The Merits of a Pass-Fail Audit Report: An Experimental Investigation of Alternatives to the Must-Pass Model

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ABSTRACT

To protect investors, the SEC requires publicly-traded companies to have an unqualified audit opinion associated with that company's financial statements. In contrast, investors demand more gradient information in audit reports. We conduct an experiment in the tradition of experimental economics that models the current must-pass market and compares it to two alternatives: (1) a true pass-fail market in which auditors can choose between a positive or negative audit opinion, and (2) a gradient market in which auditors can issue a more continuous assessment, rather than a discrete pass-fail opinion. We find no differences between investor decisions in the must-pass and pass-fail markets. However, investors make less efficient and more suboptimal decisions when audit reporting is more gradient compared to the other conditions. Our findings suggest both that investors' demands for more gradient audit information may be misguided and that regulators' prohibition against qualified audit opinions may be unwarranted.

I. INTRODUCTION

Audit standards establish a "pass-fail" opinion model, where the auditor issues an unqualified opinion when they obtain reasonable assurance that the financial statements are free of material misstatements and issues a qualified or adverse opinion when they are materially misstated. While PCAOB standards allow for qualified or adverse opinions, the Securities and Exchange Commission (SEC) will not accept financial statement filings that include an audit opinion other than an unqualified audit opinion (Keyser 2022), effectively instituting a "must-pass" model on public companies in which auditors choose between forcing companies to book audit adjustments, forcing companies to delist, or declining to pursue adjustments and simply issuing an unqualified opinion, all of which prevent investors from seeing alternative audit outcomes. We experimentally investigate manager, auditor, and investor behaviors under the current must-pass model and compare investor reactions to reported information in that model to two alternatives: (1) a true pass-fail market in which auditors can issue either a positive or negative audit opinion to investors, and (2) a market in which auditors choose opinions from a more gradient continuum rather than make a binary pass-fail choice.

Studying alternatives to the current must-pass model is important due to conflicting opinions held by the SEC and other stakeholders regarding audit reporting. On one hand, the SEC views financial statements accompanied by anything other than an unqualified opinion as misleading to investors (SEC 1938; Keyser 2022), and it prioritizes investor protection over concerns that the must-pass model limits auditor options during negotiation (Cipriano, Hamilton, and Vandervelde 2017). On the other hand, academics (e.g., Christensen, Neuman, and Rice 2019), audit regulators (e.g., Goelzer 2011), and investors (e.g., CFA Institute 2018) frequently claim that even a "binary" or "pass/fail" audit report would be insufficiently informative were auditors of public companies allowed to communicate "failures" to investors. These concerns

have led some investors to call for more gradient audit reporting, such as multiple levels within the audit report or a 1 to 10 rating for management's reporting aggressiveness (Carcello 2012). In other words, SEC rules imply a true pass-fail model goes too far and could cause investors to make worse decisions. In contrast, investors believe a pass-fail model does not go far enough, and some propose that a more gradient model would allow them to make better decisions. Our study provides evidence on the relative merit of each position.

We explore alternatives to the must-pass model with an online, interactive, incentivized experiment, conducted under the traditions of experimental economics, allowing us to test the effects of policies not yet implemented in practice while holding other factors constant (Kachelmeier and King 2002). Our experiment incorporates six periods of a three-player investment game. In the game, managers and auditors first engage in up to three rounds of negotiation regarding a reported asset value. If no agreement is reached, the period ends and the auditor and manager receive a penalty, analogous to the negative outcomes that come from delisting. If an agreement is reached, the auditor issues an opinion regarding the reasonableness of that reported value. The reported value and audit opinion are then provided to an investor, who chooses how much to invest in the asset. Players are compensated based on the outcomes of the game such that managers prefer more aggressive reporting, auditors prefer less aggressive reporting, and investors prefer to invest the maximum in high-value assets and the minimum in low-value assets.

We manipulate the audit reporting model between participant triads in a 1×3 design. In the *Must-Pass* condition, the only audit opinion the auditor can provide to the investor is that the reported asset value is "reasonable." This condition is analogous to the current SEC rules, in which companies only file financial reports with unqualified audit opinions, meaning that

auditors who view financial reporting as unreasonable can either compel managers into a more reasonable position through negotiation, force the company to delist, or issue a clean opinion on statements they view as unreasonable. In the *Pass-Fail* condition, the auditor may opine that the reported asset value is "reasonable" or "not reasonable," and *either* of these outcomes are provided to the investor along with the reported value. This condition is analogous to the regime described by current PCAOB standards, in which auditors choose to issue either an unqualified or a qualified/adverse audit opinion and investors are not restricted to seeing only the former. In the *Graded* condition, the auditor does not provide a categorical opinion but instead rates their belief about the reasonableness of the reported value on a scale of one to ten, where a rating of ten (one) indicates the reported asset value is the "most reasonable possible" ("least reasonable possible").

The *Pass-Fail* and *Graded* conditions introduce variation in audit opinion outcomes that investors in those conditions can use to inform their investment decisions. However, investors should not necessarily invest more (less) in an entity based on the positive (negative) nature of audit opinion alone. Rather, their investment choices should jointly incorporate the entity's reported value and the auditor's assessment of it. For example, if a manager reports low economic value, a risk-neutral investor should view a clean audit opinion as confirming that the company is a bad investment. In contrast, if a manager reports high economic value, a clean audit opinion should encourage investors, while a non-clean opinion would deter investors. Therefore, a proper reaction to variation in audit opinions should be conditioned on the reported value, leading to changes in how responsive investors are to financial information overall.

To form predictions about how the alternative audit reporting regimes would influence investor reactions, we consider prior research that finds differences in how people react to

categorical versus continuous measures. While a more gradient audit opinion should provide investors with more precise information, psychology research suggests that people struggle to interpret continuous measures (Isaac and Schindler 2014; Fisher and Keil 2018). We propose that gradient audit opinions will be relatively more difficult than binary opinions to incorporate with reported values, leading investors to simply react to reported values and audit opinions independently. Given that auditors are likely to assess more conservative values as more reasonable, this would lead to more (less) investment in assets with a lower (higher) reported value in the *Graded* condition relative to the other conditions. In other words, investors should have a weaker reaction overall to variation in the reported values in the *Graded* condition. In contrast, we expect investors to process a binary *Pass-Fail* opinion more easily, and that the presence of a failure option in the *Pass-Fail* model will make clean opinions on higher reported values more credible, leading *Pass-Fail* investors to have stronger reactions to variation in reported values.

Consistent with our predictions, we find that investor decisions are less responsive to changes in reported values in the *Graded* condition relative to the *Must-Pass* condition. Contrary to our predictions, we find no difference in investor reactions to reported values between the *Must-Pass* and the *Pass-Fail* conditions; however, supplemental analysis suggests that investors incorporate the binary audit opinion more effectively than the graded opinion. Specifically, when the opinion is binary, investors only react to audit opinion variation when the reported value is high. In contrast, when the opinion is gradient, investors simply invest more (less) in assets where auditors have assessed higher (lower) ratings of reasonableness. In combination with auditors assessing higher reasonableness to more conservative reported values, this leads to less overall investor reaction to reported values in the *Graded* condition. We further find that our

manipulation of audit reporting regime does not influence reported values, leading investors in the *Graded* condition to make more suboptimal decisions relative to both the *Must-Pass* and *Pass-Fail* conditions. Notably, we find no evidence that *Pass-Fail* audit opinions lead to worse investor decision-making relative to a *Must-Pass* regime.

Our findings contribute to both research and practice. Regarding research, we contribute to prior work that finds processing costs sometimes prevent disclosure from having its intended effects (see Blankespoor, deHaan, and Marinovic 2020 for a recent review). We contribute to this literature in two primary ways. First, we study how a change in *audit* disclosure may not be efficiently integrated into assessments of a financial report, rather than changes in the financial report itself. Second, prior research in this area finds that financial statement users struggle to integrate more complex, voluminous disclosures (e.g., Kielty, Wang, and Weng 2023) or disclosures with otherwise high processing costs (Even-Tov, Su, and Wang 2024). We demonstrate that for audit disclosures, even a change to a relatively simple gradient report (i.e., a 1 through 10 scale) can impede proper integration of the audit opinion into investment valuation. This finding is especially relevant as advanced technology, such as artificial intelligence, makes longer and more verbose disclosures easier to summarize into simple gradient scales.

We also contribute to the literature on audit reporting. While research on audit reporting has typically focused on stakeholders reactions to additional information in the audit report, such as critical audit matters (e.g., Brasel, Doxey, Grenier, and Reffett 2016; Gimbar, Hanson, and Ozlanski 2016; Brown, Majors, and Peecher 2020; Kachelmeier, Rimkus, Schmidt, and Valentine 2020; Backof, Bowlin, and Goodson 2022), this research holds the auditor's opinion on the reasonableness of the financial statements constant. We relax this constraint by allowing auditors to issue opinions indicating a lack of reasonableness in the financial statements within

both a true pass-fail report and a more gradient report, directly comparing these regimes to the must-pass model.

Finally, we contribute to practice by informing regulators and standard-setters about the potential consequences of changing the audit opinion. Using a controlled experiment, we are able to test the effect of different audit reporting models on investor decisions across different regimes while holding constant other key factors, such as auditor incentives to constrain aggressive reporting. Notably, while SEC rules advocate limiting the variation in audit opinions investors see, our experimental results suggest allowing variation does not necessarily harm investors as long as that variation is clearly binary in nature. Thus, allowing auditors to issue a "failing" opinion on the financial statements could strike the best balance between information richness and not leading investors astray.

