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Abstract

This paper studies the effect of regulations on sell-side analysts' research. These regulations – NASD Rule 2711, NYSE Rule 472, and the Global Analyst Research Settlement – attempted to mitigate the interdependence between research and investment bank departments of U.S. brokerage houses. We document that since the regulations have been in place, many brokerage houses have migrated from the traditional five-tier rating system to a coarser three-tier system. In addition, optimistic recommendations have become less frequent and more informative, whereas neutral and pessimistic recommendations have become more frequent and less informative. Importantly, the overall informativeness of recommendations has declined. The likelihood of issuing optimistic recommendations no longer depends on whether analysts are affiliated with the covered firm, although affiliated analysts are still reluctant to issue pessimistic recommendations. An analysis of price reactions to recommendations provides mixed evidence on whether investors discount affiliated recommendations to a lesser extent than they did before the regulations.

1 Introduction

Over the past decade, academic studies, regulators, and the financial press have pointed to sell-side research that is tainted by conflicts of interest between investment banking and research departments of U.S. brokerage firms.[1] The stock market crash of 2000-2001 triggered concerns that investors were being misled by analysts' biased research. Changes in the regulatory environment began in July 2002, with the new NASD Rule 2711 and the amended NYSE Rule 472 on sell-side research. In December 2002, the Global Analyst Research Settlement involving ten U.S. investment banks ("the sanctioned banks") was formally announced.[2] The purpose of these regulations was to curb conflicts of interest that affected analysts' research by substantially limiting relations between research and investment banking departments. The new rules also established stringent disclosure requirements that intended to make research output more meaningful.

This study investigates the impact of these regulatory changes on analysts' recommendations. Have analyst recommendations become more informative following the regulations? Did the regulations mitigate the effects of conflicts of interest? Furthermore, did the regulations affect the response of investors to analysts' recommendations?

We analyze stock recommendations and price reactions to them before the regulations (the *Pre-Reg* period), and after the regulations (the *Post-Reg* period). Barber, Lehavy, McNichols, and Trueman (2006) show that the distribution of recommendations in the *Post-Reg* period has become more balanced, as analysts are more likely to issue pessimistic or neutral recommendations compared to the *Pre-Reg* period. We show that the new pattern of recommendations coincided with the adoption of new rating systems. Following the regulations, most leading investment banks moved from the traditional five-tier rating system to a coarser three-tier rating system over a short period of time (typically one day). The adoption of new rating systems was accompanied by banks completely reshuffling their recommendations, obtaining a more balanced distribution. We document, however, that while the adoption of rating systems implied massive reclassifications of outstanding recommendations, it was somewhat technical, as it did not elicit significant price reactions. Although the reclassification itself

[1] Examples in the financial press include "Merrill Alters a Policy on Analysts," *Wall Street Journal*, July 11, 2001; "Shoot All the Analysts," *Financial Times*, March 20, 2001; "Where Mary Meeker Went Wrong," *Fortune*, May 14, 2001, and "Outlook for Analysts: Skepticism and Blame," *Wall Street Journal*, June 13, 2001.

[2] The original ten investment firms included in the "Global Settlement" are Bear Stearns, Credit Suisse First Boston, Goldman Sachs, Lehman Brothers, J.P. Morgan, Merrill Lynch, Pierce, Fenner & Smith, Morgan Stanley, Citigroup Global Markets, UBS Warburg, and U.S. Bancorp Piper Jaffray. In August 2004 Deutsche Bank and Thomas Weisel joined the settlement, bringing the total number of participants to twelve.

may be cosmetic to some extent, an ongoing use of a coarser grid of recommendations may significantly reduce their informativeness, and hence may have real economic effects.

We thus examine the informativeness of recommendations, as proxied by investors' reactions, and how it was affected by the regulations. We start by examining conditional informativeness measured as the abnormal price reactions to recommendations, conditional on their type (optimistic, neutral, and pessimistic). The results suggest that investors internalized the change in the distribution of recommendations in the period following the regulations. For instance, the price response to optimistic recommendations is more positive in the *Post-Reg* period, suggesting that optimistic recommendations are perceived to be more reliable. By contrast, price responses to neutral and pessimistic recommendations are less negative following the regulations, since more recommendations fall under these categories.

Note that optimistic recommendations have become more informative but less frequent, whereas neutral and pessimistic recommendations have become less informative but more frequent. In addition, it is likely that investors can extract less information when a coarser grid is in use. So, has the overall informativeness of recommendations increased or decreased following the regulations? To answer this question we examine *absolute* abnormal price reactions to recommendations unconditional on their type. This allows us to pool together price reactions from different recommendation types and estimate the overall (unconditional) informativeness of recommendations both before and after the regulations. Higher (lower) absolute price reactions imply that on average investors learn more (less) from recommendations, unconditionally.

We find that the overall informativeness of recommendations has significantly decreased following the regulations: The absolute price reactions to stock recommendations are significantly lower in the *Post-Reg* period. This holds after controlling for changes in market volatility, analyst experience, past market and firm performance, and changes in sample composition across the two periods. We further show that recommendations issued by brokers who use a three-tier rating system (before or after the regulations) provide less information to investors. Additionally, the decline in informativeness after the regulations is stronger for sanctioned banks, all of whom have switched to a three-tier system. These results are consistent with a causal effect of the regulations on the informativeness of stock recommendations.

We next turn to evaluating the effect of the regulations on analysts' conflicts of interest related

to investment banking. We identify cross-sectional variations in the exposure of analysts or covered firms to conflicts of interest related to underwriting business. We then use a difference-in-differences approach to gauge the impact of the regulations. Our main proxy for the presence of conflicts of interest is past underwriting relationship between the brokerage house and the recommended firm. It is motivated by prior evidence which suggests that affiliated analysts, whose employer has business relations with the covered firm, are more biased than unaffiliated analysts (Michaely and Womack, 1999, Dugar and Nathan, 1995, Lin and McNichols, 1998, Krigman, Shaw, and Womack, 2001).[3] We also propose two additional proxies for the presence of conflicts of interest that are based on the likelihood that a firm will raise capital in the near future. Analysts are expected to express optimism for such firms, regardless of prior underwriting relationship, to get a share in the managing team of the upcoming offering. Given the evidence that equity offerings are serially correlated, our first variable is whether the firm has issued equity in the recent past. The second variable relies on a firm's financing deficit, using the idea that firms pressed for cash are likely to raise capital in the near future.

We document a significant change in how conflicts of interest influence stock recommendations. We corroborate prior research and the concerns of regulators by showing that conflicts of interest were associated with excess optimism in the *Pre-Reg* period. We show that in the *Post-Reg* period, affiliated analysts are as likely to issue optimistic recommendations as unaffiliated analysts. Moreover, the difference-in-differences between affiliated and unaffiliated analysts across the two periods is significant, suggesting that analysts have changed their recommendation practices. In contrast, conflicts of interest might still be influencing pessimistic recommendations. In both the *Pre-Reg* and *Post-Reg* periods, affiliated analysts are more reluctant to issue pessimistic recommendations than unaffiliated analysts, and the difference-in-differences is not significant. When we use the alternative measures of conflicts of interest we also find significant changes in analysts' practices. Before the regulations, analysts were overly optimistic regarding firms that have recently issued equity, and with respect to firms that experience financing deficit. We show that after the regulations, this optimism has declined significantly.

The importance of these changes could be dismissed on the grounds that rational investors would

[3] These studies mainly demonstrate a bias in stock recommendations. The evidence is less conclusive with respect to other research outputs such as earnings forecasts (Dugar and Nathan, 1995, Cowen, Groysberg, and Healy, 2003), price targets (Cowen, Groysberg, and Healy, 2003) and long-term earnings growth forecasts (Lin and McNichols, 1998, Dechow, Hutton, and Sloan, 2000). Other studies of conflicts of interest in sell-side research are Boni and Womack (2002a), Chan, Karceski and Lakonishok (2003), Ljungqvist, Marston, Starks, Wei, and Yan (2005), Barber, Lehavy, and Trueman (2007), and Agrawal and Chen (2005).

adjust for any bias by analysts. However, some recent evidence supports regulators' claim that such changes were required: In the *Pre-Reg* period, retail investors acted naively, failing to adjust for biases in analysts' stock recommendations, whereas institutional investors did not (Boni and Womack, 2002b, 2003, Malmendier and Shanthikumar, 2007, De Franco, Lu, and Vasvari, 2007). Thus, prior to the regulations, there appeared to be a wealth transfer from unsophisticated to sophisticated investors, in line with the concerns of the regulators.

Finally, we examine whether investors react differently to recommendations issued by potentially conflicted analysts before and after the regulations. We find that investors discount affiliated neutral recommendations to a lesser extent after the regulations. However, we do not find such evidence for optimistic and pessimistic recommendations.

Collectively, we view our findings as consistent with a limited achievement of the regulations' objectives. Although the mix of recommendations has become more balanced, the overall informativeness of recommendations has declined in the *Post-Reg* period. The regulations seem to have been successful in curbing the issuance of optimistic recommendations by analysts facing potential conflicts of interest. However, affiliated analysts are still reluctant to issue pessimistic recommendations. Finally, price reactions to recommendations suggest that investors have internalized some of the effects of the regulations on analysts' practices.

