Optimism Biases Among Brokerage and Non-Brokerage Firms' Equity Recommendations: Agency Costs in the Investment Industry

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This paper studies the investment recommendations made by brokerage and nonbrokerage firms in an effort to examine the differential agency costs across three unique recommendation production environments. Using the ACE database, recommendation production environments are categorized into national, regional, and non-brokerage firms. The results prove that differences exist between brokerage and nonbrokerage firms: 1) brokerage firms significantly inflate recommendations; 2) regional firms significantly inflate recommendations, compared to national firms; 3) brokerage firms' recommendations, compared to nonbrokerage firms' recommendations, are less credible and less predictive of future stock performance; 4) national firms have more reputational capital, and therefore, their recommendations are more predictive of investment performance than the regional brokerage firms' recommendations.

■ This paper studies the effect agency costs in the investment industry have on the level and the performance of analysts' investment recommendations. We compiled a sample of 15,653 recommendations on 1,257 corporations for which each corporation is jointly followed by national brokerage, regional brokerage, and non-brokerage firm analysts. We compare the strength of the recommendations and the ability of the recommendations to predict investment performance.[1] Prior research on analysts' recommendations has focused considerable attention on ex-post stock performance. Notable contributions can be found in Elton, Gruber, and Grossman (1986), and in particular, a recent article by Womack (1996).[2] In relating the unique production environment to the level of the recommendation, our study performs both ex-ante and ex-post analyses. Our study is closely related to the literature which has more generally investigated agent/principal relationships.[3] Parallel to the relationship between the decision-making managers who are characterized as agents for the stockholders in the corporate form of organization, analysts make recommendations as *agents* for the investors. Our

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[1]For clarity and consistency, we shall use the term "firm" to refer to the entity that produced the recommendation and "corporation," or occasionally "company," to refer to the organization that is being analyzed.

[2]For other studies that explore the ability of individual investment advisors to create abnormal returns, see Diefenback (1972); Logue and Tuttle (1973); Cheney (1970); Bjerring, Lakonishok, and Vermaelen (1983); and Bower and Bower (1991). For those studies that explore whether Value Line recommendations (which can be considered "independent" recommendations) lead to abnormal returns, see Black (1971); Kaplan and Weil (1973); Copeland and Mayers (1982); Stickel (1985); Huberman and Kandel (1987, 1990); and Affleck-Graves and Mendenhall (1992).

[3]See Jensen and Meckling (1976) on the manager/outside shareholders relationship; Leland (1978) on the mineral owner/extractor relationship; Weitzman (1980) on the government/contractor relationship; Stiglitz (1975, 1974) and Harris and Raviv (1978) on the employer/employee relationship; Baron (1982) on the issuer/investment banker relationship; Brickley, Dark, and Weisbach (1991) on the franchisor/franchisee relationship, and Starks (1987) on the investor/investment advisor relationship.

study investigates how this principal/agent relationship in the investment industry may be influenced by the production environment.

From an economic perspective, brokerage firms perform an important service by assisting corporations in raising funds. They do this by purchasing either equity or debt securities from the corporation and, in turn, reselling the securities to individual and institutional investors. A second primary task of the brokerage firm is to facilitate the transfer of seasoned securities between investors. In support of this activity, brokerage firms employ research analysts. The objective of their work seems quite simple: to identify undervalued or overvalued stocks for the benefit of investors. However, if this objective is not embraced, then agency costs occur. The simplest illustration of the source of this agency problem (of why this objective may not be embraced) is the pressure the brokerage firm may feel to inflate research recommendations in order to capture underwriting business. A number of articles in the *Wall Street Journal* illustrate this issue by referencing some insightful examples:

1)"After Mr. Salem (a former bank analyst at Prudential Securities Inc.) wrote a series of negative reports on Citicorp in 1992, Prudential executives became frustrated that the firm couldn't win lead-manager status on asset-backed bond deals by Citicorp, the nation's biggest bank and an active asset-backed issuer." (See Siconolfi, 1995.)

2) "The pressure to stay positive is most intense for analysts whose firms have investment banking business with the issuer—or want some. Dean Witter, Discover & Co. analyst Patrick McCormack had a buy rating on Kmart Corp last year (1994) when its stock was trading in the low 20s. As Kmart stock tumbled into the teens, Mr. McCormack slightly ratcheted down his rating but steadfastly refused to issue his firm's lowest recommendation. During this period, Dean Witter won a coveted co-manager role in underwriting a $503.5 million initial public offering of Kmart's OfficeMax Inc., ... Days after the OfficeMax IPO settled, Mr. McCormack lowered his rating on Kmart to swap—his firm's lowest—and an euphemism for sell." (See Siconolfi, 1995.)

3) "Peter Sidoti, former health-care analyst at Drexel, Burnham Lambert Inc., recalls the fireworks when he wrote a negative report about one of the firm's investment-banking clients. The corporate-finance department went to Mike Milken, who called up the research director and gave him hell for jeopardizing business with a corporate-finance client... While his boss stood up for him, Mr. Sidoti says in the end the report wasn't issued." (See Schultz, 1990.)

An additional article in *Euromoney* (Celarier, 1996) offers an equally inspiring example: "After 15 years spent working as a Wall Street analyst, 'the tremendous conflict of interest' Joyce Albers felt between her responsibility to investors and the demands of her firm's investment banking clients finally convinced her to leave. Although Albers was a top-rated analyst at CS First Boston, covering pharmaceutical and healthcare companies, she claims much of her time was spent following a handful of companies that were the firm's banking clients ... Albers switched last year to the buy side and now works as an analyst for the US institutional investment firm Deerfield Management, where she views Wall Street research with a healthy dose of skepticism."