II. BACKGROUND & HYPOTHESIS DEVELOPMENT

Auditors are responsible for expressing an opinion on whether the financial statements are free of material misstatements. If auditors believe the financial statements are materially misstated, PCAOB standards allow them to depart from the standard unqualified opinion and instead give an opinion reflecting that misstatement.[1] However, the SEC requires companies to file financial statements accompanied by an unqualified audit opinion due to SEC concerns about protecting investors from potentially misleading financial statements (Butler, Leone, and Willenborg 2004; Keyser 2022). While the SEC can hypothetically allow exceptions on a case-by-case basis (e.g., Keyser 2022), Cipriano et al. (2017) find that only eight public companies

[1] While stakeholders often refer to this as a "pass/fail" model, an audit opinion that identifies a material departure from GAAP could either be "qualified" or "adverse" depending on the pervasiveness of the identified issue. Given the low degree of gradience between these options, we consider the model described by PCAOB standards to be closer to a pass-fail model than a truly gradient audit opinion and, consistent with other stakeholders, refer to the PCAOB model as pass-fail throughout this manuscript.

received qualified audit opinions between 2000 and 2015. Such infrequent occurrences of qualified opinions show that the SEC's rules effectively institute a must-pass reporting model in the United States, where auditors who believe they have detected a material misstatement either (1) convince management to make corrections, (2) force both the company and the auditor to face extreme negative consequences in the form of delisting, or (3) acquiesce to management and issue an unqualified opinion.[2] This means that investors are unable to observe variation in audit opinions, i.e., all potential investments receive a "pass" opinion.

Interestingly, while the SEC seems to believe that accepting financial reports with a "failing" audit opinion goes too far, many audit stakeholders believe it does not go far enough. Academics (e.g., Vanstraelen, Schelleman, Meuwissen, and Hofmann 2012; Christensen et al. 2019), audit regulators (e.g., Goelzer 2011), investors (e.g., CFA Institute 2018) and even the courts (Weil 2023) have all claimed that a "binary" or "pass/fail" audit report is insufficiently informative. Consistent with these criticisms, some investor advocates have called for more gradient audit opinions to replace the current reporting model. In a PCAOB's Investor Advisory Group survey of audit stakeholders, 45 percent of respondents expressed support for an audit report that provided multiple opinion levels, and 42 percent supported auditors providing a 1-10 scale grading management's aggressiveness (Carcello 2012). Ninety percent of surveyed CFA Institute members support an auditor assessment of the *quality*, not just the acceptability, of management's accounting (CFA Institute 2011). Such a quality-based assessment implies gradience beyond a "pass" opinion, as best reflected in one CFA member's response: "the report

[2] While acquiescence is clearly undesirable, both experimental studies (e.g., Kachelmeier and Rimkus 2022) and archival evidence (e.g., Choudhary, Merkley, and Schipper 2022) suggest that auditors, at least at times, will fail to impose adjustments for known accounting issues.

should require [the] auditor to 'grade' management in some more precise manner" (p. 7).[3]

Changes to the Auditor Report

While the SEC's must-pass mandate remains in place, the PCAOB has adopted changes to the audit report to increase its informativeness (Church, Davis, McCraken 2008). One notable change is the disclosure of Critical Audit Matters (CAMs). Various studies have examined the impact of CAMs on financial reporting (e.g., Reid, Li, Carcello, Neal, and Francis 2019; Bentley, Lambert, and Wang 2021), auditor liability (e.g., Gimbar et al. 2016; Kachelmeier et al. 2020; Backof et al. 2022), and investor behavior (e.g., Christensen et al. 2014). However, CAMs only highlight areas that challenged the auditor, and the auditor is required to describe how they overcame these challenges in order to still "pass" the client, meaning that all audit opinions with CAMs still offer the same level of assurance over the underlying financial statements.[4] Overall, while the PCAOB's recent efforts have changed the content and format of the audit *report,* the audit *opinion* itself remains unaltered.

Prior Research on Departures from Unqualified Audit Opinions

While the SEC historically has never allowed financial statements with audit opinions qualified due to material misstatement, it has previously accepted financial reports accompanied by audit opinions qualified for reasons other than misstatement (e.g., auditor doubts about the company's ability to continue as a going concern, the presence of uncertainty due to contingencies, and inconsistencies due to appropriate changes in accounting principles).[5] While prior research suggests such qualifications can impact financial statement user decisions (e.g.,

[3] Notably, not *all* investors and financial statement users necessarily demand more gradient information (Ariel-Rohr et al. 2024). The fact that prior surveys and interviews suggest a degree of conflict in the investment community over these issues further motivates research that evaluates the merits of opposing positions.
[4] This is a plausible reason why investors do not "react" to the presence of CAMs or feel they provide incremental information, on average (Burke, Hoitash, Hoitash, and Xiao 2023).
[5] In the past, auditing standards allowed for opinions to be qualified for reasons other than GAAP departures or scope limitations, although these were eliminated by SAS No. 58 in 1988 (Keyser 2022).

Dodd, Dopuch, Holthausen, and Leftwich 1984; Choi and Jeter 1992; Menon and Williams 2010; Chen, He, Ma, and Stice 2016), these studies do not address qualifications for unreasonable or otherwise misstated financial information.

Other studies have explored the impact of audit opinions qualified due to misstatement on user choices in non-US markets (e.g., Chen, Su, and Zhao 2000). However, such studies are set within a single regulatory regime and do not generally allow for cross-sectional tests of the effects of varied audit reporting regimes while controlling for likely confounds. Additionally, none allow comparisons to a gradient audit opinion regime. This further motivates the experimental approach we take in the current study, in which we can directly compare the current must-pass audit reporting regime to both a hypothetical pass-fail regime *and* a more gradient audit reporting regime. Finally, under our experimental approach, all auditor, manager, and investor choices are incorporated and observable, allowing us to examine how and why the various audit reporting regimes influence all three parties.

Hypothesis Development

For hypothesis development, we consider a simple setting in which participants review two sources of information: reported values (i.e., financial statement information) and audit opinions. In a must-pass regime, financial statements vary in the degree to which they suggest the company is a good or a bad investment, i.e., higher or lower in reported value. Given that the audit opinions are a constant in a must-pass regime, we expect investors to respond to variation in reported value with more or less willingness to invest. In our hypothesis development, we consider how introducing alternative regimes would change investors' overall responses to the reported values.

Effect of a Pass-Fail Audit Report on Investor Reactions to Reported Values

We theorize that a pass-fail regime could lead to more responsive investment decisions when reported values vary due to the failing option making "pass" outcomes more credible. Cipriano et al. (2017) model the "must-pass" regime in auditor negotiation, suggesting that such a regime results in a "Rotten Kid" game where auditors are not able to credibly threaten clients with a qualified audit opinion. Cipriano et al. (2017) argue that this could lead to auditors giving unqualified opinions to misstated financials. In a pass-fail regime, auditors could still face incentives to maintain financial reporting quality and constrain overreporting (DeFond, Lennox, and Zhang 2018) but also have the option to issue negative audit opinions, giving them an additional source of leverage in negotiation. To the extent a pass-fail regime affords auditors more leverage (Cipriano et al. 2017), and leverage leads to auditor-preferred outcomes in negotiation (Brown and Wright 2008; Salterio 2012), investors could anticipate this effect through backwards induction and have more confidence that higher reported values with clean opinions are accurate. Assuming that most audit opinions in a pass-fail market "pass," this would make them more positively responsive to increases in reported values in that market.[6] Formally,

> **H1:** Investment decisions will be more positively responsive to financial reporting values under a pass-fail audit reporting regime than a must-pass reporting regime.

While H1 suggests that variations in audit opinions could make investors more positively responsive to variations in reported values, we next consider the possibility that any such variation would have a different effect if the audit opinion was more gradient, rather than binary.

[6] In contrast, if most high reported values in a pass-fail regime are accompanied by "failures," it would work against our prediction. Our setting assumes that auditors face strong enough incentives to constrain aggressive reporting by managers across audit regimes to prevent this outcome. We account for this in analysis with a supplemental test that excludes failing audit opinions to test if H1 is supported when only examining clean opinions.

Effect of a Gradient Audit Report on Investor Reactions to Reported Values

An audit opinion setting is unique from other settings in that audit opinions are evaluations of another party's reporting, rather than a rating for the underlying consumer products or assets. Specifically, managers claim a specific value for their economic assets and activities, and auditors determine if that value is reasonable based on financial reporting standards.[7] Recall our simple setting in which an investor sees two factors: reported values and audit opinions. When audit opinions can vary in this setting, investors should not necessarily invest more (less) in an entity based on a positive (negative) audit opinion alone. Rather, their investment choices should incorporate both the reported value of the entity *and* the auditor's opinion, effectively conditioning their reaction to the audit opinion on the reported value. For example, if an entity reports low economic value, a risk-neutral investor should view a clean audit opinion as confirming that the entity is an unattractive investment, i.e., they should not react positively to the audit opinion. In contrast, if a company reports high economic value, a clean audit opinion should encourage investment, while a non-clean opinion should deter investors.[8]

Given that investors should incorporate variation in the audit opinion with the reported values, we consider whether the categorical versus continuous nature of that variation could interfere with that incorporation. In general, even when continuous measures provide more

[7] Because auditors technically assess adherence to financial reporting standards (Kinney and Palmrose 2018), it is possible that to the extent financial reporting standards do not encourage accurate reflections of economic reality, then auditors' assessment of a financial report's "reasonableness" has little to do with the true value of the underlying assets and operations. Any potential disconnect between accounting standards and economic reality is beyond the scope of our research, and our experiment assumes that assessments of a financial report's "reasonableness" is unaltered whether that assessment concerns reporting standards or economic reality.