To our knowledge, our paper is the first comprehensive research testing the effects of the regulations on the informativeness of recommendations, and on analysts' conflicts of interest related to investment banking. Our paper is related to Barber, Lehavy, McNichols, and Trueman (2006). They show that after the regulations, the distribution of recommendations has become less skewed. We add to their results by (i) documenting the change in rating systems; (ii) studying the change in informativeness of recommendations; and (iii) investigating the effect of the regulations on conflicts of interest related to underwriting relationships.

The rest of the paper is organized as follows. In section 2 we discuss the regulatory changes. Section 3 describes the data. Section 4 documents the change in the rating systems and the changes in the informativeness of the analysts' recommendations. In section 5 we examine the effect of the regulations on conflicts of interest related to investment banking. We conclude in section 6.

2 The New Regulations

During the summer of 2001, Congress held the "Analyzing the Analysts" hearings. Two pieces of closely related regulations followed. First, new rules were enacted by the self regulatory organizations (the SROs), NASD and NYSE, affecting virtually all brokerage houses operating in the United States. The second regulatory intervention was the Global Settlement, which applies directly only to the sanctioned banks (see Footnote 2).

The SROs Regulation. In July 2002, new rules for sell-side analysts became effective through NYSE (amended Rule 472) and NASD (Rule 2711). The main purpose of the SROs' new rules was to sever the ties between investment banking (IB) and research departments. Among other measures, the rules limited the relationships and communications between IB and research personnel, prohibited analyst compensation that is based on specific IB transactions, and banned subject companies from reviewing research reports before publication (except for checking factual accuracy). The new rules also established stringent disclosure requirements for research reports. These requirements were aimed at providing better information to properly interpret research outputs, and to identify potential conflicts of interest. For example, along with the research report, an analyst has to disclose whether she received compensation based on IB's revenue, whether she holds a position as an officer or a director in the subject company, or whether the subject company is a client of the firm. Finally, to make research output more meaningful and easily comparable across different analysts and firms, the rules prescribed that every research report must explain the meaning of its rating system and disclose the percentage recommendations in the "buy," "hold," and "sell" categories.

The Global Settlement. In June 2001, the New York Attorney General began investigating Merrill Lynch following a *Wall Street Journal* article about an alleged misconduct of security analysts. Contrary to favorable public reports by analysts about certain stocks, internal e-mails by those same analysts showed a clear dissatisfaction with the attractiveness of the stocks. Following the Merrill Lynch inquiry, the Attorney General investigated other investment banks for similar issues. Supposedly, from approximately mid-1999 through mid-2001, investment bankers engaged in practices that created or maintained inappropriate influence over research analysts, thereby tainting research with conflicts of interest. The investigations led to the Global Settlement between the SEC, the NYSE, the NASD, the New York Attorney General, and ten (later twelve) U.S. investment firms.

The Global Settlement's objectives closely mirrored the SROs' new regulations, most importantly with respect to severing the ties between IB and research departments. In a few cases, the Global Settlement goes beyond the SROs' new rules. For example, it requires that IB and research departments be physically separated and that the research department have a dedicated legal department. Besides the regulatory measures on sell-side research operations, the Global Settlement required the sanctioned banks to pay fines and penalties totaling roughly $1.4 billion.

3 Data

Sample Period. We focus on analysts' stock recommendations in the period following the enactment of the regulations (September 2002 - December 2004), referred to as the *Post-Reg* period. We begin this period in September 2002, immediately after the first set of rules was enacted. We compare analysts' outputs in the *Post-Reg* period to their outputs in the preceding period (November 2000 - August 2002), which we label the *Pre-Reg* period. We begin this period in November 2000 because Regulation FD, another substantial regulation influencing analysts, was enacted in October 2000. Our aim is to gauge the effect of the regulations beyond what may have already been achieved as a result of Reg FD (see Gintschel and Markov, 2004).

Stock Recommendations. Although brokerage houses produce many other pieces of information about the stocks they track (general research reports, earnings forecasts, etc.), we focus on the effects of the regulations on stock recommendations. Recommendations were the focal point of the complaints about conflicts of interest and of the demand for the regulations. For example, the SEC describes the purpose of the regulations as to "address conflicts of interest that are raised when research analysts recommend securities in public communications" (SEC Release no. 45908, p. 3). Moreover, recommendations seem to represent a research output that is more binding. Elton, Gruber, and Grossman (1986) describe recommendations as "one of the few cases in evaluating information content where the forecaster is recommending a clear and unequivocal course of action..." (p. 699).[4]

We obtain information on stock recommendations from the IBES database.[5] For firms that issued

[4] Conflicts of interest can also influence analysts' earnings forecasts, but in this case, the influence might occur in more subtle ways, for example, through an outright optimistic forecast or through strategic pessimism in order to avoid earnings disappointments. The literature on the subject presents mixed results, with some reporting an influence of underwriting activies on analysts' forecasts (e.g., Rajan and Servaes, 1997, Chan, Karceski, and Lakonishok, 2003, and Cowen, Groysberg, and Healy, 2003), but others not (e.g., Lin and McNichols, 1998, and Agrawal and Chen, 2004).

[5] The IBES tapes we used were downloaded between November 2005 and November 2006. These tapes are virtually free from the data problems identified in Ljungqvist, Malloy, and Marston (2007). These problems are reltaed to IBES

equity, we label as "affiliated" those recommendations issued during the two years following the equity offering by analysts who are employed by either its lead underwriter(s) or by the co-manager(s). This definition is consistent with Bradley, Jordan, and Ritter (2007), who argue that the interests of lead underwriters and co-managers are similar. Some descriptive information about all stock recommendations available for our analysis is provided in Panel A of Table 1. Note that some recommendations issued in the *Post-Reg* period are related to IPOs/SEOs that occurred in the *Pre-Reg* period. We consider these recommendations as belonging to the *Post-Reg* period. The rationale is that once the regulations are in place they apply to all recommendations, regardless of when the related offering took place.

Brokers. Our data cover all brokers issuing stock recommendations and surveyed by IBES. In some of our analyses, we distinguish between brokers who participated in the Global Settlement and those who did not. We term the first group "sanctioned banks" and the second group "non-sanctioned banks" (see Footnote 2 for a list of participants in the Global Settlement). Note that in August 2004 two additional banks joined the settlement. The results reported in the paper place only the original ten banks in the sanctioned group, since most of our *Post-Reg* period precedes August 2004.[6]

Panel B of Table 1 reports some descriptive statistics about the equity offering market during our sample period, stratified by the types of brokerage houses. The table reveals that the sanctioned brokerage houses dominate the IPO and SEO markets. In the *Pre-Reg* period they participated as lead or co-lead underwriters in 69% of the equity offerings, which accounted for about 87% of the total proceeds. In the *Post-Reg* period, the participation of sanctioned brokerage houses slightly decreased.

Firms. Our analysis focuses on all U.S. firms with available stock recommendations in the IBES database. Some of our analyses require a definition of an underwriting relationship between the analyst and the recommended firm. To achieve that, we focus on firms that issued equity, either through an IPO or an SEO. To allow the inclusion of affiliated recommendations that were issued starting in November 2000, we include IPOs and SEOs starting from November 1998. We obtain a list of such firms from the SDC database. We exclude all closed-end funds and trusts as well as all unit investment trusts.

tapes from 2002-2004. We have also verified the results using IBES tapes from September 2007. We thank Alexander Ljungqvist and Felicia Marston for advising us on this issue.

[6] We repeated the analysis using the extended group. This change does not affect any of the conclusions.

Some descriptive statistics about our sample firms are reported in Panel C of Table 1. We separate equity offerings into three subperiods. The average proceeds for SEOs in our sample ranges between $170 and $270 million across our sample period. The average IPO proceeds ranges from $163 million to $348 million. The average market capitalization of an SEO firm is about $4 billion. IPO firms are smaller, on average. Despite that, IPO firms exhibit lower book-to-market ratios, reflecting their larger growth opportunities and their younger age.

Stock Returns. We obtain stock returns from CRSP. To analyze price reactions to recommendations we use size- and industry-adjusted abnormal returns. Size-adjusted returns for each stock are computed by subtracting from the stock's actual return the return of the CRSP market capitalization decile portfolio corresponding to the stock. Given the prominence of industry benchmarks in the rating systems, we also use industry-adjusted returns similar to Womack (1996) as follows. A size-adjusted return is computed for each stock in the sample as well as for all other stocks from the NYSE and NASDAQ in the same industry, using Fama and French's 48-industries classification. The industry-adjusted return for each stock is then computed as the difference between the size-adjusted return for the stock and the mean of the size-adjusted returns for the industry-matched stocks.

4 New Rating Systems and the Informativeness of Recommendations

4.1 Change in Rating Systems

One important aspect of the regulations is the stringent disclosure requirements imposed on how information is produced and disseminated by the brokerage houses. The new rules aimed at providing investors with "better information to make assessments of a firm's research" (SEC Release No. 45908, p. 7), expressing concern about rating systems that were loosely defined and perhaps not properly understood by the research's consumers. By analyzing the IBES database, articles in the media, and information from each brokerage house's web site, we collected information about general characteristics of the rating system in use by each sanctioned brokerage house, and whether a new rating system was adopted after 2001.

