Uncertain Litigation Cost and Seller Behavior: Evidence from an Auditing Game

Ping Zhang, Bryan K. Church, and Lucy F. Ackert

Federal Reserve Bank of Atlanta
Working Paper 98-17
September 1998

Abstract: This paper reports the results of two experiments, each consisting of six sessions, designed to investigate difficulties that arise in estimating expected litigation costs in an auditing game. In each experimental session, the game consists of a series of periods in which sellers submit sealed offers to computerized buyers and, if hired, choose an effort level (low or high). The effort level affects the certain (direct) and uncertain (litigation) costs of performing the engagement. Across the two experiments, we vary the uncertainty surrounding the determination of the expected litigation cost. Our results strongly suggest that cognitive limitations hinder sellers' abilities to estimate total expected litigation costs. Across both experiments we observe a nontrivial number of suboptimal effort choices. Moreover, as the uncertainty of determining the expected litigation cost increases, the frequency of observed fee offers below the total expected cost of an engagement increases markedly.

JEL classification: M40, C91

Key words: auditing, litigation costs

The authors gratefully acknowledge the financial support of the Certified General Accountants of Canada. They also thank Linda Bamber, Mike Bamber, Arnie Schneider, and workshop participants at the University of Georgia for helpful comments. The views expressed here are those of the authors and not necessarily those of the Federal Reserve Bank of Atlanta or the Federal Reserve System. Any remaining errors are the authors' responsibility.

Please address questions regarding content to Ping Zhang, School of Business and Economics, Wilfrid Laurier University, Waterloo, Ontario N2L 3C5, Canada, 519/884-0170 ext. 2672, pzhang@wlu.ca; Bryan K. Church, DuPree School of Management, Georgia Institute of Technology, Atlanta, Georgia 30332, 404/894-3907, bchurch@mgt-sun2.gatech.edu; or Lucy F. Ackert, Research Department, Federal Reserve Bank of Atlanta, 104 Marietta Street, NW, Atlanta, Georgia 30303-2713, 404/521-8783, 404/521-8810 (fax), lucy.ackert@atl.frb.org.

Questions regarding subscriptions to the Federal Reserve Bank of Atlanta working paper series should be addressed to the Public Affairs Department, Federal Reserve Bank of Atlanta, 104 Marietta Street, NW, Atlanta, Georgia 30303-2713, 404/521-8020. The full text of this paper may be downloaded (in PDF format) from the Atlanta Fed's World-Wide Web site at http://www.frbatlanta.org/publica/work_papers/.

Uncertain Litigation Cost and Seller Behavior:

Evidence From an Auditing Game

1. Introduction

Much has been written about the liability crisis facing auditors in North America and the United Kingdom. The total legal claims against auditors are staggering, with estimates in the billions of dollars (e.g., Hill, Metzger, and Schatzberg [1993]; Jaffee [1994]). Reports indicate that the Big Six firms are now spending more than 15 percent of their audit and accounting revenue on professional-liability coverage (McDonald [1997]). Practitioners contend that runaway litigation is threatening the survival of accounting firms of all sizes and could destroy the profession as a whole (O'Malley [1993, p. 82]). As a consequence, auditors have lobbied heavily for reform, most notably in the area of damage sharing.[1]

While institutional arrangements and damage-sharing regimes are certainly of interest and have important economic consequences, a more fundamental issue is the auditor's ability, a priori, to estimate and manage the total cost of an engagement. If the auditor is unable to accurately assess total expected cost in the long run, effort choices and fee offers may be suboptimal. In turn, lobbying efforts and concerns over professional liability may, to some extent, be misplaced.

The total expected cost of an engagement consists of two components: the direct cost of planning and performing the audit and the expected cost of litigation. Both costs are affected by the auditor's effort choice. The direct cost is increasing in effort, whereas the expected litigation cost is decreasing in effort. The auditor likely has little difficulty estimating direct costs because such costs are known with relative certainty once an effort level is chosen. By comparison, problems can arise in estimating expected litigation costs because of cognitive limitations.

Litigation costs, including settlement costs, legal costs, and loss of reputation, are uncertain and incurred in some periods and not in others. Although the auditor's effort choice affects the likelihood that litigation costs are incurred, uncertainty remains.

Insight into auditor behavior is provided by research in behavioral decision making, which suggests that individuals in general have difficulty coping with uncertainty (e.g., Lipshitz and Strauss [1997]). This difficulty can create a major obstacle to effective decision making (e.g., Brunsson [1985]; Orasanu and Connolly [1993]). For the auditor, problems may arise in the conceptualization and assessment of expected litigation costs. In pricing an engagement and choosing an effort level, the auditor may downplay uncertainty and focus unduly on the direct cost of an engagement. Such behavior enables the auditor to conserve cognitive effort and avoid delay in decision making. However, by focusing on direct costs, the auditor's behavior may be suboptimal and diverge from theoretical predictions.

We conduct two experiments, each consisting of six sessions, to explore effort choices and fee offers in an auditing game. Across both experiments, the game is characterized as follows. Each session consists of a series of periods in which individuals submit sealed offers to provide investigation services and, if hired, choose an effort level: low or high. The level chosen affects the direct (certain) and expected (uncertain) cost of performing the engagement. Within each experiment, we manipulate the direct cost of providing high effort between sessions. This manipulation allows us to determine whether individuals focus unduly on direct costs in making decisions.[2]

Across the two experiments, we vary the uncertainty surrounding the determination of expected litigation costs, which include legal costs. In experiment one, the auditor incurs legal costs regardless of the outcome of litigation, which is akin to the current system in the United States and is referred to as the American rule. In contrast, in our second experiment the auditor must pay legal costs, but only if liable for damages suffered. This is the cost allocation system in place in the United Kingdom and is referred to as the British rule. Practitioners in the United States support the adoption of the British rule because it is believed to reduce the number of frivolous lawsuits (e.g., Lochner [1993]; O'Malley [1993]). But the British rule introduces an added layer of uncertainty (i.e., whether legal costs must be paid), which can make it more difficult to assess the expected litigation costs. A comparison of results between the two experiments sheds light on whether behavior generalizes across settings in which the legal cost allocation rule differs.

