

Fair Market Value Could Have Contributed to the Crash

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Abstract

Mark-to-model accounting is the practice of using estimates of fair market values of assets in settings where market prices are unavailable or unreliable. Critics have blamed mark-to-model accounting for the current financial crisis, an assessment that the Securities and Exchange Commission and the Financial Accounting Standards Board both dispute. This paper presents a new explanation for how mark-to-model accounting could have caused the recent crisis, and demonstrates the mechanism through a laboratory experiment. Our analysis and results suggest that mark-to-model accounting can indeed cause markets to freeze up, as its critics have charged.

Keywords: Fair value accounting, mark-to-market, asymmetric information, laboratory experiments, financial reporting, uncertainty

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1 Introduction

Many factors led to the current global financial crisis, yet the role of fair market value accounting—and more specifically, mark-to-model accounting—has received considerable attention. For instance, within weeks of the collapse of Lehman Brothers in 2008, former Federal Deposit Insurance Corporation Chairman William Isaac told CNBC that mark-to-model accounting was responsible for the shutdown of credit markets:

The SEC has destroyed \$500 billion of bank capital by its senseless marking to market of these assets for which there is no marking to market, and that has destroyed \$5 trillion of bank lending. That's a major issue in the credit crunch we're in right now.¹

The Securities and Exchange Commission attempted to address this concern in its report in fair market value accounting, which it was required to conduct as part of the Emergency Economic Stabilization Act of 2008 (SEC 2008). The main focus of the SEC report is that fair market value could not have caused the crash through contagion, with excessively low reports coming from market prices that were reflecting liquidity pricing.² The report concluded that the evidence did not support mark-to-market accounting as a source of contagion, and empirical researchers in accounting have generally reached the same conclusion (Barth and Landsman 2010, Laux and Leuz 2010, Badertscher et al. 2012, are examples). A notable exception is Khan (2012).

The argument that mark-to-model accounting played no role is more indirect. The argument goes that mark-to-model accounting could not have played a large role in the financial crisis,

¹Interview with CNBC on October 9, 2008. See <http://www.cnbc.com/id/27100454>.

²The report focuses on the downward regulatory spiral, where low book values interfere with regulatory capital, causing more selling pressure. See the models of Allen and Carletti (2008) and, for a different contagion story, Plantin et al. (2008).

on the grounds that investors heavily discounted mark-to-model reported values. This is consistent with the findings in the academic literature. For example, Goh et al. (2009) find that the market discounted fair value accounting reports based on models extremely heavily. Using data from 2008, they report that an asset recorded at market value based on a quoted price for the same asset in an active market—known as a Level 1 mark-to-market asset under SFAS 157—was discounted to 84% of its stated value. By contrast, assets reported under Level 2 (valued based on the prices of similar assets, or based on prices in inactive markets, or some other market-related information) were discounted to 63% of their stated values. Assets whose market value came purely from unobservable, firm-generated inputs (Level 3) were discounted to 49% of their stated values. Other authors using different samples did not arrive at quite as dramatic numbers (e.g., Song et al. 2010), but their general observations were the same: market values that were based on models (whether using market inputs or firm-generated inputs) were generally higher than current prices. So again, there would seem to be little evidence for fair market values being a cause of the senseless wealth destruction that concerned former FDIC Chairman Isaac.

In what follows, we do not dispute that mark-to-model reports have an optimistic bias. On the contrary, we argue that it is precisely this bias, and investors' rational discounting of marked-to-model reports, that causes markets to freeze up and for observed prices to fall. We explain the underlying theory, and then demonstrate in a laboratory experiment that mark-to-model accounting causes a drop in trading activity, compared with an alternative regime based on conservative financial reporting.³

The same force—opportunistic reporting—drives both the lower prices and the reduced liquidity of a mark-to-model regime, compared with a conservative regime. Because there is

