

# **Auditors' Belief Revision: Recency Effects of Contrary and Supporting Audit Evidence and Source Reliability**

**Arvind Patel**

**Department of Commerce, University of Queensland, Australia**

**Abstract:** Recent findings in auditing indicate that sequential processing of conflicting audit evidence can lead to possible non-normative responses. The objective of this research is to investigate the effects of conflicting audit evidence and source reliability on audit judgement during sequential processing. Eighty-eight auditors from the Big 5 CPA firms in Fiji participated in the study.

The results suggests that auditors only display significant differences in judgments when presentation order is reversed for conflicting audit evidence from a source with high reliability. Application of a weighted average model supports the notion that the reliability of source affects the weighting of conflicting audit evidence. Additional analysis shows that presentation order inhibits auditors from rationally weighing conflicting audit evidence with varying source reliability. The arithmetic weights computed using a linear model are likely to be useful in setting benchmarks for the validation of cue weights in expert systems and for policy decisions on formulation of audit practice statements.

**Key Words:** Conflicting audit evidence, Source reliability, Recency and order effects, Sequential processing

**Data Availability:** Data and experimental materials will be made available by the author upon request.

# **AUDITORS' BELIEF REVISION: RECENCY EFFECTS OF CONTRARY AND SUPPORTING AUDIT EVIDENCE AND SOURCE RELIABILITY**

## **INTRODUCTION**

Auditing is characterised as a sequential process in which pieces of audit evidence are evaluated relative to financial statement assertions (e.g., Cushing and Loebbeck 1986; Felix and Kinney 1982; Gibbins 1984). In arriving at a judgment concerning a particular financial statement assertion, auditors start with an initial belief about the assertion and revise the belief upward or downward as they receive and assess each new piece of audit evidence. The audit evidence may be positive (or supporting; or mitigating; or confirming) or negative (or rejecting; or contrary; or disconfirming) and strong or weak.

### **Objectives and Research Question**

The extent to which collected audit evidence is persuasive is a matter of professional judgment (Gibbins and Mason 1988; CICA Handbook, Section 5300; SAS N0. 1, AICPA 1975 and AUS 502 1996). Although theoretical discussions of the nature of evidence in auditing exist (e.g., Shafer and Srivastava 1990; Toba 1975) and professional standards have attempted to codify audit evidence requirements (SAS N0.1, AICPA 1975 and AUS 502 1996), our understanding of how auditors judge the persuasiveness of audit evidence remains limited.

Understanding how persuasiveness and sequential presentation of audit evidence affect auditors' judgments is particularly important in situations where there is conflicting (positive and negative) audit evidence of varying strengths. For example, consider a situation where the auditor is presented with positive audit evidence from a source with high reliability followed by negative audit evidence from a source with low reliability. The literature suggests two different outcomes. Studies have shown both that auditors place greater weight on negative evidence compared to positive evidence (Ashton and Ashton, 1988; Asare, 1992; McMillan and White, 1993) and that they are sensitive to source reliability (Rebele et al., 1988; Hirst, 1994; Goodwin and Trotman, 1996; Goodwin, 1999). Whether the direction (positive or negative) or source reliability (high or low) of the pieces of audit evidence plays an important role in belief revision is an important question to investigate. Positive and negative audit evidence can also be received in the reverse order. Hence, whether the order of presentation affects auditor's belief revision is also an important issue. Thus, the research question is the following: Do auditors display order effects in belief revisions when positive and negative (mixed) audit evidence of varying reliability is presented in a sequential mode? Order effects are investigated by manipulating the order of presentation. In the sequential mode, weak evidence can follow strong evidence (or vice versa), negative evidence can follow positive evidence (or vice versa), and so on.

### **Motivation for the Current Study**

There are two reasons for undertaking this study. First, despite the critical nature of audit evidence to audit engagement, very few studies have examined the relation between audit evidence characteristics and audit judgment. Recently, researchers have highlighted this deficiency. For example, Caster and

Pincus (1996) specifically encourage studies that investigate the interactive effects of source reliability and other characteristics of audit evidence.

Second, and most importantly, this research is motivated by the belief that auditors experience maximum judgmental stress within a contradictory audit evidence paradigm. Unfortunately, no audit guidelines exist to help auditors evaluate contradictory audit evidence. The absence of guidelines is especially problematic when mixed audit evidence of varying reliability is evaluated. Hence, there is a need to increase the understanding of auditors' behaviour under a contradictory audit evidence paradigm.

### **Importance of Recency and Order Effects in Auditing**

The Belief-Adjustment Model developed by Hogarth and Einhorn (1992) has provided audit researchers with a model to predict and study the effects of audit evidence on audit judgment. The Belief-Adjustment Model is based on an anchoring and adjusting process and attempts to provide a descriptive theory of belief updating. It models auditors' belief adjustments as a function of direction, strength, type of evidence, order of presentation and response mode (step-by-step or sequential (SbS) or end-of-sequence (EoS)).

The Belief-Adjustment Model provides a number of recency (order) effect predictions. Of particular interest to the present study are those situations where participants receive a short series of cues that contain mixed (positive and negative) evidence in an SbS mode. For complex tasks, the model suggests that a recency effect will occur. Recency effects refer to situations where, when auditors are presented

with informational items in sequential form, the latter items dominate their final opinion (Hogarth 1987, 55).

The issue of recency is important to auditors because evidence suggests that auditors revise beliefs in a manner different from other information evaluators. Because of the nature of auditing, auditors are likely to be more sensitive to certain types of audit evidence than other decision makers (Trotman and Wright 1996). For example, because auditors encounter the risk of legal liability of mis-statement, their primary concern is that financial statement errors may go undetected. Hence, auditors are more likely to place greater weight on negative audit evidence than on positive audit evidence (Ashton and Ashton 1988; Ashton and Ashton 1990; Gibbins and Wolf 1982; Kida 1984; Knechel and Messier 1990; Asare 1992; McMillan and White 1993).

To illustrate recency effects in an auditing setting, suppose an auditor initially believes (based on a review of controls and the results of analytical procedures) that the net balance of assets is likely to be fairly stated in accordance with generally accepted accounting principles. Additional audit evidence about assets can be either positive or negative; that is, the information can either increase or decrease the strength of the auditor's initial belief about fair presentation. Moreover, each piece of additional audit evidence collected is not likely to be equally persuasive to the auditor. Instead, its strength with respect to supporting or rejecting the initial belief about fair presentation is likely to vary depending on its source or other factors.<sup>1</sup> Finally, additional audit evidence collected could support or reject the initial belief. Alternatively, the additional audit evidence could be mixed in its apparent implications about fair presentation.

Most auditors probably will agree that beliefs about fair presentation should be influenced by the direction, strength, and type of audit evidence, but not by the order in which audit evidence is evaluated. If the auditors strength of belief about fair presentation depends on whether strong audit evidence is received before or after weak audit evidence, or on whether positive audit evidence is received before or after negative audit evidence, then the amount of additional audit evidence collected, and potentially the efficiency and effectiveness of the audit, can vary (Ashton and Ashton 1988). For example, two auditors may receive exactly the same evidence but in a different order and subsequently arrive at different conclusions, thereby potentially reducing audit effectiveness or efficiency (Trotman 1996).

### **Recency Effects Studies in Auditing**

Several studies in accounting and auditing concentrate on testing the predictions of the Belief-Adjustment Model by manipulating direction, type of evidence, and response mode of pieces of audit evidence (Ashton and Ashton 1988; Butt and Campbell 1989; Ashton and Ashton 1990; Tubbs et al. 1990; Asare 1992; Pei et al. 1992; Krull et al. 1993; Messier 1992; Cushing and Alawat 1993; Kennedy 1993; Messier and Tubbs 1994; Trotman and Wright 1996; Arnold et al. 2000; Monroe and Ng 2000). Generally, results have been consistent regarding the prevalence of significant recency effects when mixed audit evidence is evaluated in a sequential mode. Other situational factors that Hogarth and Einhorn (1992) believe mitigate recency effects (e.g., prior beliefs, experience, review process, hypothesis frame, task complexity, accountability) have also been investigated with respect to mixed audit evidence and response mode (Butt and Campbell 1989; Pei et al. 1992; Krull et al. 1993; Kennedy 1993; Messier and Tubbs 1994; Cushing and Ahlawat 1993; Trotman and Wright 1996; Arnold et al. 2000). Some of these studies show conflicting results (Pei et al. 1992; Krull et al. 1993;

Kennedy 1993; Messier and Tubbs 1994; Cushing and Ahlawat 1993; Trotman and Wright 1996; Arnold et al. 2000; Monroe and Ng 2000). For example, Messier and Tubbs' (1994) results suggest that auditor experience serves to mitigate recency effects, while Krull et al. (1993) and Arnold et al. (2000) find that experienced auditors exhibit greater recency effects.

The primary objective of most order effects studies has been to investigate situational variables that may mitigate order effects. One aspect of the Belief-Adjustment Model that has not been investigated to date is the order effect due to combining mixed audit evidence of varying strengths. In a sequential mode, the Belief-Adjustment Model predicts greater belief revisions for stronger pieces of evidence. Strength with respect to supporting or rejecting the initial belief about fair presentation is likely to vary depending on its source or other factors (Ashton and Ashton 1988). This study defines strength of a piece of audit evidence in terms of source reliability (credibility).<sup>2</sup>

The issue of belief revision is important when audit evidence has differing persuasive (reliability) power (Mautz 1958; Anderson and Marchant 1989). Because the cost of collecting different types of audit evidence differs (e.g., the cost of collecting debtors' confirmations is different from computing receivable ratios), knowledge about the inferential value of each type of audit evidence will be helpful to auditors. If auditors do not consider reliability appropriately, audit efficiency or effectiveness can be compromised.

Failing to consider the reliability of audit evidence can also lead to the threat of legal action. Under common law, auditors must exercise reasonable care and skill in evaluating audit evidence. In the case of *Alexander & Ors v Cambridge Credit Corp Ltd & Anor* (1987) 5 ACLC 587, the defendants

claimed that the plaintiffs (auditors) were negligent and sought damages to the extent of \$142 million. The Court of Appeal in New South Wales, Australia ruled that the plaintiffs (auditors) were not negligent for relying on incorrect legal opinion in applying the terms of the debenture trust deed. However, the Court of Appeal went on further to mention that the auditor should obtain the advice of a reliable expert when faced with a problem that is beyond the auditor's competence. The auditor should regard the expert's opinion as an important body of audit evidence, although ultimately the judgment is the responsibility of the professional auditor.

### **Contributions**

Our comprehension of the attributes that make audit evidence persuasive would be useful in developing theory-based models of professional judgement (Caster and Pincus (1996). A general theory of audit evidence will allow us to evaluate the several competing mathematical models (e.g., Dutta and Srivastava 1993; Srivastava and Shafer 1992; and Boritz and Wensley 1990) that best represents audit judgment.

