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WP 15-02

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Fixed Prices and Regulatory Discretion as Triggers for Contingent Capital Conversion: An Experimental Examination*

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Abstract

An unresolved issue regarding the implementation of 'contingent capital' bonds regards identifying the best mechanism for triggering the conversion of debt into equity. This paper reports a laboratory experiment that builds on previous work to evaluate the relative desirability of two leading candidate mechanisms: a price informed regulator and a mechanistic fixed-price trigger. We find that the conversion rule in effect determines the desirability of these two mechanisms. When the conversion increases incumbent equity value, a fixed trigger is preferable, but when the conversion decreases value, the reverse holds. Two modifications for improving the regulator mechanism, creating regulator bias (e.g., giving a regulator asymmetric rewards over intervention) and probabilistically providing a regulator with non-market information, only enhance this result.

Keywords: bank regulation; experiments; contingent capital

JEL codes: C92; G14; G28

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1. Introduction

In the aftermath of the 2008 financial crisis regulators and banking scholars have devoted considerable attention to policies that might improve the stability of the banking system. One proposal that has received particular attention would require systemically important banks to carry as a significant portion of their balance sheets a new class of "contingent capital" bonds that convert to equity when the bank passes a pre-defined triggering condition. In times of financial distress these 'CoCo' bonds could importantly address a bank's debt overhang problems by enabling it to raise equity at a pre-determined price just when raising equity in the capital markets is most problematic.[1]

Critical to the effective implementation of CoCo's is the trigger for converting debt into equity. Many proposals suggest the use of a mechanistic price-based rule as a conversion trigger (e.g., Calomiris and Herring, 2013; Flannery, 2009; McDonald, 2013; Pennacchi, 2011; and Pennacchi, Vermaelen, and Wolff, 2013). Price-based triggers offer the important advantage of adjusting continuously to current market conditions.[2] Mechanistic 'fixed trigger' variants of price-based rules, such as a pre-determined minimum equity price, are less susceptible to external pressures that may affect their implementation than would be less rigidly defined alternatives, such as the use of a regulator with discretionary authority. Further, even absent external pressures, mechanistic rules reduce the uncertainty inherent in a regulator-based conversion mechanism regarding the timing and magnitude of a conversion.

As shown recently by Sundaresan and Wang '*SW*' (2014), however, 'fixed-trigger' mechanisms may not work: For certain ranges of fundamental values, a fixed trigger can undermine the informational content of the prices on which it relies. The predicted effects of a fixed trigger depend on the *conversion rule*, or the effect of the conversion on the value of equity to incumbent equity owners. The effects of triggering mechanisms on both value-increasing and

[1] In addition to addressing the 'debt overhang' problem, CoCo's also automatically restructure part of a bank's capital structure, thus reducing the chance of a costly resolution, and may temper managerial risk-taking incentives. See Prescott (2012) for a discussion.

[2] An alternative triggering mechanism, and what has been used in existing CoCo bonds, is one based on accounting measures, such as capital adequacy ratios. A weakness of accounting measures is that they lag actual economic performance of banks. For example, since 1992, U.S. bank regulators have followed prompt corrective action rules. These rules restrict the activities of banks and require regulators to take preventative actions when regulatory capital ratios are breached, which can include putting the bank into receivership. One goal of PCA was to reduce losses to the FDIC when a bank failed. Despite this reform, in the 2008 crisis losses to deposit insurance funds were over 25%. See Balla, Prescott, and Walter (2014) for details. Furthermore, accounting-based measures can sometimes be manipulated. See Calomiris and Herring (2012).

value-decreasing conversion rules are of interest. Although most proposals for the design of CoCo's advocate implementing a value-decreasing conversion rule as a means of tempering risk taking incentives by bank managers, as a practical matter, the bulk of existing CoCo issues involve value-increasing conversions.[3] In the case of a value-decreasing conversion, *SW* show that a fixed trigger creates multiple equilibria for a range of market fundamentals above the trigger price. In the case of a value-increasing conversion, they show that equilibrium does not exist for a range of market fundamentals below the trigger price.

Despite the previously raised issues of implementation associated with regulator-based triggering mechanisms, such mechanisms are worth studying because they have different properties than fixed triggers. Birchler and Facchinetti '*BF*' (2007) and Bond, Goldstein, and Prescott '*BGP*' (2010) show that in the case of a value-decreasing conversion the use of a regulator eliminates the problem of multiple equilibria. Unfortunately, in the case of a value-increasing conversion, *BF* and *BGP* also establish that equilibrium non-existence persists in a regulator regime and in fact arises over a wider range of market fundamentals than under a fixed-trigger rule.

Data from naturally occurring markets provide little guidance as to the type of triggering mechanism that might as a practical matter work most effectively. Although issues of CoCo type bonds have increased substantially in the last several years, no instance of a triggering condition being breached has yet occurred.[4] Furthermore, all the existing issuances use accounting ratios rather than market prices as the trigger. Given the paucity of empirical data, experimental methods are a particularly useful source of evidence. We are aware of only one such paper. Davis, Korenok, and Prescott '*DKP*' (2014) report an experiment that evaluates the relevance of these predicted imprecisions with price-based triggering mechanisms. They find that in both fixed-trigger and regulator regimes the theoretically predicted problems of multiple equilibria and equilibrium non-existence manifest themselves as variability in realized prices, prices deviating from realized values, a misallocation of resources, and errors in conversion. Further, and contrary to theoretical predictions, in the case of a value-decreasing conversion, errors

[3] Avdjiev, Kartasheva, and Bogdanova (2013) reports that over half of CoCo issues in 2013 involve a principal write down and that in most cases the write down is complete. Such bonds represent an extreme case of a value-increasing conversion rule, because in the event of a conversion, debt is simply retired with no associated change to existing equity

[4] Most of the CoCo issues have been in Europe. Avdjiev et al. (2013) report €70 billion in CoCo issuances between 2009 and 2013, compared to €410 billion in standard debt issues in the same time frame. Hayden (2014) asserts that an additional €150 billion in CoCo issues are planned in the next three years.

occurred in the regulator regime as well as in the fixed-trigger regime. As a consequence for some ranges of fundamentals, frequent conversion errors occur in markets using either rule.

An important question not definitively addressed by *DKP* regards the relative performance of the two triggering mechanisms.[5] Furthermore, there are several realistic modifications to the regulator environment that could improve the performance of a regulator. In this paper, we study two such modifications. The first one regards the regulator's incentive to act. A primary observation from *DKP* is that the regulator must infer the fundamentals from prices, while traders need to guess how the regulator will react to prices. Changing the regulator's incentives so that there is a bias away from or toward conversion should affect the regulator's behavior, what traders infer, and ultimately when conversions will occur.

The second modification is to supplement the regulator's price observations with non-market information. Bank regulators have special legal powers to conduct regular bank examinations and via this process can see information beyond what is reported in financial statements. Several studies report that such examinations do give bank regulators access to some information before the markets.[6] While current and accurate information should clearly help a regulator make decisions, timely non-market information is not always available. Further, as the literature also makes clear, the market regularly possesses information that the regulators do not have. Consequently, we will study an environment where the regulator has his own signal with some probability.

We study these questions by reporting a follow-up experiment to *DKP* that evaluates the relative accuracy of fixed-trigger and regulator-based conversion rules. In addition to more systematically analyzing conversion error rates in the 34 market sessions previously reported in *DKP*, we report 12 new market sessions conducted in variants of a regulator regime that incorporate regulator bias and non-market information. We find that the conversion rule

[5] Observing that the fixed trigger mechanism was both more readily understood by traders and eliminated uncertainty regarding the monitor's actions, *DKP* offers some guarded support for the fixed trigger mechanism. However, as reviewed below, support for the fixed trigger mechanism in the *DKP* experiment is far from unqualified, and in several dimensions the regulator regime generated superior results.