³In Statement No. 4 of the Accounting Principles Board (1964), *conservatism* is defined as a general preference that measurement errors be in the direction of understating net assets and income. Our notion of conservatism is limited to that which standard setters use, in the spirit of Beyer (2012), and not on what conservatism is, along the lines of Basu (1997) or Gigler et al. (2009).

considerable flexibility in Level 2 and Level 3 reports,⁴ the market will anticipate that firms will make the most aggressive mark-to-model reports that they can succeed in making. Anticipating this, firms quickly learn that the only information they can credibly communicate in a Level 2 or Level 3 report is an optimistic scenario. Such a report, while biased, is nevertheless informative. The equilibrium reporting strategy forces the firms to disclose the maximum value that the firm can justify for the asset. This helps the market avoid valuing the firm overly aggressively. Prices become efficient because a firm loses its information rent when using mark-to-model: the equilibrium forces the firm to disclose the most optimistic valuation it can justify, and the firm's rationality constraints prevent it from selling the asset below the most pessimistic valuation it cannot rule out.

The key observation, however, is that prices are observable only when there is trade. The market has no way of learning, and the firm has no credible way of communicating, what a pessimistic scenario might be. A conservative regime requires the firm to report a pessimistic scenario, based on the firm's current information. Without the conservatism requirement, the market can rely only on an ex ante pessimistic scenario. So while the fair value regime keeps a firm from earning an information rent, a conservative regime gives the firm a way to tell the market a lower bound on the asset's valuation. Anyone who has wondered why it takes forever to sell a house is familiar with this phenomenon: potential buyers do not know the lowest bid they should offer, and the homeowner cannot credibly communicate the lowest credible offer. The information rent is the cost of keeping markets liquid (see Bushman et al.

⁴Many studies have documented that mark-to-model reports are made opportunistically. Beatty and Weber (2006) demonstrate opportunism in the amount and timing of unverifiable goodwill impairment calculations. Aboody et al. (2006) and Bartov et al. (2007) have similar findings with employee stock option (ESO) fair value estimates. Blacconiere et al. (2011) also study fair value reports of ESOs, and note that, over time, firms became more likely to issue a press release disavowing the fair value calculation when the number was unfavorable. Core (2011) remarks that the level of opportunism that Blacconiere et al. find is likely understated, due to the ability of firms to stay silent in order to avoid drawing attention to their opportunism. Dechow et al. find evidence of opportunistic valuations in reporting for securitizations. In voluntary disclosures of earnings per share forecasts, Bamber et al. (2010) find evidence of opportunistic rounding up to the nearest \$0.05, in order to create some pooling that analysts cannot completely invert.

1997, on a related point).

Thus the force which drives the greater efficiency of the mark-to-model regime is exactly the same force that makes marking to model cause the market to shut down. The overall pattern that emerges is one of low prices (compared with those under a conservative regime), illiquid markets, and high book values of marked-to-model assets. The concerns that former FDIC Chairman Isaac raised are exactly what plays out, despite book values appearing to be too high for the story on first blush to seem likely.

Some technical points about the theory and experiment are worth highlighting here. The model and the experiment rely on ambiguity in asset values; in this sense, our model is similar to the recent model of illiquidity and fair value that Easley and O'Hara (2010) propose (though their question and setting differs from ours). There are three reasons for us making this assumption. First, we want to capture the idea that an asset's fair market value is not uniquely defined, as this seems central to the concept of Level 2 and Level 3 accounting. Second, when valuing an asset with an ambiguous distribution, it is natural to focus on who knows what about a best-case and worst-case scenario, and this is the issue that concerns us. Our third reason is technical rather than conceptual. Our goal is to show how fair market value can lead the market to shut down. If we were to assume decision making under risk, with asymmetric information, we would be stacking the deck in favor of our desired result. Standard no-trade theorems (Milgrom and Stokey 1982) or lemons arguments (Akerlof 1970) would give us the desired result almost for free. It is critical for us to demonstrate that the reason for liquidity disappearing from the market is not such a result, but one that arises from the choice of reporting regime.⁵

