

## DO BUY-SIDE ANALYSTS OUT-PERFORM THE SELL-SIDE?

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### Abstract:

We examine the performance of buy-side analysts relative to that of the sell-side. Our tests show that buy-side analysts at a large investment firm make less optimistic stock recommendations than sell-side analysts, consistent with their facing fewer conflicts of interest. However, their earnings forecasts are relatively optimistic and inaccurate and returns to their buy recommendations under-perform sell-side recommendations. Large sample tests that compare the performance of sell-side analyst recommendations and portfolio managers who rely exclusively on buy-side research confirm the sell-side's superiority. These performance differences appear to be partially explained by the buy-side's higher retention of poor-performing analysts and by differences in performance benchmarks used to evaluate buy- and sell-side analysts.

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## 1. Introduction

Recent scandals on Wall Street have highlighted conflicts of interest for sell-side analysts who work for investment banks, brokerage firms and research boutiques, and provide investment reports to institutional and retail investors. Conflicts can arise if sell-side analysts at investment banks are rewarded for recommending stocks of current or potential banking clients regardless of their investment potential (see Lin and McNichols (1998), Michaely and Womack (1999), Dechow, Hutton and Sloan (2000), and Lin, McNichols and O'Brien (2005)).<sup>1</sup> They can also arise if sell-side analysts provide optimistic research that encourages clients to buy stocks simply to increase brokerage commissions (see Cowen, Groyberg and Healy, 2006). Finally, conflicts can arise because sell-side analysts depend on access to managers for information about their company. Consequently, they may be reluctant to issue negative reports on stocks for fear that managers will reduce access to company information.<sup>2</sup>

As discussed in section 2, buy-side analysts, who work for money management firms and provide investment reports to portfolio managers at their firms, do not face such conflicts. Their firms do not perform investment banking or provide brokerage services. Further, since their reports are private and not available to managers of firms they cover, buy-side analysts are less likely to be concerned about issuing negative reports on stocks to preserve access to company information. Consequently, all else

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<sup>1</sup> The Global Settlement of March 2003 attempted to eliminate this conflict by prohibiting investment bankers from playing a direct role in awarding bonuses to sell-side analysts, from having analysts assist them in investment banking activities, and by requiring that meetings between investment bankers and sell-side analysts be supervised.

<sup>2</sup> Regulation Fair Disclosure, adopted by the SEC in August 2000, was created to address this conflict by requiring management to ensure that all material information is disclosed to all investors simultaneously.

equal, buy-side research is likely to be less optimistic and higher quality than sell-side research.

In addition, because it is private rather than public information, buy-side research is potentially more valuable to users than sell-side research. Buy-side analysts' reports are available only to their own portfolio managers, whereas sell-side research is public information that is widely distributed throughout the market. Money management firms can therefore potentially recover the cost of their own research by trading on buy-side recommendations. In contrast, users of sell-side research are likely to find it difficult to profit from trading on sell-side findings since in an efficient market, prices quickly adjust to reflect new public information. Consequently, no single investor is willing to pay much for sell-side research, posing a funding challenge for sell-side firms.<sup>3</sup>

Given the conflicts facing sell-side analysts and the challenges in funding sell-side research, academics have predicted that sell-side research is more optimistic and lower quality than buy-side research (see for example, Cheng, Liu and Qian (2005)). However, in field interviews, some sell-side practitioners commented that buy-side firms tend to employ lower quality analysts than the sell-side. This quality difference, the practitioners noted, is reflected in buy-side compensation. Given the proprietary nature of buy-side research, it has been difficult for researchers to examine the integrity and quality of buy-side research.<sup>4</sup> As discussed in section 3, this paper uses data from a single, large,

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<sup>3</sup> Sell-side research costs have traditionally been recovered through trading commissions and investment banking revenues. However, declining trading commissions, due to competition from discount brokers and institutional trading networks which offer investors low cost trade execution but no research, and reduced investment banking benefits from sell-side research due to restrictions imposed by the Global Settlement, have eroded funds available for sell-side research.

<sup>4</sup> Willis (2001) finds that public earnings forecasts by mutual fund managers are optimistic and concludes that this is attributable to cognitive bias rather than any attempt to manipulate the market. However, he does not compare mutual fund manager forecast to those of sell-side analysts, and examines only public buy-side forecasts.

reputable buy-side firm to compare the optimism and performance of its analysts with those of sell-side firms. In large sample tests, we also compare the performance of portfolio managers at firms that report relying exclusively on buy-side research to that of sell-side analyst recommendations.

The findings on research optimism, reported in section 4, are mixed. The buy-side firm analysts make *less* optimistic stock recommendations than their sell-side counterparts, consistent with their facing fewer conflicts of interest. However, they also make *more* optimistic near- and medium-term earnings forecasts. On average, their earnings forecasts are 17-27% higher than those for sell-side analysts forecasting for the same firm-year and forecast horizon.

Tests of analyst performance indicate that the buy-side firm analysts underperform their sell-side counterparts. Earnings forecasts by the buy-side analysts are less accurate than by their sell-side counterparts. For short-horizons, mean absolute buy-side forecast errors are 27% of the consensus forecast compared to 6% for the sell-side. The significant differences in forecast optimism and accuracy hold for all forecast horizons, and after controlling for differences in analyst experience, industry specialization, coverage, and firm size. Finally, average market-adjusted and four-factor model abnormal returns from investing in the buy-side analysts' Buy recommendations are lower than those for sell-side analysts by 3.2% and 6.4% per year respectively.

As discussed in section 5, several factors appear to at least partially explain these findings. First, sell-side firms are less likely to retain analysts with low prior-year earnings forecast accuracy than the buy-side firm. This explains roughly one-third of the poor earnings forecast performance of the buy-side analysts.

A second explanation is that the buy-side firm evaluates and rewards its own analysts for performance relative to an absolute standard (the S&P 500 index), rather than comparing them to the sell-side or using a more complex three or four factor model. In contrast, it is common for sell-side analysts to be regularly benchmarked against each other. The buy-side firm's internal analysis, which shows average annualized market-adjusted returns of 3.4% for its own analysts' Buy recommendations, led it to conclude that its research added value. Only recently, with the creation of StarMine Corp., a company that provides members with ratings of their own analysts' performance versus other buy- and sell-side member analysts, has our sample firm and other buy-side firms begun benchmarking their analysts' performance against the sell-side.

We also find that the buy-side analysts' performance varies markedly over the sample period. There is a sharp decline in their relative forecast optimism and an increase in relative forecast accuracy in 2001 and 2002, primarily as a result of an increase in sell-side analysts' forecast optimism and inaccuracy during these years. This change coincides with the adoption of Regulation Fair Disclosure, and is consistent with sell-side analysts' access to company information being temporarily curtailed by the new regulation. However, we are cautious in interpreting these findings: 2001 and 2002 were turbulent years for the US equity market. It is equally plausible that the sell-side simply *ex post* under-estimated the severity of the economic downturn during these years.

Follow-up tests enable us to rule out several other plausible explanations for the findings. The results are unchanged when we compare the buy-side analysts' performance to that of analysts at sell-side firms with a comparable number of analysts and breadth of industry coverage, suggesting that the findings are not driven by

differences in the buy- and sell-side analysts' scope of coverage. Buy-side relative forecast optimism is strong even for newly-covered stocks, indicating that the findings are not solely driven by a difference in truncation bias that would arise if buy-side analysts are more likely to stop writing reports on poor-performing firms than sell-side analysts. Tests of the quality of analysts hired by the buy-side firm from the sell-side indicate that the buy-side firm does not hire low quality sell-side analysts, but that the performance of these new analysts deteriorates after they join the firm. Finally, we find no evidence that the sample investment firm is a poor performer, which could explain the performance of its analysts.

One limitation of our study is that we rely on data from a single investment firm. To assess the generalizability of the sample firm findings, in section 6 we examine the investment performance of portfolio managers at a sample of buy-side firms that report relying exclusively on buy-side research relative to the performance of sell-side buy recommendations. The buy-side sample comprises an average of 31 investment firms and 340 funds per year for the period 1997 to 2005. Consistent with findings of prior studies of portfolio manager performance, we find that the sample funds generate small negative abnormal returns of -1.3% per year. In contrast, the sell-side analysts' buy recommendations generate annualized abnormal returns of 5.4% even after allowing for transactions costs. The difference of -6.7% is both economically and statistically significant, indicating that users of buy-side research under-perform the recommendations of sell-side analysts.

In summary, our findings indicate that despite concerns about the impact of conflicts of interest on the quality of sell-side research, sell-side analysts have performed

remarkably well relative to both analysts at a large buy-side firm and a sample of buy-side portfolio managers who report they use buy-side research heavily. These differences appear to be in part driven by a more competitive sell-side environment, which screens out poor performers more quickly than the buy-side, and the buy-side's method of evaluating its analysts. However, we recognize that these explanations are incomplete and look to future research to more fully understand the sell-side's superior performance.

## **2. Background on Buy-side Analysts<sup>5</sup>**

### Comparison of Buy- and Sell-Side Research

At a fundamental level, buy- and sell-side research analysts perform similar functions. Both study companies in order to make recommendations about whether to “buy”, “sell” or “hold” specific securities. The tasks they perform to generate their “stock picks” are similar - evaluating firms' business models, forecasting short-term earnings, and building financial models of stock prices. Both write reports to communicate their analysis and recommendations, including an overview of the firm's business, earnings forecasts, stock price projections, the recommendation, and a justification for the recommendation (see Appendix A for a sample buy-side report).

However, buy- and sell-side research differs fundamentally in a variety of ways: the scale and scope of their coverage, the sources of information on which their research is based, the private versus public dissemination of reports, their target audiences, and the ways that they are compensated.

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<sup>5</sup> The following description of buy-side analysts draws on discussions with buy-side analysts, portfolio managers, research directors and chief investment officers at several leading money management firms. See also, US Institute Executive Summary (2004).

*(i) Scale and Scope of Coverage.* Research departments at money management firms are typically considerably smaller than those at sell-side firms. For example, on average during the period 1997 to 2004, the research department at the buy-side firm studied in this paper, one of the ten largest firms in assets under management, employed 20-30 analysts compared to 186 analysts employed by the average bulge investment bank.

The smaller research departments at buy-side firms imply that fewer companies are covered and there is less in-depth analysis on any given stock. Analysts at buy-side firms are often responsible for covering an entire sector, such as technology. Of the 50 to 100 stocks they follow in the sector, buy-side analysts write reports on roughly 15 stocks at any given time. In contrast, a sell-side analyst usually covers only one segment of an industry, such as semiconductors or biotech. While sell-side analysts also write reports on only 10-15 stocks at a given time, this usually represents a much larger fraction of the total stocks followed than for the buy-side analyst.

Perhaps as a result of these differences in scope, reports by analysts at the sample buy-side firm are shorter in length, typically only two pages, compared to those provided by the leading sell-side analysts, who also include detailed industry analysis and bottom-up firm-level analysis.

*(ii) Information Sources.* Sell-side analysts spend as much as 30% of their time communicating and marketing their ideas to other analysts interested in the same sector, to sales force representatives and traders at their firm, and to clients. Through these interactions, sell-side analysts subject their ideas to broad scrutiny which can potentially generate valuable new information and feedback. For example, traders and sales staff provide analysts with data on observed changes in trading volumes and planned future

large purchases or sales by influential clients. Institutional investors push analysts on their analysis and conclusions. Sell-side analysts who we interviewed commented that their research improves significantly through these interactions. In contrast, buy-side analysts do not have the opportunity for such diverse feedback and new insights. They have fewer colleagues with whom to debate their ideas, and pitch their recommendations to their own portfolio managers and their staff.

In addition, sell-side analysts frequently meet with management of the firms that they cover. Concern that this access could potentially provide sell-side analysts with an unfair advantage over other investors led the SEC to approve Regulation Fair Disclosure in August 2000. The new rules, which became effective on October 23, 2000, prohibited managers from disclosing selective new information to only favored finance professionals.

*(iii) Private versus Public Report Dissemination.* Sell-side research is widely disseminated to institutional and retail clients, whereas buy-side research is private and is only available to the buy-side firm's portfolio managers. This has several implications. First, it enables the investment benefits from superior research to be more effectively internalized on the buy-side than on the sell-side. Portfolio managers can capitalize on a buy-side analyst's new ideas by buying recommended stocks and selling those predicted to under-perform ahead of other investors. If the analyst's ideas have merit, recommended stocks will appreciate in value and those predicted to under-perform will decline. In contrast, in an efficient capital market any insights from public sell-side reports will be rapidly reflected in prices, making it difficult for clients to benefit from acting on recommendations. As a result, sell-side recommendations are likely to be of

limited investment value to investors, making it more challenging to fund sell-side research.

A second implication of the private dissemination of buy-side research is that buy-side analysts are less likely to face pressure to write positive reports from managers of companies they cover. Prior to Regulation Fair Disclosure, the SEC alleged that sell-side analysts' dependence on access to managers for information could make them reluctant to issue negative reports on stocks. In contrast, since their private research cannot be viewed by managers or the public at large and since they were less reliant on management information, buy-side analysts were less likely to face such conflicts of interest.

*(iv) Target Audience.* Buy- and sell-side analysts also differ in terms of their target audience. Buy-side analysts make recommendations to their firm's portfolio managers, who have ultimate authority for deciding whether to buy or sell stocks. Buy-side analysts add value for portfolio managers in two ways. First, they filter sell-side research and company news, distilling the large amount of sell-side analysis and company news reported into a short monthly report that can be easily used by portfolio managers and their staff. Acting in this capacity, buy-side analysts can add value to portfolio managers by directing them to particular sell-side reports that they believe are interesting or newsworthy.

