Experiential Learning in Auditing:

Four Experiments for the Classroom

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Abstract

This paper provides detailed descriptions of four economic experiments intended as instructional tools for auditing courses. The first two experiments involve asset markets under asymmetric information. They demonstrate that investment and productive inefficiencies result from information asymmetries and can be used as a basis for discussing the societal benefits of auditing. The third experiment concerns the acquisition of new clients by auditors and the potential incentives for auditors to make a bid below cost in the initial year of the engagement. It can be used as a basis for discussing the relationship between lowballing and auditor independence. The final experiment relates to the threat of litigation faced by auditors, and can be used as a basis for discussing the need for a long-term strategy to manage this threat. Our experience from conducting these experiments is that students' participation allows them to more easily apply economic concepts so as to obtain a better understanding of various phenomena that affect the auditing profession.

1. Introduction

The instruction of auditing often involves discussion of its economic aspects. For example, the textbook by Ricchiute (1998) mentions auditors' role in reducing information risk to investors, as well as the costly liability exposure faced by auditors. A thorough understanding of these issues requires familiarity with topics such as incomplete markets and moral hazard. Because auditing students often have not had prior exposure to these topics, they generally do not fully appreciate the importance of the economic context in which auditors operate. Instructors are likely to find it impracticable to devote classroom time to describing abstract economic theories and then relating them to auditing problems. However, given its importance, it would be useful to devise a practicable means for delivering instruction concerning the economic context of auditing.

We propose that typical auditing students, who often have only a small amount of prior exposure to economics, can greatly benefit by participating in the classroom experiments described herein. These experiments have the advantage of being a more efficient means of providing insight into various auditing environments than lengthy lectures on abstract economic concepts. In addition, we have found that even if sufficient time were available to lecture on fundamental economic aspects of auditing, these classroom experiments greatly enhance student comprehension beyond that obtained from a lecture. Further, our experiments are designed to be easily integrated into auditing course work, to require only modest classroom time, and to be enjoyable for students.[1]

It is important to note that the purpose of economic experiments in the classroom is different from their purpose in scientific investigations. The purpose of economic experiments in scientific investigation is to test theoretical predictions, observe markets that do not naturally

[1] Experiments have long been used as an instructional tool in the economics classroom (Chamberlin 1948). Frank (1997), Gremmen and Potters (1997) and Holt (1999) provide evidence of the effectiveness of classroom experiments in achieving the goals of increasing student interest and comprehension. Recently, economics experiments have been introduced into accounting courses (Berg et al., 1995; Frischmann, 1996; Boylan, 2000).

occur, or discern the cause of empirical regularities from several alternatives. In contrast, the purpose of economics experiments in the classroom is to expose students to well-known and understood economic phenomena. Just as a chemistry instructor would not request his students mix chemicals without an understanding of their interaction, classroom economic experiments would not be particularly useful without the instructor's knowledge of the concepts underlying the experiment and the probable results. This is not to say that anomalous results do not occur in the classroom. In fact, when they do, they sometimes spark the most insightful discussions. However, in keeping with the primarily educational purpose of classroom experiments, all the experiments presented herein are based on fundamental economic theories that have been extensively tested through prior scientific experimentation.

We present detailed descriptions of four classroom experiments that relate to topics typically included in undergraduate or graduate auditing courses. In each experiment, students assume the role of an auditor or an investor. In their roles, students interact in structured yet simple environments designed to capture important economic aspects of the auditing setting under consideration. At the conclusion of each experiment, class time can be used to summarize the results of the experiment and to discuss how the experimental setting can be used to interpret and understand the relevant auditing issues.

The first two experiments are intended to demonstrate the potential value of an independent audit under very different settings. In both experiments, information asymmetry creates a demand for auditing services. In the first experiment a student acts as an owner of a firm whose value would increase if its ownership were transferred to a potential student-buyer. However, the owner has private information about the value of the firm to the potential buyer. As a result, no trade frequently occurs. This experiment demonstrates that socially beneficial trades might not occur unless an assurance service is made available.

The second experiment is more complicated than the first, but provides additional educational benefit because it takes place in a much richer economic setting. In particular, it involves a student acting as a firm manager who can make a potentially profitable investment decision. This decision is personally costly to the manager and is unobservable to potential investors. The student-manager then issues a report regarding whether the investment was made. This experiment demonstrates that managers might forego investments that would increase social welfare unless an assurance service is made available.

The two experiments together illustrate different ways that auditing can increase social welfare. They are similar to those described by Boylan (2000), but are much simpler and specially designed to be integrated more easily into a regular classroom setting.

The third experiment involves audit firm bidding for clients. In this experiment students act as potential auditors who must bid for the acquisition of a client. An important aspect of the economic setting is the presence of startup costs in the initial year of the engagement. In a competitive market for audit services, one would expect auditors to bid below their first year costs. It has been conjectured that this bidding practice, commonly referred to as low-balling (DeAngelo 1981), would give auditor firms additional incentives to retain clients in order to recapture their first year losses in later years when audit costs are lower. This experiment illustrates lowballing and facilitates discussion of whether it will impair auditor independence.

The fourth experiment relates to an audit firm's reaction to the threat of litigation. In the experiment a student-auditor defends against a number of student-investors who can potentially bring forth a lawsuit. This experiment demonstrates that auditors might find it beneficial to develop a reputation for resisting out-of-court settlement offers in order to deter future potential litigants from filing non-meritorious suits.

Sections 2 through 5 describe each experiment. Each section presents results from actual experiments performed at two major state universities, as well as discussion of classroom use. Selected student feedback data are provided with the final experiment. Section 6 discusses the

ethical issues of student anonymity and remuneration, and the importance of students' degree of participation in the experiments. Section 7 concludes the paper.