This study has potentially important implications for audit engagements. Our understanding of how auditors' judgments are affected by the various source characteristics of audit evidence is likely to improve the design of decision aids for auditors. In the design of decision aids and expert systems, designers need quantitative measures of the strength or persuasiveness of evidence. In some cases, developers of expert systems make strong assumptions about the strength of evidence because little is understood about the factors that determine the persuasiveness of evidence. For example, the model of audit evidence evaluation developed by Boritz and Wensley (1990) and ADAPT expert system

developed by the Grant Thornton International CPA firm (Gillett 1993) both rely on heuristic rules for assigning weights. One such heuristic rule assigns a weight of “3” to positive evidence and a weight of “1” to negative evidence. A deeper understanding of the characteristics that influence persuasiveness would provide a more refined foundation for assigning weights (Caster and Pincus 1996).

The study of characteristics that influence persuasiveness of evidence has potential benefits for the education and training of auditors. At least until research provides a normative model of audit judgment that is widely used for expert systems in practice, audit judgment will remain a human-decision process (Caster and Pincus 1996). In such a situation, students and novice auditors may benefit from training regarding the characteristics that make evidence more or less persuasive to experienced auditors. Finally, the outcome of this research will increase awareness among auditors about possible problems associated with processing audit evidence in a sequential mode.

Section 2 presents an overview of the Belief-Adjustment Model and presents the arguments and evidence that relate to the various hypotheses. Section 3 outlines the research design. Section 4 presents the results and Section 5 discusses the limitations, implications and future research.

## **THE BELIEF-ADJUSTMENT MODEL**

Hogarth and Einhorn (1992) have proposed and tested a descriptive model of belief revision called the Belief-Adjustment Model. They hold that individuals faced with new evidence revise their beliefs using a

sequential anchoring-and-adjustment process. This results in the current opinion (the anchor) being adjusted by the impact of succeeding pieces of evidence. The model can be formulated as follows:

$$S_k = S_{k-1} + w_k [ s(x_k) - R ] \quad (1)$$

where:

$S_k$  = degree of belief in some hypothesis, impression or attitude after evaluating  $k$  pieces of evidence ( $0 \leq S_k \leq 1$ ).

$S_{k-1}$  = anchor or prior opinion. The initial strength of belief is denoted  $S_0$ .

$s(x_k)$  = subjective evaluation of the  $k$ th piece of evidence. (Different people may accord the same evidence,  $x_k$ , different evaluations. Bounds on  $s(x_k)$  are specified below.)

$R$  = the reference point or background against which the impact of the  $k$ th piece of evidence is evaluated.

$w_k$  = the adjustment weight for the  $k$ th piece of evidence ( $0 \leq w_k \leq 1$ ).

The adjustment weight,  $w_k$  is dependent upon the individual's sensitivity to new evidence, the sign (+ or -) of the impact of the evidence (i.e.,  $s(x_k) - R$ ) and the level of the anchor,  $S_{k-1}$ . Thus, when  $s(x_k) \leq R$ ,  $w_k = a S_{k-1}$  and when  $s(x_k) > R$ ,  $w_k = b (1 - S_{k-1})$  where  $a$  and  $b$  ( $0 \leq a, b \leq 1$ ) represent sensitivity toward "positive" and "negative" evidence respectively.

### Order Effects Predictions

Hogarth and Einhorn (1992) make a distinction between evaluation and estimation tasks. In evaluation tasks, evidence is seen as bipolar ( $-1 \leq (x_k) \leq +1$ ) relative to a hypothesis (confirming versus disconfirming), and its impact is independent of the reference point  $R$  (i.e.,  $R=0$ ). In contrast, in

estimation tasks, evidence is seen as unipolar ( $0 \leq s(x_k) \leq 1$ ), and its impact is dependent upon  $R$  (i.e.,  $R=S_{k-1}$ ). Different predictions are made depending on (a) how the evidence is coded (i.e., evaluation versus estimation task); how the evidence is processed (i.e., Step-by-Step (SbS) versus End-of-Sequence (EoS)); and (c) the nature of the adjustment process, which is dependent upon the values of  $a$  and  $b$ . That is, the adjustment weight for negative evidence is proportionally equal to the anchor, and the adjustment weight for positive evidence is proportionally equal to the complement of the anchor.

This study's experimental task is an evaluation task. It is not an estimation task because the evidence will need to be interpreted as confirming or disconfirming the hypothesis under consideration. Specifically, the task will require the formulation of opinion with respect to an account balance based on evaluation of mixed audit evidence of varying strength using an SbS response mode. Under these conditions, the Belief-Adjustment Model predicts a recency (i.e., an order) effect. That is, when subjects evaluate several pieces of mixed evidence (e.g., positive and negative), the last (most recent) piece will have an inordinately strong impact on the final judgment. The expected strength of this effect can be expressed as follows (for the derivations, see Appendix A):

$$D = - a b s(x_-) s(x_+) \quad (2)$$

where:

$D$  = recency effect;

$a$  and  $b$  are as defined earlier;

$s(x_-)$  = subjective evaluation of negative evidence; and

$s(x_+)$  = subjective evaluation of positive evidence.

The above equation indicates that the magnitude of the recency effect is dependent upon  $a$  and  $b$  (i.e., sensitivity to positive and negative evidence). Table 1 summarises the predictions of the Belief-Adjustment Model.

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Insert Table 1 here

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As an illustration in auditing, suppose an auditor receives two pieces of mixed audit evidence in sequential mode for an evaluation task. Assume that the confirming audit evidence is from a source with low reliability and the auditor assesses the subjective strength ( $s(x_k)$ ) of this piece of audit evidence as 0.4 (on a scale of 0 to 1, where 0 represents weak audit evidence and 1 represents strong audit evidence). The disconfirming audit evidence is from a source with high reliability, and the auditor assesses the subjective strength of this piece of audit evidence to be 0.6. Assume that the anchor or prior opinion ( $S_{k-1}$ ) is held constant at 0.5 and the auditor has a neutral attitude toward both the positive and negative audit evidence (i.e.,  $a$  and  $b$  are both equal to 1). The Belief-Adjustment Model predicts a lower belief revision for confirming audit evidence followed by disconfirming audit evidence compared to disconfirming audit evidence followed by confirming audit evidence.

Appendix B presents the numerical calculations using the Belief-Adjustment Model. Belief revision is computed by subtracting the final belief from the initial belief or anchor (see Ashton and Ashton 1988; Asare 1994). That is, the belief revision for the above illustration for positive/negative sequence is -0.22

(0.28 - 0.50) and negative/positive sequence is 0.02 (0.52 - 0.50). Accordingly, the following hypothesis is proposed:

*H1: Auditors exhibit recency effects when they evaluate short series of mixed audit evidence in a sequential mode.*

### **Competence of Source**

Several studies in psychology show that the competence of the source is an important determinant of persuasive power (Petty et al. 1981; Heesacker et al. 1983; Chaiken 1980; Kelman and Hovland 1953; Rhine and Severance 1970; Cook and Fay 1978). Similar studies in auditing show that auditors are sensitive to source competence (Rebele et al. 1988; Hirst 1994; Goodwin and Trotman 1996) In the audit opinion judgment context, audit evidence from a more competent person is expected to be more reliable than audit evidence from a novice. A competent person means that an individual has the ability to measure or interpret an item or event accurately. Here the primary belief is that an expert or informed person has the correct information about the item or event. Courts of Law have emphasised similar views (see *Alexander & Ors v Cambridge Credit Corp Ltd & Anor* (1987) 5 ACLC 587). As discussed earlier, there is legal and professional (SAS No 11, AICPA 1975; AUS 606 1995) requirements for auditors to exercise due care and skill in evaluating audit evidence that comes from persons with varying competence. Such an environment is likely to cause auditors to place higher reliance on audit evidence from a more competent person.

The above discussions result in the following research hypotheses<sup>3</sup>.

*H2: The mean belief revision of auditors who evaluate positive audit evidence from a source with high competence is greater than the mean belief revision of auditors who evaluate positive audit evidence from a source with low competence.*

*H3: The mean belief revision of auditors who evaluate negative audit evidence from a source with low competence is greater than the mean belief revision of auditors who evaluate negative audit evidence from a source with high competence.*

### **Conflicting Audit Evidence and Source Reliability**

Prior psychological literature shows that individuals place more weight on evidence from a more reliable source when presented with conflicting evidence (Rosenbaum and Levin 1968). In auditing contexts, when presented with conflicting audit evidence, auditors are expected to place greater weight on audit evidence from a more reliable source. Also, legal and professional requirements emphasise source reliability factors. Despite auditors being concerned with financial statement errors going undetected, they are likely to pay more attention to source reliability factors when presented with conflicting evidence. This situation will occur because auditors do not face a significant increase in perceived risk of legal liability for placing lower weight on conflicting audit evidence from a less reliable source compared to conflicting audit evidence from a more reliable source.<sup>4</sup>

Moreover, if auditors fail to consider the source reliability of audit evidence appropriately, audit efficiency and effectiveness can be compromised (Hirst 1994). For example, if the reliability of positive audit evidence is overweighed (underweighed) underauditing (overauditing) can result. Similarly, if the reliability of negative audit evidence is overweighed (underweighed) overauditing (underauditing) can result. Figure 1 illustrates these effects. Therefore, it is likely that the weight auditors place on conflicting audit evidence from a more reliable source is likely to outweigh the weight auditors place on conflicting audit evidence from a less reliable source.

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Insert Figure 1 here

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### **Conflicting Audit Evidence, Source Reliability and Configural Processing**

Source reliability (high versus low) and conflicting audit evidence (positive versus negative) are likely to produce an interaction effect (configural processing). Configural information processing is "cognition in which the pattern (or configuration) of the stimuli is important to the subsequent judgment/decision" (Brown and Solomon 1990, p.19). Because auditors are more sensitive to negative audit evidence compared to positive audit evidence (Ashton and Ashton 1988; Asare 1992; McMillan and White 1993) they are likely to pay less attention to source reliability when audit evidence is negative compared to when audit evidence is positive. This should result in a significant interaction effect, with the mean differences between the low source reliability and the high source reliability being smaller when audit evidence is negative compared to when it is positive. In a recent empirical study, Goodwin (1999) investigated the effects of source integrity (low and high) and consistency (consistent and inconsistent) of audit evidence. Her results show that auditors pay more attention to source integrity when evidence is consistent.

### **Conflicting Audit Evidence and Order of Presentation**

Several studies in accounting and auditing show that auditors display recency effects when they evaluate conflicting audit evidence in a sequential mode (Ashton and Ashton 1988; Tubbs et al 1990; Messier 1992; Asare 1992; Krull et al. 1993; Messier and Tubbs 1994; Kennedy 1993; Trotman and Wright 1996). Recency implies that greater weight is given to the latest piece of conflicting audit evidence. Recency effects are presumed to be the largest when both positive and negative audit evidence is strong and when beliefs are highly sensitive to evidence. The Belief-Adjustment Model also predicts recency effects for weak pieces of conflicting audit evidence, an implication of the model that has not been tested previously. Therefore, auditors are expected to display recency effects when they evaluate conflicting audit evidence of varying reliability in sequential mode.