The remainder of the paper is organized as follows. First, we describe the experimental method. Next, we present theoretical and behavioral predictions and report the results of the two experiments. Lastly, we provide concluding remarks.

2. Research Method

2.1 Participants and Procedures

We conduct 12 experimental sessions, each consisting of six participants. The participants are recruited from third- and fourth-year undergraduate and fifth-year post-baccalaureate students in business and economics attending a medium-sized university. In experiment one (two), students earned from $13.00 to $41.74 ($13.50 to $39.44), with an average of $18.84 ($16.76), for participating approximately 100 minutes.

Experiment one consists of sessions 1-6 across which we manipulate the direct cost of high effort. In all six sessions, the American rule is used to determine who is responsible for the payment of legal costs. Experiment two consists of sessions 7-12. Again we manipulate the direct cost of high effort between sessions, but the British rule is used to determine who is responsible for the payment of legal costs. The experimental design is summarized in Table 1.

At the beginning of each session, instructions are distributed and read aloud.[3] To ensure that participants understand the instructions, a short quiz is administered. The quiz includes six questions and participants are paid $0.50 for each correct answer. Upon completion of the quiz, the answers are announced and thoroughly explained.[4]

Participants use a computer to complete the remainder of the experiment. Participants assume the role of a seller, who provides investigation services to a buyer. The buyer's role is assumed by the computer. The buyer must decide whether to invest in a project, where two types are possible: type I and type II. A type I project produces a profit of $11.00 ($\pi_I$), whereas a type II project produces a loss of $10.00 ($\pi_{II}$). The buyer cannot observe the project type ex ante, but knows the prior probability of each is 50 percent (Q_I and Q_{II}). As such, the buyer hires a seller to report on the project type and then invests accordingly.

The sequence of procedures that occur each period is summarized in Table 2 and the experimental parameters are provided in Table 3. Initially, sellers submit offers to provide investigation services to verify project type, where a maximum offer is specified.[5] The five lowest offers are accepted and the highest accepted offer is announced.[6] Ties are settled randomly.

If a seller is hired, an effort (investigation) level is chosen and a cost is incurred. A low level of effort (DC_l) has a direct cost of $0.50. In experiment one (two), a high level of effort

(DC_h) has a direct cost of $1.50 in session 1-2 (7-8), $2.50 in sessions 3-4 (9-10), and $3.50 in sessions 5-6 (11-12). The effort level affects the probability that a type II project is mistakenly identified as a type I project (β_e) and the probability that the seller is held accountable (liable) for the buyer's losses (J_e). Participants are informed that β_l is 60 percent, J_l is 90 percent, β_h is 40 percent, and J_h is 40 percent. To emphasize the importance of β_e and J_e in assessing potential losses, participants also are informed of the joint probability that the seller makes a mistake and is held accountable: 54 percent for low effort and 16 percent for high effort. Subsequently, the computer determines the outcome of the investigation. The buyer always (never) invests when the seller's report indicates that the project is type I (II). If a type II project is mistakenly identified as type I, the buyer suffers a loss of $10.00. According to the predetermined probabilities, the computer determines whether the seller is accountable and informs the seller. The buyer, on the other hand, is not informed.

The buyer may file for arbitration in an attempt to recoup losses. If arbitration is pursued, each party incurs a cost of $2.50 ($F_b$ and F_s), though the legal cost allocation rule determines who actually pays the cost. In experiment one (the American rule), each party pays $2.50. In experiment two (the British rule), the loser pays the total cost of arbitration, which is $5.00 (i.e., the loser pays the winner's cost).

In order to avoid arbitration, the seller is permitted to make a settlement offer. The seller knows that the buyer is risk neutral and will accept any offer that equals or exceeds the expected value of pursuing arbitration. The seller also is informed that the buyer attempts to infer whether the seller is accountable based on the settlement offer. We include settlement offers to gain insight into whether the seller can make an accurate assessment of the total cost associated with arbitration, which is a component of the expected litigation cost.

The buyer is programmed to behave as follows. Settlement offers that equal or exceed a minimum amount are accepted. In experiment one, this amount is \$7.50, which equals the buyer's loss (π_{II}) less the arbitration cost that is avoided by reaching a settlement (F_b). In experiment two, this amount is \$10.00, which equals the buyer's loss (π_{II}). Under the British rule, arbitration costs are not considered in determining the minimum acceptable offer because the winner does not pay such costs. In both experiments, offers that are less than the minimum acceptable amount but greater than zero are rejected and arbitration is pursued. In this case, the buyer infers that the seller is accountable. A mixed strategy is used when settlement offers equal zero (i.e., arbitration is pursued in some instances and not in others). With an offer of zero, the buyer cannot distinguish whether the seller is accountable and bluffing or not accountable. The buyer is programmed to file for arbitration with a probability of 60 percent when the settlement offer is zero in experiment one and 67 percent in experiment two (r_e).

The computer determines the outcome of the arbitration process and the seller's payoff. Participants are paid \$10.00 for completing the experiment and allowed to keep any additional earnings (and not required to cover losses).[7] The experimental procedures are repeated in subsequent periods. Each experimental session consists of 30 periods and participants are not informed beforehand of the number of periods.

