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Do Analyst Conflicts Matter?
Evidence from Stock Recommendations

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Abstract

We examine whether conflicts of interest with investment banking and brokerage induce sell-side analysts to issue optimistic stock recommendations and, if so, whether investors are misled by such biases. Using quantitative measures of potential conflicts constructed from a novel dataset containing revenue breakdowns of analyst employers, we find that recommendation levels are indeed positively related to conflict magnitudes. The optimistic bias stemming from investment banking conflict was especially pronounced during the late-1990s stock market bubble. However, evidence from the response of stock prices and trading volumes to upgrades and downgrades suggests that the market recognizes analyst conflicts and properly discounts analyst opinions. This pattern persists even during the bubble period. Moreover, the one-year performance of revised recommendations is unrelated to the magnitude of conflicts. Overall, our findings do not support the view that conflicted analysts are able to systematically mislead investors with optimistic stock recommendations.

Keywords: Stock analysts, Security analysts, Analyst conflicts, Corporate governance, Stock recommendations, Wall Street research, Brokerage research, Conflicts of interest

JEL Classifications: G24, G28, G34, G38, K22, M41

Do Analyst Conflicts Matter?
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In April 2003, ten of the largest Wall Street firms reached a landmark settlement with state and federal securities regulators on the issue of conflicts of interest faced by stock analysts.[1] The settlement requires the firms to pay a record $1.4 billion in compensation and penalties in response to government charges that the firms issued optimistic stock research to win favor with potential investment banking clients. Part of the settlement funds are earmarked for investor education and for provision of research from independent firms. In addition to requiring large monetary payments, the settlement mandates structural changes in the firms' research operations and requires the firms to disclose conflicts of interest in analysts' research reports.

The notion that investors are victims of biased stock research presumes that (1) analysts respond to the conflicts by inflating their stock recommendations, and (2) investors take analysts' recommendations at face value. Even if analysts are biased, it is possible that investors understand the conflicts of interest inherent in stock research and rationally discount analysts' opinions. This alternative viewpoint, if accurate, would lead to very different conclusions about the consequences of analyst research. Indeed, investor rationality and self-interested behavior imply that stock prices should accurately reflect a consensus about the informational quality of public announcements (see Grossman (1976) and Grossman and Stiglitz (1980)). Rational investors would recognize and adjust for analysts' potential conflicts of interest, largely avoiding the adverse consequences of biased stock recommendations.

In this paper, we provide evidence on the extent to which analysts and investors respond to conflicts of interest in stock research. We address four questions. First, is the extent of optimism in stock recommendations related to the magnitudes of analysts' conflicts of interest? Second, to what extent do investors discount the opinions of more conflicted analysts? In particular, do stock prices and trading volumes react to recommendation revisions in a manner that rationally reflects the degree of analyst

[1]Two more securities firms (Deutsche Bank Securities Inc. and Thomas Weisel Partners LLC) were added to the formal settlement in August 2004.

conflicts? Third, is the medium-term (i.e., three- to twelve-month) performance of recommendation revisions related to conflict severity? And finally, do conflicts of interest affect analysts or investors differently during the late 1990s stock bubble than during the post-bubble period? The answers to these questions are clearly of relevance to stock market participants, public policy makers, regulators, and the academic profession.

We use a unique, hand-collected dataset that contains the annual revenue breakdown for 232 public and private analyst employers. This information allows us to construct quantitative measures of the magnitude of potential conflicts not only from investment banking, but also from brokerage business. We analyze a sample of over 110,000 stock recommendations issued by over 4,000 analysts during the 1994-2003 time period. Using univariate tests as well as cross-sectional regressions that control for size of the followed company and individual analysts' experience, resources, workloads, and reputations, we attempt to shed light both on how analysts respond to pressures from investment banking and brokerage and on how investors compensate for the existence of such conflicts of interest.

A number of studies (e.g., Dugar and Nathan (1995), Lin and McNichols (1998), Michaely and Womack (1999), Dechow, Hutton, and Sloan (2000), and Bradley, Jordan, and Ritter (2007)) have focused on conflicts faced by analysts in the context of existing underwriting relationships.[2] Our paper complements this literature in several ways. First, we take into account the pressure to generate underwriting business from both current and potential client companies. Even if an analyst's firm does not currently do investment banking (IB) business with a company that the analyst tracks, it might like to do so in the future. Second, we examine the conflict between research and all investment banking services (including advice on mergers, restructuring, and corporate control), rather than just underwriting. Third, we examine conflicts arising from brokerage business in addition to those from IB.[3]

[2]See also Malmendier and Shanthikumar (2007) and Cliff (2007). Bolton, Freixas and Shapiro (2007) theoretically analyze a different type of conflict of interest in financial intermediation, one faced by a financial advisor whose firm also produces financial products (such as in-house mutual funds). Mehran and Stulz (2007) provide an excellent review of the literature on conflicts of interest in financial institutions.

[3]Hayes (1998) theoretically analyzes how pressure on analysts to generate brokerage commissions affects the availability and accuracy of earnings forecasts. Both Irvine (2004) and Jackson (2005) find that analyst optimism increases a brokerage firm's share of trading volume. Ljungqvist, et al. (2007) find that analysts

Fourth, the prior empirical finding that underwriter analysts tend to be more optimistic than other analysts is consistent with two alternative interpretations: (a) an optimistic report on a company by an underwriter analyst is a reward for past IB business or an attempt to win future IB business by currying favor with the company; or (b) a company chooses an underwriter whose analyst likes the stock to begin with. The second interpretation implies that underwriter choice is endogenous, and does not necessarily imply a conflict of interest. We sidestep this issue of endogeneity by not focusing on underwriting relations between an analyst's firm and the followed company. Instead, our conflict measures focus on the importance to the analyst's firm of investment banking and brokerage businesses, as measured by the percentage of its annual revenue derived from IB business and from brokerage commissions. Unlike underwriting relations between an analyst's firm and the followed company, the proportions of the entire firm's revenues from each of these businesses can reasonably be viewed as given, exogenous variables from the viewpoint of an individual analyst. Finally, our approach yields substantially larger sample sizes than those used in prior research, leading to greater statistical reliability of the results.

Several papers adopt an approach that is similar in spirit to ours. For example, Barber, Lehavy and Trueman (2007) find that recommendation upgrades (downgrades) by investment banks (which typically also have brokerage business) under-perform (outperform) similar recommendations by non-IB brokerages and independent research firms. Cowen, Groysberg and Healy (2006) find that full service securities firms (which have both IB and brokerage businesses) issue less optimistic forecasts and recommendations than non-IB brokerage houses. Finally, Jacob, Rock and Weber (2007) find that short-term earnings forecasts made by investment banks are more accurate and less optimistic than those made by independent research firms. We extend this line of research by quantifying the reliance of a securities firm on IB and brokerage businesses. This is an important feature of our paper for at least two reasons. First, given that many securities firms operate in multiple lines of business, it is difficult to classify them by

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employed by larger brokerages issue more optimistic recommendations and more accurate earnings forecasts. However, none of these papers examine how investor responses to analyst recommendations and the investment performance of recommendations vary with the severity of brokerage conflicts, issues that we investigate here.

business lines. By separately measuring the magnitudes of both IB and brokerage conflicts in each firm, our approach avoids the need to rely on a classification scheme. Second, since the focus of this research is on the consequences of analysts' conflicts, the measurement of those conflicts is important. Our conclusions sometimes differ from classification-based studies.

We find that analysts do indeed seem to respond to pressures from investment banking and brokerage: larger potential conflicts of interest from these businesses are associated with more positive stock recommendations. We also document that the distortive effects of investment banking were larger during the late-1990s stock bubble than during the post-bubble period. Nonetheless, the empirical analysis yields several pieces of evidence to suggest that investors are sophisticated enough to adjust for these biases. First, the short-term reactions of both stock prices and trading volumes to recommendation upgrades are significantly negatively related to the magnitudes of potential IB or brokerage conflicts. For downgrades, the corresponding relation is negative for stock prices but positive for trading volume. Second, the one-year investment performance of recommendation revisions bears no systematic relationship with the magnitude of conflicts. Finally, investors continued to discount conflicted analysts' opinions during the bubble period, even amidst the euphoria prevailing in the market at the time. Altogether, these results strongly support the idea that the marginal investor rationally discounts stock recommendations taking analysts' conflicts into account.[4]

The remainder of the paper is organized as follows. We discuss the issues in section 2 and describe our sample and data in section 3. Section 4 examines the relation between recommendation levels and the degree of IB or brokerage conflict faced by analysts. Section 5 analyzes how conflicts are related to the response of stock prices and trading volume to recommendation revisions. Section 6 investigates the relation between conflicts and the investment performance of recommendation revisions. Section 7

[4]In a companion paper (Agrawal and Chen (2005)), we find that analysts appear to respond to conflicts when making long-term earnings growth projections, but not short-term earnings forecasts. This finding is consistent with the idea that with short-term forecasts, analysts worry about their deception being revealed with the next quarterly earnings release, but they have greater leeway with long-term forecasts. We also find that the frequency of forecast revisions is positively related to the magnitude of brokerage conflicts, and several tests suggest that analysts' trade generation incentives impair the quality of stock research.

presents our results for the late 1990s stock bubble and post-bubble periods, and section 8 concludes.

2. Issues and hypotheses

Investment banking activity is a potential source of analyst conflict that has received widespread attention in the financial media (e.g., Gasparino (2002) and Maremont and Bray (2004)) as well as the academic literature (e.g., Lin and McNichols (1998) and Michaely and Womack (1999)). When IB business is an important source of revenue for a securities firm, a stock analyst employed by the firm often faces pressure to inflate his recommendations. This pressure is due to the fact that the firm would like to sell IB services to a company that the analyst tracks.[5,6] The company, in turn, would like the analyst to support its stock with a favorable opinion. Thus, we expect that the more critical is investment banking revenue to an analyst's employer, the greater the incentives an analyst faces to issue optimistic recommendations.