A second role for buy-side analysts is to provide the firm's portfolio managers with a different perspective on companies than they would receive from sell-side analysts. Buy-side analysts are expected to do more than simply reiterate sell-side analysts' opinions – instead they are expected to reach their own independent

conclusions. If these conclusions differ materially from those of the sell-side, buy-side analysts have an opportunity to add value to their portfolio managers.

In contrast, sell-side research is distributed to buy-side analysts and portfolio managers at a wide range of firms, as well as to retail investors. Sell-side analysts' roles and value differ widely by type of client. For institutional investors, their role is to provide information on an industry and a firm's positioning within its industry, to update clients on important stock news, to facilitate meetings with management, and to provide new investment ideas. Institutional clients reward sell-side firms for providing these services by directing trading activity to their firms, enabling the costs of research to be recovered through commissions. For retail investors, the primary role of sell-side research is to promote new investment ideas that will encourage investors to trade, leading to higher brokerage commissions. Finally, sell-side analysts provide value for issuer companies by lowering information costs for investors and helping to create a liquid market for stocks. The cost of providing these services is recovered indirectly through investment banking fees.

The differing target audiences of buy- and sell-side analysts lead to fundamental differences in incentives. Sell-side analysts create value for their firms by providing clients with research and services that generate additional trading volume in stocks covered or increased demand for a new issue that their firms underwrite or distribute. However, sell-side analysts' incentives to generate additional trading volume and demand for stocks can potentially lead to conflicts of interest. By producing optimistic research that encourages clients to buy stocks, analysts may be able to generate trading volume or increase demand for a new issue even if the stock is not a sound investment. Prior

research finds evidence of such conflicts. Sell-side analysts at firms that rely more on trading commissions to fund research have been found to make more optimistic short-term earnings forecasts, long-term earnings growth forecasts, target price forecasts and stock recommendations than analysts working for investment banks (see Cowen, Groysberg and Healy (2006)). Sell-side analysts are particularly optimistic about the long-term prospects of investment banking clients and are relatively slow to downgrade poor performing clients (see Lin and McNichols (1998), Michaely and Womack (1999), Dechow, Hutton and Sloan (2000), and Lin, McNichols and O'Brien (2005)).

In addition, their public rankings by *Institutional Investor* and the public dissemination of their research are likely to provide sell-side analysts with an incentive to follow-the-crowd, consistent with theories of herd behavior (see Scharfstein and Stein (1990) and Healy and Palepu (2004)). Sell-side analysts who differ from the consensus and make recommendations that prove to be wrong or mistimed risk loss of market-wide reputation, whereas those who make the same incorrect calls as other analysts are unlikely to suffer reputation penalties.

In contrast, buy-side analysts have very different incentives. They are encouraged to present portfolio managers with a fresh perspective on stocks that are currently owned and stocks that are not owned but which are attractive buys. As a result, they are likely to be more willing to make recommendations and forecasts that differ from the Street's consensus and to issue both sell and buy recommendations.

(v) *Compensation.* The buy-side analysts at our sample firm received a salary (approximately \$300,000 in 2004) and a bonus which was effectively capped at roughly twice their salary. The top analysts at the firm made roughly \$1 million in salary and

bonus. Annual bonuses were based on two factors – the performance of the analyst’s buy recommendations (measured by quarterly holding returns adjusted for returns on the S&P 500 Index) and the impact of research on portfolio managers (measured by portfolio managers’ quarterly ratings of whether the analyst provided good stock ideas, communicated those ideas effectively, made good judgment calls, etc.).

Promotions for our sample firm were primarily to higher analyst levels within the research department, with accompanying increases in compensation. The firm intended successful analysts to have lengthy careers as analysts with opportunities for growth and development within the department. In contrast, some other firms in the industry have viewed analysts as “portfolio managers in training.” The analyst function is then considered to be an entry position, with analysts rotated among industries to receive broad industry exposure. The most successful analysts are eventually promoted to portfolio manager, which is typically a more highly-remunerated position.<sup>6</sup>

Compensation for sell-side analysts is typically tied to metrics such as commissions and soft dollar revenues in the stocks they cover, their *Institutional Investor* ranking and, prior to the Global Settlement, their ability to create demand for a new issue that their firm is underwriting or distributing. In 2002, Institutional Investor Research Group (2002) reported that on average, star US analysts earned \$1.6 million and second-tier analysts earned \$900,000.

These forms of compensation generally reinforce the differing roles and incentives of buy- and sell-side analysts described above. Buy-side analysts are rewarded for providing support and new ideas to portfolio managers which differ from the Street

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<sup>6</sup> For our sample firm, at the end of 2004, less than 10% of the portfolio managers had been hired from its research department. Many of these had been with the company for 20-30 years.

consensus. Sell-side analysts are rewarded for creating new business for their firm, either by generating trading volume in the stocks they cover or, before the Global Settlement, by generating demand for new issues that their company underwrites or distributes.

### Implications for Relative Performance of Buy- and Sell-Side Analysts

Our study attempts to understand how differences in the roles of buy- and sell-side analysts identified above affect their research. Conflicts of interest from investment banking and trading activities, and from concern about alienating company management are predicted to lead sell-side analysts to issue more optimistic research reports than buy-side analysts who face no such conflicts. To test this hypothesis, we examine the relative optimism of buy- and sell-side analysts' earnings forecasts and their stock recommendations.

We also examine the accuracy of analysts' earnings forecasts and returns generated from their recommendations to assess whether there are differences in the quality of research for buy- and sell-side firm analysts. The conflicts of interest noted above are likely to imply that the quality of buy-side research will exceed that of the sell-side. However, other institutional differences could lead sell-side analysts to out-perform their buy-side counterparts. As discussed above, sell-side analysts cover more narrowly-defined industries, permitting greater specialization in fewer stocks. Also, sell-side analysts have access to feedback and market information from clients, sales representatives, traders and management of companies they cover that is likely to be valuable in testing and improving their research ideas, whereas buy-side analysts' primary audience is the portfolio managers at their own firm.

The performance effects of other institutional differences between buy- and sell-side analysts are difficult to predict. For example, we anticipate that there are differences in risk aversion between buy- and sell-side analysts, with the buy-side more willing to make recommendations that run counter to the Street consensus. If buy-side analysts are able to successfully make such recommendations, they will out-perform the sell-side. If not, they will show comparable or inferior performance. There could also be greater coverage bias for buy-side analysts, who are less likely to continue covering out-of-favor stocks than sell-side analysts. However, while this bias is likely to affect buy-side optimism, it is unclear how it will affect performance. Finally, there could be quality differences between buy- and sell-side analysts – although it is unclear a priori which type of analyst is higher quality. If money management firms can recover the costs of research more easily than sell-side firms, they may find it financially attractive to support higher quality research. But it is also plausible that the transparency of sell-side analysts' performance and the upside from being rated a star analyst may attract higher quality analysts.

Our empirical tests explore the impact of some of the above factors on the relative performance of buy- and sell-side analysts' earnings forecasts and stock recommendations.

### **3. Sample, Data, and Tests**

#### **3.1 Sample and Data**

The sample firm is a top ten-rated money management firm for which fundamental research is an essential part of its stock selection process. From analyst reports provided by the firm for the period July 1997 to December 2004, we collect

annual earnings forecasts and stock recommendations for each firm covered. For sell-side analysts, earnings forecasts and recommendations are collected from Thompson Financial's I/B/E/S (Institutional Broker Estimates System) database.

For each company covered by the buy-side firm analysts, we construct an earnings forecast database that includes the company name, CUSIP, industry, the buy- and sell-side analysts' annual earnings forecasts for that company, the dates that their forecasts were issued, a code for the analyst and analyst firm names, *I/B/E/S*'s values for actual earnings, and the date that each analyst first appeared on *I/B/E/S* or was hired by the buy-side firm. Buy-side forecasts are adjusted for any stock splits or stock dividends to ensure comparability to actual earnings per share and sell-side forecasts. Finally, we confirm with the buy-side firm and from the buy-side firm analyst reports that the earnings metric forecasted by its analysts is identical to that forecasted by sell-side analysts.<sup>7</sup>

To examine results for differing forecast horizons, earnings forecasts are separated into seven different horizons prior to a company's annual earnings announcement date: less than 3 months, 4-6 months, 7-9 months, 10-12 months, 13-15 months, 16-18 months, and more than 18 months. The forecasts are approximately evenly distributed across these horizons. To reduce the risk of non-independence of observations, we include only the first forecast made by an analyst for each company and three-month forecast horizon.<sup>8</sup>

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<sup>7</sup> As further confirmation that its analysts forecast the same earnings number as sell-side analysts, the sample firm recently began submitting its earnings forecasts to StarMine, a firm that compares buy- and sell-side analysts forecast and recommendation performance for investment firms and institutional investors.

<sup>8</sup> We re-ran the tests using the last forecast made by an analyst for each company during the three-month forecast horizon, and using a random forecast made by the analyst for each company within a three-month forecast horizon. The results are similar to those reported in the paper.

Panel A of table 1 shows how the sample of usable earnings forecasts is constructed. The final sample is made up of 3,526 buy-side forecasts and 58,562 sell-side forecasts. Observations are excluded primarily because analysts make multiple forecasts for the same firm within a three-month period (in which case we select the first observation), or because observations for a particular company-period are covered by sell-side analysts but not a buy-side analyst or vice versa.

Descriptive data for the earnings forecast sample on the number of analysts, number of analyst-firms, and number of stocks covered are reported in panel A of table 2. The final sample is made up of 37 buy-side analysts (for the single buy-side firm) and 3,184 sell-side analysts from 298 sell-side firms. Due to the matched research design, both buy- and sell-side analysts cover the same 337 stocks.

For the stock recommendation tests we use three different samples. To test recommendation performance, the sample includes all recommendations with available stock return data. For recommendation optimism tests, we use both unmatched and matched samples. The unmatched sample comprises all recommendations for companies covered by more than one analyst. If duplicate recommendations are made by the same analyst in a given quarter, we use only the first. The matched sample uses recommendations for company-quarters with a buy- side recommendation and at least one sell-side recommendation, comparable to the earnings forecast sample design. For each recommendation used, we constructed a database that includes the company name, CUSIP, industry, the analysts' recommendation, the date that the recommendation was issued, a code for the analyst and analyst firm names, and the date that the analyst first appeared on *I/B/E/S* or was hired by the buy-side firm.

Construction of the sample of usable recommendations is shown in panel B of table 1. For recommendation performance tests, we use 2,013 buy-side recommendations and 255,114 recommendations by sell-side analysts. The unmatched optimism sample eliminates recommendations for company-quarters covered by only one analyst and duplicate recommendations by a given analyst in the same quarter, leaving 1,370 buy-side recommendations and 149,811 sell-side recommendations. Finally, the matched sample excludes companies not covered by both a buy- and sell-side analyst, generating a final sample of 1,370 buy-side recommendations and 7,541 sell-side recommendations.

Descriptive data for the recommendation sample on the number of analysts, number of analyst-firms, and number of stocks covered is reported in panel B of table 2. For the recommendation performance tests, the sample comprises 46 buy-side analysts (for the single buy-side firm) covering 567 stocks, versus 8,486 sell-side analysts from 627 firms, covering 8,780 stocks. For the unmatched recommendation performance tests, the sample is made up of 46 buy-side analysts covering 471 stocks, and 7,454 sell-side analysts from 568 sell-side firms covering 4,936 stocks. For the matched sample, we have 46 buy-side analysts covering 471 stocks, and 2,331 sell-side analysts from 256 firms covering the same number of stocks.

### **3.2 Research Optimism Tests**

Two measures of research optimism are examined: the relative optimism of buy- and sell-side analysts' earnings forecasts, and differences in stock recommendation optimism

## Relative Earnings Forecast Optimism

To estimate relative optimism of buy-side analysts' earnings forecasts, we adopt a similar approach to Cowen, Groyberg, and Healy (2006), who construct a measure of relative optimism that controls for company- or time-specific factors that affect forecast performance. The relative optimism/pessimism (*ROPT*) of each analyst's earnings forecast is computed as follows:

$$ROPT_{ij}^{t+k} = \frac{FORECAST_{ij}^{t+k} - \overline{FORECAST_{it}^{t+k}}}{STDEV(FORECAST_{it}^{t+k})}$$

$FORECAST_{ij}^{t+k}$  is analyst *j*'s forecast of company *i*'s earnings for period *t+k*, where the forecast is made at time *t*. This forecast is then compared to the average or consensus forecast for all analysts (buy- and sell-side) making forecasts for company *i*'s earnings in period *t*, again within the same forecast horizon ( $\overline{FORECAST_{it}^{t+k}}$ ). The relative forecast is standardized across firms by deflating by the standard deviation of forecasts across all analysts forecasting earnings for company *i* in period *t*, again within the same forecast horizon ( $STDEV(FORECAST_{it}^{t+k})$ ).<sup>9</sup>

The distributions of relative optimism for all buy- and sell-side analysts' earnings forecasts (without controlling for horizon) are shown in Figure 1. The difference between the two distributions is striking. Sell-side analysts' relative earnings forecast optimism is tightly clustered around zero, with little evidence of skewness. In contrast, relative optimism for buy-side analysts is highly positively skewed, leading to a higher mean and variance.

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<sup>9</sup> We also considered deflating relative forecast optimism by stock price. However, as noted by Jacob, Lys, and Neale (1999) for earnings this effectively weights optimism by the price-earnings ratio, implying that changes in price-earnings ratios over time and across firms will affect price-deflated relative optimism. Consequently, we opted for deflating our optimism measures by the standard deviation of the forecasts.