[8] One can model the proper incorporation as follows: if investment (I) is influenced by reported values (R) and audit opinions (A), then an investor for whom $I = R + A$ is not properly incorporating the audit opinion with the reported value. Rather, proper incorporation of the audit opinion requires an interaction term ($R \times A$), with the reaction to the opinion conditioned on the reported value.

precise information, people tend to struggle with interpreting and reacting to these measures relative to binary and categorical information (Medvec and Savitsky 1997; Isaac and Schindler 2014; Fisher and Keil 2018; Fisher, Newman, and Dhar 2018). Given that complex problems tend to lead to simpler decision rules (Kahneman and Frederick 2002), we believe that failing to incorporate the opinion with the reported value could lead to simply reacting to the two factors independently, i.e., investment will be positively associated with both variation in the audit opinion and the reported values.

If investors simply invest more in entities that receive more reasonable ratings from auditors in a gradient reporting regime, this could lead to investors being *less* responsive to reported values overall due to *auditor* behavior. Specifically, auditors are likely to consider more conservative reporting values to be more reasonable (Canace, Hatfield, and Jackson 2016; Chy and Hope 2021; Hatfield, Mullis, and Trotman 2022), meaning that higher (lower) reported values should be accompanied by lower (higher) auditor ratings for reasonableness.[9] Taken together, if reported values and audit opinions are negatively correlated in a gradient regime, and investors react to the two factors independently, the offsetting effects would mute the overall investment response relative to other regimes.[10] Formally,

> **H2:** Investment decisions will be less positively responsive to financial reporting values under a gradient audit reporting regime than a must-pass or pass-fail reporting regime.

An alternative mechanism by which we could observe support for H2 is that investors in a gradient regime, who struggle to incorporate the audit opinion and the reported value together,

[9] Such a preference for conservatism could even be enhanced under a gradient regime, given that less extreme reactions to continuous assessments as opposed to distinct categories (Medvec and Savitsky 1997; Kachelmeier et al. 2020), an auditor could feel more comfortable slightly lowering a reasonableness rating for a higher reported value than going to the extreme of an "unreasonable" rating.

[10] Extending the previous model example provided in Footnote 8, if investor decisions are characterized as independently reacting to *R* and *A* such that $I = R + A$, but *R* is negatively correlated with *A*, then investor reactions should be muted relative to a regime where *A* is constant and investors only respond to *R*.

react by simply ignoring both and being unwilling to invest, regardless of variation in the inputs. While this process would also lead to support for H2, individuals in uncertain economic settings tend to be "cursed" with incremental knowledge (e.g., Camerer, Loewenstein, and Weber 1989), making it difficult to ignore information that is plainly available to them even if it is beneficial to do so. Nonetheless, we address the alternative possibility of simply ignoring information in our tests of the behavioral mechanism, where we statistically model the incorporation of both audit opinion variance and reported value variance in investor decisions.

Effect of Alternative Audit Report Regimes on Reported Values and Suboptimal Investment

Given our predictions from H1 and H2 that a pass-fail (gradient) audit reporting regime will cause investors to react more (less) to changes in reported values compared to a must-pass regime, we are naturally interested in whether this proposed change in investor behavior is maladaptive. Whether changing investor reactions is optimal ultimately depends on whether the audit reporting regime is also changing the accuracy of the reported values relative to their true underlying value. For example, if investors respond less to changes in reported values but the reported values are also becoming less reliable indicators of the entity's true value, then investors' behavioral changes could be adaptive.

It is not clear *ex ante* whether a change in audit reporting regime alone would also change the reported values of market assets. On one hand, to the extent that categorical differences introduce stronger reactions than gradient scales (Medvec and Savitsky 1997; Kachelmeier et al. 2020), it is possible that more gradient audit reporting could weaken auditors during auditor-manager negotiation. For example, managers could be more anxious about receiving "fail" opinions than receiving a lower gradient rating. On the other hand, to the extent that auditors' incentives to maintain financial reporting quality remain constant, these incentives could crowd

out any behavioral effects from changes in audit reporting regime. Further, Cipriano et al. (2017) suggest that a must-pass regime could actually lead to less accurate reported values than a regime where auditors have more reporting options. As such, we pose two research questions to address the potential for changes in audit reporting to change both (1) reported values and (2) the optimality of their investment decisions.

> **RQ1:** Do changes in the audit reporting model change the reported values that auditors and reporters agree upon?
>
> **RQ2:** Do changes in the audit reporting model cause investors to make more or less optimal investment decisions?

III. METHODOLOGY

Overview and Setting

We test our hypotheses and research questions using an online experiment that incorporates a 1×3 between-participants design manipulating the types of opinions auditors may render.[11] Following the traditions of experimental economics and using LIONESS Lab (Giamattei, Yahosseini, Gächter, and Molleman 2020), we construct a setting in which participants, assigned to the role of financial reporting manager (hereafter, "manager"), auditor, or investor, play a stylized game in which they earn points that are converted into real money. Because our setting requires no domain-specific knowledge or expertise, we do not recruit auditing or financial reporting professionals (Libby, Bloomfield, and Nelson 2002). Rather, we recruit participants from the Prolific online platform, with 264 participants forming triads that complete all six periods of the experiment. These participants are 37 years old on average, and 137 (51.89%) identify as women. On average, they complete the experiment in 32 minutes and receive total compensation of $9.62, resulting in an average hourly wage of $18.03.

[11] We received IRB approval for our experiment.

Experimental Procedures

First, participants read instructions detailing the choices that the manager, auditor, and investor make during each of the six periods of the investment game.[12] The instructions include a series of quizzes intended to highlight key aspects of the game, which participants must answer correctly before proceeding to ensure comprehension. Once three participants have completed the instructions, LIONESS groups them into a triad and assigns each to the role of manager, auditor, or investor. Before each period of the investment game begins, the manager is endowed with 60 points and the auditor and investor are each endowed with 100 points.

When the game begins, the manager privately learns the true value of an asset, which may range from 1 to 100, and then proposes a reported value equal to or greater than the asset's true value. Next, the auditor learns the manager's proposal and a 40-point range for the asset that contains the asset's true value. The auditor then chooses to either accept or reject the manager's proposal. If the auditor rejects the manager's proposal, the auditor provides a counterproposal that may be any value from the low end of the 40-point range up to the manager's proposed value. The manager then makes a new proposal, and the process is repeated up to two more times. Each rejection costs the auditor five points, and if the auditor rejects the manager's proposal three times, the period ends and both the manager and the auditor lose 50 points, with the investor retaining their 100-point endowment. If instead, the auditor accepts the manager's proposal or the manager's proposal equals the auditor's last counterproposal, the manager's proposal becomes the reported asset value, which is forwarded to the investor along with the auditor's opinion regarding the reasonableness of the reported asset value.

[12] In the experimental materials shown to participants, we use the more abstract term "verifier" instead of "auditor," and "reporter" instead of "financial reporting manager" or "manager" to avoid role-playing and other effects extraneous to our variables of interest (Haynes and Kachelmeier 1998). For ease of exposition, we use the more contextualized terms "auditor" and "manager" throughout this manuscript.

Auditors are incentivized to constrain reports during negotiation, while managers are incentivized to report higher asset values. The auditor incentive for constraint comes from a penalty the auditor receives for every point of difference between the reported asset value and the true asset value, with a maximum of 60 to avoid bankruptcy constraints. The manager incentive for reporting higher values comes from higher reported values being more attractive to investors, as described next.[13]

After receiving the reported asset value and the auditor's opinion, the investor chooses how many of their points to invest in the asset. This number of points, which can range from 1 to 100, is awarded to the manager. Investors then win or lose points with a probability equal to the true asset value. For example, if the true asset value equals 70, there is a 70 percent (30 percent) chance that the investor will win (lose). If the investor wins, they receive 1.5 times the number of points they invest plus the number of points not invested. If the investor loses, they lose all points invested but retain the number of points not invested.

In addition, if the investor loses, then the investor chooses how to allocate a 20-point penalty between the auditor and manager. For example, if the investor loses and chooses to penalize the auditor 5 points, then the manager is penalized 15 points. This penalty analogizes investor litigation against auditors and managers for investment losses.