An analyst also faces a potential conflict with his employer's brokerage business. Here, the pressure on the analyst originates not from the companies that he follows, but from within his firm. Brokerage trading generates a large portion of most securities firms' revenues, and analyst compensation schemes are typically related explicitly or implicitly to trading commissions. Thus, analysts have incentives to increase trading volume in both directions (i.e., buys and sells). Given the many institutional constraints that make short sales relatively costly, a much larger set of investors participates in stock purchases as compared to stock sales.[7] Indeed, it is mostly existing shareholders of a stock who sell. This asymmetry between purchases and sales implies that the more important is

[5]Throughout the paper, we refer to an analyst's employer as a 'firm' and a company followed by an analyst as a 'company'.

[6]Ljungqvist, Marston and Wilhelm (2005, 2006) find that while optimistic recommendations do not help the analyst's firm win the lead underwriter or co-manager positions in general, they help the firm win the co-manager position in deals where the lead underwriter is a commercial bank.

[7]Numerous regulations in the United States increase the cost of selling shares short (see, e.g., Dechow, Hutton, Meulbroek and Sloan (2001)). Therefore the vast majority of stock sales are regular sales rather than short sales. For example, over the 1994-2001 period, short sales comprised only about ten percent of the annual New York Stock Exchange trading volume (see NYSE (2002)).

brokerage business to an analyst's employer, the more pressure the analyst faces to be bullish in his recommendations.

An analyst who responds to the conflicts he faces by issuing blatantly misleading stock recommendations can develop a bad reputation that reduces his labor income and hurts his career.[8] Stock recommendations, however, are not as easily evaluated as other outputs of analyst research such as 12-month price targets or quarterly earnings forecasts, which can be judged against public, near-term realizations. So it is not clear whether an analyst's career concerns can completely prevent him from responding to pressures to generate IB or brokerage business.

The relation between conflict severity and the short-term (two- or three-day) stock-price impact of a recommendation should depend upon whether investors react to the opinion rationally or naïvely.[9] Under the *rational discounting hypothesis*, the relation should be asymmetric for upgrades and downgrades. For upgrades, the stock price response should be negatively related to the degree of conflict. This is because analysts who face greater pressure from IB or brokerage are likely to be more bullish in their recommendations, and rational investors should discount an analyst's optimism more heavily. For downgrades, however, the story is different. When an analyst downgrades a stock despite facing large conflicts, rational investors should find the negative opinion more convincing and should be more likely to revalue the stock accordingly. This implies that the short-term stock price response to a downgrade should be negatively related to the degree of conflict.

The rational discounting hypothesis also predicts cross-sectional relationships between conflict severity and the short-term trading volume response to recommendations. As Kim and Verrecchia (1991) demonstrate in a rational expectations model of trading, the more precise a piece of news, the more individuals will revise their prior beliefs and hence the more trading that will result. In the present context, investor rationality implies that an upgrade by a highly conflicted analyst represents less precise

[8]See, e.g., Jackson (2005) for a theoretical model showing that analyst concerns about reputation can reduce optimistic biases arising from brokerage business.

[9]This framework follows Kroszner and Rajan (1994) and Gompers and Lerner (1999), who analyze the conflicts that a bank faces in underwriting securities of a company, when the bank owns a (debt or equity) stake in it.

news to investors, and so such a revision should be followed by relatively small abnormal volume. But when an analyst downgrades a stock despite a substantial conflict, the signal is regarded as being more precise, and thus the downgrade should lead to relatively large abnormal trading.

By contrast, under the *naïve investor hypothesis*, investors are largely ignorant of the distortive pressures that analysts face and accept analysts' recommendations at face value. This implies that there should be no relation between conflict severity and the short-term response of either stock prices or trading volume to recommendation revisions. Furthermore, the absence of a systematic relationship should hold true for both upgrades and downgrades.

What are the implications of the two hypotheses for the medium-term (3 to 12-month) investment performance of analyst recommendations? Under the rational discounting hypothesis, there should be no systematic relation between the magnitude of conflicts faced by an analyst and the performance of her stock recommendations: the market correctly anticipates the potential distortions upfront and accordingly adjusts its response. But the naïve investor hypothesis predicts that performance should be negatively related to conflict severity for both upgrades and downgrades. That is, investors ignore analysts' conflicts upfront and pay for their ignorance later on.

3. Sample and data

3.1. Sample

Our sample of stock recommendations comes from the I/B/E/S U.S. Detail Recommendations History file. This file contains data on newly issued recommendations as well as revisions and reiterations of existing recommendations made by individual analysts over the period from 1993 to 2003. Although the exact wording of recommendations can vary considerably across brokerage houses, I/B/E/S classifies all recommendations into five categories ranging from *strong buy* to *strong sell*. We rely on the I/B/E/S classification, encoding recommendations on a numerical scale from 5 (*strong buy*) to 1 (*strong sell*).

Since we are primarily interested in examining how the nature and consequences of analyst recommendations are related to investment banking or brokerage businesses, we require measures of the importance of these business lines to analysts' employers. Under

U.S. law, all registered broker-dealer firms must file audited annual financial statements with the Securities and Exchange Commission (SEC) in x-17a-5 filings.[10] These filings contain information on broker-dealer firms' principal sources of revenue, broken down into revenue from investment banking, brokerage commissions and all other businesses (such as asset management and proprietary trading). We use these filings to obtain various financial data, including data on our key explanatory variables: the fraction of total brokerage house revenues from investment banking and from brokerage commissions. Beginning with the names of analyst employers contained in the I/B/E/S Broker Translation file,[11] we search for all available revenue information in x-17a-5 filings from 1994 to 2003.[12] For publicly traded broker-dealer firms, we also use 10-K annual report filings over the sample period to gather information on revenue breakdown, if necessary. We thus obtain annual data from 1994 to 2003 on investment banking revenue, brokerage revenue, and other revenue (from asset management, trading, etc.) for 188 privately held and 44 publicly-traded brokerage houses.[13] For each brokerage house, we match recommendations to the latest broker-year revenue data preceding the recommendation date. Over the sample period, we are able to match in this fashion 110,493 I/B/E/S recommendations issued by 4,089 analysts.

All broker-dealer firms are required to publicly disclose their balance sheets as part of their x-17a-5 filings. But a private broker-dealer firm can withhold the public disclosure of its income statement, which contains the revenue breakdown information needed for this study, if the SEC deems that such disclosure would harm the firm's competitive position. Thus, our sample of private securities firms is limited to broker-dealers that disclose their revenue breakdown in x-17a-5 filings. We examine whether this selection bias affects our main results by separately analyzing the sub-sample of publicly traded securities firms, for which public disclosure of annual revenue information is mandatory. Our findings do not

[10]The Securities Exchange Act, sections 17 (a) through 17 (e). We accessed these filings from Thomson Financial's Global Access database and the SEC's public reading room in Washington, DC.

[11]We use the file supplied directly by I/B/E/S on CD-ROM. This file does not recode the name of an acquired brokerage firm to that of its acquirer for years before the merger.

[12]The electronic availability of x-17a-5 filings is very limited prior to 1994, the year the SEC first mandated electronic form filing. Hence, we do not search for revenue information prior to 1994.

[13]We exclude a small number of firm-years in which total revenue is negative (e.g., due to losses from proprietary trading).

appear to be affected by this selection bias. All our results for the sub-sample of publicly traded securities firms are qualitatively similar to the results for the full sample reported in the paper. In the Appendix, we describe the characteristics of disclosing and non-disclosing private securities firms, shed some light on the firms' income statement disclosure decisions, and use a selectivity-corrected probit model to examine whether the resulting selection bias can explain analysts' response to conflicts in these private firms. We find no evidence that selection bias affects our results for these firms.

3.2 Characteristics of analysts, their employers, and companies followed

We next measure characteristics of analysts, their employers, and the companies they cover. Prior research (e.g., Clement (1999), and Jacob, Lys, and Neale (1999)) finds that analysts' experience and workloads affect the accuracy and credibility of their research. Using the I/B/E/S detail history files, we measure an analyst's experience and workloads in terms of all of her research activity reported on I/B/E/S, including stock recommendations, quarterly and annual earnings-per-share (EPS) forecasts, and long-term earnings growth (LTG) forecasts. We measure general research experience as the number of days since an analyst first issued research on any company in the I/B/E/S database, and company-specific research experience as the number of days since an analyst first issued research on a particular company. We measure analyst workload as the number of different companies or the number of different 4-digit I/B/E/S S/I/G industry groups[14] for which an analyst issued research in a given calendar year.

The amount of resources devoted to investment research within brokerage houses also affects the quality of analysts' research (Clement (1999)). Larger houses have access to better technology, information and support staff. Accordingly, we use three measures of brokerage house size: the number of analysts issuing stock recommendations for a brokerage house over the course of a calendar year, book value of total assets, and net sales. All our subsequent results are qualitatively similar under each of the three size measures. To save space, we only report results of tests based on the first size measure.

[14]I/B/E/S Sector/Industry/Group (S/I/G) numbers are six-digit codes that provide information on the industry sectors and sub-sectors for companies in the I/B/E/S database. We use the first four digits, which correspond to broad industry groupings.

