The Nature of Accounting Information Reliability: Inferences from Archival and Experimental Research

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SYNOPSIS: Reliability is an essential characteristic for accounting information to be useful for decision making. Reliability represents the extent to which the information is unbiased, free from error, and representationally faithful (FASB 1980). Despite the central role of reliability, it is a complex and elusive construct of accounting information. Reliability is difficult to specify precisely in accounting standards and practice, and it is difficult to examine directly with research. The primary goal of this paper is to better understand the nature of accounting information reliability by synthesizing archival and experimental research evidence within the context of a framework for accounting information usefulness. Greater understanding of the empirical literature on accounting information reliability should assist standard setters and regulators in establishing financial reporting standards, preparers and auditors in implementing standards, and financial statement users in evaluating accounting information reliability. Finally, greater understanding of reliability should assist academics in conducting research to produce new insights on reliability and in conveying the important role of reliability to students.

INTRODUCTION

In this paper, we discuss insights from empirical accounting research into the reliability of accounting information. Reliability denotes that accounting information is reasonably free from error and bias, and faithfully represents what it purports to represent (FASB 1980, glossary). While reliability is essential for accounting information to be useful, it is a complex and elusive construct in theory, practice, and research. Accordingly, our primary goal in this paper is to provide a better understanding of the nature of accounting information reliability by synthesizing empirical research findings within the context of a framework for accounting information usefulness.

We anticipate multiple benefits from greater understanding of the empirical literature on accounting information reliability. Such understanding should assist standard setters and

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regulators in establishing financial reporting standards, and preparers and auditors in implementing these standards, in a manner that increases the reliability of accounting information. Greater understanding also should help financial statement users to gauge accounting information reliability and, therefore, make better decisions based on that information. Finally, greater understanding of reliability should assist academics in conducting research to produce new evidence and insights on reliability, and to convey the important and complex role of accounting information reliability to students.

To build a foundation for our discussion of academic research, we begin with the Financial Accounting Standards Board's (FASB) Conceptual Framework definition of reliability and its characteristics. We then develop a framework that conceptually distinguishes reliability from relevance and other factors that influence the usefulness of accounting information for predicting future cash flows. We use this framework to guide and structure our review of archival and experimental academic research on reliability. We organize this review into two sections: research related to achieving accounting information reliability and research related to assessing accounting information reliability.

We briefly summarize the results of our review with the following conclusions. Our synthesis of research on achieving reliability highlights the difficulty of making reliability operational by showing that even expert accountants do not necessarily agree on the nature of reliability characteristics. Research findings also indicate that reliability impairments arise because preparers respond to incentives by interpreting or applying standards in a non-neutral fashion. The forms of reliability impairments and the processes by which they occur (e.g., implementation of standards versus transaction structuring) depend on the interaction between preparers' incentives and accounting standards.

Research on assessing reliability provides insight on the limitations inherent in the verification approach to assessing the reliability of accounting information. Archival research introduces a number of alternative approaches for assessing reliability, including inferring the degree of reliability from the relation between accounting information and proxies for underlying economic constructs and/or future cash flows. Research also infers reliability from aspects of the financial reporting process or from characteristics of financial reporting outcomes.

Finally, both experimental and archival research provide evidence that users react to differences in accounting information reliability. However, experimental research indicates that users do not adjust for low reliability in accounting information when they lack knowledge about the underlying economic constructs or face high cognitive costs of adjusting information. Research in this area consistently highlights the importance of disclosures designed to reveal reliability. Accounting standards that require firms to provide more complete disclosures related to the underlying economic constructs represented by accounting information can help users better assess accounting information reliability.

We organize this paper as follows. In the next section, we develop our accounting information usefulness framework. The third section describes the archival and experimental research methodologies and their advantages and disadvantages for studying reliability. The fourth section contains the main body of the paper, wherein we summarize inferences about achieving and assessing accounting information reliability from archival and experimental research findings. In the last section of the paper, we offer some concluding remarks about existing research and opportunities for future research.

THE DEFINITION AND ROLE OF RELIABILITY
Reliability in the FASB's Conceptual Framework

The FASB's Conceptual Framework indicates that reliability, in conjunction with relevance, determines the usefulness of accounting information. The Conceptual Framework emphasizes two characteristics of reliability: representational faithfulness ("the correspondence or agreement between a measure or description and the phenomenon it purports to represent" [FASB 1980, ¶63)]) and verifiability ("the ability through consensus among measurers to ensure that information represents what it purports to represent or that the chosen method of measurement has been used without error or bias" [FASB 1980, glossary]). The Conceptual Framework also notes that neutrality interacts with reliability. Neutrality signifies that the processes of formulating and implementing accounting standards, and the resulting accounting information, should be free from bias toward a predetermined result (FASB 1980, ¶98–99). Finally, the Conceptual Framework emphasizes that reliability is a matter of degree, rather than an all-or-none concept (FASB 1980, ¶59). However, accounting information must meet some threshold level of reliability to be useful to investors, creditors, and other financial statement users.

Reliability in an Accounting Information Framework

Despite the guidance in the Conceptual Framework, reliability is elusive because it is difficult to directly observe or measure. As a result, researchers often use indirect approaches to study reliability. To clarify reliability as a construct and to distinguish among approaches for studying reliability, we develop a framework that portrays accounting information as a representation of economic constructs that are embodied in a firm's commercial arrangements, transactions, and events that yield a firm's future cash flows.[1] Our framework comprises the following three distinct relations, which we depict in Figure 1:

1. the relation between economic constructs arising from current-period commercial arrangements, transactions, and events and future-period cash flows (the economic relation);
2. the relation between current-period economic constructs and current-period accounting information representing and measuring those constructs (the accounting relation); and
3. the relation between current-period accounting information and future-period cash flows (the predictive relation, including users' expectation formation).

The Economic Relation

Stakeholders are fundamentally interested in the amount, timing, and uncertainty of a firm's future net cash flows (FASB 1978, ¶51). These cash flows arise from a firm's past, current, and future commercial arrangements and transactions, as well as events beyond the control of the company. Hereafter, we refer to these commercial arrangements, transactions, and events as "economic constructs." In our framework, relation (1) represents the link between current economic constructs and future cash flows, which we term the "economic relevance" of the economic constructs. At least two factors influence the degree of economic relevance. First, the relevance of economic constructs is decision-specific, i.e., the stakeholder's decision context determines the relevant future cash flows and, therefore, the relevant current economic constructs giving rise to these cash flows. Second, the likelihood

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[1] In addition to our framework, a number of studies create analytical models of reliability and examine its effects on the usefulness of accounting information. See, for example, Ijiri and Jaedicke (1966), Ijiri and Noel (1984), and Kirschenheiter (1997).