[6] The survey in Flannery (1998) discusses the literature on market prices and bank quality. He reports numerous studies that find that market prices contain information that is predictive of changes in bank quality as measured by bank regulators. However, he also reports on some studies, such as Berger and Davies (1998), that find that regulators also have some information that the market does not have. See also Berger, Davies, and Flannery (2000) and DeYoung, Flannery, Lang, and Sorescu (2001). Furthermore, *BGP* show that if the regulator is given his own signal drawn from a uniform distribution, the range of fundamentals for which an equilibrium does not exist decreases as the quality of the signal improves.

importantly affects the relative accuracy of fixed price and regulator based triggering mechanisms. In the case of a value-increasing conversion, results support economists' predisposition toward the use of a fixed trigger: Previously reported fixed trigger markets are marginally superior to regulator markets, and both inaction bias and adding non-market information actually strengthen the superiority of a fixed trigger rule. However, in the case of a value-decreasing conversion, the regulator based mechanism is superior. In previously reported sessions we find that in several dimensions regulator markets perform better than fixed trigger markets. Moreover, both inaction bias and non-market information substantially improve the performance of a regulator based rule.

The remainder of this paper is organized as follows. Section 2 reviews the pertinent theoretic and experimental literature. Sections 3 and 4 present respectively, the experimental design and results. The paper concludes with a short fifth section.

2. **Background.**

Theoretical Motivation. To understand the potential for ambiguity in price-based triggering rules, consider the following example, which also serves as the basis for our experimental design. The equity of a bank has an underlying fundamental value realization θ randomly drawn from a possible range of values between \$2.00 and \$8.00. Suppose that this fundamental realization is known by traders who trade the equity. Suppose further, however, that when the fundamental is below a critical value $\hat{\theta} = \$5.00$, the bank is in distress and a debt-to-equity conversion is socially desirable and that conversion changes the equity payout by \$2.00. *SW* study a related model in which conversion occurs if the price is below a fixed amount, analogous to the \$5.00 trigger in our example.

In the case of a value-decreasing conversion, *SW* establishes that a fixed price trigger creates a potential for multiple equilibria. If conversion drops the value of equity by \$2.00, then for $\$5.00 \le \theta < \$7.00$ an equilibrium exists at the price where no conversion occurs. However, for the same fundamental a second equilibrium also exists: If traders pessimistically assume that a conversion will occur, they will all incorporate the value of the conversion, ω, into their price. Since no unilateral action by any trader could raise the price above the trigger, $\hat{\theta} = \$5.00$, then a

Table 1. Reference Predictions by Treatment

Treatment	Conversion Condition	Range			
		<\$3.00	\$3.00 - \$4.99	\$5.00- \$6.99	≥\$7.00
Fixed-Trigger (*SW*)	(1) Value Decreasing	*	*	Mult. Eq.	*
	(2) Value Increasing	*	No Eq.	*	*
Regulator (*BGP&BF*)	(3) Value Decreasing	*	*	*	*
	(4) Value Increasing	*	No Eq.	No Eq.	*

Key: * Unique rational expectation equilibrium exists; Mult. Eq.: Multiple rational expectations equilibria exist; No Eq. – No rational expectations equilibrium exists.

price of θ - ω, is also a rational expectations equilibrium. This prediction is summarized in the top row of Table 1.

SW further shows that in the case of a value-increasing conversion, a fixed-trigger rule generates problems of equilibrium nonexistence for fundamental realizations between \$3.00 and \$5.00, as listed in the second row of Table 2. Figure 1 illustrates the intuition driving this result. For example, if θ_i is \$3.50, then the unit is worth \$5.50 to traders in the case of a conversion. The conversion will occur, however, only if the market price is below \$5.00. For such a realization (and for any fundamental realization between \$3.00 and \$5.00) no equilibrium price exists.

Suppose alternatively that a regulator with discretionary authority to intervene makes the conversion decision. *BGP* and *BF* study this situation. The bottom two rows of Table 1 summarize pertinent predictions for regulator-based triggering mechanism. Notice in row 3 of Table 1 that in contrast to a fixed-trigger rule a regulator-based regime does not generate multiple equilibria in the case of a value-decreasing conversion. This result holds because in this model, existence requires that the price function be monotonic and a regulator can infer from any monotonic price function exactly what the underlying fundamental is. Therefore, the regulator never converts when the fundamental is above $\hat{\theta} = \$5$, which eliminates the inefficient price functions that were equilibria in the fixed-price mechanism.

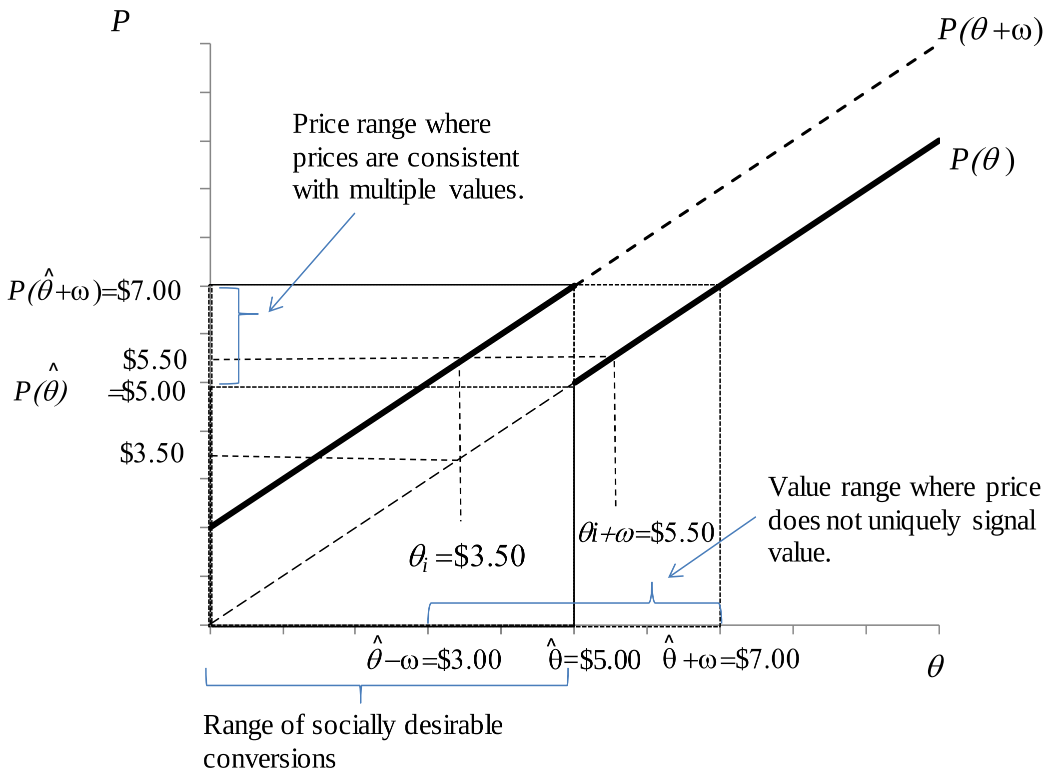

Figure 1. Security Prices, Given the Possibility of a Value-Increasing Conversion.

However, as summarized in the bottom row of Table 1, in the case of a value-increasing conversion, equilibrium non-existence remains a problem, and in fact arises over a wider range of fundamental realizations than under a fixed-trigger rule. Figure 1 illustrates the difficulty of transmitting fundamental value information with prices in this case. At prices below $5.00, the regulator can unambiguously infer that conversion is welfare improving, since θ must be below $3.00 whether or not the conversion takes place. Similarly, at prices above $7.00, the regulator can conclude that a conversion would not be welfare enhancing, since θ must exceed $5 even if traders fully incorporate the possibility of a conversion into the price. But if the price is between $5.00 and $7.00, no clear inference regarding the fundamental may be drawn. For example, a price of $5.50 is consistent both with an underlying fundamental of $3.50 (if the price incorporates the value of the conversion) and $5.50 (if in fact θ=$5.50 and the traders anticipate no conversion). In this case the transaction price of the security does not convey enough information to allow the regulator to distinguish between these two possible fundamentals, so the regulator does not know whether to intervene or not. For this reason, over the range of fundamental realizations between $3.00 and $7.00 no equilibrium exists.