To capture the degree to which investors believe that individual analysts have skill in providing timely and accurate research, we use two measures of analyst reputation. The first is based upon *Institutional Investor* (*II*) magazine's survey of *All-American* analysts. Each year around October 15, *II* mails an issue to subscribers listing the names of analysts that receive the most votes in a poll of institutional money managers. About 300 to 400 analysts are identified. We construct a variable that indicates, for each recommendation revision, whether the recommending analyst was named to the first, second, third, or honorable mention team in the latest annual *All-American* survey. As a complementary, objective measure of analyst reputation, we use a variable based on the *Wall Street Journal*'s annual *All-Star* survey of analysts. Membership on the *WSJ All-Star* team is determined by an explicit set of criteria relating to past stock-picking performance and forecasting accuracy.[15] The survey covers about 50 industries annually and names the top five stock pickers and top five earnings forecasters in each industry.[16]

Table 1 summarizes the characteristics of our sample. In Panel A, both the mean and median percentages of analyst employer revenues derived from investment banking decline monotonically with the first four recommendation levels, but these values are highest for *strong sell* recommendations (mean = 16.27%; median = 14.9%). Likewise, it is the brokerage firms issuing *strong sell* recommendations that generally derive the highest percentage of their total revenues from brokerage commissions. Notably, in each of the five categories, mean percentage of revenue from commissions is about twice as large as the mean percentage from IB. This underscores the importance of trading commissions as a source of revenue for many securities firms. The last column shows that about 95% of the recommendations in the sample are at levels 5 (strong buy), 4

[15]We recognize that the performance metrics used in the *WSJ All-Star* survey are public information and can, in principle, be replicated by investors. However, to the extent that computing and evaluating analyst performance is a costly activity, being named to the *All-Star* team can still affect an analyst's reputation and credibility.

[16]Since the I/B/E/S Broker Translation File only provides analysts' last names and first initials, in some instances it is not possible to ascertain from I/B/E/S data alone whether or not an analyst in our sample was named to the *II* or *WSJ* teams. For these cases, we determine team membership of analysts using *NASD BrokerCheck*, an online database (accessed from http://www.nasd.com in October 2004) that provides the full names of registered securities professionals as well as their employment and registration histories for the past ten years. The database also keeps track of analyst name changes (e.g., resulting from marriage).

(buy), or 3 (hold). Levels 1 (strong sell) and 2 (sell) represent only about 1% and 4% of all recommendations, respectively.

Panel B provides a flavor for our sample of analysts and their employers. As noted by Hong, Kubik and Solomon (2000), careers as analysts tend to be relatively short. The median recommendation is made by an analyst with about 4.9 years of experience as analyst, of which about 1.2 years was spent following a given stock. Stock analysts tend to be highly specialized, following a handful of companies in a few industries. The median recommendation is made by an analyst following 15 companies in three industries, who works for a securities firm employing 60 analysts. Being named as an *All-American* team member by the *Institutional Investor* magazine is a rare honor, received only by about 3.5% of all analysts in our sample.

Finally, Panel C shows that the typical followed company is large, with mean (median) market capitalization of about $8.8 billion ($1.4 billion) in inflation-adjusted 2003 dollars. Over the time span of a year, a company is tracked by a mean (median) of 9.1 (7) analysts.

4. Conflicts and the levels of analyst recommendations net of the consensus

In this section, we examine whether the level of an analyst's stock recommendation net of the consensus (i.e., median) recommendation level is related to the conflicts that she faces. We start by ascertaining the level of the outstanding recommendation on each stock by each analyst following it at the end of each quarter (March, June, September, December) from 1995 through 2003. An analyst's recommendation on a stock is included only if it is newly issued, reiterated, or revised in the past 12 months.

We estimate a regression explaining individual analysts' net stock recommendation levels at the end of a quarter (= recommendation level minus the median recommendation level across all analysts following a stock during the quarter).[17] The regression pools observations across analysts, stocks and quarters, and includes our two main explanatory variables: the percentages of an analyst employer's total revenues from investment banking and from brokerage commissions. Following Jegadeesh, et al. (2004)

[17]To ensure meaningful variation in the dependent variable, we omit stocks followed by only one analyst in a quarter.

and Kadan, et al. (2006), who find that momentum is an important determinant of analyst recommendations, we control for the prior 6-month stock return.

The regression also controls for other factors that can affect the degree of analyst optimism such as the size of the followed company, and the resources, reputation, experience and workload of an analyst. As a measure of resources available to an analyst, we use a dummy variable for a large brokerage house that equals one if the firm ranks in the top quartile of all houses in terms of the number of analysts employed during the year. We measure analyst reputation by dummy variables that equal one if the recommending analyst was named in the most recent year as an *All-American* by the *Institutional Investor* magazine or as an *All-Star* by the *Wall Street Journal*. An analyst's company-specific research experience is measured by the natural logarithm of one plus the number of days an analyst has been producing research (i.e., EPS forecasts, long-term growth forecasts, or stock recommendations) on the company. We measure an analyst's workload by the natural logarithm of one plus the number of companies for which she produces forecasts or recommendations in the current year. Size of the followed company is measured by the natural logarithm of its market capitalization, measured 12 months before the end of the month.

Finally, we control for industry and time period effects by adding dummy variables for I/B/E/S 2-digit S/I/G industries and for each calendar quarter (March 1995, June 1995, etc.). Since net recommendation levels can take ordered values from -4 (strongly pessimistic) to +4 (strongly optimistic) in increments of 0.5, we estimate the regression as an ordered probit model.[18] Z-statistics are based on a robust (Huber/ White/ sandwich) variance estimator.

Table 2 shows the regression estimate. In Panel A, the coefficients of the IB revenue % and commission revenue % are both positive, implying that greater conflicts with investment banking and brokerage lead an analyst to issue a higher recommendation on a stock relative to the consensus. Stocks followed by busier analysts and stocks of larger companies receive higher recommendations relative to the consensus. Stocks that experience a price run-up over the prior six months, stocks followed by analysts at large

[18]Notice that recommendation levels can take integer values from 1 to 5 and the median recommendation can take values from 1 to 5 in increments of 0.5. See Greene (2003) for a detailed exposition of the ordered probit model.

brokerage houses, and stocks followed by *Wall Street Journal All-Star* analysts all receive lower recommendations relative to the consensus. All of these relations are highly statistically significant.

To provide a sense for the magnitude of the main effects of interest, Panel B shows derivatives of the probability of each net recommendation level with respect to IB revenue % and commission revenue %.[19] For example, a one standard deviation increase in IB revenue % increases the probability of an optimistic recommendation (i.e., net recommendation level > 0) by .1193 x (.0325 + .0671 + … + .0003) = .0151. Compared to the unconditional probability of an optimistic recommendation by an analyst, this represents an increase of about 5.9% (= .0151 / .2575). The effect of a change in commission revenue % is much smaller. A one standard deviation increase in commission revenue % increases the probability of an optimistic recommendation by .2475 x .01105 = .0027, or about 1% (=.0027 / .2575) of the unconditional probability. Thus, despite possible concerns about loss of reputation, analysts seem to respond to conflicts of interest, particularly those stemming from investment banking.

5. Conflicts and investor response to recommendation revisions

5.1 Stock price response

This section examines whether an analyst's credibility with investors is related to the degree of conflict that he faces. We interpret the reaction of stock prices to a recommendation revision as an indication of analyst credibility. Our analysis focuses on revisions in recommendation levels, rather than on recommendation levels *per se*, because revisions are discrete events that are likely to be salient for investors, and previous research finds that revisions have significant information content (see, e.g., Womack (1996) and Jegadeesh, et al. (2004)). To capture the effects of the most commonly observed and economically important types of revisions, we structure our tests around four basic categories: *added to strong buy, added to buy/strong buy, dropped from strong buy, and*

[19]Notice that for each explanatory variable, these derivatives sum up to zero across all the relative recommendation levels.

dropped from buy/strong buy.[20] These four categories are defined to include initiations, resumptions, and discontinuations of coverage because such events also reflect analysts' positive or negative views about a company.[21] Thus, for example, we consider a stock to be *added to strong buy* under two scenarios: (a) the recommendation level is raised to *strong buy* from a lower level; or (b) coverage is initiated or resumed at the level of *strong buy*.[22] Defining revisions in this fashion yields a sample of 94,892 recommendation revisions made over the 1994-2003 period.

5.1.1. Average stock price response

We compute the abnormal return on an upgraded or downgraded stock over day t as the return (including dividends) on the stock minus the return on the CRSP equal-weighted market portfolio of NYSE, AMEX and Nasdaq stocks. The cumulative abnormal return (CAR) on the stock over days t_1 to t_2 relative to the revision date (day 0) is measured as the sum of the abnormal returns over those days. Table 3 shows mean and median CARs for three windows: days -1 to 0, -1 to +1, and -5 to +5. T-statistics for the difference of the mean abnormal returns from zero are computed as in Brown and Warner (1985) and shown in parentheses below the means. P-values for the Wilcoxon test are reported in parentheses below the medians.

It is clear from the table that recommendation revisions have large effects on stock prices. For example, when a stock is added to the strong buy list, it experiences a mean abnormal return of about 2% over the two-day revision period. Downgrades have even larger effects on stock prices than do upgrades. Strikingly, the two-day mean

[20]Our analysis focuses on these four types of revisions instead of the other four (*added to strong sell,* etc.) because, as shown in Table 1, Panel A, *sell* and *strong sell* recommendations are quite rare. But note that *dropped from buy* and *dropped from buy or strong buy* revisions can entail movement to *sell* or *strong sell* categories.

[21]We use the I/B/E/S Stopped Recommendations file to determine instances where a brokerage firm discontinued coverage of a company. This file contains numerous cases where an analyst 'stops' coverage of a stock, only to issue a new recommendation a month or two later. Conversations with I/B/E/S representatives indicate that such events likely represent pauses in coverage due to company quiet periods or analyst reassignments within a brokerage house. We define a stopped coverage event to be a true stoppage only if the analyst does not issue a recommendation on the stock over the subsequent six months.