The analysis indicates a widespread transition to new rating systems along with the adoption of the new regulations. Every new rating system adopted a three-tier scale, in contrast with the then traditional five-tier scale. Overall, in the *Post-Reg* period, about 75% of all IBES recommendations

are issued using a three-tier system, as opposed to 17% in the *Pre-Reg* period. In particular, all of the ten original participants in the Global Settlement adopted a new rating system (eight of them in 2002 and the other two later on). Ten of the next twenty biggest brokerage houses adopted a new rating system starting in 2002. The motivation for this change can be linked to the disclosure requirements of the regulations that "regardless of the rating system that a member employs, a member must disclose in each report the percentage of all securities rated by the member which the member would assign a buy, hold/neutral or sell rating" (Rule 2711, p. 7).

Given the widespread adoption of new rating systems, we investigate these events in more detail. Table 2 reports summary statistics about these events for all eight original participants in the Global Settlement that adopted new systems in 2002. There is a concentrated adoption of new systems in September 2002 (five adoptions, four of them on the same day), and only one such adoption occurred before July 2002 (the month when the new NASD and NYSE regulations took effect). The adoption date of most new rating systems coincided with the introduction of the rule that brokerage houses have to disclose the distribution of the outstanding recommendations together with each research report.

All brokerage houses reduced their coverage when they adopted the new rating system: The second and third columns of Table 2 show an average reduction of 12% in the size of each brokerage house's portfolios.[7] The next set of columns reports how the new recommendations are distributed among the three rating levels. All but the second brokerage house ended up with about 20% of recommendations being pessimistic; this is particularly remarkable given that all these brokerage houses had, on the day before the new rating systems took effect, less than 2% of their covered firms rated at a pessimistic level.

We next analyze the previous classification of the new recommendations in each rating category. The new distribution is not achieved by the addition of new firms to the portfolio of tracked firms, as the fraction of initiations of coverage in each category never reaches more than 1% of the final portfolio. Instead, new distributions were obtained by reshuffling – and, for the most part, downgrading – outstanding recommendations. More than 90% of the newly rated pessimistic recommendations were rated at least neutral under the old system, and more than 40% of the new neutral recommendations

[7] In unreported results, we analyze for each brokerage house the sample of firms whose coverage was discontinued. Results suggest that the decision to drop a firm was related to size and past performance rather than the firm's future prospects. Thus, the tendency of analysts to drop firms with unfavorable prospects (e.g., McNichols and O'Brien, 1997) is not revealed here. This is not very surprising given that the goal of adopting a new ratings system was to achieve a more balanced distribution, which required the presence of firms with unfavorable prospects in the sample of covered firms.

were at least "buy" or "strong buy" under the old system. On the other hand, less than 5% of the new optimistic recommendations were not already considered as such under the old rating system. These results suggest that during the change in rating systems, brokers redefined their recommendations and shifted them downwards, creating a more balanced distribution over a short period of time.

We also separately examined (but do not tabulate) the three-day price reactions and long-term returns to recommendations issued during the event of change in rating system for the eight brokers reported in Table 2. For the recommendations classified in an optimistic category, three-day abnormal returns are significantly positive for five out of eight brokerage houses (for another brokerage house, the event returns are significantly negative), but the effect largely disappears after six months. For neutral and pessimistic recommendations, both event reactions and long-term returns are typically insignificant. We conclude that during the adoption of new rating systems, reclassifying a stock did not seem to convey new information to the market.[8]

The change in rating systems should be interpreted with care. While prior to the regulations most analysts used a five-tier scale, the vast majority of recommendations were in the "strong buy," "buy," and "hold" categories. Hence, one way to view the scale changes is that brokers moved from a de-facto three-point scale with the option to use additional points in extreme cases, to a three-point scale without such an option. This view suggests that the scale change is somewhat cosmetic.

Still, the change in rating systems may have economic consequences for two reasons. First, the use of a de-facto three-point system prior to the regulations may have been acceptable for savvy, institutional investors who mentally adjusted for this, reading a "strong buy" as a "buy," a "buy" as a "hold," and a "hold" as a "sell." However, retail investors may have failed to make the adjustment (see for example Malmendier and Shanthikumar, 2007, De Franco, Lu, and Vasvari, 2007, and Mikhail, Walther and Willis, 2007). Consequently, regulators were concerned with the literal meaning of the recommendations. For example, the regulations prescribed that "definitions of ratings terms also must be consistent with their plain meaning" and that a "hold rating should not mean or imply that an investor should sell a security" (NASD Rule 472, p. 9). Thus, the move from a de-facto three point scale to a scale where recommendations represent their true literal meaning may have helped retail investors.

[8] Consequently, we excluded from the remaining tests all recommendations associated with the reclassification event. The purpose of this exclusion is to distinguish between "regular" recommendations, which are of interest to us, and the "one time" event of change in rating system. In unreported results, we did include these recommendations, and the conclusions of the study did not change.

Second, a coarser grid limits the information conveyed by recommendations. Although "sell" and "strong sell" recommendations were rarely used, such recommendations conveyed a lot of information to investors when used (because they were so rare).[9] Thus, the reduction in the number of recommendation tiers might have reduced the informativeness of recommendations in the *Post-Reg* period. We discuss this further in the next section when studying unconditional informativeness.

4.2 Informativeness of Analyst Recommendations

Barber, Lehavy, McNichols, and Trueman (2006) show that prior to the regulations, the distribution of recommendations was heavily tilted toward optimistic recommendations, whereas following the regulations the distribution has become more balanced. The recommendation frequencies reported in Table 3 are consistent with their observations. In this section we study the informativeness of stock recommendations by examining the price responses to them before and after the regulations. We distinguish between the informativeness of specific recommendation types (conditional informativeness) and the overall informativeness of recommendations (unconditional informativeness).

Conditional Informativeness. If investors internalized the change in the distribution of recommendations following the regulations, then recommendations in the *Post-Reg* period should entail different price reactions compared to the *Pre-Reg* period. When an analyst is highly optimistic, "buy" recommendations are issued for a large variety of firms, and hence are not so informative. By contrast, "sell" recommendations are issued only for a small set of poorly performing firms, and hence convey very negative information. When analysts become less optimistic, "buy" recommendations are restricted to a smaller and better subset of firms, and hence become more informative, while "sell" recommendations are applied to a larger set of firms, and are hence less informative. Thus, we expect a more positive price response to "buy" recommendations and less negative price response to "sell" recommendations following the regulations. Similarly, the average quality of firms recommended "hold" is expected to improve following the regulations, resulting in a less negative price reaction to such recommendations.

To test the above predictions we estimate the following model applied to the periods before and after the regulations:

$$RET = \alpha_1 OPT + \alpha_2 NEU + \alpha_3 PESS + Controls + \varepsilon, \quad (1)$$

[9] This is similar to the grading of MBA students. Some schools have a four-point scale (ABCD), yet D's are rarely used. One view is that nothing would change if the scale would be just ABC. However, when the option to use D remains, any such grade (however rare) conveys a lot of information about the student. We thank a referee for pointing out this analogy.

where RET is the relevant abnormal stock return over the three days surrounding the recommendation, adjusted for size and industry, and OPT, NEU, and $PESS$ are dummy variables for optimistic, neutral, and pessimistic recommendations.

Results are reported in Table 3. The three-day price reactions to optimistic recommendations in the *Post-Reg* period are about 80% greater than in the *Pre-Reg* period (2.20% vs. 1.21%). The three-day price reactions to neutral and pessimistic recommendations are significantly less negative than in the previous period. For neutral recommendations, the price reaction is 60% less negative (-1.76% vs. -4.46%), whereas for pessimistic recommendations, the price reaction is about 50% less negative (-3.97% vs. -7.45%). These results are consistent with the predictions derived above. The results are qualitatively similar after controlling for past firm and market performance and analyst experience.

To further explore the effect of the change in rating systems discussed in the previous section we examined a modified version of Table 3 in which we define the independent variables in the *Pre-Reg* period as follows: OPT includes only "strong buy" recommendations, NEU includes only "buy" recommendations, and $PESS$ includes "hold," "underperform," and "sell." We then re-estimate the *Pre-Reg* regressions and test for equality of coefficients across the *Pre-* and *Post-Reg* periods. This modified analysis relies on the premise that "strong buy" recommendations in the *Pre-Reg* period were largely transformed into optimistic recommendations in the *Post-Reg* period; "buy" recommendations in the *Pre-Reg* period were largely transformed into neutral in the *Post-Reg* period; and "hold," "underperform," and "sell," recommendations into pessimistic. While this premise is not entirely supported by the data,[10] this analysis sheds more light on the consequences of the change in rating systems.