These stories illustrate the existence of agency problems in the investment community; however, the academic literature has produced relatively limited work in addressing these issues. Pratt (1993), Dugar and Nathan (1995), Michaely and Womack (1997), and Lin and McNichols (1993, 1997) are exceptions. Pratt (1993) recognizes the potential conflict of interest for the brokerage firm. In effect, Pratt contends that sell recommendations may harm a brokerage firm's investment banking relationships, and, thus, they are usually discouraged by the firm's investment bankers. Dugar and Nathan (1995) investigate investment recommendations by sell-side analysts. Sell-side analysts are those who are employed by brokerage firms that sell stock in the primary or secondary market. They do not include non-brokerage firm (buy-side) recommendations in their sample. Their results compare the recommendations of sell-side analysts of brokerage firms who have underwriting relationships with the corporation being analyzed to the recommendations of sell-side analysts of brokerage firms who do not have underwriting relationships with the corporation being analyzed. In a sample of 250 corporations, they find significantly more optimistic recommendations given by the analysts who work for investment banking firms that have underwriting relationships with the corporation. However, they do not find significant differences in post-recommendation investment performance between the two analyst groups. Similarly, Lin and McNichols (1993, 1997) report that analysts offer more favorable earning forecasts and recommendations on companies that are underwriting clients (seasoned issues) to their brokerage firm. Michaely and Womack (1997) examine analysts' recommendations of 391 initial public offerings (IPOs) in 1990 and 1991. They show that

underwriters' buy recommendations of their own underwritings perform poorly, as compared to recommendations by non-underwriters, prior to, at the time of, and subsequent to the recommendation date. They attribute this finding to conflict-of-interest bias.

Our study differs from these earlier research studies in four important respects. First, we compare brokerage (sell-side) to non-brokerage (buy-side) research environments. The Lin and McNichols (1993, 1997), Michaely and Womack (1997), and Dugar and Nathan (1995) papers focus on the sell-side firms. Second, we investigate the sensitivity of the bias across three categories of analyst recommendations. According to the Analyst's Consensus Estimates (ACE) database, the institutions or environments through which research is generated can be categorized into three classes: national brokerage firms, regional brokerage firms, and non-brokerage firms.[4] Each institution presents alternative research environments and principal/agent relationships. National and regional brokerage firms, which both advise investors on which stocks to buy/sell and underwrite corporate bonds/stocks, may feel pressure to inflate recommendations in an effort to align themselves with the corporation and its management in the hope of receiving underwriting contracts.[5] Moreover, while the national and regional brokerage firms may feel pressure to inflate recommendations, the tendency to inflate recommendations may be offset by the brokerage firm's concern for the value of their reputation capital, which is partly dependent upon delivering an unbiased investment research product.[6] If national brokerage firms have relatively more reputational capital at stake, we may find their recommendations to be less biased than the recommendations of the regional brokerage firms.[7] Non-brokerage firms, which operate on the buy side, do not feel the same pressure as the brokerage firms to inflate recommendations. Third, to investigate further both the conflict-of-interest hypothesis and the reputational-capital hypothesis, we assess the ability of the three research environments to predict investment performance. This is particularly important in light of the insignificant findings of Dugar and Nathan concerning investment performance for their sample of brokerage firms. Fourth, our study utilizes a considerably larger data set (with 1,257 firms and 15,673 recommendations) than others have employed.

Our paper contributes to the existing literature through the investigation of how agency problems in the investment industry vary across three different research production environments. Our results show that significant differences do exist. First, regional and national brokerage firms, which have conflicts of interest emerging from their activities in both underwriting securities and making investment recommendations, tend to produce more optimistic recommendations than non-brokerage firms. Second, regional brokerage firms, which have less reputational

[4]Compustat defines national securities firms as those conducting a securities business throughout the nation, such as Merrill Lynch and Salomon Smith Barney. Regional securities firms are those conducting a securities business in a specific region of the country (e.g., Dain Bosworth in the Midwest and Pacific Northwest and Robert W. Baird & Co. in the Midwest). Non-brokerage research firms do not operate on the sell side (e.g., Abraham & Sons and Bhirud Associates). Nelson's *Directory of Investment Research* provides a listing of brokerage firms, divided into national and regional, and non-brokerage research firms.

[5]Another possible source of pressure on analysts to report positive recommendations emerges from the trading operation of the brokerage firm. Simply stated, it is understood to be easier to market securities that have a higher rating because every investor can respond to a buy recommendation but only the investors that are holding the particular stock can respond to sell recommendations (Lakonishok and Maberly, 1990). Consequently, analysts may inflate recommendations in order to generate more commissions. Support for this explanation is found in the literature. However, there are reasons why the agency issue associated with the role of brokerage firms in both underwriting and recommending securities is important. First, Lin and McNichols (1993, 1997) and Michaely and Womack (1997) find that brokerage firms that have underwriting relationships with corporations do issue more favorable analyses. This finding can not be explained by the desire to generate more commissions. Second, if generating more commissions were the sole motivation, the size of the corporation would explain the variations in the recommendations, but not the research environment (e.g., national vs. regional brokerage firms). This is because stocks of larger corporations normally are more heavily traded. The fact that we find that the research environment is a dominant explanatory variable in an ordered-logistic analysis where the size of a corporation is also included as a control variable supports our main hypothesis.

[6]Economists have long considered reputations to be private devices which assure contract performance (Hayek, 1948). For a theoretical exposition on the importance of reputational capital, see Klein and Leffler (1981). Our argument is also consistent with the empirical findings of Carter and Manaster (1990), in which prestigious underwriters, to maintain their reputation, only market IPOs of low-dispersion firms. Consequently, a significant negative relationship is found between prestige and the magnitude of IPO price run-up.

[7]The authors interviewed two equity analysts during our investigation of the significance of any differences between the environments. The first analyst worked for a regional brokerage firm and subsequently in a money management position. His opinion was simply that the regional brokerage firms have to "try harder" to get the corporate finance business. The second analyst, who worked for a national brokerage firm as an analyst and now is in a management position at a regional brokerage firm, echoed similar sentiments. As a further investigation into the issue of the relative importance of reputational capital for regional as compared to national firms, the authors used Nelson's *Directory of Investment Research* to classify brokerage firms as national or regional. Then reputational capital rankings were assigned based upon the paper by Carter, Dark, and Singh (1998). The results show that the national brokerage firms have significantly greater reputational capital.

capital to protect, tend to inflate their recommendations as compared to national brokerage firms. Third, we find a greater tendency for non-brokerage firm recommendations to predict investment performance accurately than either the national or regional brokerage firm recommendations. Fourth, we find that national brokerage recommendations are more credible and, therefore, more capable of predicting investment performance than recommendations made by the regional brokerage firms.