The DKP Experiment. To evaluate the consequences of the above-discussed theoretical problems with price-based triggering mechanisms, *DKP* report a laboratory experiment based on the parameterized example discussed in this section. The experiment consisted of a series of 34 multi-period market sessions. In each period 10 traders, endowed with two asset units and a working capital loan, were invited to trade. Trading was conducted under standard open book double auction rules. Traders knew that in each period dividends took on one of two realizations, either the market fundamental, θ, or a lower value θ-\$0.60, where the lower value was imposed on a minority of traders to induce an incentive to trade. Traders did not know whether their realization was high or low for the period, but they did know that there were more high-value than low-value units (12 high-value versus eight low-value), so that the high-value θ was the competitive equilibrium in the absence of a conversion decision. Also, while traders were informed about the triggering mechanism, they did not learn until after the close of trade whether or not a conversion occurred. Conversions either raised or reduced the dividend values by \$2.00, depending on whether the conversion rule was value-increasing or value-decreasing.[7]

Sessions included both regulator and fixed-trigger regimes.[8] In the regulator '*REG*' regime, following the close of trade, three financially motivated monitors both guessed the market dividend and made conversion decisions in light of the median contract price.[9] Monitor decisions were made simultaneously and, once complete, one of the three decisions was randomly selected and implemented in market. In the fixed-trigger '*FT*' regime, a median contract price below \$5 automatically triggered a conversion.

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[7] It is worth noting that the experiment is not exactly the same as the rational expectations Walrasian model described earlier. The experimental environment differs for practical reasons. First, we introduced some value heterogeneity among participants to motivate trade. Second, we conducted trade via an open book double auction because of its effective performance in experiments and because it resembles trading mechanisms used in practice.

[8] In 12 of the 34 sessions the primary purpose was to investigate the capacity of a prediction market to remedy the ambiguity of price information caused by using a regulator-based triggering mechanism under. As *BGP* show, a prediction market where traders also trade an asset that pays off when conversion occurs resolves the equilibrium nonexistence issue that arises in the case of a value-increasing conversion. Behaviorally, *DKP* report that the addition of a prediction market reduces but hardly eliminates conversion errors. Here in the text we consider only the five periods in each of these sessions where a regulator-triggering regime was used absent a prediction market (these periods preceded the introduction of the prediction market). In an unpublished appendix A1 we analyze more fully performance of the prediction market relative to the previously reported regulator and fixed trigger regimes, as well as relative to the variations of the regulator regime studied below.

[9] Monitors earned up to \$3 (lab) for accurately guessing the market fundamental given the median contract price. They earned \$10 from a correct conversion decision – that is a decision to convert when the market fundamental was below \$5 and a decision to not convert when the market fundamental was \$5.00 or above. To prevent hedging, monitors were obligated to make consistent market fundamental guess/ conversion decision choices.

The conversion error rates listed in Figure 2 summarize the results. In each panel of the figure notice that market fundamentals are clustered into six ranges: the <\$3.00 and ≥\$7.00 ranges where neither triggering mechanism creates price ambiguity, as well as partitions of the \$3.00-\$4.99 and \$5.00-\$6.99 ranges, where, depending on the triggering mechanism and conversion rule, either multiple equilibria or equilibrium non-existence arise. The partitions separate out the ranges 60¢ above and below the \$5.00 efficient conversion limit. Although the proximity of a market fundamental realization to \$5.00 is not pertinent in the *BGP* or *SW* models (both of which use a rational expectations framework), it does affect market performance in the more fully specified market context examined in *DKP* that includes the value heterogeneity necessary for trade, because for market fundamental realizations within 60¢ of the \$5.00 conversion cutoff, some traders must learn the location of the market fundamental from the trading process.[10]

Looking first at the case of value-increasing conversions, observe that under both triggering mechanisms, conversion errors do in fact tend to cluster around fundamental realizations close to the \$5.00 cutoff. However, in the *REG* markets errors are distributed both above and below the \$5.00 cutoff, while in the *FT* markets, errors cluster in the \$3.00 to \$4.99 range. These results are consistent with theoretical predictions: In the *REG* regime market, fundamentals of, say, \$4.60 and \$5.40 may generate very similar transaction prices, both somewhere in excess of \$5.00, leaving monitors confused as to the desirability of conversion and roughly as likely to err by converting as by not converting. On the other hand, in the *FT* regime, conversion errors occur predominantly when the market fundamental is slightly below \$5.00 and traders are unable to keep the median transaction price below the automatic conversion cutoff.

[10] For example, if the market fundamental was \$5.20, six traders (with 12 asset units) would see a fundamental above \$5 while four other traders (with eight asset units) would see a fundamental of \$4.60. The traders with the low value must learn from the bids and offers of the high-value traders that the market fundamental is above \$5.00 and hence no conversion should occur. A similar situation arises for a fundamental of \$4.80, except that in this case the four low-value traders know that a conversion should occur, and the high-value traders must learn the location of the fundamental relative to \$5.00 from bids and offers.

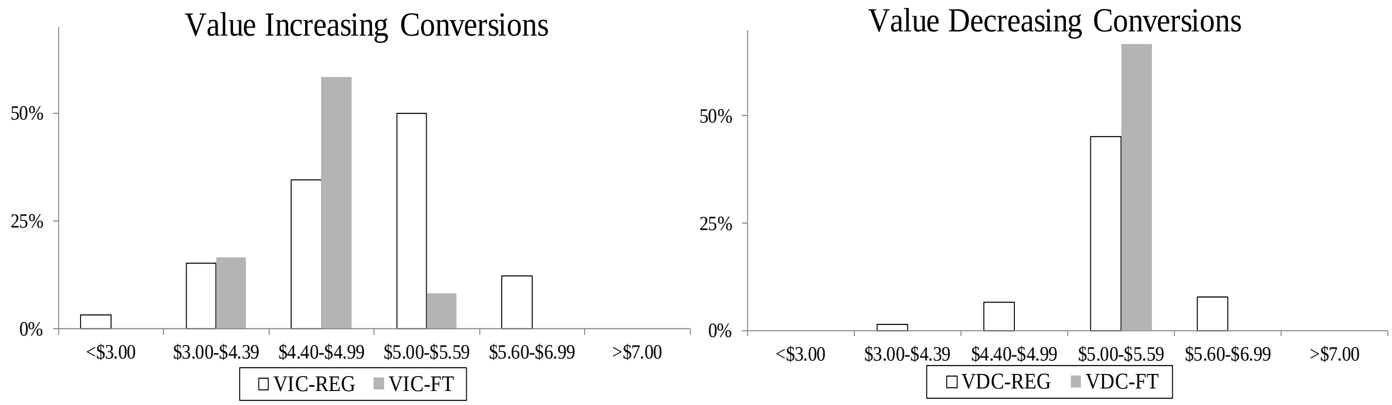

Figure 2. Conversion Error Rates for Regulator and Fixed-Trigger Regimes.

In the case of value-decreasing conversions, errors occur frequently in the *FT* regime for fundamental realizations just above the $5.00 cutoff, as is also predicted by the theory. Not consistent with theoretical predictions is the unpredicted incidence of conversion errors under a *REG* regime. Here again, when market fundamentals were close to but above $5.00 traders often partially incorporated the value of a conversion into prices, in this way generating median prices in the $3.00 - $4.99 range. These downward price adjustments yield prices that would not be observed in an equilibrium for the *REG* regime – traders should either fully incorporate the value of a conversion, generating market prices of $2.99 or less, or realize that the market fundamental exceeds $5.00 and no conversion will occur, generating prices of $5.00 or more. However, upon seeing these prices the monitors often errantly concluded that the market fundamental was below $5.00 and decided to convert.

Combined, these experimental results indicate that the problems of discerning fundamental information from market prices suggested in the theoretical work may frequently lead to errant decisions. Inspecting Figure 2 further, however, notice that the relative desirability of the two triggreing mechanisms is not obvious. In the case of a value-increasing conversion, the overall incidence of errors is roughly the same under either triggering condition. Nevertheless, the type of error differs. In the *REG* regime, the bulk of errors occur for market fundamentals above $5.00, meaning they were socially undesirable conversions (e.g., type II errors of comission). In contrast, in the *FT* regime, errors are concentrated in the ranges of market fundamentals below $5.00, meaning that socially desirable conversions failed to occur (type I, errors of omission). McDonald (2013) argues that type II errors are likely more problematic than type I errors.

In case of a value-decreasing conversion, the bulk of conversion errors are type II errors of comission under either triggering condition. In other respects, the relative superiority of the triggering mechansims depends on the criterion used: The overall incidence of conversion errors is slightly higher in the *FT* than in the *REG* regime, while errors occur over a wider range of fundamental realizations in the *REG* regime.

More generally, as discussed in the introduction, a more complete evaluation of the relative desirablity of fixed-trigger and regulator-based triggering mechanisms requires evaluation of both the effects of introducing inaction bias as well as the direct and indirect effects of non-market regulator information. Our experiment extends this previous research by conducting a series of 12 additional market sessions that examine the effects of these treatments on the accuracy of conversion decisions.

