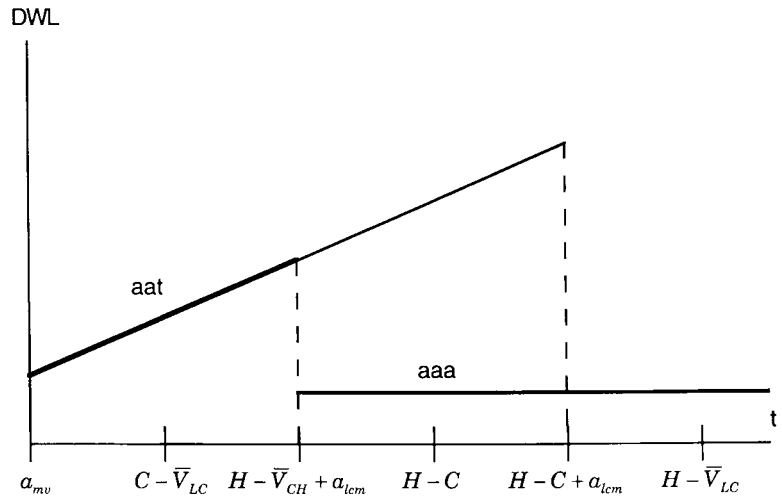

Figure 2. Total deadweight loss (DWL) as a function of t under lower-of-cost-or-market.

loss associated with auditing and transacting. As noted above, this deadweight loss is a direct consequence of the information asymmetry between the firm and outside investors regarding changes in the value of the firm's assets. We start with a comparison based on the level of the transaction cost. We then examine the relation between the distribution function of asset values and the magnitude of the deadweight loss.

4.1. Comparison Based on Transaction Costs

It is apparent from Propositions 1 and 2 that a comparison of the deadweight loss between the lower-of-cost-or-market and historical cost regimes as a function of t depends on the equilibrium prevailing under each regime. This, in turn, depends on the ordering of the *cutoff points* of the ranges of t in both regimes. For example, for certain cost parameters and probabilities, we could have: $H - \bar{V}_{CH} + a_{lcm} > C - \bar{V}_{LC}$, in which case the equilibria to be compared in the range $t \in (a_{mv}, C - \bar{V}_{LC})$, are *aat* for the lower-of-cost-or-market regime and *att* for the historical cost regime. The relevant deadweight loss comparison is therefore between $(1 - p_H)Na_{lcm} + p_H Nt$ and $(1 - p_L)Nt$. This leads to the result that lower-of-cost-or-market dominates historical cost if and only if

$$t > \frac{(1 - p_H)a_{lcm}}{p_C}. \tag{6}$$

If, on the other hand, $H - \bar{V}_{CH} + a_{lcm} < C - \bar{V}_{LC}$, it is possible for the equilibrium *aaa* to prevail in the range $t \in (H - \bar{V}_{CH} + a_{lcm}, C - \bar{V}_{LC})$, in addition to the equilibrium *aat*. If *aaa* prevails, the relevant comparison is between Na_{lcm} and $(1 - p_L)Nt$, leading to the result that lower-of-cost-or-market dominates historical cost if[24]

$$t > \frac{a_{lcm}}{1 - p_L}. \tag{7}$$

As will become clear from the proof of Proposition 2, a full-blown analysis of every possible ranking of cutoff points would not add substantive results beyond those that can be obtained by placing some additional structure on the distribution of prior beliefs about firm type. For simplicity, therefore, we focus our attention in this section on the following class of symmetric distribution functions,

$$H - C = C - L,$$

and

$$p_L = p_H \equiv \alpha,\ p_C = 1 - 2\alpha. \tag{8}$$

(This simplifying assumption is relaxed in Section 4.2 below.)

Proposition 2 presents a set of conditions under which each reporting regime dominates the other two regimes in terms of deadweight loss.

We only present here the results for the more interesting range $t \in (a_{mv}, \min\{C - \bar{V}_{LC}, H - \bar{V}_{CH}\})$. In this range, t is small enough so that C finds it worthwhile to transact when not

transacting would cause it to be pooled with L, with a resulting valuation $\bar{V}_{LC}$. Similarly, H finds it worthwhile to transact when not transacting would cause it to be pooled with C with a resulting valuation $\bar{V}_{CH}$. This restriction simplifies the statement of Proposition 2 because it enables us to focus on a subset of possible equilibrium combinations. For completeness, the proof contains the results for all values of t.

Proposition 2 *Consider the range* $t \in (a_{mv}, \min\{C - \bar{V}_{LC}, H - \bar{V}_{CH}\})$ *and the class of symmetric distribution functions defined in (8). Then,*

1. *A necessary and sufficient condition for the* ***historical cost*** *regime to dominate the other two regimes in terms of deadweight loss is*

$$t < \min\left\{\frac{a_{mv}}{1-\alpha}, \frac{(1-\alpha)a_{lcm}}{1-2\alpha}\right\}. \tag{9}$$

2. *A necessary and sufficient condition for the* ***lower-of-cost-or-market*** *regime to dominate the other two regimes in terms of deadweight loss, is*

$$\frac{(1-\alpha)a_{lcm}}{1-2\alpha} < t < \frac{a_{mv} - (1-\alpha)a_{lcm}}{\alpha}. \tag{10}$$

3. *A necessary and sufficient condition for the* ***market value*** *regime to dominate the other two regimes in terms of deadweight loss, is*

$$t > \max\left\{\frac{a_{mv} - (1-\alpha)a_{lcm}}{\alpha}, \frac{a_{mv}}{1-\alpha}\right\}. \tag{11}$$

Conditions (9), (10), and (11) convey the following intuition. Note that conditions (9) through (11) cover the entire range of t.[25] As we move from a historical cost regime, via a lower-of-cost-or-market regime, to a market value regime, auditing gets more expensive while transacting occurs less frequently. As historical cost reporting involves the lowest audit cost and the largest volume of transactions, it will dominate the other two regimes if the cost of transacting is sufficiently low. Similarly, as market value reporting involves the highest audit cost and the least (no) transacting, it will dominate the other two regimes if the cost of transacting is high.