FIGURE 1
Schematic Representation of the Accounting Information Framework
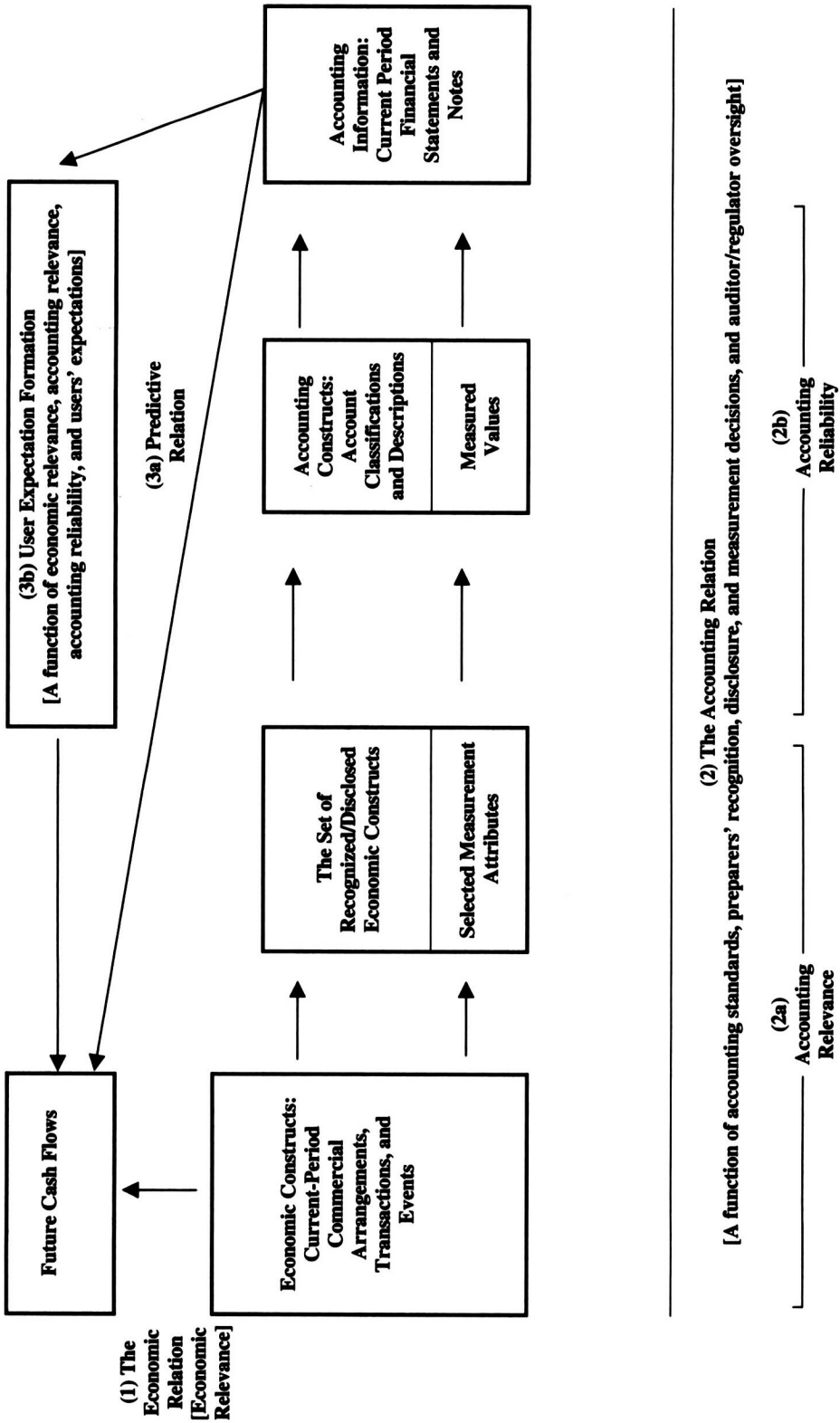
that unexpected future events will affect future cash flows reduces the economic relevance of current-period economic constructs. Even if stakeholders could observe current economic constructs without error (which typically is not possible), unexpected future factors decrease stakeholders' ability to predict future cash flows.[2]

The Accounting Relation

One role of accounting is to represent and summarize a firm's current commercial arrangements, transactions, and events (economic constructs) within a set of financial statements and related notes. We depict this mapping as the accounting relation (2) in Figure 1.

The left half (2a) of the accounting relation in Figure 1 depicts the *relevance* of accounting information as a function of two choices: the *subset of economic constructs recognized or disclosed* in the financial statements and notes and the *measurement attributes* (e.g., historical cost, fair value) used to measure these economic constructs. Standard setters are primarily responsible for making these choices, although preparers influence these choices in cases for which the standards allow latitude. Accounting information loses relevance if financial statements omit relevant economic constructs or if the chosen measurement attributes do not reflect the relation between economic constructs and future cash flows.[3]

The right half (2b) of the accounting relation in Figure 1 depicts the *reliability* of accounting information. For a given economic construct recognized within a set of financial statements, the reliability of the resulting accounting information about the construct depends on two choices: the choice of an *accounting construct* and the choice of a *measured value*. We define "reliability" as follows:

> Reliability is the degree to which a piece of accounting information (1) uses an accounting construct that objectively represents the underlying economic construct it purports to represent, and (2) measures that construct without bias or error using the measurement attribute it purports to use.

Thus, in our framework, reliability corresponds to the idea of representational faithfulness in the FASB's Conceptual Framework.[4] Reliability is inherent in the information itself, and not in the use of the information. Note that the relevance of economic constructs and measurement attributes represented by accounting information is a prerequisite for reliability to matter. Thus, reliability is a *necessary but not sufficient condition* for accounting information to be useful.

The choice of an *accounting construct* to represent an economic construct involves classification and description. Standard setters classify selected economic constructs into accounting constructs using financial statement elements (e.g., "assets" and "liabilities" to represent economic resources and obligations, respectively). In turn, preparers map their

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[2] For example, suppose the firm holds one lottery ticket, which it purchased for $1. The ticket pays off either $0 or $1 million, with only a one-in-a-million chance of winning. The lottery ticket comprises an economic construct with a large random component, which reduces its relevance for decision making. See SFAC No. 2 (FASB 1980, ¶ 60–62, 75) for further discussion of these points.

[3] We also note that in theory, the relevance of accounting information can be impaired by recognizing or disclosing irrelevant economic constructs. We believe that the standard-setting process and accounting practice mitigate the potential for this type of error. That is, while all accounting information likely is not relevant for *all* decisions, all accounting information likely is relevant for *some* decisions. We therefore do not include in Figure 1 a category for accounting information that corresponds to irrelevant economic constructs.

[4] Unlike the FASB's Conceptual Framework, our definition of reliability does not contain the very closely related characteristics of verifiability and neutrality. We view verifiability as a characteristic that describes the extent to which the reliability of accounting information (particularly measurements) can be assessed by auditors and other external parties rather than as a component of reliability itself. We view neutrality as a characteristic of the nature of the accounting standards and the standard-setting process.

commercial arrangements, transactions, and events (firm-specific economic constructs) into these financial statement classifications and provide associated descriptions. Preparers also choose *measured values* for the measurement attributes associated with accounting constructs. Preparers can observe values for some measurement attributes with a high degree of reliability (e.g., historical cost of recently acquired equipment or fair value of a liquid security), but they must estimate values for unobservable measurement attributes (e.g., fair value of an illiquid asset such as goodwill or the present value of pension obligations).

Accounting information reliability depends on how well accounting standards require and enable firms to represent economic constructs with appropriately informative accounting classifications and measurements. For example, adoption of Statement of Financial Accounting Concepts No. 7, *Using Cash Flow Information and Present Value in Accounting Measurements*, should assist preparers in formulating more reliable fair value and present value estimates.

Reliability also depends on how well preparers use their private information to identify, classify, describe, and measure relevant firm-specific economic constructs. Reliability can be impaired by biases or intentional or unintentional errors that arise from preparers' incentives, personal traits, decision processes, or lack of knowledge or data. In addition, uncertainty in the relation between an economic construct and future cash flows (i.e., the unexpected future factors discussed in relation (1)) impedes preparers' determination of an appropriate accounting construct and measurement.[5] Finally, reliability is impaired by imprecise measurement models or missing information needed to appropriately classify or measure accounting constructs and measurement attributes.

The Predictive Relation and Users' Expectations Formation

The predictive relation (3a) in Figure 1 represents the association between a firm's current accounting information and future cash flows.[6] Relation (3a) encompasses both relations (1) and (2) and indicates that the usefulness of accounting information depends on the degree to which it provides a reliable representation of the relevant economic constructs that determine future cash flows to the firm.

In practice, the predictive relation also depends on users' processing (collection, analysis, and transformation) of accounting information into cash flow expectations. We reflect users' expectation formation in relation (3b). In predicting future cash flows from accounting information, users may lack necessary knowledge, make random errors, or be biased. Alternatively, users can mitigate low reliability in accounting information by adjusting or correcting unreliable accounting information. For example, if users understand that a particular firm conservatively understates the value of its assets, then they can adjust for this bias in their forecast of future cash flows.