3. Experiment Design and Procedures.

The section first explains the *inaction bias* and *non-market information* treatments and then more generally discusses procedures.

3.1. Inaction Bias. The distortionary effects of external pressures on the timing and magnitude of conversion decisions is potentially an important factor in assessing the value of allowing a regulator to make a conversion decision. There are two distinct reasons to consider introducing bias as a treatment. First, in both the Great Recession and the Savings and Loan Crisis of the 1980s, regulators were criticized for not intervening with sufficient speed. In the Savings and Loan Crisis, in particular, it is well documented that many S&Ls were insolvent but were allowed to continue to operate in the hope they would recover (White, 1991). Introducing a bias toward not taking an action can be viewed as a more realistic description of regulatory incentives in such contexts. Second, in the previously reported sessions, where the regulator had symmetric preferences over taking actions, undesirable conversions were the most frequent error. This suggests that adjusting the regulator's incentives toward inaction may be a way to reduce these errors and affect how traders forecast regulator behavior

To gain some insight into the effects of incentives that bias a regulator against making a conversion decision, we conduct a *REGB* treatment, which replicates the *REG* regime in *DKP*, except that we alter monitors' incentives so as to weaken their willingness to make a conversion decision. As in the *REG* regime, monitors were told the median contract price for the periods and then guessed the underlying market fundamental and made a conversion decision. They earned a small amount (up to $3 lab) for guessing with sufficient accuracy the market fundamental, and then a larger amount ($10 lab) for making a correct conversion decision (e.g., either converting when socially desirable or not converting when not socially desirable). In the *REGB* treatment, we supplement this incentive scheme with penalties for decisions to intervene that turn out to be errant. Specifically, if the monitor chooses to convert when conversion is not socially desirable, the monitor not only forgoes the $10 reward, but incurs a $10 penalty. As before, after all monitors make decisions, one of their choices is selected at random and implemented in the market (e.g., increasing or decreasing the market fundamental by $2 in the case conversion is selected). We evaluate cases of both value-increasing and value-decreasing conversions.

In the literature, the commitment problem that encourages inaction is widely regarded as a reason to prefer a fixed-trigger mechanism to a regulator-based trigger. The analysis in *DKP* focuses on a different tradeoff, namely, how allowing a regulator to react to prices changes the informational content of prices. Here, we see if changes to the regulator can improve the information contained in prices. In particular, in the case of a value-increasing conversion, inaction bias will weaken the willingness of regulators to convert when facing trading prices in the uninformative $5.00-$6.99 range. Incentives against action should increase the incidence of forgone desirable conversions that generate such uninformative prices (e.g., for market fundamentals in the $3.00 - $4.99 range), but at the same time they should reduce the incidence of socially undesirable conversions that generate roughly the same prices (e.g., for market fundamentals between $5.00 and $6.99). Referring back to Figure 2, observe that in the value-increasing *REG* sessions reported in *DKP*, the bulk of conversion errors occurred for market fundamentals between $5.00 and $5.59. Inaction bias may be beneficial on net if it reduces the incidence of these socially undesirable and arguably more costly errors.

In the case of value-decreasing conversions, the possibility of beneficial consequences from an induced inaction bias is even stronger. As can be seen in Figure 2, for the *REG* regime conversion errors are concentrated in the $5.00 - $5.59 range of fundamentals, as pessimistic traders incorporate the value of a socially undesirable conversion when the market fundamental is slightly above the $5.00 cutoff, resulting in prices between $3.00 and $4.99 that reflect a partial discounting of the market fundamental (this is also true in the *FT* regime). A bias toward inaction should make monitors more reluctant to make a decision to convert for prices in the $3.00 - $4.99 range and in this way may reduce the incidence of such 'type II' errors.

On balance then, the expected effects of inaction bias may not be entirely negative. In the case of a value-increasing conversion, inaction bias should reduce the incidence of socially undesirable conversions, partially or even completely offsetting an expected reduction in the incidence of socially desirable conversions. In the case of a value-decreasing conversion, inaction bias may well reduce the high incidence of conversion errors of commission observed in previous *REG* sessions.

3.2 Non-Market Information. The second treatment we examine regards non-market information. A primary hesitancy among policymakers to adopt a mechanistic fixed-price trigger is that the pertinent regulatory authorities (e.g., bank examiners) may have access to information regarding a bank's institutional well-being that is not available to market participants and for that reason may not be incorporated in prices. Such information, when available, should improve the accuracy of decisions made by regulators, a result that *BGP* establish formally for the case of a value-increasing conversion. Nevertheless, if bank examiners do not always have access to accurate information, the market response to a perception that regulators know the market fundamental may importantly dampen the direct effects of regulators actually being informed.

We evaluate the effects of providing regulators with information by using a *REGI* treatment, which is identical to the *REG* regime in *DKP*, except that in addition to seeing the median transactions price, the market fundamental is revealed to monitors each period with probability ½. Traders know the probability that monitors are informed, but they do not know whether the monitor is informed or not in any particular period. We run the *REGI* treatment under both value-increasing and value-decreasing conversion rules.

The expected effects of monitors probabilistically knowing the market fundamental vary importantly with the conversion rule. In the case of a value-increasing conversion, the possibility that monitors know the market fundamental should motivate traders to more fully incorporate the value of socially desirable conversions into prices, in this way *reducing* the informational content of prices in the uninformative $5.00 -$6.99 range. As a consequence, in periods where monitors are not in fact uninformed we might see an increased incidence of conversion errors and over a wider range of market fundamentals than in the previously reported *REG* treatment (and thus also in the *FT* treatment). On the other hand, in the case of a value-decreasing conversion the market response to probabilistically revealing the market fundamental to monitors should lead to a reduction in the incidence of conversion errors. A presumption on the part of traders that monitors know the market fundamental should help clarify the informational content of prices: If monitors know the fundamental, traders should either fully incorporate the value of a conversion into their prices (and trade at prices below \$3.00) or ignore any pessimism on the part of other traders and trade only at prices \$5.00 and above. In sum, even though the probabilistic presentation of market fundamentals to monitors will eliminate conversion errors in the periods where the monitors are informed, the market response to monitors possibly having such information should offset conversion error reductions in the case of a value-increasing conversion but enhance conversion error reductions in the case of a value-decreasing conversion.

3.3 Experiment Procedures. The experiment consists of a series of 12 market sessions, with six sessions conducted in *REGB* treatment and another six session in the *REGI* treatment. At the outset of each session a cohort of 13 student volunteers (10 traders and three monitors) were randomly seated at visually isolated PCs. An experiment administrator then read aloud a common set of instructions, which explained incentives for traders and for monitors as well as how to make decisions on the computer interface used in the experiment.[11] The experiment was programmed and conducted with the software z-Tree (Fischbacher, 2007). To facilitate understanding, screen shots were projected onto a wall at the front of the lab. Following the instructions, participants completed a short quiz of understanding, which the experiment administrator reviewed publicly. At any time during the instructions and quiz, participants were encouraged to ask questions by raising their hands. Questions were answered privately. Following the quiz, the sessions commenced.

Initial instructions were for a *BASE* condition where traders buy and sell asset units, after which monitors, given the median contract price for the period, attempt to guess the underlying market fundamental for the period. After two periods in the *BASE* condition, the session was

[11] Instructions are available in an unpublished appendix A5.

Table 2. Experiment Design and Session Progression

Session	Number of Sessions	1-2	3-12	13-25
			Session Structure, by Periods	
REGB-VIC/REGB-VDC	3	<u>*BASE*</u>	*REGB-VIC*	*REGB-VDC*
REGB-VDC/REGB-VIC	3	<u>*BASE*</u>	*REGB-VDC*	*REGB-VIC*
REGI-VIC/REGI-VDC	3	<u>*BASE*</u>	*REGI-VIC*	*REGI-VDC*
REGI-VDC/REGI-VIC	3	<u>*BASE*</u>	*REGI-VDC*	*REGI-VIC*

paused and additional instructions were distributed, for either the *REGB* or for the *REGI* treatment under a value-increasing (value-decreasing) conversion rule. An experiment administrator then read aloud these instructions and administered another short quiz of understanding, after which a 10 period segment commenced. Following the conclusion of the second segment, a similar protocol was followed for a third segment, which was identical to the second, except that the conversion rule was switched to value decreasing (value increasing). Following the conclusion of the third segment, the experiment ended and participants were privately paid and dismissed from the lab.