2. Value of Auditing in Facilitating Trade

2.0 Learning Objectives

Often some information regarding the value of the firm is known only to those most closely associated with its operations. This situation would be particularly problematic if those with private information sought to sell a share in the firm. If the informational advantage held by insiders is strong enough, they might not be able to sell their share in the firm for any price, even though potential buyers value shares in the firm more than the insiders. The intuition for this is as follows. For a given price, some sellers might not be willing to put their shares up for sale – presumably, these are the sellers whose private information indicates their firm's value is high. Potential investors anticipate this and adjust the price they are willing to pay downward, which in turn drives out more potential sellers. If potential sellers cannot credibly communicate their private information the market might collapse completely. This phenomenon is referred to as *adverse selection* in the economics literature (Ackerloff 1970; Kreps 1990, ch. 17).

The market for initial public offerings (IPOs) can be used to illustrate the relation between the above-described scenario and real world markets with which students may be familiar. Entrepreneurs (sellers) in the IPO market are assumed to sell ownership shares in order to improve diversification or liquidity, and therefore may value the residual claims on their firms less than potential buyers. In general, one would expect that IPO sellers to be better informed of the value of their firms than are potential buyers. If sellers cannot credibly signal the value of their firms, investors will rationally offer prices equal to the expected value of the assets that remain in the market, which will drive higher quality firms out of the IPO market. Auditing is a mechanism that enables sellers to credibly signal their firms' value (Hogan, 1997), which facilitates efficient trade between buyers and sellers.

In the experiment below, students are designated as either buyers or sellers in a market where only the sellers know the true value of the assets for sale. Buyers announce prices at which they are willing to buy and sellers announce prices at which they are willing to sell. Buyers learn not to bid too high, or else they will bring assets into the market whose value is less than the price. In response, sellers of the superior assets refuse to enter the market and so retain assets that are worth less to them than to a buyer. As a result, social welfare is foregone without the presence of assurance services. This experiment illustrates that audits, because they reduce the level of information asymmetry, have potential value to both the auditor and auditee.

2.1 Procedures

2.1.1 Materials

For each market, the instructor should prepare in advance six index cards, one for each seller. Each of the six cards should be assigned one of three possible value-pairs having the property that buyer value exceeds seller value for each. Value-pairs we have used are: {Buyer value = 100, Seller value = 80}, {Buyer value = 50, Seller value = 40} and {Buyer value = 25, Seller value = 20}. The assignment of value combinations to each index card is to be made using a random draw “with replacement”.

Materials should be prepared in advance for as many markets as the instructor desires to conduct. We suggest preparing material for at least three markets, because it often takes buyers three markets to learn how to make reasonable bids (see discussion in section 2.1.2). Some instructors might desire that all students participate as both buyers and sellers. Each market involves six sellers, with the rest of the class acting as buyers. For smaller classes -- fewer than 36 students -- instructors can conduct up to six markets in a relatively short period of time. For larger classes, students can form two-person teams.

2.1.2 Participants

The instructor randomly distributes one index card, face down, to each of six different students from the class. These students are designated as potential sellers of an asset. Sellers

should inspect the values written on the cards, but should not show their card to any other students; nor should they communicate to any other student the values contained on their card.

The remaining students in the class are designated as potential buyers of the asset. The instructor informs the students of the roles they have been assigned, the three possible buyer value/seller value combinations found on the index card, and that each combination is equally likely. The instructor informs the class on how to calculate profits as shown below.

Seller Profit = Price Paid for Asset - Seller Value

Buyer Profit = Buyer Value - Price Paid for Asset

2.1.3 Asset Market

A market for the assets is then conducted. Each seller only has one asset for sale, whereas buyers are free to purchase as many assets as they choose. The choice of market institution is somewhat arbitrary; however, we suggest a double oral auction. A brief description of the "pit-boss" version of the double oral auction is found below. Further discussion may be found in Wells (1991) and DeYoung (1993).

All six assets are put up for sale simultaneously in one market. Buyers wishing to bid for an asset raise their hands in order to be recognized by the instructor. Once recognized, a buyer publicly announces a bid to the class, at which time it is recorded on the chalkboard or some other publicly viewable medium. All subsequent bids are treated in this manner. Each bid is required to exceed all previous bids. The bids apply to any of the assets, because of the random, independent assignment procedure. For the same reason, any seller may accept any buyer's bid. Simultaneously, sellers are announcing ask prices (offers to sell at a given price) in a similar manner. Each ask price should be lower than any previous ask price. When a buyer (seller) wishes to accept the most current ask (bid) she announces her intentions to the class when called upon by the instructor. Both buyer and seller record the transaction price and with whom the transaction was completed. The chalkboard is then cleared of all previous bids and asks, and new

bids and asks are accepted. An example of the how bids and asks may be presented to the class is shown in Figure 1.

After the sale of the six assets, or when bids and asks are no longer being made, the instructor should report to the class the sales price and the buyer and seller value of each asset sold. After completion of the first market, the instructor distributes a new set of index cards to six different sellers and conducts another market. Table 1 shows the results from a classroom experiment performed at a major state university.

2.2 Discussion

Buyers should eventually realize that any bid above 25 would bring assets into the market with an expected value of less than the bid. For example, if a buyer bids 50, only sellers with values of 20 or 40 could earn a non-negative profit by entering the market. Therefore, the expected value to a buyer of assets in the market when a bid of 50 is made is equal to (25+50)/2 = 37.5, which results in an expected loss for the buyer.

We expect that buyers will eventually learn not to bid too high.[2] Students learn that without assurance services, sellers of higher value assets are unable to convince buyers of their asset value, and buyers will not bid high enough for other than the lowest quality sellers to enter the market. We have found that sellers with the higher asset values often express their desire to turn over their card and reveal its contents to the class. If no students indicate this desire, we try to induce them to do so via class discussion. Turning over one's card, or otherwise credibly revealing the value of one's asset, may be compared to the role auditors serve in financial markets.

This experiment is useful in facilitating several aspects of auditing. The first is that auditing is useful not only to those being audited but also to the economy as a whole. To illustrate, consider the data in Table 1. The students in the class earned a total of 20. However if

[2] This learning is important in order for the experiment to illustrate the potential value of assurance services.

every asset had been sold the students would have earned a total of 60, regardless of the assets' selling prices.[3]

Another aspect of auditing that may be discussed subsequent to this experiment is the need for auditing itself to be credible. If the market participants did not believe the auditors' announcements, auditing would not ameliorate the adverse selection problem that is illustrated in the experiment. At this point, it can be useful to highlight the need for auditor independence in both fact and appearance.