At the end of each session, a post-experiment questionnaire is administered. The questionnaire is designed to collect general information about participants and how they view the experiment.[8] Three open-ended questions also are included to probe how participants determined effort level, fee offers, and settlement offers. Participants are paid $2.00 for completing the questionnaire.

2.2 Theoretical and Behavioral Predictions

We develop competing predictions in light of the setting described in the preceding section. We predict differences in behavior based on the direct cost of high effort (i.e., $1.50 versus $2.50 versus $3.50), where the predictions are similar across the two experiments. We do not predict differences *between* the two experiments. Rather, the two experiments allow us to determine whether behavior generalizes across settings in which the legal cost allocation rule differs.

Using the experimental parameters summarized in Table 3, we predict effort choices and fee offers assuming that the seller minimizes total expected cost. In addition, we develop behavioral predictions recognizing that the seller may focus unduly on the direct cost of an engagement.

To minimize cost, the seller compares the total expected cost of alternative effort levels (the model development is detailed in the appendix). The expected total cost is expressed as

$$E(TC_e) = DC_e + E(LC_e)$$

where $E(\cdot)$ is the expectations operator and TC_e, DC_e, and LC_e are the total cost, direct cost, and litigation cost, respectively, associated with effort level e for e = l (low), h (high). In experiment one, the expected litigation cost is

$$E(LC_e) = [Q_{II} * \beta_e * J_e * (\pi_{II} - F_b)] + [Q_{II} * \beta_e * (1 - J_e) * F_s * r_e]$$

where Q_{II} is the probability of a type II project, β_e is the probability that a type II project is mistakenly identified as type I, J_e is the probability that the seller is held accountable for the buyer's losses, π_{II} is the loss that arises from investing in a type II project, F_b is the buyer's arbitration cost, F_s is the seller's arbitration cost, and r_e is the probability that the buyer files for arbitration when the seller's settlement offer is zero. The product in the first set of brackets represents the expected cost if the seller is accountable for the buyer's losses. The product in the second set of brackets represents the expected cost if the seller is not accountable, but the buyer pursues arbitration.

In experiment two, the expected litigation cost is

$$E(LC_e) = Q_{II} * \beta_e * J_e * \pi_{II}.$$

The product represents the expected cost if the seller is accountable for the buyer's losses. As compared with the American rule, F_b and F_s are irrelevant because these costs are borne by the loser if arbitration is pursued.

Point predictions and directional hypotheses are summarized in Table 4. In experiment one (two), based on the parameter values, $E(LC_l)$ = \$2.07 (\$2.70) and $E(LC_h)$ = \$0.78 (\$0.80). Across both experiments, theory predicts that the seller minimizes total cost by choosing high effort when DC_h = \$1.50 and low effort when DC_h = \$2.50 or \$3.50. Predictions for fee offers follow naturally assuming competitive markets, in which case fees are predicted to converge to the minimum total expected cost. In experiment one (two), predicted fees are \$2.28 (\$2.30), \$2.57 (\$3.20), and \$2.57 (\$3.20) when DC_h = \$1.50, \$2.50, and \$3.50, respectively.

Although theory provides a basis for point predictions, experimental results typically deviate from such predictions. Deviations may occur because theoretical predictions rely on simplifying assumptions (e.g., individuals know one another's utility functions). As a consequence, theoretical predictions are viewed as benchmarks for comparisons which provide a basis to posit directional hypotheses (Dopuch, King, and Schatzberg [1994, 123-124]).

Behavioral theory also provides a foundation for directional hypotheses. These predictions recognize that the seller has difficulty estimating the expected litigation cost, which makes it difficult to compare total cost across effort levels. Thus, the seller may compare the attributes of alternative effort levels (e.g., Svenson [1979]; Montgomery [1983]). The seller knows the difference between DC_l and DC_h with certainty. The seller also knows that $E(LC_l) - E(LC_h) > 0$, but does not know the magnitude of the difference. Because of the uncertainty surrounding the expected litigation cost and the seller's cognitive limitations, the seller may focus unduly on direct cost. We do not suggest that the seller ignores $E(LC_e)$, but rather that the litigation cost is of relatively less concern as the difference between DC_l and DC_h increases. As this difference increases, a choice of low effort may be perceived to be more justifiable (e.g., Shafir, Simonson, and Tversky [1993]). Across both experiments, we hypothesize that high effort is chosen less frequently as the direct cost of high effort increases.

Difficulty in estimating expected litigation cost also can affect fee offers. In this case the seller uses alternative strategies, rather than focusing on the minimum cost of the engagement. A potential strategy involves the use of a focal point in setting fees (Schelling [1957]). Certain fee levels may become prominent for reasons that are not captured by theoretical predictions. We investigate whether the auditor fixates on the direct costs associated with alternative effort choices in making pricing decisions. Specifically, we hypothesize that the direct cost of high effort serves as a lower bound in determining fees because such a strategy ensures that the seller covers the certain cost component. With this type of pricing strategy, the seller is able to make a profit as long as litigation costs are avoided, regardless of the effort level chosen. Across both experiments, the behavioral prediction is that fee offers increase as the direct cost of high effort increases.

Although the focus of this study is on effort choices and fee offers, we also explore settlement offers. The theoretical prediction is that if the seller is not liable, the settlement offer should be zero, regardless of the legal cost allocation rule. If liable, on the other hand, the seller should offer an amount that covers the buyer's losses minus avoidable arbitration costs (if applicable) with probability a_e and zero with probability 1-a_e (see appendix). In experiment one this amount is \$7.50 (\$10.00 - \$2.50), and in experiment two it is \$10.00. Furthermore, in experiment one (two), a_e is 50 percent (24 percent) when the optimal effort choice is high (DC_h = \$1.50) and 96.3 percent (44.4 percent) when it is low (DC_h = \$2.50 or \$3.50). Uncertainty surrounding the arbitration process, however, may result in nonzero settlement offers that differ from predicted amounts. Behavioral theory recognizes that the seller may have difficulty determining optimal settlement offers because of cognitive limitations, but it does not provide a basis for predicting differences between the three experimental groups. Therefore, we do not make behavioral predictions about settlement offers.