### **Conflicting Audit Evidence, Source Competence, and Order of Presentation**

Conflicting pieces of audit evidence with varying source competence can be processed sequentially. As an example in auditing, suppose that the auditor is in the process of ascertaining the fairness of the value of inventory of a client in the chicken industry. The auditor is trying to verify the value of live chicks that form a material part of the inventory. The valuation of live chicks is a complicated process. Often live chicks are valued using a standard formulation developed for a specific breed. However, the process of determining the value is affected by changes in growth rates. Auditors often rely on experts to provide evidence as to the value of live chicks. In such an instance, the auditor could obtain reports from independent valuers. Assume that the auditor receives a report from a valuer with one year's experience with the chicken industry. This person provides a negative report, that is, the value of the live chicks

inventory is materially overstated. Further, assume that the auditor obtains a second report from an independent person with ten years of experience in the chicken industry. This person provides a positive report, that is, the value of the live chicks inventory is acceptable as reported. The auditor faces a situation of conflicting audit evidence with differing competence of source.

The auditor can also receive the same pieces of audit evidence, but in the reverse order. The auditor is likely to place greater weight on the piece of audit evidence from the valuer with more experience as opposed to the valuer with less experience. Because auditors are more concerned about financial statement errors going undetected, negative audit evidence from the valuer with more experience is likely to receive the greatest weight.

Irrespective of competence of the source of the pieces of conflicting audit evidence, the Belief-Adjustment Model predicts recency effects when mixed audit evidence is evaluated in a sequential mode (Hogarth and Einhorn, 1992). That is, the latest piece of conflicting audit evidence receives greater weight. For example, when positive audit evidence from a more competent person is followed by negative audit evidence from a less competent person, the Belief-Adjustment Model predicts that the latter audit evidence is likely to receive a greater weight. Accordingly the following hypothesis is proposed:<sup>5</sup>

*H4: Regardless of the competence of the source, the mean belief revision of auditors who evaluate positive audit evidence followed by negative audit evidence is less than that of auditors who evaluate the same evidence in the reverse order.*<sup>6</sup>

## RESEARCH DESIGN

In this study, two independent variables were manipulated using a within-subjects design. These variables were (1) level of competence (high (H) versus low (L)) of the source supplying the positive (P) evidence, and (2) level of competence (high versus low) of the source supplying the negative (N) evidence. The proxy for level of competence was the level of experience possessed by the person supplying the audit evidence (one year for low and ten years for high). The four experimental situations consisted of all the combinations of these two variables. Positive (negative) audit evidence was pieces of audit evidence that supported (rejected) the audit assertion. The audit evidence was framed within an overstatement of asset scenario with a non-error hypothesis frame.<sup>7</sup> In addition to the variables manipulated within subjects, one independent variable was manipulated between subjects. The order (positive followed by negative and vice versa) in which the audit evidence was presented was manipulated at two levels. Figure 2 presents the research design and Table 2 presents the within-subjects and between-subjects situations.

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Insert Figure 2 and Table 2 here

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### **Task**

One case was developed based on the characteristics of audit evidence identified in the previous section. The case contained an evaluation task. It seems likely that auditors would evaluate a new piece of audit evidence as being positive or negative in relation to the audit assertion before revising their belief

about that audit assertion. It is assumed therefore, that auditors generally employ an evaluation (additive) mode when revising beliefs. The assumption is based on the fact that previous research in audit setting (e.g., Ashton and Ashton 1988; Tubbs et al. 1990) report evidence (no order effects with consistent evidence) that supports the prediction of the model for evaluation but not estimation tasks. Specifically, auditors were required to evaluate positive and negative audit evidence from source with varying competence in a sequential mode. The task was to form an opinion about the fairness of inventory valuation in the chicken industry. Positive audit evidence indicated that inventory was fairly valued and negative audit evidence indicated that it was materially overvalued.

### **Participants**

Auditors from three of the Big 5 CPA firms in Fiji participated in this study. Eighty-eight auditors participated in the experiment. The participants were randomly assigned to the two treatment groups. The sample size of each group was made up of 44 participants. Table 3 presents some demographic information.

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Insert Table 3 here

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### **Procedure**

The experiment was conducted at the offices of the audit firms. Three separate sessions were conducted, one each, at each of the audit firms. All participants received an experimental booklet with several parts. The first part contained an introduction with the purpose of the research and general instructions. The second part contained the case. Participants were required to study the case. An initial

judgment (anchor) with respect to the account balance was presented (50 in this case). Care was taken to design the case that made the anchor as realistic as possible. On the following pages the participants were provided with four conditions (treatments). Each condition contained two pieces of audit evidence. The second piece of audit evidence in each condition was secured with an office pin to ensure that participants did not read the second piece of evidence before revising the initial judgment with respect to the first piece of audit evidence. For each condition participants were required to revise their initial judgment after evaluating the first piece of the audit evidence (J1). Participants scored final belief on a scale of 0 to 100 where 0 was most likely that the inventory accounts were presented unfairly and 100 was most likely that they were presented fairly. They were then required to remove the pin and read the second piece of audit evidence on the next page. They were allowed to compare the second piece of audit evidence with the first piece of audit evidence but not allowed to change their revision with respect to the first piece of audit evidence. They were then required to revise their opinion in light of the second piece of audit evidence (J2). Participants were required to follow the same procedure to complete the other three conditions. The dependent variable was computed by subtracting the final judgment from the initial judgment (J2 - 50).

The participants were then required to identify the audit evidence as either positive or negative and indicate the persuasive strength of each piece of audit evidence on a scale of 0 to 100 (0 indicating weak persuasiveness and 100 indicating strong persuasiveness). This test was conducted to test the manipulation of each piece of audit evidence. The responses were then analyzed to determine the error rate in identifying the direction (positive or negative) and reliability of the pieces of audit evidence.

## ANALYSIS OF RESULTS

### Manipulation Test

The results of the manipulation check for the direction of the audit evidence show that only 7 of the 352 responses suggest coding errors. Four of these 7 responses relate to negative audit evidence, which were coded as positive. As a result of small percentage of such errors, the manipulation of direction of audit evidence is viewed as successful. Results of the manipulation check for source reliability indicate that audit evidence from a source with high competence is seen as more reliable than from a source with low competence ( $t=32.054$ ,  $p=0.000$ ). There is no significant difference on points assigned to positive audit evidence from a source with high (low) competence compared to negative audit evidence from a source with high (low) competence,  $t=-0.397$ ,  $p=0.692$  ( $t= -0.527$ ,  $p=0.599$ ).

### Analysis of Results

The experiment was conducted to test the effects of source competence and the order of presentation on belief revisions of contradictory audit evidence. Table 4 presents the sequences and conditions of each combination of the variables. For the purposes of analysis, responses and initial anchor are divided by 100. Column 3 of Table 4 presents the mean of the final belief revision (dependent variable). A three-way repeated-measures ANOVA model is used to analyse the data. The model is positive by negative by order of presentation. Table 5 presents the ANOVA results.<sup>8</sup>

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Insert Table 4 & 5

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## **Order Effects of Conflicting Audit Evidence Evaluated in a Sequential Mode: Test for H1**

Tests of the order effects of the factorial design provide support for H1. The mean (standard deviation) belief revision for the positive/negative order is  $-0.03892$  ( $0.013$ ) and for the negative/positive order is  $0.02227$  ( $0.013$ ). This difference is statistically significant ( $F= 11.927$ ,  $p =0.001$ ). It indicates a significant recency effect, with the content of the second piece of audit evidence having more influence on the final belief than the first piece of audit evidence. Thus, H1 is supported.

A linear model is applied to further explore the significant recency effects. This model assumes differential weighting of evidential pieces as a joint function of ordinal position and reliability of the source of evidence. Both weighted average (Anderson 1968) and weighted sum (Fishbein 1967) models have been shown to provide useful contexts for examining the differential weighting of evidence as a function of factors like ordinal position and set size within a simple order effects paradigm (Rosenbaum and Levin, 1968).

A weighted average model is employed in this study to test the validity of the assumption that reliability of source contributes to differential weighting of evidential items and to explore the interactive effects of reliability of source and ordinal position. The general weighted average model applied to a simple order effects paradigm assumes that the final belief response is a weighted average of the scale values of the evidence presented, with the weighting of a given evidence being a function of its serial position in the sequence (Anderson, 1964). To account for differential weighting due to reliability of source, the following assumption is added to the general model: the serial position weight assigned to a piece of

evidence of a given value is incremented by an amount directly related to the reliability of the source supplying that piece of evidence (Rosenbaum and Levin, 1968).

Applied to the present paradigm, the model involves the presentation of two contradictory pieces of evidence supplied by two different sources. It can be stated as follows:

$$R = M + [(W_1 + W_{s,1}) A_1 + (W_2 + W_{s,2}) A_2] / (W_1 + W_2) \quad (3)$$

where:

R represents the final belief following presentation of the two pieces of audit evidence

M represents the midpoint or point of neutrality of the rating scale employed, which in the present study is 50 (initial anchor).

$W_1$  and  $W_2$  are the serial position weight-components for Positions 1 and 2

$W_{s,1}$  and  $W_{s,2}$  are the source reliability weight-components. The parameters  $W_{s,1}$  and  $W_{s,2}$  will take on one of the values  $W_{PH}$ ,  $W_{PL}$ ,  $W_{NH}$ , or  $W_{NL}$ , depending upon the combination of the sign and reliability of source supplying that evidence

$A_1$  and  $A_2$  are the values of the audit evidence in ordinal position 1 and 2.  $A_1$  or  $A_2$  receives the value of  $P$  if positive audit evidence is presented in that position and  $N$  if negative audit evidence is presented in that position.

The model predicts that the amount of change in belief above or below the neutral point is a weighted average of the values of the sign of the evidence presented. Each piece of evidence is weighted differentially as a function of ordinal position and the combination of the sign of the evidence and source reliability.

A linear expression for the predicted belief for each of the sign-source sequence conditions is generated using this model. Column 3 of Table 6 shows these expressions. The combined responses to Conditions NL-PH plus PL-NH, and Conditions NH-PL plus PH-NL, and Conditions PH-NH plus NL-PL, and Conditions NH-PH plus PL-NL are all predicted to be equal (Rosenbaum and Levin, 1968). The weighted average model then predicts that all interactions of the factorial design are zero (Anderson, 1964). Results of the 3-way ANOVA (positive by negative by order of presentation) show that none of the interactions are significant (Table 5). Therefore, the main effects of positive, negative and order of presentation are further analysed.

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Insert Table 6 here

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### **Conflicting Audit Evidence and Source Competence**

Tests of the main effects of reliability (high versus low source competence) of the Positive (P) source and reliability (high versus low source competence) of the Negative (N) source confirm that high (H) sources consistently produce more polarized responses than low (L) sources thus, supporting H2 and H3. That is, the mean belief revision is significantly greater when positive evidence is supplied by a person with high competence than when it is supplied by a person with low competence ( $F = 64.790$ ,  $p$

= 0.000). The mean belief revision is significantly lower when the negative evidence is supplied by a person with high competence than when it is supplied by a person with low competence ( $F=54.599$ ,  $p<0.0000$ ).

Since, support for the model has already been noted, meaningful relationships between parameter values can now be assessed. From the data it can be estimated that the ratio  $(W_{PH}-W_{PL})/(W_{NH}-W_{NL})$  is equal to 1.11. This ratio indicates that the difference between the effect of high source competence and the effect of low source competence is slightly more for positive audit evidence compared to negative audit evidence.