Because the students so easily discover the potential role of auditing and readily determine the effects auditing would have on the buyers' behavior, we do not recommend taking class time to run a market with auditing present. However, if instructors desire to run such a market, auditing can be introduced by having some class members (auditors) examine the sellers' cards and "certify" the value to the market.[4] If desired, imperfect auditing can be introduced by having the auditor privately roll a die, reporting accurately only if the numbers two through six are rolled.

3. Value of Auditing In Facilitating Investment

3.0 Learning Objectives

Managers of a firm often are required to take actions that will affect themselves as well as the current or potential investors in the firm. Without reliable auditing, the nature of the actions taken may remain hidden from investors for a lengthy period of time. This information asymmetry can create an incentive for managers to act in a way that is consistent with their self-interest, but may conflict with the interests of the stakeholders. By increasing the reliability of financial disclosures, auditing increases the visibility of actions, including those that are unwanted by the stakeholders. This increase in the visibility of actions should help stakeholders provide incentives for managers to make investments that increase the value of the firm. This

[3] The available surplus for each asset is the difference between seller and buyer value. Thus, the total available surplus for the six assets in this market was (1)(20) + (3)(10) + (2)(5) = 60. Because not all assets were sold, realized surplus was only (0)(20) + (1)(10) + (2)(5) = 20.

problem is referred to as moral hazard in the economics and accounting literature (Harris and Raviv, 1978; Holmstrom, 1979; Baiman and Demski, 1980; Evans, 1980; Grossman and Hart, 1983; Antle and Demski, 1988; Kreps 1990). It also has served as the motivation for studying auditing in economic experiments (Dopuch et al., 1989; Dopuch and King, 1991; Kachelmeier, 1991).

In the experiment below students, acting as firm managers, choose whether to invest in a project. If they make the investment, their firm would become a "high type"; otherwise, their firm would remain a "low type." The expected liquidating dividend paid by a high type firm is larger than what would be paid by a low type firm, but the realized amount of the dividend is also affected by "chance."[5] After making their investment decisions, student-managers issue a disclosure to potential student-investors regarding their firm's type. The disclosures need not be truthful. A market for each firm is then conducted. If the firm is sold, the investor in the firm receives a dividend. The parameters are chosen so that the expected increase in the dividend associated with the investment exceeds the manager's private cost of investing. Therefore, the investment has social value. However, the manager alone bears the cost of the investment and cannot credibly signal whether he or she has made the investment. This experiment illustrates that the inability to observe the manager's investments leads to underinvestment relative to the socially optimal level.

3.1 Procedures

3.1.1 Materials

In this subsection we describe the materials necessary for one market. One index card is inserted into each of four unsealed envelopes. In addition, six more index cards are kept on hand. The envelopes containing the index cards are marked A through D, and the additional index cards are marked one through six. A set of random numbers is prepared ranging from zero to nine. The random number set should contain at least four numbers for each market the instructor plans to

[4] If this option is used, buyers would bid for specific assets.

conduct. We suggest conducting at least two markets. Each market involves four sellers and six buyers, so it is usually feasible for instructors to conduct enough markets to allow all class members to actively participate, if so desired. Also, the number of sellers and buyers can be modified slightly if necessary.

3.1.2 Participants

Preserving student anonymity is important when conducting this experiment. The instructor distributes one envelope, identification-down, to each of four students. These four students are sellers of their firm's liquidating dividend. One index card is distributed, identification-down, to each of six other students. These six students are potential buyers of the dividend to be paid by the firm.

The instructor informs the students as follows. Each seller must decide whether or not to make an investment in a firm project. The cost of the investment is 20. If the investment is made, the seller's firm becomes the high type; otherwise, it remains a low type. The high type yields a dividend of 100 with probability 0.9 and 0 with probability 0.1. The low type yields a dividend of 100 with probability 0.1 and 0 with probability 0.9.

Each of the sellers marks down their investment choice on an index card. Then they each place the index card back in the envelope and seal it. The sellers then make disclosures to potential investors regarding their firm type, which the sellers alone now know with certainty. Sellers may disclose their firm's type as high or low, regardless of their investment choice – that is, the disclosures need not be truthful. Sellers mark their disclosures on the outside of the envelope on the same side as the letter identification. The envelopes are collected from the sellers and their order randomized, to preserve anonymity. At this point, the buyers and the sellers remain uncertain of the dividends that will be paid.

[5] The use of chance incorporates the notion that investments in projects are not always successful.

3.1.3 Asset Market

A market for the assets then takes place using a first-price, sealed-bid mechanism. The instructor announces a seller identification letter and its corresponding disclosure for the first asset. Then buyers write their bids on their index cards for that asset. The instructor repeats the procedure for each asset. After the bids for the fourth asset are completed, all four index cards are collected from the buyers and randomized. The seller envelopes are then opened and inspected by the instructor alone, and dividend values are determined contingent on asset type and a draw from the table of random numbers that was prepared in advance. That is, for high-type firms, a random number of zero yields a dividend of 0 and a random number between one and nine yields a dividend of 100. Thus, for a high-type firm, there is a 90% chance that the dividend will be 100. For low-type firms, a random number between zero and eight yields a dividend of 0 and a random number of nine yields a dividend of 100. A different random number should be used for each asset. Winning (highest) bids for each asset, as well as the dividend amount, are announced to the class.

Each asset disclosure, sale price, and dividend outcome, as well as buyer and seller identity (using the letter and number codes), should be displayed to the class. The *total* number of investments is then revealed to the class, although the seller's investment decisions and whether their disclosures were truthful should not be revealed at the individual level.