3. Results

3.1 Effort Choice

For each experiment we perform an analysis of variance (ANOVA) to examine the effect of the direct cost of high effort (DC_h) on the seller's effort choice.[9] The dependent variable is the proportion of times that the seller chooses high effort over periods 1-30.[10]

3.1.1 Experiment One. As shown in Panel A of Table 5, DC_h is statistically significant at $p = 0.023$. The cell means indicate that high effort is chosen slightly more than half of the time in the DC_h150 group and slightly less than one third of the time in the DC_h250 and DC_h350 groups. Newman-Keuls pairwise tests indicate that DC_h150 is significantly different from DC_h250 and DC_h350 at $p < 0.05$, whereas DC_h250 and DC_h350 are not statistically different from one another. The results are consistent with the theoretical, directional hypothesis ($H1_T$), though differing markedly from point predictions (see hypotheses summarized in Table 4).

Deviations from point predictions may arise because of cognitive limitations which affect the seller's ability to estimate expected litigation costs.[11] Sellers' settlement offers provide additional insight into this issue. Theoretical predictions indicate that if the seller is liable, settlement offers should equal zero or $7.50. The frequencies of these offers per group are reported in Panel A of Table 6. We find that 44 of 168 offers (or 26 percent) are consistent with theoretical predictions. The majority of offers fall between zero and $7.50. We compute the mean, nonzero settlement offer, which provides an estimate of the loss expected by the seller due to arbitration, and find that it is $4.07, $5.51, and $5.36 for the DC_h150, DC_h250, and DC_h350 groups, respectively. Each differs significantly from $7.50 at $p < 0.01$ using two-tailed t-tests. These results provide evidence that sellers have difficulty estimating expected arbitration costs.[12]

3.1.2 Experiment Two. As shown in Panel B of Table 5, DC_h is statistically significant at $p = 0.001$. The cell means indicate that high effort is chosen slightly less than half of the time in the DC_h150 and DC_h250 groups and less than 10 percent of the time in the DC_h350 group. Newman-Keuls pairwise tests indicate that DC_h150 and DC_h250 differ significantly from DC_h350 at $p < 0.05$, but not from one another. The results are not consistent with either theoretical or behavioral directional hypotheses.[13]

To gain further insight, we investigate the seller's settlement offers. Theoretical predictions indicate that if the seller is liable, settlement offers should equal zero or \$10.00. The frequencies of these offers per group are reported in Panel B of Table 6. We find that 76 of 203 offers (or 37 percent) are consistent with theoretical predictions. The majority of offers fall between the zero and \$10.00. The mean, nonzero offer is \$5.73, \$7.00, and \$6.99 for the DC_h150, DC_h250, and DC_h350 groups, respectively, and each differs significantly from \$10.00 at $p < 0.001$ using two-tailed t-tests. As with experiment one, the results suggest that sellers have difficulty estimating expected arbitration costs.[14]

3.2 Fee Offers

For each experiment we investigate observed fee behavior per session and then perform an ANOVA to examine the effects of DC_h on the seller's fee offers. The dependent variable is the average fee offer per seller over periods 1-30.

3.2.1 Experiment One. Figures 1-3 show plots of the highest accepted fee offer per period for the DC_h150, DC_h250, and DC_h350 groups, respectively. The time series reveal an interesting behavioral pattern: fee offers appear to oscillate between bounds. The highest accepted offer is typically above the competitive price and at times reaches the maximum allowed offer. Moreover, it never falls below the direct cost of high effort. The highest accepted fee appears to move downward for a period of time, due to competitive pressures, before ratcheting upward toward the maximum allowed offer. This pattern then repeats itself.[15]

The time series data suggest that the direct cost of high effort is focal in determining fee offers. We investigate whether all fee offers are bounded from below by the direct cost of high effort. Across sessions 1-6, only 13 of 1,080 offers (or 1.2 percent) are below DC_h: one in session 1, nine in session 5, and three in session 6. Twelve of 13 instances occur in the first four periods and one occurs in the eighth period. Hence, DC_h appears to be prominent and serve as a lower bound in determining fee offers. This result is suggestive of the behavioral directional hypothesis ($H2_B$).

Next we perform an ANOVA to formally test whether DC_h affects the seller's fee offers. The results, shown in Panel A of Table 7, indicate that DC_h is significant at $p < 0.001$.[16] The cell means increase as the cost of high effort increases. Using Newman-Keuls tests, we find that all pairwise comparisons are significant at $p < 0.05$. These findings are consistent with $H2_B$.

We also investigate deviations in the seller's fee offers from the competitive price. For each experimental group, we compute the average fee offer per seller over periods 1-30 standardized by the competitive price. The means are 1.17, 1.18, and 1.44 for the DC_h150, DC_h250, and DC_h350 groups, respectively. Each mean is significantly different from the competitive price at $p < 0.01$ using two-tailed t-tests. The results are unchanged when we examine the standardized average accepted fee offer per seller.[17] Notably, fees include a premium, even when the direct cost of high effort is well below the competitive price (as in the DC_h150 group).