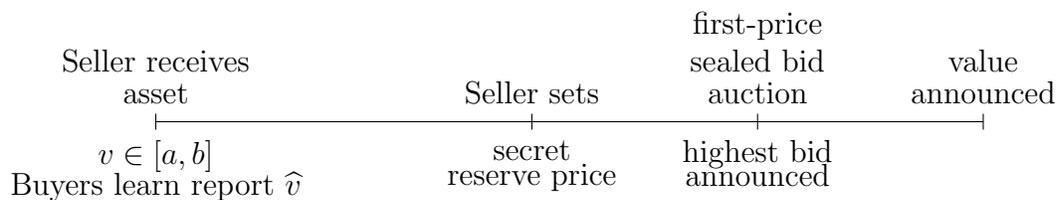
⁵Having agents trade under risk but with heterogeneous priors or risk attitudes would serve equally well for preventing the market from shutting down, though it would not capture the essence of an indeterminate fair market value for the asset. Dickhaut et al. (2011) run experiments on a market similar to the one considered here, and test which of these forces can drive trade. They find that heterogeneity cannot be the driving force, and conclude that subjects act as if they face ambiguity. As de Castro and Chateaufneuf (2011) show theoretically, ambiguity can increase a desire to trade in settings where agents have ambiguous initial

In the next section, we describe the theoretical framework and predictions. Section 3 describes the experiment design. Section 4 gives the results of the experiment. Section 5 discusses extensions and conclusions.

2 Theory and Predictions

The setting we study is one of an asset that has an uncertain value v and where there is asymmetric information. One agent, called the *seller*, owns the asset, and has private bounds $[a, b]$ on the asset's possible value. The other agents, called the *buyers*, have commonly known bounds $[\underline{a}, \bar{b}]$ on the asset's value, where $\underline{a} \leq a \leq b \leq \bar{b}$. Some of the seller's information is revealed to the buyers before the market opens. We refer to this as the *report*.

In the *conservative* reporting regime, the buyers are informed of a , while in the *mark-to-model* regime, the sellers may choose to report any value in $[a, b]$. The agents then participate in a first-price sealed bid auction, in which the seller enters a private reserve price. After the auction, the asset's value is realized and paid to its owner, either the seller if there is no trade or the buyer who made the highest bid if trade occurred. The timeline is summarized as follows:



In the conservative regime, \hat{v} is always equal to a . In the fair value regime, the seller strategically chooses $\hat{v} \in [a, b]$.

endowments. Thus the lack of a unique value for the firm should make trade more likely in our scenario, making it harder for us to get illiquidity simply due to adverse selection or the usual no-trade results.

The following result is standard:

Proposition 2.1. *Suppose that every agent is an expected utility maximizer, that everyone has the same utility, and that agents have a common prior. Then in the mark-to-model regime, all buyers bid at most \underline{a} , and in the conservative regime, all buyers bid at most a . The seller's reserve price is always in (a, b) , and consequently, there is no trade.*

The intuition is as follows: the seller optimally chooses a reserve price equal to the certainty equivalent of the asset, conditional upon knowledge of a and b . The buyers have less information, and realize that any winning bid must be above the certainty equivalent. Therefore, the buyers bid at most the minimum the asset could be worth, and the market shuts down.

To discuss the effects of reporting in this context, we assume throughout that the agents know bounds on the asset's value but do not form a prior. In this setting, it is necessary to describe the agents' objectives. Because the asset value is ambiguous, we model agent's preferences as incomplete, in the spirit of Bewley (2002) and of the recent, related model by Easley and O'Hara (2010).