The more interesting part of Proposition 2 is the one pertaining to the lower-of-cost-or-market. The lower-of-cost-or-market regime involves intermediate levels of audit cost and transaction volume. If the cost of transacting is too high, the fact that the audit cost a_{lcm} is lower than in the market value regime will not be sufficient to offset high t, and market value accounting will dominate. If, on the other hand, the cost of transacting is sufficiently low, the fact that the audit cost exceeds that of the historical cost regime will be the critical factor, and consequently historical cost accounting will dominate. The lower-of-cost-or-market regime will therefore dominate the other two if t is in an intermediate range. However, the lower-of-cost-or-market regime may *never* emerge as superior if the audit cost a_{lcm} is not sufficiently smaller than a_{mv}. Specifically,

Corollary to Proposition 2 *When* $\frac{a_{mv}}{a_{lcm}} < 1 + \frac{\alpha^2}{1-2\alpha}$, *the* ***lower-of-cost-or-market*** *regime is dominated by either the* ***market value*** *or the* ***historical cost*** *regime, for* any *level of transaction cost* t.

The following example provides a numerical illustration of Proposition 2.

Example 1 Consider the parameter values $(L, C, H) = (500{,}000, 1{,}000{,}000, 1{,}500{,}000)$, $a_{lcm} = 10{,}000$, $a_{mv} = 12{,}500$, and $\alpha = 0.3$. Table 1 summarizes resulting equilibrium dead-weight losses for different transaction cost values. Note that the optimal accounting regime could be any of the three regimes.

Table 1. Deadweight losses under different accounitng regimes. (Optimal regime appears in bold.)

	t = 14,000	t = 18,000	t = 19,000
Market Value	$aaa \rightarrow$ 12,500	$aaa \rightarrow$ 12,500	$aaa \rightarrow$ **12,500**
Lower-of-Cost-or-Market	$aat \rightarrow$ 11,200	$aat \rightarrow$ **12,400**	$aat \rightarrow$ 12,700
Historical Cost	$att \rightarrow$ **9,800**	$att \rightarrow$ 12,600	$att \rightarrow$ 13,300

Up to this point, the analysis has been silent on whether it applies to the aggregate assets of the firm (with a_{lcm}, a_{mv}, and t referring to *aggregate* audit and transaction costs), or to individual assets (with a_{lcm}, a_{mv}, and t appropriately interpreted). Indeed, nothing in the analysis precludes us from applying the above results item-by-item. To illustrate this point, consider marketable securities. Condition (11) seems to be the relevant one: since market values are readily available for this type of asset, the associated audit cost is very low. Thus, it seems that condition (11) is likely to be fulfilled, which is consistent with the empirical observation that marketable securities in the categories of trading and held for sale, are reported at fair (market) value (see SFAS #115).[26]

4.2. Comparison Based on the Distribution Function of Asset Values

In this subsection, we relax assumption (8) and allow asymmetric distribution functions of asset values. This enables us to present an alternative, intuitive interpretation of the conditions under which each reporting regime sometimes dominates the other two.

Qualitatively, we expect a market value reporting regime to prevail in an environment of rising asset prices or inflation, which we interpret here as one in which p_H is higher than p_L. The reasoning behind this conjecture is that the higher audit cost under market value would be more than compensated by the elimination of the transaction cost that would be incurred by the relatively large number of firms that would try to separate themselves from lower types under the other regimes. Similarly, we expect a lower-of-cost-or-market regime to do better in an environment of falling asset prices (i.e., p_H is lower than $1 - p_H$, coupled with p_L not being "too low"). The reasoning here is that the small probability of value increases would not justify the high cost of market value auditing. At the same time, under lower-of-cost-or-market, the incremental cost of auditing would be offset by the saving of

the transaction cost C would incur to separate itself from L under the historical cost regime. Finally, we expect a historical cost regime to prevail in an environment of stable asset prices (i.e., p_H and p_L are both sufficiently low), as most firms would not choose to incur the transaction cost.

To test this intuition, we adopt again the assumption of equal changes in value,

$$H - C = C - L, \tag{12a}$$

but now allow the probabilities of L and H to differ[27]

$$p_H \neq p_L. \tag{12b}$$

It is apparent from the proofs of Propositions 1.1 and 1.2 that the main complication arising from (12b) is due to the different possible orderings of the cutoff points

$$a_{mv},\ C - \bar{V}_{LC},\ H - \bar{V}_{LCH},\ \text{and}\ H - \bar{V}_{CH} + a_{lcm},$$

and to the possible multiplicity of equilibria in the relevant ranges of t. To avoid burdening the presentation, we focus on

$$t \in (a_{mv}, \min\{C - \bar{V}_{LC},\ H - \bar{V}_{CH}\}). \tag{13}$$

This restriction guarantees that the resulting equilibria are *att* under historical cost, *aat* under lower-of-cost-or-market, and *aaa* under market value. As we argued earlier, we consider (13) to be the most interesting range.[28]

The following proposition presents a set of conditions for p_H and p_L under which each reporting regime dominates the other two regimes in terms of deadweight loss.