To test whether relative optimism differs for buy- and sell-side analysts, we estimate the following model:

$$ROPT_{ijt}^{t+k} = \alpha + \beta_1 BUYSIDE_{jt} + \beta_2 HORIZON_{ijt}^{t+k} + \beta_3 AEXP_{jt} + \varepsilon_{ijt}$$

$ROPT_{ijt}^{t+k}$  is the relative optimism for analyst j's forecast for company i's year t+k earnings made at time t, and  $BUYSIDE_{jt}$  is a dummy variable that takes the value 1 if analyst j works for a buy-side firm at time t and zero otherwise. The model is estimated using Huber-White adjusted standard errors to allow for any lack of independence between forecasts made by the same analyst.

Two control variables that earlier studies have been found to be important in explaining relative optimism are included in the model: forecast horizon and analyst experience. Forecast horizon is partially controlled for by benchmarking analysts' performance against the mean of all analysts forecasting for the same company, time period, and three-month horizon. This design controls for forecasts made during the same three-month period, but does not allow for differences in horizon within the three months. We therefore include a finer measure of forecast horizon, the number of days between the forecast issue date and the subsequent fiscal year end ( $HORIZON_{ijt}^{t+k}$ ). We expect that the estimated coefficient will be negative, implying that forecast optimism increases the longer the horizon.

The second control variable is analyst experience, measured by the natural logarithm of the number of quarters analyst j has worked as an analyst at either a sell-side firm or with the sample buy-side firm ( $AEXP_{jt}$ ).<sup>10</sup> The coefficient will be negative if

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<sup>10</sup> This approach under-estimates the experience of analysts who started work at a buy-side firm other than the sample firm.

experience leads to lower optimism, and positive if analysts with more experience forge closer links to management and find it difficult to be unbiased.

Table 3 reports summary statistics on relative earnings optimism, forecast horizon and analyst experience. On average, the buy-side analysts are more optimistic and less experienced than their sell-side counterparts. Mean relative forecast optimism is 0.78 for buy-side analysts versus -0.05 for sell-side analysts. Buy-side analysts have an average of 14.9 quarters of experience (shown in table 3 as log experience of 2.7) as an analyst, compared to 20.1 quarters ( a log value of 3.0) for the average sell-side analyst. There is no significant difference in average forecast horizon for buy- and sell-side analysts.

### Recommendation Optimism

The frequencies of stock recommendations for the full performance sample, and the unmatched and matched optimism samples of buy- and sell-side analysts are reported in table 3.<sup>11</sup> The results for the three samples are quite similar. Buy-side analysts issue fewer Strong Buy/Buy recommendations and more Hold and Under-perform/Sell recommendations than their sell-side counterparts. Depending on the sample, 44-46 % of the recommendations issued by buy-side analysts are Strong Buy/Buy, compared to 54-58% for sell-side analysts. In contrast, 10-14% of buy-side analyst recommendations are Under-perform/Sell, versus 6% for sell-side analysts.

To formally test whether there are differences in the optimism of buy-side analysts' recommendations controlling for differences in the company and the time

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<sup>11</sup> For several years of the sample period, the sample firm provided only three types of recommendation (versus the usual five for sell-side firms). We, therefore, used this classification throughout the sample period, combining Strong Buys with Buys, and Sells with Strong Sells. We also replicated the tests using all five classifications for the sub-period they are available. The results are not materially different from those reported in the paper.

period covered by the recommendation, we treat dependent variables as categorical and ordered as suggested by Kolasinski and Kothari (2004). The estimated ordered probit model is as follows:

$$REC = g(BUYSIDE, \%BUY, \%HOLD, AEXP)$$

The dependent variable in this analysis is the analyst's recommendation (*REC*), coded as 2 for a Strong Buy/ Buy, 1 for a Hold, and 0 for an Under-perform/Sell. The *BUYSIDE* indicator variable captures any difference in overall recommendation optimism for buy-side analysts relative to the sell-side firms. To control for company and time period effects, the model includes control variables for the percentage of Strong Buy/Buy and Hold recommendations (*%BUY* and *%HOLD*) made by other analysts for the same company and quarter. Finally, as in the earnings forecast optimism tests, we control for analyst experience (*AEXP*).

### **3.3 Research Performance Tests**

We examine two measures of research performance, the relative accuracy of buy- and sell-side analysts' earnings forecasts and the performance of their stock recommendations.

#### Earnings Forecast Accuracy

Our measure of earnings forecast accuracy is similar to that used by Jacob, Lys and Neale (1999), Clement (1999), Hong, Kubik and Solomon (2000) and Hong and Kubik (2003), who control for any company- and time-specific factors that affect accuracy. We estimate relative accuracy (*RACC*) for each analyst's earnings forecast as follows:

$$RACC_{ijt}^{t+k} = \frac{|FERR_{ijt}^{t+k}| - \overline{|FERR_{it}^{t+k}|}}{STDEV(|FERR_{it}^{t+k}|)}$$

$FERR_{ijt}^{t+k}$  is the forecast error for analyst j's forecast of company i's earnings for period t+k, made at time t. The absolute value of this forecast error is then compared to the average of the absolute forecast errors for all analysts making forecasts for company i's earnings for period t+k, again within the same forecast horizon ( $\overline{|FERR_{it}^{t+k}|}$ ). The relative forecast error is standardized across firms by deflating by the standard deviation of the absolute forecast error across all analysts forecasting earnings for company i, in period t, again within the same forecast horizon.

The distributions of relative earnings forecast accuracy (without controlling for horizon) for buy- and sell-side analysts are shown in Figures 2. The distributions look very similar to those for forecast optimism, and indicate that forecast accuracy for buy-side analysts has a higher mean and variance, and is positively skewed relative to that for sell-side analysts.

To test whether relative accuracy differs for buy- and sell-side analysts, we estimate the following model:

$$RACC_{ijt}^{t+k} = \alpha + \beta_1 BUYSIDE_{jt} + \beta_2 HORIZON_{ijt}^{t+k} + \beta_3 AEXP_{jt} + \beta_4 ACOYS_{jt} + \beta_5 ASPEC_{jt} + \beta_6 FSIZE_{jt} + \beta_7 FSPEC_{ijt} + \varphi_{ijt}$$

$RACC_{ijt}^{t+k}$  is the relative accuracy for analyst j's forecast for company i's earnings at time t+k made at time t,  $BUYSIDE_{jt}$  is the indicator variable for a buy-side analyst at time t.

The estimated  $BUYSIDE$  coefficient represents the mean difference in relative forecast accuracy for buy-side analysts versus all sell-side analysts. We again estimate Huber-

White adjusted standard errors to allow for any lack of independence between forecasts made by the same analyst.

Control variables for forecast horizon ( $HORIZON_{ijt}^{t+k}$ ) and analyst experience ( $AEXP_{jt}$ ), defined above, are also included in the model. Variables to control for other factors found to be related to analyst forecast accuracy include: the number of companies for which analyst j publishes forecasts in calendar year t ( $ACOYS_{jt}$ ), the percentage of other companies followed by analyst j within the forecast firm's I/B/E/S industry classification in calendar year t ( $ASPEC_{jt}$ ), the number of analysts working at analyst j's firm in calendar year t ( $FSIZE_{jt}$ ), and the percentage of the other analysts at analyst j's firm covering other stocks in the forecast firm's industry in calendar year t ( $FSPEC_{ijt}$ ).<sup>12</sup>

Earlier studies (see for example O'Brien (1990), Clement (1999), and Jacob, Lys and Neale (1999)) find that analyst forecast inaccuracy (measured by absolute forecast errors) is an increasing function of forecast horizon ( $HORIZON$ ) and the number of companies an analyst covers ( $ACOYS$ ), and a decreasing function of analyst industry specialization ( $ASPEC$ ), firm size ( $FSIZE$ ), and firm specialization ( $FSPEC$ ). However, findings for analyst experience have varied across studies. For example, Clement (1999) and Mikhail, Walther and Willis (1997) find that forecast accuracy improves with experience, whereas Jacob, Lys and Neale (1999) find no relation.

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<sup>12</sup> Although there is no necessary economic link between these additional variables and relative forecast optimism, we have also included them as controls in the relative forecast optimism model. Not surprisingly, most of the additional estimates are insignificant. More importantly, our findings for the buy-side variable are unchanged.

Table 3 reports summary statistics for relative earnings forecast accuracy, as well as for the control variables. The estimates indicate that relative to the sell-side, the buy-side firm analysts make less accurate earnings forecasts (with mean relative earnings forecast errors of 0.85 versus -0.05). On average, relative to sell-side analysts, analysts at the buy-side firm issue reports on fewer firms (9 versus 14) but from a broader industry pool since they are less specialized by industry (36% of the firms they cover are in the same industry, versus 49% for the sell-side). This difference in industry specialization implies that the buy-side analysts cover roughly three industries, compared to two for the sell-side. As noted above, the buy-side analysts are less experienced than their sell-side counterparts. Finally, they have fewer in-house analyst colleagues (19 versus 27) and a smaller percentage of colleagues who cover other firms in the same industries (6% versus 10%). The multivariate tests help us to judge whether differences in the relative forecast accuracy of buy-side analysts are related to differences in these factors or to other factors specific to buy-side firms.

### Abnormal Stock Return Performance

We use two approaches to estimate stock return performance of buy- and sell-side analysts' recommendations. The first is the metric used by the buy-side firm to evaluate analyst performance – market-adjusted returns using a value-weighted market index S&P 500. For each recommendation, market-adjusted returns are cumulated from the day after the recommendation report until the recommendation is changed (if the stock continues to be covered), or for 250 trading days (if the stock ceases to be covered). Recommendation holding-period returns are averaged for three recommendation types: Strong Buy/Buy,

Hold, and Under-perform/Sell. This metric indicates whether through market timing or use of value or momentum strategies, analysts are able to select stocks that beat the market.

Since the market-adjusted approach does not control for risk, or for other factors known to be associated with stock performance, we also estimate abnormal returns using a four-factor model. To compute abnormal returns, we first create portfolios based on analysts' recommendations (Strong Buy/Buy, Hold, and Under-perform/Sell) and estimate returns for each portfolio using a similar approach to Barber, Lehavy and Trueman (2004). To illustrate this method, consider the algorithm used to construct returns for the Strong Buy/Buy portfolio. Stocks are included in this portfolio from the day after they are upgraded, reiterated or covered for the first time as a Strong Buy or Buy, and are held until the rating is changed or for 250 trading days if no report is issued within 250 days.

An equal initial investment is made in each stock that enters the portfolio. Calendar time abnormal returns are computed for each recommendation portfolio by estimating the following four-factor model using daily stock returns:

$$R_{jt} - R_{ft} = \alpha_j + \beta_j (R_{mt} - R_{ft}) + s_j SMB_t + h_j HML_t + w_j WML_t + \nu_{jt}$$

Where  $R_{jt}$  is the daily return for portfolio j,  $R_{ft}$  is the daily risk-free return,  $R_{mt}$  is the daily return on the value-weighted market index,  $SMB_t$  is the daily difference in return for a value-weighted portfolio of small stocks over a similar portfolio of large stocks,  $HML_t$  is the daily difference in return for a value-weighted portfolio of high book to market stocks and a similar portfolio of low book-to-market stocks.  $WML_t$  is the daily return on a value-weighted portfolio of stocks with high recent returns and a similar portfolio with low

recent returns. The slope coefficients from this model represent risk factors for each recommendation portfolio, and the intercept is the average daily abnormal return for that portfolio.

To compare the performance of buy- and sell-side portfolios, we regress the difference in portfolio returns on the four factors:

$$R_{it} - R_{jt} = \alpha + \beta \cdot (R_{mt} - R_{ft}) + s \cdot SMB_t + h \cdot HML_t + w \cdot WML_t + \nu_t$$

where  $R_{it}$  is the daily return for the buy-side analysts' portfolio and  $R_{jt}$  is the daily return for the sell-side analysts' portfolio. The estimated intercept represents the daily abnormal return from buying the buy-side analyst portfolio and shorting the sell-side analyst portfolio.

## **4. Results**

### **4.1 Research Optimism**

#### Earnings Forecast Optimism

Results of earnings forecast optimism tests are presented in table 4. They indicate that, controlling for forecast horizon and analyst experience, earnings forecasts by the buy-side firm analysts are considerably more optimistic than those made by analysts at all sell-side firms. These differences persist across all seven forecast horizons (from less than three months to more than eighteen months ahead).

The estimated relative forecast optimism coefficient for the buy-side firm is 1.07 for the shortest horizon (0-3 months), 0.78 for forecasts of 10-12 months ahead, and 0.85 for forecasts of more than 18 months ahead, all highly statistically significant. To assess the economic significance of the coefficients, we transform the expected standardized

relative forecast optimism for all analyst-firm-quarter-horizons into unstandardized expected forecasts by multiplying by the standard deviation for the relevant firm-quarter-horizon and adding back the consensus forecast. The average percentage differences in unstandardized forecasts for buy- and sell-side analysts for each horizon are sizable. For example, the mean forecast for the 1-3 month horizon is 22% higher for the sell-side than the buy-side.

Consistent with earlier findings, the coefficients on forecast horizon (*HORIZON*) are positive and highly significant, implying that within each of the three-month horizons more timely forecasts tend to be relatively less optimistic. Finally, analyst experience (*AEXP*) is unrelated to forecast optimism except for forecasts with the shortest horizon.