Table 2 summarizes the experiment design. In total, 156 undergraduate student volunteers participated in the experiment. Participants were upper-level math, science, engineering, and business students enrolled in courses at Virginia Commonwealth University in the spring semester of 2014. No one participated in more than one session. Lab earnings were converted to U.S. currency at $12.00 lab =$1.00 U.S. rate. Participant earnings for the 90-120 minute sessions ranged from $17.50 to $29.50 and averaged $24.25 (inclusive of a $6 appearance fee).

Results of these sessions are evaluated in light of the 34 *FT* and *REG* markets previously reported in *DKP*, which involved 424 subjects. With only minor differences, the previously reported markets were conducted under the same conditions as the sessions reported here.[12]

[12] Procedures for the new sessions parallel almost exactly those for the six *FT* sessions reported in *DKP*, including the same series of market fundamental realizations and the same rotation in the order of value-increasing and value-decreasing segments with sessions across treatments. The only difference was that, due to time constraints, the number of periods in the *BASE* condition was reduced from five to two. Procedures for the 16 *REG* sessions reported in *DKP* differ from the *REGB* and *REGI* sessions in that value-increasing and value-decreasing treatments were not varied within sessions. Rather, each *REG* session consisted of five *BASE* periods followed by 15 periods under either a value-increasing or a value-decreasing conversion rule. Finally *DKR* also report 12 sessions in a prediction market treatment. These sessions included periods in a *BASE* condition, followed by five periods in a *REG* treatment and finally 10 periods in a prediction market treatment, where traders bought and sold 'conversion likelihood tickets' as well as asset units. For these sessions, value-increasing and value-decreasing conversion conditions were also conducted separately. Only the five *REG* periods in each of the prediction market sessions are

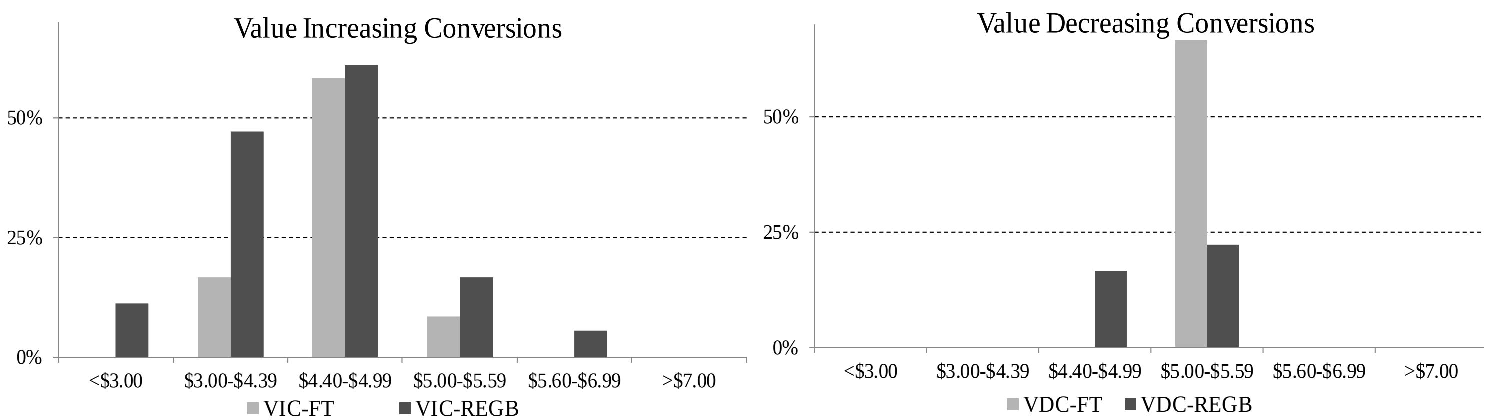

Figure 3. Conversion Error Rates, *REGB* Treatment Relative to the *FT* Treatment.

4. Experiment Results.

4.1 Overview. Figures 3, 4, and 5, respectively plot conversion error rates for the *REGB* and two different aspects of the *REGI* treatments relative to the counterpart *FT* treatments. In each bar graph, observations are clustered into the same six ranges of fundamental realizations reported in Figure 2.

Looking first at the *REGB* treatment, notice that in the case of value-increasing conversions, inaction bias shifts the incidence of conversion errors from the roughly symmetric dispersion around the $5.00 cutoff generated in the *VIC-REG* treatment (see Figure 2) to a dispersion more like that in *VIC-FT* treatment, with the bulk of errors occurring for market fundamental realizations below $5.00.[13] Nevertheless, the reduction in type II errors of commission in the *VIC-REGB* treatment does not compensate for the increased incidence of conversion errors for fundamentals below $5.00, and relative to the *VIC-FT* treatment the *VIC-REGB* condition is unreservedly less accurate: For every range of fundamental values where conversion errors occurred, the incidence of errors is higher in the *VIC-REGB* condition than in the *VIC-FT* treatment. While still imperfect, in the case of a value-increasing conversion, a fixed-trigger rule yields more desirable results than a monitor who faces pressures to not make a conversion.

included in the results reported in the text. An analysis of the relative performance of the prediction market treatment appears in unpublished appendix A1.

[13] Unpublished appendix A3 offers direct comparisons of the *REGB* and *REGI* treatments relative to the *REG* treatment.

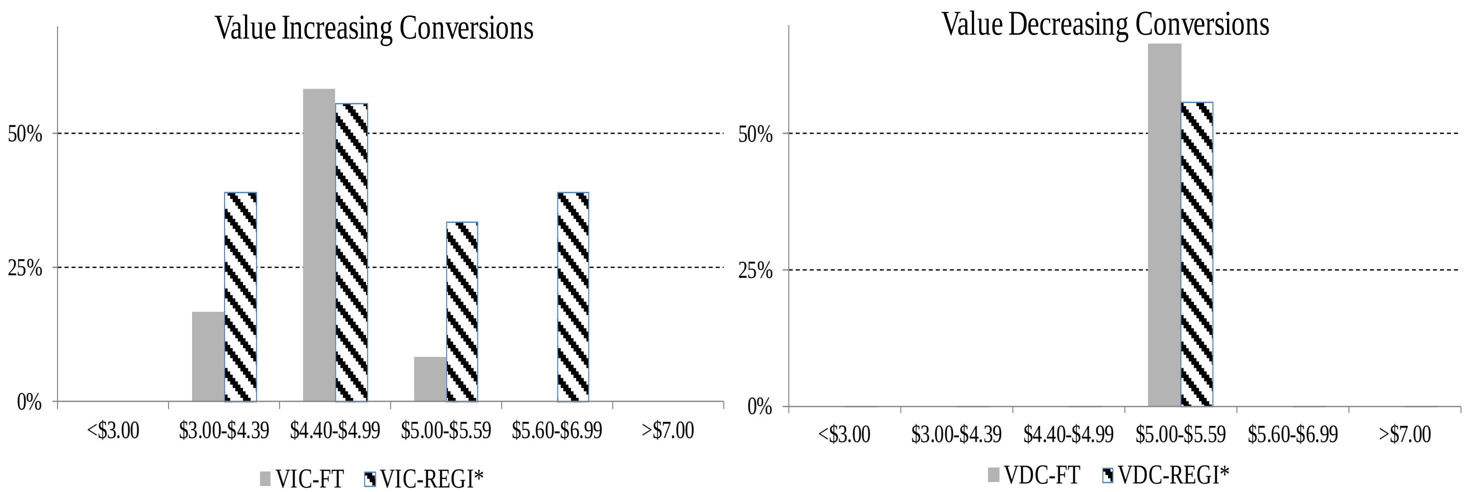

Figure 4. Conversion Error Rates, *REGI** treatment Relative to *REG* and *FT* Treatments

In contrast, in the case of a value-decreasing conversion, inaction bias improves the relative performance of a regulator based triggering rule. As seen in the right panel of Figure 3, the *VDC-REGB* treatment cuts the incidence of undesirable conversions in the $5.00-$5.59 range of fundamental realizations by roughly two-thirds relative to the *VDC-FT* treatment. This reduction in conversion error rates for market fundamentals just above $5.00 comes at the cost of some increase in the incidence of forgone socially desirable conversions for market fundamentals in the $4.40-$4.99 range. Nevertheless, both the overall incidence of errors and the incidence of errors of commission are considerably lower in the *VDC-REGB* treatment than in the *VDC-FT* treatment