Untabulated results show that the price reaction to optimistic (pessimistic) recommendations in the *Post-Reg* period is not statistically different from the price reactions to "strong buy" ("hold," "underperform," and "sell") recommendations in the *Pre-Reg* period. This suggests that the change in rating system is somewhat cosmetic, and reflects a renaming of the different categories. Further, this specification shows again that "buy" recommendations have become more informative as they are largely viewed now as "strong buy" recommendations prior to the regulations. By contrast,

[10] The frequency of optimistic recommendations in the *Post-Reg* period is about 42% whereas the frequency of "strong buy" recommendations in the *Pre-Reg* is about 28%. Thus, not all *Pre-Reg* "buy" recommendations were shifted into neutral. Similarly, the frequency of neutral recommendations in the *Post-Reg* period is 47% while the frequency of "buy" recommendations in the *Pre-Reg* period is 29%. Thus, a significant portion of neutral recommendations in the *Post-Reg* period did not emanate from previous "buy" recommendations. A similar argument applies to the "hold" category. Additionally, Table 2 shows that a simple mapping was not exclusively used at the events of changes in rating systems.

"sell" recommendations have become less informative as the information they carry is similar to that conveyed by several categories prior to the regulations.

Unconditional Informativeness. Table 3 reveals that with the new regulations, optimistic recommendations have become more informative but also less frequent (42% vs. 58%), while pessimistic and neutral recommendations have become more prevalent but less informative. Thus, highly informative recommendations have become less common, whereas less informative recommendations have become more common. The overall effect of the regulations on informativeness is not clear. In addition, the move from a five-tier to a three-tier rating system by many investment banks may have lowered the informativeness of recommendations. In an extreme case of only one tier, a recommendation would not convey any information (except for the fact that the analyst has chosen to issue one). More generally, coarser recommendation grids likely entail a lower level of information transmission.

To evaluate the consequences of the regulations, we take a broader view and assess the overall change in the informativeness of stock recommendations. This analysis takes into account the potentially conflicting forces of the change in the distribution of recommendations, the change in the informativeness of each recommendation type, and the change in rating system. We use the absolute value of price reactions as a measure of informativeness. This allows us to include all types of recommendations in one analysis despite the different directions of price reactions they entail. This is in contrast to the analysis in Table 3, where we were interested in the conditional informativeness and therefore reported the signed price reactions. The unconditional expected abnormal price reaction (denoted by $E\left(ABS\_RET\right)$) can be written as:

$$E\left(ABS\_RET\right) = \sum_{i=1}^{N} E\left(ABS\_RET | rec\_type_i\right) \Pr\left(rec\_type_i\right),$$

where N is the number of recommendation categories. It is a weighted average of the conditional absolute price reactions. The regulations have affected the conditional price reactions, the weights (probabilities) of the different recommendation categories, and the number of categories (N). The change in the average absolute price reaction encapsulates all of these effects. Higher (lower) average absolute price reactions imply that investors learn more (less) from recommendations unconditionally.

We estimate the following model for all recommendations in our sample period:

$$\begin{aligned} ABS\_RET &= \alpha_0 + \alpha_1 POST + \alpha_2 TIER3 + \alpha_3 SANCT + \alpha_4 SANCT \times POST \\ &\quad + \alpha_5 PASTFIRMPERF + \alpha_6 PASTMKTPERF + \alpha_7 MKT\_STD \\ &\quad + \alpha_8 EXPERIENCE + \alpha_9 EXPERIENCE \times POST + \varepsilon, \end{aligned} \tag{2}$$

where ABS_RET is the absolute value of the abnormal size- and industry-adjusted three-day price reactions to recommendations, and $POST$ is a dummy taking a value of 1 in the *Post-Reg* period. The sign of the coefficient of $POST$ indicates whether the regulations are associated with an increase or a decrease in the unconditional informativeness of stock recommendations. Furthermore, to examine whether the change in informativeness is related to the regulations in a causal manner, we use two additional variables: (i) $TIER3$ which is a dummy equal to 1 if the broker had been using a three-tier rating system at the time the recommendation was issued;[11] and (ii) $SANCT$ which is a dummy equal to 1 if the recommendation was issued by a sanctioned bank. We hypothesize that recommendations issued by brokers that use a three-tier rating system are less informative (a negative α_2). Furthermore, since sanctioned banks have all moved to a three-tier rating system following the regulations, we hypothesize that their recommendations have become less informative (negative α_4). We control for past firm and market performance ($PASTFIRMPERF$ and $PASTMKTPERF$) to account for momentum effects, for the standard deviation of market returns (MKT_STD) to account for any changes in volatility that may affect price reactions, and for analyst experience.

Table 4 reports the results. In all specifications the $POST$ dummy has a negative and significant coefficient, suggesting that the overall informativeness of recommendations is lower in the *Post-Reg* period. The economic magnitude of this effect is also significant: Using column (3) we learn that the average absolute abnormal price reaction to a recommendation has decreased from about 7.1% to about 5.3%, a decline of about 25% in the overall informativeness of recommendations.[12]

As hypothesized, the coefficient of $TIER3$ is significantly negative, indicating that the use of three tiers is associated with lower informativeness of recommendations. Based on column (3), the decline in unconditional informativeness is about 12%. Additionally, a significantly negative coefficient of

[11] To generate $TIER3$, for each broker, we identify the first and last date in which each recommendation type appears in the IBES database. Based on these dates we infer the time periods during which the broker used a three-, four-, or five-tier rating system.

[12] A concern is that these results are affected by a change in the composition of firms followed by analysts before and after the regulations. We have repeated this analysis restricting attention only to firms covered in both periods. The conclusions are not affected by this change.

$SANCT \times POST$ reveals that recommendations from sanctioned banks have become less informative following the regulations. This reinforces the view that a move to a three-tier system had a causal effect on the informativeness of recommendations. Note, however, that even after controlling for these additional explanatory variables, the $POST$ dummy remains significant, suggesting that there might be some other unidentified effects causing the reduction in informativeness.[13] For example, Chen and Marquez (2005) argue that lower informativeness of recommendations following the regulations can be tied to reduced information transmission between investment banking and research departments due to strict information barriers.

In summary, the results above suggest that analyst recommendations have become less informative, unconditionally, following the regulations. The use of a three-tier rating system is associated with lower informativeness. Recommendations issued by sanctioned banks, all of which moved to a three-tier system, have become less informative.

5 Conflicts of Interest Related to Investment Banking

We next analyze the effect of the regulations on the ties between investment banking and research. Our approach here is to identify cross-sectional variations in the exposure of different groups of analysts or covered firms to conflicts of interest related to investment banking. We then examine the difference between groups that are likely to be tainted and those that are not, and compare these differences across the two time periods - before and after the regulations. This difference-in-differences approach diminishes calendar effects of potential omitted variables.

We first proxy for conflicts of interest using affiliation, which is based on prior underwriting relationships. We then turn to alternative proxies that capture expected future underwriting relationships. Finally, we study how the regulations affected price reactions to recommendations with different levels of conflicts of interest.

5.1 Conflicts of Interest and Underwriting Relationships

Past studies show that before the regulations, affiliated analysts were more optimistic about the prospects of firms underwritten by their employer than unaffiliated analysts covering the same firms.[14]

[13] Note that we control directly for analysts' experience, hence it is unlikely that the results on informativenes are driven by this variable.

[14] Dugar and Nathan (1995), Lin and McNichols (1998), and McNichols, O'Brien, and Pamukcu (2006) all show that the average recommendation issued by affiliated analysts was more optimistic than the average recommendation issued by unaffiliated analysts for different sample periods spanning 1983 to 2001.

Two explanations are provided for this result. According to the "selection bias" explanation, firms are likely to choose underwriters whose analysts are more optimistic about their prospects (McNichols and O'Brien, 1997). The "strategic bias" explanation argues that research departments issue more optimistic recommendations for strategic reasons, to increase the likelihood of their firms being hired as underwriters and/or to provide support for previously underwritten companies. The motivation of the regulations was directly aimed at optimism resulting from "strategic bias."

Our analysis focuses on firms that issued equity (IPO or SEO). We examine recommendations issued for these firms in the 24 months following the offering, and define a recommendation as affiliated if it was issued by a brokerage house that was a lead underwriter or a co-manager in the offering.[15]

Table 5 reports the frequency of recommendations for the sample used in this analysis. Panels A and B break the sample by affiliated and unaffiliated analysts. In the *Pre-Reg* period, 70% of affiliated analysts' recommendations were optimistic, while only 49% of such recommendations were optimistic in the *Post-Reg* period. On the other hand, the percentage of affiliated analysts' recommendations in the "hold" and "sell" categories increased from 28% to 44% and from 2% to 6.5%, respectively. The changes for unaffiliated analysts are similar but smaller in magnitude. Panels C and D break the sample by IPOs and SEOs and show a similar picture. There is a decline in optimistic recommendations for both IPOs and SEOs in the *Post-Reg* period and a steep increase in pessimistic recommendations.

