

THE DETERMINATION OF CONJOINT MATERIALITY:
A SIMULATION STUDY

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Proposal Draft

* This research effort is preliminary in nature and should not be quoted without explicit consent of the author. Comments and suggestions are requested and would be appreciated.

ABSTRACT

This proposal describes the concepts of conjoint, account and item materiality and proposes a simulation study to establish the potential effects of materiality assessment on an independent item-by-item or account-by-account basis. Its results may lead to the reformulation of current materiality assessment procedures in audit situations where current practices ignore the multivariate interactive effects of repetitive biases or account correlations. The study will encompass:

1) the development of a conceptual materiality framework where different levels of materiality are defined, their interrelations postulated and auditor perceptions discussed,

2) the formulation of hypotheses relating to conjoint materiality assessment and the measurement of errors,

3) development of a simplified corporate accounting model where key accounts are represented by best estimators of sample populations,

4) experimentation with four different scenarios where material discrepancies are found both at the item and account level,

5) sensitivity analysis on the actual discrepancies found and their conjoint materiality,

6) analysis using two approaches: a) the expectancy value model and b) conjoint analysis,

7) conclusions on the effects found and

8) procedural suggestions for practice.

OUTLINE

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IV. Methodology

-expectancy value analysis

-conjoint analysis

V. Conclusions

-a On the potential of this research

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I. OBJECTIVES

In spite of the importance of the concept of materiality in accounting and auditing, very little is known of the effects of aggregation and correlation among items upon the overall fairness of financial statements.

The FASB (1975) summarized the main issues relating to determining materiality in financial statements but did not issue a specific statement as it linked the definition of materiality to the greater topic of "Conceptual Framework." Only the first part of the conceptual framework has been promulgated, dealing with the less controversial issue of "Objectives of Financial Statements." Just recently the FASB added to the effort by issuing an exposure draft on accounting procedures for an inflationary environment which somewhat departs from the historical basis of accounting.

The FASB(1975), in its discussion memorandum on materiality, recalled that the AICPA, in its first Accounting Research Bulletin, issued in 1939, stated:

The committee contemplates that its pronouncements will have application only to items large enough to be material and significant in the relative circumstances. It considers that items of little or no consequence may be dealt with as expediency may suggest.

The FASB also recalled a few other pronouncements such as the following:

Financial reporting is only concerned with information that is significant enough to affect evaluations or decisions. (APB Statement no. 4)

Any reduction of less than 3% in the aggregate need not be considered as dilution in the computation and presentation of earnings per share data, as discussed through this Opinion. (APB Opinion no. 15)

In determining materiality, extraordinary items should be related to the estimated income for the full fiscal year. (APB Opinion no. 28)

Items should be considered individually and not in the aggregate in determining whether an extraordinary event or transaction is material. However, the effects of a series of related transactions arising from a single specific and identifiable event or plan of action . . . should be aggregated to determine materiality. (APB Opinion no. 30)

The term "material" when used to qualify a requirement for the furnishing of information as to any subject, limits the information required to those matters about which an average prudent investor ought reasonably to be informed. (Regulation S-X, Rule 1-02, Securities and Exchange Commission)

The above definitions of materiality are among the many presented by the FASB in the above discussed document. Other authoritative sources also referred to in the discussion memorandum include the Cost Accounting Standards Board, the American Accounting Association, the National Association of

Accountants, the Interstate Commerce Commission, the Federal Power Commission, sources from other countries such as Canada, the United Kingdom and Australia, as well as a plethora of judicial decisions that are of importance on the issue.

The FASB also mentioned a series of empirical studies conducted on the issue of materiality. They decided to concentrate on nine studies in which they concluded:

"those by Woolsey, Waters, Boatsman, and Dyer used questionnaires, cases, or a combination thereof to obtain information about the concept of materiality perception of preparers and auditors. Bernstein, Neumann, and Frishkoff analyzed published financial statements. Rose, Beaver, Becker, and Sorter conducted a laboratory experiment to determine what magnitude of accounting information influences investors.

While each of these studies has developed important information about the concept of materiality, the studies were of such nature that few definitive conclusions were reached and generalization is difficult. Although several of the researchers recommended the adoption of quantitative criteria for determining materiality, each such proposal was tempered by the caveat that the existence of surrounding circumstances dictates the need for the exercise of professional judgement in the application of quantitative guides.