At the end of each period, all players receive feedback analogous to the types and timing of information in the real-world context. Specifically, all players learn the investment amount, whether the investor won or lost, and the penalty allocated to the auditor and manager. The manager and investor further learn the number of points earned that period. The auditor does not

[13] In reality, managers might face incentives to understate performance in one period in order to gain the opportunity to overstate performance in a future period (e.g., "cookie jar" accounting). Given that such a strategy requires an unreasonable overstatement at *some* point in time, we abstract away from this possibility by making each round independent, thereby simplifying the game for participants.

learn the number of points they earn until all periods are complete but does receive feedback after each period regarding the points lost due to rejecting the manager's proposals and due to investor penalties.[14] The auditor and investor never learn the true asset values. After six periods, the game ends, and participants complete a post-experimental questionnaire.[15] Following the questionnaire, participants learn their total number of points and the amount of their earnings in U.S. dollars.[16]

Independent Variable

We manipulate *Audit Report Regime* at three levels. In the *Must-Pass* condition, the only audit opinion the auditor can provide to the investor is that the reported asset value is "reasonable." This condition is analogous to the current regime in the U.S., in which companies only file financial reports with unqualified audit opinions due to the SEC's position that qualified opinions indicate misleading financial statements (SEC 1938; Cipriano et al. 2017). Under the *Pass-Fail* condition, when the auditor accepts the manager's proposed asset value, the auditor may opine that the reported asset value is "reasonable" or "not reasonable," which is analogous to the regime described by current PCAOB standards in which auditors choose to issue either an unqualified or a qualified audit opinion. In the *Graded* condition, the auditor does not provide a categorical opinion that the reported asset value is "reasonable" or "not reasonable" but instead rates their belief about the reported asset's value's reasonableness on a scale of one to ten, where a rating of ten (one) indicates the reported asset value is the "most reasonable possible" ("least

[14] We delay informing the auditor of any penalty due to the exact difference between the true value of the asset and the reported value to reflect the reality that auditors must typically infer, with a degree of uncertainty, whether management is likely to be aggressive in their reporting, rather than knowing with *certainty* exactly how aggressive management typically is before beginning the next year's audit.
[15] We measure risk preferences using a question adapted from Dohmen et al. (2011) as part of our post-experimental questions. Controlling for risk preferences does not alter our conclusions.
[16] We translate points to USD at a rate of $0.00625 per point, which is then added to a $6 base payment for completing the study.

reasonable possible"). Appendix A contains representative screenshots of the investor's choice from each condition.

Dependent Variables

We measure several outcomes of interest. *Reported Value* is the value of the asset that managers and auditors ultimately send to the investor, and *Investment* is the number of points that the investors choose to risk on the asset. We also measure suboptimal investment decisions based on how a risk-neutral participant should invest, given the parameters of the game. Specifically, because our parameters suggest that a risk-neutral investor maximizes wealth by investing all (none) of their points if the true asset value is greater than (equal to or less than) 66, we calculate *Suboptimal Investment* as 100 minus *Investment* in periods where the true asset value is greater than 66 and equal to *Investment* when the true asset value is less than or equal to 66. In both calculations, *Suboptimal Investment* represents a misallocation of points by the investor from what would be wealth-maximizing in expectation. See Appendix B for proof of this result.

IV. RESULTS

Our 264 participants form 88 triads of managers, auditors, and investors who complete all six periods of the game. Of these triads, 30 are in the *Must-Pass* condition, 28 are in the *Pass-Fail* condition, and 30 are in the *Graded* condition.

Comprehension and Manipulation Checks

Before the experiment, participants must read instructions for all three roles and answer comprehension questions about the instructions correctly before they can advance to joining a triad. Participants who answer these comprehension questions incorrectly must either leave the experiment or attempt the questions again, and they review the correct answers after each set of comprehension questions. These questions help to ensure that participants properly understand

the features of the game before the experiment begins.

In addition, to ensure that our audit reporting manipulation is salient to investors, we ask investor participants to identify in the post-experimental questions what reporting options the auditor had regarding the reasonableness of the reported value. 76 percent of investors answer this question correctly, with the pass rate being lower in the *Must-Pass* condition (66.67 percent) than the *Pass-Fail* (82.14 percent) or *Graded* (80.10 percent) conditions. *Ex post,* we speculate this is due to participants finding it more difficult to confidently assert the absence of a feature (in this case, the ability to issue a "not reasonable" opinion) than the presence of a feature. All statistical conclusions reported hereafter are unaltered by removing participants who answered incorrectly, so we retain all observations given that it is unclear whether incorrect answers represent a true "failure" of the manipulation (e.g., Aronow, Baron, and Pinson 2019; Varaine 2023).

Descriptive Statistics

Table 1 presents descriptive statistics for *Investment, Reported Value,* and *Suboptimal Investment* for each period, by condition, as well as the true values for each period.[17] Table 1 suggests that managers and auditors jointly produce reported values that are similar regardless of audit reporting regime, which would appear consistent with auditors' (managers') incentives to restrict (pursue) aggressive reporting being held constant across conditions. Despite this similarity in reported values, the investors' decisions seem to diverge in the *Graded* condition from the *Must-Pass* and *Pass-Fail* conditions, particularly in later periods of the game.

[17] In both the descriptive statistics and our formal analysis that accounts for multiple observations per participant, we exclude instances where the auditor and manager are unable to agree upon a value and the auditor chooses to force the 50-point penalty upon both parties. This only occurs in six individual periods across all conditions and participants in the experiment, three times in the *Must Pass* condition and three times in the *Graded* condition. This suggests that our incentives successfully model an undesirable outcome, similar to how SEC delisting operates in reality (Cipriano et al. 2017).

Consistent with this notion, the correlation (untabulated) between *Reported Value* and *Investment* is similarly positive and significant in the *Must-Pass* (corr = 0.56, $p < 0.01$) and *Pass-Fail* conditions (corr = 0.52, $p < 0.01$), but seems less pronounced in the *Graded* condition (corr = 0.12, $p = 0.11$). Altogether, while the audit reporting regime does not appear to alter reported values, it does seem to alter investors' reactions to those reported values.

Figure 1 depicts the overall level of *Investment* and *Suboptimal Investment* by condition. The pattern in Figure 1 suggests that investors make decisions of similar quality in the *Must-Pass* and *Pass-Fail* conditions. However, investors appear to make worse decisions in the *Graded* condition relative to both the *Must-Pass* and *Pass-Fail* conditions even though the *Graded* condition provides more precise information to investors. Having observed these differences in descriptive statistics, we formally test these differences while accounting for nonindependence in observations, as described next.

Plan of Analysis

Because we obtain multiple measures from each participant, we use Generalized Estimating Equations (GEE) throughout our analyses to estimate models corrected for cluster-correlated data (Hanley, Negassa, Edwardes, and Forrester 2003; Ballinger 2004). We specify a first-order auto-regressive correlation structure, which accounts for investment decisions having a stronger correlation the closer they are together, with robust estimation.[18]

Test of RQ1: Reported Values

We begin by examining whether changes in the audit reporting regime influence reported values in our setting, which holds audit and financial reporting incentives constant. We estimate a GEE model with *Audit Report Regime* as a three-level categorical independent variable and

[18] Specifying a mixed model with a random intercept for each participant does not alter our conclusions.

Reported Value as the dependent variable. Consistent with the descriptive information from Table 1, we find no effect of *Audit Report Regime* on *Reported Value* (untabulated $\chi_1^2 = 0.14$, $p = 0.93$). We attribute this lack of variation to the consistency in our incentive structure across conditions, i.e., auditors are incentivized to constrain aggressive reporting regardless of condition. However, while the audit reporting regime does not seem to influence the reported values that auditors and managers agree upon, Table 1 and Figure 1 do suggest it alters investor reactions to those values. We turn to this analysis next.

Test of H1 and H2: Investor Reactions to Reported Values

To examine investor reactions to reported values, we estimate a GEE model with *Audit Report Regime* as a three-level categorical independent variable, *Reported Value* as a mean-centered continuous independent variable, and the interaction of the two as the third independent variable. *Investment* is the dependent variable. In addition, because *Reported Value* is a continuous variable, we visualize the interaction between our manipulated categorical variable and reported value using spotlighting (Spiller, Fitzsimons, Lynch, and McClelland 2013) to estimate the marginal means of the dependent variable at differing points in the continuous variable. This allows us to interpret whether the shape of any significant interaction is consistent with the hypothesized effects in H1 and H2. Specifically, H1 (H2) suggests that the investor reactions to variation between lower and higher reported values should be more (less) pronounced in the *Pass-Fail (Graded)* condition as compared to *Must-Pass.* Table 2, Panel A reports and Figure 2 depicts estimated marginal means of *Investment* at the minimum and maximum levels of *Reported Value.*[19] The spotlighted means suggest similar reactions to

[19] Importantly, spotlighting is an estimation approach, meaning that estimation at any given point uses *all* data available. As such, we follow the advice of Spiller et al. (2013) by utilizing the entire observed range of the continuous variable, which offers the most possible insight into the shape of the interaction.

variations in reported values under both *Must-Pass* and *Pass-Fail* regimes, but much less pronounced reactions under a *Graded* regime. In other words, the results seem inconsistent with H1, but consistent with H2.