Due to the limited degrees of freedom available, a unique set of estimates of the parameters of the model cannot be obtained. However, if certain restrictions are placed on some of the parameter values, then the remaining ones can be estimated. If it is assumed that  $P = -N = 0.333$  (which is equal to two-third the distance between the neutral point (anchor) and the extreme points of the rating scale),  $(W_1 + W_2) = 1$ , and  $W_{NL} = 0.5$ , then the remaining parameters are estimated as follows:  $W_1 = 0.45$ ,  $W_2 = 0.55$ ,  $W_{PH} = 0.79$ ,  $W_{PL} = 0.47$  and  $W_{NH} = 0.80$ .<sup>9</sup> Refer to Appendix C for detailed computations. This particular combination of parameter values predicts the data in Table 4 quite accurately. The correlation coefficient between the predicted (Column 7) and observed (Column 5) mean of the final belief is 0.978, which is significant at  $p < 0.01$  significance level.

### **Order Effects of Conflicting Audit Evidence and Source Competence**

This section presents the results of H4. These results were analysed using t-statistics because they entail testing for order effects of individual situations (Situation 1 to 4).<sup>10</sup> Table 7 presents the results of H4. The results of t-tests show support for *only* Situation 1. That is, the mean belief revision of auditors who evaluate positive audit evidence from a source with high competence followed by negative audit evidence from a source with high competence is less than that of auditors who evaluate the same evidence in the reverse order ( $t = -3.99, p = 0.000$ ). Thus, H4 is only partially supported. The direction of the mean belief revision for Situations 2-4 is as expected.

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Insert Table 7 here

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### **Order Effect Bias and Configural Processing of Conflicting Audit Evidence with Varying Source Competence**

Additional analysis was conducted to investigate the effects of conflicting audit evidence and source competence of belief after the first piece of audit evidence (J1) and after the second piece of audit evidence (J2). Dependent variable D1 was the absolute value of the belief after the first piece of audit evidence minus the initial anchor ( $J1 - 50$ ). Dependent variable D2 was the belief after the second piece of audit evidence minus the belief after the first piece of audit evidence ( $J2 - J1$ )<sup>11</sup>. A 2x2 mixed design ANOVA was conducted on each dependent variable to test the effects of conflicting audit evidence (positive versus negative) and source competence (high versus low).

Source competence was a within-subjects factor and conflicting audit evidence was a between-subjects factor. Dependent variables D1 and D2 were divided by 100 for the purpose of analysis. Tables 8 and

9 present the results of the analysis for D1 and D2 respectively. For D1, both the main effects and interaction effects are significant. For D2, only the main effects of source competence are significant. Tables 10 and 11 present the mean and standard deviation for D1 and D2 respectively. For D1, both the main effects and interaction effects are significant. For D2, only the main effects of source competence are significant.

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Insert Tables 8, 9, 10 and 11 here

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The above analysis shows that auditors display configural processing only when evaluating the first set of conflicting pieces of audit evidence with varying source competence (without order effects). The interaction effect shows that auditors pay less attention to the competence of source when audit evidence is negative. However, when auditors are presented with a second set of conflicting pieces of audit evidence with varying source competence, they do not weigh the evidence in a similar manner (with order effects). They only pay attention to source competence.

## **Discussion of Results**

The results of the research show three major findings. These findings relate to order effects, source reliability and configural processing within a contradictory evidence paradigm.

First, the results indicate that overall, auditors place significantly greater weight on the second piece compared to the first piece of conflicting audit evidence when the direction is only considered. These

results confirm the predictions of the Belief-Adjustment Model. However, when both direction and source reliability of audit evidence is considered the results indicate that auditors arrive at their beliefs by applying differential weightings to the conflicting set of audit evidence.

These differential weightings are a function of source reliability and order of presentation. The results show that auditors only display significant recency (order) effects when they evaluate mixed audit evidence from a source of high reliability in a sequential mode. Where both or either positive or negative audit evidence is received from a source of low reliability, no significant recency effects are observed thus, only partially supporting the predictions of the Belief-Adjustment Model.

Second, when viewed within the context of a weighted average model, source reliability effects are interpreted to indicate that evidential matter receives more weight when supplied from a source with high reliability than when supplied from a source with low reliability.

Application of the linear model for the overall data reveals source reliability variations to be slightly more for positive audit evidence compared to negative audit evidence. This behaviour is an expected one, given the belief that auditors are more concerned about financial statement errors going undetected. Auditors are more prepared to accept negative audit evidence irrespective of whether it is from a source with high or low reliability. They are only willing to fully accept positive audit evidence when it is from a source with high reliability.

Third, further analysis was performed on the weights auditors place on the first and second set of conflicting audit evidence. These analyses reveal that auditors display configural processing of conflicting audit evidence from sources with varying reliability when presented with the first set of conflicting pieces of audit evidence. The interaction shows that auditors pay less attention to source reliability when audit evidence is negative. However, auditors fail to display configural processing after receiving the second set of conflicting audit evidence from sources with varying reliability. These results indicate that order effect biases appear to inhibit auditors from displaying configural processing of conflicting audit evidence from sources with varying reliability.

In summary, it appears that source reliability and the order of presentation of evidence are major factors affecting the way conflicting audit evidence is weighted by auditors during sequential processing. Computed weights using a linear model show that auditors place greater weight on audit evidence from a source with high reliability. They also generally place greater weight on negative audit evidence. Finally, order effect biases appear to affect the way auditors weigh conflicting pieces of audit evidence from sources with varying reliability.

## **LIMITATIONS AND FUTURE RESEARCH**

A number of limitations for the study need to be discussed. First, a mixed design was employed in this study. Two variables were manipulated within subjects. The advantages of using repeated measures include ability to control for individual subject differences and increased power of statistical tests. One disadvantage of using repeated measures is that the levels of variability may be transparent to subjects.

However, one variable (order of presentation) was manipulated between-subjects. Pany and Reckers (1987) found that certain significant effects disappeared when a between-subjects design instead of repeated measures was used in a mail survey. Further, Schepanski et al. (1992), 124) report that “accounting studies possess characteristics that render the presence of demand effects less likely.” The risk of demand effects in this study may have been minimised by the fact that the experiments were conducted in person and at the premises of the participants.

Second, the audit evidence was manipulated either as positive or negative and either as highly reliable or less reliable within case scenarios. Case scenarios, though seemingly realistic and pilot tested, may not capture audit evidence in actual audit situations. As Trotman and Yetton (1985) point out, the factorial design proposed in this study may threaten external validity. The design employed here necessitates a high degree of task abstraction. For example, only one source variable was manipulated at two levels. The source factors could potentially exist at more levels. Hence, the experimental case that was used in this study may be less complicated than an actual audit situation.

Third, the linear model used to compute the configural weights assumed that the total weight assigned to a given piece of audit evidence was equal to a weight component attributable to source credibility plus a component due to ordinal position. The model also assumed that the values of the two types of audit evidence (positive and negative) and the values of the several weighting factors were invariant across the mixed audit evidence source sequence. The outcome of the analysis-of-variance tests for the model tends to confirm this additive assumption.

## **Directions for future research and implications**

The results of this study are promising in that several characteristics of audit evidence are combined to test their effects on audit judgment. Most interestingly, this study uses a contradictory evidence paradigm to test the effects of source reliability and order of presentation. Results of this study could be helpful in validating and testing theories of evidence. For example, Caster and Pincus (1996) use Bentham's 1827 theory of evidence to investigate the effects of various factors on auditor belief revision. Bentham's 1827 theory of evidence covers such characteristics of audit evidence as source reliability and direction of evidence, but it does not cover the order of presentation. Results of this study is likely to be useful as a guide in future studies that intend to more fully develop and test Bentham's model. Results of this study would also be helpful in constructing an appropriate general theory of persuasiveness of audit evidence.

The configural weights computed in this study using the linear model could be used as benchmarks for validation of cue weights in expert systems and decision aids designed for use by practitioners.

The results of this study have possible implications for regulators of auditing practice and corporate governance. While the present audit practice statements emphasize source reliability factors, no mention is made of the direction of audit evidence. In the face of large corporate failures regulators may need to provide guidelines for evaluating conflicting audit evidence.

Possibilities for future research include extending the study to examine more levels of variables or to consider additional characteristics of audit evidence that may affect auditors belief revisions. Other possible variables unique to auditing can be further employed to test the implications of the Belief-

Adjustment Model. For example, timeliness, as suggested by AUP 502, is an important variable that could easily be manipulated to vary strength of a piece of audit evidence. Second, this study employed a non-error hypothesis frame. Further studies could consider error hypothesis frame (McMillian and White 1993).

The linear model employed in this study to compute the configural weights should be compared to other sophisticated models (for example, relative-weight averaging model, Birnbaum, Wong, and Wong 1976) to determine which model more accurately predicts the judgments of auditors. In order to be able to use more sophisticated models, more complex designs need to be employed.

Finally, the credibility of source of evidence may represent a variable affecting the belief dimension of auditors' judgments. Fishbein (1967) suggests that belief toward an object is a function of (a) the strength of beliefs about the object, and (b) the evaluation aspect of those beliefs. Operationally, strength of belief has been determined from ratings on such polar scales as probability-improbability and truth-falsity (Fishbein and Raven (1962). Future research is needed to determine the relationship between pre-scaled source credibility and strength of belief revisions.

## **Conclusion**

This research has shown that auditors only display significant order effects when they sequentially evaluate mixed audit evidence that comes from a source with high competence. That is, source reliability is an important factor affecting order effects when auditors evaluate conflicting audit evidence in a sequential mode. Most interestingly, additional results show that order effect bias inhibits auditors from

configurally processing conflicting evidential matter of varying reliability. Some limitations have been identified with some possible implications for research, practice and auditing regulations. These findings and implications should be interpreted with caution.