3.2.2 Experiment Two. Figures 4-6 show plots of the highest accepted fee offer per period for the DC_h150, DC_h250, and DC_h350 groups, respectively. In sessions 7-8 (DC_h150), the highest accepted offer declines gradually over time and falls below the competitive price, though typically remaining above the direct cost of high effort. In sessions 9-10 (DC_h250), the highest accepted fee moves downward, toward the competitive price, before ratcheting upward -- always remaining above the direct cost of high effort. In session 11 (DC_h350), the highest accepted fee oscillates between the maximum fee and the direct cost of high effort, never falling below the competitive price. By comparison, in session 12 (DC_h350) the highest accepted fee declines over time and falls well below the direct cost of high effort *and* the competitive price.

To provide a basis for comparison with experiment one, we investigate whether the direct cost of high effort appears to be focal in determining fee offers. Across sessions 7-11, only 29 of 900 offers (or 3.2 percent) are below DC_h: 23 in session 8, three in session 9, and three in session 11. Twenty-eight instances occur in the first six periods and one occurs in the twentieth period. For sessions 7-11, DC_h appears to serve as a lower bound in determining fee offers, which is suggestive of the behavioral directional hypothesis ($H2_B$). In session 12, on the other hand, 171 of 180 offers (or 95 percent) are below DC_h. The observed fee behavior in this session appears to be anomalous. For some reason, market dynamics drive fees to very low levels.[18]

We perform an ANOVA to formally test whether DC_h affects the seller's fee offers. The results, shown in Panel B of Table 7, indicate that DC_h is significant at $p < 0.001$.[19] The mean fee offer is lowest in the DC_h150 group and highest in the DC_h250 group. The mean fee offer of the

DC_h350 group is in the middle because of the peculiar fee behavior observed in session 12.[20] Looking at the two DC_h350 sessions separately, we find that the mean fee offers are $3.81 and $2.22 in sessions 11 and 12, respectively.

We also investigate deviations in the seller's fee offers from the competitive price. For each experimental group, we compute the average fee offer per seller over periods 1-30 standardized by the competitive price. The means are 0.93, 1.11, and 0.95 for the DC_h150, DC_h250, and DC_h350 groups, respectively. The mean for DC_h150 (DC_h250) is significantly different from the competitive price at $p = 0.066$ ($p = 0.012$) using a two-tailed t-test.[21] The mean for the DC_h350 group is not significantly different from the competitive price because of the divergent fee behavior observed across sessions 11 and 12.

4. Conclusion

This paper reports the results of two experiments, each consisting of six sessions, designed to investigate whether sellers focus unduly on the direct cost of an engagement. Such behavior may arise because the seller has difficulty estimating expected litigation costs. Across the two experiments, we vary the uncertainty surrounding the determination of the expected litigation costs, which include legal costs. In experiment one, the seller incurs legal costs regardless of the outcome of litigation (the American rule). In experiment two, the seller must pay legal costs, but only if liable for damages suffered (the British rule). Hence, in experiment two, an added layer of uncertainty is introduced concerning the determination of expected litigation cost.

Our results strongly suggest that cognitive limitations hinder sellers’ abilities to assess total expected litigation cost. In experiment one, sellers’ effort choices are generally consistent with theoretical, directional predictions, though differing markedly from point predictions. A majority of the time sellers choose effort levels that minimize the expected total cost of the engagement; however, a nontrivial number of suboptimal effort choices is observed. In experiment two, sellers' effort choices are not consistent with theoretical, directional predictions and in some cases suboptimal effort levels are chosen a majority of the time. The additional uncertainty introduced by the British rule of legal cost allocation appears to hamper performance.

Cognitive limitations also appear to affect fee offers. Across the two experiments, the data from 11 of 12 sessions suggest that the direct cost of high effort (DC_h) is focal and serves as a lower bound in determining fee offers. In sessions 1-6 of experiment one, only 13 of 1,080 offers (or 1.2 percent) are below DC_h. In sessions 7-11 of experiment two, only 29 of 900 offers (or 3.2 percent) are below DC_h. The observed fee behavior in session 12, which is not consistent with that observed in other sessions, appears to be anomalous. One difference stands out when we compare fees across the two experiments. In experiment one, fees typically include a premium: fees tend to be above the competitive price. In experiment two, this result does not hold: fees often fall below the competitive price. Again, the additional uncertainty introduced by the British rule of legal cost allocation appears to detract from performance, sometimes driving fees below the total expected cost of the engagement.

In sum, our findings suggest unequivocally that sellers have difficulties coping with uncertain costs. Such difficulties are intensified as the complexities involved in the determination of uncertain costs are increased (e.g., going from the American rule of legal cost allocation to the British rule). Our findings suggest that as these difficulties increase, the likelihood of suboptimal behavior increases. Future theoretical work is advised to incorporate cognitive limitations that impede sellers' abilities to accurately assess uncertain costs and, with respect to pricing, cause them to unduly focus on the certain costs of alternative effort choices.

Appendix

Proposition 1: With the American rule of legal cost allocation, if

$$DC_h + (Q_{II} * \beta_h) * [J_h * (\pi_{II} - F_b) + (1 - J_h) * F_s * r_h] \\ \leq DC_l + (Q_{II} * \beta_l) * [J_l * (\pi_{II} - F_b) + (1 - J_l) * F_s * r_l], \tag{A1}$$

the seller chooses high effort. Otherwise, the seller chooses low effort. If the buyer suffers a loss, the seller is permitted to make a take-it-or-leave-it offer in order to avoid arbitration costs. Settlement offers are as follows. If not accountable, the seller only offers zero. If accountable, the seller offers $\pi_{II} - F_b$ with probability a_e and zero with probability $1 - a_e$, where e = h, l and a_e solves the following equation.

$$[J_e * (\pi_{II} - F_b) * (1 - a_e)] - [(1 - J_e) * F_b] = 0. \tag{A2}$$

The buyer accepts the offer $\pi_{II} - F_b$ and files for arbitration with probability r_e after receiving an offer of zero, where r_e solves the following equation

$$\pi_{II} - F_b = (\pi_{II} + F_s) * r_e\,. \tag{A3}$$

Then the seller's total cost is

$$TC_e = DC_e + (Q_{II} * \beta_e) * [J_e * (\pi_{II} - F_b) + (1 - J_e) * F_s * r_e].$$

Proof: The seller does not make a settlement offer between zero and $\pi_{II} - F_b$ because such an offer signals that the seller is accountable. If the seller is not accountable, only settlements of zero are offered. If accountable, the seller offers either zero or $\pi_{II} - F_b$. The probability that an accountable seller offers $\pi_{II} - F_b$ is determined by equation A2, which makes the buyer indifferent between filing or not filing for arbitration. Similarly, the probability that a buyer files for arbitration after receiving an offer of zero is determined by equation A3, which makes an accountable seller indifferent between offering zero or π_{II} - F_b.