Table 2, Panel B presents the formal results of our GEE model, confirming a significant *Audit Report Regime* × *Reported Value* interaction (χ_2^2 = 13.06, p < 0.01). To further verify the pattern suggested by the spotlighted means, we estimate investor's response coefficients (RC) within each regime by separately estimating a model with *Reported Value* as the sole independent variable in each condition. Table 2, Panel C presents the RC estimates. Notably, the *Must-Pass* RC of 0.82 is greater than the *Pass-Fail* RC of 0.67, inconsistent with H1.[20] However, the *Graded* RC of 0.31, relative to the other conditions, is consistent with H2. To determine whether the attenuation of investor responses to reported values in the *Graded* condition differs from both other conditions, Table 2, Panel D reports the results of the interaction term when including just two conditions at a time. These comparisons continue to suggest no significant difference between the *Must-Pass* and *Pass-Fail* regimes (χ_1^2 = 0.98, p = 0.32) and that the *Graded* regime significantly differs from both (both p < 0.01). Overall, this suggests that a more gradient audit reporting regime leads to a significant reduction in overall investor reactions to variation in reported values, despite the fact that (1) incentives for audit quality and financial reporting quality are held constant across conditions, and (2) the reported values themselves do not significantly differ across conditions.

[20] A potential reason we do not observe support for H1 is that muted investors reactions to "not reasonable" audit opinions attenuates their reaction to the reported values. However, when filtering out instances of "not reasonable" opinions and limiting the model to only include the *Must-Pass* and *Pass-Fail* conditions, the interaction term is still insignificant (χ_1^2 = 0.02, p = 0.88). Given that H1 relies on investor participants being able to induce the outcome of a negotiation between two other parties, our failure to observe support for H1 likely stems from most individuals struggling to induce strategic moves by others (Nagel 1995; Camerer, Ho, and Chong 2004).

Test of RQ2: Are Changes in Investor Reactions Suboptimal?

Having determined that gradient audit reporting attenuates investor reactions to reported values, we next investigate whether this change is suboptimal. Given that the actual reported values are unaffected by audit reporting regime, our expectation is that, assuming reported values were at least somewhat informative of true values in the *Must-Pass* and *Pass-Fail* conditions, a decrease in investor responses to those reported values would be suboptimal for investors. We formally verify this expectation next.

Table 3, Panel A reports the estimated marginal means from a GEE model that estimates the effect of *Audit Report Regime* on *Suboptimal Investment.* Consistent with the raw descriptives in Figure 1, *Suboptimal Investment* is greater in the *Graded* condition (43.10) than either the *Must-Pass* (36.54) or *Pass-Fail* (36.80) conditions. Table 3, Panel B reports a significant effect of *Audit Report Regime* on suboptimal investment decisions (χ_2^2 = 8.67, p = 0.01). Table 3, Panel C reports pairwise comparisons confirming that investor decisions in a more gradient audit reporting environment are worse compared to both the *Must-Pass* ($p < 0.01$) and *Pass-Fail* (p = 0.02) conditions. There is no significant difference between *Must-Pass* and *Pass-Fail* (p = 0.91). Overall, our findings suggest that introducing more gradient audit reporting causes investors to make worse decisions, but this effect does not occur when the auditor simply has the option to issue a binary pass-or-fail opinion.

Given that *Suboptimal Investment* includes both overinvestment in bad assets *and* underinvestment in good assets, we further examine whether one or the other is primarily responsible for our *Suboptimal Investment* finding. We estimate a model (untabulated) that includes *Asset Type* as a categorical independent variable indicating whether the true value of the asset called for maximum (minimum) investment based on the wealth-optimizing preferences of

a risk-neutral investor. We find no evidence of a main effect (χ_1^2 = 0.66, p = 0.42) or an interaction with *Audit Report Regime* (χ_2^2 = 1.11, p = 0.58). In contrast, the main effect of *Audit Report Regime* on *Suboptimal Investment* remains significant s (χ_2^2 = 8.79, p = 0.01). Altogether, the evidence suggests that more gradient audit reporting leads to increases in both underinvestment in good assets and overinvestment in bad assets, with the latter being particularly concerning given regulator concerns with investor protection (SEC 2024).

Supplemental Analysis: Evidence for Behavioral Mechanism

In this section, we present additional analysis that provides evidence supporting the theoretical mechanism behind investment choices being less sensitive to reported values under more gradient audit reporting. Recall our supposition that because more gradient measures are more challenging to process, investors could inappropriately incorporate auditors' gradient reasonableness ratings into their decisions, i.e., fail to condition any response to variance in audit opinions on the reported value. In this section, we distinguish between two possible mechanisms whereby this effect could lead to muted overall reactions to reported values. The first is that investors choose to ignore both the reported value and the gradient audit opinion. The second is that investors simply respond positively to higher ratings from the auditor independent of the reported value. In combination with the reported value and gradient auditor rating being negatively correlated, this would lead to more investment in lower reported values and less investment in higher reported values.

First, we consider whether auditors in the *Graded* and *Pass-Fail* conditions prefer, through their reporting options, more conservative reported values. We create a continuous variable for the reasonableness ratings auditors gave to the reported value (*Auditor Rating*) in the *Graded condition,* and a categorical variable indicating whether the auditor gave a "not

reasonable" opinion (*Unreasonable*) in the *Pass-Fail* condition. *Auditor Rating* has an average value of 7.36 in the *Graded* condition, and *Unreasonable* opinions occur 20% of the time in the *Pass-Fail* condition, suggesting both regimes result in a reasonable number of departures from the cleanest possible opinion. Figure 3 further depicts the frequency of each auditor rating, one through ten, and suggests that while auditors become comfortable issuing the highest reasonableness rating more often than any other, there is still enough variation in audit opinions to support our test of theory.[21] In untabulated analysis, we further find that *Auditor Rating* is negatively correlated with *Reported Value* (ρ = -0.26, $p < 0.01$), and *Unreasonable* is positively correlated with *Reported Value* (ρ = 0.43, $p < 0.01$), consistent with auditors being more comfortable with more conservative reported values.

Next, we isolate investor participants in the *Graded* condition and estimate a GEE model for *Investment* that uses *Reported Value, Auditor Rating*, and the interaction of the two as independent variables. Table 4, Panel A reports the test of model effects, which indicate two significant main effects (both $p < 0.01$) but *no* interaction. This suggests that investors do not condition their response to gradient audit opinions on the reported values, and instead respond to both independently. We also find (untabulated) that the regression coefficient associated with the main effect of *Auditor Rating* is positive (B = 3.66, SE = 1.02), supporting the notion that higher auditor ratings of reasonableness increase investment independent of reported value. Taken together with these ratings being negatively correlated with reported value, these findings

[21] The auditor ratings in the *Graded* regime suggest that auditors gave a rating of 5 or less about 22.1% of the time, consistent with the *Pass-Fail* regime resulting in failing audit opinions 20% of the time. In other words, auditors in the *Graded* regime seem to view a rating of 5 or less as equivalent to a "not reasonable" binary rating. It is worth noting that even though 20% of auditor opinions are failures in the *Pass-Fail* condition, both this condition and the *Graded* condition have no differences in their reported values from the *Must-Pass* condition. This suggests that auditors in the *Must Pass* condition, rather than using negotiation to bring reported values they would otherwise view as unreasonable to a lower level, are acquiescing to managers in the *Must-Pass* regime (e.g., Cipriano et al. 2017). Given our focus on investor reactions, we leave further exploration of this possibility to future research.

suggest that muted overall investor reactions in the gradient condition are due to auditors viewing more conservative values as more reasonable, and investors not properly incorporating this gradient assessment of reasonableness with the reported value when making decisions.

We contrast these findings with the *Pass-Fail* condition to further demonstrate that this effect arises due to the difficulty in assessing more *continuous* assessments of reasonableness, not just due to the presence of "negative" audit opinions that are correlated with the reported values. Within the *Pass-Fail* condition, we estimate a GEE model with *Reported Value, Unreasonable,* and the interaction of the two. In contrast to the *Gradient* findings, the model effects reported in Table 4, Panel B indicate a marginal interaction (two-tailed $p = 0.12$) between *Reported Value* and *Unreasonable*.[22] Table 4, Panel C reports spotlighted comparisons of *Unreasonable* at high and low levels of *Reported Value,* indicating that the decrease in investment following an unreasonable opinion is greater for higher reported values (25.28, $\chi_1^2 = 5.44$, $p = 0.02$) than lower values (-4.76, $\chi_1^2 = 0.21$, $p = 0.65$), suggesting that investors in this condition are able to better incorporate variation of the audit opinion into their investment decisions.

Notably, our tests of the behavioral mechanism suggest that all three parties in the manager-auditor-investor triad contribute to the outcome of more gradient audit reporting causing suboptimal investment. Investors do not properly impound gradient audit reporting information, leading them to simply invest more (less) in assets with higher (lower) reasonableness ratings. This effect, in combination with (1) auditors giving more reasonable ratings for more conservative values and (2) auditor-manager negotiations not leading to changes in the reported value under gradient audit reporting, leads to investor decisions being suboptimal.

[22] The significance of the interaction term improves when either dropping participants who failed the manipulation check (two-tailed $p = 0.06$) or controlling for participant risk preferences (two-tailed $p = 0.07$).

This underscores the importance of addressing our research questions with a fully interactive, three-party game in which all parties contribute to the outcome (Kachelmeier 2018).

Supplemental Analysis: Investor Experience

Because our experimental task is relatively abstract and does not require experience to complete, we do attempt to recruit participants with specialized experience. This introduces a potential limitation if investing experience interacts with our manipulation of audit reporting regime. In this section, we conduct additional, untabulated analysis to explore the possibility of experience moderating the effect we observe.