The rest of the paper is organized as follows. Section I discusses the data sources and methodology. Section II reports descriptive statistics, contingency tables, univariate analyses, and the results we obtained from ordered-logistic and ordinary-least-squares (OLS) regression analyses. Section III provides our conclusions.

I. Data Sources and Methodology

We gathered the sample of firms employed in this study from the ACE database produced by Compustat for December 1994. The tape provides information on 4,547 companies, more than 2,300 analysts, and more than 200 brokerage and non-brokerage firms. However, to be included in our study, sample firms were also required to have financial data available on the Compustat and the CRSP databases. Moreover, in order to reduce potential problems associated with market segmentation, we further limit the sample to those companies that are followed by all three types of firms.[8] This resulted in a sample of 1,257 companies and 15,673 recommendations.[9]

To study the significance of the principal/agent problem in the investment industry, we investigate four hypotheses:

Hypothesis 1 (Conflict-of-Interest Hypothesis—Ex-Ante Test): Due to the conflict of interest resulting from brokerage firms both underwriting securities for companies and making investment recommendations to investors, we expect the recommendations made by both national brokerage firms and regional brokerage firms to be more optimistic than those made by non-brokerage firms.

Hypothesis 2 (Conflict-of-Interest Hypothesis—Ex-Post Test): In the absence of a conflict of interest, we expect non-brokerage firm recommendations to be more credible and, therefore, offer better predictive ability than comparable recommendations generated by brokerage firms. We expect post-recommendation stock performance to be more closely related to the non-brokerage recommendations.

Hypothesis 3 (Reputational-Capital Hypothesis—Ex-Ante Test): Due to varying degrees of allegiance to the corporation and varying levels of reputational capital, we expect the recommendations made by national brokerage firms and regional brokerage firms to differ. Because national brokerage firms have more reputational capital to protect, we expect national brokerage firm recommendations to be more conservative as compared to regional brokerage firm recommendations.

Hypothesis 4 (Reputational-Capital Hypothesis—Ex-Post Test): Because the national brokerage firms have more reputational capital to protect, we expect their recommendations to be more credible than regional brokerage recommendations and, therefore, to exhibit better investment performance predictive ability.

We test these hypotheses using contingency tables, univariate analysis, ordered-logistic regression analysis, and OLS regression analysis.[10] Employing contingency tables and chi-squared statistics, we test for dependence between the strength of the recommendations and the type of environment out of which the recommendations are generated. Simple, univariate analyses allow us to compare the recommendations and to compare the predictive ability of the recommendations across the three research environments.

We employ ordered-logistic regression analysis to model the strength of the recommendations as a function of the research environment and various control variables. Greene (1997) reports this methodology to be popular for analyzing bond ratings. The ordered-recommendation variable, REC, takes on the values 1, 2, or 3 to signify sell, hold, or buy opinions. The parameters of the model are estimated using an iteratively reweighted least-squares algorithm (SAS, 1991). The variables included in the logistic model are chosen based upon a stepwise selection procedure using a chi-squared statistic with a 0.05 level of confidence for both entry and retention of a variable in the model. Our second multivariate methodology employs simple OLS regression to study

[8]Market segmentation means that national brokerage firms, regional brokerage firms, and non-brokerage firms may each tend to follow particular segments of the market. Consequently, differences in recommendations could result from this market segmentation.

[9]The ACE database reports recommendations by company, but we wrote a program to reshape the data so that individual recommendations could be studied.

[10]We employed an ordered-logistic analysis because, although the dependent variable is discrete, the multinomial logit model fails to account for the ordinal nature of the dependent variable (see Zavonia and McElvey, 1975, and Marcus and Greene, 1985).

the performance of the investment recommendations.

A. The Variables

To conduct these various univariate and multivariate analyses, we defined the following variables and obtained/derived the information to calculate them from the ACE, Compustat, and CRSP tapes:

REC = a discrete ordering variable set equal to 3 for a buy, 2 for a hold, or 1 for a sell;

RECnat = a discrete variable for investment recommendations made by national brokerage firms; it is equal to 3 for a buy, 2 for a hold, or 1 for a sell;

RECreg = a discrete variable for investment recommendations made by regional brokerage firms; it is equal to 3 for a buy, 2 for a hold, or 1 for a sell;

RECnon = a discrete variable for investment recommendations made by non-brokerage firms; it is equal to 3 for a buy, 2 for a hold, or 1 for a sell;

DIFFnat-reg = $\underline{\text{REC}}$nat - $\underline{\text{REC}}$reg; where $\underline{\text{REC}}$ represents mean value of REC;

DIFFreg-non = $\underline{\text{REC}}$reg - $\underline{\text{REC}}$non;

DIFFnat-non = $\underline{\text{REC}}$nat - $\underline{\text{REC}}$non;

G = analysts' earnings growth rate forecast;

BETA = beta of the firm's common stock;

DIV = dividend yield on the stock;

NUM = number of analysts following the company;

PE = analyst's forecasted PE ratio;

PEIA = analyst's forecasted PE ratio minus industry average PE;

MVBV = ratio of the market value of equity to the bok value of equity;

DUMNAT = dummy variable which takes on the value 1 if a national brokerage firm generated the recommendation and 0 otherwise;

DUMREG = dummy variable which takes on the value 1 if a regional brokerage firm generated the recommendation and 0 otherwise;

DUMNON = dummy variable which takes on the value 1 if a non-brokerage firm generated the recommendation and 0 otherwise; and

PERF = Sharpe performance measure (i.e., reward-to-variability ratio), which is calculated as a) the difference between the daily post-recommendation return on the stock and the daily risk-free rate over the three-month period from 12/15/94 through 3/15/95 divided by b) the standard deviation of the return series. The daily risk-free rate is the 3-month T-bill yield.