To study the effect of the regulations on the recommendation practices of affiliated analysts, we estimate two separate panel logistic models. We use firm fixed effects to parsimoniously control for firm characteristics that are not varying over time, and control directly for broker characteristics and time-varying aspects such as firm and market performance. The models take the following form:

$$\begin{aligned}\Pr(REC \;=\; type) = {} & \alpha_1 AFF \times PRE + \alpha_2 SANCT \times PRE + \alpha_3 PASTMKTPERF \times PRE \\ & + \alpha_4 PASTFIRMPERF \times PRE + \alpha_5 EXPERIENCE \times PRE + \alpha_6 TIER3 \times PRE \\ & + \alpha_7 POST + \alpha_8 AFF \times POST + \alpha_9 SANCT \times POST + \alpha_{10} PASTMKTPERF \times POST \\ & + \alpha_{11} PASTFIRMPERF \times POST + \alpha_{12} EXPERIENCE \times POST \\ & + \alpha_{13} TIER3 \times POST + \varepsilon,\end{aligned} \tag{3}$$

where REC is a dummy equal to 1 if the recommendation is of a certain type (optimistic or pessimistic), AFF is a dummy equal to 1 if the recommendation was issued by an affiliated broker, and PRE is a

[15] In untabulated tests, we also define affiliation based on shorter windows of six and twelve months.

dummy equal to 1 if the recommendation was issued in the *Pre-Reg* period. The remaining explanatory variables are as in Eq. (2).

We include $PASTFIRMPER$ and $PASTMKTPERF$ given the overwhelming evidence that momentum is an important determinant of new recommendations (see Womack, 1996, and Jegadeesh et al., 2004). To quantify the differential likelihood of sanctioned brokerage houses to issue a particular recommendation type, we include the $SANCT$ dummy. Moreover, $SANCT$, $TIER3$, and $EXPERIENCE$ serve as controls for brokerage house and analyst-specific characteristics (see Hong, Kubik and Solomon, 2000, for a similar approach). Finally, the control variables are interacted with the PRE and $POST$ dummies.[16] The models we report use robust standard errors clustered at the firm level.[17]

The first two columns of Table 6 present the results for model (3). Note first that in both models the coefficient of the $POST$ dummy is significant at the 1% level. It is negative for the optimistic model and positive for the pessimistic model. This indicates that analysts, in general, are more likely to issue pessimistic and neutral recommendations in the *Post-Reg* period, and less likely to issue optimistic ones. The odds-ratio (not reported in the table) in the pessimistic model suggests that the odds of observing a pessimistic recommendation are 270% higher in the *Post-Reg* period. By contrast, the odds of observing an optimistic recommendation in the *Post-Reg* period are 59% lower compared to the *Pre-Reg* period. This is consistent with Barber, Lehavy, McNichols, and Trueman (2006), who find a general change in the distribution of recommendations following the new regulations.

Our main results follow from the affiliation variable (AFF). Consider first the optimistic model. The coefficient of $AFF \times PRE$ is significantly positive: Its odds-ratio suggests that before the regulations affiliated analysts were 22% more likely to issue optimistic recommendations compared to unaffiliated analysts. By contrast, the coefficient of $AFF \times POST$ is not statistically different from zero, indicating that after the regulations, affiliated analysts are no longer more likely to issue op-

[16] Our analysis includes all the recommendations in the relevant periods except for the recommendations associated with the change in rating system. In unreported regressions, for a given month and firm we included recommendations only if this firm had recommendations issued by both a sanctioned and a non-sanctioned brokerage house in that month. This is intended to control for differences in the characteristics of firms for which sanctioned and non-sanctioned brokerage houses issued recommendations. The results are similar. Following Ljungqvist et al. (2005) we also tested models controlling for institutional ownership. The main results are not affected.

[17] Note that the models for the two recommendation types are not mutually independent. They reflect the same set of results viewed from two different angles. It would have been desirable to pool the two separate logistic models into a single ordered-logit model. Unfortunately this is not possible, since the Wald test rejects the parallel regression assumption, implying that an ordered-logit (and similarly an ordered-probit) is not valid in this case. See Long and Freese (2006: p. 197-200) for details.

timistic recommendations. Furthermore, the difference-in-differences comparison shows a significant difference between the two coefficients (p-value of 0.0245). The picture in the pessimistic model is quite different, where both coefficients of $AFF \times PRE$ and $AFF \times POST$ are significantly negative, and not significantly different from each other: Affiliated analysts have been reluctant to issue pessimistic recommendations, and this behavior has not changed after the regulations.

The results also point to a major difference between the firms that participated in the Global Settlement and those that did not. The $SANCT \times PRE$ and $SANCT \times POST$ coefficients indicate that before the regulations sanctioned brokers did not differ in their recommendation practices from other brokers. After the regulations they are more conservative, being more likely to issue pessimistic recommendations and less likely to issue optimistic ones.

The results in this section should be viewed in the context of the evidence in McNichols, O'Brien, and Pamukcu (2006) who extend the study of Michaely and Womack (1999) to the period 1994-2001. They find that the difference in 12-month returns between affiliated and unaffiliated recommendations varies across years. Their results can be interpreted in two ways: Either underwriting bias was not robust before the regulations, or it was robust, but investors' ability to undo this bias changed over the years. Given this inconclusive evidence regarding the *Pre-Reg* period, one may question the need for the regulations and the importance of our results regarding the decline in optimism of affiliated analysts. Several recent papers help clarify this issue.[18] They show that unsophisticated investors could not completely undo the bias of affiliated analysts, suggesting a wealth transfer between unsophisticated and sophisticated investors in the *Pre-Reg* period. Thus, our result of a reduction in affiliated analysts' optimism in the *Post-Reg* period is important since it implies a lower likelihood of such a wealth transfer. This is consistent with regulators' goal to prevent research from misleading unsophisticated investors.

5.2 Conflicts of Interest and Expected Equity Offerings

In this section we propose alternative proxies for conflicts of interest between research and investment banking that are based on future expected underwriting business, as opposed to past underwriting relationships. We argue that analysts covering firms that have recently undergone an equity offering face conflicts of interest regardless of whether their brokerage house was a part of the leading underwriting team. This claim is anchored on two assumptions: First, analysts express optimism in an attempt

[18] See Boni and Womack (2002b, 2003), Malmendier and Shanthikumar (2007), and De Franco, Lu, and Vasvari (2007).

to win future underwriting business ("currying favor").[19] Second, firms that raised equity recently are more likely to raise equity in the future.[20] Together, these assumptions suggest that analysts have incentives to strategically inflate their recommendations for firms that have recently undergone an equity offering, to increase their chances of winning the likely future underwriting business. We emphasize that this strategic optimism is independent of affiliation. That is, it applies to all analysts covering firms unconditionally on their past underwriting relationships.

The analysis in Section 5.1 was restricted to firms that issued equity in the two years prior to the recommendation. To capture the new dimension of conflicts of interest we expand the dataset to include recommendations issued for all firms during our sample period. We then classify a recommendation for a firm that has issued equity in the two preceding years as an SEO/IPO recommendation by assigning a value of 1 to an indicator variable labeled $SEOIPO$. We test whether analyst optimism (regardless of affiliation) is associated with a recent equity offering, and whether the regulations affected this optimism, using models similar to (3) with the additional $SEOIPO$ dummy interacted with PRE and $POST$.

The market timing literature offers an alternative explanation for optimistic analyst recommendations following equity offerings. It may be that managers try to time the offerings to periods in which analysts are bullish about the issuing firm. This is similar to the claim in Baker and Wurgler (2002) that managers time their equity offerings to periods when equity is overpriced. This alternative explanation raises concerns regarding the causal effect of a recent offering on analysts' optimism. We address these concerns in several ways. First, we use a difference-in-differences approach: To the extent that the regulations did not affect the market timing behavior of managers, any difference between the optimism of analysts for SEOIPO vs. non-SEOIPO firms across the two periods is attributed to the effect of the regulations on conflicts of interest. Second, we control in our models for past firm

[19] Ljungqvist, Marston, and Wilhelm (2006) find no evidence that aggressive analyst recommendation practices increase their bank's probability of winning a *lead* underwriting position in future offerings. However, several recent papers provide additional insights on this issue. Ljungqvist, Marston, and Wilhelm (2007) show that aggressively optimistic research for an issuer attracts co-management appointments, which in turn substantially increase a bank's chances of winning lead-underwriting positions in the future. Derrien (2007) and Bradley, Clarke, and Cooney (2007) also present evidence consistent with the currying favor hypothesis, but point out some subtleties related to the bank's prestige and sample period.

[20] In each year between 1998 and 2004, about 4% of all listed firms on NYSE and NASDAQ raised equity through an SEO. In comparison, in each year during this time period, about 13% of all firms that issued equity in the prior two years have issued equity again. That is, the probability of equity offering conditional on a recent equity offering (an IPO or SEO) is over three times higher than the unconditional probability. Moreover, Eckbo, Masulis, and Norli (2007) report that between 1983 and 2000 roughly half of the IPO firms go back to raise capital externally through a security offering of any kind. They show that the average time between the IPO and the next offering is about two years.

and market performance. If market timing by managers is correlated with recent run-ups in the stock price, it will be captured by these controls. Third, we set the indicator variable for SEOIPO to 1 only if the recommendation was issued at least six months after the IPO or SEO. Arguably, managers' decision to raise equity is unlikely to be correlated with excess analysts' optimism more than six months following the equity offering. Thus, this kind of optimism is more likely to be related to expected future underwriting business.