Consider now the *REGI* treatment. Here, our primary interest regards the indirect market response to monitors probabilistically knowing the underlying fundamental, because the direct effects of such information must necessarily reduce the incidence of conversion errors. We evaluate these indirect effects by examining the incidence of conversion errors in the periods where the market fundamental was *not* revealed to monitors. Figure 4 illustrates the incidence of conversion errors in these '*REGI**' periods relative to the *FT* regime. Looking first at the case of value-increasing conversions, observe that here the market response to monitors possibly knowing the market fundamental significantly undermines the accuracy of a regulator-based trigger mechanism when monitors are not in fact informed. Compared to the *FT* regime, the incidence of conversion errors in the *REGI** periods is convincingly worse. Except for the $4.40-$4.99 range, where conversion error rates for the two treatments are quite similar, conversion errors occur with a markedly higher frequency in the *REGI** periods than in the *FT* treatment. In the case of a value-decreasing conversion, errors are confined to the $5.00-$5.59

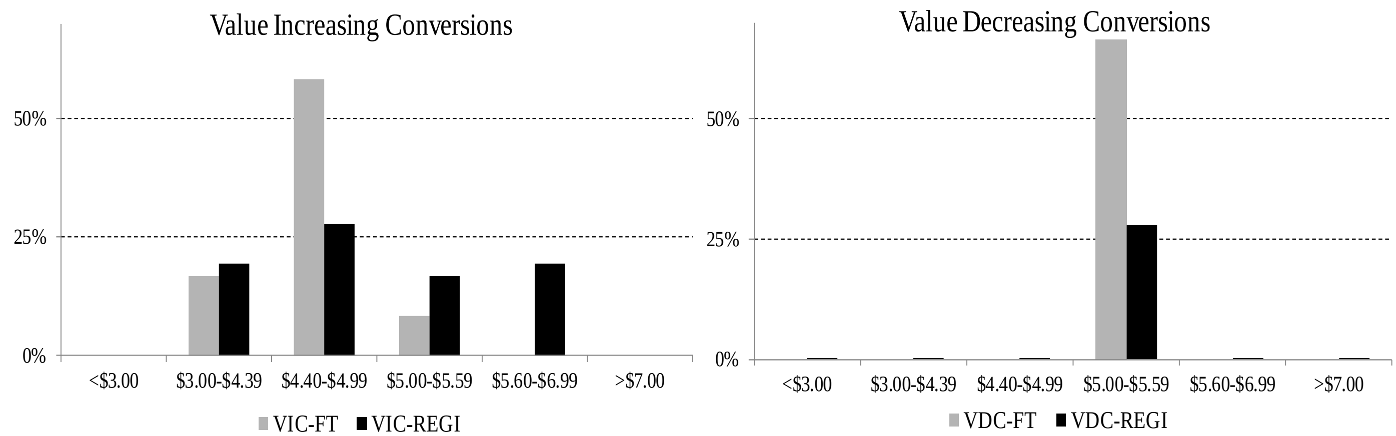

Figure 5. Conversion Error Rates, *REGI* treatment Relative to the *FT* Treatments

range of fundamentals in the *REGI** periods and roughly parallel the incidence of conversion errors in the *FT* treatment. The failure of probabilistically providing information to monitors to clarify traders' pricing incentives was something of a surprise to us, because we expected that the possibility of such information would temper traders' tendencies to pessimistically incorporate the value of a conversion for market fundamentals slightly above $5.00. This did not occur to any important extent. Nevertheless, the market response to monitors probabilistically knowing the market fundamental does nothing to undermine the accuracy of the regulator regime relative to the *FT* regime in the case of a value-decreasing conversion.

The overall incidence of conversion errors in the *REGI* treatment, shown as the black bars in Figure 5, combines the necessarily ameliorative direct effects of informed monitors with the indirect market responses reflected in the *REGI** periods and allows assessment of the net effect of probabilistically revealing the market fundamental to monitors. As seen in the left panel of the figure, in the case of value-increasing conversions, the direct effects of informed monitors, which scale down the overall incidence of conversion errors, are importantly offset by the increased range of fundamentals for which conversion errors occur. Thus, while the overall incidence of errors in the *REGI-VIC* treatment is not noticeably higher than in the *FT-VIC* counterpart, the increased dispersion in errors causes monitors in the *REGI-VIC* treatment to both err more frequently when the market fundamental is not close to the $5.00 cutoff and to commit more 'type II' errors of commission (socially undesirable conversions).

On the other hand, as seen in the right panel, in the case of a value-decreasing conversion incorporation of the direct effects of market information on conversion errors makes the regulator in the *REGI-VDC* treatment unquestionably superior to the *FT-VDC* counterpart.

4.2 Analysis. As the above overview suggests, an assessment of the relative merits of alternative triggering mechanisms in terms of conversion error rates involves comparisons across multiple dimensions. To quantify the relative merits of the alternative triggering rules, we offer four bases for comparison. First, and perhaps most obviously, we compare the overall incidence of conversion errors across triggering mechanisms. Second, following McDonald's suggestion that socially undesirable conversions (e.g., errors of commission) are generally more problematic than failures to convert, we evaluate the incidence of conversion errors for market fundamentals \$5.00 and above. Third, we consider the extent to which a triggering mechanism facilitates the discovery of the market fundamental via the trading process by evaluating the incidence of conversion errors in the ranges \$0.60 below and \$0.60 above the \$5.00 efficient conversion cutoff. Finally and fourth, we consider the extent to which a triggering rule results in 'gross' errors, or errors for fundamentals that deviate by more the \$0.60 from \$5.00.

A series of simple bivariate linear probability regressions allows evaluation of performance in terms of these four criteria.[14] Labelling the six fundamental ranges <\$3.00, \$3.00-\$4.39, \$4.40-\$4.99, \$5.00-\$5.59, \$5.60-\$6.99, and >\$7.00 alphabetically as '*a*', '*b*', '*c*', '*d*', '*e*', and '*f*', respectively, we assess the relative performance of a regulator treatment (*REG*, *REGB*, or *REGI*) relative to the *FT* treatment by estimating the incremental effect of the regulator treatment relative to the *FT* reference. To assess the effect of a regulator treatment relative to the fixed trigger overall, a first regression estimates the incremental effect of the regulator treatment relative to the fixed-trigger rule for all fundamental ranges '*a*' though '*f*' combined. A second regression assesses the incremental effect of a regulator treatment on the incidence of socially undesirable errors by restricting the set of observations to those where the market fundamental exceeds \$5.00, or is in the '*d*', '*e*', and '*f*' ranges. Similarly, a third regression assesses the incremental effect of the regulator triggering mechanism on traders' capacities to learn via the act of trading the location of the market fundamental relative to the \$5.00 efficient conversion cutoff by restricting the set of observations to market fundamentals in the '*c*' and '*d*' ranges. The fourth set of regressions estimate the incremental effect of the regulator triggering mechanism on the incidence of 'gross' errors where market fundamentals are in the ranges below \$4.39 or above \$5.60, the '*a*, '*b*', '*e*', and '*f*' ranges. All regressions use the monitor as the unit of

[14] We report linear probability estimates for expositional ease. Comparable probit regression estimates, which are reported in unpublished appendix A4, yield substantially identical results.

observation, and to control for repeated measures on monitors, we model them as random effects.[15] Further, to control for possible correlations across monitors within markets we cluster data by markets.[16]

Baseline Comparisons. Table 3 summarizes the performance of previously reported *REG* markets relative to those using a fixed-trigger mechanism. Looking at estimates for the value-increasing conversion rule, shown in the left panel, observe that the small and statistically insignificant coefficient estimate on β_{REG} suggests no overall difference between the fixed-trigger and regulator regimes. The *REG* and *FT* triggering mechanisms are further indistinguishable under a value-increasing conversion rule in terms of facilitating discovery of the market fundamental or on the incidence of 'gross' errors, as indicated by the statistically insignificant coefficient estimates on $\beta_{REG\text{- }cd}$ and $\beta_{FT\text{-}abef}$, respectively. The baseline *REG* markets, however, do raise the incidence of type II errors over the *FT* markets by roughly 14% as indicated by the coefficient estimate on $\beta_{REG\text{- }def}$ (p<.01).