Thus, the usefulness of accounting information for predicting future cash flows depends on a number of factors, including:

- economic relevance—the association of current economic constructs with future cash flows;
- accounting information relevance—the choice of relevant economic constructs and measurement attributes for inclusion in financial statements;

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[5] For example, uncertainty in the relation between current research and development (R&D) activities and future cash inflows creates ambiguity as to whether firms should represent R&D activities as an asset or an expense.

[6] We note that accounting information can have a direct impact on the future cash flows of a company. Commercial arrangements often depend on accounting information, e.g., employee bonuses and lease payments based on net income and debt covenants based on accounting ratios. For simplicity, we omit this feedback loop between accounting information and cash flows from Figure 1.

- accounting information reliability—the extent to which accounting constructs and measured values faithfully represent economic constructs without error or bias; and
- users' expectations—the ability of users to appropriately use accounting information to form expectations of future cash flows.

As suggested by the above list, reliability is but one of a number of important factors affecting the usefulness of accounting information. However, because financial statement users cannot observe some of the factors affecting the predictive relation (3a) and user expectation formation (3b), their perceptions of the reliability of accounting information can be confounded by factors unrelated to reliability, including their own errors and biases in forming expectations and the inherent randomness in the relation between current period economic constructs and future cash flows. Similarly, researchers studying accounting information reliability face difficulties in disentangling the effects of reliability from those of other factors that can confound reliability. In our discussion of empirical research, we use Figure 1 to discuss the challenges of studying reliability using empirical data. Additionally, we distinguish between research that directly examines reliability (e.g., relation (2b) in Figure 1), and research that provides indirect evidence on reliability through the predictive relation (3a) or user expectation formation (3b).

EMPIRICAL APPROACHES TO STUDYING RELIABILITY
Archival and experimental research both use empirical data to investigate reliability. Archival research studies examine data generated in the normal course of business, focusing particularly on accounting data from financial statements or notes, i.e., the observable outputs from the financial reporting process (relation (2) in Figure 1). In contrast, each experimental study generates data through the experiments designed specifically for the purposes of that research study. These data typically represent judgments and decisions made by individuals within controlled, hypothetical scenarios involving the manipulation of certain key variables.

Archival and experimental research methods have unique limitations but complementary strengths. Archival research has the benefit of analyzing data related to decisions that arise from conducting business, which enhances the external validity of conclusions coming from archival research. However, archival research is constrained to tests based on data and settings that occur in the business world. Further, because numerous factors affect decisions, archival research has difficulty establishing that accounting information rather than other factors affect a decision (for example, earnings information is only one of many forces that can cause a change in share prices). In contrast, experimental research can better establish causality and isolate effects by manipulating specific variables within a controlled setting. Further, experiments can create accounting information in hypothetical settings rather than being limited to naturally occurring information. However, data generated in experimental settings may not generalize directly to actual business practice where a number of factors interact to affect decisions.

To examine reliability, relation (2b) in Figure 1 suggests that research should directly test the extent to which accounting classifications/descriptions and measured values faithfully represent and measure underlying economic constructs. Archival research can achieve this objective when economic constructs are observable; unfortunately, commercial arrangements and transactions are often not observable to individuals outside of a firm. Experimental research can overcome this limitation by creating hypothetical commercial arrangements and transactions and examining how individuals map these items into accounting classifications and measures.

Both archival and experimental research studies often investigate relation (2b) by examining differences in accounting information arising from factors, such as incentives, that should have no effect on representational faithfulness. These studies predict the directional effects of such factors, and assess unreliability by the extent to which preparers' classification and measurement decisions reflect bias or error in the predicted direction. Archival studies have the advantage of examining the types and magnitude of these factors as they exist in the business world, while experimental studies are able to disentangle the effects of various factors that might co-exist in real business settings.

Experimental research also can investigate relation (2b) via consensus—a facet of reliability included in the FASB's Conceptual Framework as a method for *verifying* representational faithfulness. Experimental research can assess whether consensus provides assurance of representational faithfulness by evaluating whether agreement between preparers and auditors is high when accounting classifications and measures faithfully represent economic constructs and their measurement attributes, and is low when accounting classifications and measures are not faithful representations.

Finally, research uses the predictive relation (3a) and user expectation formation (3b) in our framework to provide indirect evidence on reliability. Archival research examines the relation between accounting information and future cash flows predicted to be associated with this information (relation 3a). This approach jointly tests economic relevance, accounting relevance, and accounting reliability. Archival and experimental research also investigate reliability even more indirectly by examining the relation between accounting information and users' judgments related to future cash flows, e.g., users' earnings forecasts, stock value judgments, and share prices/returns (relation 3b). Empirical evidence in this area is abundant. Research studies using this indirect approach, however, require careful research designs to isolate the effects of reliability from those of other factors affecting relation (3b), such as economic relevance, accounting relevance, and user errors and biases.

EMPIRICAL RESEARCH ON RELIABILITY

In this section, we highlight implications from research evidence related to the reliability of accounting information, relying primarily but not exclusively on archival and experimental research. We organize the evidence on reliability into two sections: *achieving* accounting information reliability and *assessing* accounting information reliability. Research related to achieving reliability is based on relation (2b) in Figure 1, while research on assessing reliability uses both the relatively direct approach in relation (2b) and indirect approaches in relations (3a) and (3b).

Research on Achieving Reliability

Standard setters and preparers play the primary roles in achieving reliable classification and measurement of accounting information. Standard setters provide the primary authoritative guidance for accounting classification and measurement, and determine the degree of discretion that preparers have in making classification and measurement decisions.[7] Within the guidance of these standards, preparers exercise judgment to map firm-specific economic constructs into accounting constructs and to measure those constructs. Empirical research provides limited evidence on the effects of standard setters in achieving reliability. In contrast, a significant body of research examines the effects of preparers, focusing on

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[7] Accounting guidance is also established by securities regulators, preparer and industry organizations, and judicial precedent.

biases arising from preparer incentives and unintentional judgment errors. We discuss these research streams in turn.

Standard Setters and Reliability (Relation (2b))

Joyce et al. (1982) examine whether former standard setters agree on characteristics of relevance and reliability at a construct level, and how they weight these characteristics in determining their financial reporting preferences. With respect to reliability, Joyce et al. (1982) find that standard setters possess a fairly common understanding of verifiability, but show little agreement about the meaning of representational faithfulness and only moderate agreement about neutrality. However, standard-setters' preferences among financial reporting alternatives are well explained by their evaluations of relevance and reliability for different reporting alternatives. In particular, standard-setters' evaluation of relevance alone predicts their preferences quite well.

Given the expertise of former standard setters, these findings reinforce the difficulty in understanding reliability characteristics and making these characteristics operational. The results also highlight the need for a framework that defines reliability, given that the standard setters in the experiment were former members of the Accounting Principles Board (APB), which operated without a conceptual framework. FASB board members likely would exhibit greater consensus on relevance and reliability constructs given guidance in the Conceptual Framework.

Research on Preparers' Incentives (Relation (2b))

Preparers face various incentives that can bias their judgments and decisions, diminishing representational faithfulness. Some empirical research uses relation (2b) to test the effects of such incentives by comparing judgments, decisions, or outcomes (e.g., financial statement numbers) generated in the presence of strong incentives to those generated in the presence of weak or no incentives. Other studies implicitly assume the existence of preparer incentives and examine the effects of these incentives in situations in which preparers have more or less opportunity to bias accounting information (e.g., accounting standards with more or less discretionary latitude). We organize research in this area into two categories: incentives and financial reporting standards, and incentives and accruals management.