#### Stock Recommendation Optimism

Table 5 reports unmatched and matched sample results of the ordered probit model used to test differences in stock recommendation optimism of buy- and sell-side analysts. The results are remarkably similar. They indicate that buy-side analysts are less optimistic in making stock recommendations than their sell-side counterparts. The estimated coefficients for *BUYSIDE* are -0.31 for the unmatched sample and -0.29 for the matched sample. They imply that for the unmatched (matched) sample, the likelihood of issuing a Strong Buy/Buy is 58% (55%) for sell-side analysts versus 45% (43%) for buy-side analysts.

The model also shows that analyst recommendations are strongly related to the percentage of Strong Buy/Buy and Hold recommendations made by other analysts covering the same stock during the quarter. The estimates for both variables are highly statistically significant. Finally, the estimate for analyst experience (*AEXP*) is negative

and significant for the unmatched sample, indicating that more experienced analysts make less optimistic recommendations, and negative but only weakly significant (at the 10% level) for the matched sample.

The difference in earnings and stock recommendation optimism for buy-side analysts is counter-intuitive. It implies that buy-side analysts are more optimistic than their sell-side counterparts about firms' fundamentals (represented by earnings) but are less confident about their stock market prospects. Bradshaw (2004) also finds evidence of a disconnect between analysts' earnings forecasts and recommendations. One explanation for these findings is that sell-side analysts use earnings forecasts and recommendations to communicate with two very different audiences, institutional and retail investors (see Malmendier and Shanthikumar (2005)).

## **4.2 Research Performance Tests**

### Earnings Forecast Accuracy

Earnings forecast accuracy test results are reported in table 6. They show that even after controlling for differences in forecast-timing, analyst characteristics and analyst firm effects, the buy-side analysts are markedly less accurate than their sell-side counterparts across all horizons. The estimated coefficients are 1.53 for the short-term horizon (0-3 months), 0.93 for horizons of 10-12 months, and 0.89 for forecasts with 18 or month horizons, all highly statistically significant.

We again examine the economic significance of the coefficients by transforming the expected standardized relative forecast accuracy for all analyst-firm-quarter-horizons into unstandardized expected forecast errors by multiplying by the standard deviation for the relevant firm-quarter-horizon. For the 0-3 month horizon the estimates imply that the

mean absolute forecast error (unstandardized) as a percent of the consensus forecast is 6% for sell-side analysts and 27% for buy-side analysts; for the 18+ month horizon the comparable estimates are 38% for sell-side analysts and 68% for the buy-side firm. These differences are sizable and imply that the differences are economically significant as well as statistically reliable.

Estimates for many of the other coefficients are consistent with findings of prior studies. The forecast horizon coefficient is positive and significant, implying that more timely forecasts within each three-month horizon are more accurate. For short- to medium term forecast horizons the coefficients are positive for number of companies covered (*ACOYS*), and negative for analyst experience (*AEXP*), analyst specialization in the forecast firm's industry (*ASPEC*), and analyst firm size (*FSIZE*). These imply that analysts' earnings forecasts are more accurate if they cover fewer stocks, have more experience as an analyst, specialize in the forecast firm's industry, and are employed by larger firms that presumably have more resources.

### Stock Recommendation Returns

Results of stock recommendation tests are presented in table 7. Much of our attention is focused on returns to 'Strong Buy/Buy' recommendations, since these are used to compute buy-side analysts' bonuses. During the sample period, Strong Buy/Buy recommendations by analysts at the buy-side firm generate mean annualized market-adjusted returns of 3.4%. This estimate is statistically and economically significant, implying that on average the buy-side firm analysts' Strong Buy/Buy recommendations out-performed the overall market index. However, their performance looks less

impressive when it is benchmarked against that of sell-side analysts, whose comparable recommendations generate a mean market-adjusted return of 6.5%.<sup>13</sup> The difference between buy- and sell-side analyst returns (-3.2%) is highly statistically significant, implying that sell-side analysts make superior Strong Buy/Buy recommendations.

Abnormal returns, estimated using the four factor model, show an even more dramatic difference. Mean annualized abnormal returns from investing in the buy-side analysts' Strong Buy/Buy recommendations are 1.2% versus 7.5% for sell-side analysts. The average abnormal return for the buy-side is insignificant, but the difference versus the sell-side is statistically reliable, confirming that sell-side Strong Buy/Buy recommendations are superior to those made by the buy-side firm analysts.

Returns to 'Hold' and 'Underperform/Sell' recommendations are more difficult to interpret. Some have argued that since sell-side analysts make relatively few Underperform/Sell recommendations, their Hold recommendations should really be interpreted as Underperform/Sell. In contrast, the buy-side analysts are less averse to labeling negative recommendations as Underperform/Sell. Mean market-adjusted returns

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<sup>13</sup> Ljungqvist, Malloy and Marston (2006) find that changes were made to recommendations on the historical I/B/E/S database between 2002 and 2004. These included additions of new recommendations, deletions of prior recommendations, removal of the analyst identifier codes for some recommendations, and changes in some actual recommendations. As a result, abnormal returns to sell-side buy recommendations made in 2002 increased from 5.9% using the 2002 database to 8.1% using the modified 2004 version. Some of the changes are corrections of data errors but others appear to be changes made by analysts (who self-report their recommendations) to conceal poor performing recommendations, a potential cause for concern in interpreting our findings. Ljungqvist et al. point out that there is very little that researchers can do to correct this data problem. We acknowledge the problem but do not believe that it is likely to fully explain the strong performance of sell-side analysts in our study for two reasons. First, Ljungqvist et al note that no such changes were made to the I/B/E/S earnings file, implying that our earnings forecast bias and accuracy results are unaffected by the problem. Second, prior studies that use other sources of recommendation data also find evidence of abnormal returns to sell-side analysts' buy recommendations comparable to those documented in this paper. Womack (1996) uses FirstCall data; Stickel (1995), Barber, Lehavy, McNichols and Trueman (2001), and Jagadeesh, Kim, Krische and Lee (2004) use the Zachs database, where recommendations are coded by Zachs directly from analyst reports; and Elton, Gruber and Grossman (1986) use a database provided by Bankers Trust Company.

for Hold recommendations are similar for both the buy- and sell side analysts. However, mean abnormal returns confirm the common belief that sell-side analysts' Hold recommendations are effectively Underperform/Sell. The mean abnormal return for their Hold recommendations is -1.1% versus 5.3% for the buy-side firm analysts. The difference between these estimates is statistically reliable.

For Underperform/Sell recommendations the results are inconsistent. Mean market-adjusted returns indicate that the buy-side firm analysts' recommendations underperform those of the sell-side. The difference in means is statistically reliable. In contrast, there is no significant difference in mean abnormal returns to buy- and sell-side analysts' Underperform/Sell recommendations.

Overall, the findings indicate that sell-side analysts' Strong Buy/Buy recommendations out-perform those of the buy-side firm. .

### **4.3 Sensitivity Tests**

We undertake several sensitivity tests to assess whether the main findings are driven by our research design. We first examine the effect of differences in sample size for the buy- and sell-side samples by re-running our analysis using matched samples of sell-side analyst forecasts and recommendations. For each buy-side earnings forecast and stock recommendation, we randomly select a single observation from all sell-side forecasts and recommendations made for the same company, forecast horizon and forecast period. The estimated differences in research optimism and performance using the matched sell-side samples are similar to those reported above using the full sell-side samples.

To judge how the buy-side firm performs relative to sell-side firms we estimate the earnings optimism and accuracy tests including fixed firm effects and dropping the *BUYSIDE* variable. Using the fixed firm effect coefficients we rank all firms in terms of their analysts' earnings forecast optimism and accuracy. For forecast optimism, the buy-side firm ranks between 13<sup>th</sup> and 25<sup>th</sup> most optimistic of the 299 sample firms, depending on the forecast horizon. For forecast accuracy, it ranks between 7<sup>th</sup> and 20<sup>th</sup> most inaccurate.

## **5. Potential Explanations**

We examine seven potential explanations for the optimism and weak performance of the buy-side firm analysts.

(1) Analyst Retention. One explanation is that the buy-side firm retains fewer high quality analysts or more low quality analysts than the sell-side. To test this hypothesis, we estimate the relation between analyst retention and analyst forecast performance for both the buy-side firm and the aggregate sell-side. For each analyst, we estimate forecast performance as average accuracy across earnings forecasts made for all companies and horizons during a given year. Analyst retention is a dummy variable that takes the value one if a buy-side (sell-side) analyst continues to generate forecasts for the buy-side firm (on I/B/E/S) in the following year, and zero otherwise. The annual retention rate for the buy-side analysts is 71.3%, significantly higher than the 64% rate for the sell-side.

For sell-side analysts, the relation between analyst retention and forecast performance is non-linear. Retention rates are lower for high and low forecast performers. The lower retention of high performers could arise because recognized stars

exit the industry to manage money themselves. Retention rates are likely to be lower among poor performers because they exit the industry. In contrast, the buy side firm also shows lower retention rates for its high performing analysts, but there is no relation between retention and performance for its worst-performers. Controlling for differences in average retention rates between the buy-and sell-side, we find that the buy-side firm is 2% *more* likely to retain analysts in its lowest performing quartile whereas sell-side firms are 6% *less* likely to retain their lowest performing quartile analysts. This difference is statistically reliable and implies that poor-performing analysts are more likely to continue working at the buy-side firm than on the sell-side.

To examine how much of the earnings forecast accuracy findings can be explained by the higher buy-side retention of low accuracy analysts, we use the sell-side relation between retention and forecast performance to estimate the performance cutoff below which poor performing sell-side analysts have a more than 50% chance of exiting the sell-side industry. On average, this cutoff implies that each year the bottom performing 5% of sell-side analysts exit the industry. If the same cutoff is applied to the buy-side, 15% of the worst performing buy-side analysts would exit. We then create a dummy variable for buy-side analysts that we predict would have been fired for poor performance had they been on the sell-side, and re-estimate our original earnings forecast models including this variable. The estimated coefficients on the firing dummy show whether the poor performance for these analysts is sustained, and enable us to assess how much of the total buy-side bias and inaccuracy are attributable to the failure of the buy-side firm to replace poor performing analysts. We find that the effects are modest for short horizons, but explain as much as 40-45% of the buy-side forecast bias and inaccuracy for the

longest horizons. On average across all horizons the retention of poor performers by the buy-side firm explains roughly 20% of buy-side forecast inaccuracy and one third of forecast bias. It is also interesting to note that performance for poor-performing analysts retained by the buy-side firm is particularly weak for only one further year and then appears to improve. This could arise if these analysts eventually learn how to make less biased and more accurate forecasts, or if the firm only replaces analysts who have performed poorly over multiple years.

(2) Differences in Buy and Sell-Side Analyst Incentives. A second explanation for the findings is that buy- and sell-side analysts have different incentives. Bonuses for the buy-side firm analysts are tied directly to market-adjusted returns of their Buy recommendations and to portfolio manager ratings of their contributions. No attempt is made to benchmark their performance against sell-side analysts. As reported above, the buy-side analysts at the sample firm generate 3.4% positive market-adjusted returns from their Buy recommendations. Top managers at the buy-side firm inferred from this performance that their research adds value. What they did not consider was that market-adjusted returns for comparable sell-side recommendations were even higher (6.5%). In follow-up discussions, they pointed out that their reward system and benchmarking was typical within the industry. However, in late 2004, this began to change as StarMine Corp., a firm that analyzes and reports on the performance of member companies' financial analysts began attracting buy-side firms.

In contrast, sell-side analysts have long been benchmarked against other sell-side analysts. *Institutional Investor* magazine's analyst ratings, which rank analysts within an

industry based on a survey of institutional investors, are published each year, and affect sell-side analysts' standing and compensation.

(3) Sell-Side Information Advantage. Our findings could also reflect an information advantage for sell-side analysts over the buy-side. There are several potential sources of this advantage. One is the sell-side firms' own sales force and traders (who have deep knowledge about current market conditions). A second is managers of the companies covered (prior to Reg. FD). Finally, sell-side analysts may develop an information advantage through feedback on their ideas from their own institutional clients. While it is difficult to assess the value of most of these information sources, the 2000 adoption of Reg. FD to prevent managers from providing information to favored (supposedly sell-side) analysts, enables us to indirectly test whether sell-side analysts had superior access to management information prior to the regulatory changes.

Our supplemental tests examine the buy-side analysts' relative earnings forecast and stock recommendation optimism, earnings forecast accuracy, and stock recommendation performance before and after the adoption of Reg. FD. Prior to the regulation, buy-side analysts' earnings forecasts are significantly more optimistic and less accurate than the sell-side. After, the differences are much smaller and are largely insignificant. Further, these differences in performance are largely attributable to changes in sell-side optimism and inaccuracy, both of which deteriorate after the new regulation, rather than to changes in buy-side performance.

While these findings are consistent with the sell-side information advantage hypothesis, there are other plausible explanations. The year 2000 was a particularly turbulent one for the US market: key events included the conclusion of the bull

technology market of the late-1990s and the financial scandal and collapse of Enron and others. It is possible that the sell-side *ex post* under-estimated the impact of these events, leading to several years of over-optimism. Indeed, a more detailed analysis of the performance of the buy- and sell-side performance by year indicates that the improvement in buy-side performance is concentrated in the period 2001 and 2002. In 2003 and 2004, their relative forecast optimism and inaccuracy returns. We are therefore cautious about over-interpreting the time series findings.

(4) Analyst Coverage Scope. Even though at any given time the buy-side analysts write reports on roughly the same number of companies as the typical sell-side analyst, they follow many more companies. The average analyst at the buy-side firm follows between 50 and 100 firms from a broad sector and at any given time writes a report on nine of these. In contrast, analysts at a bulge firm (who dominate the sell-side sample) cover and write reports on 15 stocks from a more narrowly defined industry. One explanation for the poor performance of the buy-side firm analysts is that the scope of their coverage makes it difficult to spend as much time on any given stock, leading to less in-depth analysis. Consistent with this explanation, typical buy-side reports at the sample firm are only two pages long and far less comprehensive than those for typical sell-side analysts.