Columns (3) and (4) of Table 6 report the results. For the optimistic model the coefficient on $SEOIPO \times PRE$ is significantly positive, indicating that prior to the regulations analysts were more likely to issue optimistic recommendations for firms that have recently issued equity. By contrast, the coefficient on $SEOIPO \times POST$ is significantly negative. Moreover, the likelihood of issuing an optimistic recommendation following an equity offering is different across the two periods - the difference-in-differences hypothesis is rejected at the 1% level. For the pessimistic model, before the regulations analysts were less likely to issue pessimistic recommendations for firms that have recently issued equity ($SEOIPO \times PRE$ negative and significant). This effect no longer exists in the *Post-Reg* period ($SEOIPO \times POST$ is insignificant), and the difference across periods is significant at the 1% level.

To further alleviate concerns that some of the previous results are driven by market timing behavior of managers, we propose an alternative variable to capture firms' intentions to raise capital. Following Frank and Goyal (2003), we argue that firms' demand for capital is closely tied to their financing deficit, defined as the excess cash outflows over internally generated cash inflows.[21] The financing deficit is an operational indicator of the need for external capital, and hence is less likely to be affected by managerial market timing. Using an indicator variable denoted by DEF, we distinguish between firms that have a positive financing deficit and hence are in need of capital ($DEF = 1$) and firms that have a negative financing deficit and whose demand for capital is low ($DEF = 0$).

In our sample, DEF is positively correlated with both concurrent and future equity issuance: The correlation between DEF and equity issuance during the same year is 0.37, and with equity issuance in the following year is 0.21. By its definition, DEF is not likely to be mechanically tied to analysts' optimism. If anything, analysts might not be optimistic about firms that experience financing deficits.

Columns (5) and (6) of Table 6 report results parallel to those in columns (3) and (4), where we

[21] Formally, financing deficit in year t is defined as cash dividends plus net investments plus change in working capital less cash inflows from operations in year t. See Eq (1) in Frank and Goyal (2003) for details.

replace $SEOIPO$ with DEF. Consider first the optimistic model. We find that the coefficient on $DEF \times PRE$ is positive and significant, indicating that before the regulations analysts were more likely to issue optimistic recommendations for firms that were experiencing a financing deficit. The coefficient of $DEF \times POST$ is still significantly positive but its magnitude is about three times smaller. Moreover, the significant differences-in-differences statistic indicates that financing deficit plays a weaker role in analysts' decision to issue optimistic recommendations. A similar story is told by the pessimistic model, only that the coefficient of $DEF \times POST$ is insignificant. This indicates that after the regulations, analysts are no longer reluctant to issue pessimistic recommendations for firms experiencing a financing deficit.

To summarize, the results in this section suggest that analysts have changed their recommendation practices regarding firms that are likely to engage in future equity offerings. This reinforces the results obtained in Section 5.1 regarding past underwriting relationships. We examined four types of cross-sectional variations based on: affiliation, whether the bank is sanctioned, recent equity offerings, and financing deficit. All of these analyses point to a reduction in optimism related to conflicts of interest following the regulations.

5.3 Price Reactions Related to Conflicts of Interest

In Section 5.1 we documented a significant change in the recommendation practices of affiliated vs. unaffiliated analysts. Here we ask whether price responses to recommendations issued by analysts with different levels of conflicts of interest have changed after the regulations. Several papers examined price reactions to recommendations issued by affiliated vs. unaffiliated analysts before the regulations.[22] Overall, they find that price reactions to optimistic recommendations were somewhat less positive for affiliated analysts, although this result varies by sample period. Moreover, investors significantly discounted affiliated neutral recommendations before the regulations.

To examine whether the regulations were associated with different price reactions to recommendations exposed to different levels of conflicts of interest, we estimate a regression similar to Eq. (1). But, in this case we interact each recommendation type with an affiliation dummy. Table 7 shows

[22] Michaely and Womack (1999) find marginally significant evidence that the stock price following affiliated "buy" recommendations increases by less than following unaffiliated ones during 1990-1991. McNichols, O'Brien, and Pamukcu (2006) find significantly lower three-day price reactions to optimistic recommendations issued by affiliated analysts during 1994-2001. In contrast, Bradley, Jordan, and Ritter (2003, 2007) do not find a difference between price reactions to optimistic recommendations during 1996-2000. Finally, Lin and McNichols (1998) do find a significant difference for neutral recommendations.

that in the *Pre-Reg* period, unaffiliated and affiliated optimistic recommendations entail a similar abnormal price reaction. As for neutral recommendations, we find strong and negative abnormal price reactions to both affiliated and unaffiliated recommendations. Similar to Lin and McNichols (1998), price reactions to neutral recommendations issued by affiliated analysts in the *Pre-Reg* period are significantly more negative. This is consistent with investors accounting for the bias in neutral affiliated recommendations before the regulations. For pessimistic recommendations, we do not find a difference in price reactions between the two analysts' types. However, this may be due to lack of power, since the number of pessimistic recommendations before the regulations is small.

During the *Post-Reg* period the reaction to optimistic recommendations is positive and significant for both affiliated and unaffiliated analysts, and there is no difference between them. The difference-in-differences across the two periods is not significant (p-value of 0.5570). For neutral recommendations we still see a significant difference between abnormal price reactions for affiliated vs. unaffiliated recommendations. That is, investors still seem to discount neutral affiliated recommendations. However, the difference-in-differences statistic shows that the degree of discounting has significantly decreased (p-value of 0.0521). Finally, we do not observe a significant change in the difference in price reactions to pessimistic recommendations across the two periods. These results suggest that the main effect of the regulations on investors' reactions to affiliated vs. unaffiliated recommendations was in reinterpreting neutral recommendations.

6 Conclusion

In this paper we investigate the effects of regulations on sell-side analysts' recommendations. The regulations – NASD Rule 2711, NYSE Rule 472, and the Global Settlement – aimed at curbing the conflicts of interest between investment banking and research departments.

We document a massive migration of investment banks to a three-tier rating system following the regulations that was accompanied by a more balanced distribution of recommendations. While this change was somewhat cosmetic, it seems to have affected the informativeness of recommendations. On one hand, the literal meaning of recommendations better reflects now the intentions of the analyst, helping retail investors utilize recommendations. On the other hand, we present evidence that a smaller number of tiers restricts the information content of recommendations.

Stock price reactions show that investors internalized the change in the distribution of recommen-

dations. Price reactions to optimistic recommendations have become stronger after the regulations, whereas price reactions to neutral and pessimistic recommendations have become less negative. The overall informativeness of recommendations as measured by absolute abnormal price reactions has declined following the regulations.

We show that conflicts of interest were an important determinant of stock recommendations before the regulations. Affiliated analysts were significantly more (less) likely to issue optimistic (pessimistic) recommendations compared to unaffiliated analysts. After the regulations, affiliated analysts are no longer more likely to issue optimistic recommendations. However, they are still less likely to issue pessimistic recommendations compared to unaffiliated analysts. Alternative variables capturing conflicts of interest that account for expected future underwriting relationships show similar results: Analysts are no longer excessively optimistic about firms that have recently undergone an equity offering. Additionally, the optimism of analysts about the prospects of firms that experience a financing deficit was significantly reduced. An analysis of price reactions to recommendations provides mixed evidence on whether investors discount affiliated recommendations to a lesser extent than they did before the regulations.

These results suggest that the regulations had some success in curbing conflicts of interest. Investors seem to be aware of the changes in analysts' practices, as reflected in their price reactions. However, overall, the informativeness of recommendations has declined in the period following the regulations.

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Table 1. Summary Statistics on Recommendations, Brokerage Houses, and Equity Offerings

This table presents summary statistics on stock recommendations, brokerage houses, and equity offerings during our sample period (November 2000 – December 2004). *Pre-Reg* is the period between November 2000 and August 2002. *Post-Reg* is the period between September 2002 and December 2004. **Panel A** reports the number of stock recommendations, their mean, and their standard deviation. When calculating the mean and standard deviations, we assign stock recommendations a numeric value as follows: "strong buy" and "buy"=2, "hold"=3, "underperform" and "sell"=4. The hypothesis that there is no difference in means across periods is rejected at a significance level of less than 1%. **Panel B** presents summary statistics on brokerage houses' participation in equity offerings. We report results aggregated for the sanctioned brokerage houses that initially participated in the Global Settlement as well as for the twenty next biggest brokerage houses (non-sanctioned). For this purpose, the size of brokerage house is proxied by the number of recommendations issued throughout the period for U.S. common stocks. We consider a brokerage house to have participated in an equity offering if it was a lead underwriter in the offering. If there are joint lead underwriters, the participation variables (offerings and proceeds) are divided proportionally among all lead underwriters. Equity offerings include all IPOs and SEOs. **Panel C** reports summary statistics of various variables for sample firms that underwent an IPO or an SEO during the years 1998-2004. We report statistics about the proceeds received in the equity offering (in millions of dollars), the market capitalization as of the end of the fiscal year of the IPO or SEO (in millions of dollars), and the book-to-market ratio defined as book value of equity divided by market capitalization.