Incentives and financial reporting standards. A number of experimental and archival studies provide evidence on the interactions between incentives and reporting standards. Financial reporting standards that allow preparers the latitude to exercise accounting judgment and estimation increase the ability of preparers to convey credibly their private information to stakeholders through the financial statements. However, standards that allow preparers to use accounting judgment and estimation also enable preparers to misuse that latitude and report information that is biased and not representationally faithful. Examples of latitude in standards include:

- flexibility in classification, such as SFAS No. 115 for classification of investment securities or SFAS No. 133 for classification of derivatives,
- flexibility in measurement attributes (such as fair value or amortized cost depending on the classification of investment securities under SFAS No. 115 or derivatives under SFAS No. 133) and measurements (consider the many estimated amounts in financial statements), and
- flexibility in timing the adoption of a new accounting standard, such as SFAS No. 106 or SFAS No. 115, which permits firms to choose when to implement the new standard.

Studies document the trade-offs that occur for reliability when accounting standards permit preparers to exercise accounting latitude. For example, some studies document how preparers use accounting latitude to signal their private information to the capital markets, thereby increasing reliability (for examples, see Beaver et al. 1989; Wahlen 1994; Petroni et al. 2000). Other studies find that preparers use accounting latitude to impair reliability by strategically affecting the classification of balance sheet items, by timing the effects of adoption of new standards, or by managing reported earnings numbers or other key accounting numbers (for examples, see Amir and Livnat 1996; Amir and Ziv 1997; Godwin et al. 1998; Ramesh and Revsine 2000). Together, these studies indicate that accounting standards that permit preparers the latitude to use accounting judgment and estimation can lead to more or less accounting information reliability, depending on how preparers use that latitude.

Ironically, research also documents that some firms will report less reliable accounting information by exploiting accounting standards that seemingly *restrict* preparer discretion by using bright-line rules. Standards with bright-line demarcations trigger the potential for unreliable accounting information if the bright-line rules do not capture appropriately meaningful distinctions across underlying economic constructs, or firms structure transactions in order to accomplish financial reporting objectives that do not faithfully represent the underlying economics of the firm's resources, obligations, or arrangements. The ongoing debate about principles-based versus rules-based standards emanates, in part, from these concerns.

Experimental and survey research provides evidence that preparers bias reporting decisions under both principles- and rules-based regimes. Cuccia et al. (1995) find that tax preparers make reporting decisions that favor clients in the presence of both vague verbal standards and strict numerical standards. Preparers facing vague standards support their position with a liberal interpretation of the standard, while preparers facing strict standards use a liberal interpretation of the evidence as support. Nelson et al. (2002) describe similar results for financial reporting, finding that preparers manage earnings using transaction structuring for precise standards and use other means for imprecise standards.[8]

Incentives and accruals management. The reliability of accounting information depends critically on the reliability of accruals, which is one of the focal points of the extensive literature on earnings management. Studies examine the effects of preparers' incentives on the behavior of specific accruals (such as loss provisions) or aggregate accruals to test for potential unreliable reporting of earnings, components of earnings, balance sheet numbers, and footnote amounts. These studies predict and find evidence of accruals-based earnings management resulting from a wide array of differing incentives, including incentives created by preparer opportunism (bonus plans, insider trading), corporate control activities (management buyouts, proxy contests, initial public offerings, seasoned equity offerings, stock-for-stock mergers), political/economic objectives, earnings expectations (management's forecasts or analysts' forecasts), debt covenants and potential distress, tax strategies, pressure to meet regulatory requirements, and many others. We do not undertake a detailed review of the earnings management literature because this topic is covered by two prior

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[8] Research suggests that rules-based versus principles-based approaches may have different effects on auditors' verification decisions. Client pressure appears to have little effect on auditors' decisions when GAAP is precise, but pressure influences auditors' decisions when GAAP is imprecise (Trompeter 1994; Hackenbrack and Nelson 1996). See Nelson (2003) for further discussion of earnings management under more versus less precise standards and the implications for principles-based versus rules-based standards.

papers (Healy and Wahlen 1999; Dechow and Skinner 2000). Rather, we highlight general approaches and inferences of this literature.

While some earnings management studies produce specific implications about accounting information reliability, many earnings management studies simply show that incentives trigger less reliable reporting without examining how firms impair reliability. To illustrate the differences in general versus specific tests of earnings management, consider the growing number of studies that document discontinuities in the distribution of earnings numbers, implying earnings management by firms to avoid reporting losses, avoid earnings declines, or beat earnings expectations (e.g., Burgstahler and Dichev 1997; Burgstahler and Eames 2003). Recent studies take a more specific approach and examine which components of earnings firms manage to meet earnings targets. For example, Plummer and Mest (2001) examine discontinuities in the distribution of earnings components and find that firms appear to manage revenues upward and accrued operating expenses downward to meet earnings targets. Beatty et al. (2002) and Beaver et al. (2003) find that financial institutions meet earnings targets by exercising discretion over loss provision estimates and the timing of realized security gains.

Many archival research studies document suspicious differences in aggregate discretionary or abnormal accruals across firms facing different incentives to manage reported earnings, but because these studies do not examine specific components of earnings, they provide little specific evidence upon which standard setters and those involved in the financial reporting process can act to improve reliability. Other studies specifically determine which accruals preparers use to strategically increase or decrease reported earnings numbers, providing more specific implications regarding reliability. To illustrate, Phillips et al. (2003) find that preparers exercise discretion with respect to the deferred tax expense to avoid reporting an earnings decline.

Together, the findings from the two research streams on the effects of incentives suggest that reliable accounting information depends on the interaction between accounting standards and the preparers who implement the standards. Some preparers will undermine the objective of reliable reporting by biasing their judgments and estimates to circumvent the intentions of the standards, particularly when preparers need to exercise significant judgment, as in the case of accrual estimates. Accounting standards can enhance the reliability of accounting information by requiring preparers to make judgments and estimates that more closely match the underlying economic constructs that the standards portray. To this end, accounting standards can (1) provide preparers and auditors more complete specification of the underlying economic constructs associated with a new standard and guidance for making appropriate choices within each new standard, and (2) require firms to make their judgments and choices more transparent to external stakeholders by providing disclosures on the underlying economic assumptions on which they are based.

Research on Judgment and Decision Errors (Relation (2b))

Experimental research relating to accounting information reliability demonstrates the importance of unintentional errors for the accuracy of judgments and decisions. We briefly summarize findings of research in this area related to (1) information processing and (2) knowledge.

Research indicates that humans exhibit both systematic and idiosyncratic errors in judgment due to faulty information processing. Systematic errors (biases) often arise because individuals use heuristics, i.e., simple judgment or decision rules that reduce mental effort, while idiosyncratic errors typically arise because individuals are inconsistent in processing information (see Ashton and Ashton [1995] for further discussion). These errors have been

documented for different groups, although studies suggest that experts are less prone to these biases (Smith and Kida 1991). While these studies have not been specific to accounting information reliability, the pervasiveness of the findings suggests that preparers also make such information-processing errors when generating accounting information.

Research also suggests various approaches to mitigate such errors. As one example, research indicates that human error can be reduced by aggregating judgments from multiple individuals (or models), with most of the benefit coming from combining two or three individual estimates (Libby and Blashfield 1978; Ashton and Ashton 1985).[9] The incremental benefit from combining judgments depends on the level of dependence between estimates (Clemen and Winkler 1985), indicating that consensus judgments may be better suited to reducing idiosyncratic rather than systematic errors. Overall, research suggests that preparers may wish to combine measurements from different models or sources to arrive at reported values. Future research can assess whether the increased accuracy from combining multiple measures exceeds the costs of obtaining these measures.