The seller chooses an effort level to minimize the expected total cost. If inequality A1 holds, the expected total cost is lower with high effort. Conversely, if inequality A1 does not hold, the expected total cost is lower with low effort.

Proposition 2: With the British rule of legal cost allocation, if

$$DC_h + Q_{II} * \beta_h * J_h * \pi_{II} \leq DC_l + Q_{II} * \beta_l * J_l * \pi_{II} \qquad (A4)$$

the seller chooses high effort. Otherwise, the seller chooses low effort. After the buyer suffers a loss, the seller makes the following settlement offers. If not accountable, the seller only offers zero. If accountable, the seller offers π_{II} with probability a_e and zero with probability 1 - a_e, where e=h, l and a_e solves the following equation.

$$J_e * \pi_{II} * (1 - a_e) - (1 - J_e) * (F_b + F_s) = 0. \qquad (A5)$$

The buyer accepts the offer π_{II} and files for arbitration with probability r_e after receiving an offer of zero, where r_e solves the following equation

$$\pi_{II} = (\pi_{II} + F_b + F_s) * r_{e.} \qquad (A6)$$

Then the seller's total cost is

$$TC_e = DC_e + Q_{II} * \beta_e * J_e * \pi_{II}.$$

Proof: The seller does not make a settlement offer between zero and π_{II} because such an offer signals that the seller is accountable. If the seller is not accountable, only settlements of zero are offered. If accountable, the seller offers either zero or π_{II}. The probability that an accountable seller offers π_{II} is determined by equation A5, which makes the buyer indifferent between filing or nor filing for arbitration. Similarly, the probability that a buyer files for arbitration after receiving an offer of zero is determined by equation A6, which makes an accountable seller indifferent between offering zero or π_{II}.

The seller chooses an effort to minimize the expected total cost. If inequality A4 holds, the expected total cost is lower with high effort. Conversely, if inequality A4 does not hold, the expected total cost is lower with low effort.

Endnotes

1. In the United States, the Private Securities Reform Act of 1995 was recently enacted, which provides for proportionate liability, in which case the auditor's liability is assessed on a basis proportional to fault. In the United Kingdom, the Auditing Practices Board proposed to cap the auditor's liability, in which case the auditor and client would negotiate and contract on a liability limit. As discussed subsequently, another difference between the audit environment in the United States and the United Kingdom involves the allocation of legal costs.

2. Previous studies have examined the effects of alternative liability and damage-sharing regimes on behavior in experimental audit markets (e.g., Dopuch and King [1992]; Wallin [1992]; Dopuch, King, and Schatzberg [1994]; Dopuch, Ingberman, and King [1997]; Gramling, Schatzberg, Bailey, and Zhang [1998]). These studies manipulate the expected litigation cost, holding direct cost constant, and show that the structure of the legal system can have important effects on economic efficiencies. While the legal system is clearly of consequence, the direct cost of alternative effort choices may be dominant in decision making. Direct costs are known and largely controllable and, thus, play an important role in decision making.

3. A copy of the experimental instructions is available from the authors upon request.

4. The mean and median number of correct answers across participants in experiment one (two) are 4.5 (4.9) and 5.0 (5.0), respectively.

5. The buyer is willing to pay up to the amount that the investigation service has value (i.e., the benefit of acquiring the service equals or exceeds the cost).

6. The engagement risk associated with the prospective client is assumed to be acceptable. We do not address instances in which risk differs across prospective clients or, broadly speaking, client acceptance issues. For insight into such issues, see Gramling, Schatzberg, Bailey, and Zhang (1998).

7. The experimental parameters are designed such that additional earnings are expected to be zero if the seller's services are priced competitively and the seller behaves in accordance with theoretical predictions.

8. Participants' responses to the post-experiment questionnaire suggest that they found the experiment interesting and the monetary incentives somewhat motivating. Participants responded on a seven-point scale as to how interesting they found the experiment, where 1 = not very interesting and 7 = very interesting. In experiment one (two), the mean response was 5.86 (5.36). Participants also responded on a seven-point scale as to how they would characterize the amount of money earned for taking part in the experiment, where 1 = nominal amount and 7 = considerable amount. In experiment one (two), the mean response was 3.89 (4.44).

9. The analyses reported in the paper are repeated excluding data from the first five and ten periods. In all cases, inferences are unaffected.

10. Press (1972, 264-265) warns that when using proportions, variances are a function of group means. So unequal means can cause heteroskedasticity. An arcsine square root transformation is recommended. We applied this transformation to the dependent variable and repeated the analysis. Inferences are unaffected.

11. When participants were asked how they determined their effort level, no response was provided by a majority. The most common response was that no systematic method was used in choosing an effort level.

12. When participants were asked how they determined settlement offers, we observed two frequent responses. Ten of 36 participants indicated that they relied on past experience (see also Dopuch, Ingberman, and King [1997]), whereas eight indicated that offers were determined randomly.