[22]Note that the definition of our four recommendation revision groups implies that stocks can be added to a group more than once on a given day. Nonetheless, excluding days on which a stock experiences multiple revisions does not change any of our qualitative results.

abnormal return around the *dropped from strong buy* list is -4%. Median values are consistently smaller in magnitude than means, indicating that some revisions lead to very negative price reactions. Mean and median two-day abnormal returns are statistically different from zero for all four groups of forecast revisions. The magnitudes of abnormal returns are slightly larger over the three-day and eleven-day windows than over the two-day window. Overall, these returns are consistent with those found by prior research that examines the average stock price impact of recommendation revisions (e.g., Womack (1996) and Jegadeesh, et al. (2004)).

5.1.2. Cross-sectional analysis

Table 4 contains cross-sectional regressions of stock price reactions to recommendation revisions over days -1 to +1. The main explanatory variables of interest in these regressions are our revenue-based measures of the magnitudes of IB and brokerage conflicts. We include controls for the size of an analyst's employer, size of the company followed, and measures of an analyst's reputation, experience and workload.[23] We estimate a separate regression for each of the four groups of recommendation revisions. T-statistics based on a robust variance estimator are reported in parentheses below the coefficient estimates.

The coefficient on IB revenue % is significantly negative for both upgrades and downgrades. The coefficient on brokerage commission revenue % is also negative in all four regressions; it is statistically significant in all cases, except in the case of *dropped from strong buy* revisions.[24] Collectively, these results favor the rational discounting hypothesis over the naïve investor hypothesis. The magnitudes of these effects are non-trivial. For instance, a one standard deviation increase in IB revenue % leads to a change of about -0.31 (-0.42) percentage points in the three-day abnormal return around the move to (from) a *strong buy* recommendation. Similarly, a one standard deviation

[23]Prior research finds that analysts who have more experience, carry lower workloads or are employed by larger firms tend to generate more precise research (see, e.g., Clement (1999), Jacob, Lys, and Neale (1999), and Mikhail, Walther, and Willis (1997)). In addition, more reputed analysts tend to generate timelier and more accurate research (see, e.g., Stickel (1992), and Hong and Kubik (2003)). We expect such analysts to be more influential with investors.

[24]These and all subsequent regression results in the paper are qualitatively similar when we winsorize the dependent variable at the first and 99th percentiles of its distribution.

increase in brokerage commission revenue % leads to a change of about -0.37 (-0.22) percentage points in the corresponding abnormal return around the move to (from) a *buy or strong buy* recommendation.[25, 26]

The results for control variables are also noteworthy. The dummy variable for a large analyst employer is positively (negatively) related to the market reaction to upgrades (downgrades). This finding is consistent with the idea that revisions by analysts employed at larger brokerage houses (which tend to be more reputable) have more credibility with investors. The size of the company followed is negatively (positively) related to the market reaction to upgrades (downgrades), consistent with the notion that for larger companies, an analyst's recommendation competes with more alternative sources of information and advice.

Revisions by *Institutional Investor All-American* analysts are positively (negatively) related to the stock price reaction to upgrades (downgrades), suggesting that *All-American* analysts wield more influence with investors. This is a notable finding; we are unaware of previous work documenting a relationship between analyst reputation and the stock price reaction to both upgrades and downgrades. As the coefficient on WSJTEAM indicates, however, being designated as a *Wall Street Journal All-Star* does not seem to enhance the credibility of an analyst's recommendations.[27] The absence of an effect here is somewhat surprising given that the *WSJ* has a much broader readership base than *Institutional Investor* magazine. One explanation is that *II* analyst rankings are based on an opinion poll of money managers, who control substantial assets and therefore

[25]For each group of revisions (e.g., added to strong buy), we also estimate the regression after excluding similar revision events that a stock experiences within three days of a given revision event. These results are qualitatively similar to those reported in Tables 4 and 6.

[26]We also examine the possibility that investors perceived the conflicts to be more severe, and hence discounted them more, in securities firms that were charged by regulators (i.e., the ten firms that were part of the Global Analyst Settlement) than other firms. We do this by interacting both IB revenue % and brokerage commission revenue % variables in the regression with binary (0, 1) dummy variables for securities firms that are part of the Global Analyst Settlement and firms that are not. We find no significant difference in the coefficient of IB revenue % or commission revenue % between the two groups of firms in the regressions shown in Tables 4 and 6.

[27]Although *II All-American* and *WSJ All-Star* analyst dummies both measure aspects of analyst reputation, they are not highly correlated. The correlation coefficient is 0.14 across all upgrades and 0.13 across all downgrades.

directly affect stock prices, while *WSJ* rankings are based on strictly quantitative measures of analysts' past stock-picking or forecasting performance.

The market reaction to upgrades is positively related to an analyst's company-specific research experience. This finding suggests that more experienced analysts tend to be more influential with investors. But the reaction to downgrades is also positively related to analyst experience. Finally, the stock price reaction to upgrades is negatively related to analyst workload, suggesting that busier analysts' opinions tend to get discounted by the market. All of these relations are statistically significant.

5.2. Response of trading volume

In this section, we measure analyst credibility via changes in the volume of trade around recommendation revisions.[28] Revisions of analyst recommendations can affect trading volume by inducing investors to rebalance their portfolios to reflect updated beliefs.

5.2.1. Average response of trading volume

We compute the abnormal volume for a trading day t as the mean-adjusted share turnover for stock i:[29]

(1) $e_{it} = v_{it} - v_i$,

where v_{it} = the trading volume of stock i over day t divided by common shares outstanding on day t, and v_i = mean of v_{it} over days -35 to -6.

The cumulative abnormal volume for stock i over days t_1 to t_2 is measured as

(2) $$CAV^i_{t_1,t_2} = \sum_{t=t_1}^{t_2} e_{it}.$$

Table 5 shows mean and median values of CAV over three windows surrounding revisions in analyst stock recommendations. Over the two-day revision period, the mean

[28]Many prior studies have used trading volume to examine investors' response to informational events (see, e.g., Shleifer (1986), Jain (1988), Jarrell and Poulsen (1989), Meulbroek (1992), and Sanders and Zdanowicz (1992)).

[29]This approach has been used by a number of prior studies (e.g., Shleifer (1986), Vijh (1994), and Michaely and Vila (1996)).

abnormal volume is positive for both upgrades and downgrades, but its magnitude is substantially larger for downgrades. The move to (from) the strong buy list increases a stock's trading volume by a mean of about 0.9% (2.6%) of the outstanding shares, compared to a normal day's volume. For longer windows, mean abnormal volumes are substantially higher for downgrades. Median values are lower than the means. Each mean and median abnormal volume is statistically greater than zero, with a p-value below .01. Clearly, revisions of stock recommendations by analysts generate trading.

5.2.2. Cross-sectional analysis

Table 6 presents cross-sectional regressions of cumulative abnormal volume over days -1 to +1 surrounding the recommendation revisions. The explanatory variables in the regressions are the same as in regressions of cumulative abnormal returns in section 5.1.2 above. The results provide strong support for the rational discounting hypothesis. The coefficients of both the IB revenue % and commission revenue % variables are generally significantly negative (positive) for both groups of upgrades (downgrades). The magnitudes of these effects are non-trivial. For example, a one standard deviation increase in IB revenue % leads to a change in the three-day abnormal volume around the addition (omission) of a stock to (from) the strong buy list of about -0.12% (+0.36%) of the outstanding shares; a corresponding change in commission revenue % results in a change in abnormal volume of about -0.15% (+0.22%).

Recommendation revisions by larger brokerage houses generate more trading. Abnormal volume is also larger for revisions involving smaller companies. Revisions by *II All-American* team members generate significantly more abnormal volume for the dropped from buy or strong buy group. Upgrades (downgrades) by more experienced analysts result in larger (smaller) abnormal volume, and upgrades by busier analysts are less credible.

6. Conflicts and the performance of recommendation revisions

We next consider the investment performance of analysts' recommendation revisions over periods of up to 12 months. Here, the choice of the benchmark used to compute abnormal returns is somewhat more important than in section 5.1, where we

measure abnormal returns over a few days around the revision. But the results here are likely to be less sensitive to the benchmark employed than in studies of long-run stock performance, where the time period of interest can be as long as 5 to 10 years (see, e.g., Agrawal, Jaffe and Mandelker (1992), and Agrawal and Jaffe (2003)).

6.1 Average performance

We use an approach similar to Barber, Lehavy and Trueman (2007). To evaluate the performance of a group of stocks over a given window, say months +1 to +12 following the month of their inclusion (month 0) in a given group of revisions such as the *added to strong buy* list, we form a portfolio p that initially invests $1 in each recommendation. Each recommended stock remains in the portfolio until month +12 or the month that the stock is either downgraded or dropped from coverage by the securities firm, whichever is earlier. If multiple securities firms recommend a stock in a given month, the stock appears multiple times in the portfolio that month, once for each securities firm with a strong buy recommendation. The portfolio return for calendar month t is given by

$$(3) \qquad R_{pt} = \sum_{i=1}^{n_t} x_{it} \cdot R_{it} \Big/ \sum_{i=1}^{n_t} x_{it},$$

where R_{it} is the month t return on recommendation i, x_{it} is one plus the compound return on the recommendation from month +1 to month t-1 (i.e., x_{it} equals one for a stock that was recommended in month t), and n_t is the number of recommendations in the portfolio. This yields a time series of monthly returns for portfolio p.

We compute the abnormal performance of portfolio p as the estimate of the intercept term α_p from the Fama and French (1993) 3-factor model. Accordingly, we estimate the following time-series regression for portfolio p:

$$(4) \qquad R_{pt} - R_{ft} = \alpha_p + \beta_{1p} (R_{mt} - R_{ft}) + \beta_{2p} SMB_t + \beta_{3p} HML_t + \varepsilon_{pt}, \; t=\text{January 1994 to December 2003},$$

where R_f is the risk-free rate, R_m is the return on the value-weighted market index, SMB equals the monthly return on a portfolio of small firms minus the return on a portfolio of big firms; and HML is the monthly return on a portfolio of high book-to-market ratio firms minus the return on a portfolio of low book-to-market ratio firms. The error term in

the regression is denoted by ε. The time series of monthly returns on ($R_m - R_f$), SMB and HML are obtained from Professor Kenneth French's website.[30] We repeat this procedure for each time window of interest, such as months +1 to +3, and for each group of revisions, such as the *dropped from strong buy* list.