Research also consistently documents the importance of task-specific experience and associated knowledge for accurate (reliable) judgments and decisions (Bonner and Lewis 1990; Libby and Luft 1993). For example, McDaniel et al. (2002) find that individuals with significant financial reporting experience are more likely to identify potential impairments of financial reporting quality associated with normal business activities than are individuals with significant general business experience. In the context of reliability (relation (2b)) in Figure 1, this research suggests that for accounting information to be reliable, preparers (and standard setters and auditors) must be knowledgeable about economic constructs affecting future cash flows, the relation between accounting constructs and these economic constructs, and methods for measuring reliable values. Additionally, these results suggest that parties in the financial reporting process have educational roles. For example, standard setters amass a great deal of knowledge about the mapping between economic constructs and accounting constructs in their deliberations on a standard. Standard setters can enhance the reliability of accounting information by incorporating this information in new standards and discussions with representatives of constituent groups.

Research on Assessing Reliability

The reliability of accounting information is assessed by auditors, users, and regulators. The Conceptual Framework presents verification as an approach to assess reliability. That is, individuals other than preparers (e.g., auditors) observe a firm's commercial arrangements, transactions, and events to assess the appropriateness of preparers' classification and measurement decisions (i.e., decisions required for relation (2b) in Figure 1). The Conceptual Framework indicates that agreement between auditors and preparers on classifications and measurements provides users with at least some assurance that accounting information is reliable. Some research studies examining consensus have used agreement as a measure of accounting information reliability, while others challenge whether agreement among multiple individuals indicates reliability.

Our framework suggests several alternative approaches to verification for assessing accounting information reliability. First, in some cases reliability can be assessed directly using relation (2b) to evaluate representational faithfulness. Research in this area compares accounting information to various economic benchmarks, including empirical proxies for

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[9] Note that this research examines the combination of judgments from multiple individuals, not group judgments. The benefits from combining individual judgments are similar to those obtained from diversification in an investment portfolio.

economic constructs, simulated economic constructs, future cash flows, and forward-looking accounting measures. In addition, research on relation (2b) also generates insights about assessing reliability by analyzing the characteristics of firms for which the accounting data have been revealed to be unreliable through subsequent restatements. Second, reliability can be assessed indirectly using relation (3a) by comparing current period accounting information to the future cash flows that the accounting information purports to represent. For example, net accounts receivable can be compared to future cash collections. Finally, reliability can be assessed even more indirectly by examining financial statement users' reactions to accounting information with different degrees of reliability (i.e., relation (3b)).

Assessing Reliability through Verifiability (Relation (2b))

SFAC No. 2 states that verification implies consensus (agreement) among independent measures and that verifiability can be measured by the dispersion within a number of independent measurements of a phenomenon (FASB 1980, ¶84). Some accounting research assumes that consensus implies reliability and uses consensus to measure the reliability of different measurement attributes (see Parker [1975] for an example of this research). However, most research on verifiability questions the appropriateness of using consensus as assurance of reliability.

Auditors and preparers may agree on unreliable classifications and measurements for a variety of reasons, including similar incentives, similar knowledge or information, and common information-processing heuristics. Research typically studies whether the level of agreement among individuals is a good surrogate for accuracy by examining tasks in which multiple individuals provide estimates for variables with known outcomes (e.g., sales forecasts). Initial research in this area documents a strong positive relation between consensus and accuracy (e.g., Ashton 1985); however, this finding likely is due to the high level of individual accuracy in the tasks used in these studies. Subsequent research using tasks with greater variation in individuals' accuracy documents only a moderate relation between consensus and accuracy (Davis et al. 2000). For these tasks, individuals typically exhibit high consensus on incorrect answers due to reliance on knowledge gained from common experiences that have little relevance to the task. Davis et al. (2000) observe, however, that the relation between consensus and accuracy increases with significant task experience.

Overall, this research highlights factors that affect the Conceptual Framework's approach of using verification to assure accounting information reliability. These factors include those commonly advocated for auditors—independence and competence. Independence is harmed not only by common incentives, but also by the use of common information-processing heuristics, common information, or common training that lead to inaccurate judgments. This research suggests a need to explore other approaches for assessing accounting information reliability; we turn next to approaches suggested by our framework.

Assessing Reliability through Current Economic Constructs (Relation (2b))

Archival research provides relatively direct evidence on representational faithfulness by examining the reliability relation (2b) within the accounting relation (2) in Figure 1. This research either compares current-period accounting information to economic benchmarks as proxies for current-period economic constructs, or tests simulated economic and accounting data. We discuss each of these areas in turn.

Economic benchmarks as proxies for economic constructs. A relatively direct route to test the reliability relation (2b) within the accounting relation (2) in Figure 1 is to examine the association between firms' reported accounting information and observable economic

benchmarks as proxies for firms' underlying economic constructs. For example, one can gauge the reliability of reported fair values of investment securities by their corresponding market values. Chandar and Bricker (2002) predict and find that returns to market-wide portfolios (i.e., the S&P 500 Index and the Russell 2000 Index) enable users to gauge the reliability (e.g., overstatement or understatement) of fair value gains and losses reported by a sample of closed-end mutual funds.[10] In another example, Alford and Boatsman (1995) use measures of historic stock return volatility to gauge the reliability of reported estimates of expected future return volatility that firms use to estimate fair values stock option-based compensation. They document how differences in these expected return volatility measures trigger differences in the degree of reliability in estimates of options-based compensation expense.

One implication from these studies is that disclosures of benchmark data related to underlying economic constructs may help financial statement users to assess the reliability of accounting information. Required disclosures of independent and verifiable financial and nonfinancial metrics related to underlying economic constructs could provide users with information to gauge the reliability of reported accounting estimates and the parameter assumptions used in estimating stock option values, fair values, pension and other post-employment benefit obligations, loss reserves, and others.

Simulated economic constructs. In order to assess representational faithfulness within the accounting relation (2) in Figure 1, several studies simulate data on relevant economic constructs and test the reliability of various accounting measurement rules. For example, Barth et al. (1998) simulate data on the components of corporate debt and use option-pricing models to estimate fair values of those components. Their analysis sheds light on the potential reliability in fair value estimates of debt components. Healy et al. (2002) simulate data on R&D expenditures and the firm's financial statements, while varying the length of the period over which the firm capitalizes and amortizes these expenditures. Their analysis provides insight into the reliability of potential capitalization of R&D expenditures. Simulation-based studies can calibrate the degree of reliability (or, conversely, the potential measurement error) in accounting numbers *prior* to the adoption of a new standard. However, simulated data are not generated in the normal course of business and, therefore, may not reflect all of the potential information or noise in reported accounting information.

Assessing Reliability from Evidence from Violations of GAAP (Relation (2b))

In some instances, preparers (or securities regulators) reveal that prior financial reports are not reliable and must be restated. In these instances, the reliability relation (2b) within the accounting relation (2) in our framework in Figure 1 does not hold—accounting information does not reliably reflect the firm's underlying economic constructs. Such cases enable archival research to take a pathological approach to provide inferences about reliability by examining the characteristics of firms and their accounting information when that information is revealed to be unreliable. This line of research has examined accounting information from firms subject to Accounting and Auditing Enforcement Releases by the Securities and Exchange Commission and firms that have publicly restated prior accounting reports that violated GAAP.[11] These studies document that restatement and fraud firms most

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[10] Similarly, prior studies used different industry-wide and economy-wide price-level indexes and baskets of assets to test reliability across measurement attributes under SFAS No. 33 (e.g., Sunder and Waymire 1983; Casler and Hall 1985; Shriver 1986, 1987).

[11] For examples, see Kinney and McDaniel (1989), Summer and Sweeney (1998), Bonner et al. (1998), Beneish (1999), Dechow et al. (1996), Lee et al. (1999), Palmrose and Scholz (2003), Rosner (2003), and others.

frequently misstate core components of earnings (especially revenues). Further, misstatements of core earnings components trigger the most significant negative market reactions, the greatest likelihood of enforcement actions and litigation, and the largest settlement costs. Studies like these can, in a general sense, direct standards-setters' attention to areas of accounting that may warrant sharper standards or measurement rules. These studies can also trigger auditors and financial statement users to assess reliability with greater scrutiny. Also, the results from studies like these reinforce the value of reliable accounting information by demonstrating the costly consequences of unreliable accounting information.