Table 2 displays the results of an actual classroom experiment performed at a major state university. It reveals that two investments were made but three sellers disclosed their asset type as being high. This indicates that one seller did not disclose truthfully. Note that the instructor should not present the data to the class as it is displayed in Table 2, because it might allow students to more easily discern which sellers might have been untruthful -- this would violate the anonymity required to properly administer the experiment.

Students calculate profits as shown below:

Seller Profit = Price Paid for Asset - Cost of Investment Made

Buyer Profit = Dividend - Price Paid for Asset

Thus, for Asset A, the seller's profit, assuming that an investment was made, is 85 – 20 = 65 (numbers are from Table 2). If the seller of Asset A did not make an investment, the profit is 85. The buyer of Asset A realized a loss of 85 (= 0 – 85).

3.2 Discussion

The parameters of this experiment have been chosen such that the investment yields an incremental increase in expected surplus to the economy. Without investment, each asset contributes an expected surplus of 10, which is the expected value of the dividend for a low-type asset (= .90(0) + .10(100)). If the seller makes an investment, the expected surplus is 70. This is the expected value of the dividend for a high-type asset of 90 (= .10(0) + .90(100)) minus the 20 cost of investment.

To illustrate the loss to the economy due to non-investment, instructors can use the results from the in-class markets, as shown in Table 2. The first calculation in the bottom panel of Table 2 shows the expected surplus if investments were made for all four assets, 280 = 4 assets at an expected surplus of 70 each. The second calculation shows the expected surplus given the investments actually made in the market. Two investments were made, so the expected surplus is 2(10) for the two low-type assets plus 2(70) for the two high-type assets, for a total expected surplus of 160. Thus, non-investment caused an expected reduction in surplus of 120 for this actual in-class market.

Class discussion should focus on why sellers might choose not to invest, to the detriment of the economy as a whole. One way to explain this is as follows. A seller can earn 20 more by not making the investment, but disclosing that an investment was made. This assumes that buyers will trust the disclosure, and bid high for high-type disclosures. Buyers, however, are aware that sellers can make untruthful disclosures, and would therefore bid as though the seller made no

investment. Sellers, suspecting this type of buyer behavior, would have no reason to invest.[6] This analysis indicates that the expected loss in surplus is 240, which is the total available surplus of 280 minus the expected surplus if no sellers invest of 40 (= (4)(10)).

One risk of using actual in-class market data is that the data might depart significantly from equilibrium predictions. For example, it is conceivable that all sellers would choose to invest, and there would be no loss in surplus. It is unlikely, however, that this would occur in all the markets that were conducted. If it did occur in all the markets, then the instructor should still guide class discussion as in the preceding paragraph.

In this market, as in the hidden information setting, a demand for verification services arises. If sellers could credibly signal the expected value of their asset, it would be worthwhile for them to make the investment. As with the hidden information market, students usually readily see this, and we find no need to conduct a market with auditing present. However, if instructors desire to demonstrate the role of auditing, market can be conducted with auditing present. To demonstrate the benefits of perfect auditing, before bids are collected on an asset some student-auditors can examine sellers' cards and report whether a seller's disclosure appropriately reflects the investment decision. To demonstrate imperfect auditing, the auditor could privately roll a die, reporting accurately for high-type disclosures only if the numbers two through six are rolled. For low-type disclosures, the auditor would always report accurately. The number of investments made in the non-auditing market (as in Table 2) can be compared with the number of investments made in the auditing market as another measure of the value of auditing.

In contrast to the hidden information setting, which is analogous to the IPO market, this experiment focuses on established entities where there is separation between managers and owners. The separation between ownership and management, which decreases the visibility of management actions, provided the rationale for auditing in its earliest phases (Pany and

[6] In the Table 2 market, bids for high-type assets were relatively high, indicating that buyers in general believed the sellers' disclosures. As described earlier, one of the disclosures was false.

Whittington, 1997, pp. 9-10). The experiment may be viewed as a facilitator for the discussion of the role of an independent auditor in the efficient use of economic resources.

4. Auditor Bidding

4.0 Learning Objectives

Unlike the hidden information and hidden action settings, where there are strong theoretical predictions supported by empirical studies, the incidence and ramifications of lowballing are unclear. For this reason, we provide a review of the research findings with respect to lowballing.

Intentional underbidding by auditors for clients, commonly referred to as lowballing, has been examined through theoretical analysis (DeAngelo, 1981; Dye, 1991; Kanodia and Mukherji, 1994), experimental markets (Schatzberg, 1990, 1994; Dopuch and King, 1996) and archival data (Simunic, 1980; Palmrose, 1986; Ettredge and Greenberg, 1990). The underlying assumption in most of these studies is that auditor switching involves transaction costs. For example, the new auditor faces various start-up costs in the initial year of an engagement, while the client faces search costs for the new auditor. In theory, an auditor rationally foresees that if he or she becomes the incumbent auditor, economic rents can be extracted from the client in future years, given the difficulty in switching auditors. Therefore, in a competitive market for audit services, the equilibrium bid is below the expected cost of the audit for the initial year of an engagement.

The chief concern of audit regulators and researchers regarding lowballing is its effect on auditor independence. The quasi-rents to be collected by the incumbent auditor in years subsequent to the initial year may be thought of as an implicit receivable from the client. The ability to collect this receivable depends on whether the auditor is retained. Auditors, fearing dismissal by the client, might be more willing to issue reports favorable to the client in the first year of an audit, thus compromising audit quality.

Given the lack of available archival data, empirical studies of the effect of lowballing on auditor independence have been conducted primarily within the laboratory. The results thus far

may be described as inconclusive. Schatzberg and Sevcik (1994) report impaired independence when the expected benefits of such impairment exceed the expected costs. Dopuch and King (1996) report a reduction in audit quality when lowballing is imposed on auditors, but not when lowballing emerges from market activity. Davis (1989) also reports a mild impairment of independence associated with lowballing. Given the restrictions used in both the Schatzberg and Sevcik and the Dopuch and King studies, and the lack of conclusive evidence found in the Davis study, the ability to generalize from these results remains in question.