**Table 1: Summary of Order Effect Predictions**

<b>Encoding</b>	$R = S_{k-1}$ <i>Estimation</i>		$R = 0$ <b>Evaluation</b>			
	<b>All</b>		<b>Mixed</b>		<b>Consistent</b>	
<b>Type of evidence</b>						
<b>Response mode</b>	<b>End-of-Sequence</b>	<b>Step-by-Step</b>	<b>End-of-Sequence</b>	<b>Step-by-Step</b>	<b>End-of-Sequence</b>	<b>Step-by-Step</b>
<b>Short series Simple</b>	Primacy	Recency	Primacy	Recency	Primacy	No effect
<b>Short series Complex</b>	Recency	Recency	Recency	Recency	No effect	No effect
<b>Long series</b>	Force toward primacy	Force toward primacy	Force toward primacy	Force toward primacy	Primacy	Primacy

**Source: Hogarth and Einhorn (1992) p.17**

$R =$  the reference point or background against which the impact of the *kth* piece of evidence is evaluated

$S_{k-1} =$  anchor or prior opinion

$k =$  number of pieces of evidence

**Table 2: Research Design: Within- and Between-Subjects Treatments**

<b>Within-Subjects</b> <b>Between-Subjects</b>	<b>Situation 1</b>	<b>Situation 2</b>	<b>Situation 3</b>	<b>Situation 4</b>
Pos, Neg	PH-NH Condition A	PH-NL Condition C	PL-NH Condition E	PL-NL Condition G
Neg, Pos	NH-PH Condition B	NL-PH Condition D	NH-PL Condition F	NL-PL Condition H

**Table 3: Demographic information of participants**

Firm		Partners	Managers	Supervisors	Seniors	Assistants	Total
A	Number of auditors	3	2	-	12	5	22
	Average experience in years (standard deviation)	14.33 (1.15)	8.50 (2.12)	-	2.46 (1.34)	0.94 (0.51)	4.28 (4.69)
B	Number of auditors	-	2	2	6	13	23
	Average experience in years (standard deviation)	-	7.00 (1.41)	4.50 (1.41)	3.00 (1.45)	1.66 (0.71)	2.72 (1.89)
C	Number of auditors	2	4	7	14	16	43
	Average experience in years (standard deviation)	16.50 (0.71)	8.00 (2.82)	4.64 (2.41)	2.61 (0.76)	1.11 (0.51)	3.53 (3.67)
Total	Number of auditors	5	8	9	32	34	88
	Average experience in years (standard deviation)	15.12 (1.48)	7.88 (2.17)	4.61 (2.15)	2.63 (1.12)	1.3 (0.65)	3.51 (3.67)

**Table 4: Belief revision and final belief for each audit evidence source-sequence condition**

	Sequence (condition)	Observed mean (standard deviation) of the belief revision (J2- initial anchor)	Observed mean (standard deviation) of the final belief	Predicted mean of the final belief <sup>12</sup>
1	PH-NH	-0.0693 (0.1545)	0.4307 (0.1545)	0.4640
2	NH-PH	0.0413 (0.0992)	0.5414 (0.0992)	0.5252
3	PH-NL	0.0761(0.2062)	0.5761 (0.2062)	0.5648
4	NL-PH	0.1318 (0.1330)	0.6318 (0.1330)	0.6260
5	PL-NH	-0.1239 (0.1278)	0.3761 (0.1278)	0.3574
6	NH-PL	-0.0830 (0.1196)	0.4170 (0.1196)	0.4186
7	PL-NL	-0.0386 (0.0881)	0.4614 (0.0881)	0.4581
8	NL-PL	-0.0011 (0.1278)	0.4989 (0.1278)	0.5193

PH = positive audit evidence from a source with high competence

PL = positive audit evidence from a source with low competence

NH = negative audit evidence from a source with high competence

NL = negative audit evidence from a source with low competence

**Table 5: Conflicting audit evidence and source competence, analysis of variance - positive by negative by order with the difference between the initial anchor and final belief (J2 – initial anchor)**

Source	Sum of squares	Df	Mean square	F	Probability
<i>Main Effects</i>					
Positive audit evidence	1.0010	1	1.0010	64.7900	0.0000*
Negative audit evidence	0.8930	1	0.8930	54.5990	0.0000*
Order of presentation	0.3300	1	0.3300	11.9270	0.0010*
<i>Two-Way Interaction</i>					
Positive audit evidence x Order of presentation	0.0426	1	0.0425	2.7540	0.1010
Negative audit evidence x Order of presentation	0.0188	1	0.0187	1.1470	0.2870
Positive audit evidence x Negative audit evidence	0.0260	1	0.0261	1.7530	0.1890
<i>Three-Way Interaction</i>					
Positive audit evidence x Negative audit evidence x Order of presentation	0.0146	1	0.0146	0.9840	0.3240
Error	1.2800	86	0.0150		

PH = positive audit evidence from a source with high competence

PL = positive audit evidence from a source with low competence

NH = negative audit evidence from a source with high competence

NL = negative audit evidence from a source with low competence

**Table 6: Linear model for each source sequence**

	Sequence (condition)	Predicted response
1	PH-NH	$M + [(W_1 + W_{PH})P + (W_2 + W_{NH})N] / (W_1 + W_2)$
2	NH-PH	$M + [(W_1 + W_{NH})N + (W_2 + W_{PH})P] / (W_1 + W_2)$
3	PH-NL	$M + [(W_1 + W_{PH})P + (W_2 + W_{NL})N] / (W_1 + W_2)$
4	NL-PH	$M + [(W_1 + W_{NL})N + (W_2 + W_{PH})P] / (W_1 + W_2)$
5	PL-NH	$M + [(W_1 + W_{PL})P + (W_2 + W_{NH})N] / (W_1 + W_2)$
6	NH-PL	$M + [(W_1 + W_{NH})N + (W_2 + W_{PL})P] / (W_1 + W_2)$
7	PL-NL	$M + [(W_1 + W_{PL})P + (W_2 + W_{NL})N] / (W_1 + W_2)$
8	NL-PL	$M + [(W_1 + W_{NL})N + (W_2 + W_{PL})P] / (W_1 + W_2)$

M= midpoint or point of neutrality = 0.5

$W_1$ = weight of the piece of audit evidence when it is in serial position 1

$W_2$  = weight of the piece of audit evidence when it is in serial position 2

$W_{PH}$  = weight of positive audit evidence from high source competence

$W_{PL}$  = weight of positive audit evidence from low source competence

$W_{NH}$  = weight of negative audit evidence from high source competence

$W_{NL}$  = weight of negative audit evidence from low source competence.

**Table 7: Conflicting audit evidence and source competence, result of H4 that tests the order effects of specific situations**

Situations	Sequence	Mean (standard deviation) of the belief revision	Reverse Sequence	Mean (standard deviation) of the belief revision	Results
Situation 1	PH-NH	-0.0693 (0.1545)	NH-PH	0.0413 (0.0992)	Supported t = -3.990, p = 0.000*
Situation 2	PH-NL	0.0761 (0.2062)	NL-PH	0.1318 (0.1330)	Not supported t = -1.506, p = 0.136
Situation 3	PL-NH	-0.1239 (0.1278)	NH-PL	-0.0830 (0.1196)	Not supported t = -1.550, p = 0.125
Situation 4	PL-NL	-0.0386 (0.0881)	NL-PL	-0.0011 (0.4989)	Not supported t = -1.602, p = 0.113

PH = positive audit evidence from a source with high competence

PL = positive audit evidence from a source with low competence

NH = negative audit evidence from a source with high competence

NL = negative audit evidence from a source with low competence

**Table 8: Conflicting audit evidence and source competence, analysis of variance for belief after the first piece of evidence (J1) minus the initial anchor (absolute value)**

Source	Sum of Squares	Df	Mean Square	F	Probability
<b>Main Effects</b>					
Conflicting evidence	0.1530	1	0.1530	67.1110	0.0020*
Source competence	0.6960	1	0.6960		0.0000*
<b>Two-Way Interactions</b>					
Conflicting evidence x source competence	0.0489	1	0.0489	4.7190	0.0310*
Error	1.8040	174	0.0010		

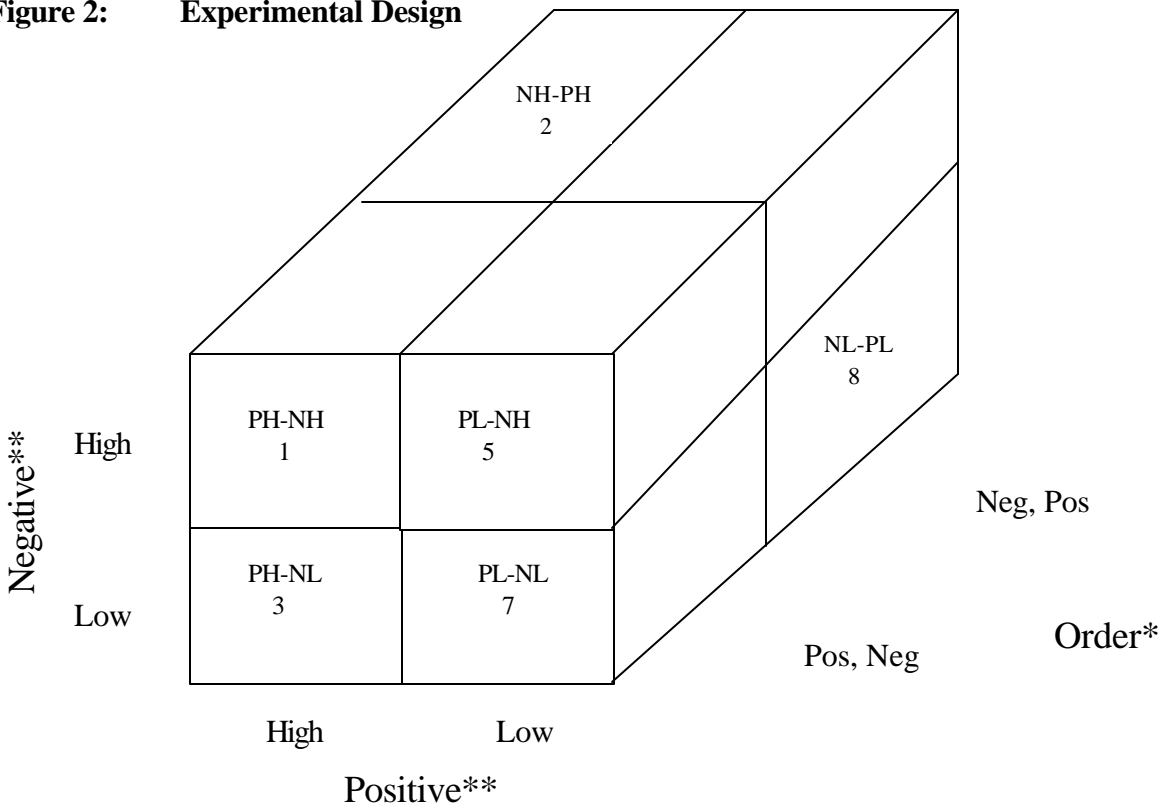
**Table 9: Conflicting audit evidence and source competence, analysis of variance for belief after the second piece of evidence (J2) minus the belief after the first piece of evidence (J1) (absolute value)**

Source	Sum of Squares	Df	Mean Square	F	Probability
Main Effects					
Conflicting evidence	0.0505	1	0.0505	1.7990	0.1820
Source competence	0.5430	1	0.5430	30.4790	0.0000*
Two-Way Interaction					
Conflicting evidence x source competence	0.0018	1	0.0018	1.0130	0.3150
Error	3.0980	174	0.0178		

**Figure 1: Conflicting Audit Evidence and Source Reliability Judgments**

		Audit Evidence	
		Positive	Negative
Source Reliability Judgments	Overweigh	Underauditing	Overauditing
	Underweigh	Overauditing	Underauditing

**Figure 2: Experimental Design**



\* Factor manipulated between-subjects

\*\* Factor manipulated within-subjects

H1 = (Block 1+ Block 3 + Block 5 + Block 7) < (Block 2 + Block 4 + Block 6 + Block 8)

H2 = (Block 1+ Block 2 + Block 3 + Block 4) > (Block 5 + Block 6 + Block 7 + Block 8)

H3 = (Block 3 + Block 4 + Block 7 + Block 8) > (Block 1+ Block 2 + Block 5 + Block 6)

H4 = Block 1 < Block 2 and Block 3 < Block 4 and Block 5 < Block 6 and Block 7 < Block 8

PH-NH = positive audit evidence from a source of high reliability followed by negative audit evidence from a source of high reliability

PH-NL = positive audit evidence from a source of high reliability followed by negative audit evidence from a source of low reliability

PL-NH = positive audit evidence from a source of low reliability followed by negative audit evidence from a source of high reliability

PL-NL = positive audit evidence from a source of low reliability followed by negative audit evidence from a source of low reliability

NH-PH = negative audit evidence from a source of high reliability followed by positive audit evidence from high a source of reliability

NL-PH = negative audit evidence from a source of low reliability followed by positive audit evidence from a source of high reliability

NH-PL = negative audit evidence from a source of high reliability followed by positive audit evidence from a source of low reliability

NL-PL = negative audit evidence from a source of low reliability followed by positive audit evidence from a source of low reliability

**Appendix A:** (Reproduced from Hogarth and Einhorn, 1992, pp. 48-49)

*Order-Effects for the SbS Process when  $R = S_{k-1}$ : Mathematical Proof*

As stated in the text, order-effects for the SbS process when  $R = S_{k-1}$  always imply recency effects. Hogarth and Einhorn demonstrate the conditions under which this statement holds following the proof provided in Anderson and Hovland (1957).