B. Data

REC is a discrete variable that quantifies the strength of the investment recommendations: 3 represents a buy, 2 represents a hold, and 1 represents a sell. RECnat, RECreg, and RECnon are similarly defined for subsamples of the recommendations provided by the national brokerage firms, the regional brokerage firms, and the non-brokerage firms, respectively. The growth rate (G) is obtained from the ACE database where it represents analysts' consensus forecast of the earnings growth rate. The PE variable, also taken from the ACE database, is analysts' consensus forecasted PE ratio where price is the stock price per share and earnings is the forecasted earnings per share. PEIA is the difference between the firm's PE ratio and the industry PE ratio, which is defined for the two-digit SIC codes for the 1,257 firms in the sample. We estimated beta for each stock by employing a standard market model using daily CRSP data from December 31, 1993 through December 31, 1994. We calculate the dividend yield (DIV) by dividing the annual dividend by the market price of the company's common stock. We calculated the MVBV variable by dividing the market price of the stock by the book value of shareholders' equity. Total assets, dividends, market share price, shares outstanding, and book value of equity were taken from the Compustat tapes as of December 31, 1994. We employ ACE's definition of national, regional, and non-brokerage firms. National brokerage firms have offices throughout the country. Regional brokerage firms have offices

within a specific region of the country. Non-brokerage firms do not work on the sell side. PERF represents a performance measure, which we use to compare the credibility of the recommendations across the different production environments.

C. Methodology

To test Hypotheses 1 and 3 (ex-ante analysis), we select possible *explanatory variables* for inclusion in the ordered-logistic analysis based upon the factors considered in our discussion of the agency problem in the investment industry and a survey of investment valuation models. To measure the agency problems, we define dummy variables that capture the environmental effects: DUMNAT is equal to 1 if the recommendation is generated by a national brokerage firm and 0 otherwise; DUMREG is equal to 1 if the recommendation is generated by a regional brokerage firm and 0 otherwise; and DUMNON is equal to 1 if the recommendation is generated by a non-brokerage firm and 0 otherwise. We also consider additional investment valuation variables in the model as control variables. These variables are based upon three popular models that have been suggested to structure investment analysis: the discounted dividend model (DDM), the PE ratio model (PEM), and the market-value-to-book-value ratio model (MVBVM). Using the DDM, the explanatory variables may include the analysts' consensus growth forecast (G), the risk surrogate (BETA), and the dividend yield (DIV).[11] Alternatively, using the PE ratio model (PEM), a firm with a low PE ratio relative to the industry average may be considered to be undervalued. A third competing model to the DDM and the PEM is the market-value-to-book-value ratio model (MVBVM). Fama and French (1992) conjecture that the market-value-to-book-value ratio plays a more important role in determining security returns than systematic risk. Finally, the model includes NUM, which is defined as the number of analysts providing recommendations per company, and industry dummy variables, which are defined by two-digit SIC codes. The variable NUM offers a measure of the amount of information in the market on a particular company and tests for the possibility that recommendations are influenced by "herd" effects, where a positive recommendation by one analyst results in more positive recommendations by other analysts.[12] The industry dummy variables control for systematic preferences by analysts toward particular industries.

The ordered-logistic model with all possible *explanatory variables* can therefore be represented as:

$$\begin{aligned}\text{Probability (REC} = 1,2,3) \\ = f(&G, DIV, BETA, PEIA, MVBV, \\ &NUM, DUMREG, DUMNON, \\ &\text{Industry Dummy Variables}) \quad (1)\end{aligned}$$

Because DUMNAT is left out as the reference variable in Equation (1), Hypothesis 1 would be supported if the coefficient of DUMNON is negative and significant; Hypothesis 3 would be supported if the coefficient of DUMREG is positive and significant.

Hypotheses 2 and 4 argue that the credibility of the recommendations, as measured by the ability to predict the post-recommendation stock returns, is a function of the environment out of which the recommendations are generated. To perform this ex-post analysis, we use simple OLS regressions to model the performance measure. If non-brokerage firms produce more credible recommendations than brokerage firms, then the investment performance should be more closely related to the recommendations of non-brokerage firms than brokerage firms. If national brokerage firms have relatively more reputational capital to protect, then we may observe less biased recommendations by national brokerage firm analysts as compared to regional analysts and, consequently, a superior predictive ability for the national brokerage firm recommendations. We use a series of dummy variables to measure the strength and the source of the recommendations. For example, we define BUYNAT to be equal to 1 if the recommendation was a buy and the recommendation was generated by a national brokerage firm; otherwise, BUYNAT is equal to 0. Also, SELLNAT is equal to 1 if the recommendation was a sell and the recommendation was generated by a national brokerage firm. In a similar fashion, HOLDNAT corresponds to hold recommendations by national brokerage firms, and BUYREG, HOLDREG, SELLREG, BUYNON, HOLDNON, and SELLNON are defined similarly for regional brokerage firm recommendations and for non-brokerage firm recommendations in our sample. The performance model is

$$\begin{aligned}PERF = f(&BUYNAT, SELLNAT, BUYREG, SELLREG, \\ &BUYNON, SELLNON) \quad (2)\end{aligned}$$

Because HOLDNAT, HOLDREG and HOLDNON are left out of the models, the parameter estimates for the

[11]We are not explicitly estimating intrinsic values of stocks in the regression analysis. Rather, we are examining, for example, other things held constant, if a higher-growth-rate firm is preferred over a lower-growth-rate firm.

[12]Because the number of analysts is highly correlated with firm size ($\rho = 0.75$), the variable NUM also reflects some of the size effect. We employ the variable NUM because we believe it is more informative than the size variable. Our results did not change when NUM was replaced by a size measure (the logarithm of the market value of equity).

dummy variables can be compared to a hold recommendation. Stronger parameter estimates for the non-brokerage firm dummy variables (BUYNON and SELLNON) and weaker parameter estimates for the national and regional brokerage firm dummy variables (BUYNAT, SELLNAT, BUYREG and SELLREG) would furnish support for Hypothesis 2.[13] Stronger parameter estimates for the national brokerage firm dummy variables (BUYNAT and SELLNAT) and weaker parameter estimates for the regional brokerage firm dummy variables (BUYREG and SELLREG) would furnish support for Hypothesis 4.

II. Empirical Results

This section reports the empirical results.