The incompleteness creates indeterminacy in valuation, so that a seller with asset with value in the range $[a, b]$ can be counted on to sell the asset at any price above b and not to sell the asset for any price below a . In between, the theory does not specify the seller's behavior, and it is this indeterminacy that gives rise to potential gains from trade. A buyer faces a trade-off: there are possible gains from raising a bid, in the hopes of purchasing the asset from a seller who has set a reserve price in the low end of the indeterminate range, but there is potential harm from setting a bid too high, and potentially paying b (or higher in the conservative regime) and facing a sure loss.⁶

⁶As noted above, the ambiguity in the seller's endowment makes trade more likely; see de Castro and Chateaufneuf (2011) on this point. On the point that rents may persist, i.e., that markets may not incorporate all the seller's information, see Condie and Ganguli (2011a,b).

We require that all agents prefer an asset that is guaranteed to have a higher value to one that is guaranteed to be lower. Letting

$$X = \{[a, b] | \underline{a} \leq a \leq b \leq \bar{b}\}$$

we have the following:

Axiom 2.1 (Interval Order). *All agents have preferences that are monotone in the range of values, in the sense that, if asset x has value in $[a, b]$ and asset y has value in $[c, d]$, then*

$$b \leq c \Rightarrow x \succsim y,$$

and if there is at least one strict inequality among $a \leq b \leq c \leq d$, then $x \succ y$.

Note that this axiom implies an analogue of a full support condition.

To get predictions on how the seller reports, we need to extend preferences to *rectangular* subsets (“rectangles”), which are of the form

$$R(w, x, y, z) := \{[a, b] \in X | w \leq a \leq x \leq y \leq b \leq z\}$$

We can restrict attention to extending preferences to rectangles because the seller can report \hat{v} under fair value only if

$$\underline{a} \leq a \leq \hat{v} \quad \text{and} \quad \hat{v} \leq b \leq \bar{b}$$

$$\Rightarrow \hat{v} \text{ is reportable iff } [a, b] \in R(\underline{a}, \hat{v}, \hat{v}, \bar{b})$$

Our next axiom is monotonicity with rectangular sets:

Axiom 2.2 (Witnessed Strict Dominance). *Let S, T be rectangular subsets of X . Suppose*

that:

$$(\forall [a', b'] \in S)(\exists [a'', b''] \in T) \quad [a', b'] \prec [a'', b'']$$

and

$$(\forall [c'', d''] \in T)(\forall [c', d'] \in S) \quad \neg([c'', d''] \succsim [c', d'])$$

Then $S \prec T$.

This says that, if $S \prec T$, it is always possible to produce an element of T that serves as a witness to T dominating S , and it is never possible to find an element of S that serves as a witness to S dominating T .

Our two remaining axioms are an independence principle and, to avoid trivialities, a nondegeneracy principle:

Axiom 2.3 (Disjoint Union Independence). *Let R, S, T be rectangular subsets of X . Suppose $S \prec T$. Then*

$$R \cup S \prec R \cup T$$

This is clearly related to the independence of irrelevant alternatives axiom in the standard von Neumann-Morgenstern theory. It is also close to the Bolker-Jeffrey axioms Bolker (1967), Jeffrey (1983), Broome (1990). But because we restrict attention to disjoint unions, we have a strictly weaker framework, and thereby avoid implying the existence of an expected utility representation.

Axiom 2.4 (Nondegeneracy). *For any rectangular subset S of X , if S nonempty, then*

$$\emptyset \prec S$$

With these axioms, we can prove the following:

Theorem 2.2 (Aggressive Fair Value Reporting). *In the fair value regime, if the seller's private information is $[a, b]$, then the optimal report is $\hat{v} = b$.*

Proof. Consider two reports $r, r' \in [a, b]$ with $r < r'$. The values of $[a, b]$ under which r is a feasible report can be written as

$$\{[a, b] | \underline{a} \leq a \leq r \leq b < r'\} \cup \{[a, b] | \underline{a} \leq a \leq r \leq r' \leq b \leq \bar{b}\}$$