Proposition 3 *Consider the range* $t \in (a_{mv}, \min\{C - \bar{V}_{LC},\ H - \bar{V}_{CH}\})$ *and the class of asymmetric distribution functions defined in (12).*

1. *A necessary and sufficient condition for the* ***market value*** *regime to dominate the other two regimes in terms of deadweight loss, is:*

$$p_H > \frac{a_{mv} - a_{lcm}}{t - a_{lcm}} \text{ and } p_L < 1 - \frac{a_{mv}}{t}. \tag{14}$$

2. *A necessary and sufficient condition for the* ***lower-of-cost-or-market*** *regime to dominate the other two regimes in terms of deadweight loss, is:*

$$p_H < \min\left\{\frac{a_{mv} - a_{lcm}}{t - a_{lcm}},\ \frac{(1 - p_L)t - a_{lcm}}{t - a_{lcm}}\right\}. \tag{15}$$

3. *A necessary and sufficient condition for the* ***historical cost*** *regime to dominate the other two regimes in terms of deadweight loss, is:*

$$p_H > \frac{(1 - p_L)t - a_{lcm}}{t - a_{lcm}} \text{ and } p_L > 1 - \frac{a_{mv}}{t}. \tag{16}$$

Condition (14) seems consistent with our intuition that we should expect the market value regime to prevail in an environment of rising asset prices in that it places a lower bound on p_H and an upper bound on p_L. It is interesting to note, however, that the market value regime could prevail even when p_H is smaller than p_L, i.e., in an environment of declining prices. In general, the relation between the bounds on p_H and p_L depends on the particular values of a_{lcm}, a_{mv}, and t. Example 2 below illustrates part (1) of Proposition 3.

Example 2 Consider the parameter values $(L, C, H) = (500{,}000, 1{,}000{,}000, 1{,}500{,}000)$, $a_{lcm} = 10{,}000$, $a_{mv} = 12{,}500$, and $t = 20{,}000$. The first column of Table 2 illustrates the dominance of market value accounting for $p_H = 0.75 > p_L = 0.15$. The second column illustrates the dominance of market value accounting for $p_H = 0.26 < p_L = 0.37$.

Table 2. Dominance of the market value regime. (Optimal regime appears in bold.)

	$p_H = 0.75, p_L = 0.15$	$p_H = 0.26, p_L = 0.37$
Market Value	$aaa \rightarrow$ **12,500**	$aaa \rightarrow$ **12,500**
Lower-of-Cost-or-Market	$aat \rightarrow$ 17,500	$aat \rightarrow$ 12,600
Historical Cost	$att \rightarrow$ 17,000	$att \rightarrow$ 12,600

Similarly, the upper bound placed on p_H in condition (15) seems consistent with our intuition that the lower-of-cost-or-market prevails when prices are non increasing.[29] Again, it is interesting to note that lower-of-cost-or-market could prevail even if prices are most often rising, i.e., p_H is larger than $1 - p_H$. The relation between p_H and p_L depends on the values of a_{lcm}, a_{mv} and t. Example 3 below illustrates part (2) of Proposition 3.

Example 3 Consider the parameter values $(L, C, H) = (500{,}000, 1{,}000{,}000, 1{,}500{,}000)$. The first column of Table 3 illustrates the dominance of the lower-of-cost-or-market regime in a case where prices are declining, i.e., when $p_H < p_L$. The second column illustrates the dominance of the lower-of-cost-or-market regime when prices are most often rising, i.e., $p_H > 1 - p_H$.

Table 3. Dominance of the lower-of-cost-or-market regime. (Optimal regime appears in bold.)

	$a_{lcm} = 10{,}000$ $a_{mv} = 12{,}500$ $t = 20{,}000$ $p_H = 0.15, p_L = 0.4$	$a_{lcm} = 10{,}000$ $a_{mv} = 15{,}000$ $t = 18{,}000$ $p_H = 0.54, p_L = 0.2$
Market Value	$aaa \rightarrow$ 12,500	$aaa \rightarrow$ 15,000
Lower-of-Cost-or-Market	$aat \rightarrow$ **11,500**	$aat \rightarrow$ **14,320**
Historical Cost	$att \rightarrow$ 12,000	$att \rightarrow$ 14,400

Finally, condition (16) seems counterintuitive. We expect the historical cost regime to prevail when asset prices are stable, i.e., when p_H and p_L are both low. Condition (16),

Table 4. Dominance of the historical cost regime. (Optimal regime appears in bold.)

	$p_H = 0.5, p_L = 0.38$	$p_H = 0.03, p_L = 0.03$
Market Value	$aaa \rightarrow$ 12,500	$aaa \rightarrow$ 12,500
Lower-of-Cost-or-Market	$aat \rightarrow$ 15,000	$aat \rightarrow$ 10,300
Historical Cost	$att \rightarrow$ **12,400**	$aat \rightarrow$ **600**
		$att \rightarrow$ 19,400

however, places *lower bounds* on both p_H and p_L. (We return to this result later, and explain the intuition behind it.)

It is interesting to note, however, that our intuition is confirmed for parameter values t outside the range of $(a_{mv}, \min\{C - \bar{V}_{LC}, H - \bar{V}_{CH}\})$. In particular, for

$$\frac{p_L}{1 - p_H} \leq \frac{t}{C - L}, \tag{17}$$

it is possible, under the historical cost regime, for the equilibrium aat to prevail, in addition to att. Then we can show that a sufficient condition for at least one equilibrium under the historical cost regime to dominate the other two regimes is

$$p_H < \frac{a_{mv}}{t}. \tag{16*}$$

Taking (16*) into account, (17) can be replaced by the following sufficient condition for aat to prevail in addition to att:

$$\frac{p_L}{1 - \frac{a_{mv}}{t}} \leq \frac{t}{C - L}, \quad \text{or} \quad p_L \leq \frac{t - a_{mv}}{C - L}. \tag{18}$$

Taken together, conditions (16*) and (18) conform to our intuition that the historical cost regime dominates the other two regimes when asset prices are stable, i.e., when the probabilities of price increases and decreases are both low. We note, however, that this intuition holds up only if the cost of transacting is such that C prefers to be pooled with L rather than transact. Example 4 below illustrates part (3) of Proposition 3 and the case described in (16*) and (17).