Table 7 shows the performance of analysts' recommendation revisions. Over the period of three months following the month of recommendation revision, the average abnormal returns to upgrades are positive and the returns to downgrades are negative. The magnitudes of these returns are non-trivial. For example, the addition of a stock to the strong buy list has an abnormal monthly return of about 0.8755% or about 2.62% over the three-month period. The pattern is generally similar over longer windows. For example, over months +1 to +12, the abnormal monthly return for the *added to strong buy* list is 0.679% or about 8.15% over the 12-month period. The abnormal returns are significantly different from zero for upgrades in all cases; they are insignificant for downgrades in all cases except one.

6.2 Cross-sectional analysis

Table 8 shows results of a regression similar to that in section 5.1.2 above, except that the dependent variable here is the average monthly abnormal return for a firm over months +1 to +12 following the month of a recommendation revision. We compute this abnormal return by estimating a time-series regression similar to equation (4) above over months +1 to +12 for each stock in a sample of recommendation revisions. The intercept from this regression is our estimate of the performance of the recommendation revision. Observations involving recommendation revisions on a stock that occur within 12 months of an earlier revision are omitted from each regression.[31]

In each regression reported in Table 8, the coefficients of IB revenue % and commission revenue % are insignificantly different from zero. These results favor the rational discounting hypothesis, at least for the marginal investor. The performance of both groups of recommendation upgrades is negatively related to company size; the

[30] http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html (accessed in November 2004).

[31] The results are qualitatively similar when we include these observations.

performance of one group of downgrades is positively related to the dummy variable for *WSJ All Star* analysts. None of the other variables is statistically significant.

7. Bubble vs. post-bubble periods

We next exploit the fact that our sample spans both the late 1990s U.S. stock bubble and a post-bubble period. During the bubble period, IPO and merger activities and stock prices were near record highs, and media attention was focused on analysts' pronouncements. We therefore examine whether analyst behavior and investor response to analyst recommendations differed during the bubble and post-bubble periods. Given the euphoria on Wall Street and among investors during the bubble, analysts appear to have been under acute pressure to generate investment banking fees and brokerage commissions. As for the response of investors, the rational discounting hypothesis predicts greater discounting of analyst opinions during this period in response to heightened conflicts, while the naïve investor hypothesis predicts lower discounting.

We estimate regressions similar to those in Table 2 for relative recommendation levels, Table 4 for announcement abnormal returns, Table 6 for announcement abnormal volume, and Table 8 for 12-month investment performance of recommendation revisions, except that we now interact the IB revenue % and commission revenue % by dummy variables for the bubble (January 1996 to March 2000) and post-bubble (April 2000 to December 2003) periods. Accordingly, we restrict the sample period for these regressions to January 1996 to December 2003. For regressions corresponding to Table 2, we also replace the calendar-quarter dummies with a post-regulation indicator (equal to 1 for quarters ending after May 2002). In May 2002, both the NYSE and NASD considerably tightened the regulations on the production and dissemination of sell-side analyst research.[32] The findings of Barber, et al. (2006) and Kadan, et al. (2006) suggest that these regulations exerted a downward pressure on recommendation levels. The regression results are presented in Table 9. To save space, we only report the coefficient estimates for IB revenue % and commission revenue %.

Panel A of Table 9 shows that analysts appear to have inflated their recommendations in response to investment banking conflicts during both the bubble and

[32]See NYSE Amended Rule 472, 'Communications with the Public,' and NASD Rule 2711, 'Research Analysts and Research Reports.'

post-bubble periods. But the magnitude of this effect is substantially greater during the bubble period than post-bubble. This difference is statistically significant. The magnitude of the effect is smaller for brokerage conflicts than for IB conflicts during both periods. In fact, the effect for brokerage conflicts is negative during the bubble; it is positive and significantly higher post-bubble.

Panel B shows that in regressions of three-day abnormal returns, the coefficients of both IB revenue % and commission revenue % are significantly negative during the bubble period for both groups of upgrades. For the *added to strong buy* group, the coefficient of IB revenue % is significantly lower during the bubble period than post-bubble. For downgrades, the coefficients of both variables are generally negative in both periods, and significantly lower post-bubble.

In regressions of three-day abnormal volume, the coefficients of IB revenue % and commission revenue % are negative for upgrades and positive for downgrades in all cases, both during and after the bubble. These coefficients are insignificantly different between the bubble versus post-bubble periods for both groups of upgrades and one group of downgrade. For the *dropped from strong buy* group, the coefficient of IB revenue % is significantly larger during the bubble period than post-bubble, but the coefficient of commission revenue % is significantly smaller. In regressions of 12-month stock performance, the coefficients of both variables are insignificant both during and after the bubble in nearly all cases, consistent with the results in Table 8 for the full sample period.

Overall, analysts appear to respond to investment banking conflicts both during and after the bubble, but the magnitude of their response has gone down post-bubble. Perversely, while analysts do not seem to respond to brokerage conflicts during the bubble, they appear to do so after the bubble. Perhaps the intense regulatory and media focus on investment banking conflicts has led analysts to look for alternate avenues. Did investors discount conflicted analysts' opinions more during the bubble than in the post-bubble period? The answer to this question is mixed. However, our evidence does not support the notion that investors threw caution to the wind during the bubble.

8. Summary and conclusions

Following the collapse of the late-1990s U.S. stock market bubble, there has been a widespread hue and cry from investors and regulators over the conflicts of interest faced by Wall Street stock analysts. The discovery of e-mails, in which analysts were privately disparaging stocks that they were touting publicly, led to the landmark $1.4 billion settlement between a number of leading Wall Street firms and securities regulators in April 2003. The settlement requires the firms to disclose investment banking conflicts in analyst reports and imposes a variety of restrictions designed to strengthen the Chinese Walls that separate research from investment banking. Part of the settlement funds are set aside for investor education and for providing research produced by independent firms. The settlement basically presumes that analysts respond to the conflicts by inflating their stock recommendations, and that investors take analyst recommendations at face value.

Consistent with the view of the media and regulators, we find that optimism in stock recommendations is positively related to the importance of both IB and brokerage businesses to an analyst's employer. This pattern is more pronounced during the late 1990s stock market bubble with respect to IB conflict. However, we provide several pieces of empirical evidence that suggest that investors are sophisticated enough to adjust for this bias. First, the short-term reactions of both stock prices and trading volumes to recommendation upgrades vary negatively with the magnitude of potential IB or brokerage conflict faced by analysts. For instance, over the three days surrounding upgrades to *strong buy*, a one standard deviation increase in the proportion of revenue from investment banking is associated with a 0.31 percentage point decrease in abnormal returns and a 0.12 percentage point decrease in abnormal volume. These results suggest that investors ascribe lower credibility to an analyst's upgrade when the analyst is subject to greater pressures to issue an optimistic view. For downgrades, conflict severity varies negatively with the short-term stock price reaction and positively with the short-term trading volume impact. This pattern is consistent with the idea that investors perceive an analyst to be more credible if he is willing to voice an unfavorable opinion on a stock despite greater pressures to be optimistic.

Second, we find no evidence that the one-year investment performance of recommendation revisions is related to the magnitude of analyst conflicts, either for upgrades or for downgrades. This finding suggests that on average, investors properly

discount analyst opinions for potential conflicts at the time the opinion is issued. Finally, investors discounted conflicted analysts' opinions during the late 1990s stock bubble, even in the face of the prevailing market euphoria. This evidence does not support the popular view that recommendations of sell-side analysts led investors to throw caution to the wind during the bubble period.

Overall, our empirical findings suggest that while analysts do respond to investment banking and brokerage conflicts by inflating their stock recommendations, the market discounts these recommendations taking analysts' conflicts into account. These findings are reminiscent of the story of the nail soup in Brealey and Myers (1991), except that here, analysts (rather than accountants) are the ones who put the nail in the soup and investors (rather than analysts) are the ones to take it out. Our finding that the market is not fooled by biases stemming from conflicts of interest echoes similar findings in the literature on conflicts of interest in universal banking (e.g., Kroszner and Rajan (1994, 1997) and Gompers and Lerner (1999)) and on bias in financial media (e.g., Bhattacharya, et al. (2007) and Reuter and Zitzewitz (2006)). Finally, while we cannot rule out the possibility that *some* investors may have been naïve, our findings do not support the notion that the marginal investor was systematically misled over the last decade by analyst recommendations.

Appendix

The purpose of this Appendix is to describe the characteristics of disclosing and non-disclosing private securities firms, shed some light on their decisions to publicly disclose the income statement, and examine whether the resulting selection bias affects our main results in Table 2. Table A1 provides summary statistics of recommendation levels and characteristics of disclosing and non-disclosing private securities firms. Disclosing firms tend to be smaller and more liquid, and issue somewhat more optimistic stock recommendations than non-disclosing firms. The mean recommendation level for disclosing (non-disclosing) firms is about 3.9 (3.8). Their median total assets are about $4.0 million ($28.4 million) and the median ratio of cash and equivalents to total assets is about 0.10 (0.05). All these differences are statistically significant. The two groups of firms have similar financial leverage ratios and two-year growth rates in total assets.