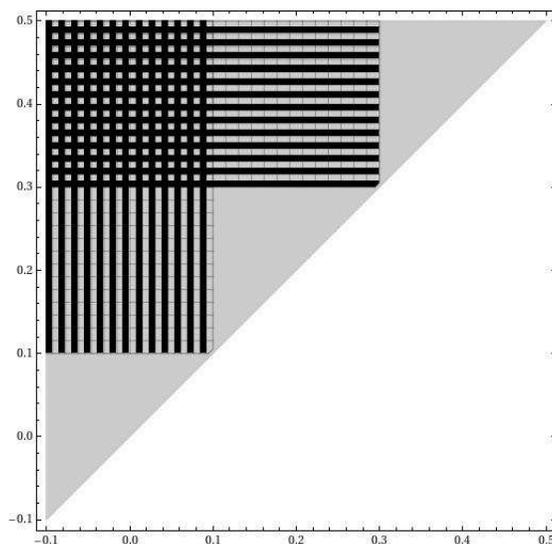
Similarly, the values of $[a, b]$ under which r' is a feasible report can be written as

$$\{[a, b] | \underline{a} \leq a \leq r \leq r' \leq b \leq \bar{b}\} \cup \{[a, b] | r < a \leq r \leq b \leq \bar{b}\}$$

By disjoint union independence, we can eliminate the common set from both. The result then follows from witnessed strict dominance.

□

The following picture illustrates the idea of the proof:



The x -axis represents the asset's lower bound (which in the illustration ranges from a cost to its owner of -0.1 to a positive value of 0.5 ; that is, $\underline{a} = -0.1$ and $\bar{b} = 0.5$ in this figure). The y -axis is the upper bound on the asset's value. The area in gray therefore represents the set of possible asset values, prior to either the seller or the buyers learning any information.

Suppose that $a \leq 0.1 < 0.3 \leq b$, so that 0.1 and 0.3 are both feasible mark-to-model reports. The vertically striped region, including the checked region, is the set of possible ranges of asset values under which the report of 0.1 would be feasible. Hence, if the seller reports 0.1 as a possible value of the asset, then the buyers' interpretation of the report must be some subset of the vertically striped region. Similarly, if the seller reports 0.3 , then the only possible range of values that the seller could have faced are in the horizontally striped region, again including the checked region.

Let S be the vertically striped region, excluding the checked region. Let T be the horizontally striped region, excluding the checked region, and let U be the checked region. For any point in S , the upper bound on the range of possible values is strictly below the lower bound on the range of values for all points in some subset of T . That is, everything in S is strictly worse than something in T , while none of T is strictly worse than anything in S . An asset with a range of values in S is worse than an asset with a range of values in T . Disjoint union independence then gives that an asset with a range of values in $S \cup U$ is strictly worse than one with a range of values in $T \cup U$. This implies that the buyers strictly prefer a higher report to a lower one under the mark-to-model regime. Anticipating this, the seller realizes that the only information that he or she can credibly disclose is the upper bound b .

Because the seller can set the reserve price as low as a , the buyers should bid at least a under the conservative regime: doing so has some possibility of winning, and if it does win, it is guaranteed not to lose money and could possibly win money. Buyers can vary on the upper bounds of the bids that they can justify. The incomplete preferences only assure that their

bids must fall in $[a, \bar{b}]$. This gives the following:

Hypothesis 1. The buyers' bids in the conservative regime will be in $[a, \bar{b}]$.

The prediction for bids in the mark-to-model treatment, given the optimistic reporting, is analogous:

Hypothesis 2. Under the mark-to-model regime, the buyers bids will be in $[\underline{a}, b]$

Taken together, hypotheses 1 and 2 imply that, if there is trade under the conservative reporting regime, prices will be in the interval $[a, \bar{b}]$. The market is inefficient under conservative reporting, because the seller's information about b is not affecting prices. However, buyers know the lowest bid that could win, and should bid at least this amount.