Example 4 Consider the parameter values $(L, C, H) = (500{,}000, 1{,}000{,}000, 1{,}500{,}000)$, $a_{lcm} = 10{,}000$, $a_{mv} = 12{,}500$, and $t = 20{,}000$. The first column of Table 4 illustrates the dominance of historical cost under the conditions of Proposition 3. The second column considers parameters outside of the range covered by Proposition 3. This example illustrates the dominance of historical cost when prices are stable, i.e., for small p_H and p_L.

The reason why some aspects of the results of Proposition 3 seem counterintuitive is that there are two, at times conflicting, forces determining the optimal regime. The first factor is the one that was guiding our original intuition, i.e., the relative magnitudes of the probabilities p_L and p_H. There is, however, a second factor which plays an important role in

determining the optimal regime—the magnitude of the variation in asset value. To see that, we focus attention on the variance of the distribution function of asset value by considering the special case of Proposition 3, where $p_L = p_H = \alpha$ (recall (8)). The following result immediately emerges, establishing a unique ordering of optimal regimes in terms of the magnitude of the variance.

Corollary to Proposition 3 *Consider again the symmetric distribution in (8). Hold all other parameters fixed and consider the effect of increasing the variance of the distribution in (8). Then, (i) either two or all three regimes emerge as an optimal regime for certain values of α; and (ii) the dependence of the optimal regime on the variance of the distribution is uniquely determined and is summarized in Table 5.*

Table 5. Optimal accounting regime as a function of the variance of asset prices.

Level of Variance	Optimal Regime (Case 1)	(Case 2)	(Case 3)
Low	LCM	LCM	LCM
Mid	MV	*NA*	MV
High	HC	HC	*NA*

Note that while the lower-of-cost-or-market regime is always optimal for sufficiently small levels of α, it is possible that either the market value or the historical cost regime never emerges as optimal for the considered parameters. In fact, we can show that (i) a sufficient condition for historical cost to never prevail as the optimal reporting regime is $t > 2a_{mv}$; and (ii) a sufficient condition for market value to never prevail as the optimal reporting regime is $t < a_{mv} + \sqrt{a_{mv} \cdot (a_{mv} - a_{lcm})}$.

One interesting aspect of the corollary is that when the variance is sufficiently large, the historical cost regime dominates the other two. In that case, the savings in audit costs on the part of the many low-type firms under historical cost, dominates the excess cost of transacting over auditing incurred by higher types.[30] More specifically, for the parameters considered, the equilibrium att prevails under historical cost; the advantage of this regime is that the audit cost (borne only by the L type) is low (in fact, scaled to zero). To bring out this advantage vis-à-vis the market value regime, $p_L = \alpha$ must be high. At the same time, $p_H = \alpha$ needs to be high enough for the disadvantage of lower-of-cost-or-market (i.e., the fact that H transacts) to become a critical factor.

In the context of our setting, it also seems counterintuitive that at a low level of variance, lower-of-cost-or-market emerges rather than historical cost. One should expect historical cost to dominate when the variance is very low, because in that case almost every asset is valued at C, and therefore there is essentially no demand for "separation." Remember, however, the restriction of the parameter t to the range $(a_{mv}, \min\{C - \bar{V}_{LC}, H - \bar{V}_{CH}\})$. This restriction implies a certain lower bound on the variance. As we argued earlier, we consider this subset to be the most interesting range. If we were to consider parameters outside of this range, we would augment the above table to allow for "very low" variance

values, and one of the corresponding optimal regimes would be, as anticipated, the historical cost regime.

5. Concluding Comments

We presented a simple model in which firms attempt to maximize their perceived value in a setting where there is information asymmetry between firms and interested outsiders, and where the costs of auditing and the transaction costs associated with (suboptimally) selling assets are considered a deadweight loss. We compared three alternative reporting regimes in terms of their associated deadweight loss, and identified conditions under which each of the regimes emerges as superior. One interesting result establishes that, under certain conditions, the lower-of-cost-or-market regime involves a strictly lower deadweight loss than *either* the market value regime or the historical cost regimes. Our analysis suggests that it might be desirable to choose different reporting measures for different types of assets. For example, have market value accounting for marketable securities, while using lower-of-cost-or-market accounting for real estate.

An interesting interpretation of our results is based on the dynamics of changes in the level of asset values. We identify the optimal reporting regime as a function of the likelihood and magnitude of changes in asset values. For example, we show that a market value regime dominates the other regimes if the probability of an increase in the asset price is bounded below, while the probability of a decrease is bounded above. Although this result partially recovers the intuition that a market value regime is likely to do better in an environment of rising asset prices (i.e., the probability of price increases is higher than that of price decreases), we observe that, depending on the parameters of the problem, this intuition is not necessarily upheld. Similar results are obtained for the lower-of-cost-or-market and historical cost regimes.

Our model has focused on cost tradeoffs, and ignored another important aspect of financial disclosure: the informational benefits to users associated with the differently reporting regimes. "Information quality" considerations introduce another important tradeoff (for users), the one which is often referred to as the tradeoff between *relevance* and *reliability*; that tradeoff is the focus of Kirschenheiter (1997). An interesting extension, one that is beyond the scope of this study, will be to develop an integrated model in which both tradeoffs are present. It should be noted, however, that the cost tradeoff identified in this paper seems independent of the information-quality tradeoff. Also, there is no reason to expect that one form of tradeoff would always dominate the other, as in both our and Kirschenheiter's settings, no accounting regime always dominates the others.

In our setting, all managers are interested in maximizing the end-of-period (interpreted as short-term) value of the firm. In a more realistic setting, there would also be managers who, for a variety of reasons exogenous to the model (e.g., holding a significant restricted equity position), would have no interest in short-term performance. In such cases, we expect that the larger is the percentage of long-term oriented managers, the less viable is market value reporting compared to either lower-of-cost-or-market or historical cost reporting.