In the experiment described below, we do not attempt to illustrate the effects of lowballing on auditor independence. Instead, we concentrate exclusively on the auditor bidding process for clients. The potential effects of auditor underbidding on how audits are performed are left for classroom discussion.

4.1 Procedures

4.1.1. Materials

For each market, the instructor prepares three index cards numbered from one to three.

4.1.2 Participants

The instructor distributes one index card to each of three students. These students are assigned the role of potential auditor. If instructors desire to include more students, teams of students may be used. The students are instructed as follows. A client has asked several auditors to submit bids for an audit engagement. The cost of the audit is known to be 50, and this cost is identical for each auditor. However, in the first year of the engagement, the auditor will incur an additional 50 as a start-up cost.

The bidding takes place in two-year rounds. In year one, there is assumed to be no incumbent auditor. Therefore, the auditor chosen for the engagement will incur 100 in costs. In the second year the incumbent auditor, if re-hired, will incur 50 in costs whereas any of the non-incumbent auditors will incur 100.

4.1.3 Market

Each year the three potential student-auditors submit bids for the audit fee. At the beginning of year one, the instructor requests that each auditor write down a bid on the index card. Bids should be written simultaneously and privately. The instructor then collects the index cards and informs the class of the winning (lowest) bid and the auditor number. In the case of ties, one auditor from among those tied is randomly chosen as the winning bidder. The first year profit for the chosen auditor is calculated as *Bid* - 100. All other auditors earn 0 for the period.

The instructor begins the second year by re-distributing the index cards to the auditors and requesting the submission of second-year bids. Bids are recorded as in the first year. The instructor collects the cards and informs the class of the winning bid and auditor. In the case of ties involving the incumbent auditor, the incumbent auditor retains the engagement. Auditor profits in the second year are *Bid* - 50 if the incumbent is re-hired, or *Bid* - 100 if a non-incumbent is hired.

We have found that it takes more than one round for low-balling to occur, so we suggest conducting several two-period rounds with the same student-auditors. If desired, another market with different auditors may be conducted. Results from an actual classroom experiment are shown in Table 3.

4.2 Discussion

In the experiment above, the emergence of lowballing is expected, as it is part of equilibrium behavior. The intuition, which should be discussed in class, is as follows. In year two, the incumbent auditor should bid 100; any bid below this amount will unnecessarily reduce second year profits. Any bid above 101 would allow non-incumbent auditors to undercut the incumbent auditors bid at a profit. Therefore, the expected profit to the incumbent auditor in year two is 50. Given that the value of incumbency in the second year is 50, an auditor should be willing to incur up to a 50 loss in the first year in order to gain the second year incumbency. Because any bid above 51 may be undercut for a positive expected two-year profit, the

equilibrium first year bid is 51. To summarize, we expect a first year bid winning bid of 51 and a second year winning bid, by the incumbent auditor, of 100, yielding a two-year profit of 1. The results in Table 3 for rounds 2 and 3 happened to closely mimic the theoretical expectations.

In the experiment, we have limited the role of the auditor to bidding. Further, the experiment is not designed to illustrate impaired independence, because it has not been consistently demonstrated that lowballing leads to impaired independence. However, instructors should ask students to discuss the possible effects of underbidding on auditor independence.

5. Auditor Response to Litigation

5.0 Learning Objectives

In recent years, audit firms have been increasingly vocal regarding the costs of litigation. Although the auditing industry has gained important victories in both court decisions and legislative acts (Cloyd et al., 1998), audit firms maintain that the cost of defending themselves against meritless suits remains exorbitant. Audit firms may therefore decide to settle less meritorious suits in order to avoid costly legal fees. However, audit firms must balance the cost savings from quick settlements against reputation effects, such as an increased belief by potential litigants that audit firms are easy targets (Alexander, 1991). In fact, auditors might find it beneficial in the long run to establish a reputation for fighting less meritorious lawsuits. In this experiment, students consider the conflict between early settlement of litigation and developing a reputation for fighting litigation.

The situation faced by auditors may be depicted as in Figure 2, which is based on a chain-store game (Selten, 1978) (see details in the Appendix). The plaintiff, who is assumed to have a weak case, must decide whether to sue the auditor-defendant; if he chooses not to sue (option *B*), he receives a payoff of 8 and the auditor receives a payoff of 4. If the plaintiff chooses to sue (option *A*), the payoff is contingent on what the auditor chooses to do. If the auditor chooses to fight (option *a*), the plaintiff receives nothing and the auditor receives a payoff of 1. The plaintiff's payoff is 0 because his case is weak and he loses the suit; the auditor's payoff is

relatively low because she incurs costs in defending the case. If the auditor decides to settle (option *b*), the plaintiff receives 16 and the auditor receives 2. The plaintiff receives a payoff greater than 8 because the weak case is not brought to trial and he receives the settlement amount. The auditor receives a payoff of more than 1 because she incurs no legal costs, but less than 4 because she has paid a settlement.

Often auditors may minimize their expected losses to a single litigant by quickly settling cases with the plaintiff, regardless of the merits of the case. However, such a strategy might encourage additional litigation to be initiated against the auditor. Instead, audit firms may choose to pursue a long-run strategy of vigorously defending themselves against litigation in order to discourage less meritorious suits from being initiated. The following experiment captures the auditor's tradeoff between short-term loss minimization and investing in a reputation for refusing to settle lawsuits out of court.

5.1 Procedures

5*.1.1 Materials*

No specific materials are required for this experiment. The instructor should present Figure 3 to the class and explain the payoff structure. Figure 3 is similar to Figure 2, with the labels changed.

5.1.2 Participants

The instructor selects one student to assume the role of the *Y* player (*Auditor-defendant*). The student remains in this role until the game ends. The remaining students in the class are *X* players (*Plaintiffs*). Teams of students may be used if desired. In this experiment we believe it is important to avoid role-playing, so we recommend that the players be abstractly referred to by the letters *Y* and *X*. Only after all rounds of all the auditor-litigation games should *Y* be equated with auditors and *X* with plaintiffs.