On the other hand, in the case of a value-decreasing conversion, the regulator rule outperforms the fixed trigger in most dimensions: The *REG* markets reduce the overall incidence of conversion errors, β_{REG} = - 6% (p<0.05), the incidence of type II errors $\beta_{REG\text{- }def}$ = - 13% (p<0.01) and helps with the discovery of the market fundamental $\beta_{REG\text{- }cd}$ =- 14% (p<0.05). The regulator-based trigger does suffer relative to the fixed-trigger rule in the sense that it generates more 'gross' errors $\beta_{FT\text{-}abef}$ =3% (p<0.10). We summarize these outcomes into the following first result.

[15] In the fixed trigger sessions, each market is treated as a single monitor.

[16] As mentioned in note 10, in an unpublished results appendix (tables A2.1 to A2.3) we follow this same general method to evaluate trading efficiencies, with three differences. First, for both the fixed trigger and regulator markets, the market is the unit of observation, so we model the error term to treat markets as a random effect. Second, trading efficiencies are generated prior to the implementation of conversion decisions, so there is no difference between *REGI**" and *REGI* sessions. Third, when evaluating efficiency performance the '*def*' range (e.g., errors of commission) loses its interpretation (e.g., as tracking errors of commission) and for that reason is dropped. Trading efficiency results echo in all respects the conversion error frequency results reported in the text.

Table 3. Conversion Error Rate Comparisons for *REG* relative to *FT* (Percentages)

	VIC				VDC			
β_0	17^{***}	3	33^{***}	6^{*}	13^{***}	27^{***}	0.33^{***}	0
	(4)	(3)	(10)	(0.03)	(2)	(4)	(5)	(0)
β_{REG}	2				-6^{**}			
	(5)				(2)			
$\beta_{REG\text{-}def}$		14^{***}				-13^{***}		
		(4)				(5)		
$\beta_{REG\text{-}cd}$			7				-14^{**}	
			(12)				(6)	
$\beta_{REG\text{-}abef}$				3				3^{*}
				(4)				(2)
Wald χ^2	0.15	10.36^{***}	0.36	0.59	5.15^{**}	7.2^{**}	6.17^{**}	3.35^{*}
N	510	234	156	354	510	234	158	354

Key: ***, **, * denote rejection of the null hypothesis at p<0.01, p<0.05 and p<0.10 respective (two-tailed tests).

Result 1. *Comparing fixed-trigger and regulator-based triggering mechanisms in a baseline environment, the evidence, while mixed, suggests that the relative performance of alternative triggering rules is sensitive to the conversion rule. In the case of a value-increasing conversion, the FT and REG triggering rules perform similarly, except that the regulator based mechanism generates significantly more socially undesirable conversions. In the case of a value-decreasing conversion, the fixed trigger is inferior to the regulator-based mechanism in all respects except for a relatively small increase in the incidence of 'gross' errors.*

Inaction Bias. Table 4, formatted in a manner similar to Table 3, evaluates the effects of inaction bias by estimating results for the *REGB* treatment relative to the *FT* regime. As can be seen in Table 4, a bias against action makes the comparison of the *REG* and *FT* treatments more unambiguously dependent on the conversion type. In the case of a value-increasing conversion, the regulator-based regime raises the overall incidence of conversion errors, β_{REGB} =11% (p<0.10) and the incidence of 'gross' errors, $\beta_{REGB\text{-}abef}$= 14% (p<0.01). On the other hand, in the case of value-decreasing conversion, inaction bias makes the regulator-based rule a clearly superior alternative. Incentives inducing inaction eliminate the incidence of 'gross' errors in a regulator regime (e.g., errors outside the '*c*' and '*d*' ranges), making the *REGB-VDC* and *FT-VDC* treatments identical in this respect. In the other three dimensions, the regulator regime results in fewer errors overall β_{REGB} =-6% (p<0.10), fewer socially undesirable conversion $\beta_{REGB\text{-}def}$ =-18% (p<0.01), and reduced fewer errors when the market fundamental is close to the \$5.00 cutoff $\beta_{REGB\text{-}cd}$ =14% (p<0.10).

Table 4. Conversion Error Rates Comparisons of *REGB* relative to *FT* (Percentages)

	VIC				VDC			
β_0	17***	3	33***	6*	13***	27***	33***	†
	(4)	(3)	(10)	(3)	(2)	(4)	(5)	
β_{REGB}	11*				-6*			
	(6)				(3)			
$\beta_{REGB\text{-}def}$		6				-18***		
		(5)				(4)		
$\beta_{REGB\text{-}cd}$			6				-14*	
			(11)				(8)	
$\beta_{REGB\text{-}abef}$				14***				†
				(6)				
Wald χ^2	3.03*	1.21	0.24	6.11***	3.34*	17.45***	3.22*	
N	240	120	96	144	240	120	96	

Key: ***, **, * denote rejection of the null hypothesis at p<0.01, p<0.05 and p<0.10 respective (two-tailed tests). †No observations

These results allow statement of a second result.

Result 2*: The addition of incentives that bias monitors against making conversions weakens the performance of a regulator based trigger under a value-increasing conversion rule but strengthens it under a value-decreasing rule. The incremental effects of inaction bias leave a regulator-based trigger rule inferior to a fixed-trigger rule in the case of a value-increasing conversion, but superior to a fixed-trigger rule in the case of a value-decreasing conversion.*

Non-Market Information. Table 5 reports evidence regarding the indirect effects of probabilistically revealing the market fundamental to monitors by estimating incremental error rates in the uninformed *REGI** periods relative to the *FT* regime. As shown on the right side of the table, in the case of a value-increasing conversion, the indirect effects of probabilistically informed monitors unquestionably weakens a regulator based triggering rule relative to a fixed-trigger mechanism. Over the four dimensions we evaluate, the regulator makes between 11% and 24% more errors in the *REGI** periods than does a fixed trigger, with the differences significant at $p<0.01$ in all cases but one. In contrast in the case of a value-decreasing conversion, the accuracy of a regulator in the *REGI** periods is statistically indistinguishable from a fixed-trigger rule in all dimensions.

Table 5. Conversion Error Rate Comparisons of *REGI** Relative to *FT* (Percentages)

	VIC				VDC			
β_0	17^{***}	3	33^{***}	6^{*}	13^{***}	27^{***}	$.33^{***}$	†
	(4)	(3)	(10)	(3)	(2)	(4)	(5)	
β_{REGI*}	13^{**}				-2			
	(5)				(03)			
$\beta_{REGI*\text{-}def}$		24^{***}				-3		
		(4)				(7)		
$\beta_{REGI*\text{-}cd}$			11				-6	
			(12)				(7)	
$\beta_{REGI*\text{-}abef}$				15^{***}				†
				(5)				
Wald χ^2	6.1^{*}	30.8^{***}	0.83	9.94^{***}	0.58	0.18	0.57	
N	150	78	60	90	150	72	60	

Key: ***, **, * denote rejection of the null hypothesis at p<0.01, p<0.05 and p<0.10 respective (two-tailed tests). †No observations.

Table 6 summarizes the overall incremental effects of a regulator based rule in the *REGI* treatment relative to a fixed-trigger mechanism. In the case of a value-increasing conversion results suggest that the market response to probabilistically revealing the market fundamental to monitors very considerably undermines the ameliorative effects of monitors actually knowing the fundamental. The ‘regulators’ (monitors) who actually know the market fundamental in one-half of the periods fail to significantly outperform the fixed-trigger mechanism in any dimension and generate significantly higher incidences of socially undesirable conversions ($\beta_{REGI\text{-}def}$ =11%, p<0.01) and ‘gross’ errors ($\beta_{REGI\text{-}abef}$ =7%, p<0.10). In contrast, given a value-decreasing conversion, relatively weak indirect effects leave a regulator rule significantly superior to the fixed-trigger regime in the three dimensions where they differ, a reduced overall rate of conversion errors, β_{REGI} =-8% (p<0.01), a lower incidence of socially undesirable conversions, $\beta_{REGI\text{-}def}$ =-16% (p<0.01), and a lower incidence of ‘close’ errors, $\beta_{REGI\text{-}cd}$ =-19% (p<0.05). We summarize these observations as the third and final result

***Result 3**: In the case of a value-increasing conversion, the indirect effects of probabilistically revealing the market fundamental to monitors sharply undermine the benefits of monitors actually knowing the fundamental. On balance a regulator based mechanism is inferior to a fixed-trigger rule in this case. In the case of a value-decreasing conversion, indirect effects are*

Table 6. Conversion Error Rate Comparisons of *REGI* relative to *FT* (Percentages)

	VIC				VDC			
β_0	7	3	33	6	13^{***}	27^{***}	33^{***}	†
	(4)	(3)	(10)	(3)	(2)	(4)	(5)	
β_{REGI}	0				-8^{***}			
	(5)				(2)			
$\beta_{REGI\text{-}def}$		11^{***}				-16^{***}		
		(4)				(5)		
$\beta_{REGI\text{-}cd}$			-11				-19^{***}	
			(11)				(6)	
$\beta_{REGI\text{-}abef}$				7^{*}				†
				(4)				
Wald χ^2	0	8.8^{***}	1.09	3.36^{*}	11.67^{***}	11.62^{***}	11.59^{***}	
N	240	120	96	144	240	120	96	

Key: ***, **, * denote rejection of the null hypothesis at p<0.01, p<0.05 and p<0.10 respective (two-tailed tests). †No observations

less pronounced, and on balance a regulator based rule is significantly more accurate than a fixed trigger.