Since the FASB (1975) document, a series of academic research studies has been published. These are discussed in more detail in section II of this proposal. In summary:

The financial accounting process is designed to culminate in the preparation of financial information

which presents FAIRLY an enterprise's financial position. . . . If presentation of financial information is to be prepared economically on a timely basis and presented in a concise, intelligible form, the concept of MATERIALITY is crucial. (FASB 1975, p. 6, emphasis added)

The FASB (1975) document also listed key issues in discussing materiality:

- 1) Orientation and frame of reference of materiality determination
- 2) Level of specificity of materiality criteria
- 3) Mode of expression of materiality criteria.

It also asked for comments on six implemental issues:

- I.1) Factors other than magnitude and financial effect to be considered
- I.2) Ways of expressing quantitative materiality criteria
- I.3) If materiality is to be expressed in terms of relative amounts, what are the relationships to be considered?
- I.4) If materiality is to be expressed in terms of quantitative measurements, what should these be?
- I.5) Should sensitive situations be considered differently? How?
- I.6) "How should the materiality of group matters, not deemed material individually, be determined? Should similar items be aggregated? Should dissimilar items be aggregated? Should the items be grouped without regard to similarity and dissimilarity?"

(p. 21)

Implemental issue I.6 relates to the key research questions being asked in this project.

What are the effects of aggregation upon the allowable error ranges prescribed by materiality assessment rules?

What are the components that affect overall (conjoint) materiality?

Intrinsic to these questions are the beliefs: First, that too much of the research on materiality issues has been effected on a normative level as opposed to an empirical or analytical level; second, that research on materiality should now focus on actual discrepancies between reported and actual data instead of on ways that auditors perceive and evaluate materiality; and third, that there is very little comprehension of the components that interact to provide the basis of materiality assessments.

II. LITERATURE REVIEW

In addition to the studies discussed by the FASB (1975), a series of more recent articles have added to the state-of-the-art of materiality theory.

Hofstede and Hughes (1977) used an experimental setting and student subjects to examine the joint problems of materiality and disclosure. The experimental design had subjects assessing the need for disclosure of particular financial items (based on materiality). Their conclusions seem to: 1) reinforce the idea of a materiality threshold related to operating income, 2) find large variability among individual assessments, 3) observe limitations of subject's cognitive and analytical information-processing skills and, 4) suggest the use of the clinical research paradigm for research into materiality.

Furthermore, they conclude:

Last, the problem of setting standards of materiality can be studied with some rigor and tentative empirical conclusions can be offered. As always will be the case, empiricism cannot dictate policy, but it can provide the policy maker with some measure of consequences of given policies."

Ward (1976) used practicing CPA's to examine attitudes about the materiality construct in audit. His experimental design used 24 professionals from 3 major CPA firms using a Q methodology for attitude examination. Subjects ranked 20 items in their importance to the materiality decision. His conclusions indicate agreement between auditors and CPA firms on the ranking of the different factors which may be considered when materiality judgements are required. It also indicates that practitioners may have different perceptions on the meaning and effect of these

factors. A limited number of tests were performed partitioning subjects into groups in order to achieve some decomposition effects. The sample size however, was too small to allow major results on this dimension.

Moriarity and Barron (1976) modeled the materiality judgements of audit partners by using conjoint measurement (Green, Carmone and Wind, 1972; Green and Rao, 1971). Their conclusions disagree with Ward's stating that "...the findings of this research have demonstrated that, in fact, no consensus exists in the profession."

They quote four reasons for differences among auditor decision models:

- (1) choice of variables
- (2) materiality thresholds
- (3) scale values of the variables
- (4) basic form of the decision models

Abdel-khalik (1977) used sensitivity analysis to evaluate materiality at an aggregate market level. Discriminant analysis was used to develop an investor prediction model and showed that "...a change in mean earnings per share equal to or less than 10% does not significantly affect prediction."