5.1.3 Game

Play proceeds as follows. At the start of each round, *Y* is matched with a different *X* player. *X* is asked whether he wants to choose option *A* or *B*. If option *B* is chosen the round ends, and players *X* and *Y* receive their payoffs (8 and 4, respectively). If, however, *X* chooses *A*, then *Y* chooses either *a* or *b*. The round then ends, with players receiving their payoffs.

The instructor then initiates another round. Students know in advance that there will be at least three rounds; that is, in each game, Player *Y* will encounter three *X* players with certainty. This gives the *Y* player a chance to develop a reputation for fighting, if she desires. After *Y* has met three different *X* players, a coin is flipped. If heads occurs, the game continues to the next round with *Y* and the next *X* player; if tails, the game ends. This procedure continues until a tail is observed.

This classroom experiment was recently conducted at a major state university. Five games were conducted. In order to involve the entire class, we formed a group of four *X* players who collectively decided upon a strategy. In two of the five games, the *Y* player succeeded in establishing a reputation for playing *a* given a choice of *A* by the *X* players. In these two games, *X* players chose not to sue (*B*) in subsequent rounds. In the other three games, the *Y* player made no attempt to establish a reputation, repeatedly choosing to settle (*b*) after a choice of *A* by the *X* players. This result may be viewed as typical, being consistent with laboratory experiments on reputation formation (King, 1996).

After the experiment was administered, we distributed a short questionnaire designed to gauge the effectiveness of the experiment in illuminating certain aspects of the underlying economic context of auditor litigation. We chose this particular experiment to administer the questionnaire because it was the only one of the four in which every member of the class participated. In addition, the game is the most abstract of the four experiments. This class contained 32 sophomores in the accounting honors program. More than 90% answered that (1) they had not given any thought to the issue of auditor litigation prior to participating in the

experiment, (2) participating in the experiment changed their view of how to play the game (relative to having the game described to them), and (3) participating in the experiment helped them formulate a view on how auditors should respond to litigation.[7]

5.2 Discussion

The game is introduced as context-free as possible to inhibit subject role-playing. For example, auditing students may have pre-formed notions as to the proper response of an auditor-defendant to a threat of litigation. After the experiment is concluded, the instructor should encourage class discussion regarding the comparability of the stylized setting used in the game and the litigation environment faced by auditors.

Class discussion should also include discussion of the role of reputation-forming. The instructor may accomplish this by comparing the single-round scenario with a repeated-round scenario. For the single round, the payoff structure in Figures 2 and 3 indicate that the auditor is best off if the plaintiff chooses not to sue (auditor payoff = 4). The plaintiff, however, is better off suing if he can be assured that the auditor will settle. The plaintiff knows that, given that he sues, the auditor has a higher payoff from settling, so the plaintiff is likely to sue. This analysis assumes that there is only one round; i.e., the auditor has no opportunity to develop a reputation for fighting.

If the auditor has a chance to develop a reputation for fighting, then a different equilibrium may exist. For example, there exists an equilibrium in which the initial plaintiff chooses to sue (option *A*), the auditor fights (option *a*), and subsequent plaintiffs choose not to sue (option *B*). (See the Appendix for the intuition behind this equilibrium.) Because plaintiffs eventually choose not to sue, the auditor is better off in the long run by fighting. The payoffs in Figures 2 and 3 give rise to this equilibrium, assuming that: (1) there are repeated rounds, (2) the auditor faces a different plaintiff in each round, and (3) the auditor's history of decisions are

[7] Four of the students indicated they did not fully understand the payoff implications or long term aspects of the game before they were asked to make decisions. Sixteen expressed confidence that auditors should establish a reputation for fighting to ward off future lawsuits.

known to the market. Note that in 2 of the 5 games we conducted, behavior consistent with this equilibrium occurred.

If one considers a lawsuit against an audit firm in isolation, without taking into consideration the effect on future litigation, auditors face considerable pressure to settle the case. For example, attorney fees for even a successful defense are exorbitant (Pany and Whittington, 1997, p. 135), the perceived quality of that firm's audits might be diminished by a highly visible trial, liability coverage is structured such that firms have an incentive to settle class-action suits (Alexander, 1991), and auditors may be concerned that juries will not understand the intricacies of the auditing environment. However, the threat of litigation is ongoing, and, owing to their size, quick settlements made by audit firms are likely to be publicized within the legal community. Hence, the auditor faces a conflict between early settlement of litigation and the determent of future legal actions from potential claimants. This experiment is designed to capture the essence of this conflict.

6. Additional Considerations

6.1 Anonymity

Experiments conducted by Hoffman et al. (1996) and Bohnet and Frey (1999), among others, have shown that participant behavior may be affected by the perceived degree of anonymity. These studies focus on settings wherein specific allowable behaviors are considered unethical. In contrast, classroom experiments pertaining to ethically neutral market behavior have been conducted, without consideration of student anonymity, as far back as Chamberlin (1948) and Smith (1962).

In the four games described above, only the moral hazard setting might appear to involve seemingly unethical behavior by the participants. Therefore, that experiment was developed in such a manner as to preserve participant anonymity to the greatest extent possible. Preserving anonymity in the other three experiments was not considered necessary.

6.2 Compensation

When conducting economic experiments for scientific purposes, participant remuneration should be both salient to the decisions being studied and dominant when compared to other incentives present (Davis and Holt, 1993, p. 24-6). Within reasonable bounds, classroom incentives should also satisfy these conditions. In general, instructors may choose from three forms of compensation for classroom experiments: monetary, extra credit, or hypothetical.

Recommendations in the literature regarding the use of monetary incentives in classroom experiments are not uniform. DeYoung (1993) points out that, because in classroom experiments participants do not have to be compensated for the opportunity cost of their time, monetary compensation can be considerably less than for experiments run outside the classroom. Moreover, Holt (1999) argues that explicit payments might not be necessary at all in the classroom. He purports that during classroom experiments students tend to act rivalistically with their classmates, perhaps even more so than in an isolated laboratory environment. Holt suggests that, if monetary incentives are to be used, the instructor should choose a single student at random subsequent to running the experiment, who would be paid a percentage of his or her experimental points.