As part of post-experimental questions, we ask investor participants whether they have any prior investing experience. 49 out of 88 investor participants (55.7%) report previous investment experience. When including *Investment Experience* as a fully-crossed variable with *Audit Report Regime*, we observe no main effect of *Investment Experience* on *Suboptimal Investment* (χ_1^2 = 0.23, p = 0.63) nor an interaction with *Audit Report Regime* (χ_2^2 = 0.98, p = 0.61). In contrast, the main effect of *Audit Report Regime* remains significant (χ_2^2 = 7.89, p = 0.02). Notably, online labor market users that report investment experience have previously been used in accounting research as a proxy for non-professional investors (e.g., Clor-Proell, Guggenmos, and Rennekamp 2020; Chen, Tan, and Wang 2023), and the SEC is especially concerned with protecting these types of unsophisticated investors (e.g., Lizárraga 2023). This suggests that at a minimum, our theoretical effect likely applies to the investors whom SEC is especially concerned about making suboptimal decisions.[23]

[23] As an alternative test of experience, we estimate the same model used for Table 3 and eliminate the first three periods, allowing us to maximize participant learning and comfort with the task (Hertwig and Ortmann 2001; Kachelmeier and Rimkus 2022). The effect of *Audit Report Regime* on *Suboptimal Investment* is strongly significant in these later periods (χ_2^2 = 9.74, p < 0.01), suggesting that both a degree of experience with the task itself does not moderate our effects and that actually experiencing variation in both audit opinions and reported values allows for a stronger test of investor reactions to those variations.

Supplemental Analysis: Negotiation and Liability

Finally, we report two additional, untabulated outcomes from our experimental game: the length of auditor-manager negotiations and how liable investors hold auditors for negative outcomes. The average length of auditor-manager negotiations, which can range between 1 and 3 rounds, is 1.37 overall and does not differ by condition (χ_2^2 = 2.47, p = 0.29). The average points that investors penalize auditors for negative outcomes, which can range from 0 to 20, is 11.24 overall and does not differ by condition (χ_2^2 = 0.32, p = 0.85). While we observe no effects of our manipulation on either auditor-manager negotiations or the degree to which investors hold auditors liable, future research can explore whether changing elements of our setting or design does yield differences.

V. CONCLUSION

Despite concern about the lack of information in a pass-fail audit opinion, SEC standards restrict investors from even seeing "failed" financial statements in the market. This regulatory desire to keep negative audit opinions out of the capital markets stands in conflict with investors' demands for more variation in audit reporting. In this paper, we conduct an experiment that compares a must-pass audit reporting system to both a pass-fail system and a more gradient audit reporting system. We find that more gradient audit reporting leads to less efficient, suboptimal investment decisions relative to a must-pass reporting system. However, this problem does not arise when implementing a true pass-fail system, because investors better incorporate categorical audit opinion variation into their decision-making.

Our findings suggest that both regulators *and* investors might be incorrect about the audit opinion. On the one hand, investors that claim a pass-fail audit opinion is insufficient should be aware of the potential negative consequences associated with more gradient reporting. On the

other hand, we find no evidence that investment decisions are worse when negative audit opinions are in the market, as long as those opinions are clearly binary in nature. Taken together, our findings suggest a compromise that would introduce more variation and information to the capital markets without compromising investment efficiency: allowing auditors to issue negative (i.e., qualified) opinions. In other words, despite both investor *and* regulator concerns to the contrary, a pass-fail audit reporting model could strike the appropriate balance between information richness and optimal investor decision-making.

It is important to note that our study has limitations. While we find no evidence of experience interacting with our manipulation of audit reporting, it is possible that highly experienced participants could still react differently to more gradient reporting. We argue that the benefits of incorporating a fully interactive, three-party experiment are worth the external validity risks posed by less experienced participants. Further, even if the effects we identify did not occur among more sophisticated investors, a regulatory regime that widens the gap between sophisticated and unsophisticated investors directly contradicts the SEC's mission of investor protection. Nonetheless, future research could explore how different participant pools or other contextualized features of reporting and investing environments could moderate our results.

We also model a setting in which auditors' incentives to maintain financial reporting quality are held constant across conditions. We believe this design choice is important not only for cleanly manipulating the audit opinion regime, but also because regulators and the court system would be unlikely to approve of auditors making no attempt to maintain financial reporting quality in an environment where they can issue negative opinions (DeFond et al. 2018). However, to the extent that changes in policy *also* change auditors' perceived incentives to

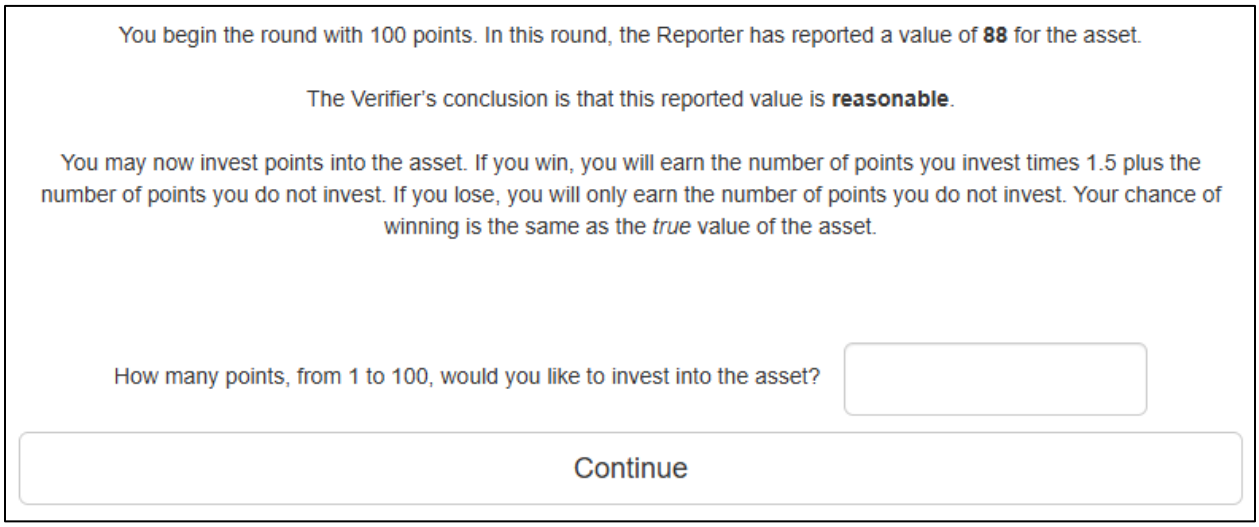
maintain financial reporting quality, it could alter our findings. Future research can test this supposition.

More generally, qualities of auditors and reporters that would alter auditors' opinions under either a pass-fail or a gradient regime could qualify our findings to the degree that they lead to different investor reactions. For example, expanding or narrowing the range of the auditor's noisy signal regarding possible true values during negotiation could lead to circumstances where, over an extended number of periods, even a more gradient audit opinion becomes effectively binary (e.g., the auditors only issue a ten or a one, and investors become accustomed to this pattern). Future research can further explore the audit opinion as a *dependent* variable, and how factors such as auditor qualities or an extended number of periods might cause an auditor to make a gradient assessment mimic a more binary assessment. While such an outcome represents a potential setting where our findings would not materialize, it is notable that a gradient regime that ultimately mimics a pass-fail regime would defeat the purpose of a gradient regime in the first place: wider (and hypothetically, more informative) variation in audit opinions.

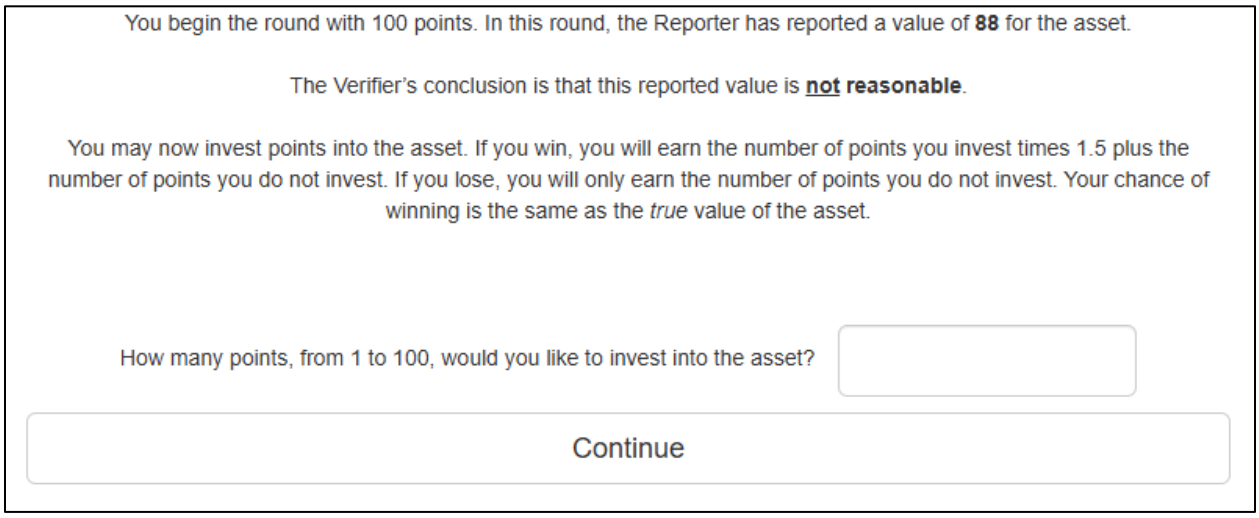
More generally, we encourage future research that explores alternatives to the current audit opinion model. While our study provides evidence of how investors would react to different audit opinion regimes, the limitations of a single study with a single method cannot fully inform policymakers on its own. Only a thorough body of academic research can address all the potential merits and consequences of both the current audit opinion model and alternatives that regulators could consider. We consider our study to be an initial step in this direction, and particularly encourage further research in the area.