Taken together, the hypotheses imply that, if there is trade under the mark-to-model regime, prices will be in the interval $[a, b]$. This is because the seller never sets the reserve price below a , and the equilibrium in the reporting game forces the seller to disclose b . The buyers correctly interpret the seller's report, and never pay more than b . The result is in efficient pricing. However, the buyers do not know a , and the seller has no credible way of communicating it to them. This means that buyers who are attempting to make winning bids end up making bids in the range $[\underline{a}, a)$, and these have no hope of winning. The implication is the following:

Hypothesis 3. Under the mark-to-model regime, there will be less frequent trade than under the conservative reporting regime.

3 Description of the Experiment

To test the predictions of the theory, we ran a laboratory experiment. Our subjects were recruited from the Carnegie Mellon Tepper/Social and Decision Sciences subject pool.

Participants in the experiment were grouped together in groups of 5 for 16 rounds. Each group was assigned to one of two conditions: either a fair value condition or a conservative reporting regime condition. In both treatments, one subject was randomly and privately selected in each round as the seller for that round. The other four participants in the group were the buyers for that round.

In each round, the seller was endowed with an asset, whose value was commonly known to be between \$0.50 and \$1.50. The buyers would receive an endowment of \$1.50, which they could use only in the current round.

We generated a list of values for (a, v, b) for each of the 16 rounds for each pair of groups. Pairing enabled us to control order effects, while keeping subjects together gave us the ability to investigate whether subject heterogeneity was driving their behavior. Each of the random values of lower bounds, upper bounds, and asset values was selected using the ambiguity generator of Stecher et al. (2011). This draws numbers from a nonstationary, nonergodic process with a unit root, and with a divergent mean and infinite second moment. The idea is to draw from a distribution where the sample order statistics are divergent, so that no one (not even the experimenters) can be estimated.⁷

The timeline for the experiment was as in the theory. The experiment was run using z-Tree software (Fischbacher 2007). We now describe the different treatments.

⁷To get results in the finite set, we truncate the decimal portion, and keep the remainder from integer division. But it is the nonstationarity and nonergodicity that drives the results.

In the fair value treatment, the buyers were informed of the upper bound b , corresponding to the equilibrium report under Theorem 2.2. In the conservatism treatment, the buyers were informed of the lower bound a . Buyers in the fair value treatment were reminded that the lower bound would always be at least \$0.50, and were quizzed to verify that they understood that the seller had a lower bound that would be between \$0.50 and b . Similarly, in the conservatism treatment, the buyers were reminded that the upper bound would always be at most \$1.50, and they were quizzed to verify that they understood that the seller had a private upper bound that would be between a and \$1.50.

We checked for order effects by comparing the behavior in the first eight rounds with behavior in the second eight rounds for each group. We checked for heterogeneity by comparing subjects in how aggressively they bid against each other subject, in order to get a pairwise ordering of how aggressively the subjects bid. We then extended the pairwise ordering to an order over all five participants in a group, and then investigated the frequency with which the implied ranking in bids by the pairwise comparisons differed from the observed rankings among all five bidders.

Our hypotheses, as stated in the theory section, can now be made more precise:

$$H_0^1: P(\text{trade} \mid \text{FV}) \geq P(\text{trade} \mid \text{C})$$

$$H_0^2: \text{Maximum bid} \mid \text{FV} \geq \text{Maximum bid} \mid \text{C}.$$

$$H_0^3: \text{Reserve price} \mid \text{FV} = \text{Reserve price} \mid \text{C}.$$

$$H_0^4: \text{There is no difference in reserve prices within a group in rounds 1–8 versus rounds 9–16.}$$