We next examine cross-sectional determinants of a private securities firm's decision to disclose its income statement. In an excellent review of the corporate disclosure literature, Healy and Palepu (2001) point out that a firm is more willing to voluntarily disclose financial information when it needs to raise external financing, and when it is less concerned that the disclosure would damage its competitive position in product markets. Ceteris paribus, firms with greater growth opportunities, higher financial leverage, and less liquid resources are more likely to need external financing. So they are more likely to be open with potential investors by disclosing financial information, including the income statement. Similarly, smaller firms are likely to have greater need for external financing as they try to grow. In addition, given the intense competition in the securities business, smaller private firms are also likely to be more willing to disclose their profits and profitability because they have less business at stake. For both reasons, smaller firms are likely to be more willing to disclose financial information. We control for firm size by the natural logarithm of one plus total assets in millions of dollars; growth opportunities by the two-year growth rate of total assets; financial leverage by the ratio of long-term debt to total assets; and liquidity by the ratio of cash and equivalents to total assets. We estimate a probit regression of discloser, which equals one for a disclosing firm, and zero otherwise.

Consistent with the predictions of corporate disclosure theory, the coefficients on firm size and liquidity are negative, and the coefficient on growth is positive. Contrary to the prediction, the coefficient on leverage is negative. All of these coefficients are highly statistically significant. The pseudo-R^2 of this model is 0.08. These results are not reported in a table to save space.

Finally, we examine whether the selection bias caused by a private securities firm's disclosure choice (and consequently the availability of data on IB revenue % and commission revenue %) affects our main results in Table 2. While there is no Heckman selectivity correction for the ordered probit model, there is one for the regular probit model. So we define a binary variable to measure an optimistic recommendation that equals one, if an analyst's recommendation level on a stock exceeds the consensus level; it equals zero otherwise. We then replace the dependent variable in the regression in section 4 above by this optimistic recommendation dummy. We estimate the resulting equation for the sub-sample of private securities firms two ways: (a) a regular probit model, and (b) a Heckman selectivity-corrected probit model, using the equation described in the second paragraph of this Appendix as the selection equation. Using approach (b) above, the coefficient of the selection term (i.e., the inverse Mills ratio) is statistically significant in the second-stage probit regression. More important for our purposes, the sign, magnitude and statistical significance of our main explanatory variables, IB revenue % and commission revenue %, are similar between the regular probit and the Heckman-corrected probit regression. These results do not support the idea that our main results in Table 2 are driven by the selection bias caused by a private securities firm's decision to disclose its revenue breakdown. To save space, these results are not reported in a table.

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Table 1

Characteristics of Analysts, Analyst Employers, and Companies Followed

The table shows statistics on characteristics of analysts, analyst employers, and followed companies for 110,493 stock recommendations (including 94,892 recommendation revisions) drawn from the I/B/E/S U.S. Detail Recommendations History file from 1994-2003. Recommendation revisions include recommendation changes as well as initiations, resumptions, and discontinuations of coverage. Panel A reports, by recommendation levels, the percentages of analyst employer revenue that come from investment banking or brokerage commissions. Panel B shows characteristics of analysts and analyst employers for the sample of recommendation revisions. Analyst experience is measured from all analyst research activity in I/B/E/S, including EPS forecasts, long-term earnings growth forecasts, and stock recommendations. An analyst is considered to be a top stock picker or team member if he appeared in the relevant portion of the most recent analyst survey by *Institutional Investor* or *Wall Street Journal* at the time of a recommendation revision. Panel C shows the size (i.e., market capitalization 12 months before the end of the current month) and analyst following (i.e., stock recommendation coverage) of companies experiencing recommendation revisions. Market capitalization numbers are inflation-adjusted (with CPI numbers and with 2003 as the base year).

Panel A: Revenue Sources of Analyst Employer by Recommendation Level

Recommendation Level	Investment banking revenue %		Brokerage commission revenue %		Sample Size
	Mean	Median	Mean	Median	
5 (Strong Buy)	13.94	11.81	29.87	24.09	28,901
4 (Buy)	13.81	11.21	26.68	17.22	37,478
3 (Hold)	12.68	11.13	28.44	24.07	37,883
2 (Sell)	11.61	10.55	23.13	16.12	4,875
1 (Strong Sell)	16.27	14.90	33.44	24.95	1,356
P-value for (4&5) vs. (1&2)	0.0000	0.0000	0.0000	0.0023	

Panel B: Analyst and Firm Characteristics for Sample of Recommendation Revisions

	Mean	Median	Std. deviation	Sample Size
Investment banking revenue %	13.60	11.25	11.93	94,892
Brokerage commission revenue %	28.74	24.07	24.75	94,892
Analyst's company-specific experience (years)	2.42	1.20	3.29	85,531
Analyst's general experience (years)	6.41	4.90	5.32	85,531
Number of analysts employed by a firm	86.34	60	79.73	94,618
Number of companies followed by an analyst	17.24	15	12.93	84,016

Table 1 (cont.)

		Mean	Median	Std. Deviation	Sample size
Number of 4-digit I/B/E/S S/I/G industry groups followed by an analyst		3.05	3	1.90	84,014
Institutional Investor All-American Stock Picker		0.005	0	0.07	85,531
Institutional Investor All-American Team Member		0.035	0	0.18	85,531
Wall Street Journal All-Star Stock Picker		0.018	0	0.13	85,531
Wall Street Journal All-Star Team Member		0.136	0	0.34	85,531
Panel C: Characteristics of Companies Experiencing Stock Recommendation Revisions					
		Mean	Median	Std. Deviation	Sample size
Market Capitalization ($ millions)		8,804.46	1,367.22	27,758.81	81,333
Analyst Following		9.14	7	6.88	92,869

Table 2
Ordered Probit Analysis of Recommendation Levels Net of the Consensus

The table shows the results of ordered probit regressions explaining individual analysts' stock recommendation levels net of the consensus (i.e., median) recommendation level at the end of each quarter (March, June, September, December) from 1995 through 2003. Observations are excluded if the analyst issued no new or revised recommendation in the past 12 months. The regression includes observations pooled across analysts, stocks, and quarters. Investment banking (Brokerage commission) revenue % is the percentage of the brokerage firm's total revenues derived from investment banking (brokerage commissions). Large brokerage house dummy is an indicator variable that equals one if a brokerage house is in the top quartile of all houses, based on the number of analysts issuing stock recommendations on I/B/E/S in a given calendar year. Institutional Investor All-American (Wall Street Journal All-Star) analyst dummy is an indicator variable that equals one if the recommending analyst was listed as an All-American (All-Star) Team member in the most recent *Institutional Investor* (*Wall Street Journal*) analyst ranking. Company-specific research experience is the natural log of (1 + the number of days that an analyst has been issuing I/B/E/S research on a company). Number of companies followed equals the natural log of (1 + the number of companies followed by an analyst in the current calendar year). Company size is the natural logarithm of a followed company's market capitalization, measured twelve months prior to the end of the current month. The regression includes dummy variables for 2-digit I/B/E/S S/I/G industries and for calendar-quarters. Test statistics are based on a robust variance estimator.

Table 2 (cont.)

Panel A: Coefficient Estimates			
Explanatory variable		Coefficient	Z-statistic
Investment banking revenue %		0.4167	17.35
Brokerage commission revenue %		0.0363	3.00
Prior 6-month stock return		-0.0068	-2.89
Large brokerage house dummy		-0.0639	-8.60
Institutional Investor All-American analyst dummy		0.0032	0.15
Wall Street Journal All-Star analyst dummy		-0.0196	-2.23
Company-specific research experience		0.0012	1.42
Number of companies followed		0.0070	4.64
Company size		0.0038	2.89
Number of observations		213,011	
P-value of chi-squared test		<0.0001	

Panel B: Marginal Effects and Sample Distribution						
		-4	-3.5	-3	-2.5	-2
Investment banking revenue %		-0.00031	-0.0002	-0.0026	-0.0010	-0.0199
Brokerage commission revenue %		-0.00003	-0.00001	-0.0002	-0.00009	-0.0017
Observed Frequency		0.0001	0.0001	0.0016	0.0007	0.0176
		-1.5	-1	-0.5	0	0.5
Investment banking revenue %		-0.0086	-0.0744	-0.0321	0.0123	0.0325
Brokerage commission revenue %		-0.0008	-0.0065	-0.0028	0.0011	0.0028
Observed Frequency		0.0094	0.1241	0.0948	0.4940	0.0937
		1	1.5	2	2.5	3
Investment banking revenue %		0.0671	0.0077	0.0188	0.0002	0.0003
Brokerage commission revenue %		0.0059	0.0007	0.0016	0.00002	0.00003
Observed Frequency		0.1289	0.0111	0.0233	0.0002	0.0003

Table 3

Abnormal Returns Surrounding Revisions in Analyst Stock Recommendations

The table reports mean and median values of cumulative abnormal stock returns (CARs) surrounding recommendation revisions (i.e., recommendation changes and initiations, resumptions, and discontinuations in coverage). Day 0 is the revision date. The sample of revisions is obtained from the I/B/E/S U.S. Detail Recommendations History file over the period 1994-2003. Recommendation revisions are classified according to the level of any existing recommendation and whether coverage is being initiated or dropped. For example, a revision by an analyst is classified as *added to strong buy* if the new recommendation is *strong buy* and either (a) the previous recommendation was lower than *strong buy*; or (b) analyst coverage by the brokerage house is resumed or initiated. A recommendation is classified as *dropped from strong buy* if the previous recommendation was *strong buy* and either (a) the new recommendation is lower than *strong buy*; or (b) research coverage on the company is stopped. T-statistics (in parentheses below mean abnormal returns) for the difference from zero are computed as in Brown and Warner (1985). P-values (in parentheses below medians) for the difference from zero are from a Wilcoxon test. N denotes sample size.