We repeated our study for a discretionary auditing environment in which firms are not required to hire an auditor. We chose not to report the results of that analysis here be-

cause we found that allowing discretionary auditing does not add substantive results. The interesting observation we made was that the conditions under which lower-of-cost-or-market dominates the other two regimes are always non-empty.[31] We can also show that the lower-of-cost-or-market regime prevails more often under discretionary auditing than under mandatory auditing.

There are two other possible extensions to the present analysis that could be of interest. The first is to investigate a discretionary auditing environment in which firms are free to choose the type of audit (historical cost, lower-of-cost-or-market, or market value). The second extension is to introduce an imperfect audit technology. If audits are imperfect, the firm's action choice becomes two-dimensional: in addition to hiring an auditor, the firm now also decides what to report. This brings us to the realm of strategic reporting models, where, depending on the specification of the audit technology, it is possible that firms over- or under-report in equilibrium. However, we expect the main insights of this paper to remain intact.

Appendix: Highlights of Proofs

Equilibrium Analysis

From the eight potential pure-strategy equilibria, we rule out the four strategy profiles in which L transacts; the best L can hope for is to be pooled with one of the higher types, while the worst it can hope for is to have its asset value revealed. To reveal its type through costly transaction, therefore, is always a dominated strategy. This leaves only the strategy profiles *aaa*, *aat*, *ata*, and *att* as potential pure-strategy equilibria. (We do not analyze equilibria at the endpoints of the sub-ranges of t, because the set of parameters for which these equilibria exist has measure zero.) Recall the notation

$$\bar{V}_{LCH} \equiv p_L L + p_C C + p_H H,\ \bar{V}_{LC} \equiv \frac{p_L L + p_C C}{p_L + p_C},\ \bar{V}_{CH} \equiv \frac{p_C C + p_H H}{p_c + p_H}.$$

Proposition 1.1 We proceed by establishing, for each candidate strategy profile, conditions under which C and H will play the corresponding strategies.

1. *aaa*

Type C: $\quad C - t < \bar{V}_{LCH}$

where, given the conjectured equilibrium *aaa*, the RHS represents C's valuation in this equilibrium, while the LHS represents the valuation C would receive if it defects from *aaa*.

Type H: $\quad H - t < \bar{V}_{LCH}$

Therefore, the strategy profile *aaa* is an equilibrium when $t > H - \bar{V}_{LCH}$.

2. *aat*

Type C: $C - t < \bar{V}_{LC}$

Type H: $H - t > \bar{V}_{LC}$

Therefore, the strategy profile *aat* is an equilibrium if $t \in (C - \bar{V}_{LC}, H - \bar{V}_{LC})$.

3. *ata*

The following mutually exclusive conditions show that *ata* cannot be an equilibrium.

Type C: $C - t > \bar{V}_{LH}$

Type H: $H - t < \bar{V}_{LH}$

4. *att*

Type C: $C - t > L$

Type H: $H - t > L$

Therefore, the strategy profile *att* is an equilibrium if $t < C - L$. ■

Proposition 1.2

1. *aaa*

Type C: $C - t < \bar{V}_{CH} - a_{lcm}$

Type H: $H - t < \bar{V}_{CH} - a_{lcm}$

Therefore, the strategy profile *aaa* is an equilibrium if $t > H - \bar{V}_{CH} + a_{lcm}$.

2. *aat*

Type C: $C - t < C - a_{lcm}$ (by assumption)

Type H: $H - t > C - a_{lcm}$

Therefore, the strategy profile aat is an equilibrium if $t < H - C + a_{lcm}$.

3. *ata*

This profile cannot be an equilibrium because C will never choose to transact when the less costly audit already gives it the highest valuation it can hope for.

4. *att*

Let $\alpha \in [0, 1]$ be investors' posterior belief that the out-of-equilibrium signal (a, C) originates from C. Since we can never have $C - t > \alpha C + (1 - \alpha)H$, the strategy profile att cannot be an equilibrium. As was the case with ata, C will never choose to transact, because the less costly audit separates it from L under lower-of-cost-or-market. ■

Proposition 1.3 Since transacting is, by assumption, more costly than getting audited, and since audits are fully revealing under market value accounting, the only possible equilibrium in this regime is aaa. ■

The following lemma will prove useful for the comparison of the lower-of-cost-or-market and historical cost regimes.

Lemma 1 For the symmetric distribution functions defined in (8),

$$C - \bar{V}_{LC} + H - \bar{V}_{CH} = H - C.$$

Proof: We have

$$p_L = p_H \equiv \alpha, \; p_C = 1 - 2\alpha,$$

which means that

$$C - \bar{V}_{LC} = C - \frac{\alpha L + (1 - 2\alpha)C}{1 - \alpha}, \text{ and } H - \bar{V}_{CH} = H - \frac{(1 - 2\alpha)C + \alpha H}{1 - \alpha}.$$

Therefore, $C - \bar{V}_{LC} + H - \bar{V}_{CH} = C\left(1 - \frac{2(1-2\alpha)}{1-\alpha}\right) + H - \frac{\alpha}{1-\alpha}(H + L)$, which, taking into account that $H - C = C - L$, leads to

$$C - \bar{V}_{LC} + H - \bar{V}_{CH} = H + C\left(1 - \frac{2}{1 - \alpha} - \frac{2\alpha}{1 - \alpha} + \frac{4\alpha}{1 - \alpha}\right) = H - C. \quad ■$$

The following observation will also prove useful.

Observation $C - \bar{V}_{LC} \leq H - \bar{V}_{CH}$ if and only if $\alpha \leq \frac{1}{3}$.

This observation is based on

$$C - \bar{V}_{LC} > H - \bar{V}_{CH} \Leftrightarrow H - \frac{(1-2\alpha)C + \alpha H}{1-\alpha} > C - \frac{\alpha L + (1-2\alpha)C}{1-\alpha};$$

taking into account $C = \frac{H+L}{2}$, $C - \bar{V}_{LC} \leq H - \bar{V}_{CH}$ if and only if $\alpha \leq \frac{1}{3}$. ■

Proposition 2 We present here the analysis for the entire range of t. The case considered in the statement of the proposition is based on region 1 of Case I and region 1 of Case II.