To examine this explanation, we compare the performance of the buy-side analysts to that of analysts at sell-side firms with comparable size and coverage scope. To identify these firms we eliminate all sell-side firms with more than 50 analysts. Some of the remaining firms focus on a narrower set of industries (e.g. technology stocks) than the buy-side firm. We therefore eliminate firms that cover fewer than 75 industries from the

revised sell-side sample.<sup>14</sup> The remaining firms are comparable to the buy-side firm in number of analysts and breadth of industry coverage.

We replicate our earnings forecast tests using the revised sample of sell-side firms. The findings (unreported) are very similar to those reported above, indicating that differences in coverage scope probably do not explain the earnings forecast optimism and inaccuracy of the buy-side analysts.

(5) Truncation Bias. Another potential explanation for the poor buy-side performance is that the buy-side analysts are more likely than sell-side analysts to write reports on stocks for which they are positive (i.e. optimistic).and to stop writing reports on out-of-favor stocks. This is especially plausible given the large number of stocks screened by the buy-side analysts and the fact that the money management firm is not permitted to short stocks.

To assess the impact of this bias on our findings, we compare the relative earnings forecast optimism and accuracy for newly-covered stocks for the buy- and sell-side analysts, a subsample that should not be subject to truncation bias. The findings are even stronger than those reported above, particularly in the initiation quarter, and show that the buy-side firm analysts make more optimistic and less accurate earnings forecasts even for newly-covered stocks than their sell-side counterparts. We conclude that truncation bias alone is unlikely to explain the relative optimism of the buy-side analysts.

(6) Quality of Analysts Hired. Sell-side firms often argue that the quality of sell-side analysts is higher than that of the buy-side, potentially explaining the poor performance of the buy-side firm analysts. To test this hypothesis, we examine the time-series

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<sup>14</sup> We use a number of different cutoffs to define the sample of sell-side firms with comparable coverage scope to the buy-side firm. The findings are insensitive to these cutoffs.

performance of 27 buy-side analysts who were hired from the sell-side. We extend the sell-side earnings forecast data-set to begin in 1983 for earnings forecasts and in 1993 for stock recommendations, and track the relative performance of these analysts when they work on the sell-side and after they join the buy-side.

Figures 3 and 4 present the distribution of relative earnings optimism and accuracy for the switching analysts before and after moving to the buy-side. Both figures show that prior to the switch, there is little difference in optimism or accuracy between the sell-side analysts who are hired by the buy-side firm, and those who continue working on the sell-side. However, after the change there are pronounced shifts to the right in switching analysts' distributions of optimism and accuracy, representing an increase in both forecast optimism and inaccuracy.

Multivariate tests confirm these conclusions. For earnings forecast optimism, the pre-hire estimates for sell-side analysts subsequently hired by the buy-side firm range from -0.17 to 0.01 (across the different forecast horizons), and are statistically insignificant for all but two horizons. This implies that prior to being hired by the buy-side firm, sell-side analysts are no more optimistic than their sell-side competitors. However, the same sell-side analysts become more optimistic once they are hired by the buy-side firm, when the estimates ranged from 0.46 to 1.03 and are all statistically significant. Finally, the estimates for buy-side analysts who are not hired from the sell-side range from 0.72 to 1.02, and are statistically significant, indicating that these analysts are also highly optimistic relative to the sell-side.

The findings for forecast accuracy provide a similar picture. In the pre-hire period, sell-side analysts subsequently hired by the buy-side firm are as accurate as their sell-side

counterparts, reflected in the insignificant coefficients. However, after being hired, the same analysts become less accurate than their sell-side peers, evidenced by significant positive estimates that range from 0.52 to 1.33 across the forecast horizons. Buy-side analysts who were not hired from the sell-side were relatively inaccurate, reflected in significant positive estimates that range from 0.85 to 1.57.

One potential explanation for the change in earnings forecast performance after joining the buy-side firm is that the new analysts are assigned to stocks that they had not previously covered.<sup>15</sup> Consistent with this explanation, during their first two years as buy-side analysts, former sell-side analysts have an average coverage turnover of 64% relative to the stocks covered during their final year as a sell-side analyst. In contrast, during their last two years as sell-side analysts, average coverage turnover for these same analysts is only 28%.

To examine the effect of this turnover on the performance of buy-side analysts hired from the sell-side, we separately estimate optimism and accuracy for stocks that the analyst covers both before and after moving to the buy-side firm, and for stocks that are newly covered following the hiring change. The results (unreported) indicate that there is no significant difference in forecast optimism or accuracy for the two types of stocks – forecast optimism and inaccuracy increase comparably for both types of stocks after the sell-side analysts switch to the buy-side.

We also replicate the recommendation optimism tests for sell-side analysts who switch to the buy-side. The findings indicate that prior to the switch, sell-side analysts who joined the buy-side firm are significantly less optimistic than their non-switching

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<sup>15</sup> Mikhail, Walther and Willis (1997) find that analysts' forecast accuracy increases the longer they have covered a stock.

counterparts. The estimated coefficient of -0.23 implies that the likelihood of issuing a Strong Buy/Buy is 61.3% for non-switching sell-side analysts versus 52.2% for those who switched, a 9.1% difference. Results from the post-switch period show that switching analysts continue to make less optimistic recommendations than non-switching sell-side analysts after the switch

Finally, we compare the performance of stock recommendations for sell-side analysts hired by the buy-side, before and after the change. The sample comprises 1075 recommendations by 17 sell-side analysts who subsequently switched to the buy-side and 693 recommendations by the same analysts after the switch. The recommendations are made during the period January 1993 to December 2004.

Return results vary depending on whether return performance is measured using market-adjusted or calendar method abnormal returns. There is a statistically reliable decline in the mean *abnormal* returns to Strong Buy/Buy recommendations for switching analysts (from 14.5% prior to the hiring change to -4.5% after the switch). No such drop in return performance is observed for sell-side analysts that do not switch to our buy-side firm. However, when we use *market-adjusted* returns to measure recommendation performance, there is no evidence of declining performance. Mean market-adjusted returns are 5.6% prior to the switch and 4.8% after.

Overall, we conclude that, prior to being hired by the buy-side firm, sell-side analysts had comparable earnings forecast and stock recommendation performance to other sell-side analysts. However, after the switch, there is some evidence of deteriorating performance. This suggests that the poor earnings forecast and stock recommendation

performance of the buy-side firms' analysts is probably not attributable to the buy-side firm hiring inherently low quality analysts.

(7) Poor Investment Firm Performance. The final explanation examined is that the buy-side firm is simply a poor-performing firm, perhaps because of its poor research performance. To test this hypothesis, we collect data on the performance of the buy-side firm portfolio managers from *Reuters* and *Institutional Investor* ratings of top US fund management groups from 1997 to 2003. The ratings were based on responses of US corporations to an annual questionnaire that requested ratings of the leading institutional investors. The sample firm was consistently ranked among the top ten firms during the sample period.

We also collect Morningstar ratings for equity funds at the sample firm and the other top-ten-rated money management firms as ranked by *Institutional Investor* in 2003. For each firm we estimate the average Morningstar one-, three-, five-, and ten-year ratings by fund type (e.g. Foreign Small/Mid Growth, Large Blend, Large Growth, etc.). The sample firm's relative performance ranks in the top 30% for four of the seven categories in one-year performance, and three of the six categories for three- and five-year horizons. Insufficient data is available to estimate meaningful ratings across categories for the ten-year period. If we compute firm average Morningstar ratings across all equity funds that they offer (with no control for fund type), the sample firm's average rating exceeds the average ratings for other top ten firms for one-, three-, and five-year horizons, but not for the ten-year horizon.

Finally, we compute the annual market-adjusted performance of the firm's large-cap equity funds (since most of the analyst reports are written on large cap stocks). The

mean annualized market-adjusted return for these portfolios during the sample period is 2.7%. Performance varies considerably over time, with the weakest returns generated during the 1998-99 tech boom (-21.5% and -8.2%) and the strongest performance in 1997, 2000, 2001 and 2003 (9.2%, 12.7%, 9.2%, and 19.5% respectively). The relation between the firm's annual mutual performance and its research performance (measured by the annual market-adjusted returns of its analysts Strong Buy/Buy recommendations) is positive but insignificant.

## **6. Generalizability**

One limitation of our study is that we examine the performance of analysts at a single buy-side firm, raising questions about whether our findings can be generalized to other investment firms. Ideally, we would have performed our tests using buy-side analyst data from a large, randomly-selected sample of firms. Unfortunately, we do not have access to such data. However, we are able to obtain data on the performance of buy-side firm portfolio managers who report they rely exclusively on buy-side research for making investment decisions, and use this data to conduct additional tests. By examining fund-level performance at these sample firms we can indirectly evaluate the performance of buy-side research using a larger sample of firms.

The sample firms and funds are identified from a search of Nelson's Directory of Investment Research from 1997 to 2005, where each investment firm reports the intensity of use of buy-and sell-side research. During the period 1997 to 2005 an average of 205 firms per year reported that they rely 100% on buy-side research for investment advice. For these investment firms, we collect monthly returns from 1997 to 2005 for all their

funds covered by CRSP Morningstar. Our usable sample averages 31 firms and 340 funds per year.

Since we do not have a good understanding of factors that lead firms to rely exclusively on buy-side research, we also examine a benchmark sample of investment firms that use a mix of buy-side research. This sample comprises an identical number of investment firms each year randomly selected from all firms listed on CRSP Morningstar that reported in Nelson's Directory that they did not rely exclusively on buy-side research. The sample averages 31 investment firms (by construction) and 636 funds per year. Interestingly, many of these firms also report that they rely heavily on buy-side research.<sup>16</sup> Finally, we use data from I/B/E/S to identify strong buy and buy recommendations made by all sell-side analysts from 1997 to 2005.

We estimate mean annualized market-adjusted and abnormal returns (estimated using the calendar-time approach and four-factor model discussed above) for buy-side portfolio managers who rely/do not rely exclusively on buy-side research, and for sell-side analysts' strong buy/buy recommendations.<sup>17</sup> Sell-side recommendation performance is computed after adjusting for transactions costs of 0.15% on stock purchases that occur with a recommendation upgrade and sales that occur when a stock is downgraded or a recommendation is not reiterated for twelve months.<sup>18</sup>

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<sup>16</sup> Cheng, Liu, and Qian (2004) show that in 2001 and 2002 the median firm in Nelson's Directory reports that 80% of its research is based on in-house buy-side analysis and only 20% on sell-side analysis.

<sup>17</sup> The tests use monthly returns for investment firm funds and monthly returns (generated by cumulating daily returns) for sell-side analyst strong buy/buy recommendations from day +1 to 250 relative to the recommendation issue date or until the recommendation is downgraded below buy. Returns for mutual funds are computed before adding back expenses, which averaged 1.3% per year for firms that report they rely exclusively on buy-side research, and 1.4% for the random sample.

<sup>18</sup> This estimate of transaction costs was obtained from industry experts who reported that costs for trades of 100,000 shares, which would be a typical size trade for most investment funds, range from 0.1% to 0.3% and depend on factors such as the stock's liquidity, the order size, the order urgency and arrival time, market condition, and whether there is a news event. To assess the sensitivity of our findings to the

The findings, reported in table 8, show that mean annualized market-adjusted returns are -1.9% for buy-side portfolio managers who rely exclusively on buy-side research and -2.5% for the random subsample of buy-side portfolio managers who do not rely exclusively on buy-side research.<sup>19</sup> Both estimates are insignificant. In contrast, sell-side analysts' strong buy/buy recommendations generate average market-adjusted returns of 6.1% per year. This return is significantly different from zero and significantly higher than returns for either sample of buy-side portfolio managers at the 10% level.

These performance differences are not explained by risk, size, book-to market or momentum factors. After controlling for these effects, mean annualized abnormal returns for investment firms that rely exclusively on buy-side research are -1.3% (significant at the 6% level) versus -0.8% (insignificant) for the firms that use both buy- and sell-side research. In contrast, sell-side analysts' strong buy/buy recommendations generate a 5.4% abnormal annualized return, significant at the 1% level. The mean abnormal return for the sell-side is significantly higher than for either buy-side subsamples at the 1% level; there is no significant difference between the performance of buy-side managers who rely exclusively on buy-side research and those who do not.

The large sample results for portfolio managers are broadly consistent with prior research which also shows that fund managers find it difficult to earn positive abnormal returns (see Grinblatt and Titman (1989, 1993), Brown and Goetzmann (1995), Daniel, Grinblatt, Titman and Wermers, (1997), Malkiel (1997), Carhart (1997) and Wermers

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magnitude of transactions costs we also estimate sell-side recommendation performance using 0.3% transactions costs, the upper end of the range quoted by industry experts. The findings are similar to those reported.

<sup>19</sup> As reported above, the mean fund return for the sample investment firm during the period 1997 to 2004 was 2.7%. During the same period, the mean market-adjusted return for funds of firms relying exclusively on buy-side research was -2.1% and for funds at firms using a combination of buy- and sell-side research was -2.8%, confirming our conclusion that the sample firm is not a poor performer.

(2000)) and with prior studies on the performance of sell-side analysts' strong buy/buy recommendations (see Elton, Gruber and Grossman (1986), Stickel (1995), Barber, Lehavy, McNichols and Trueman (2001), and Jagadeesh, Kim, Krische and Lee (2004)). More importantly, these large-sample findings suggest that our findings that sell-side analysts out-perform analysts at the buy-side firm are likely to represent a general phenomenon.