Assessing Reliability through Representational Faithfulness of Future Cash Flows (Relation (3a))

Archival research also examines representational faithfulness using the predictive relation (3a). Some studies compare specific current-period accounting *estimates* of future cash flows (e.g., accounts receivable) to the future cash flow *realizations*. Others examine whether changes in accounting measures (e.g., asset revaluations) relate to firms' future cash flows. Finally, other studies investigate the relation between current-period risk-related disclosures and variability of future income and cash flows.

Explicit accounting estimates of future cash flows. Archival research provides evidence on reliability by examining the relation between accounting information and future cash flows (the predictive relation (3a)). As we show in Figure 1, the predictive relation (3a) depends on both the relevance and reliability of accounting information. Therefore, studies of the predictive relation are joint tests of three factors: (1) the mapping of economic constructs into recognized accounting information (accounting relevance (2a)), (2) the accounting classifications and measurements used to report the economic constructs that are recognized in financial statements (accounting reliability (2b)), and (3) controls for all other factors that influence future cash flow realizations. Studies of the predictive relation assume that a strong relation between particular accounting numbers and realized future cash flows implies a high degree of reliability. Unfortunately, discovering a weak relation reveals the difficulty in this approach. A weak relation could be attributable to accounting information with low reliability because of poor representational faithfulness or inherent randomness in future cash flows realizations. Alternatively, the weak relation could arise because the particular accounting information being examined has low relevance for those particular future cash flow realizations. Despite these difficulties, we believe this approach is a promising avenue for future empirical research to consider the reliability of accounting information.[12]

To highlight examples of the line of research that examines the predictive relation (3a) in Figure 1, we focus on studies of the reliability of loss reserves. Loss reserves are accounting constructs that represent expected future cash flows from economic risks (e.g., credit risk or underwriting risk). Therefore, studies provide relatively direct inferences about loss reserve reliability by comparing loss reserve estimates with *ex post* loss realizations. McNichols and Wilson (1988) is a prime example of an early step in this research direction. They model the provision for bad debts as a function of the beginning balance in the allowance for bad debts and the current and future period write-offs of accounts receivable. They find that firms performing extremely well or poorly appear to exercise discretion to overstate the reported bad debts provision, violating neutrality.

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[12] For example, one might test the reliability of different models of fair values of employee stock options grants by estimating their relation with values of options on future exercise dates. Alternately, one might test the equity versus debt properties of components of deferred tax liabilities by examining their relations with future tax expense accruals and tax cash payments. For examples of this general approach, see Dechow et al. (1998), Barth, Cram, and Nelson (2001), and Dechow and Dichev (2002).

Relatedly, a number of studies use the predictive relation (3a) to test the reliability of property-casualty insurers' loss reserves by exploiting the information in loss reserve development disclosures. These disclosures reveal the relation between claim loss reserves recognized each accident year, subsequent cash payments to settle claim losses, and subsequent re-estimates of claim loss reserves, over periods of nine years following each accident year. For example, Petroni (1992) utilizes these development data to show that distressed insurers understate claim loss reserve estimates, indicating low reliability when these reserves are particularly relevant.[13]

As compared to insurers' claim loss reserves, drawing inferences about the reliability of banks' loan loss reserves is more difficult because accounting standards do not require banks to disclose the relation between loan loss reserve estimates and *ex post* loan loss realizations.[14] Banks do disclose, however, information related to credit risk, including concentrations of credit risk (types of loans outstanding), loan charge-offs, and nonperforming loans. Researchers use these data to examine the reliability of banks' loan loss reserves. Studies show that banks exercise non-neutral reporting with respect to loan loss reserves to signal future earnings strength, to meet earnings targets, and to meet regulatory capital requirements.

One of the implications of these studies is that explicit disclosures linking prior period accrual estimates and *ex post* realizations can help financial statement users assess the reliability of current period accrual estimates, which is particularly important for accruals pertaining to core elements of operations (e.g., underwriting risk of insurers and credit risk of banks). Users can also better assess accounting information reliability with disclosures of related economic and accounting factors (e.g., concentrations of credit risk and nonperforming loans of banks). Further, reliability can be made more transparent by reporting accruals that are disaggregated into current period amounts versus amounts for corrections or revisions of prior accrual estimates.[15]

Reliability of asset revaluations. Accounting standards in the U.K. and Australia permit firms to revalue upward nonfinancial resources such as: property, plant, and equipment; investment property; and intangible assets (including brand assets). Research has used the predictive relation (3a) in Figure 1 to examine whether such (presumably relevant) upward revaluations are reliably associated with future financial performance.[16] In general, consistent with the predictive relation (3a), these studies find that upward revaluations of nonfinancial assets are significantly positively related to future operating income and cash flows, but that these relations are weaker among firms with incentives favoring upward revaluations. Several studies find that asset revaluations are more reliable when based on independent appraisals from external valuation experts or auditors than firm directors or internal appraisers, as indicated by lower frequency of subsequent reversals in upward asset revaluations. Several of these studies also predict and find that asset revaluations are more likely to be perceived as reliable by external stakeholders (e.g., as reflected in share prices or stock returns) when the revaluations are based on independent appraisals. Overall, these

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[13] Other studies related to reliability that use loss reserve development disclosure data include Petroni and Beasley (1996), Anthony and Petroni (1997), Beaver and McNichols (1998), Nelson (2000), Petroni et al. (2000), and Beaver et al. (2003).

[14] Studies of bank loan loss reserves and loan loss provisions include Beaver et al. (1989), Wahlen (1994), Collins et al. (1995), Beatty et al. (1995), Beaver and Engel (1996), Liu and Ryan (1995), Liu et al. (1997), Kim and Kross (1998), Ahmed et al. (1999), and others.

[15] Lundholm (1999) provides a useful commentary to elaborate these ideas.

[16] See Barth and Clinch (1998), Aboody et al. (1999), Muller (1999), Dietrich et al. (2000), Muller and Riedl (2002), Cotter and Richardson (2002), and Kallapur and Kwan (2004).

studies imply that upward asset revaluations are more reliable if verified by independent external appraisers or auditors.[17]

Risk-related disclosures. Our framework in Figure 1 links the firm's underlying economic constructs (which are inherently difficult to observe) to accounting information, and links accounting information to the *magnitude* as well as the *uncertainty* inherent in future cash flows. The degree of uncertainty in future cash flows affects the reliability of related accounting information (e.g., greater risk and uncertainty in future cash flows can impair the representational faithfulness and verifiability of accounting constructs and measured values). Financial statements recognize and disclose information intended to inform users about the potential magnitude and uncertainty in future cash flows; as such, disclosures relating to uncertainty also reveal potential sources of unreliability. For example, value-at-risk disclosures reveal a degree of uncertainty (i.e., potential unreliability) in recognized amounts pertaining to certain assets and/or liabilities that are subject to market price risk, as well as potential volatility in future income and cash flows. Several recent archival studies use the predictive relation (3a) in the accounting information framework in Figure 1 to assess the reliability of value-at-risk disclosures by testing their associations with future income volatility. Specifically, Jorion (2002) and Liu et al. (2004) find that commercial banks' quarterly value-at-risk disclosures for their trading portfolios reflect exposure to interest rate risk and are reliable indicators of volatility in one-quarter-ahead trading portfolio income. Liu et al. (2004) also find that value-at-risk disclosures relate to banks' stock return volatility and market beta. Relatedly, Schrand (1997) examines risk-related disclosures in savings and loan associations' regulatory reports (off-balance-sheet derivatives and gaps in contractual maturities of fixed-rate financial instruments). She predicts and finds that these data explain cross-sectional differences in stock-price sensitivity to interest rate changes. Similarly, Rajgopal (1999) examines data from the SEC's required market risk disclosures and finds these data explain oil- and gas-producing firms' stock-price sensitivity to changes in oil and gas prices.

