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Signal jamming models of fraudulent misreporting and economic prospects: An experimental investigation☆

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ABSTRACT

This study uses experimental methodology to examine how the frequency and magnitude with which managers commit fraud varies with economic prospects (Boom, Middle and Bust). The experimental design is based on signal-jamming equilibrium (SJE) models of fraud in which managers make potentially inaccurate public reports and investors bid on shares. Under SJE, managers always exaggerate reports by a fixed amount up to the maximum possible report, independent of the truth. Shareholders can perfectly correct managers' reports (except for the maximum possible report). In contrast, the results of the experiment show four robust deviations from SJE predictions: (1) managers exaggerate and shareholders correct reports according to dominated mixed-strategies with probabilities significantly less than one, (2) managers exaggerate more frequently and by more when outcomes are poor, (3) shareholders adjust low reports by less than high reports, and (4) shareholders correct relatively high reports by more in booms than busts even though managers' reporting strategies are invariant to economic prospects.

1. Introduction

The manipulation of corporate disclosures has long been an important issue in accounting, finance, and economics.[1] The high-profile cases of fraudulent misreporting (e.g., Enron, WorldCom, Tyco) and the passage of the Sarbanes-Oxley Act of 2002 renewed academic interest in models of manipulation/fraud. The largest class of manipulation models (including, e.g., Dutta and Fan, 2014; Laux and Laux, 2009; Crocker and Slemrod, 2007; Goldman and Slezak, 2006; Liang, 2004; Dutta and Gigler, 2002; Feltham and Xie, 1994) consists of those that have signal-jamming equilibria (SJE), as in Fudenberg and Tirole (1986). A key feature of SJE is that managers' manipulations are ineffective in equilibrium because the intended victims expect manipulation and simply adjust the managers' signals by the equilibrium amount of manipulation. Although ineffective, managers manipulate in equilibrium, since if they didn't their signals would still be adjusted. An important implication

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[1] See, e.g., Dye, 1988; Feltham and Xie, 1994; Healy and Wahlen, 1999; Kothari, 2001; Dutta and Gigler, 2002; Goel and Thakor, 2003; Liang, 2004; Goldman and Slezak, 2006; Chen, Hemmer, and Zhang, 2007; Crocker and Slemrod, 2007; Povel, Singh, and Winton, 2007; Peng and Röell, 2008; Kedia and Philippon, 2009; Kumar and Langberg, 2009; Laux and Laux, 2009; Dechow, Ge, and Schrand, 2010; Beyer, Guttman, and Marinovic, 2014; Dutta and Fan, 2014).

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of this key feature is that, in equilibrium, firm values are "fair," reflecting the truth, even though disclosures do not. In this paper, we examine whether these fundamental features of SJE can be replicated in an experimental setting. To our knowledge, this is the first study to provide direct experimental evidence regarding whether subjects adopt the strategies indicated by and used in signal jamming models of corporate manipulation.[2]

It is important to establish whether SJE are predictive because the "fair price" result has important implications with respect to investor welfare and regulation. The first policy implication of SJE is that outside investors do not need protection since prices are fair. But, since manipulation can be costly to the firm (e.g., the manager distorts other productive actions in order to manipulate), the second implication is that current owners of the firm have an incentive to control manipulation internally. These implications may need to be reconsidered if managers and shareholders fail to manipulate or correct as predicted.

Our experimental game was designed to isolate managers' fraudulent behavior and shareholders' ability to adjust, abstracting away from additional features of manipulation models (such as incentive contracting and strategic monitoring). Specifically, the manager in our game privately observes the realization of a random component of the future payoff on an asset; hereafter, we refer to this realization as the manager's information. After observing the information, the manager makes a report of its value to the shareholder. The report does not have to be accurate, but inaccurate reports are costly to the manager (e.g., as with the expectation of a penalty for being caught having committed fraud). The shareholder then bids to purchase the manager's share. When determining what to report, the manager must balance the possible increase in the price he or she receives for the share against the cost of inaccuracy. Given the manager's report, the shareholder then must decide how much to bid for the asset given their beliefs about the manager's incentive to bias their reports. The equilibrium is such that, for all but the top-most realizations of information, managers exaggerate reports by a fixed amount (related to the penalty parameter only) and shareholders adjust the reports accordingly.