Consider two evidence items,  $a$  and  $b$ , with subjective strengths  $s(x_a)$  and  $s(x_b)$  where, without loss of generality,  $s(x_a) < s(x_b)$ . Define opinion reached after processing the evidence in the order  $a$  followed by  $b$  by  $S_{ab}$ , and opinion reached after processing the same information in the reverse order by  $S_{ba}$ , and opinion reached after processing the same information in the reverse order by  $S_{ba}$ . Let the order effect be defined by  $D = S_{ab} - S_{ba}$  and note that recency is implied by  $D > 0$ . By successively applying Eq. (1) in the text, we can write

$$S_{ab} = S_0 + w_a [s(x_a) - S_0] + w_{ab} [s(x_b) - S_0 - w_a \{s(x_a) - S_0\}] \quad (\text{A.1})$$

and

$$S_{ba} = S_0 + w_b [s(x_b) - S_0] + w_{ba} [s(x_a) - S_0 - w_b \{s(x_b) - S_0\}], \quad (\text{A.2})$$

where  $w_a$  and  $w_{ba}$  refer to the adjustment weights when evidence item  $a$  is processed first and second, respectively, and  $w_b$  and  $w_{ab}$  are the analogous adjustment weights in respect of evidence item  $b$  ( $0 \leq w_a, w_{ba}, w_b, w_{ab} < 1$ ). By subtracting Eq. (A.2) from (A.1), we obtain

$$D = [s(x_a) - S_0] [w_a - w_a w_{ab} - w_{ba}] + [s(x_b) - S_0] [w_{ab} - w_b + w_b w_{ba}]. \quad (\text{A.3})$$

Anderson and Hovland (1957) assume that  $w_a = w_{ba}$  and  $w_b = w_{ab}$  in which case Eq. (A.3) can be reexpressed as

$$D = [s(x_b) - S_0] w_a w_b - [s(x_a) - S_0] w_a w_b \quad (\text{A.4})$$

or

$$D = w_a w_b [s(x_b) - s(x_a)]. \quad (\text{A.5})$$

Because  $s(x_b) > s(x_a)$ ,  $D > 0$  and recency always obtains.

Hogarth and Einhorn and note that in their model it is not necessarily the case that  $w_a = w_{ba}$  and that  $w_b = w_{ab}$ . However, this assumption considerably simplifies the algebraic proof of recency effects. In addition, the form of Eq. (A.5) shows that the size of recency effects is proportional to the difference between  $s(x_b)$  and  $s(x_a)$ .

*Order-Effects for the SbS Process when  $\mathbf{R} = \mathbf{0}$ : Mathematical Proof* (Reproduced from Hogarth and Einhorn, 1992, pp. 49-50)

*Consistent evidence.* For consistent evidence, no order-effects are predicted by the SbS process when  $\mathbf{R} = \mathbf{0}$ . To see why in the case of negative evidence [  $s(x_k) < \mathbf{0}$  ], note that Eq. (7a) in the text can be rewritten in the form

$$S_k = S_{k-1} [ I + \mathbf{a} s(x_k) ]. \quad (\text{B.1})$$

Thus when  $k = 2$ , Eq. (C.1) can be written  $S_2 = S_1 [ I + \mathbf{a} s(x_2) ]$  and further expands as

$$S_2 = S_0 [ I + \mathbf{a} s(x_1) ] [ I + \mathbf{a} s(x_2) ]. \quad (\text{B.2})$$

Since multiplication is commutative,  $S_2$  is not affected by the order in which  $s(x_1)$  and  $s(x_2)$  are processed, a result that can be generalized for  $k > 2$ . Thus, the model predicts no order-effects.

In analogous fashion, same prediction can be made for the case of consistent positive evidence. Specifically, Eq. (7b) in the text can be rewritten as

$$S_k = S_{k-1} [ I - \mathbf{b} s(x_k) ] + \mathbf{b} s(x_k), \quad (\text{B.3})$$

which, when  $k = 2$ , can be expanded to the form

$$S_2 = S_0 + \mathbf{b} (I - S_0) [s(x_1) + s(x_2) - \mathbf{b} s(x_1)s(x_2)]. \quad (\text{B.4})$$

Since both addition and multiplication are commutative, it can be seen that the order in which  $s(x_1)$  and  $s(x_2)$  are processed has no effect on  $S_2$ , a result that can also be generalized for  $k > 2$ .

*Mixed evidence.* When processing a sequence of mixed evidence the SbS process (with  $\mathbf{R} = \mathbf{0}$ ) does lead to order-effects, and specifically recency. Consider the effects of processing a negative piece of evidence, denoted  $s(x_-)$ , followed by a positive piece, denoted  $s(x_+)$ , and then the positive followed by negative. Define an order effect as

$$D = S(-, +) - S(+, -). \quad (\text{B.5})$$

This can be written

$$\begin{aligned} D &= [ S_0 + w_1 s(x_-) + r_2 s(x_+) ] - [ S_0 + r_1 s(x_+) + w_2 s(x_-) ] \\ &= s(x_+)(r_2 - r_1) + s(x_-)(w_1 - w_2). \end{aligned} \quad (\text{B.6})$$

By definition,  $r_1 = \mathbf{b} (I - S_0)$  and  $r_2 = \mathbf{b} [ I - \{ S_0 + w_1 s(x_-) \} ]$  such that  $(r_2 - r_1) = -\mathbf{b} w_1 s(x_-)$  or  $-S_0 \mathbf{a} \mathbf{b} s(x_-)$ . Similarly,  $w_1 = \mathbf{a} S_0$  and  $w_2 = \mathbf{a} [ S_0 + r_1 s(x_+) ]$  such that  $(w_1 - w_2) = -\mathbf{a} r_1 s(x_+)$  or  $-(I - S_0) \mathbf{a} \mathbf{b} s(x_+)$ . Substituting these values into Eq. (B.6) we obtain

$$\begin{aligned} D &= -s(x_-) S_0 \mathbf{a} \mathbf{b} s(x_-) - s(x_-) (I - S_0) \mathbf{a} \mathbf{b} s(x_+) \\ &= -\mathbf{a} \mathbf{b} s(x_-) s(x_+) > \mathbf{0}, \end{aligned} \quad (\text{B.7})$$

because  $s(x_-) < \mathbf{0}$ .

Thus for two pieces of mixed evidence, the recency effects is the product of both sensitivity to evidence ( $\mathbf{a}$  and  $\mathbf{b}$ ) and the subjectivity strengths of the two pieces of evidence. Note also that the model predicts that the magnitude of recency effect is unrelated to the size of the initial anchor (an implication that was explicitly tested and verified by Ashton and Ashton, 1988).

## APPENDIX B

### NUMERICAL COMPUTATION USING BELIEF-ADJUSTMENT MODEL

This section presents the numerical computations of the belief after processing each piece of audit evidence presented in the example on page 21. The Belief-Adjustment Model is used to compute the values. The Belief-Adjustment Model is stated as follows :

$$S_k = S_{k-1} + w_k [s(x_k) - R]$$

Because the task in the example on page 21 is assumed to be an evaluation task,  $R$  is equal to 0. The initial anchor ( $S_{k-1}$ ) in the example is assumed to be 0.5 and  $a$  and  $b$  are assumed to be equal to 1. The strength of positive audit evidence from a source with low reliability ( $s(x_k)$ ) is equal to 0.4. The strength of negative audit evidence from a source with high reliability is equal to 0.6.

Substituting the above values in the Belief-Adjustment Model, the belief ( $S_k$ ) after evaluating positive audit evidence from the initial anchor is as follows:

$$\begin{aligned} S_k &= S_{k-1} + b (1 - S_{k-1}) [s(x_k) - R] \text{ for } s(x_k) > R. \\ &= 0.5 + 1(1 - 0.5)(0.4) \\ &= 0.7 \end{aligned}$$

The belief after evaluating positive audit evidence followed by negative audit evidence is as follows:

$$\begin{aligned}
S_k &= S_{k-1} + \mathbf{a} S_{k-1} [s(x_k) - R] \quad \text{for } s(x_k) \leq R \\
&= 0.7 + 1(0.7) (-0.6) \\
&= 0.28
\end{aligned}$$

Note that  $S_{k-1}$  takes the value of  $S_k$  after evaluating the positive audit evidence.

The belief ( $S_k$ ) after evaluating negative audit evidence from the initial anchor is as follows:

$$\begin{aligned}
S_k &= S_{k-1} + \mathbf{a} S_{k-1} [s(x_k) - R] \quad \text{for } s(x_k) \leq R \\
&= 0.5 + 1(0.5) (-0.6) \\
&= 0.2
\end{aligned}$$

The belief after evaluating negative audit evidence followed by positive audit evidence is as follows:

$$\begin{aligned}
S_k &= S_{k-1} + \mathbf{b} (1 - S_{k-1}) [s(x_k) - R] \quad \text{for } s(x_k) > R. \\
&= 0.2 + 1(1 - 0.2) (-0.4) \\
&= 0.52
\end{aligned}$$

Note that  $S_{k-1}$  takes the value of  $S_k$  after evaluating the negative audit evidence.