Newton (1977a) used CPA partners to examine auditor risk

perception and its effect on materiality decisions. Three hypothetical cases were used to elicit responses and cardinal utility curve analysis was used to evaluate the responses. Her conclusions show consistency in auditor risk attitudes as well as auditors incorporating the probability that an event will occur in their decision processes. Subjects were also shown to be rather risk averse and resistant to change in assessment of probability expectations. She concludes that "...the materiality issue in general is in need of additional research ... additionally, since the risk factor and its role has been studied, other factors in the materiality decision should be examined ..." (p.107)

Moriarity and Barron (1979) followed their original study by using conjoint analysis to examine auditor judgement under a type of Human Information Processing methodology (see Libby and Lewis, 1977). Their sample was based on eight partners of a large CPA firm who were given, in the first day of the experiment, thirty cases to specify the expected audit effort levels for each of 30 firms (cases). The following day they were presented with the author's analysis of their responses which consisted of prediction, prediction error, individual part-worth functions and bases for differences in judgements. Then the participants were engaged in an open-ended discussion of the task and the general topic of audit materiality.

Concluding the authors state:

Although consensus was not achieved, explicit bases for the lack of consensus were determined. We are optimistic that further research with different variables and factor levels will help us shed some light on the black box of professional materiality judgement. (Moriarity and Barron, 1979, p.27)

The practitioner literature has offered further examinations of the materiality issue. Waters (1977) argued for the adoption of different levels of materiality for different accounting areas and the setting of these standards by the FASB. Barnes (1976) urged further study of both an analytical and a descriptive nature into the audit judgement process. Gillis (1976) examined the recent legal case of Bausch and Lomb and its implications for the legal definition of materiality. Newton (1977b) proposed a process to be adopted for the assessment of materiality.

In conclusion, the emphasis of the recent literature is on the modeling and description of auditor materiality decision making and on norms for materiality assessment. Intrinsic to the focus of auditor modeling is the concept that there is a "correct" materiality assessment buried somewhere in the auditor's mind and that accounting researchers are groping to unbury it. Unfortunately, most of the recent Human Information Processing literature basically shows the human information processor as a limited linear information processor rather prone to information overload (e.g. Slovic and Lichtenstein, 1971; Libby and Lewis, 1977; Driscoll and Mock, 1976). A more promising approach would be the emphasis on the error population

distribution literature (e.g. Loebbecke and Neter, 1975), the examination of the composition of these errors, the aggregation issues relating to these errors, and the potential of systematic biases. This approach would emphasize not auditor judgement reflected by the numerical relational system (Mock, 1977), but the other side of the process -- the empirical relational system being examined.

The next section of this proposal will offer a set of hypotheses that explore the problem from this standpoint while the following section will present a methodology to do so.

III. HYPOTHESES

For the purposes of this paper we shall divide materiality assessments into three hierarchical levels. The first, Conjoint Materiality, is an assessment of the overall level of inaccuracy of the financial statement. The second, Account Materiality, deals with the accuracy levels of particular accounts or cycles (e.g. Accounts Receivable, Cash, etc.). The third, Item Materiality deals with the assessment of accuracy of particular economic transactions and their measurement.

In spite of the fact that the sampling literature has given ample recognition to the relative magnitude of the items in a sample (e.g. dollar unit sampling), the materiality literature has virtually ignored the composition biases of the two lower

level materiality assessments leading to the third.

This study will hypothesize assertions about relative compositions of populations and their overall error content.

General Hypothesis: Account and item materiality assessments are not necessarily additive into conjoint materiality.

The practice of many of the major CPA firms of reconciling required adjustments on an account-by-account basis for ultimate evaluation of the fairness of financial statements may be misleading as these errors may not be additive.

In addition, some of the behavioral literature seems to indicate the existence of a systematic bias whereby all accounts are somewhat twisted towards obtainment of particular desirable results. For example in a year of weak results old inventory items may not have been written off while at the same time the allowance for bad debts was understated leading to two inaccuracies that per se may not be material but compounded could lead to material misstatement of financial statements. In addition, several of the sampling distributions, assumed to be normal during the sampling process, are slanted in compounding directions. Idiosyncrasies of sample populations have been discussed by Loebbecke and Neter (1975).

From the general hypothesis we derive a set of operational hypotheses to be examined:

H1: If there is correlation between perceived errors within population distributions, the conjoint materiality measure cannot be derived by simple addition of item and/or account materiality measurements.

H2: Item materiality assessment is irrelevant if populations are significantly skewed.

H3: Item population distribution features can be used to significantly predict overall error rates at the conjoint materiality level.

In order to examine these hypotheses and to explore the issues of item relevancy and materiality a methodology was devised and will be described in the following section.