## **7. Conclusions**

We examine analyst optimism and performance for buy-side analysts at a large, reputable money management firm relative to sell-side analysts. The evidence on analyst optimism is mixed. The buy-side firm analysts' stock recommendations are less optimistic than their sell-side counterparts, consistent with buy-side analysts facing few conflicts of interest. However, the buy-side analysts make markedly more optimistic earnings forecasts than analysts on the sell-side. Findings on the buy-side analysts' performance are remarkably consistent: their earnings forecasts are highly inaccurate, and returns for their Strong Buy/Buy recommendations are lower than those of their sell-side counterparts.

In follow-up tests we examine several explanations for the poor buy-side firm performance. We conclude that roughly one-third of the buy-side analysts' poor earnings forecast performance is attributable to the investment firm's higher retention rate for low quality analysts. The performance differences also appear to arise because the buy-side firm rates its own analysts using market-adjusted returns of their buy recommendations, rather than benchmarking against the sell-side. Since the sample period mean market-

adjusted returns for these recommendations were 3.4%, the firm's management concluded that its research adds value. Yet sell-side analysts, who are regularly benchmarked against each other, generate even higher returns from their buy recommendations. Time series tests show that immediately after Reg. FD there is a temporary decline in sell-side performance which is not matched by the buy-side, consistent with sell-side analysts having had an information advantage relative to the buy-side that is removed with the new regulation. However, we interpret this finding with caution, since the year that Reg. FD was adopted, 2000, coincided with several other significant economic events that could have affected buy- and sell-side performance. Finally, the findings do not appear to be due to differences in coverage scope, differences in truncation bias, the quality of analysts hired, or the quality of sample firm as measured by its funds' performance.

One limitation of our study is that we examine the performance of analysts at a single buy-side firm, raising questions about whether the findings can be generalized. To address this question we analyze the performance of fund managers at investment firms that report they rely exclusively on buy-side research for investment decision-making. The sample comprises an average of 340 funds at 31 investment firms per year during the period 1997 to 2005. Mean abnormal returns for the fund managers were -1.3% per year compared to 5.4% for sell-side analysts' buy recommendations. This performance difference is highly economically and statistically significant. It is also remarkably similar to the difference in abnormal returns observed for sell-side and analysts at the sample buy-side firm, indicating that findings for that firm are likely to apply to a broader sample.

Our study raises several questions for researchers and practitioners. First, the findings raise questions about why investment firms continue to fund buy-side research and do not simply rely on the sell-side. Second, given prior research on the investment performance of mutual funds, our evidence on the stock performance of buy-side recommendations is less surprising than the remarkably strong performance of the sell-side. Follow-up research is called for on whether this performance holds for longer periods, and why it has persisted during the sample period. Finally, it will be interesting to assess how services such as StarMine affect the performance of buy-side analysts as management at investment firms become better informed about the performance of their analysts relative to other buy-side firms and to the sell-side.

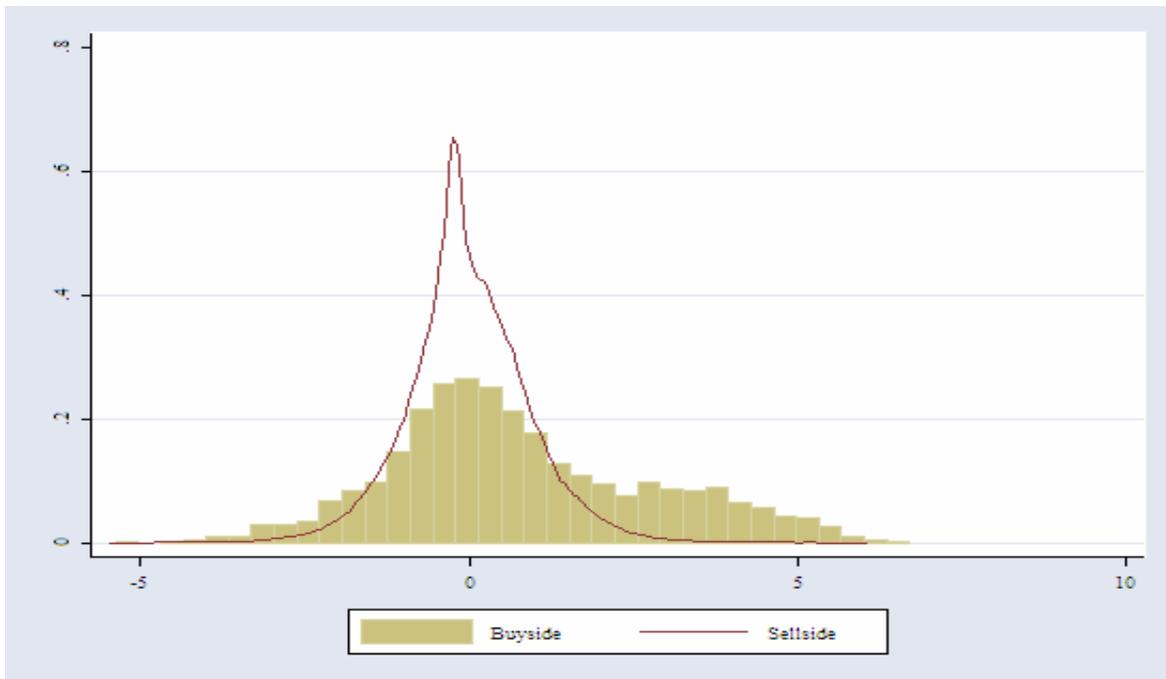
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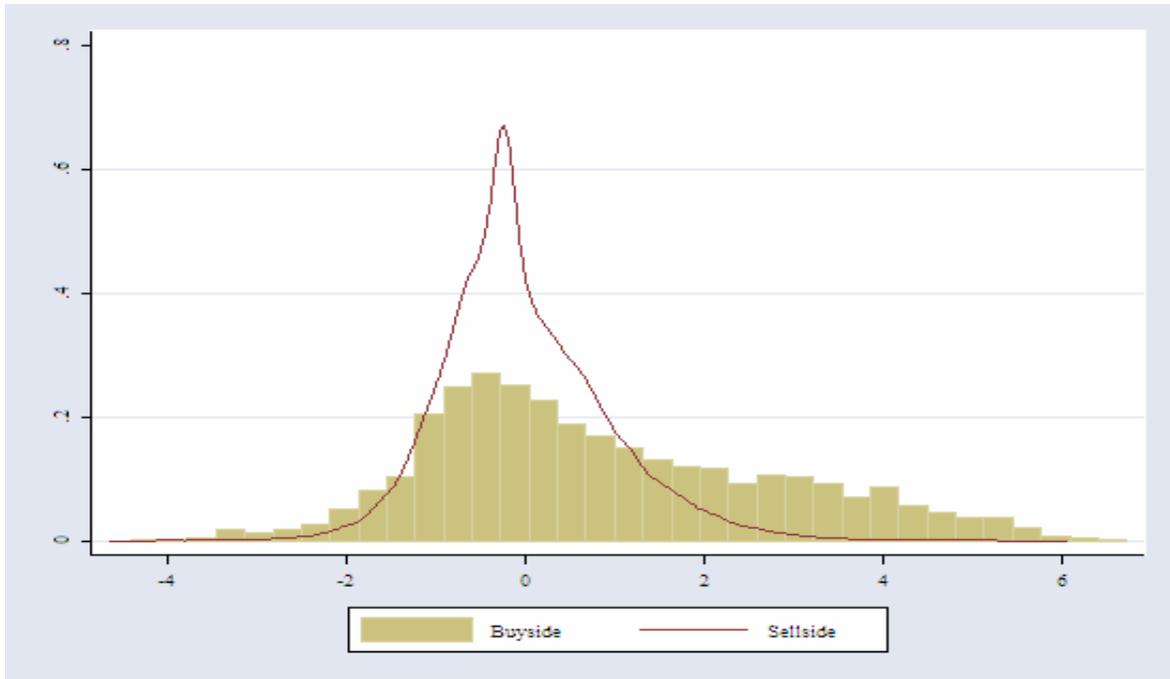
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Figure 1  
Distribution of relative earnings forecast optimism for buy- and sell-side analysts from  
the period July 1997 to December 2004<sup>a</sup>



<sup>a</sup> Relative earnings forecast optimism is the difference between an analyst's forecast and the average forecast for all analysts forecasting for the same company, quarter, and forecast horizon, deflated by the standard deviation of forecasts for the company, quarter, and horizon.

Figure 2  
Distribution of relative earnings forecast accuracy for buy- and sell-side analysts from the period July 1997 to December 2004<sup>a</sup>

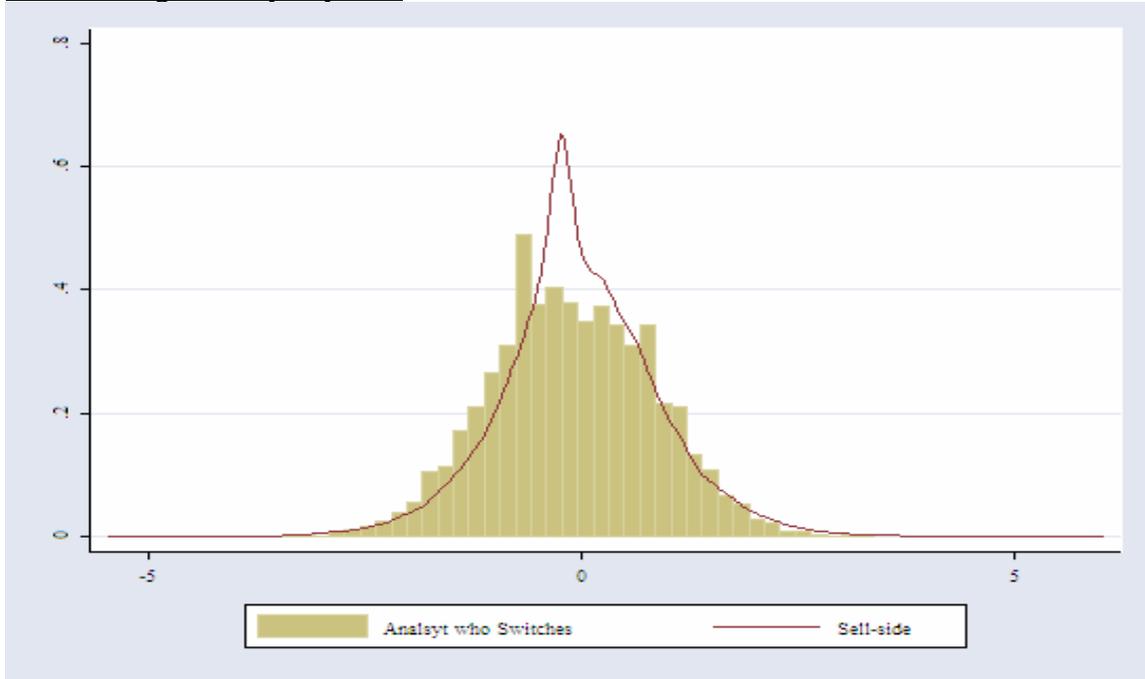


<sup>a</sup> Relative earnings forecast accuracy is the difference between an absolute value of the analyst's forecast error and the average absolute forecast error for all analysts forecasting for the same company, quarter, and forecast horizon, deflated by the standard deviation of the absolute forecast errors for the company, quarter, and horizon.

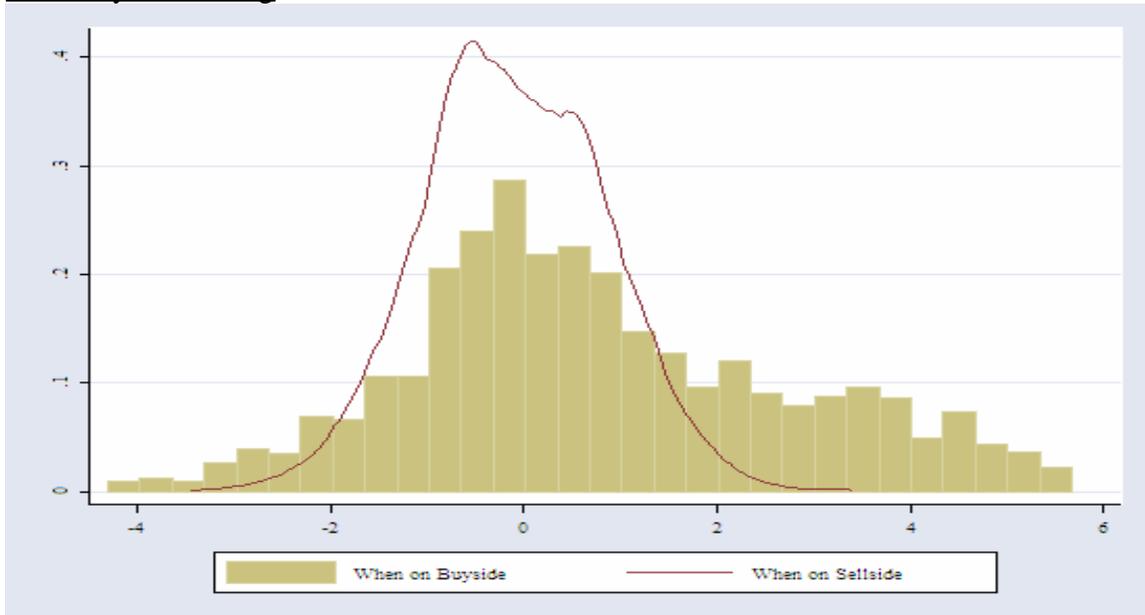
Figure 3

Distribution of relative earnings forecast optimism for buy-side analysts hired from the sell-side (before and after hiring). The sample period is January 1984 to December 2004<sup>a</sup>