Appendix A
Representative Screenshots of Investor Decision

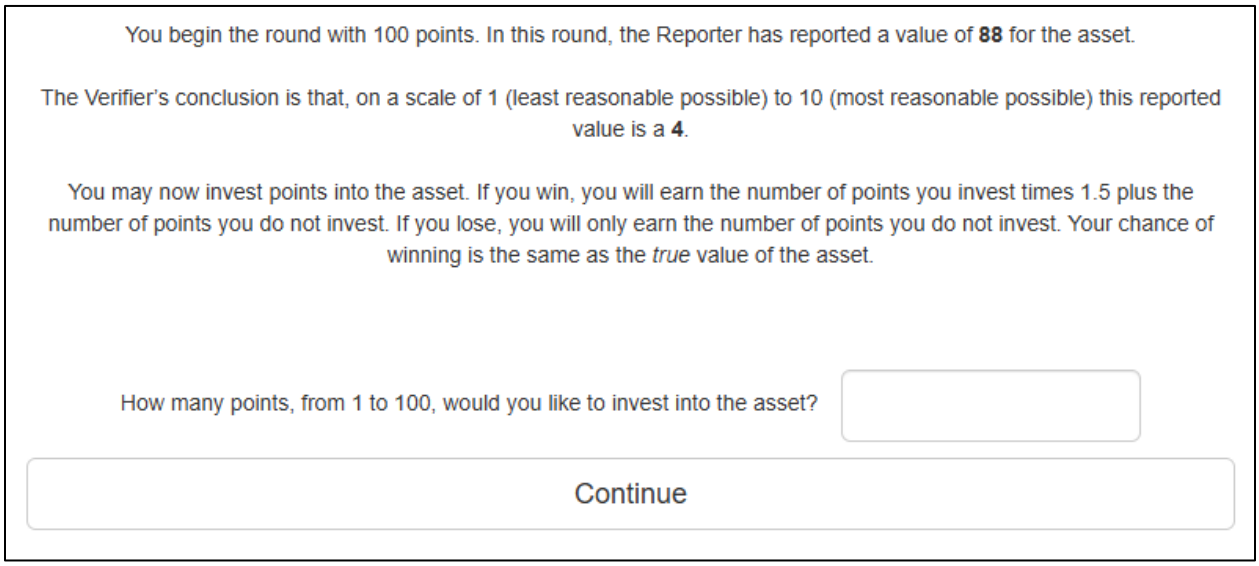
Below is a representative screenshot of the investor's decision from either the *Must-Pass* or the *Pass-Fail* condition, with a reported value of 88 and a passing audit opinion.



Below is a representative screenshot of the investor's decision from the *Pass-Fail* conditions, with a reported value of 88 and a failing audit opinion.



Below is a representative screenshot of the investor's decision from the *Graded* condition, with a reported value of 88 and an audit opinion of 4 out of 10 for reasonableness.



Appendix B
Proof of Optimal Investor Decision

Investors begin each period with 100 points. After the auditor and manager have settled on a reported value, investors can choose to invest those points in the asset. If the investor loses, they lose all points invested. If the investor wins, they receive 1.5 times the number of points invested. The probability of the investor winning is equal to the true value of the asset. Thus, the expected value of the investor's outcome for any period they make an investment choice is given by:

$$E[\text{outcome}] = v \times (0.5x + 100) + (1 - v) \times (100 - x)$$

In which x = the points invested, and $v = \frac{\text{true value of the asset}}{100}$

Expanding and simplifying this equation yields the following:

$$E[\text{outcome}] = 0.5vx + 100v + 100 - 100v - x + vx$$

Combining like terms yields the following:

$$E[\text{outcome}] = 1.5vx - x + 100$$

$$E[\text{outcome}] = (1.5v - 1)x + 100$$

Suggesting that the coefficient of *x* (the points invested) is equal to $1.5v - 1$. When $v = 0.66$, this coefficient equals -0.01, and when $v = 0.67$, it equals 0.005. As such, the expected value of the investor's outcome linearly decreases with investment when the true value of the asset is equal to or less than 66, and increases with investment when the true value of the asset is equal to or greater than 67.

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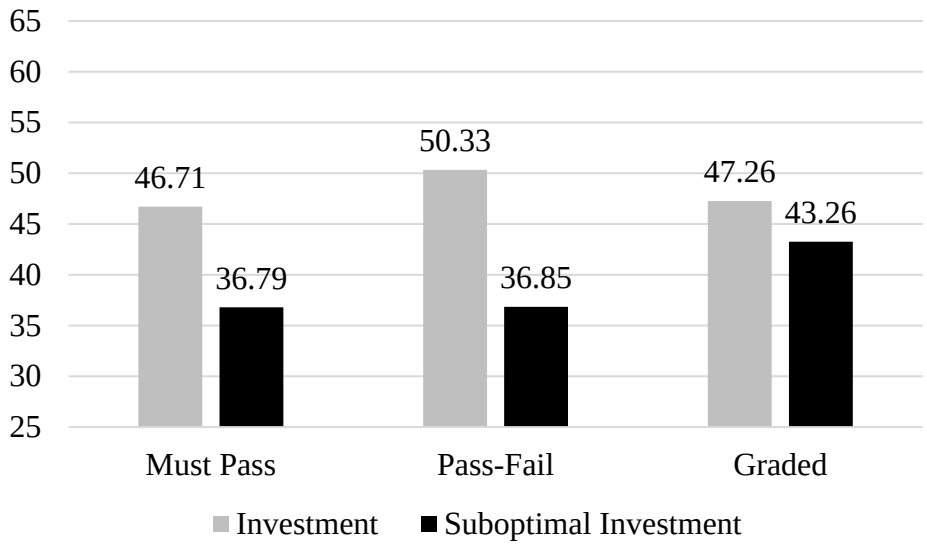
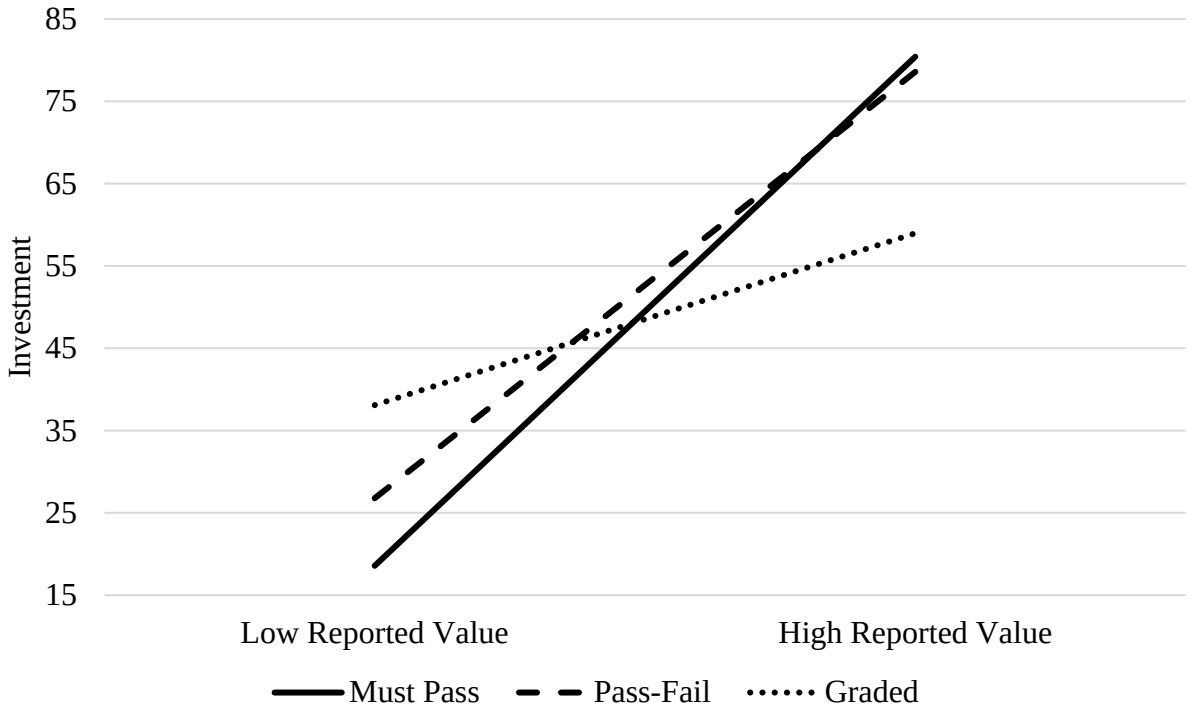
Figure 1
Investment Choices: Descriptive Results