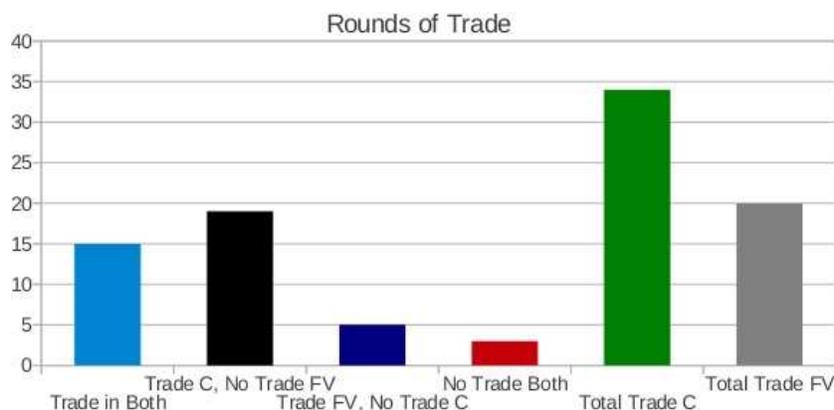
$$H_0^5: \text{There is no difference in bids within a group in rounds 1–8 versus rounds 9–16.}$$

4 Results

We recruited 40 subjects, whose average earnings were \approx \$22. The subjects were split into four pairs of eight groups. Each pair faced the same sequence of asset values and revised bounds, and differed only in the reports issued to the buyers.

Our setting gave us potentially 64 matched pairs of rounds, with 512 bid observations and 128 reserve price observations. In roughly 2/3 of the rounds (42/64), the bids and reserve prices were consistent with profit maximizing behavior.⁸ If the probability of behavior being consistent with profit maximization is equal across treatments, then there would be roughly an 81% probability that a group was consistent in a given round with profit maximization. Because aggressive buyers can alter behavior of a group in a first-price auction, we focus on the rounds where subjects acted consistently with profit maximization.⁹

On the question of liquidity, we found that trade occurred in 48% of the rounds in fair value and 81% of the rounds under conservatism. Using a McNemar's nonparametric test, we reject the null H_0^1 in favor of the alternative that trade is less likely under fair value ($p < 0.01$). The figure below illustrates:



⁸An example of a violation would be a bid of \$1.40 after learning that $b = \$1.20$, or setting a reserve price outside of $[a, b]$.

⁹Including other rounds weakens results but does not reverse them.

The maximum average bid under fair value was \$1.0256, compared with \$1.135 under conservatism. Under a Wilcoxon signed-rank test, this was again strongly significant. As a robustness check, we compared the difference between the highest bid and the reserve price under each treatment. In the fair value sessions, the highest bid was on average 1.48¢ *below* the reserve price; under conservative, the highest bid was on average 14.14¢ *above* the reserve price. Again, these were highly significant under a Wilcoxon signed-rank test. We strongly reject H_0^2 in favor of the alternative, and conclude that switching from conservatism to fair value causes prices to fall.

For the remaining hypotheses, we used a Wilcoxon signed-rank test to assess the differences in reserve prices (\$0.9936 under conservatism, \$1.0407 under fair value), and used a Mann-Whitney test for unpaired observation to compare behavior in each group over the first and last half of the experiment. All of these were insignificant, with p-values of 0.35 or higher. We therefore fail to reject the nulls H_0^3, H_0^4, H_0^5 , and conclude that we do not find evidence in favor of order effects or of differences in seller reserve price across treatments.

Finally, our pairwise rankings of bidders was violated by the complete bidding profile in almost every round across groups. We therefore infer that heterogeneity could not have been the sole driving force behind trading behavior.

5 Extensions

The model we develop makes predictions about opportunistic reporting among sellers in a mark-to-model regime, and about trading behavior given that sellers indeed report opportunistically. Our tests, however only address the latter issue, and take opportunistic reporting as given. As noted in the introduction, there is considerable evidence in favor

of opportunistic use of discretion with fair value reports. Nevertheless, the analysis would be more complete if we were to establish that sellers indeed report in accordance with the predictions of our theoretical results. A separate treatment along those lines is planned.