IV. METHODOLOGY

The large majority of materiality studies have used a-priori research (see Nelson, 1973) as a means of theory development. Most recently several studies have emphasized actual auditor cognitive judgement and the subjective composition of his/her

judgement. These studies used empirical methodology and measured, through a series of approaches, what we here denominated the auditor's conjoint materiality estimation. Therefore, these studies examined the numerical relational system (NRS) of the conjoint materiality measurements instead of examining the empirical relational system (ERS) of actual errors and error populations.

This study will utilize a greatly simplified set of accounts to represent corporate financial statements where assets will be represented by cash, accounts receivable, and property plant and equipment, while equities will encompass accounts payable, retained earnings (accumulated net earnings) and capital.

A simulation methodology was chosen as allowing for sensitivity analysis of error composition under different circumstances. The simulation will be programmed in the APL language and will be parameterized based on actual distributions of real accounting populations. These populations, obtained from Audit Research Study No. 2 (Neter and Loebbecke, 1975), will serve as a random basis for composition.

Such an approach adds to the external validity of the simulation but may restrict the generalizability of the findings to the extent that other populations present analogous characteristics.

The design will test specific stated hypotheses under four

different scenarios and test the significance of the differences between the "conjoint error rate" estimated using a one-way analysis of variance.

The four scenarios entail:

- Best estimators for each population (normality assumed)
- Best estimators for each population adjusted for skewness
- "Worst possible" cases composed
- "Minimum exposure" case composed

Two methods of analysis will be used: an expectancy value model and the technique of conjoint analysis.

Expectancy Value Analysis

The overall error rate of each of these scenarios will be estimated by its statistical distribution based on a sample and replicated by the computer using discrete simulation. These results will be tested against total tabulations of the book and actual values of the population for assessment of real versus estimated error rates differences. The population of error rate variances will be tested by nonparametric statistics (due to the small sample) to see if it is significantly different from zero.

These procedures will allow us to:

- Measure actual and estimated error rates at the item,

account, and conjoint level

-Measure the quality of sampling prediction based on traditional assumptions

-Measure sensitivity of estimators to changes in assumptions about the populations.

This approach is similar to Wilkie and Pessemier's (1973) description of expectancy-value models which draw upon a compositional or build-up method in contrast to conjoint analysis which is based on a decompositional approach and which will be used as our second way to analyze data.

Conjoint Analysis

Moriarity and Barron(1979) used conjoint analysis to examine the elements of decision maker attitudes that accounted for the overall materiality assessment. Their emphasis was therefore the numerical relational system.

The emphasis of this second approach of data analysis will use conjoint analysis (Green and Srinivasan, 1978; Green and Wind (1975); Tversky, 1967) and examine interrelationships within the empirical relational system.

While the first approach will use traditional estimation methodologies to assess the quality of overall error measurements based on different scenarios, the second approach will attempt to analyse the relationships of the components that lead to the conjoint error determination.

V. CONCLUSIONS

a. On the potential of this research

This proposed research effort may provide a different approach to the examination of the principle of materiality. The conceptualization of three levels of materiality is a contribution to the literature in that it allows for examination of materiality of actual error populations as opposed to judgemental assessments.

The potential results of this research may contribute to a linkage of the materiality literature with the statistical sampling field (see Lin et al. (1979) for an overall examination of the academic audit literature) with the potential of leading to systematic audit procedures that unbiasedly estimate conjoint error in financial statements. These procedures will decrease the potential of ultimate audit error by avoiding the pitfalls of intuitive biases such as assumptions of linearity or conservatism. However, at its ultimate, even with improved

overall error estimation, materiality assessment will remain an intuitive judgement for which carefully assembled (and maybe less biased) evidence can be gathered leading to the auditor's final opinion.

Project Schedule

Step completion Date	Expected
Audit literature review	September 15, 1979
Sampling literature review	September 21, 1979
Conjoint measurement literature review	October 1, 1979
Experimental design planning	October 8, 1979
ARS tape analysis	October 15, 1979
Planning of simulation system	October 29, 1979
Programming of simulation	November 12, 1979
Approach No. 1 analysis	November 19, 1979
Approach No. 2 analysis	Novemebr 26, 1979
Paper writeup	January 7, 1979
Comments received	March 5, 1979
Revised paper submitted	April 7, 1979

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