Before being hired by buy-side



After buy-side hiring

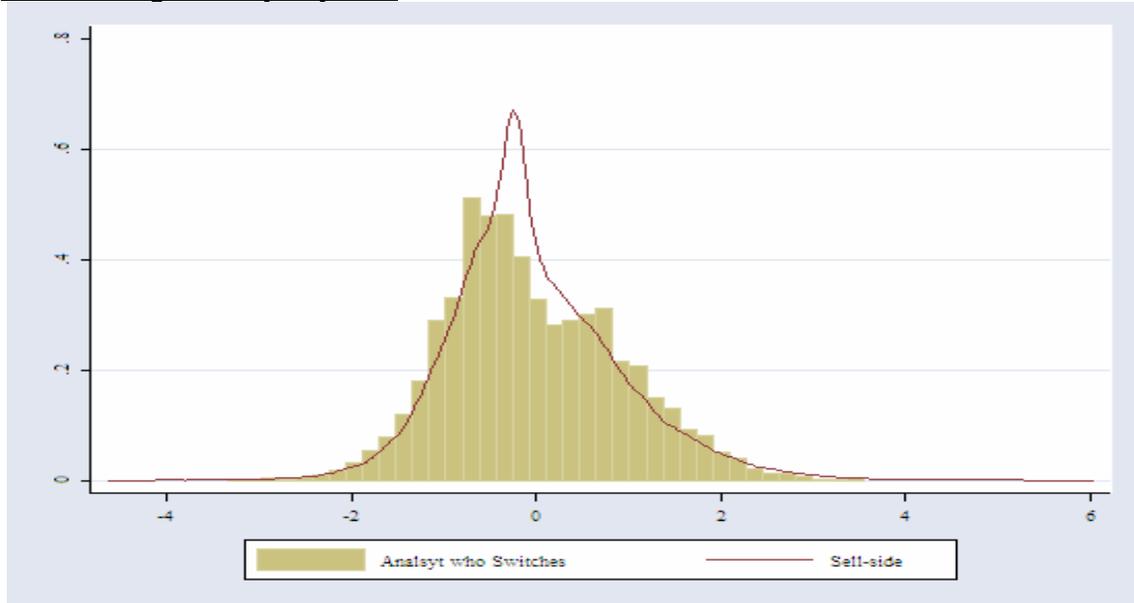


<sup>a</sup> Relative earnings forecast optimism is the difference between an analyst's forecast and the average forecast for all analysts forecasting for the same company, quarter, and forecast horizon, deflated by the standard deviation of forecasts for the company, quarter, and horizon.

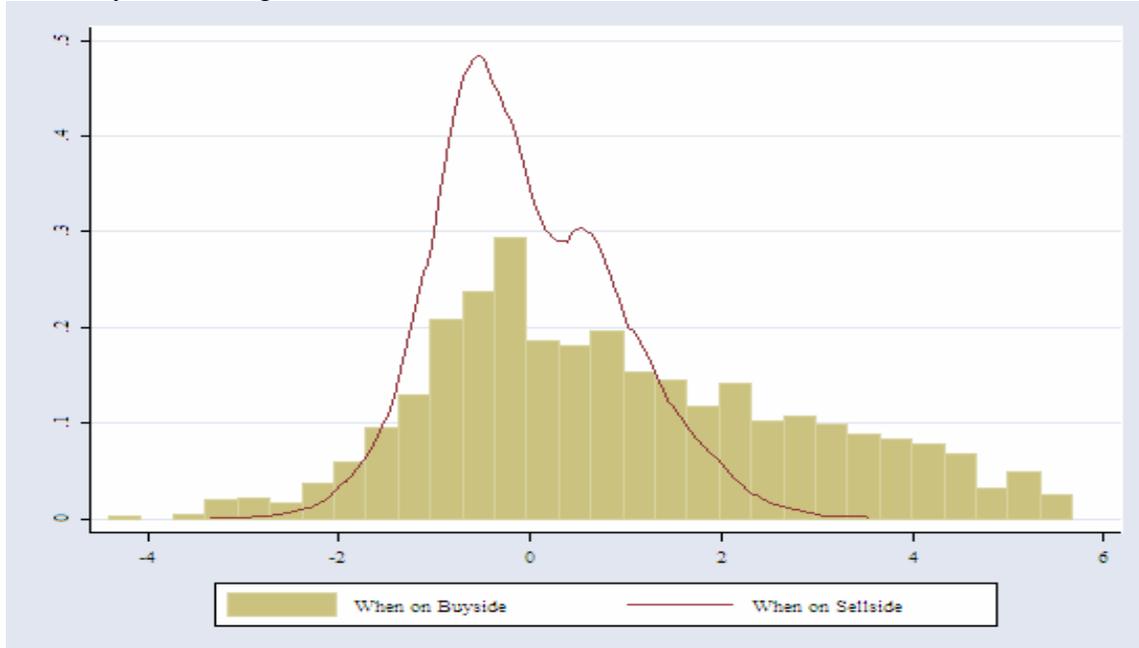
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After buy-side hiring



<sup>a</sup> Relative earnings forecast accuracy is the difference between an absolute value of the analyst's forecast error and the average absolute forecast error for all analysts forecasting for the same company, quarter, and forecast horizon, deflated by the standard deviation of the absolute forecast errors for the company, quarter, and horizon.

Table 1  
Construction of buy- and sell-side earnings forecast and stock recommendation samples.  
The sample period is July 1997 to December 2004.

	Number of forecasts/ recommendations	
	Buy-side analysts	Sell-side analysts
<i>Panel A: Earnings forecast sample</i>		
Full sample of U.S. company earnings forecasts from July 1997 to December 2004	14,641	2,623,650
Less:		
Duplicate forecasts by analyst in forecast period	5,958	1,149,483
Forecasts for firms covered by only buy-/sell-side or all forecasts for company/horizon identical	3,742	1,390,570
Forecasts with missing (negative) horizon data	347	1,857
Forecasts with missing actual earnings data	1,068	23,178
Final sample for earnings forecast tests	3,526	58,562
<i>Panel B: Stock recommendation samples</i>		
Full sample of U.S. company recommendations from July 1997 to December 2004	2,689	262,756
Less:		
Recommendations with missing company or date information	676	0
Recommendations with missing return information	0	7,642
Final sample for recommendation performance tests	2,013	255,114
Less:		
Recommendations with only one analyst covering the same company in that quarter	251	81,862
Duplicate recommendations for each quarter by same broker firm (retain first recommendation)	165	23,441
Recommendations with missing analyst experience information	227	0
Final unmatched sample for recommendation optimism tests	1,370	149,811
Less:		
Recommendations for companies not covered by both a buy- and sell-side analyst during the quarter	0	142,270
Final matched sample for recommendation optimism tests	1,370	7,541

Table 2  
Descriptive data for buy- and sell-side analysts' earnings forecast and stock recommendation samples, selected from the period July 1997 to December 2004.

	No. of analyst firms	No. of analysts	No. of stocks covered	No. of forecasts /recs.
<i>Panel A: Earnings Forecast Sample</i>				
Buy-side	1	37	337	3,526
Sell-side	298	3,184	337	58,562
Total	299	3,218 <sup>+</sup>	337 <sup>+</sup>	62,088
<i>Panel B: Recommendation Samples</i>				
Recommendation Stock Performance Sample				
Buy-side	1	46	567	2,013
Sell-side	627	8,486	8,780	255,114
Total	628	8,513 <sup>+</sup>	8,797 <sup>+</sup>	257,127
Unmatched Recommendation Optimism Sample				
Buy-side	1	46	471	1,370
Sell-side	568	7,454	4,936	149,811
Total	569	7,490 <sup>+</sup>	4,936	151,811
Matched Recommendation Optimism Sample				
Buy-side	1	46	471	1,370
Sell-side	256	2,331	471	7,541
Total	257	2,372 <sup>+</sup>	471	8,911

<sup>+</sup> Note: Columns do not sum since there is overlap between buy and sell side during sample period, as some analysts transferred from sell-side to buy-side.

Table 3  
Descriptive statistics on relative earnings forecast accuracy and optimism,  
recommendation frequency, and control variables for buy- and sell-side analysts. The  
sample period is July 1997 to December 2004.

Summary Statistics <sup>a</sup>	Buy-side analysts		Sell-side analysts	
	Mean	Std. dev.	Mean	Std. dev.
<i>Panel A: Earnings forecast sample</i>				
Relative forecast optimism ( <i>ROPT</i> )	0.78	1.98	-0.05	0.85
Relative forecast accuracy ( <i>RACC</i> )	0.85	1.93	-0.05	0.85
Forecast horizon ( <i>HORIZON</i> )	322	199	335	221
Analyst experience ( <i>AEXP</i> )	2.7	1.1	3.0	1.1
# companies covered per analyst ( <i>ACOYS</i> )	9.2	4.5	14.3	11.0
Analyst specialization in forecast stock's industry ( <i>ASPEC</i> )	35.8%	28.8%	48.9%	33.5%
# of analysts per firm ( <i>FSIZE</i> )	19.3	5.6	26.6	41.2
Firm analysts also covering stocks in forecast stock's industry ( <i>FSPEC</i> )	6.0	9.0	10.4	14.2
<hr/>				
<i>Panel B: Recommendation samples</i>				
	<u>No.</u>	<u>%</u>	<u>No.</u>	<u>%</u>
<u>Recommendation frequency for performance sample:</u>				
Buy	888	44.1%	148,993	58.4%
Hold	851	42.3%	91,150	35.7%
Under-perform	274	13.6%	14,971	5.9%
Total	2,013	100.0%	255,114	100.0%
<u>Recommendation frequency for unmatched optimism sample:</u>				
Buy	628	45.8%	85,697	57.2%
Hold	603	44.0%	55,176	36.8%
Under-perform	139	10.2%	8,938	6.0%
Total	1,370	100.0%	149,811	100.0%
<u>Recommendation frequency for matched optimism sample:</u>				
Buy	628	45.8%	4,084	54.2%
Hold	603	44.0%	2,975	39.4%
Under-perform	139	10.2%	482	6.4%
Total	1,370	100.0%	7,541	100.0%

<sup>a</sup> *ROPT* is the difference between an analyst's forecast and the average forecast for all analysts forecasting for the same company, quarter, and forecast horizon, deflated by the standard deviation of forecasts for the company, quarter, and horizon. *RACC* is the difference between the absolute value of an analyst's forecast error and the average absolute forecast error for all analysts forecasting for the same company, quarter, and forecast horizon, deflated by the standard deviation of the absolute forecast errors for the company, quarter, and horizon. *HORIZON* is the number of days between the issue of a forecast and the fiscal year end relating to the forecast. *AEXP* is the log of the number of quarters that an analyst has been publishing forecasts. *ACOYS* is the number of companies for which the analyst publishes forecasts in a given calendar year. *ASPEC* is the percentage of companies covered that the analyst covers are in the same industry as the forecast company. *FSIZE* is the number of analysts working for the firm in a given calendar year. *FSPEC* is the percentage of other analysts at the firm covering other stocks in the forecasted stock's industry during the forecast year.

Table 4

Relative earnings forecast optimism for buy-side and sell-side analysts. The sample comprises 3,526 buy-side forecasts and 58,562 sell-side forecasts made from July 1997 to December 2004<sup>a</sup>

Independent variables	Coefficient (t statistic) for forecast horizons of:						
	1-3 months	4-6 months	7-9 months	10-12 months	13-15 months	16-18 months	18+ months
Constant	-0.19 (-3.2)*	-0.54 (-5.3)*	-0.84 (-6.2)*	-1.30 (-6.2)*	-2.55 (-10.7)*	-2.57 (-9.0)*	-0.78 (-5.4)*
<i>BUYSIDE</i>	1.07 (4.3)*	0.88 (4.1)*	0.79 (2.7)*	0.78 (2.6)*	0.69 (3.4)*	0.69 (4.2)*	0.85 (3.8)*
<i>HORIZON</i>	0.0035 (6.6)*	0.0036 (6.7)*	0.0036 (6.5)*	0.0039 (6.3)*	0.0060 (11.4)*	0.0051 (9.4)*	0.0011 (5.3)*
<i>AEXP</i>	-0.031 (-2.1)	-0.022 (-1.5)	-0.027 (-1.7)	-0.014 (-0.8)	-0.003 (-0.2)	-0.028 (-1.7)	-0.018 (-1.3)
R <sup>2</sup>	6.9%	4.8%	4.2%	4.3%	4.8%	4.6%	5.9%
No. of observations	11,121	9,692	8,157	8,094	8,480	6,867	9,677

\* Significant at the 1% level using a two-tailed test.

<sup>a</sup> The dependent variable, relative earnings forecast optimism, is the difference between an analyst's earnings forecast and the average forecast for all analysts forecasting for the same company, quarter, and forecast horizon, deflated by the standard deviation of forecasts for the company, quarter, and horizon. Independent variables include a dummy variable that takes the value 1 for analysts working for a buy-side firm and zero otherwise (*BUYSIDE*), the number of days between the issue of a forecast and the fiscal year end relating to the forecast (*HORIZON*), and the log of the number of quarters that an analyst has been publishing forecasts (*AEXP*). The model is estimated using robust cluster analysis.