	Cumulative abnormal stock returns over days									
	-1 to 0			-1 to +1			-5 to +5			
Recommendation Revision	Mean (t-stat)	Median (p-value)	*N*	Mean (t-stat)	Median (p-value)	*N*	Mean (t-stat)	Median (p-value)	*N*	
Upgrades										
Added to Strong Buy	0.0207 (49.53)[a]	0.0109 (0.000)	24,560	0.0240 (46.89)[a]	0.0130 (0.000)	24,556	0.0263 (26.84)[a]	0.0187 (0.000)	24,499	
Added to Buy/ Strong Buy	0.0149 (46.47)[a]	0.0071 (0.000)	36,879	0.0165 (42.01)[a]	0.0085 (0.000)	36,875	0.0207 (27.53)[a]	0.0128 (0.000)	36,780	
Downgrades										
Dropped from Buy/Strong Buy	-0.0337 (-56.21)[a]	-0.0126 (0.000)	33,322	-0.0358 (-48.75)[a]	-0.0155 (0.000)	33,262	-0.0491 (-34.92)[a]	-0.0287 (0.000)	33,197	
Dropped from Strong Buy	-0.0399 (-49.88)[a]	-0.0153 (0.000)	22,825	-0.0427 (-43.58)[a]	-0.0183 (0.000)	22,795	-0.0570 (-30.38)[a]	-0.0326 (0.000)	22,767	

[a,b] Denote statistical significance at the 1% and 5% levels, respectively, in two-tailed tests.

Table 4
Cross-sectional Regressions of Abnormal Returns Surrounding Recommendation Revisions

Each column in the table shows the results of a cross-sectional OLS regression explaining cumulative abnormal stock returns over days (-1, +1) surrounding one type of recommendation revision, as defined in Table 3. Day 0 is the revision date. Investment banking (brokerage commission) revenue % is the percentage of a brokerage firm's total revenues derived from investment banking (brokerage commissions). Large brokerage house dummy is an indicator variable equal to one if a brokerage house is in the top quartile of all houses, based on the number of analysts issuing I/B/E/S stock recommendations in a given calendar year. Company size is the natural logarithm of a followed company's market capitalization, measured 12 months prior to the end of a given month. Institutional Investor All-American (Wall Street Journal All-Star) analyst dummy is an indicator variable equal to one if the recommending analyst was listed as an All-American (All-Star) in the most recent *Institutional Investor* (*Wall Street Journal*) annual analyst survey. Company-specific research experience is the natural log of (1 + the number of days that an analyst has been issuing I/B/E/S research on a company). Number of companies followed equals the natural log of (1 + the number of companies followed by an analyst in the current calendar year). T-statistics based on a robust variance estimator are reported in parentheses below coefficient estimates. All regressions include calendar-year and 2-digit I/B/E/S S/I/G industry dummies (not reported).

Explanatory Variable	Added to Strong Buy	Added to Buy/ Strong Buy	Dropped from Buy /Strong Buy	Dropped from Strong Buy
Intercept	0.0369 (7.66)[a]	0.0412 (11.21)[a]	-0.2294 (-31.31)[a]	-0.2224 (-29.25)[a]
Investment banking revenue %	-0.0262 (-5.65)[a]	-0.0139 (-3.57)[a]	-0.0200 (-2.74)[a]	-0.0354 (-3.92)[a]
Brokerage commission revenue %	-0.0187 (-6.51)[a]	-0.0148 (-6.43)[a]	-0.0089 (-2.39)[b]	-0.0013 (-0.29)
Large brokerage house dummy	0.0116 (7.46)[a]	0.0088 (6.88)[a]	-0.0242 (-12.79)[a]	-0.0220 (-10.25)[a]
Company size	-0.0056 (-16.13)[a]	-0.0041 (-15.40)[a]	-0.0004 (-0.97)	0.0018 (3.77)[a]
Institutional Investor All-American analyst dummy	0.0159 (4.11)[a]	0.0122 (3.82)[a]	-0.0148 (-2.93)[a]	-0.0207 (-3.28)[a]
Wall Street Journal All-Star analyst dummy	0.0015 (0.81)	0.0013 (0.84)	-0.0011 (-0.48)	0.0045 (1.78)
Company-specific research experience	0.0017 (8.42)[a]	0.0019 (12.49)[a]	0.0039 (7.37)[a]	0.0018 (3.21)[a]
Number of companies followed	-0.0012 (-2.97)[a]	-0.0016 (-5.37)[a]	0.0007 (1.49)	0.0008 (1.31)
Number of observations	19,440	28,665	28,618	19,632
Adj. R-square	0.038	0.0240	0.028	0.035
P-value of F-test	< 0.0001	< 0.0001	< 0.0001	< 0.0001

[a,b] Denote statistical significance at the 1% and 5% levels, respectively, in two-tailed tests.

Table 5

Abnormal Volume Surrounding Announcements of Revisions in Stock Recommendations by Analysts

The table shows cumulative abnormal trading volume surrounding revisions in analyst stock recommendations. Revisions are defined and classified as in Table 3. Abnormal volume for stock *i* on day *t* is computed using daily CRSP data as $e_{it} = v_{it} - v_i$ where v_{it} is volume on day t and where v_i is average volume over days -35 to -6 relative to the recommendation revision date (day 0). All share volumes are normalized by dividing by common shares outstanding on the same day. T-statistics for the difference in mean values from zero are shown in parentheses below the means. P-values of the Wilcoxon test are shown in parentheses below median values. N denotes sample size.

	Cumulative abnormal trading volume over days								
	-1 to 0			-1 to +1			-5 to +5		
Recommendation Revision	Mean (t-stat)	Median (p-value)	*N*	Mean (t-stat)	Median (p-value)	*N*	Mean (t-stat)	Median (p-value)	*N*
Upgrades									
Added to Strong Buy	0.0086 (8.89)[a]	0.0011 (0.000)	24,506	0.0097 (8.18)[a]	0.0015 (0.000)	24,502	0.0071 (3.13)[a]	0.0030 (0.000)	24,488
Added to Buy/ Strong Buy	0.0053 (5.08)[a]	0.0002 (0.000)	36,800	0.0058 (4.54)[a]	0.0004 (0.000)	36,796	0.0020 (0.818)	0.0008 (0.000)	36,766
Downgrades									
Dropped from Buy/Strong Buy	0.0217 (114.47)[a]	0.0010 (0.000)	33,291	0.0265 (114.14)[a]	0.0014 (0.000)	33,232	0.0381 (85.70)[a]	0.0039 (0.000)	33,175
Dropped from Strong Buy	0.0259 (128.76)[a]	0.0017 (0.000)	22,808	0.0315 (127.86)[a]	0.0025 (0.000)	22,779	0.0453 (96.03)[a]	0.0057 (0.000)	22,756

[a,b] Denote statistical significance at the 1% and 5% levels, respectively, in two-tailed tests.

Table 6

Cross-sectional Regressions of Abnormal Volume Surrounding Recommendation Revisions

Each column in the table shows the results of a cross-sectional OLS regression explaining cumulative abnormal share volume over days (-1, +1) surrounding one type of recommendation revision, as defined in Table 3. Day 0 is the revision date. Share volume is normalized by dividing by the number of shares outstanding. Investment banking (brokerage commission) revenue % is the percentage of a brokerage firm's total revenues derived from investment banking (brokerage commissions). Large brokerage house dummy is an indicator variable equal to one if a brokerage house is in the top quartile of all houses, based on the number of analysts issuing I/B/E/S stock recommendations in a given calendar year. Company size is the natural logarithm of a followed company's market capitalization, measured 12 months prior to the end of a given month. Institutional Investor All-American (Wall Street Journal All-Star) analyst dummy is an indicator variable equal to one if the recommending analyst was listed as an All-American (All-Star) in the most recent *Institutional Investor* (*Wall Street Journal*) annual analyst survey. Company-specific research experience is the natural log of (1 + the number of days that an analyst has been issuing I/B/E/S research on a company). Number of companies followed equals the natural log of (1 + the number of companies followed by an analyst in the current calendar year). All regressions include calendar-year and I/B/E/S 2-digit industry dummies (not reported). T-statistics based on a robust variance estimator are reported in parentheses below coefficient estimates.

Explanatory Variable	Added to Strong Buy	Added to Buy/ Strong Buy	Dropped from Buy /Strong Buy	Dropped from Strong Buy
Intercept	0.0083 (2.65)[a]	0.0042 (1.90)	0.0946 (13.72)[a]	0.0828 (15.01)[a]
Investment banking revenue %	-0.0100 (-3.31)[a]	-0.0085 (-2.26)[b]	0.0140 (2.18)[b]	0.0304 (3.63)[a]
Brokerage commission revenue %	-0.0057 (-1.76)	-0.0059 (-4.13)[a]	0.0087 (2.76)[a]	0.0055 (1.45)
Large brokerage house dummy	0.0058 (3.72)[a]	0.0038 (4.50)[a]	0.0168 (11.12)[a]	0.0171 (9.48)[a]
Company size	-0.0031 (-9.54)[a]	-0.0018 (-12.30)[a]	-0.0023 (-7.60)[a]	-0.0041 (-11.40)[a]
Institutional Investor All-American analyst dummy	0.0035 (1.74)	0.0033 (1.88)	0.0084 (2.32)[b]	0.0046 (1.21)
Wall Street Journal All-Star analyst dummy	0.0008 (0.74)	0.0013 (1.42)	0.0023 (1.36)	-0.0006 (-0.29)
Company-specific research experience	0.0010 (8.39)[a]	0.0010 (11.19)[a]	-0.0041 (-6.18)[a]	-0.0019 (-4.11)[a]
Number of companies followed	-0.0009 (-3.49)[a]	-0.0013 (-6.23)[a]	-0.0001 (-0.38)	-0.0005 (-0.99)
Number of observations	19,431	28,653	28,594	19,619
Adj. R-square	0.025	0.019	0.030	0.042
P-value of F-test	< 0.0001	< 0.0001	< 0.0001	< 0.0001

[a,b] Denote statistical significance at the 1% and 5% levels, respectively, in two-tailed tests.