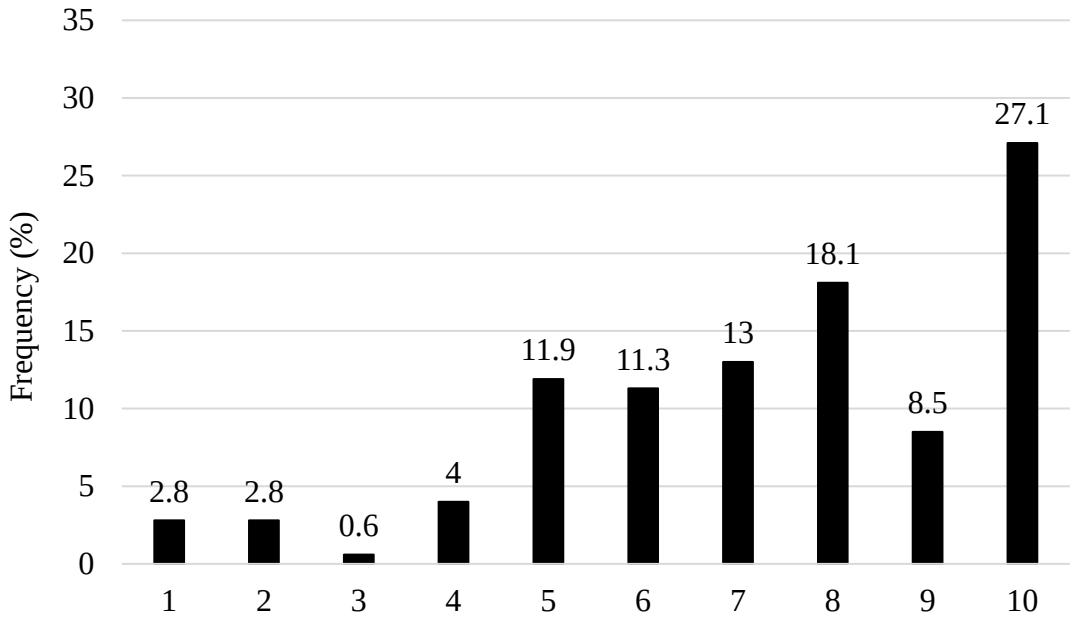
Notes: This figure depicts the overall means for both *Investment* and *Suboptimal Investment* by condition. *Investment* is the number of points that the investors choose to risk on the asset. *Suboptimal Investment* is 100 minus *Investment* in periods where the true asset value is greater than 66, and equal to *Investment* when the true asset value is less than 66. In both situations, it represents the misallocation of points from what is economically optimal. In the *Must-Pass* condition, the investors can only view reported values where the auditor has reported a "reasonable" opinion. In the *Pass-Fail* condition, investors can view reported values where the auditor has either reported a "reasonable" or an "not reasonable" opinion. In the *Graded* condition, investors can view reported values where the auditor has rated reasonableness on a scale of 1 to 10.

Figure 2
Investor Reactions to Differing Reported Values



Notes: This figure depicts the estimated marginal means from a Generalized Estimating Equations (GEE) model for *Investment*. Estimated marginal means are spotlighted at the minimum and maximum observed values of *Reported Value*. See Table 1 for variable definitions.

Figure 3
Frequency of Different Auditor Ratings in *Graded* Condition



Notes: This figure depicts the frequency with which each rating, 1 through 10, that auditors assign occurs in the *Graded* condition.

Table 1
Investment Choices: Descriptive Results

Panel A: True values by period

Period 1	Period 2	Period 3	Period 4	Period 5	Period 6
72	47	33	81	28	73

Panel B: Means (Standard Errors) for *Investment* by period

	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6
Must-Pass	54.55	42.53	31.70	63.40	27.10	62.29
	(4.00)	(4.10)	(4.40)	(5.38)	(3.85)	(5.35)
Pass-Fail	58.29	44.64	36.82	65.75	30.07	66.39
	(4.48)	(3.70)	(3.97)	(5.15)	(3.82)	(4.36)
Graded	51.45	45.07	36.79	54.28	39.73	56.27
	(3.92)	(4.26)	(4.17)	(5.71)	(5.31)	(5.18)

Panel C: Means (Standard Errors) for *Reported Value* by period

	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6
Must-Pass	74.00	52.27	40.37	77.30	35.77	74.93
	(1.37)	(1.41)	(1.45)	(1.79)	(1.46)	(1.60)
Pass-Fail	75.07	51.89	39.75	82.36	33.89	73.75
	(1.62)	(1.26)	(1.60)	(1.38)	(1.70)	(1.46)
Graded	73.41	54.03	40.10	78.41	34.90	74.50
	(1.39)	(1.37)	(1.57)	(2.22)	(1.62)	(1.93)

Panel D: Means (Standard Errors) for *Suboptimal Investment* by period

	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6
Must-Pass	45.45	42.53	31.70	36.60	27.10	37.71
	(4.00)	(4.10)	(4.40)	(5.38)	(3.85)	(5.35)
Pass-Fail	41.71	44.64	36.82	34.25	30.07	33.61
	(4.48)	(3.70)	(3.97)	(5.15)	(3.82)	(4.36)
Graded	48.55	45.07	36.79	45.72	39.73	43.73
	(3.92)	(4.26)	(4.17)	(5.71)	(5.31)	(5.18)

Notes: This table presents the descriptive statistics for the true asset values, *Investment, Reported Value*, and *Suboptimal Investment* by period and condition. *Investment* is the number of points investors choose to risk on the asset. *Reported Value* is the value of the asset that investors see. *Suboptimal Investment* is 100 minus *Investment* in periods where the true asset value is greater than 66, and equal to *Investment* when the true asset value is less than 66. In the *Must-Pass* condition, investors only view reported values with a "reasonable" opinion. In the *Pass-Fail* condition, investors can view reported values with a "reasonable" or a "not reasonable" opinion. In the *Graded* condition, investors can view reported values with reasonableness rated on a scale of 1 to 10.

Table 2
Investor Reactions to Reported Values

Panel A: Estimated Marginal Means (Standard Errors) for *Investment*

	Low *Reported Value*	High *Reported Value*
Must-Pass	18.57	80.42
	(4.43)	(5.51)
Pass-Fail	26.78	78.58
	(3.61)	(5.36)
Graded	38.09	58.97
	(5.45)	(6.13)

Panel B: Tests of Model Effects from GEE

Source	df	Wald χ^2	*p*-value
Audit Report Regime	2	0.99	0.61
Reported Value	1	92.90	< 0.01
Audit Report Regime × *Reported Value*	2	13.06	< 0.01

Panel C: Response Coefficient (RC) Estimate by Condition

Source	Coeff.	S.E.	Wald χ^2	*p*-value
Must-Pass	0.82	0.10	69.25	< 0.01
Pass-Fail	0.67	0.10	44.32	< 0.01
Graded	0.31	0.12	6.65	0.01

Panel D: Interaction Test Comparisons

Source	Wald χ^2	*p*-value
Must-Pass vs. Pass-Fail	0.98	0.32
Must-Pass vs. Graded	11.35	< 0.01
Pass-Fail vs. Graded	7.04	< 0.01

Notes: This table presents the estimated results of a Generalized Estimating Equations (GEE) model for *Investment*. Estimated marginal means reported in Panel A are spotlighted at the minimum and maximum observed values of *Reported Value*. All *p*-values are two-tailed. See Table 1 for variable definitions.

Table 3
Suboptimal Investment

Panel A: Estimated Marginal Means (Standard Errors) for *Suboptimal Investment*

Must-Pass	*Pass-Fail*	*Graded*
36.54	36.80	43.10
(1.61)	(1.84)	(1.83)

Panel B: Test of Model Effects from GEE

Source	df	Wald χ^2	*p*-value
Audit Report Regime	2	8.67	0.01

Panel C: Pairwise Comparisons

Source	EMM Diff.	df	Wald χ^2	*p*-value
Must-Pass vs. Pass-Fail	0.26	1	0.01	0.91
Must-Pass vs. Graded	6.57	1	7.28	< 0.01
Pass-Fail vs. Graded	6.30	1	5.91	0.02

Notes: This table presents the estimated results of a Generalized Estimating Equations (GEE) model for *Suboptimal Investment*. All *p*-values are two-tailed. See Table 1 for variable definitions.

Table 4
Evidence of Behavioral Mechanism

Panel A: GEE Model Effects for *Investment* under *Graded*

Source	df	Wald χ^2	*p*-value
Reported Value	1	15.51	< 0.01
Auditor Rating	1	12.92	< 0.01
Reported Value × *Auditor Rating*	1	0.08	0.78

Panel B: GEE Model Effects for *Investment* under *Pass-Fail*

Source	df	Wald χ^2	*p*-value
Reported Value	1	30.43	< 0.01
Unreasonable	1	3.57	0.06
Reported Value × *Unreasonable*	1	2.41	0.12

Panel C: Change in *Investment* for *Unreasonable* audit opinion under *Pass-Fail*

Source	Reasonable	Unreasonable	Wald χ^2	*p*-value
High *Reported Value*	87.78	62.50	5.44	0.02
Low *Reported Value*	26.85	31.60	0.21	0.65

Notes: All *p*-values are two-tailed. *Auditor Rating* is the reasonableness rating, from 1 to 10, that auditors gave the reported value in the *Graded* condition. *Unreasonable* is a categorical variable indicating whether the auditor issued an opinion of "reasonable" or "not reasonable" in the *Pass-Fail* condition. Estimated marginal means in Panel C are spotlighted at the same high and low values of *Reported Value* used in Table 2 and Figure 2. See Table 1 for all other variable definitions.