These studies imply that risk-related disclosures play a dual role with respect to reliability. First, they provide representationally faithful information about differences in firms' exposure to underlying economic risks. Although the future cash flows associated with risky assets and liabilities may be highly uncertain and difficult to measure reliably in the current period, these types of disclosures provide reliable information about firms' exposures to such risks. Second, these types of disclosures therefore also reveal differences in the reliability of recognized amounts that are subject to uncertainty in future cash flow realizations.[18] Regulatory and industry-specific reporting requirements and norms may provide good examples of reliable information that can potentially be adapted and required for firms and industries facing similar risks and uncertainties.

Assessing Reliability through Users' Expectation Formation (Relation (3b))

Our accounting information framework in Figure 1 highlights the importance of users' expectations (relation (3b)) in determining the actual usefulness of accounting information. To make informed decisions using accounting information, users must assess the reliability

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[17] An extensive archival literature examines the role of the independent audit in the verification of accounting information. In general, the results indicate the audit is a necessary condition for the perceived reliability of financial accounting information. We do not cover this literature in this review. Correspondingly, we exclude experimental research that examines judgments/decisions specific to the audit process.

[18] For example, value-at-risk disclosures for a particular firm may reveal (1) reliable information about the firm's exposure to market risks, and (2) the degree to which recognized amounts for assets and liabilities that are exposed to such risks may therefore be unreliable because of uncertainty in future cash flows.

of that accounting information. If users perceive information as unreliable, then, in some cases, they can adjust accounting information to represent more faithfully firms' economic constructs. In other cases, if users cannot correct accounting information they perceive to be unreliable, then they will likely decrease the weight they place on that information, thus reducing the association between accounting information and users' judgments and decisions. Experimental research investigates these issues by directly examining users' judgments within an experimental setting, whereas archival research infers users' responses to differences in reliability from tests of data that reflect users' business decisions, such as share prices and stock returns.

Users' assessments of accounting information reliability. Experimental research indicates that users assess the reliability of accounting information from at least two sources: (1) information about the process by which firms determine accounting information and (2) information about the reliability of financial statement numbers. With respect to process information, Hirst et al. (1995) find that users pay attention to the incentives of firms issuing information. Users react more strongly to information when the firm acts counter to incentives (i.e., a firm issues an unfavorable report when it has incentives to issue a favorable report). Maines et al. (1997) also provide insight on process information; they find that analysts have more confidence in segment information when external financial reporting is congruent with internal reporting. These results suggest that users infer accounting information reliability from contextual factors that influence the process generating these numbers.

Other research on reliability examines whether providing confidence intervals around accounting numbers affects users' judgments. Oliver (1972) and Keys (1978) find that loan officers make similar judgments and decisions with confidence-interval financial statements as with point-estimate statements. This finding either indicates that users understand the inherent reliability in financial statements (Birnberg and Slevin 1976) or fail to understand how confidence-interval information should affect judgments and decisions. Although experimental studies do not resolve this issue, archival research finds that stock returns are associated with value-at-risk (VAR) disclosures, implying that users do not ignore statistical information about the uncertainty inherent in financial statement numbers.

Overall, this line of research suggests that users benefit from knowing contextual factors related to the process that generates accounting information. While the experimental literature to date is unclear about whether users incorporate statistical information about the reliability of financial statement numbers, archival research suggests that users' investment decisions do reflect such information (e.g., VAR disclosures). Future research can explore this potential inconsistency by investigating whether users respond differently to various types of statistical information and different approaches to conveying this information.

Users' adjustment of unreliable financial information. A number of studies indicate investors are likely to accept standard-setters' and preparers' classifications and not adjust for unreliable reporting. Some studies suggest that this occurs when investors do not fully understand the nature of economic constructs. For example, Hopkins (1996) finds that analysts assign higher stock valuations when firms classify mandatorily redeemable preferred stock (MRPS) as a liability rather than equity, indicating that analysts do not have a well-formed category of knowledge for MRPS. Similarly, judgments by nonprofessional investors in Maines and McDaniel (2000) more strongly reflect unrealized gains and losses on marketable securities when reported in a performance statement than in the statement of stockholders' equity. Other research suggests that even expert investors may not adjust unreliable reporting due to the cognitive costs of doing so. For example, Hirst and Hopkins (1998) and Hirst et al. (2004) find that financial analysts' stock-value judgments reflect the

underlying economics associated with unrealized gains and losses on financial instruments only when they are reported transparently in a performance statement.

To some extent, the results of these studies can be viewed as reflecting knowledge or effort problems associated with users' judgments and decisions (i.e., problems in relation (3b)). That is, one could argue that users should use information regardless of its classification. However, one can argue that these studies reflect the effect of problems in the representational faithfulness of information (i.e., problems in relation (2b)). Preparers are in the best position to map the economic constructs in their commercial arrangements into appropriate financial statement classifications. Studies in this area suggest that knowledge and effort barriers may limit users' abilities to undo the effects of unreliable reporting, and suggest that unreliable reporting can lead to investment decisions that are not based on a firm's underlying economic constructs.

Other studies examine individuals' ability to detect and adjust for bias in information. Results of this literature highlight the importance of repeated feedback. When individuals receive feedback about actual outcomes, they learn to detect and adjust for bias in forecasted information, but are less likely to acquire biased information than unbiased information (Ackert et al. 1997). Financial statement users do not appear to adjust for bias without such feedback. For example, Kennedy et al. (1998) find that bias in contingent liability disclosures affects users' judgments. This research highlights the importance of disclosures that compare estimates to actual outcomes, such as the disclosures discussed earlier for claim loss development by property casualty insurers. Hirst et al. (2003) find that such disclosures are most effective when they explicitly show effects of mis-estimation on both the balance sheet and net income.

Overall, these studies indicate that users need clear feedback on accounting information reliability in order to adjust for biases in financial information. Additionally, these studies imply that users may refuse to use accounting information they perceive as unreliable, leading to users' decisions reflecting incomplete information. These findings highlight the importance of standard setters and preparers choosing accounting constructs and measures that faithfully represent economic constructs, the importance of disclosures that enable users to assess reliability, and the need for investors to use all the information available to assess the reliability of accounting information (and if necessary, correct that information) in order to make informed decisions.

Inferring investors' responses to accounting information reliability from tests of share prices. Value-relevance studies use share prices (and/or stock returns) to infer whether capital market participants consider accounting information to be sufficiently relevant and reliable to be useful in making investment decisions. These types of studies implement an approach consistent with the user expectation relation (3b) in Figure 1, in which share prices are proxies for the present value of the capital markets' expectations of all future net cash flows to the firm. Studies in this line of research commonly deduce the reliability of accounting information by examining the strength of association between accounting numbers and share prices. Because these studies rely on share prices as proxies for expected future cash flows, these studies provide indirect evidence on accounting information reliability. Value-relevance studies are joint tests of: (1) the capital markets' perception of relevance of a specific piece of accounting information for the future cash flows of the firm (relation (2a)); (2) the capital market's perception of the reliability of that accounting information (relation (2b)); (3) the asset-pricing model that the researcher uses to control for all the other factors that explain share prices, such as risk; and (4) market efficiency. Because these studies are complex joint tests, drawing sharp inferences about accounting information reliability from these studies is difficult. This literature includes

studies that span a wide variety of accounting issues, such as: fair values of financial instruments; comprehensive income; goodwill and other intangible assets; research and development activities; pension assets and liabilities; other post-employment benefits obligations; deferred tax assets and liabilities; oil and gas assets and reserve disclosures; derivatives disclosures; value-at-risk and other risk-related disclosures; employee stock options; environmental liabilities; revenues; and many others. Researchers also use the value-relevance approach to compare the capital markets' use of accounting information across international regimes (e.g., Form 20-F reconciliations) and across measurement attributes.[19]