13. When participants were asked how they determined their effort level, no response was provided by a majority. The most common response was that a risk-return tradeoff was considered in choosing an effort level.

14. When participants were asked how they determined settlement offers, one common response was observed. Twelve of 36 participants indicated that they relied on past experience (see also Dopuch, Ingberman, and King [1997]).

15. When asked how they determined fee offers, 30 of 36 participants indicated that their offers were based on the previous period's highest accepted offer.

16. We repeated the analysis using the average accepted fee per seller as the dependent variable and found similar results.

17. The means are 1.16, 1.16, and 1.43 for the DC_h150, DC_h250, and DC_h350 groups, respectively.

18. When asked how they determined fee offers, 28 of 36 participants indicated that their offers were based on the previous period's highest accepted offer.

19. We repeated the analysis using the average accepted fee per seller as the dependent variable and found similar results.

20. Newman-Keuls pairwise tests indicate that DC_h250 and DC_h350 are significantly different from DC_h150 at $p < 0.05$, but not from one another.

21. The results are unchanged when we examine the standardized average accepted fee offer per seller. The means are 0.93, 1.10, and 0.94 for the DC_h150, DC_h250, and DC_h350 groups, respectively.

References

Brunsson, N. 1985. *The Irrational Organization.* New York, NY: John Wiley and Sons.

Dopuch, N., and R.R. King. 1992. "Negligence Versus Strict Liability Regimes in Auditing: An Experimental Investigation." *The Accounting Review* 67 (January): 97-120.

Dopuch, N., D.E. Ingberman, and R.R. King. 1997. "An Experimental Investigation of Multi-Defendant Bargaining in "Joint and Several" and Proportionate Liability Regimes." *Journal of Accounting and Economics* 23 (July): 189-221.

Dopuch, N., R.R. King, and J.W. Schatzberg. 1994. "An Experimental Investigation of Alternative Damage-Sharing Liability Regimes with an Auditing Perspective." *Journal of Accounting Research* 32 (Supplement): 103-130.

Gramling, A.A., J.W. Schatzberg, A.D. Bailey, Jr., and H. Zhang. 1998. "The Impact of Legal Liability Regimes and Differential Client Risk on Client Acceptance, Audit Pricing, and Audit Report Decisions." University of Illinois at Urbana-Champaign, Working Paper.

Hill, J.W., M.B. Metzger, and J.W. Schatzberg. 1993. "Auditing's Emerging Legal Peril Under the National Surety Doctrine: A Program for Research." *Accounting Horizons* 7 (March): 12-28.

Jaffee, D. 1994. "The Allocation of Fault in Auditor Liability Lawsuits Brought by Sophisticated Third Party Users of Financial Statements: A Plea for Proportionate Liability." *University of Pittsburgh Law Review:* 1051-1083.

Lipshitz, R., and O. Strauss. 1997. "Coping with Uncertainty: A Naturalistic Decision-Making Analysis." *Organizational Behavior and Human Decision Processes* (February): 149-163.

Lochner, Jr., P.R. 1993. "Accountants' Legal Liability: A Crisis that Must be Addressed." *Accounting Horizons* 7 (June): 92-96.

McDonald, E. 1997. "More Big Six Firms Are Dumping Risky Clients: Big Six Worry About Their Reputations and Chance of Costly Litigation." *Wall Street Journal* (April 25): A2.

Montgomery, H. 1983. "Decision Rules and the Search for a Dominance Structure: Towards a Process Model of Decision Making." In P. Humphreys, O. Svenson, and A. Vari, (eds.), *Analysing and Aiding Decision Processes.* New York, NY: North-Holland Publishing Company.

O'Malley, S.F. 1993. "Legal Liability is Having a Chilling Effect on the Auditor's Role." *Accounting Horizons* 7 (June): 82-87.

Orasanu, J., and T. Connolly. 1993. "The Reinvention of Decision Making." In G.A. Klein, J. Oransanu, R. Calderwood, and C. Zsambok (eds.), *Decision-Making in Action: Models and Methods.* Norwood, NJ: Ablex Publishing.

Press, S. 1972. *Applied Multivariate Analysis.* New York, NY: Holt, Rinehart, and Winston, Inc.

Schelling, T. 1957. *The Strategy of Conflict.* Cambridge, MA: Harvard University Press.

Shafir, E., I. Simonson, and A. Tversky. 1993. "Reason-Based Choice." *Cognition:* 11-36.

Svenson, O. 1979. "Process Descriptions of Decision Making." *Organizational Behavior and Human Performance:* 86-112.

Wallin, D.E. 1992. "Legal Recourse and the Demand for Auditing." *The Accounting Review* 67 (January): 121-147.

TABLE 1

Experimental Design

Experiment	Session	Direct Cost of High Effort (DC_h)	Legal Cost Allocation Rule
One	1-2	\$1.50	American Rule
	3-4	\$2.50	
	5-6	\$3.50	
Two	7-8	\$1.50	British Rule
	9-10	\$2.50	
	11-12	\$3.50	

TABLE 2

The Sequence of Procedures that Occur Each Period

1. Each seller submits an offer to provide services to a buyer.
2. The five lowest offers are accepted and the highest accepted offer is announced.
3. Each seller chooses an effort (investigation) level.
4. The outcome of the investigation is determined.
5. If the seller mistakenly identifies a type II project as a type I project, the seller proposes a settlement offer. Otherwise, the period is over.
6. The buyer accepts or rejects the settlement offer. If the offer is accepted, the period is over.
7. The buyer decides whether to pursue the arbitration process. If arbitration is not pursued, the period is over.
8. The outcome of the arbitration process is determined.