Table 7

Medium-Term Investment Performance of Revisions in Analyst Stock Recommendations

The table shows average monthly abnormal returns to portfolios formed on the basis of analyst recommendation revisions. Abnormal returns are reported for three event windows relative to the month of revision (month 0), and are computed using an approach similar to Barber, Lehavy and Trueman (2006). The abnormal return is the estimated intercept from a time-series regression of monthly portfolio returns using the Fama and French (1993) 3-factor model. For each time window, the table shows the average abnormal monthly percentage return, its t-statistic, and the number of monthly observations (N) in each time-series regression.

Portfolio	Months +1 to +3			Months +1 to +6			Months +1 to +12		
	Abnormal Monthly Return (%)	t-stat	*N*	Abnormal Monthly Return (%)	t-stat	*N*	Abnormal Monthly Return (%)	t-stat	*N*
Added to Strong Buy	0.875	6.12[a]	114	0.758	6.12[a]	114	0.679	5.70[a]	114
Added to Buy/Strong Buy	0.586	4.49[a]	114	0.511	4.82[a]	114	0.503	5.38[a]	114
Dropped from Buy/ Strong Buy	-0.361	-1.60	114	-0.260	-1.28	114	-0.072	-0.44	114
Dropped from Strong Buy	-0.367	-1.58	114	-0.395	-2.00[b]	114	-0.231	-1.49	114

[a,b] Denote statistical significance at the 1% and 5% levels, respectively, in two-tailed tests.

Table 8

Cross-Sectional Regressions of Medium-Term Performance of Recommendation Revisions

Each column in the table shows the results of a cross-sectional OLS regression of average monthly abnormal returns over months (+1, +12) following one type of recommendation revision, as defined in Table 3. Month 0 is the month of revision. Abnormal returns are estimated as the intercept from time-series regressions of monthly stock returns on Fama and French (1993) factors for each firm. Investment banking (brokerage commission) revenue % is the percentage of a brokerage firm's total revenues derived from investment banking (brokerage commissions). Large brokerage house dummy is an indicator variable equal to one if a brokerage house is in the top quartile of all houses, based on the number of analysts issuing I/B/E/S stock recommendations in a given calendar year. Company size is the natural logarithm of a followed company's market capitalization, measured 12 months prior to the end of a given month. Institutional Investor All-American (Wall Street Journal All-Star) analyst dummy is an indicator variable equal to one if the recommending analyst was listed as an All-American (All-Star) in the most recent *Institutional Investor* (*Wall Street Journal*) annual analyst survey. Company-specific research experience is the natural log of (1 + the number of days that an analyst has been issuing I/B/E/S research on a company). Number of companies followed equals the natural log of (1 + the number of companies followed by an analyst in the current calendar year). T-statistics based on a robust variance estimator are reported in parentheses below coefficient estimates. Regressions include calendar year and I/B/E/S 2-digit S/I/G industry code dummies (not reported).

Explanatory Variable	Added to Strong Buy	Added to Buy/ Strong Buy	Dropped from Buy /Strong Buy	Dropped from Strong Buy
Intercept	0.0523 (1.81)	0.0089 (0.49)	-0.0646 (-6.81)[a]	-0.0821 (-6.55)[a]
Investment banking revenue %	-0.0089 (-1.23)	-0.0018 (-0.29)	0.0042 (0.64)	-0.0068 (-0.87)
Brokerage commission revenue %	0.0064 (1.32)	0.0059 (1.54)	0.0057 (1.21)	0.0031 (0.75)
Large brokerage house dummy	0.0009 (0.38)	-0.0027 (-1.32)	0.0016 (0.72)	0.0015 (0.77)
Company size	-0.0013 (-2.74)[a]	-0.0017 (-4.18)[a]	-0.0007 (-1.71)	-0.0007 (-1.54)
Institutional Investor All-American analyst dummy	-0.0029 (-0.58)	0.0001 (0.01)	-0.0016 (-0.44)	-0.0009 (-0.23)
Wall Street Journal All-Star analyst dummy	0.0031 (1.24)	0.0002 (0.12)	-0.0029 (-1.42)	0.0056 (2.29)[b]
Company-specific research experience	0.0004 (1.08)	0.0004 (1.80)	0.0004 (0.76)	0.0004 (0.92)
Number of companies followed	-0.0011 (-1.61)	-0.0008 (-1.79)	-0.0002 (-0.45)	-0.0002 (-0.47)
Number of observations	6,411	8,851	10,644	8,368
Adj. R-square	0.026	0.023	0.019	0.020
P-value of F-test	< 0.0001	< 0.0001	< 0.0001	< 0.0001

[a, b] Denote statistical significance at the 1% and 5% levels, respectively, in two-tailed tests.

Table 9

Regressions of Relative Recommendation Levels, Abnormal Returns, Abnormal Volume and Stock Performance For Bubble versus Post-Bubble Periods

Panel A shows the results of an ordered probit regression of recommendation levels net of the consensus (i.e., median) recommendation level on the explanatory variables in Table 2, except that (1) Investment banking revenue % and Brokerage commission revenue % are interacted with dummy variables for the bubble or post-bubble period, and (2) calendar-quarter dummies are replaced with a post-regulation indicator (equal to 1 for quarters after May 2002). Panel B shows the corresponding results for ordinary-least-squares regressions explaining abnormal announcement stock returns, abnormal announcement volume, and abnormal one-year performance of recommendation revisions by the explanatory variables used in Tables 4, 6, and 8, modified as in (1) above. Day (month) 0 is the revision date. The table reports coefficient estimates for only these four interaction variables from each regression. Also reported are p-values from t-tests for the difference between the bubble and post-bubble periods in the coefficient estimates of the Investment banking revenue % and Brokerage commission revenue % variables. All test statistics are based on robust variance estimators.

Panel A: Ordered Probit Regression of Recommendation Levels Net of the Consensus

	Bubble	Post-Bubble	p-value
Investment banking revenue %	0.5103[a]	0.3089[a]	< 0.001
Brokerage commission revenue %	-0.1868[a]	0.2286[a]	< 0.001

Panel B: Ordinary Least Squares Regressions of Abnormal Returns, Abnormal Volume, and Abnormal Stock Performance

	Added to Strong Buy			Added to Buy/Strong Buy			Dropped from Buy/Strong Buy			Dropped from Strong Buy		
	Bubble	Post-Bubble	p-value	Bubble	Post-Bubble	p-value	Bubble	Post-Bubble	p-value	Bubble	Post-Bubble	p-value
Regressions of cumulative abnormal returns over days -1 to +1												
Investment banking revenue %	-0.0248[a]	-0.0120	0.083	-0.0121[a]	-0.0080	0.517	-0.0125	-0.0379[a]	0.027	-0.0361[a]	-0.0345[a]	0.908
Brokerage commission revenue %	-0.0114[a]	-0.0105[a]	0.827	-0.0099[a]	-0.0110[a]	0.720	-0.0063	-0.0208[a]	0.003	0.0017	-0.0114[b]	0.024
Regressions of cumulative abnormal volume over days -1 to +1												
Investment banking revenue %	-0.0076	-0.0052	0.655	-0.0065	-0.0082[b]	0.699	0.0257[a]	0.0130	0.214	0.0555[a]	0.0153	0.002
Brokerage commission revenue %	-0.0042	-0.0008	0.376	-0.0054[a]	-0.0031	0.179	0.0106[b]	0.0139[a]	0.521	0.0046	0.0141[a]	0.056
Regressions of average monthly abnormal returns over months +1 to +12												
Investment banking revenue %	-0.0016	-0.0151	0.273	0.00001	0.0083	0.420	-0.0085	0.0223[a]	0.003	-0.0123	-0.0051	0.564
Brokerage commission revenue %	0.0069	0.0108	0.511	0.0086	0.0096	0.842	0.0035	0.0136	0.101	-0.0036	0.0091	0.019

[a, b] Denote statistical significance at the 1% and 5% levels, respectively, in two-tailed tests.

Table A1

Summary Statistics, Disclosing vs. Non-Disclosing Brokers

Comparison of recommendation levels and firm attributes of private brokerage firms that publicly disclose their income statements and those that do not. The recommendation level statistics are computed using individual analyst's recommendation levels at the end of each quarter in the sample. The median recommendation level is computed at the end of each quarter based on all analysts recommending a stock. The statistics on broker characteristics are computed across broker years. Firm size statistics are inflation-adjusted (using the CPI as the price index and 2003 as the base year).

	Mean				**Median**				**Sample size**	
Variable	Dis-closers	Non-Dis-closers	p-value, t-test		Dis-closers	Non-Dis-closers	p-value, rank sum test		Dis-closers	Non-Dis-closers
Recommendation Level										
Level	3.902	3.810	< 0.001		4	4	< 0.001		62,417	181,068
Level - Median	0.036	0.010	< 0.001		0	0	< 0.001		62,417	181,068
Firm size										
Total assets ($ M)	383.37	1,863.52	< 0.001		4.05	28.43	< 0.001		365	615
Book equity ($ M)	26.40	68.98	< 0.001		1.97	10.56	< 0.001		365	615
Financial Leverage										
Long term debt / Total assets	0.0539	0.0653	0.253		0	0.002	0.004		365	615
Total debt / Total assets	0.0685	0.1823	0.295		0	0.018	< 0.001		365	615
Liquidity										
Cash & equivalents / Total assets	0.2392	0.1816	0.001		0.101	0.052	0.0001		365	615
2-year Growth Rate										
(Total $assets_t$ / Total $assets_{t-2}$)$^{1/2}$ - 1	0.0849	0.0697	0.440		0.052	0.020	0.099		246	541