The use of extra credit points as compensation might be more problematic. Although DeYoung (p. 341) states that "extra-credit points might also be an adequate incentive," Holt (p. 606) points out that, "The use of extra credit points as incentives becomes much more controversial because fairness becomes a constraint." He goes on to add that "the instructor might not want to base grade increments on trading skills or the cooperativeness of trading partners…"

Given these concerns over the use of monetary and extra credit rewards, and the apparent efficacy of hypothetical incentives in most circumstances, we recommend eschewing the use explicit incentives in all but the auditor litigation setting. In the first three settings, our experience is that hypothetical payments are sufficient to induce conscientious play. Further, unless all students participate in the experiment (see section 6.3), the use of explicit incentives is

inequitable. However, in the litigation setting, it is feasible to involve all of the students even in large classes. In addition, we have found student play to be over-aggressive in the litigation experiment, both from the *Y* player and the *X* players.[8] This may be indicative of a situation wherein incentives to "not lose face" dominate the small payments being offered.[9] We have found that when the game has been carried out using extra credit rather than hypothetical points, the results have been more consistent with the theoretical predictions.

6.3 Level of Student Participation

If possible, all students in the classroom should participate in the experiments. We observed that students put greater thought into the discussion when they had actually been actively participating in the experiments, consistent with the value offered by experiential learning. However, sometimes time constraints will not permit enough games to be played, and some students will act only as observers. We have noticed, however, that these students still derive benefit by witnessing the market behavior, and some of the observers are important contributors to the class discussion following the experiments. Based on our experience, all students, even those acting only as observers, can potentially benefit from these experiments.

6.4 Relation to other Classroom Auditing Experiments

Boylan (2000) has developed classroom experiments related to hidden information and hidden action. Our first two experiments are designed to illustrate the same points as Boylan's (2000), but can be integrated into the classroom more efficiently. For example, to conduct markets to illustrate hidden information using Boylan's trading markets (2000, pp. 56-57), both with and without auditing, takes two full class periods. Further, even after two class periods of markets, some students would never play the role of seller. Boylan's production markets, which illustrate hidden action, would take another two full class periods. In addition, the instructor set-up is much more time-consuming for Boylan's experiments. Finally, Boylan's experiments

[8] Our experience is that often the *Y* player tried to establish a reputation for fighting, but the *X* players continued to sue. However, when we used extra credit points, if the *Y* players established a reputation for fighting, the *X* players would not sue.

require the instructor to analyze the results outside class, prepare exhibits, and report the results during a subsequent class meeting. With the experiments described in the current paper, results are available immediately after the experiment has been conducted and can be discussed in class while the students are still engaged.

7. Conclusion

This paper presents four classroom experiments designed to enhance students' learning experience in auditing courses. Our goal in presenting these experiments is to increase student interest and understanding of the audit environment. The experiments presented herein may be used to introduce such topics as the social value of auditing, auditor liability, new client acquisition, and the importance of auditor independence.

[9] We have also used payment in the form of nickels as an incentive.

Table 1

Presentation of Results for Hidden Information Setting (Example)

	Asset 1	**Asset 2**	**Asset 3**	**Asset 4**	**Asset 5**	**Asset 6**
Buyer Value	50	25	50	100	50	25
Seller Value	40	20	40	80	40	20
Available Surplus	10	5	10	20	10	5
Sales Price	(Not Sold)	41	42	(Not Sold)	(Not Sold)	42
Seller Profit		21	2			22
Buyer Profit		<16>	8			<17>
Realized Surplus		5	10			5
Total Available Surplus = 60				Total Realized Surplus =		20
Note: Seller Profit = Sales Price – Seller Value; Buyer Profit = Buyer Value – Sales Price						

Table 2

Presentation of Results for Hidden Action Setting (Example)

Asset A	**Asset B**	**Asset C**	**Asset D**
Disclosure: High Sale Price: 85 Dividend: 0	Disclosure: Low Sale Price: 30 Dividend: 0	Disclosure: High Sale Price: 80 Dividend: 100	Disclosure: High Sale Price: 70 Dividend: 0
Total number of investments made = 2			
Total expected surplus if investment was made for all assets = 4(70) = 280 Total expected surplus given number of investments made = 2 (70) + 2 (10) = 160			

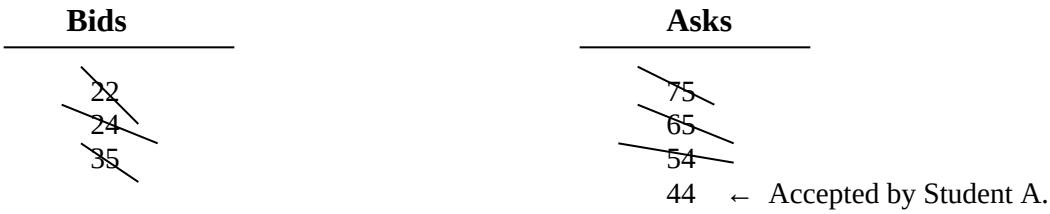
Table 3

Presentation of Results for Auditor Bidding Experiment (Example)

		Auditor-Bidder 1	Auditor-Bidder 2	Auditor-Bidder 3
Round 1	Year 1 Bids	85	120	80 Profit: <20>
	Year 2 Bids	101	110	85 Profit: 35
Round 2	Year 1 Bids	75	52 Profit: <48>	90
	Year 2 Bids	120	99 Profit: 49	100
Round 3	Year 1 Bids	54	55	52 Profit: <48>
	Year 2 Bids	100	100	99 Profit: 49

Figure 1

Presentation of Bids and Asks (Example)