A. Descriptive Statistics and Univariate Analysis

We performed various univariate tests of our hypotheses. Table 1 presents descriptive statistics, Table 2 provides a contingency table, and Table 3 contains simple univariate analyses of the classification variable, REC, and the performance measure, PERF. Table 1 reports the mean, standard deviation, minimum value, and maximum value of the variables described in Section I. The quantified recommendation variable (REC) has a mean of 2.49 with a standard deviation of 0.57. Since the REC value for a "hold" recommendation is 2, a mean REC of 2.49 suggests more favorable recommendations than unfavorable recommendations. This is consistent with prior studies that find that brokerage firms tend to make more buy recommendations than sell recommendations. The average beta is 1.13 with a standard deviation of 0.54. The average number of analysts per company is 16.70, with a standard deviation of 7.69. The dividend yield for the average firm is 2.46%; the average market-value-to-book-value ratio is 2.60; the average forecasted growth rate is 13.24%; and the average industry-adjusted PE ratio is -2.84.[14] Over the ex-post analysis period from December 15, 1994 to March 15, 1995, the Sharpe performance measure has a mean level of 4.25.

In Table 2, we report the results using a contingency table. The rows of the table show the three different sources for the recommendations. The columns show the strength of the recommendations. Each cell reports both the raw number of recommendations and the frequency of each recommendation by type of brokerage or non-brokerage firm. For example, national brokerage firms have made 3,671 buy recommendations, which comprise 51.02% of their total recommendations. The analysis suggests that differences do exist among the three classes of firms. The chi-square statistic, which tests for the relationship between the strength of the recommendation and the type of firm making the recommendation, is 420.88, which is significant at the 0.001 level.[15] Moreover, through a casual analysis of individual cells in the table, the source of the dependency emerges. For example, for "buy" recommendations, both national brokerage firms (51.02%) and regional brokerage firms (59.41%) have a higher percentage of their recommendations in this category than non-brokerage firms (39.82%). Similarly, for "sell" recommendations, both national brokerage firms (2.99%) and regional brokerage firms (2.55%) have a lower percentage of their recommendations in this category than non-brokerage firms (9.24%). This suggests that differential agency problems may exist between the brokerage firms and the non-brokerage firms with the non-brokerage firms furnishing more conservative recommendations. This finding supports Hypothesis 1. In relating national brokerage firms to regional brokerage firms, we find little difference in the frequency of their "sell" recommendations (2.99% vs. 2.55%). However, larger differences exist in their "buy" recommendations (51.02% vs. 59.41%). These preliminary results suggest that national brokerage firms offer more conservative recommendations than regional brokerage firms, which supports Hypothesis 3.

In Table 3 Panels A and B, we report the results of univariate tests to determine whether:

1) RECnat, RECreg, and RECnon are significantly different from each other. DIFFreg-nat measures the difference between RECreg and RECnat; DIFFreg-non measures the difference between RECreg and RECnon; and DIFFnat-non measures the difference between RECnat and RECnon.

2) Buy and sell recommendations exhibit differential performance across the three classes of firms making them.

In Table 3 Panel A, the mean values of the investment recommendation variable are reported separately for

[13]Womack (1996) found sell recommendations made by brokerage firms to be meaningful. Our analysis allows us to re-test these findings. Because an agency problem tends to skew the recommendation positively, a sell recommendation by the brokerage firm may in fact be credible and informative.

[14]The mean value of the industry-adjusted PE is not zero because the industry-adjusted PE is defined over the sample of firms, and not all firms have the same number of recommendations.

[15]We also developed contingency tables and chi-square tests using exhaustive two-level combinations of the environmental category (for example, we excluded the non-brokerage firm category). In each of these tables, the dependency between the environment and the level of the recommendation is highly significant. The results are available from the authors.

Table 1. Descriptive Statistics

In this table, REC is a qualitative variable that measures the strength of the investment recommendation. REC equals 3 for a buy, 2 for a hold, or 1 for a sell. BETA measures the systematic risk of a stock, NUM is the number of analysts per company, DIV is the dividend yield, MVBV is the ratio of market-value-to-book-value of equity, G is the forecasted growth rate of earnings, PE is the forecasted price-to-earnings ratio, PEIA is the industry-adjusted PE ratio, and PERF is the Sharpe performance index.

Variable	N	Mean	Std. Dev.	Min.	Max.
REC	15,653	2.49	0.57	1.00	3.00
BETA	15,653	1.13	0.54	-0.25	3.82
NUM	15,653	16.70	7.69	3.00	38.00
DIV	15,653	0.02	0.02	0.00	0.12
MVBV	15,653	2.60	4.68	-110.00	65.80
G	15,653	13.24	6.60	-2.00	56.00
PE	15,653	15.74	67.35	-477.08	2,238.00
PEIA	15,653	-2.84	65.08	-521.00	2,102.00
PERF	15,653	4.25	6.17	-25.72	28.48

Table 2. Contingency Table—Environment by Recommendation

This table reports the recommendations made by securities analysts at each type of firm in our sample. For example, national brokerage firms made 3,671 "buy" recommendations. The respective percentages of buy, hold, and sell recommendations are reported below the raw numbers. For example, national brokerage firms reported 51.02% of their recommendations as "buy". The chi-square statistic measures the relationship between the environment (national brokerage firm, regional brokerage firm, or non-brokerage firm) and the strength of the recommendations (buy, hold, or sell).

Frequency (Percentage)	BUY	HOLD	SELL
National Brokerage	3,671 (51.02%)	3,309 (45.99%)	215 (2.99%)
Regional Brokerage	3,733 (59.41%)	2,390 (38.04%)	160 (2.55%)
Non-Brokerage	866 (39.82%)	1,108 (50.94%)	201 (9.24%)

the national brokerage, regional brokerage, and non-brokerage firms. For the 7,195 national brokerage recommendations, the mean value of REC is 2.4803. For the regional brokerage firms, the mean value of REC is 2.5687. For the non-brokerage firms, the mean value is 2.3057.[16] Since both DIFFreg-non and DIFFnat-non are significantly positive, recommendations generated by non-brokerage firms are more conservative than those provided by the national and regional brokerage firms. Moreover, DIFFreg-nat is positive and significantly different from zero, which shows that, on average, recommendations by regional brokerage firms are significantly more optimistic than recommendations by national brokerage firms. Therefore, we find that agency costs vary across the three types of firms. The sign and magnitude of the REC variables support the notion that securities recommended by regional brokerage firms receive the strongest ratings followed by national brokerage firms and finally non-brokerage firms. The results reported in Table 3 Panel A continue to be supportive of Hypotheses 1 and 3.