## APPENDIX C

### ESTIMATION EQUATIONS

#### Part A: Experiment 1

Because of the additivity assumptions of the model, it is only possible to obtain four degrees of freedom for the purpose of estimating parameter values: the grand mean and the three main effects of the 2x2x2 design. By appropriately combining the model's predictions for the eight experimental conditions, the following estimation equations are found for the present data:

$$\text{Order effects} = (W_2 - W_1) (P - N) / (W_1 + W_2) = 0.0612$$

$$\text{Effect of source competence for positive evidence} = (W_{PH} - W_{PL})P / (W_1 + W_2) = 0.10665$$

$$\text{Effect of source competence for negative evidence} = (W_{NH} - W_{NL})N / (W_1 + W_2)$$

$$= -0.10075$$

$$\text{Grand mean} = 0.5 + \frac{1}{2}[(W_1 + W_2)P + N + (W_{PH} + W_{PL})P + (W_{NH} + W_{NL})N] = 0.491675$$

Because there are four equations in eight unknowns (parameter values), restrictions on four of these unknowns can be chosen arbitrarily and the remaining values can be estimated by solving these four equations simultaneously. For the solution illustrated in the text, the restriction that  $P = -N = .333$  was thought to a reasonable one in light of the rating scale employed. The restriction that  $(W_1 + W_2) = 1$  served to "normalise" these parameters and did not effect the relative values of the parameter estimates. The

choice of  $W_{NL} = .5$  was arbitrary, yet it can be shown that other choices for this parameter would still lead to the same set of predicted responses.

## REFERENCES

- American Institute of Certified Public Accountants (AICPA). 1975. Statement on Auditing Standard No. 1. New York, AICPA.
- American Institute of Certified Public Accountants (AICPA). 1975. Using the Work of a Specialist. Statement on Auditing Standard No. 11. New York, AICPA.
- Anderson, N.H.A., 1964, Note on weighted sum and linear operator models, *Psychonomic Science* 1: 189-190.
- Anderson, N.H.A., 1968, A simple model for information integration, In R.P. Abelson, E. Aronson, W. J. McGuire, T.M. Newcomb, M.J. Rosenberg, & P.H. Tannenbaum (Eds.), *Theories of cognitive consistency: A sourcebook*. Chicago: Rand-Mc-Nally.
- Anderson, U., and G. Marchant, 1989, The auditor's assessment of the competence and integrity of auditee personnel, *Auditing: A Journal of Practice and Theory* (Supplement): 1-16.
- Anderson, U., L. Koonce and G. Marchant, 1994, The effects of source-competence information and its timing on auditors' performance of analytical procedures, *Auditing: A Journal of Practice and Theory*, 13 (1): 137-148.
- Arnold, V., P. A. Collier, S. A. Leech, and S. G. Sutton, 2000, The effect of experience on order and recency bias in decision making by professional accountants, *Accounting and Finance* 40, 107-132.
- Asare, S., 1992, The auditor's going concern opinion decision: Interaction of task variables and the sequential processing of evidence, *The Accounting Review* 67 (April): 379-393.
- Ashton, A. and R. Ashton, 1988, Sequential Belief Revision in Auditing. *Accounting Review*, October, pp. 623-641.
- Ashton, A. and R. Ashton, 1990, Evidence-responsiveness in professional judgment: Effects of positive versus negative evidence and presentation mode, *Organizational Behavior and Human Decision Processes* 46 (June): 1-19.
- Australian Society of CPAs, Australian Auditing Statement (AUS) N0. 502: Audit Evidence, *Auditing Handbook*, Vol 2, 1996, Prentice-Hall.
- Australian Accounting Research Foundation, Australian Auditing Statement (AUS) N0. 606: Using Work of an Expert, 1995.
- Bentham, J., 1827, *Rationale of Judicial Evidence*, London: Hunt and Clarke.
- Berhold, M., 1971, Theory of linear profits sharing incentives, *Quarterly Journal of Economics* LXXXV, August: 460-482.

Biggs, S. F., T. J. Mock and P. R. Watkins, 1989, Analytical review procedures and processes in auditing. Vol. 14. Vancouver: The Canadian Certified General Accountants Research Foundation.

Birnbaum, M., 1982, Controversies in psychological measurement, In *Social Attitudes and Psychological Measurement*, edited by B. Wegener Hillsdale, NJ: Erlbaum: 401-85.

Birnbaum, M., R. Wong and L. K. Wong, 1976, Combining information from source that vary in credibility, *Memory & Cognition*, Vol. 4 (3): 330-336.

Boritz, J. E. and A. K. P. Wensley, 1990, Structuring the assessment of audit evidence: An expert system approach, *Auditing: A Journal of Practice and Theory* 9 (Supplement): 49-109.

Brown, C.E. and I. Solomon, 1990, Auditor configural information processing in control risk assessment, *Auditing: A Journal of Practice and Theory* 9, 17-38.

Brownell, P., 1995, Research methods in management accounting, Monograph, No. 2, *Accounting Research Methodology: Coopers and Lybrand and Accounting Association of Australia and New Zealand*.

Butt, J. and T. Campbell, 1989, The effects of information order and hypothesis-testing strategies on auditors' judgments, *Accounting, Organisations and Society* 15 (5,6): 471-479.

Canadian Institute of Chartered Accountants. Handbook, Section 5300.

Carlson, R. A., and D. E. Dulany, 1988, Diagnostic reasoning with circumstantial evidence, *Cognitive Psychology*, 20(4): 463-492.

Caster, P., and K. V. Pincus, 1996, An empirical test of Bentham's theory of the persuasiveness of evidence, *Auditing: A Journal of Practice & Theory* 15 (Supplement): 1-22.

Chaiken, S., 1980, Heuristic versus systematic information processing and the use of source versus message cues in persuasion, *Journal of Personality and Social Psychology*, 39: 752-756.

Chaiken, S., and A. H. Eagly, 1976, Communication modality as a determinant of message persuasiveness and message comprehensibility, *Journal of Personality and Social Psychology*, 23: 605-614.

Cook, T. D., and B. Fay, 1978, The temporal persistence of experimental induced attitude change: An evaluative review. In L. Berkowitz (Ed.), *Advances in Experimental Social Psychology* (Vol. 11). New York: Academic Press.

Cook, T., and D. Campbell, 1979, *Quasi-Experimentation: Design and Analysis Issues for Field Settings*, Boston: Houghton Mifflin.

Coombs, C.H., R.M. Dawes, and A. Tversky, 1970, *Mathematical psychology*, Englewood Cliffs, NJ: Prentice-Hall.

Cushing, B. E. and J. K. Loebbecke, 1986, Comparison of Audit Methodologies of Large Accounting Firms, American Accounting Association.

Cushing, B. E., and S. Ahlawat, 1995, The recency effects in audit judgment: A reassessment. Working Paper, University of Utah.

Dutta, S.K. and R. P. Srivastava, 1993, Aggregation of evidence in auditing: A likelihood perspective, Auditing: A Journal of Practice and Theory 12 (Supplement): 137-160.

Edge, W.R., and A.A. Farley, 1991, External auditor evaluation of the internal audit function. Accounting and Finance (May): 69-83.

Einhorn, H. and R. Hogarth, 1985, A contrast/surprise model for updating beliefs, Working paper, University of Chicago.

Einhorn, H. J., and R. M. Hogarth, 1986, Judging probable cause. Psychological Bulletin, 99: 3-19.

Einhorn, H. and R. Hogarth, 1987, Adaption and Inertia in Belief Updating: The Contrast-Inertia Model, Working Paper, University of Chicago.

Einhorn, H. and R. Hogarth, 1988, Order effects in belief updating: The contrast inertia model, Working paper, University of Chicago.

Felix, W. L., Jr. and W. R. Jr. Kinney, 1982, Research in the Auditor's Opinion Formulation Process: State of the Art. Accounting Review, April, pp. 245-271.

Fishbein, M., 1967, A behavior theory approach to the relations between beliefs about an object and attitude toward an object, In M. Fishbein (ed.), Readings in attitude theory and measurement, New York: Wiley.

Fishbein, M., and B. H., Raven, 1962, An operational definition of belief and attitude, Human Relations, 15: 35-44.

Fishhoff, B., and R. Beyth-Maron, 1983, Hypothesis evaluation from a Bayesian perspective, Psychological Review, July: 239-60.

Gibbins, M., 1984, Propositions about the Psychology of Professional Judgment in Public Accounting, Journal of Accounting Research, Spring: 103-25.

Gibbins, M., and Mason. 1988.

Gibbins, M. and F. M. Wolf, 1982, Auditors' subjective decision environment: The case of a normal external audit, The Accounting Review, 57(1): 105-124.

Gillett, P.R., 1993, Automated dynamic audit programme tailoring: An expert system approach, Auditing: A journal of Practice & Theory (Supplement): 173-189.

Goodwin, J., 1999, The effects of source integrity and consistency of evidence on auditor judgments, *Auditing: A Journal of Practice and Theory*, Vol. 18, NO. 2, Fall.

Goodwin, J., and T. K. Trotman, 1996, Factors affecting the audit of revalued non-current assets: Initial public offerings and source reliability, *Accounting and Finance* (November): 151-170.

Grice, G., and J. Hunter, 1964, Stimulus intensity effects depend upon the type of experimental design, *Psychological Review* (July): 247-56.

Greenwald, A. G., 1968, Cognitive learning, cognitive response to persuasion and attitude change, In A. Greenwald, T. Brock and T. Ostrom (Eds.), *Psychological foundations of attitudes*, New York: Academic Press.

Hackenbrack, K., 1993, The effect of experience with different sized clients on auditor evaluations of fraudulent financial reporting indicators, *Auditing: A Journal of Practice and Theory* (Spring): 99-110.

Heckman, D. G., 1975, Motivating managers to make investment decisions, *Journal of Financial Economics*, 2 No. 3: 273-292.

Heesacker, M., R. E. Petty and J. T. Cacioppo, 1983 Field dependence and attitude change: Source credibility can alter persuasion by affecting message-relevant thinking, *Journal of Personality*, 51: 653-666.

Hirst, D. E., 1994, Auditors sensitivity to source reliability, *Journal of accounting research*, 32 (1): 1-22.

Hogarth, R. M., 1981, Beyond discrete biases: Functional and dysfunctional aspects of judgmental heuristics, *Psychological Bulletin*, September: 197-217. Hogarth, R. M. (1989). *Judgement and Choice*, 2<sup>nd</sup> edition, John Wiley & Sons, New York.

Hogarth, R.M., 1987, *Judgment and choice: the Psychology of decision*, Chichester; New York: Wiley.

Hogarth, R. and H. Einhorn, 1992, Order Effects in Belief Updating: The Belief-Adjustment Model, *Cognitive Psychology*: 1-55.

Hopper, C., and K. T. Trotman, 1996, Configural information processing in auditing: Further evidence. *Accounting and Business Research*, Vol, 26: 125-136

Jensen, C. M., and H. W. Meckling, 1976, Theory of the firm: Managerial behavior, agency costs and ownership structure, *Journal of Finance Economics*, 305.

Joyce, E. J. and G. C. Biddle, 1981a, Anchoring and Adjustment in Probabilistic Inference in Auditing, *Journal of Accounting Research*, Spring: 120-145.

Joyce, E. J. and G. C. Biddle, 1981b, Are Auditors' Judgments Sufficiently Regressive? *Journal of Accounting Research*, Autumn: 323-349.

Kelman, H. C., and C. I. Hovland, 1953, Reinstatement of the communicator in delayed measurement of opinion change, *Journal Abnormal and Social Psychology*, 48: 327-335.

Kennedy, J., 1993, Debiasing audit judgment with accountability: A framework and experimental results, *Journal of Accounting Research* 31 (Autumn): 231-245.