By assumption,

$$0 < a_{lcm} < a_{mv} < \min\{C - \bar{V}_{LC}, H - \bar{V}_{CH}\}, \tag{19}$$

and

$$t > a_{mv}.$$

Case I: $\alpha \leq \frac{1}{3}$

From (19) and Lemma 1,

$$C - \bar{V}_{LC} < H - \bar{V}_{CH} + a_{lcm} < H - C = C - L < H - C + a_{lcm} < H - \bar{V}_{LC}. \tag{20}$$

We proceed by examining the deadweight loss in the lower-of-cost-or-market and the historical cost regimes as t moves through the range (20), keeping in mind that aaa is the only prevailing equilibrium in the market value regime, with a resulting deadweight loss of a_{mv}.

The following list presents the equilibria and resulting deadweight loss (DWL) under lower-of-cost-or-market and historical cost regimes.

Equilibrium and resulting DWL

	Lower-of-Cost-or-Market		*Historical Cost*
1. $t \in (a_{mv}, C - \bar{V}_{LC})$:	$aat \to (1-\alpha)a_{lcm} + \alpha t$	vs.	$att \to (1-\alpha)t$
2. $t \in (C - \bar{V}_{LC}, H - \bar{V}_{CH} + a_{lcm})$:	$att \to (1-\alpha)a_{lcm} + \alpha t$	vs.	$att \to (1-\alpha)t$ $att \to \alpha t$
3. $t \in (H - \bar{V}_{CH} + a_{lcm}, H - C)$:	$aat \to (1-\alpha)a_{lcm} + \alpha t$ $aaa \to a_{lcm}$	vs.	$aat \to (1-\alpha)t$ $aaa \to \alpha t$
4. $t \in (H - C, H - C + a_{lcm})$:	$aat \to (1-\alpha)a_{lcm} + \alpha t$ $aaa \to a_{lcm}$	vs.	$aat \to \alpha t$ $aaa \to 0$
5. $t \in (H - c + a_{lcm}, H - \bar{V}_{LC})$:	$aaa \to a_{lcm}$	vs.	$aat \to \alpha t$ $aaa \to 0$
6. $t > H - \bar{V}_{LC}$:	$aaa \to a_{lcm}$	vs.	$aaa \to 0$.

Analysis for Each Region

1. In region 1,

   - Historical cost involves a strictly lower deadweight loss than the other two regimes if

   $$t < \min\left\{\frac{a_{mv}}{1-\alpha}, \frac{(1-\alpha)a_{lcm}}{1-2\alpha}\right\}.$$

   - Lower-of-cost-or-market dominates the other two regimes if

   $$\frac{(1-\alpha)a_{lcm}}{1-2\alpha} < t < \frac{a_{mv}-(1-\alpha)a_{lcm}}{\alpha}.$$

   - Market value dominates the other two regimes if

   $$t > \max\left\{\frac{a_{mv}-(1-\alpha)a_{lcm}}{\alpha}, \frac{a_{mv}}{1-\alpha}\right\}.$$

2. There are two possible combinations of equilibria to be considered (where the notation between brackets refers to the equilibria in the historical cost, lower-of-cost-or-market, and market value regimes respectively): (att, aat, aaa) and (aat, aat, aaa). For the combination (att, aat, aaa), refer to the analysis of region 1. For (aat, aat, aaa), the following results hold.

   - Historical cost dominates the other two regimes if $t < \frac{a_{mv}}{\alpha}$.
   - Lower-of-cost-or-market can never dominate because it always involves greater deadweight loss than historical cost.
   - Market value dominates the other two regimes if $t > \frac{a_{mv}}{\alpha}$.

3. Here, there are four combinations to be considered:

   $$(att, aat, aaa), (aat, aat, aaa), (att, aaa, aaa), \text{ and } (aat, aaa, aaa).$$

   For the first two combinations, we refer to the analyses of regions 1 and 2. For the combination (att, aaa, aaa), the following results hold.

   - Historical cost dominates the other two regimes if $t < \frac{a_{lcm}}{1-\alpha}$.
   - Lower-of-cost-or-market dominates the other two regimes if $t > \frac{a_{lcm}}{1-\alpha}$. For the combination (aat, aaa, aaa), the following results hold.
   - Historical cost dominates the other two regimes if $t < \frac{a_{lcm}}{\alpha}$.
   - Lower-of-cost-or-market dominates the other two regimes if $t > \frac{a_{lcm}}{\alpha}$.

4. Again, there are four combinations to be considered:

$$(att, aat, aaa), (aat, aaa, aaa), (aaa, aat, aaa), \text{ and } (aaa, aaa, aaa).$$

For the first two combinations, we refer to the analyses of regions 2 and 3. For the combination (aaa, aat, aaa), the following results hold.

- Historical cost dominates the other two regimes if $t < \frac{a_{lcm}}{\alpha}$.
- Lower-of-cost-or-market dominates the other two regimes if $t > \frac{a_{lcm}}{\alpha}$.

For the combination (aaa, aaa, aaa), historical cost dominates the other two regimes.

5. For the two equilibrium combinations under consideration, (aat, aaa, aaa) and (aaa, aaa, aaa), we refer to the analysis of region 4.