We also would like to gain more insight on what situations make illiquidity more of an issue, and when it is relatively benign. Some preliminary analyses suggest that, as $b - a$ gets wide, the difference across treatments becomes small. Intuitively, this is because the report in the conservatism treatment informs the buyers that $v \in [a, \bar{b}]$, while the report in the fair value treatment informs buyers that $v \in [a, b]$. As b gets large and a gets small, the reports converge, and the seller's informational advantage vanishes. So we would expect to see the two treatments become similar. Our results are suggestive that this is the case, but we need more observations to determine if this result is meaningful.

As a third extension, we hope to investigate what leads to bids or reserve prices that, if filled, would lose money. Some early evidence suggests that this behavior might be more common when a is close to \bar{b} . Intuitively, if subjects in an experiment consistently see high values of v realized, it may encourage aggressive bidding. This is conjecture, and we hope in future work to develop this more deeply.

6 Conclusion

Our theory explains how mark-to-model accounting could have contributed to the crisis. The observed pattern—optimistic Level 2 and Level 3 reports, falling market prices, and illiquidity—all are consistent with the consequences our model predicts from a shift to mark-to-model from a conservative regime.

Recent work by Khan (2012) suggests that, even when market prices are available, contagion

may be a more serious problem than previously believed. To the extent that contagion is associated with reporting in settings where there is a market price, and not mark-to-model, the stories suggest that fair market value accounting as a whole may have been a factor in the crisis, both for assets that had a price to mark to and for those where, as former Chairman Isaac notes, there was no market.

From a methodological perspective, our paper has implications for researchers studying behavior in different accounting regimes. An analysis of the prices when trade occurs would tempt a researcher to conclude that fair market value accounting leads to greater market efficiency. A more precise conclusion, at least in our study and our theory, is that fair market value leads to greater efficiency conditional upon there being trade. The inefficiency from fair value comes from illiquidity, and researchers hoping to study this or related issues would need to study truncated regression models. We leave this methodological point to other researchers.

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Instructions

This is an experiment in the economics of decision-making. This experiment will last approximately one hour. Do not talk to others at any time during the experiment. If you have any questions during the experiment, please raise your hand.

To make a profit, you will trade a financial asset. At the end of the experiment, we will pay you a show-up fee of \$5 plus any profits you will have made.

The experiment will last for 16 rounds. In each round, the computer will randomly select one person as the seller. The other four participants will be buyers for that round. Everyone has an equal chance of being the seller in any given round. The computer will tell you whether you are a seller or a buyer. The computer will not tell the buyers who the seller is.

At the beginning of each round, the seller will receive an asset, and the buyers will receive 150 cents. The computer will determine the asset's value at the end of the round.

Your Information

If you are the seller, the computer will tell you a minimum and maximum value of the asset for that round. The minimum will be at least 50 cents, and the maximum will be at most 150 cents. The asset's value will be between the minimum and maximum.

If you are a buyer, the computer will tell you the maximum, and will remind you that minimum is at least 50 cents.

The Auction

If you are a seller, the computer will ask you to enter the lowest price for which you are willing to sell the asset. None of the buyers will see the minimum price you enter.

If you are a buyer, the computer will ask you to enter the amount you are willing to pay for the asset. We call this amount your bid. You may enter any amount from 0 to your 150 cents. None of the other participants will see your bid.

If the highest bid is at least the minimum price the seller is willing to accept, then the computer will sell the asset to the buyer who made the highest bid. The price will be the amount of the highest bid. If two or more buyers tie for the highest bid, then the computer will randomly select one of these buyers and sell the asset to the selected buyer.

The computer will then determine the asset's value. If trade does not occur, the seller will receive the asset's value. If trade occurs, the buyer who bought the asset will receive the asset's value. After the computer determines the asset's value, your money for the current round will be deposited into your account.

At the end of the experiment, we will pay you the balance in your account. If your account balance is negative, we will still pay you the full \$5 show-up fee.

If you have any questions, please raise your hand now.