Our experimental results indicate that SJE only partially characterizes the behavior of both managers and shareholders. Consistent with SJE, managers inflate and shareholders deflate reports on average. However, both managers and shareholders robustly deviate from the predictions of SJE in systematic ways. In particular, although mixed strategies are dominated by pure strategies, most managers adopt strategies that mix between being truthful and misreporting. Most shareholders also mix between believing and adjusting reports. Few managers or shareholders behave exactly as predicted by the theory, even after the subjects have experienced a significant number of rounds in which to understand the game. These deviations from the SJE prediction are important because, with mixed strategies, the prices of assets realized in the market are excessively volatile. Asset prices are too low when shareholders adjust down accurate reports and too high when shareholders fail to adjust inflated reports.

We also find prices are biased. In particular, although the manager's manipulation should be a constant independent of his/her information for all but a top set of values, we find a relationship between the level of the managers' information and the tendency to misreport for information values not in the top set. Specifically, when information is low, managers inflate reports more often, and by a greater amount, than predicted by SJE. Also contrary to SJE predictions, shareholders are unable to adjust the managers' reports either by the amount predicted by the SJE or by the amounts by which managers actually manipulate. The mismatch between manipulation and correction also depends upon the level of information. For example, managers exaggerate by more (less) but shareholders correct by less (more) when the manager's information is low (high). This results in asset values that are overvalued (undervalued) when outcomes are low (high). Thus, the fair price implication of SJE is not borne out in the experiment. This result suggests that public policy designed to protect outside investors can have value in actual markets even though SJE models do not prescribe such protection.

Although our experiment cannot directly tell us why inflated reports are more likely when the managers' receive bad news (i.e., a low information value), one plausible explanation is suggested by behavioral regularities documented in Harris and Bromiley (2007). Harris and Bromiley show that discrepancies between performance and aspiration levels are associated with a greater frequency of financial misrepresentation. When a manager performs much worse than he or she had anticipated, misconduct is more probable. Perhaps this idea also applies to bad luck. In the context of our experiment, a manager may feel more justified inflating their reports if he or she has been a victim of bad luck in that the value of the share they are going to sell is lower than its expected value.

To investigate this possibility, we examine how the magnitude and frequency of fraud and report correction varies by the distribution of prospects. We examine fraud under three different information distributions: Bust (when poorer outcomes are more likely), Boom (when poorer outcomes are less likely), and Middle (when good and bad outcomes are equally as unlikely relative to middle outcomes). We document that managers maintain a similar relationship between magnitude and frequency of fraud as a function of realized information in Booms, Busts, and Middle treatments. Thus, since a manager should be less surprised (and thus, less disappointed) by a low information draw in a Bust, that manager should manipulate less in a Bust than in the other cases if the effect highlighted in Harris and Bromiley (2007) exists. Since there is no

[2] There are many experiments that examine behavior in general sender/receiver games (e.g., Dickhaut, McCabe and Mukherji, 1995; Blume, DeJong, Kim, and Sprinkle, 1998; Blume, Dejong, Neumann, and Savin, 2002). In addition, there are many experiments that concern fraud but do not examine the signal-jamming feature. For example, many experiments can be found in the accounting literature on auditing and tax compliance that consider fraud given differences in oversight and context (see, for example, Beck, Davis, and Jung, 1991; Alm, Jackson, and McKee, 1992; Blumenthal, Christian, and Slemrod, 2001; Slemrod, Blumenthal, and Christian, 2001; Wu, Vandervelde, and Lopez, 2005; Kleven, Knudsen, Kreiner, Pedersen, and Saez, 2011).

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