6. See region 4.

Case II: $\alpha > \frac{1}{3}$

It is now possible that $H - \bar{V}_{CH} + a_{lcm} < C - \bar{V}_{LC}$, which could modify the results in regions 1 and 2 somewhat. Indeed, the equilibrium aaa can now also prevail in part[32] of the region $t \in (a_{mv}, C - \bar{V}_{LC})$. We then have:

Equilibrium and resulting DWL

	Lower-of-Cost-or-Market		*Historical Cost*
1. $t \in (a_{mv}, H - \bar{V}_{CH} + a_{lcm})$:	$aat \to (1-\alpha)a_{lcm} + \alpha t$	vs.	$att \to (1-\alpha)t$
2. $t \in (H - \bar{V}_{CH} + a_{lcm}, C - \bar{V}_{LC})$:	$\begin{cases} aat \to (1-\alpha)a_{lcm} + \alpha t \\ aaa \to a_{lcm} \end{cases}$	vs.	$att \to (1-\alpha)t$
3. $t \in (C - \bar{V}_{LC}, H - C)$:	$\begin{cases} aat \to (1-\alpha)a_{lcm} + \alpha t \\ aaa \to a_{lcm} \end{cases}$	vs.	$\begin{cases} att \to (1-\alpha)t \\ aaa \to \alpha t \end{cases}$

The analyses of regions 1 and 3 are identical to those of regions 1 and 3 of Case I. If the combination (att, aaa, aaa) prevails in region 2, the following results hold.

- Historical cost dominates the other two regimes if $t < \frac{a_{lcm}}{1-\alpha}$.
- Lower-of-cost-or-market dominates the other two regimes if $t > \frac{a_{lcm}}{1-\alpha}$.

Last, note that the above conditions (9) through (11) may be empty. A sufficient condition for the range of values for t in (9) to be non-empty is $a_{mv} < \frac{(1-\alpha)a_{lcm}}{1-2\alpha}$. A sufficient condition for the range (10) to be non-empty is

$$\frac{(1-\alpha)a_{lcm}}{(1-2\alpha)} < \min\left\{\min\{C - \bar{V}_{LC}, H - \bar{V}_{CH}\}, \frac{a_{mv} - (1-\alpha)a_{lcm}}{\alpha}\right\}.$$

A sufficient condition for the range in (11) to be non-empty is $\max\left\{\frac{a_{mv}-(1-\alpha)a_{lcm}}{\alpha}, \frac{a_{mv}}{1-\alpha}\right\} < \min\{C-\bar{V}_{LC}, H-\bar{V}_{CH}\}$. ■

Proposition 3 Let $p_H = \alpha$, $p_L = \beta$. For $t \in (a_{mv}, \min\{C-\bar{V}_{LC}, H-\bar{V}_{CH}\})$, the comparison is between $\{att \rightarrow (1-\beta)t$, $\{att \rightarrow (1-\alpha)a_{lcm}+\alpha t$, and $\{aaa \rightarrow a_{mv}$, from which it follows that

1. Market value dominates both lower-of-cost-or-market and historical cost if

$$a_{mv} < (1-\alpha)a_{lcm} + \alpha t \text{ and } a_{mv} < (1-\beta)t,$$

which immediately leads to (14).

2. Lower-of-cost-or-market dominates both market value and historical cost if

$$(1-\alpha)a_{lcm} + \alpha t < a_{mv} \text{ and } (1-\alpha)a_{lcm} + \alpha t < (1-\beta)t,$$

which immediately leads to (15).

3. Historical cost dominates both lower-of-cost-or-market and market value if

$$(1-\beta)t < (1-\alpha)a_{lcm} + \alpha t, \text{ and } (1-\beta)t < a_{mv},$$

which immediately leads to (16). ■

Corollary to Proposition 3 This is a special case of Proposition 3, where $p_L = p_H = \alpha$. Then, (15) implies $\frac{t-a_{mv}}{a_{mv}} > \alpha > \frac{a_{mv}-a_{lcm}}{t-a_{lcm}}$; similarly, (16) implies $\alpha < \min\left\{\frac{a_{mv}-a_{lcm}}{t-a_{lcm}}, \frac{t-a_{lcm}}{2t-a_{lcm}}\right\}$. Last, expression (17) implies $\alpha > \max\left\{\frac{t-a_{lcm}}{2t-a_{lcm}}, \frac{t-a_{mv}}{a_{mv}}\right\}$. It is then immediate to verify that, as t increases, we move from lower-of-cost-or-market to market value to historical cost. ■