To illustrate two value-relevance studies, we focus on Barth (1991, pension assets and liabilities) and Choi et al. (1997, nonpension accumulated post-retirement benefits obligations, denoted APBO).[20] Both studies explicitly model reliability (i.e., measurement error) and use share prices to estimate the market's perception of the reliability of these (presumably relevant) liability estimates. Barth (1991) finds that the pension liability implicit in share prices is more closely related with the accumulated and projected pension plan obligations rather than the vested benefit obligation or the book value of the pension liability recognized under SFAS No. 87. Barth (1991) also finds that the projected benefit obligation has less measurement error variance among firms when it reflects the salary progression rate, including expected future inflation and productivity changes. Choi et al. (1997) find that reported APBO amounts provide incremental explanatory power for share prices beyond the information in pension assets and liabilities, even though APBO estimates appear less reliable than analogous pension liability estimates. They also show that reliability in APBO estimates varies predictably across firms as a function of firms' retiree-to-active-employee ratios. Thus, both studies imply that the capital markets rely on measures of underlying economic constructs that these estimates portray (salary progression rates, retiree-to-active-employee ratios) to assess the reliability of these obligations estimates.[21] Thus, in terms of the framework in Figure 1, the evidence on the relation between these liability estimates and share prices suggests these liability estimates have some relevance and reliability for predicting future cash flows (relation (3b)). The evidence that indicates variation in the pricing of these liabilities across firms, conditional on factors such as salary progression rates or retiree-to-active-employee ratios, suggests these supplemental disclosures enable users to assess the reliability of these liability estimates (relation (2b)).

We believe that value-relevance research provides useful evidence for standard setters and others to consider, although we share the concerns of Holthausen and Watts (2001)

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[19] Despite the widespread use of value-relevance tests, the usefulness of inferences from value-relevance research for standard setting is controversial. Holthausen and Watts (2001) criticize drawing inferences from value-relevance research for standard setting because of a lack of theory explaining accounting standard-setter actions, and the compound roles of accounting information in valuation and other contexts. They conclude, "the value-relevance literature is unlikely to be very informative to the standard-setting community" (Holthausen and Watts 2001, 14). In response, Barth, Beaver, and Landsman (2001, 78) draw the counterpoint conclusion that "the value relevance literature provides fruitful insights for standard setting." They argue that, although value-relevance studies do not resolve standard-setting questions, they do provide evidence on the usefulness of accounting information to investors.

[20] Of course, many other studies could be used as examples of this line of research. For more complete reviews of this literature and the controversy over the relevance of this literature for standard setting, see Holthausen and Watts (2001) and Barth, Beaver and Landsman (2001). Because of the thoroughness and recency of these two papers, we elect not to cover this literature in greater detail here.

[21] Relatedly, Ali and Kumar (1993) examine differences between income numbers reported under SFAS No. 87 and APBO No. 8 in the year of adoption of SFAS No. 87. They predict and find that preparers' reporting incentives have greater influence on reported pension costs and income numbers under SFAS No. 87 than under APBO No. 8.

over the theoretical deficiencies in this research. Value-relevance evidence provides useful inferences to deduce the capital market's perceptions of accounting reliability and relevance by assessing relative valuations of alternate accounting constructs, particularly by comparing the value-relevance of alternate accounting constructs against the underlying economic constructs they portray (as exemplified in Barth 1991; Choi et al. 1997).

DISCUSSION, FUTURE RESEARCH DIRECTIONS, AND CONCLUSIONS

In this paper, we summarize inferences from archival and experimental research related to achieving and assessing accounting information reliability. Overall, research highlights that even experts can disagree on the nature of reliability. Additionally, research consistently finds that the interactions between preparers' incentives with accounting standards can trigger deficiencies in reliability. These interactions determine both the process by which unreliability occurs and the form in which unreliability manifests.

Research on assessing reliability raises concerns about using verification as an indicator of reliability and introduces alternative approaches for more directly evaluating representational faithfulness, at least on an *ex post* basis. These approaches compare current accounting information against current economic benchmarks or future cash flows. This research also consistently highlights the importance of disclosures related to underlying economic factors and preparers' assumptions and estimates that can increase the ability of financial statement users to assess reliability.

Finally, a significant body of research focuses on users' reactions to accounting information reliability. This literature generally finds that users are sensitive to differences in the reliability of accounting information and factors that impair reliability. Experimental research, however, documents that even expert users can be influenced by preparers' choices that weaken reliability.

We believe many opportunities exist for future research to provide new insights about achieving and assessing reliability. First, we encourage both theoretical and empirical research on the definition and characteristics of reliability, including analysis that may discover characteristics of reliability beyond those identified in the Conceptual Framework. Accountants trained in analytical modeling can use rigorous analysis to identify theoretical characteristics of accounting reliability and to define the role of accounting reliability in valuation and agency settings. Accountants trained in experimental and survey methods can further the research stream started by Joyce et al. (1982) to identify how participants in the financial reporting process define and characterize reliability. The participation of standard setters, preparers, auditors, and users is crucial to such research. Second, we encourage archival researchers to pursue research that assesses representational faithfulness by modeling and estimating the relation between accounting data and either underlying economic constructs or future cash flow realizations.

Finally, we support research that focuses on preparers because of their central role in the financial reporting process. Specifically, we believe research that examines sources of unreliability other than incentives can provide significant insights related to accounting information reliability. Field studies provide one approach to both assess reliability and examine sources of unreliability. In such studies, researchers would directly observe the unique proprietary archival data that firms collect and use to capture economic constructs, and how the firms summarize and report those data in financial statements. Direct observation of the financial reporting process would enable researchers to examine how firms determine relevant economic constructs, and how they make related account classification

and measurement decisions. Such direct observation would also permit researchers to deduce potential error in accounting constructs and measures. Field studies, while not uncommon in managerial accounting research, thus far are fairly rare in financial accounting research.[22] The field study approach has the potential to create powerful and direct inferences related to financial reporting reliability. With the aid and influence of the FASB and regulators, and under terms of strict confidentiality, perhaps archival researchers could get firm-specific internal data used for financial reporting purposes, and perhaps experimental researchers could get access to and cooperation from preparers, thus enabling direct tests of accounting information reliability.[23]

Experimental research can extend field studies by manipulating factors expected to affect preparers' judgments and decisions that affect reliability. Such studies could provide data to preparers regarding transactions and applicable standards, and examine the representational faithfulness of the preparers' financial reporting decisions. These studies could investigate the effects of factors such as principles- versus rules-based standards, preparer knowledge limitations in light of increasingly complex economic constructs, and difficulties in obtaining information needed to appropriately classify and measure accounting constructs.

In summary, we believe that theoretical analysis, archival data analysis, controlled experimental tests, field studies, and descriptive studies through surveys and interviews are all potentially fruitful avenues to new inferences about accounting reliability. Further, we encourage interactions between researchers, standard setters, preparers, auditors, and users to accomplish this research and to identify additional important research issues related to reliability.

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[22] Interestingly, most of the financial accounting "field study" literature comes in the form of case studies developed for classroom education. The value of such cases as research is questionable given that information typically is omitted or disguised due to its proprietary nature. A few research studies have studied the financial reporting of individual companies using publicly available data (Lipe 2002; Lys and Vincent 1995). Gibbins et al. (1990) is an example of a study that moves toward a field approach to study financial reporting; they use a series of interviews to identify factors that influence firms' disclosure policies.

[23] For example, in a study that predates SFAS No. 123, Huddart and Lang (1996) use employee stock option grant and exercise data for eight companies to describe employees' stock option exercise behavior. While their description of this economic phenomenon informed the debate concerning stock option accounting, the data available under APBO No. 25 did not allow Huddart and Lang (1996) to assess how exercise behavior affected the reliability of related amounts in the financial statements. Perhaps similar proprietary data could now be used to assess the reliability of stock option compensation estimates under SFAS No. 123R.

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