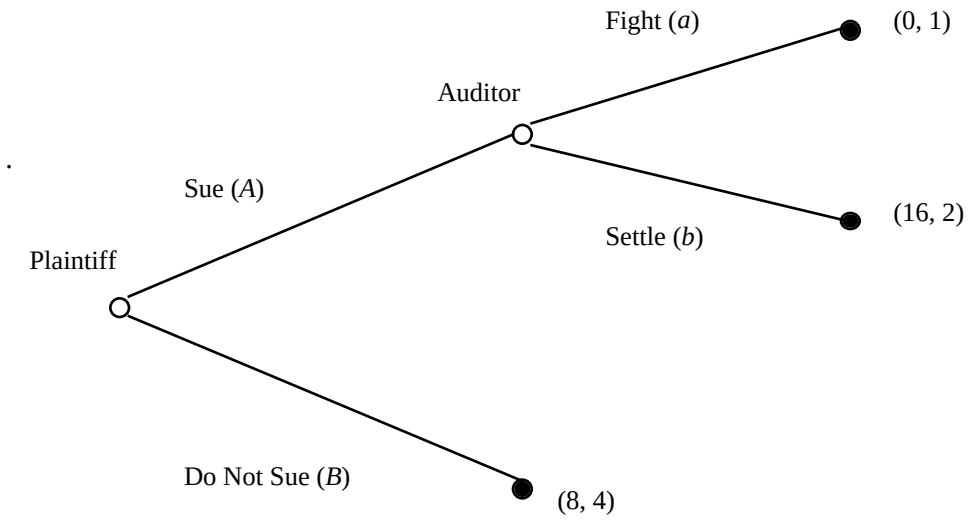


Note: Bids and Asks are recorded by the instructor as they are made in the market.

Superseded bids and asks are crossed out.

Figure 2

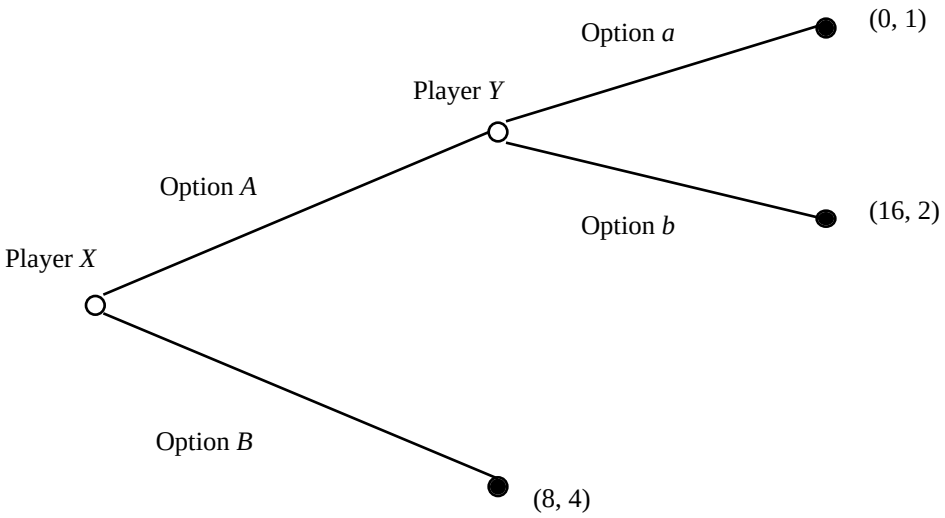
Auditor Litigation Game



Note: Parentheses contain plaintiff's payoff and auditor's payoff, respectively, for the given nodes. Open circles represent decision nodes; filled-in circles represent end-of-round nodes.

Figure 3

Payoff Structure for Use in Class



Note: Parentheses contain Player X's payoff and Player Y's payoff, respectively, for the given nodes. Open circles represent decision nodes; filled-in circles represent end-of-round nodes.

Appendix: Technical Discussion of the Auditor-Litigation Game

To illustrate the auditor's legal liability environment, we employ a form of the chain-store game (Selten, 1978), as in Figure 2, which has been modified for our purposes. In the chain-store game, a monopolist ("auditor" in the figure) operates in many different geographic markets. In each market there exists a potential entrant ("plaintiff" in the figure) who must decide whether or not to compete ("sue" or "do not sue" in the figure) with the monopolist. Given the entrant has decided to compete, the monopolist may either fight (e.g., lower prices, increase advertising) or acquiesce ("settle" in the figure). If played only once, the unique subgame perfect equilibrium has the entrant competing and the monopolist acquiescing. That is, the entrant chooses *A*, and the monopolist chooses *b*. In a single play of the game, a threat by the monopolist to choose *a* is not credible for the following reason. Given that the monopolist has the opportunity to make a choice, *b* yields a greater payoff than *a*. Therefore, only the choice of *b* is sequentially rational.

However, if the game is repeated for an unknown number of iterations, each time with a new potential entrant who is aware of the monopolist's history with previous entrants, alternative equilibria may exist. The equilibrium of greatest interest is one in which the monopolist would fight any entrant who competes and entrants, recognizing this threat is credible in the unknown horizon game, never compete. The existence of this equilibrium is dependent on the probability of the game continuing and the payoff structure. In this formulation, we propose the following alternative solution: the entrant chooses *B*, if no choices of *b* have been observed in the past; otherwise, the entrant chooses *A*, and the monopolist chooses *a*. This proposed solution is also a Nash equilibrium, and further, it is subgame perfect. Roughly the intuition is as follows: if entrants believe the monopolist player will choose ***a*,** entrants clearly have incentives to choose *B*. Since the monopolist never makes a choice, this constitutes a Nash equilibrium. If play deviates from the equilibrium path, the monopolist must choose between *a* and *b*. *A* choice of *b* yields 2 in the current period, but since reputation for fighting has been contradicted, we may assume a stream of 2-point payments in the future, yielding an expected value of $2 + 2*(1/2) + 2*(1/2)^2 \ldots$

= 4. A choice of *a* will yield 1 in the current period, but with the maintenance of the monopolist's reputation we may assume a stream of 4-point payments in the future, yielding a present value of $1 + 4*(1/2) + 4*(1/2)^2 \ldots = 5$. Therefore, the equilibrium is subgame perfect.

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