Our finding that, in the case of a value-increasing conversion, error rates for the *REGI* treatment remain in some critical respects higher than in the *FT* regime merits additional comment. As discussed above in section 3, in this case the possibility of monitors knowing the underlying fundamental may well reduce the informational content of prices, as traders, now less reluctant to incorporate the value of a conversion into their trading prices, generate prices in the ambiguous \$5.00 - \$6.99 range with an increased frequency.

The mean price deviations for the *FT*, *REG,* and *REGI* treatments from the *ex post* efficient price, shown in Figure 6, illustrates the effects of probabilistically provided monitor information on trading prices. In the *FT* treatment, traders, concerned about not triggering a conversion tended to be very reticent about incorporating the value of a conversion into their prices. Traders in the *REG* treatment, similarly concerned about not sending an ambiguous price signal to monitors, priced in a manner almost identical to their *FT* treatment counterparts on average.

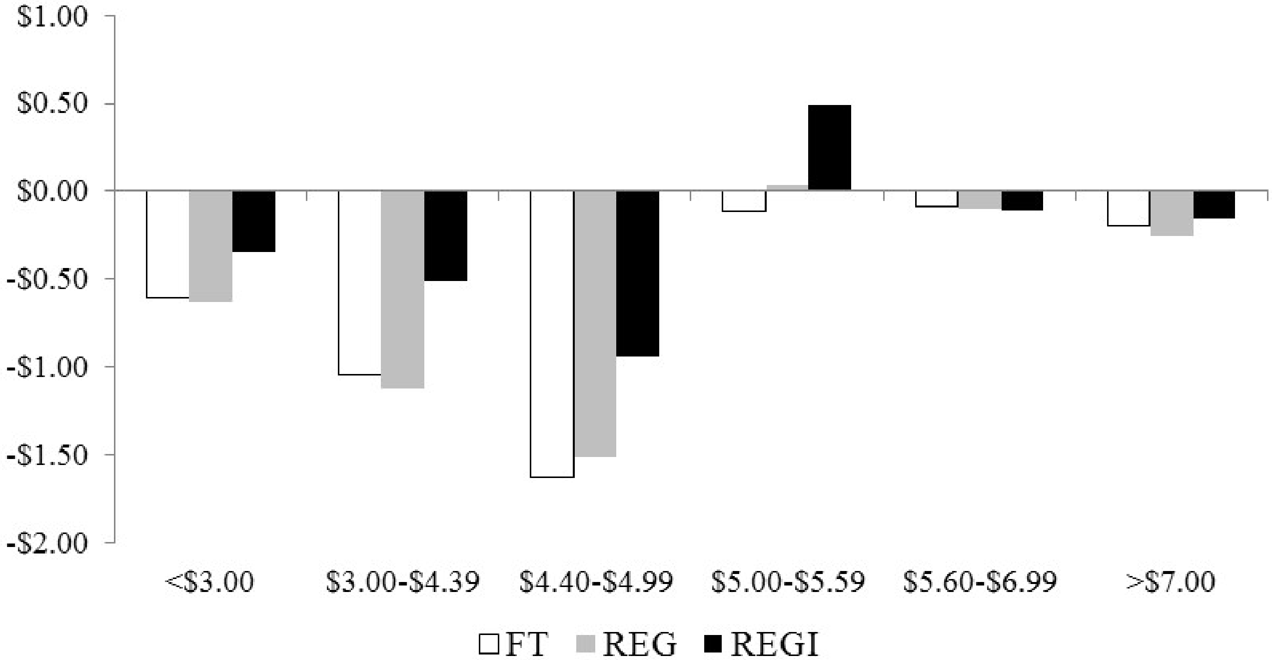

Figure 6. Mean Price Deviations from the *Ex Post* Efficient Price for the *FT*, *REG*, and *REGI* Treatments, Value-Increasing Conversion Condition

However, in the *REGI* treatment, knowing that the monitor was informed in half of the periods, traders were much more eager to incorporate the value of the conversion into prices. As a consequence, in those periods where monitors were not shown the underlying fundamental the range of effectively ambiguous prices was higher than in the *REG* treatment.[17]

4. Conclusion

CoCo's have justifiably received a great deal of attention as a potentially important tool for improving the stability of systemically significant financial institutions. An important unresolved issue regarding the implementation of CoCo bonds regards the identification of an efficient and accurate triggering mechanism.

Many academic proposals suggest that CoCo's be structured as a combination of a sharply dilutive conversion rule along with a mechanistic 'fixed' trigger. A value-decreasing conversion rule provides incentives for bank managers to temper the riskiness of their loan portfolios. A fixed triggering condition offers increased certainty in the timing and magnitude of

[17] Note finally the deviation above the *ex post* efficient value for fundamentals in the $5.00-$5.59 range. Evidently the increased propensity for monitors to make decisions to convert for prices between $5.60 and $6.99 encouraged some traders to partially price in the value of a conversion, even when a conversion was not socially efficient.

a conversion relative to a regulator-based mechanism, and is less susceptible to manipulation. Neither of these proposed conditions are uncontroversial. Management, sensitive to the well-being of equity owners will be reluctant to issue bonds that have the potential to dilute equity value. Despite their certainty of implementation, mechanistic price-based triggering conditions preclude the incorporation of non-market information.

Theoretical work establishes that both of the leading candidate price-based triggering mechanisms are imperfect in the sense that ranges of fundamental realizations exist for which the market cannot be expected to generate reliable information whether or not a conversion will be socially desirable. For this reason, the selection of a trigger mechanism is an empirical issue. Due to their recent novelty, however, no naturally occurring evidence exists to guide policy-makers in their mechanism choice.

This paper reports a laboratory market experiment conducted to evaluate the relative performance of fixed and regulator-based triggering mechanisms. In particular, we examine the relative performance of these mechanisms in environments enriched to examine the effects of two modifications that may affect the relative accuracy of the alternative mechanisms. One modification changes regulator incentives to bias them against making conversion decisions. The second modification probabilistically gives regulators their own signal about the underlying fundamental. Our experimental results suggest that the relative superiority of a price-based triggering mechanism is sensitive to the conversion rule. In the case of a value-increasing conversion, a fixed trigger outperforms a regulator-based mechanism. A bias toward inaction strengthens this result, and the possibility that the regulator possesses non-market information does not undermine it. On the other hand in the case of a value-decreasing conversion, the discretionary regulator outperforms a fixed trigger rule, and both biased incentives toward inaction and the possibility that monitors know the market fundamental strengthen the relative performance of the discretionary regulator.

We share with most economists a bias toward the use of a mechanistic triggering rule, since such a rule helps solve regulator commitment problems. However, our results should be interpreted as providing evidence on a different aspect of a bias toward inaction, namely, how such a bias affects the transmission of price information. In the case a dilutive conversion rule is not practically implementable, the use of a fixed price triggering mechanism takes on particular importance. On the other hand, if a dilutive conversion rule is in place, the use of a mechanistic triggering mechanism may be less important. In natural contexts, regulators may certainly be subject to external pressures distinct from those evaluated here, and other types of informational issues may affect monitor decisions (such as the potential for information manipulation by the regulated). Nevertheless, in the environments studied here, given a dilutive conversion rule, a regulator-based triggering mechanism not only does not suffer relative to a fixed trigger, but it exhibits superior performance.

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