In Table 3 Panel B, we find that buy recommendations outperform sell recommendations when the full sample is tested. Buy recommendations have a higher Sharpe performance measure (PERF). Interestingly, when we separately measure the differential buy/sell performance for the three classes of firms, we find that the non-brokerage firms have the strongest ability to predict differential performance. Their PERF differential is 2.08, which is significantly

[16]The mean of RECnon is significantly greater than 2 (a hold recommendation), which could be due to the optimism in the market during this time period.

Table 3. Comparison of Recommendations Across Production Environments

In this table, REC is a qualitative variable measuring the strength of the investment recommendation. REC is 3 for a buy, 2 for a hold, or 1 for a sell. RECnat, RECreg, and RECnon are measures of the strength of recommendations for the subsamples of recommendations made by national brokerage firms, regional brokerage firms, and non-brokerage firms. DIFFreg-nat tests for the difference between recommendations made by regional and national brokerage firms. Similar tests are performed using DIFFnat-non and DIFFreg-non. t-tests for REC, RECnat, RECreg, and RECnon determine whether the variable differs significantly from 2 (a "hold" recommendation) while t-tests for DIFFreg-nat, DIFFreg-non, and DIFFnat-non determine whether the variable is significantly different from zero.

Panel A. Comparison of the Strength of the Recommendations Across Production Environments

Variable	N	Mean	Std. Dev.	t-Statistic	p-Value
REC	15,653	2.4897	0.5704	108.12***	0.00
RECnat	7,195	2.4803	0.5563	73.25***	0.00
RECreg	6,283	2.5687	0.5443	82.82***	0.00
RECnon	2,175	2.3057	0.6303	22.62***	0.00
DIFFreg-nat	———	0.0884	———	9.29***	0.00
DIFFreg-non	———	0.2630	———	18.62***	0.00
DIFFnat-non	———	0.1746	———	12.42***	0.00

This panel of the table offers a comparison of the performance (PERF) of buy and sell recommendations across the three analyst categories. PERF is the Sharpe performance measure; BUY and SELL represent portfolios of buy and sell recommendations by analyst category—national brokerage analysts, regional brokerage analysts, and non-brokerage analysts. t-statistics test for the difference between the mean performance of the buy and sell recommendations for a given category of analyst.

Panel B. Comparison of the Performance of Recommendations Across Production Environments

Category	BUY	SELL	DIFF	t-Statistic
ALL	4.3035	3.2044	1.0991	4.04***
National	4.2717	3.2032	1.0685	2.44***
Regional	4.2321	3.8888	0.3433	0.67
Non-brokerage	4.7458	2.6609	2.0849	4.25***

***Significant at the 0.01 level.

different from zero at the 0.01 level. The national brokerage firm recommendations have the next strongest ability to distinguish performance. Their PERF differential is 1.07, which is statistically significant at the 0.01 level. The regional recommendations have the weakest ability to distinguish performance with differentials between buy and sell recommendations that are insignificantly different from zero at the 0.10 level.

Overall, the results presented in Table 3 Panel A and Table 3 Panel B support Hypotheses 1 through 4, which in turn are consistent with the conclusions reached earlier based upon the contingency table. To summarize, our results support two arguments. 1) Due to the conflict of interest between the research arm and the corporate finance arm within brokerage firms, the recommendations of brokerage firms are more optimistic and less credible at predicting investment performance than the recommendations of non-brokerage firms. 2) Due to the relative levels of reputational capital, the recommendations of regional brokerage firms are more optimistic and less credible at predicting investment performance than the recommendations of national brokerage firms. These conclusions, however, are based upon univariate analyses, which do not allow for the proper control of other variables. In the next section, we use multivariate techniques to test Hypotheses 1 through 4 further.

B. Multivariate Analysis: Ordered-Logistic Regression Analysis of Recommendations

In this section, we test Hypotheses 1 and 3 (ex-ante analysis) employing ordered-logistic analysis. The

results are reported in Table 4.[17]

In the ordered-logistic analysis, we employed a stepwise procedure to select the best explanatory variables. We find that the forecasted growth rate (G), the dividend yield (DIV), the number of analysts (NUM), the environmental variables (DUMNAT, DUMREG, and DUMNON), and 15 industry dummy variables significantly enter the final model. Systematic risk (BETA), P/E ratio (PEIA), and market-value-to-book-value (MVBV), however, are excluded from the model as a result of the stepwise selection procedure.

The positive signs for both G and NUM were anticipated. The higher the forecasted growth rate, the stronger the brokerage recommendations, which is consistent with the contention of the discounted dividend model. The positive parameter estimate on NUM is also consistent with a "herd" effect among analysts in which positive recommendations by one analyst encourage more positive recommendations by other analysts. The negative sign for DIV may be consistent with market-timing arguments where high-growth firms (low dividend yield) are preferred if an up-market is anticipated.[18] Importantly, all agency variables are statistically significant at the 0.01 level and have the expected signs. In Model 1, DUMNON is withheld as a reference group, and the parameter estimates on both DUMNAT and DUMREG are positive and significant, which shows that brokerage firms tend to make more optimistic recommendations than non-brokerage firms. The magnitude of the parameter of DUMREG (0.8918) is greater than that of DUMNAT (0.63) indicating that regional brokerage firms do produce more optimistic recommendations than the national brokerage firms, other things held constant. Similarly, by withholding DUMREG as the reference group in Model 2, we find that national brokerage firms and non-brokerage firms make more conservative recommendations than regional brokerage firms. Finally, by withholding DUMNAT as a reference group in Model 3, we find that regional brokerage firms make more optimistic recommendations and non-brokerage firms make less optimistic recommendations than national brokerage firms. We attribute these differences in recommendations to:

1) the conflict of interest that exists in brokerage firms that both underwrite securities for corporations and make investment recommendations for investors; and

2) the differences in the amount of reputational capital between regional and national brokerage firms.