TABLE 3

Experimental Parameters

	Session[a]						
	1-12	1-2	3-4	5-6	7-8	9-10	11-12
Direct Cost of Low Effort (DC_l)	$0.50	-	-	-	-	-	-
Direct Cost of High Effort (DC_h)	-	$1.50	$2.50	$3.50	$1.50	$2.50	$3.50
Prob of Type I Project (Q_I)	50%	-	-	-	-	-	-
Prob of Type II Project (Q_{II})	50%	-	-	-	-	-	-
Buyer's Payoff for a Type I Project (π_I)	$11.00	-	-	-	-	-	-
Buyer's Payoff for a Type II Project (π_{II})	<$10.00>	-	-	-	-	-	-
Prob of Incorrectly Identifying a Type II Project | High Effort (β_h)	40%	-	-	-	-	-	-
Prob of Incorrectly Identifying a Type II Project | Low Effort (β_l)	60%	-	-	-	-	-	-
Prob of the Seller Being Held Accountable | High Effort (J_h)	40%	-	-	-	-	-	-
Prob of the Seller Being Held Accountable | Low Effort (J_l)	90%	-	-	-	-	-	-
Seller's Arbitration Costs (F_s)	$2.50	-	-	-	-	-	-
Buyer's Arbitration Cost (F_b)	$2.50	-	-	-	-	-	-
Prob of Arbitration if Settlement Offer is zero (r_e)	-	60%	60%	60%	67%	67%	67%
Minimum Acceptable Settlement Offer (MA)	-	$7.50	$7.50	$7.50	$10.00	$10.00	$10.00
Prob of the buyer Accepting a Nonzero Offer <MA	0%	-	-	-	-	-	-
Prob of the Buyer Accepting a Settlement Offer ≥MA	100%	-	-	-	-	-	-
Maximum Fee Offer Allowed	-	$3.56	$4.07	$4.07	$3.29	$4.64	$4.64

Parameters that are constant across the two experiments and across sessions are reported in the first column of the table (labeled 1-12). Parameters that vary across sessions are reported in subsequent columns. Parameters that apply to experiment one (two) are reported in the columns labeled 1-2, 3-4, and 5-6 (7-8, 9-10, and 11-12).

TABLE 4

Theoretical and Behavioral Predictions

	Point Predictions[a]			Directional Hypotheses
	DC_h150	DC_h250	DC_h350	
Theoretical (T)				
Frequency of high effort choices (exps. 1 and 2)	100%	0%	0%	$H1_T$: $DC_h150 > DC_h250 = DC_h350$
Fee offers				
(exp. 1)	\$2.28	\$2.57	\$2.57	$H2_T$: $DC_h150 < DC_h250 = DC_h350$
(exp. 2)	\$2.30	\$3.20	\$3.20	$H2_T$: $DC_h150 < DC_h250 = DC_h350$
Behavioral (B)				
Frequency of high effort choices (exps. 1 and 2)	N.A.	N.A.	N.A.	$H1_B$: $DC_h150 > DC_h250 > DC_h350$
Fee offers (exps. 1 and 2)	N.A.	N.A.	N.A.	$H2_B$: $DC_h150 < DC_h250 < DC_h350$

[a]DC_h150, DC_h250, DC_h350 denote groups in which the direct cost of high effort equals \$1.50, \$2.50, and \$3.50, respectively.

TABLE 5

The Effect of the Cost of High Effort (DC_h) on the Seller's Effort Choice

Panel A: Experiment One (Sessions 1-6)

Variable	df	Sum of Square	F-statistic	p-value
DC_h	2	0.449	4.216	0.023
Error	33	1.756		

Cost of High Effort	Mean Proportion of High Effort Choices
DC_h150	0.5523
DC_h250	0.3299
DC_h350	0.3033

Panel B: Experiment Two (Sessions 7-12)

Variable	df	Sum of Square	F-statistic	p-value
DC_h	2	1.020	8.067	0.001
Error	33	2.086		

Cost of High Effort	Mean Proportion of High Effort Choices
DC_h150	0.4708
DC_h250	0.4290
DC_h350	0.0947

TABLE 6

Frequency of Settlement Offers by Accountable Sellers

Panel A: Experiment One (Sessions 1-6)

Cost of High Effort	Offer = \$0.00	\$0.00 < Offer < \$7.50	Offer = \$7.50	Offer > \$7.50	Total
DC_h150	10	26	1	3	40
DC_h250	5	37	11	7	60
DC_h350	8	44	9	7	68
Total	23	107	21	17	168

Panel B: Experiment Two (Sessions 7-12)

Cost of High Effort	Offer = \$0.00	\$0.00 < Offer < \$10.00	Offer = \$10.00	Offer > \$10.00	Total
DC_h150	22	28	4	4	58
DC_h250	5	36	16	2	59
DC_h350	1	51	28	6	86
Total	28	115	48	12	203

TABLE 7

The Effect of the Cost of High Effort (DC_h) on the Seller's Fee Offer

Panel A: Experiment One (Sessions 1-6)

Variable	df	Sum of Square	F-statistic	p-value
DC_h	2	6.475	45.976	0.000
Error	33	2.324		

Cost of High Effort	Mean Hired Fee
DC_h150	$2.68
DC_h250	$3.04
DC_h350	$3.72

Panel B: Experiment Two (Sessions 7-12)

Variable	df	Sum of Square	F-statistic	p-value
DC_h	2	12.346	21.665	0.000
Error	33	9.402		

Cost of High Effort	Mean Hired Fee
DC_h150	$2.15
DC_h250	$3.56
DC_h350	$3.05

The figures for this working paper are unavailable in PDF format. To obtain a hard copy of the figures, please use the publications order form

http://www.frbatlanta.org/publica/pub_ord/ordform.htm

on this Web site and request a copy of Working Paper 98-17.