Panel A: Stock recommendations

	Pre-Reg	*Post-Reg*
N	64,383	89,029
Mean	2.44	2.69
Std.	0.57	0.67

Panel B: Brokerage houses and equity offerings

	% of all equity offerings		% of all proceeds in equity offerings	
	Sanctioned	Non-sanctioned	Sanctioned	Non-sanctioned
2000	58%	16%	78%	10%
2001	71%	14%	87%	9%
2002	63%	19%	85%	10%
2003	60%	21%	80%	15%
2004	61%	24%	79%	17%

Table 1. Summary Statistics (Continued)

Panel C: Equity offerings						
	2003-2004	2001-2002	1998-2000	2003-2004	2001-2002	1998-2000
	IPOs			SEOs		
N	123	107	331	541	430	365
Proceeds (Mil $)						
Mean	216.1	348.6	162.70	170.4	199.9	271.1
Median	96.0	114.0	72.30	98.1	110.1	147.4
Std.	380.3	898.1	412.86	252.7	281.4	377.4
Market capitalization (Mil $)						
Mean	976.9	1777.9	2135.84	3264.1	3038.7	5799.8
Median	444.3	489.9	693.57	1119.1	826.8	1136.3
Std.	1682.0	6118.1	6149.35	18515.9	7650.5	26164.4
Book-to-market ratio						
Mean	0.33	0.45	0.33	0.42	0.58	0.37
Median	0.31	0.36	0.22	0.37	0.49	0.28
Std.	0.23	0.35	0.38	0.27	0.49	0.59

Table 2. Summary Statistics on Events of Changes of Ratings Systems

This table reports summary statistics on the events of change in rating systems for the eight brokerage houses among the sanctioned banks that changed their system in 2002. For each event, the table shows the date it occurred, the number of stocks whose coverage was discontinued at the event, and the number of stocks with continued coverage. For each group of stocks, we report the percentage of stocks that were pessimistic, neutral, or optimistic before the change, based on the ratings they received after the new ratings system was put into place (pessimistic, neutral, or optimistic). Optimistic recommendations are "strong buy" and "buy"; neutral recommendations are "hold"; and pessimistic recommendations are "underperform" and "sell."

Recommendations after the change →				Pessimistic					Neutral					Optimistic				
						Recommendation before the change					Recommendation before the change					Recommendation before the change		
	Date of change	# of Discont-inued coverage	# of Stocks covered after change	% of total	Initiated (%)	Pessimistic (%)	Neutral (%)	Optimistic (%)	% of total	Initiated (%)	Pessimistic (%)	Neutral (%)	Optimistic (%)	% of total	Initiated (%)	Pessimistic (%)	Neutral (%)	Optimistic (%)
Broker 1	9-8-02	136	1019	20	0	4	80	15	38	1	0	60	40	42	0	0	2	98
Broker 2	9-8-02	143	946	5	0	96	2	2	47	0	0	87	13	48	1	0	0	99
Broker 3	9-8-02	80	916	28	0	8	77	15	38	0	1	37	62	34	0	0	3	97
Broker 4	3-17-02	70	768	21	0	5	85	10	46	1	0	57	42	33	1	0	3	96
Broker 5	9-25-02	128	743	26	1	4	71	24	45	0	0	33	67	29	0	0	1	98
Broker 6	11-4-02	141	736	21	0	11	71	18	56	0	0	40	60	24	1	0	2	97
Broker 7	8-4-02	97	791	27	0	2	78	20	40	0	0	28	72	33	0	0	2	98
Broker 8	9-8-02	119	639	18	1	7	66	26	44	0	0	44	56	38	1	0	2	97
Total					**0.2**	**9**	**73.5**	**17.3**		**0.3**	**0.1**	**49.9**	**49.8**		**0.5**	**0**	**1.8**	**97.7**
		914	**6,558**	**20%**					**44%**					**36%**				

Table 3. Price Reactions to and Frequencies of Recommendations. The table reports frequencies of recommendations as well as regression results of the basic regression:

$$RET = \alpha_1 * OPT + \alpha_2 * NEUT + \alpha_3 * PESS + Controls + e.$$

The dependent variable, *RET*, is the size- and industry-adjusted return measured during a three-day period centered on the issuance of the stock recommendation. The indicator variables equal 1 as follows: OPT=1 for "buy" and "strong buy"; NEU=1 for "hold"; PESS=1 for "underperform" and "sell." **PASTFIRMPERF** is the size- and industry-adjusted firm's stock return in the six months prior to the recommendation. **PASTMKTPERF** is the cumulative market return in the six months prior to the recommendation. **EXPERIENCE** is the analyst's experience, defined as the number of years the analyst has appeared in IBES. Each model is run separately for the *Pre-Reg* and *Post-Reg* periods. *Pre-Reg* is the period between November 2000 and August 2002, and *Post-Reg* is the period between September 2002 and December 2004. The P-value column reports p-values of tests of differences between the coefficients in the *Pre-Reg* and *Post-Reg* periods. Robust standard errors are clustered at firm level and presented in parentheses. *, **, *** represent significance of 10%, 5%, and 1%, respectively.

	Event return over [-1,+1]						Frequencies of Rec.	
	Pre-Reg	*Post-Reg*	P-value	*Pre-Reg*	*Post-Reg*	P-value	*Pre-Reg*	*Post-Reg*
OPT	0.0121***	0.0220***	0.000	0.0122***	0.0197***	0.000	57.90%	42.19%
	(0.0007)	(0.0006)		(0.0016)	(0.0008)			
NEU	-0.0446***	-0.0176***	0.000	-0.0443***	-0.0196***	0.000	38.36%	46.92%
	(0.0017)	(0.0008)		(0.0022)	(0.0010)			
PESS	-0.0745***	-0.0397***	0.000	-0.0749***	-0.0417***	0.000	3.74%	10.89%
	(0.0056)	(0.0017)		(0.0059)	(0.0018)			
PASTFIRMPERF				0.0198***	0.0007	0.000		
				(0.0030)	(0.0020)			
PASTMKTPERF				0.0390***	0.0480***	0.513		
				(0.0126)	(0.0057)			
EXPERIENCE				0.0007***	0.0001	0.007		
				(0.0002)	(0.0001)			
Observations	51,194	65,476		45,284	62,738			
R^2	0.07	0.06		0.08	0.07			

Table 4. Informativeness Tests

The dependent variable is the absolute value of the size- and industry-adjusted return (**ABS_RET**) measured during a three-day period centered around the issuance of the stock recommendation. POST equals 1 if the recommendation is issued between September 2002 and December 2004. **PASTFIRMPERF** is the size- and industry-adjusted firm's stock return in the six months prior to the recommendation. **PASTMKTPERF** is the cumulative market return in the six months prior to the recommendation. **EXPERIENCE** is the analyst's experience, defined as the number of years the analyst has appeared in IBES. **MKT_STD** is the standard deviation of daily S&P 500 index one month prior to the recommendation. Robust standard errors are clustered at firm level and presented in parentheses. **SANCT** is an indicator variable equal to 1 if the recommendation is issued by an analyst who is employed by a sanctioned brokerage house. **TIER3** is an indicator variable for whether a brokerage house uses a three-tier recommendation grid at the time a recommendation is issued. *, **, *** represent significance of 10%, 5%, and 1%, respectively.

	(1)	(2)	(3)
Constant	0.0720***	0.0690***	0.0706***
	(0.0011)	(0.0017)	(0.0018)
POST	-0.0222***	-0.0150***	-0.0179***
	(0.0010)	(0.0010)	(0.0013)
TIER3		-0.0092***	-0.0086***
		(0.0006)	(0.0006)
SANCT		-0.0039***	0.0019*
		(0.0007)	(0.0010)
SANCT*POST			-0.0100***
			(0.0012)
PASTFIRMPERF		-0.0355***	-0.0354***
		(0.0017)	(0.0017)
PASTMKTPERF		-0.0129***	-0.0153***
		-0.0048	(0.0048)
MKT_STD		0.6329***	0.6302***
		(0.1123)	(0.1122)
EXPERIENCE		-0.0007***	-0.0016***
		-0.0001	(0.0002)
EXPERIENCE*POST			0.0013***
			(0.0002)
Observations	133,800	127,786	127,786
R^2	0.02	0.04	0.04

Table 5. Distribution of Recommendations for Affiliated and Unaffiliated Analysts

This table reports the frequency of stock recommendations in various groups of firms during the *Pre-Reg* and *Post-Reg* periods. *Pre-Reg* is the period between November 2000 and August 2002, and *Post-Reg* is the period between September 2002 and December 2004. The stock recommendations are issued in the window of 24 months after an IPO or SEO. Panel A reports recommendations of affiliated analysts for IPO and SEO firms. Panel B reports recommendations by unaffiliated analysts for IPO and SEO firms. Affiliated analysts are employed by the lead underwriter(s) or the co-manager(s) of the equity offering. The IPOs and SEOs reported occurred in the period starting in November 1998 and ending in December 2004. We extend the beginning of the sample period to November 1998 for the IPOs and SEOs to allow for inclusion of recommendations in the *Pre-Reg* period that refer to IPOs and SEOs that occurred before November 2000.