The results support Hypotheses 1 and 3, and this conclusion is consistent with those derived from the contingency tables and the univariate analysis.[19]

C. Multivariate Analysis: OLS Regression Analysis of Recommendation Performance

In the previous section, we obtained results supporting Hypothesis 1 and 3, which argues that ex-ante recommendations by the brokerage firms are significantly inflated as compared to those of non-brokerage firms, and that regional firms produce more optimistic recommendations than national brokerage firms. However, it is of equal interest to study how well these ex-ante opinions predict ex-post stock performance. Therefore, in this section we test Hypotheses 2 and 4, which posit that non-brokerage firm recommendations are more credible than the brokerage firm recommendations, and that, due to reputational capital concerns, national brokerage firm recommendations are more credible than regional brokerage firm recommendations. We calculate the post-recommendation stock performance using the daily stock returns from December 15, 1994 to March 15, 1995 (90 days in total). We chose December 15, 1994 as the beginning date because the recommendations used in the study were released by Compustat on that date. We did not test longer-term performance because it might be affected by recommendation revisions and/or other factors. The measure of performance we used is the Sharpe performance index (PERF), which adjusts for the riskiness of the stock.

In Table 5, we report the results we obtained from modeling the investment performance of the 15,653 recommendations. The regressions control for the research environment through a series of dummy variables. For example, BUYNAT and SELLNAT control for whether the recommendation was a buy or a sell and whether it came from a national brokerage firm or another firm. BUYREG, SELLREG, BUYNON, and SELLNON are similarly defined for regional brokerage

[17]We also conducted stepwise multiple discriminant analysis to determine which variables best discriminate among the three levels of recommendations. A variable is included in the model if it meets the 0.05 level of confidence using an F-test. Variables that entered the final step function are: growth rate (G), dividend yield (DIV), systematic risk (BETA), and most importantly, environmental dummy variables (DUMNAT, DUMREG, and/or DUMNON). These results are basically consistent with those reported using the ordered-logistic regression analysis.

[18]If an up-market is defined as "a period during which the equity market earned a return exceeding the T-bill return," 1995 satisfies the definition. Of course, the ex-post outcome has little bearing on ex-ante expectations.

[19]We also investigated the sensitivity of the ex-ante conclusions to the chosen time period studied by pooling recommendations using the ACE recommendations released on December 15, 1994 and on December 14, 1995. After controlling for the difference in conditions between the two time periods using a dummy variable, we find results comparable to those in Table 4.

Table 4. Stepwise Ordered-Logistic Regression Analysis Results

The following ordered-logistic regression models of individual analyst recommendations use an ordinal dependent variable (REC) with three levels: buy, hold, and sell. A stepwise procedure was used to identify the variables in the model. G measures forecasted growth rate; DIV is the dividend yield; and NUM is the number of analysts per company. To capture agency effects, DUMNAT, DUMREG, and DUMNON are dummy variables representing recommendations made by national brokerage firms, regional brokerage firms, and non-brokerage firms, respectively. A total of 15 industry dummies are included in the models based upon the stepwise procedure. The intercept parameters and the parameters of the industry dummies are not reported for ease of presentation, and are available from the authors. -2 Log L tests the joint significance of all the parameters in the model. Wald statistics are reported below each parameter estimate.

Variable	Model 1	Model 2	Model 3
G	0.0428	0.0428	0.0428
	(139.95)***	(139.95)***	(139.95)***
DIV	-11.5293	-11.5293	-11.5293
	(133.93)***	(133.93)***	(133.93)***
NUM	0.0163	0.0163	0.0163
	(51.03)***	(51.03)***	(51.03)***
DUMNAT	0.6300	-0.2619	
	(159.85)***	(53.18)***	
DUMREG	0.8918		0.2619
	(303.72)***		(53.81)***
DUMNON		-0.8918	-0.6300
		(303.72)***	(159.85)***
Industry Dummies	Yes	Yes	Yes
-2 Log L	25,694	25,694	25,694
	(1,409)***	(1,409)***	(1,409)***

***Significant at the 0.01 level.

firms and non-brokerage firms. In Model 1, BUYNAT is positive but not statistically significant; SELLNAT is negative and significant at the 0.01 level. Therefore, the national brokerage firms seem credible with their sell recommendations in predicting weak performance; however, their buy recommendations have little explanatory power during the sample period. In Model 2, neither BUYREG nor SELLREG is statistically significant at the 0.10 level, and BUYREG even has the wrong sign. Therefore, the regional brokerage firm recommendations are not credible, and they carry no explanatory power for either buy or sell recommendations during the sample period. In Model 3, both BUYNON and SELLNON are statistically significant at the 0.05 level and have the right signs. Therefore, the non-brokerage firm recommendations are credible and capable of predicting both strong and weak performance. Model 4 includes all the dummy variables, and the results are consistent with the first three models. In addition to the level of statistical significance, the magnitude of the parameters is also of interest. The fact that the coefficient of BUYNON (0.4781) is greater than that of BUYNAT (0.0039) and BUYREG (-0.0356) suggests a pecking order for buy recommendation credibility. The same argument also applies to the sell recommendations. The coefficient of SELLNON (-1.6069) is greater in magnitude than those of SELLNAT (-1.0645) and SELLREG (-0.3789). Overall, therefore, Table 5 provides support for Hypothesis 2 to the extent that the non-brokerage firm recommendations are more credible and offer better predictive ability than the brokerage firm recommendations. Table 5 also supports Hypothesis 4 to the extent that the national brokerage firm recommendations offer the ability to predict weak performance while the regional recommendations offer neither the ability to predict weak nor strong performance.[20] This last conclusion is consistent with Womack's (1996) that sell recommendations are more informative.

Overall, the ex-post results reinforce the ex-ante results and support the Conflict-of-Interest Hypothesis (Hypotheses 1 and 2) and the Reputational Capital

[20]We also employed total return as a performance measure over a 90-day window. We obtain similar results to those reported in the paper. In order to control for possible heteroskedasticity, we also modified the variance/covariance matrix following the approach discussed in White (1980). Very little difference emerges from these adjustments. The test results are similar to those reported in the paper and the conclusions do not change. These additional results are available from the authors.