Keppel, G., 1991, *Design and Analysis: a researcher's handbook*, 3<sup>rd</sup> Edition, Englewood Cliffs, N. J: Prentice-Hall.

Kida, T., 1984, The Impact of Hypothesis Testing Strategies on Auditors' Use of Judgment Data, *Journal of Accounting Research*, 22 (2): 332-340.

Kinney, W. R., Jr. and W. C. Uecker, 1982, Mitigating the Consequences of Anchoring in Auditing Judgment, *Accounting Review*, January, pp. 55-69.

Knechel, W. and W. Messier, 1990, Sequential auditor decision making: Information search and evidence evaluation, *Contemporary Accounting Research*, 6 (2): 386-406.

Krishnamoorthy, G., 1993, Discussion of aggregation of evidence in auditing: A likelihood perspective, *Auditing: A Journal of Practice and Theory* (Supplement): 161-166.

Krull, G. Jr., P. Reckers, and B. Wong-On-Wing, 1993, The effects of experience, fraudulent signals and information presentation order on auditors' beliefs, *Auditing: A Journal of Practice & Theory* 12 (Fall): 143-153.

Lopes, L. L., 1982, Towards a procedural theory of judgment. Working paper, University of Wisconsin, December.

Lopes, L. L., and P. H. S. Ekberg, 1980, Est of an ordering hypothesis in risky decision making, *Acta Psychologica*, August: 161-167.

Mautz, R. K., 1958, The nature and reliability of audit evidence, *The Journal of Accountancy*, May: 40-47.

McMillan, J. J and R. A. White, 1993, Auditors' belief revisions and evidence search: The effect of hypothesis frame, confirmation bias, and professional skepticism, *The Accounting Review*, July, Vol 68, No. 3, 443-465.

Mellers, B. and M. Birnbaum, 1983, Contextual effects in social judgment, *Journal of experimental Social Psychology* (March): 157-71.

Messier, W., 1992, The sequencing of audit evidence: Its impact on the extent of audit testing and report formulation, *Accounting and Business Research* (Spring): 143-150.

Messier, W., and R. Tubbs, 1994, Mitigating recency effects in belief revision: The impact of audit experience and the review process, *Auditing: A Journal of Practice & Theory* 13 (Spring): 57-72.

Monroe, G. S. and J. Ng, 2000, An examination of order effects in auditors' inherent risk assessments, *Accounting and Finance*, 40, 153-168.

Pany, K., and P. Reckers, 1987, Within- vs between-subjects experimental designs: A study of demand effects, *Auditing: A Journal of Practice and Theory* (Fall): 39-53.

Pei, B., S. Reed, and B. Koch, 1992, Auditor belief revisions in a performance auditing setting: An application of the belief-adjustment model, *Accounting, Organizations and Society* 17 (2): 169-183.

Petty, R. E., J. T. Cacioppo and M. Heesacker, 1981, The use of rhetorical questions in persuasion: A cognitive response analysis, *Journal of Personality and Social Psychology*, 40: 432-440.

Rebele, J. E., J. A. Heintz, and G. E. Briden, 1988, Independent auditor sensitivity to evidence reliability, *Auditing: A Journal of Practice and Theory* (Fall 1988): 43-52. Rhine, R., and Severance, L. (1970), Ego-involvement, discrepancy, source credibility, and attitude change, *Journal of Personality and Social Psychology*, 16: 175-190.

Reicken, H., 1962, A program for research on experiments in social psychology, In *Decisions, Values and Groups*, Vol. 2, edited by N. Washburne, New York: MacMillan: 25-41.

Rhine, R., and L. Sverance, 1970, Ego-involvement, discrepancy, source credibility and attitude change, *Journal of Personality and Social Psychology* 16: 175-190.

Robinson, L. B., and R. Hastie, 1985, Revision of beliefs when a hypothesis is eliminated from consideration, *Journal of Experimental Psychology: Human Perception and Performance*, August: 443-56.

Ross, S. A., 1973, The economic theory of agency: The Principal Problems, *American Economic Review* LXII, May: 134-139.

Ross, S. A., 1974, The economic theory agency and principal of similarity, In M. D. Balch et al. (Eds.), *Essays on Economic Behavior under Uncertainty* (North Holland, Amsterdam).

Rosnow, R., B. Goodstadt, J. Suls and A. Gitter, 1973, More on the social psychology of the experiment: When compliance turns to self defence, *Journal of Personality and Social Psychology* (September): 337-43.

Rosenbaum, M. E., and I. P. Levin, 1968, Impression formation as a function of source credibility and order of presentation of contradictory information, *Journal of Personality and Social Psychology*, Vol. 10, No. 2: 167-174.

Rosenberg, M., 1965, When dissonance fails: On eliminating evaluation apprehension from attitude measurement, *Journal of Personality and Social Psychology* (January): 28-42.

- Schepanski, A, R. M. Tubbs and R. A., Grimlund, 1992, Issues of concern regarding within- and between-subjects designs in behavioral accounting research, *Journal of Accounting Literature*, Vol 11: 121-150.
- Shafer, G., and R. Srivastava, 1990, The Bayesian and Belief-function Formalisms: A General Perspective for Auditing, *Auditing: A Journal of Practice & Theory*, 9 (suppl.): 110-148.
- Shanteau, J. C., 1970, An additive model for sequential decision making, *Journal of Experimental Psychology*, 85: 181-191.
- Silverman, I., 1968, Role-related behaviour of subjects in laboratory studies of attitude change, *Journal of Personality and Social Psychology* (April): 343-48.
- Srivastava, R., P. and G. Shafer, 1992, Belief-function formulas for audit risk. *The Accounting Review* (April): 249-283
- Tabachnick, B. G. and L. S. Fidell, 1996, *Using multivariate statistics*, 3<sup>rd</sup> edition, HarperCollins College Publishers.
- Toba, Y., 1975, A General Theory of Evidence as the Conceptual Foundation in Auditing Theory, *The Accounting Review*, 50, 7-24.
- Trotman, K. T., 1996, Research methods for judgment and decision making studies in auditing, Monograph No. 3, Coopers & Lybrand and Accounting Association of Australia and New Zealand.
- Trotman, K. T. and P. W. Yetton, 1985, The effects of the review process on auditor judgments, *Journal of Accounting Research*, 23 (1): 256-267.
- Trotman, K. T. and A. Wright, 1996, Recency effects: Task complexity, decision mode, and task-specific experience, *Behavioral Research in Accounting*, 8: 175-193.
- Tubbs, R., W. Messier and R. Knechel, 1990, Recency and presentation mode effects in the auditor's belief revision process, *The Accounting Review* 65 (April): 452-460.
- Tversky, A., and D. Kahneman, 1981, The framing of decisions and the psychology of choice, *Science*, 211: 453-458. Van Wallendael, L. R. (1989), The quest for limits on noncomplementarity in opinion revision, *Organizational Behavior and Human Decision Processes*, June: 385-405.
- Weber, S. and T. Cook, 1972, Subject effects in laboratory research: An examination of subject roles, demand characteristics, and valid inference, *Psychological Bulletin* (April): 273-95.
- Wilson, R., 1968, On the theory of syndicates, *Econometrica*, 36, January: 119-132.
- Wilson, R., 1969, La decision: Aggregation et dynamique des orders de preference, Extrait (Editions du Centre National de la Recherche Scientifique, Paris): 288-307.

Winer, B., 1971, *Statistical principles in statistical design*, New York: McGraw-Hill.

Wright, P. L., 1981, Cognitive responses to mass media advocacy, In R. E. Petty, T. M. Ostrom, and T. C. Brock (Eds.), *Cognitive responses in persuasion*. Hillsdale, NJ: Erlbaum.

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<sup>1</sup> Many factors may affect the strength of a piece of audit evidence. For example, AUS 502 discusses the importance of the relevance of a piece of audit evidence to the audit assertion under consideration. A practical example would be the evidence of the separation of duties in a payroll system and the evidence of the effectiveness of internal controls in the previous (financial year) payroll. In this case, separation of duties is more relevant to the audit assertion (accuracy of payroll) under consideration and hence, provides stronger inferential value.

<sup>2</sup> The term credibility and reliability are assumed to have the same meaning and are used interchangeably (see Rebele et al. 1988 and Goodwin and Trotman 1996).

<sup>3</sup> Because these hypotheses assume that accounts are fairly presented, positive audit evidence will cause an increase in belief and negative audit evidence will cause a decrease in belief.

<sup>4</sup> Perceived risks of legal liability are more of a concern to auditors when they are presented with conflicting audit evidence with respect to overstatement of assets or understatement of liabilities than when they are presented with conflicting audit evidence with respect to understatement of assets or overstatement of liabilities. Hence, while the direction of belief revision is expected to be the same, the expected weightings on these two scenarios may differ. No empirical study to-date exists to show this to be the case.

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<sup>5</sup> Because this hypothesis assumes that accounts are fairly presented, positive audit evidence will cause an increase in belief and negative audit evidence will cause a decrease in belief.

<sup>6</sup> Note that this hypothesis entails testing order effects of four source-sequence situations. Refer to research design on page 36.

<sup>7</sup> An auditor's hypothesis concerning the fairness of a client's financial statement can take one of two broad positions or frames: (1) that a material error exists in the financial statements or (2) that no material error exist (McMillian and White 1993).

<sup>8</sup> A second ANOVA model was conducted excluding all data that had coding errors with respect to the direction (positive or negative) of the audit evidence. No differences in results were noted. A third ANOVA model was conducted excluding all data set with a z score of more than 3. No differences in results were noted. A fourth ANOVA model was conducted to tests for ordinal effects of different treatments. A between-subjects factor was added whereby one group received treatment 1 through to treatment 4 and the other treatment 4 through to treatment 1. Thus, the model was positive by negative by order of presentation by treatment position. This variable was added to tests for possible effects of confounding of treatment levels. No differences in the results were noted. A fifth ANOVA model was conducted to test the effects of justification of one's judgment of belief revisions. A between-subjects factor was added whereby one group had to justify their judgment and other required no justification

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(see Hopper and Trotman 1996). Thus, the model was positive by negative by order of presentation by justification. Again, no differences in the results were noted.

<sup>9</sup> It can also be shown that by restricting  $W_{NL}$  to other values, the ranking of other pieces of audit evidence does not change.

<sup>10</sup> Two specific conditions combine to form one situation. That is, Condition A and B lead to Situation 1, Condition C and D lead to Situation 2, Condition E and F lead to Situation 3, and Condition G and H lead to Situation 4.

<sup>11</sup> For example, dependent variable D1 consists of four groups, i.e. PH, PL, NH, and NL. The computations were conducted as follows: PH (positive audit evidence from a source with high competence) was computed by taking the absolute value of the difference between J1 and the initial anchor in Conditions A and C. PL (positive audit evidence from a source with low competence) was computed by taking the absolute value of the difference between J1 and the initial anchor in Conditions E and G. NH (negative audit evidence from a source with high competence) was computed by taking the absolute value of the difference between J1 and the initial anchor in Conditions B and F. NL (negative audit evidence from a source with low competence) was computed by taking the absolute value of the difference between J1 and the initial anchor in Conditions D and H.

<sup>12</sup> Predictions were computed using a linear model described on page 24.