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Notes

1. See, e.g., Salwen (1992) and Linden (1990).
2. These proposals were presented in a special session of the 1993 American Accounting Association meetings, organized by Baruch Lev, titled "Why is There a Conservatism Bias in Accounting? Perspectives on Research."
3. Up to this point, the term "conservative" is used in conjunction with historical cost accounting. In the remainder of our paper, we distinguish between conservative reporting and *pure* historical cost reporting, which we will simply refer to as historical cost reporting.
4. Think, for example, of the asset category of buildings.
5. In a no-moral-hazard setting, Weyns (1993) presents a model in which the liquidity needs of current shareholders (or the owner-manager) induce an incentive to maximize the intermediate (as opposed to terminal or liquidation) value of the firm. The need to raise additional equity capital at some point in time provides a similar incentive to maximize intermediate firm value. Darrough and Melumad (1995) provide a rationale for managers to behave myopically; they show that inducing managers to achieve short-term objectives may be cost efficient in terms of screening managerial talent.
6. A related argument is made in the finance literature. For example, Brennan's (1990) work on latent assets suggests that if the market is not able to infer the values of individual assets in a firm's portfolio, the firm will have an incentive to realize by sale or spin-off the value of assets not reflected in the current market price. Another related example is the one of equity carve-outs, where a parent company makes a public stock offering for a partial ownership in a subsidiary. Schipper and Smith (1986) study equity carve-outs and find an average favorable price reaction of 5%. Two in-depth studies of public corporations having trouble communicating the true value of certain assets to the stock market can be found in Palepu (1994) and Healy and Palepu (1995).
7. We use the same notation as for the action choice of transacting. The meaning of t will be clear from the context.
8. In general, one would expect the opportunity cost component of the transaction cost to be correlated with the asset's market value. In this paper, we ignore that possibility for simplicity. Under certain conditions, we can show that our results would be qualitatively unaffected. For example, when the transaction cost is a percentage of the asset value, the specific equilibria identified in Proposition 1 still arise. For these equilibria, the results in Propositions 2 and 3 hold. However, we no longer have the relatively simple ranking of the cutoff points for the different equilibrium classes. Consequently, in some cases we would have multiple equilibria and the comparison of accounting regimes would depend on our assumption about the equilibrium prevailing in each regime.
9. The practitioner-oriented literature provides many similar examples of asset sales and the associated cost t. Winders (1991) argues that sale-leaseback transactions permit the seller or the lessee to recover the value of assets that have been depreciated below their "true" value, but contrasts this perceived benefit with the added tax costs involved.
10. The demand for disclosure is exogenous to our analysis. Given our assumption that the manager's time horizon is shorter than the firm's horizon, it is clear that the manager with favorable information will want to communicate such information. While it might be seem desirable to commit ex-ante to no disclosure in the future, we assume such a commitment is not credible/practical or just considered "unfair."
11. In an earlier version of this paper we analyzed the case of discretionary audits. Here, for brevity, we present only the mandatory setting which is the more descriptive case.
12. The action a, effectively, denotes the action of "not transacting."
13. For different audit settings where audit errors are explicitly introduced as an essential feature of the model, see, e.g., Melumad and Thoman (1990) and Shibano (1990).
14. Specifically, the deadweight loss is the sum of the aggregated transaction costs and aggregated (incremental) auditing costs borne by firms.
15. It should be noted that, in practice, buildings and land are not usually marked down to market, even when there is a significant decline in value, and the net book value of the asset significantly exceeds its market value. The argument typically invoked is that management intends to retain the asset for the long term, and eventually the asset would be fully depreciated. We stress, however, that this argument is inconsistent with the notion of conservatism. A proper application of conservatism would be to mark down these assets. See also the FASB's discussion memorandum on impairment of assets.

16. BDW make a similar observation: "historical cost accounting numbers and certain supplemental disclosures are more easily auditable by third parties . . ."
17. Another possible motivation, outside of our parsimonious model, has to do with auditors' litigation exposure. It could be argued that a regime requiring only the reporting of historical cost information will be characterized by a relatively low level of litigation against auditors. Similarly, a lower-of-cost-or-market regime, requiring less "precision" in value estimates than a market value arrangement, might also involve lower litigation exposure. These arguments, combined with the fact that in a rational expectations setting, audit fees reflect auditors' expected damage awards (for discussion, see Melumad and Thoman (1990)), suggest the relations assumed in expression (3). The problem with this line of reasoning, however, is that litigation is an equilibrium behavior. Also, the level of damage award is likely to change across different reporting regimes. The net effect of these factors would be, in general, ambiguous.
18. Note $\bar{V}_{LC}$ is the valuation when the only revision to investors' priors is that they could rule out the possibility of the asset being valued at H; $\bar{V}_{CH}$ is similarly interpreted.
19. If (5) is fulfilled, then clearly we also have $a_{mv} < H - \bar{V}_{LCH}$.
20. Note that similar equilibria are common in the signaling literature; see, e.g., Melumad and Thoman (1990).
21. Hiring an auditor is not a matter of choice in our model. We are thinking of the auditor's task as being divisible, in the sense that the asset position θ is only a part of a larger whole. If the firm decides not to sell θ, the audit will include θ with the rest of the firm. More precisely, the proposition speaks about incremental deadweight loss. In view of our normalization to zero of the audit cost in the historical cost regime, we suppress the adjective "incremental" in the remainder of the analysis.
22. Recall that audits are perfect in the sense that they perfectly identify the appropriate type classification under the prevailing accounting regime. We point out that the results here do not hinge on this simplifying assumption.
23. We do not include the market value regime, because in our setting, no equilibrium involves transacting in this regime.
24. This is not an "if and only if" statement due to the possibility that the equilibrium aat prevails instead of aaa, in which case this condition would be necessary but not sufficient.
25. However, for some parameters, condition (10) is empty and condition (11) becomes $t > \frac{a_{mv}}{1-\alpha}$. See Corollary to Proposition 2, below.
26. Also, note that assets classified as "held-to-maturity," typically involve high transaction costs (as broadly defined earlier). In our setting, for sufficiently high t, a firm will never sell its asset, and consequently the historical cost regime will involve the smallest deadweight loss.
27. This setting is analogous to a setting where the future asset values are allowed to vary. Specifically, the setting here is equivalent to one where future asset values are $H^* = \frac{p_H}{\alpha} H$, $C^* = C$, $L^* = \frac{p_L}{\alpha} L$ and $p_L = p_H \equiv \alpha$, $p_C = 1 - 2\alpha$. In that case, we say that we have *an inflationary environment* if the expected future asset price exceeds its original cost.
28. Note that (13) restricts the variation of p_H and p_L. Specifically, (13) implies $\min\left\{\frac{p_C}{1-p_L}, \frac{p_L}{1-p_H}\right\} > \frac{a_{mv}}{C-L}$. This condition guarantees that the range (13) remains non-empty as we vary p_H and p_L.
29. Note that for (15) to coexist with the assumption that $\alpha > 0$, we need to restrict $\beta < 1 - \frac{a_{lcm}}{t}$.
30. This result seems in contrast with the conventional wisdom that historical cost would be undesirable in an unstable price environment. Note, however, that the above conventional wisdom is typically based on anticipated informational benefits, a dimension suppressed in this study. See related discussion in the conclusion section below.
31. Specifically, the lower bound of the interval for t, in which lower-of-cost-or-market dominates, is always smaller than the upper bound. Contrast this observation with Corollary to Proposition 2.
32. Recall that in (5) we have assumed $a_{mv} < H - \bar{V}_{CH} + a_{lcm}$.

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