Table 5. Estimation of OLS Regression Models of the Sharpe Performance Measure

In this table, the estimations are expressed as a function of individual analyst recommendations. Stock performance, as measured by the Sharpe index, is explained as a function of the strength and the source of 15,653 analyst recommendations for 1,257 companies. The Sharpe index is defined as 1) the daily stock return minus the daily risk-free rate on a three-month treasury bill divided by 2) the standard deviation of the stock returns. The analyst recommendations are classified into three categories: buy, hold, and sell. A series of nine dummy variables is created to test the possibility of agency effects. For example, BUYNAT is equal to 1 if the recommendation was a buy and the recommendation was generated by a national brokerage firm; BUYNAT is equal to 0 otherwise. BUYNON is equal to 1 if the recommendation was a buy and the recommendation was generated by a non-brokerage firm; BUYNON is equal to 0 otherwise. HOLDNAT, HOLDREG and HOLDNON, representing the hold recommendation, are withheld in each model to allow for estimation. The analysis uses a sample of companies which are followed by all three classes of firms. t-statistics are provided beneath the parameter estimates inside the parentheses.

Variable	Model 1	Model 2	Model 3	Model 4
Intercept	4.2590 (74.92)***	4.2573 (74.85)***	4.2398 (83.07)***	4.2678 (57.13)***
BUYNAT	0.0126 (0.11)	———	———	0.0039 (0.03)
SELLNAT	-1.0558 (-2.49)***	———	———	-1.0645 (-2.49)***
BUYREG	———	-0.0251 (-0.22)	———	-0.0356 (-0.28)
SELLREG	———	-0.3684 (-0.75)	———	-0.3789 (-0.77)
BUYNON	———	———	0.5061 (2.35)**	0.4781 (2.15)**
SELLNON	———	———	-1.5789 (-3.61)***	-1.6069 (-3.64)***
R^2 (%)	0.04	0.00	0.12	0.16

***Significant at the 0.01 level.
**Significant at the 0.05 level.

Hypothesis (Hypotheses 3 and 4). Our results are similar to the results found in Michaely and Womack (1997), who find that IPOs recommended by their underwriters underperform IPOs recommended by nonunderwriters.[21] The results of our ex-ante analyses are also consistent with those of Lin and McNichols (1997), who find, for a sample of seasoned equity offerings, that lead and co-underwriter analysts' recommendations are more favorable than those of

[21]We also investigated the sensitivity of the ex-post conclusions to the time period chosen by pooling the recommendations and performance measures using the ACE recommendations released on December 15, 1994 and on December 14, 1995. After controlling for the difference in market conditions between the two time periods using a dummy variable, we find in modelling the performance measure (PERF):

1) the coefficient estimate for BUYNON (0.6513) is significantly greater than the coefficient estimate for BUYNAT (0.3681), which in turn is greater than the coefficient estimate for BUYREG (0.2697);

2) the coefficient estimate for SELLNON (-1.2358) is not significantly different from the coefficient estimates for SELLNAT (-1.5888) and SELLREG (-0.6651);

3) the coefficient estimate for SELLNAT (-1.5888) is significantly different from the coefficient estimate for SELLREG (-0.6651).

These results are consistent with those reported in the paper. In essence, the buy recommendations of the non-brokerage firms are not contaminated by bias, and there is, therefore, a stronger association between their buy recommendations and investment performance than is the case for the brokerage firms. Moreover, the buy recommendations of the national brokerage firms are influenced by reputational capital considerations, and there is, therefore, a stronger association between their buy recommendations and investment performance than is the case for the regional brokerage firms. The lack of statistical significance found when comparing the sell recommendations of the brokerage firms and non-brokerage firms is consistent with the conclusions reached in the paper. The recommendation bias is skewed toward the buy recommendations. In effect, this additional finding is also consistent with Womack's (1996) finding that sell recommendations are more informative.

unaffiliated analysts. [22]

III. Conclusion

This study investigates whether analyst recommendations depend upon the type of institution that makes the recommendation and, therefore, the unique agency issues associated with each institution. A sample of 1,257 companies was chosen in which each sample company is jointly followed by analysts from national brokerage firms, regional brokerage firms, and non-brokerage firms. A total of 15,673 investment recommendations were identified for the sample companies.

We employed a number of alternative methodologies. We found that the recommendations produced by both national brokerage firms and regional brokerage firms tend to be significantly more optimistic and less valuable in predicting future investment performance than those produced by non-brokerage firms in our sample. Furthermore, we found that the recommendations produced by regional brokerage firms tend to be significantly more optimistic and less useful in predicting future investment performance than those generated by national brokerage firms. These results lead to two important conclusions:

1) Brokerage firms that have an existing relationship with a corporation or that wish to improve their relationship with the corporation in order to increase their chances of capturing underwriting business exhibit a bias in their investment recommendations. The agency problems associated with corporate underwriting relationships are not a part of the environment within which the non-brokerage research firms operate.

2) Regional brokerage firms, as compared to national brokerage firms, have less reputational capital to protect and, thus, have a greater tendency to align themselves with the corporation in order to improve their chances of capturing underwriting contracts. They exhibit a greater optimistic bias in their investment recommendations than national brokerage firms.

Overall, the empirical evidence presented in this paper supports our hypotheses, which, taken together, make a case for the existence of agency problems in the investment industry and call into question the dual role of brokerage firms in both issuing and recommending securities. Therefore, the study has interesting implications for investors, both institutional and individual, as well as regulatory authorities. A recent National Association of Securities Dealers (NASD) warning against "spinning" of IPO shares, in which investment banks allocate hot new stocks to executives in an effort to gain underwriting business, appears to echo our findings. ■

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[22]The ex-post conclusions in this study are based upon the ACE database, which is uniquely valuable to the extent it covers the recommendations of both brokerage and non-brokerage firms. However, it also contains limitations to the extent that our ex-post analysis must be performed at the single point in time when ACE releases the recommendations. If the post-recommendation returns are sensitive to the precise timing of the recommendations, any bias that results from this problem would actually favor the rejection of our hypothesis. That is, "stale" information, if it exists and presents a problem, will only weaken the relationship between the strength of the recommendations and the post-recommendation returns. The fact that we find significant relationships between sell recommendations and stock returns for both national brokerage firms and non-brokerage firms (and between buy recommendations by non-brokerage firms and stock returns) reinforces our conclusions.

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