Panel A: Affiliated analysts		
	Pre-Reg	*Post-Reg*
Buy (%)	69.6	49.0
Hold (%)	28.3	44.5
Sell (%)	2.1	6.5
Panel B: Unaffiliated analysts		
	Pre-Reg	*Post-Reg*
Buy (%)	63.9	48.0
Hold (%)	32.7	42.8
Sell (%)	3.4	9.2
Panel C: IPOs		
	Pre-Reg	*Post-Reg*
Buy (%)	64.8	56.0
Hold (%)	32.4	39.4
Sell (%)	2.8	4.6
Panel D: SEOs		
	Pre-Reg	*Post-Reg*
Buy (%)	65.7	46.6
Hold (%)	31.2	44.2
Sell (%)	3.1	9.0

Table 6. Panel Data Logistic Regressions Relating Optimism/Pessimism to Past and Future Underwriting Relationships

The table presents results of logistic regressions whose dependent variable equals 1 when a recommendation is either optimistic or pessimistic. All models use firm fixed effects. Optimistic recommendations are "strong buy" and "buy," and pessimistic recommendations are "underperform" and "sell." **AFF** is an indicator variable equal to 1 if the broker issuing the recommendation was a lead underwriter or a co-manager in an equity offering for the firm in the 24 months before the recommendation announcement date. **SEOIPO** is an indicator variable equaling 1 if a firm has gone through an IPO or an SEO in a period of 6 to 24 months prior to the recommendation. **DEF** takes a value of 1 if a firm's financial deficit in the year of recommendation is positive**. SANCT** is an indicator variable equal to 1 if the recommendation is issued by an analyst who is employed by a sanctioned brokerage house. **PASTFIRMPERF** is the size- and industry-adjusted firm's stock return in the six months prior to the recommendation. **PASTMKTPERF** is the cumulative market return in the six months prior to the recommendation. **EXPERIENCE** is the analyst's experience, defined as the number of years the analyst has appeared in IBES. **TIER3** is an indicator variable for whether a brokerage house uses a three-tier recommendation grid at the time a recommendation is issued. **PRE** and **POST** are indicator variables equaling 1 when the recommendation is issued respectively in the *Pre-Reg* or *Post-Reg* periods. *Pre-Reg* is the period between November 2000 and August 2002, and *Post-Reg* is the period between September 2002 and December 2004. Robust standard errors (in parentheses) are clustered at the firm level. ***, **, * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Table appears in the next page.

	(1)	(2)	(3)	(4)	(5)	(6)
	Prob (Rec=OPT)	Prob (Rec=PES)	Prob (Rec=OPT)	Prob (Rec=PES)	Prob (Rec=OPT)	Prob (Rec=PES)
AFF*PRE	0.1997***	-0.5499***	0.2093***	-0.4252**	0.2804***	-0.5462***
	(0.0616)	(0.1849)	(0.0554)	(0.1725)	(0.0570)	(0.1723)
SEOIPO*PRE			0.2097***	-0.3890***		
			(0.0425)	(0.1124)		
DEF*PRE					0.2045***	-0.2984***
					(0.0315)	(0.0781)
SANCT*PRE	0.0205	-0.1946	-0.001	-0.2443***	0.0055	-0.2336***
	(0.0497)	(0.1536)	(0.0232)	(0.0665)	(0.0232)	(0.0680)
PASTMKTPERF*PRE	0.9947***	-1.9868*	0.6287***	-2.6709***	0.6613***	-2.7250***
	(0.3752)	(1.1245)	(0.1483)	(0.4570)	(0.1498)	(0.4677)
PASTFIRMPERF*PRE	0.8365***	-0.4413*	0.6909***	-0.9484***	0.6812***	-0.8744***
	(0.1192)	(0.2490)	(0.0471)	(0.1206)	(0.0472)	(0.1255)
EXPERIENCE *PRE	-0.0081	-0.0102	-0.0101***	0.0028	-0.0068*	0.0023
	(0.0082)	(0.0246)	(0.0038)	(0.0103)	(0.0037)	(0.0104)
TIER3*PRE	0.1457**	0.2530*	0.1259***	0.2781***	0.1367***	0.2857***
	(0.0588)	(0.1524)	(0.0259)	(0.0708)	(0.0253)	(0.0700)
POST	-0.8876***	1.3079***	-0.6696***	1.5073***	-0.6084***	1.4250***
	(0.0994)	(0.1912)	(0.0360)	(0.0885)	(0.0395)	(0.0947)
AFF*POST	0.0213	-0.3872***	0.0581	-0.4071***	0.0062	-0.3883***
	(0.0526)	(0.1024)	(0.0483)	(0.0884)	(0.0487)	(0.0900)
SANCT*POST	-0.4360***	0.5630***	-0.3559***	0.4095***	-0.3555***	0.4130***
	(0.0553)	(0.0978)	(0.0227)	(0.0360)	(0.0227)	(0.0364)
SEOIPO*POST			-0.1225***	-0.0491		
			(0.0421)	(0.0667)		
DEF*POST					0.0600**	-0.0408
					(0.0279)	(0.0429)
PASTMKTPERF*POST	0.5627**	-0.1706	0.8336***	-0.2860**	0.8526***	-0.2934**
	(0.2422)	(0.3896)	(0.0936)	(0.1296)	(0.0910)	(0.1332)
PASTFIRMPERF*POST	0.1731***	-0.2284*	0.1636***	-0.2585***	0.1551***	-0.2586***
	(0.0667)	(0.1263)	(0.0296)	(0.0534)	(0.0292)	(0.0546)
EXPERIENCE *POST	-0.0062	0.0107	0.0005	0.0065	0.0016	0.0053
	(0.0069)	(0.0119)	(0.0027)	(0.0046)	(0.0027)	(0.0046)
TIER3*POST	-0.3337***	0.2097**	-0.3113***	0.1280***	-0.3069***	0.1152***
	(0.0472)	(0.0922)	(0.0191)	(0.0349)	(0.0195)	(0.0348)
Observations	21,713	13,242	119,580	97,282	114,937	93,631
Difference-in-Differences Hypothesis (p-values)						
AFF*PRE=AFF*POST	0.0245	0.4330				
SANCT*PRE=SANCT*POST	0.0000	0.0000				
SEPIPO*PRE=SEOIPO*POST			0.0000	0.0055		
DEF*PRE=DEF*POST					0.0001	0.0020

Table 7. Price Reactions to Recommendations Based on Underwriting Relationships

This table presents tests of difference in price reactions, measured by size- and industry-adjusted returns, to recommendations based on whether the analyst issuing the recommendation faced potential conflicts of interest. We analyze event reactions, i.e., returns over a three-day period centered on the issuance of the stock recommendation. Returns are reported separately for the *Pre-Reg* and *Post-Reg* periods. *Pre-Reg* is the period between November 2000 and August 2002, and *Post-Reg* is the period between September 2002 and December 2004. In addition, two groups of recommendations are analyzed: (1) recommendations for firms that have raised equity in the past 24 months and that were issued by affiliated analysts, i.e., analysts employed by a lead underwriter or a co-manager of the offering, and (2) recommendations for firms that have raised equity in the past 24 months and that were not issued by affiliated analysts. The p-value columns report p-values of tests of differences between the returns of affiliated and unaffiliated analysts for IPO/SEO firms, and the returns of affiliated and unaffiliated analysts for non-IPO/SEO firms. **PASTFIRMPERF** is the size- and industry-adjusted firm's stock return in the six months prior to the recommendation. **PASTMKTPERF** is the cumulative market return in the six months prior to the recommendation. **EXPERIENCE** is the analyst's experience, defined as the number of years the analyst has appeared in IBES. Robust standard errors are clustered at firm level and presented in parentheses. *, **, *** represent significance of 10%, 5%, and 1%, respectively.

	POST			PRE			Difference in Differences
	Affiliated	Unaffiliated	P-value	Affiliated	Unaffiliated	P-value	P-value
	(1)	(2)	(1)=(2)	(1)	(2)	(1)=(2)	
OPT	0.0184***	0.0129***	0.2261	0.0077	0.0077*	0.9958	0.5570
	(0.0042)	(0.0023)		(0.0075)	(0.0044)		
NEU	-0.0387***	-0.0268***	0.0569	-0.1104***	-0.0738***	0.0010	0.0521
	(0.0055)	(0.0034)		(0.0100)	(0.0065)		
PESS	-0.0695***	-0.0571***	0.2668	-0.1211***	-0.1282***	0.8638	0.6477
	(0.0104)	(0.0061)		(0.0311)	(0.0288)		
PASTFIRMPERF	0.0062	-0.0041	0.2192	0.0254**	0.0135	0.3341	0.9111
	(0.0083)	(0.0049)		(0.0111)	(0.0088)		
PASTMKTPERF	0.1256***	0.0683***	0.0246	0.1723***	0.0219	0.2940	0.1565
	(0.0284)	(0.0242)		(0.0584)	(0.0322)		
EXPERIENCE	-0.0011**	0.0003	0.0853	0.0020*	0.0005	0.0108	0.4189
	(0.0005)	(0.0003)		(0.0011)	(0.0008)		
Observations	3,064	6,990		2,165	7,888		
R-squared	0.12	0.08		0.22	0.11		