Table 5

Recommendation optimism for buy-side and sell-side analysts. The unmatched sample comprises 1,370 buy-side recommendations and 149,811 sell-side recommendations made during the period July 1997 to December 2004. The matched sample comprises 1,370 buy-side recommendations and 7,541 sell-side recommendations that are matched by company and quarter and made during the same period.<sup>a</sup>

Independent variables	Coefficient (t statistic)	
	Unmatched sample	Matched sample
<i>BUYSIDE</i>	-0.314 (-7.6)*	-0.289 (-6.8)*
<i>%BUY</i>	2.029 (75.0)*	1.863 (18.4)*
<i>%HOLD</i>	0.887 (34.3)*	0.830 (7.9)*
<i>AEXP</i>	-0.032 (-4.4)*	-0.027 (-1.8)
Pseudo R <sup>2</sup>	0.077	0.050
Number of observations	151,181	8,911

\* Significant at the 1% level using a two-tailed test.

<sup>a</sup> The dependent variable is coded as Under-perform/Sell, Hold and Strong Buy/Buy recommendations. Independent variables include a dummy variable that takes the value 1 for analysts working for a buy-side firm and zero otherwise (*BUYSIDE*), the percentage of Strong Buy/Buy, and Hold recommendations (*%BUY* and *%HOLD*) made by other analysts for the same company and quarter, and the log of the number of quarters that an analyst has been publishing recommendations (*AEXP*). The model is estimated using ordered Probit and robust cluster analysis.

Table 6  
 Relative earnings forecast accuracy for buy-side and sell-side analysts. The sample comprises 3,526 buy-side forecasts and 58,562 sell-side forecasts made from July 1997 to December 2004.<sup>a</sup>

Independent variables	Coefficient (t statistic) for forecast horizon of:						
	1-3 months	4-6 months	7-9 months	10-12 months	13-15 months	16-18 months	18+ months
Constant	-0.40 (-7.0)*	-1.12 (-12.1)*	-1.32 (-10.0)*	-2.36 (-11.7)*	-2.05 (-8.7)*	-2.51 (-9.1)*	-0.85 (-7.7)*
<i>BUYSIDE</i>	1.53 (10.2)*	1.36 (9.8)*	1.18 (6.1)*	0.93 (4.6)*	0.77 (4.7)*	0.76 (5.1)*	0.89 (3.7)*
<i>HORIZON</i>	0.0071 (14.2)*	0.0076 (15.3)*	0.0058 (10.8)*	0.0074 (12.4)*	0.0050 (9.7)*	0.0052 (9.7)*	0.0012 (8.4)*
<i>AEXP</i>	-0.043 (-3.2)*	-0.029 (-2.0)**	-0.050 (-3.4)*	-0.023 (-1.5)	-0.013 (-0.8)	-0.027 (-1.6)	-0.016 (-1.1)
<i>ACOYS</i>	0.0020 (2.1)**	0.0026 (2.8)*	0.0030 (2.3)**	0.0015 (1.3)	0.0013 (1.3)	-0.0003 (-0.3)	-0.0003 (-0.4)
<i>ASPEC</i>	-0.0003 (-1.1)	-0.0002 (-0.8)	-0.0004 (-1.2)	-0.0002 (-0.7)	-0.0003 (-0.7)	-0.0004 (-0.9)	-0.0003 (-0.8)
<i>FSIZE</i>	-0.0002 (-1.7)	-0.0004 (-3.0)*	-0.0003 (-2.3)**	-0.0006 (-4.3)*	-0.0006 (-3.3)*	-0.0005 (-3.6)*	-0.0001 (-0.7)
<i>FSPEC</i>	-0.0013 (-1.9)	-0.0021 (-3.0)*	-0.0017 (-1.8)	-0.0002 (-0.3)	-0.0016 (-1.9)	-0.0013 (-1.5)	0.0004 (0.4)
R <sup>2</sup>	12.8%	10.5%	8.3%	7.2%	5.1%	5.6%	6.5%
No. of observations	10,783	9,307	7,811	7,826	8,257	6,622	9,334

\* Significant at the 1% level using a two-tailed test.

\*\* Significant at the 5% level using a two-tailed test.

<sup>a</sup> The dependent variable, relative earnings forecast accuracy, is the difference between an absolute value of the analyst's forecast error and the average absolute forecast error for all analysts forecasting for the same company, quarter, and forecast horizon, deflated by the standard deviation of the absolute forecast errors for the company, quarter, and horizon. Independent variables include a dummy variable that takes the value 1 for analysts working for a buy-side firm and zero otherwise (*BUYSIDE*), the number of days between the issue of a forecast and the fiscal year end relating to the forecast (*HORIZON*), and the log of the number of quarters that an analyst has been publishing forecasts (*AEXP*), the number of companies for whom the analyst publishes forecasts in a given calendar year (*ACOYS*), the percentage of companies covered by an analyst that are in the same industry as the forecast company (*ASPEC*), the number of analysts working for the analyst firm (*FSIZE*), and the percentage of other analysts at the firm covering other firms in the forecast firm's industry during the forecast year (*FSPEC*). The model is estimated using robust cluster analysis.

Table 7  
Mean annualized equal weighted market-adjusted and calendar-time abnormal returns from investing in buy- and sell-side analysts' stock recommendations. The sample comprises 2,013 buy-side recommendations and 255,114 sell-side recommendations made in the period July 1997 to December 2004.<sup>a</sup>

	Strong Buy/Buy	Hold	Under-perform/Sell
<u>Market-adjusted returns</u>			
Buy-side analysts	3.4% *	2.3% **	3.0% **
Sell-side analysts	6.5% *	2.2% *	7.2% *
Difference	-3.2% *	0.1%	-4.3% *
<u>Calendar-time abnormal returns</u>			
Buy-side analysts	1.2%	5.3%	10.6%
Sell-side analysts	7.5% *	-1.1%	-1.2%
Difference	-6.4% **	6.4% **	10.7%

\* Significant at the 1% level using a two-tailed test.

\*\* Significant at the 5% level using a two-tailed test.

<sup>a</sup> Market-adjusted abnormal returns are the mean buy-and-hold raw returns less than the return on a value-weighted market index S&P 500 from day +1 to 250 relative to the recommendation issue date or until the recommendation is changed. Calendar time abnormal returns are computed for each recommendation portfolio by regressing portfolio returns on the market excess return, a zero-investment size portfolio return, a zero investment book-to-market portfolio return and a zero investment price momentum portfolio return from day +1 to 250 relative to the recommendation issue date. Differences in calendar-time abnormal returns for buy- and sell-side analysts are estimated by regressing the difference in portfolio returns for buy- and sell-side analysts on the four factors.

Table 8

Mean annualized equal weighted market-adjusted and calendar-time abnormal returns for funds of investment firms that report relying exclusively on buy-side research, funds for a random sample of investment firms who report using buy- and sell-side research, and sell-side analysts' strong buy/buy stock recommendations. The sample comprises an annual average of 340 funds for 30 investment firms that rely exclusively on buy-side research, 636 funds for 30 investment firms that use buy- and sell-side research, and 2,850 sell-side analysts at 297 investment banks/brokerage firms. The sample period is January 1997 to December 2005.<sup>a</sup>

	Market-adjusted returns	Calendar-time abnormal returns
Funds of investment firms who rely exclusively on buy-side research	-1.9%	-1.3% <sup>***</sup>
Sell-side analysts' strong buy/buy recommendations	6.1% <sup>***</sup>	5.4% <sup>*</sup>
Difference	-8.0% <sup>***</sup>	-6.7% <sup>*</sup>
Funds of random sample of investment firms who use both buy- and sell-side research	-2.5%	-0.8%
Sell-side analysts' strong buy/buy recommendations	6.1% <sup>***</sup>	5.4% <sup>*</sup>
Difference	-8.6% <sup>***</sup>	-6.2% <sup>*</sup>

\* Significant at the 1% level using a two-tailed test.

\*\* Significant at the 5% level using a two-tailed test.

\*\*\* Significant at the 10% level using a two-tailed test.

<sup>a</sup> The tests use monthly returns for investment firm funds and monthly returns (generated by cumulating daily returns) for sell-side analyst strong buy/buy recommendations from day +1 to 250 relative to the recommendation issue date or until the recommendation is downgraded below buy. Market-adjusted returns are mean annual buy-and-hold raw returns less the return on a value-weighted market index S&P 500. Calendar time abnormal returns are alpha estimates from regressions of portfolio returns for investment funds or sell-side analyst recommendations on the market excess return, a zero-investment size portfolio, a zero investment book-to-market portfolio and a zero investment price momentum portfolio. Returns for mutual funds are computed without adding back expenses, which averaged 1.32% per year for firms that report they rely exclusively on buy-side research, and 1.44% for the random sample. Differences in calendar-time abnormal returns for buy- and sell-side analysts are estimated by regressing the difference in portfolio returns for buy- and sell-side analysts on the four factors.

## Appendix A: Sample buy-side analyst report

<b>MOTOROLA (MOT)</b>	<b>\$21.63</b>			<b>Analyst Name</b>	Analyst Contact No.	
December 14, 2000						
	<b>Earnings Per Share</b>	<b>Previous Estimate</b>	<b>P/E Ratio</b>	<b>EBITDA</b>	<b>EV/ EBITDA</b>	<b>52-Week Price Range</b>
2001E	\$0.86	\$1.19	20.8X	\$2.55	7.8X	
2000E	\$0.84	\$0.94	21.2X	\$2.36	8.6X	27-62
1999A	\$0.63		28.5X	\$2.00	10.4X	
		<i>Current</i>	<i>Previous</i>			
<b>Opinion</b>		<b>1</b>				
Target Price		26	35	Dividend		0.16
Downside Risk		15	31	Yield %		0.90
Shares Outstanding (mil)		2,250	2,180.6			
Market Cap (mil.)		47,155.9		Book Value		9.18
S&P 500		1380		Net Debt to Capital %		20
				3-Year Growth Rate %		27
Fiscal Year Ending:	Dec					

### MOTOROLA FORECAST UPDATE

#### NEWS

Motorola (MOT, \$17 13/16, 1 Rating) pre-announced lower-than-expected results for Q4 of 2000 and revised guidance downward for Q1 of 2001. We are lowering our 4Q'00 revenue and EPS targets to \$9,968 and \$0.15, respectively (from \$10,209 and \$0.25) and dropping our FY 2000 revenue and EPS targets to \$40,162 and \$0.86, respectively (from \$43,732 and \$1.19). After speaking with MOT management this morning, we believe the softness in financial results is being affected by two of the company's largest business lines, PCS and Semiconductors. Specifically in PCS, an adverse mix shift coupled with lower-than-expected savings from cost-control initiatives led to higher-than-expected supply-chain and manufacturing costs and lower margins. In semis, the company was affected by broader macro issues (e.g., the slowing semiconductor product cycle) which drove lower-than-expected revenue and margins. The other segments are expected to report in line.

## DETAILS

	Q4'00E	2000E	Q1'00E	2001E
<b>PCS</b>				
Revs. - NEW	\$3,588	\$13,377	\$3,268	\$14,123
Revs. - OLD	3,596	13,385	3,430	14,822
Op Inc. - NEW	\$76	\$442	\$98	\$920
Op Inc. - OLD	208	574	237	1,310
<b>Semis</b>				
Revs. - NEW	\$1,705	\$7,676	\$1,520	\$7,063
Revs. - OLD	1,883	7,854	2,071	9,045
Op Inc. - NEW	\$24	\$503	(\$39)	\$206
Op Inc. - OLD	157	636	180	842
<b>Total Revs. - New</b>	<b>\$9,968</b>	<b>\$37,484</b>	<b>\$8,847</b>	<b>\$40,162</b>
Total Revs. - OLD	10,209	37,725	9,952	43,732
<b>Total Op. Inc. - New</b>	<b>\$495</b>	<b>\$2,726</b>	<b>\$427</b>	<b>\$2,948</b>
Total Op. Inc. - OLD	844	3,075	832	4,091
<b>EPS - NEW</b>	<b>\$0.15</b>	<b>\$0.84</b>	<b>\$0.12</b>	<b>\$0.86</b>
EPS - OLD	0.25	0.94	0.24	1.19

### **Personal Communications**

In PCS, the issues were substantially related to product mix and not end-market demand. MOT built up inventory in certain handset categories in anticipation of demand that materialized in other parts of its product line, leading to higher-than-expected inventory and incremental supply chain expenses. This combined with a delay in realizing manufacturing cost efficiencies contributed to the margin shortfall. That said, MOT was deliberate in reiterating its expectation for continued strength in the global demand for handsets (420 MM and 525-575 MM units in 2000 and 2001 respectively), and the company's ability to participate fully (maintain share) in that growth. Management maintained the issues in PCS are almost wholly company related. As such, we have modeled most of the impact of the revision coming out of margins and only slightly trimmed our PCS revenue expectations to reflect the possibility of modest share erosion due to product repositioning.

### **Semiconductors**

MOT, along with the rest of the industry, is now feeling the pressure of the downward cycle in semis. Owing to the high fixed-cost nature of the business as demand falls, revenues are affected and margins suffer greatly. Our newly revised model reflects both lowered revenue and margin expectations in MOT's semis business. We see the issues in this business being experienced wide industry and believe they are not endemic to MOT.

### **INVESTMENT OPINION**

Despite our newly lowered forecast, we continue to rate Motorola shares a **1**. We view these as industry issues rather than company-specific issue and believe that our basic thesis of Motorola being well-positioned to capitalize on a diversified product platform in the telecom equipment space is intact. We are now using a 12-month target of \$26 based off an updated 2002 EPS estimate of \$1.30 and a P/E of 20X (this implies a P/E of 30X on our new 2001 EPS estimate of \$0.86). We continue to see little downside in the shares at these levels and would point to the recovery today as evidence. That said, we are using an initial downside risk target of \$15.