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The Performance of Analysts with a CFA® Designation: The Role of Human-Capital and Signaling Theories

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ABSTRACT: This study compares the performance of sell-side equity analysts with and without a Chartered Financial Analyst® (CFA) designation. Using a large sample of forecasts, our tests indicate that CFA charterholders issue forecasts that are timelier than those of non-charterholders. The results for accuracy are mixed. We establish that while charterholders perform at statistically significant higher levels than non-charterholders in some tests, the economic significance of these differences is questionable. For a subsample of analysts, we find evidence that charterholders improve along the dimension of timeliness after they receive their CFA charter. This result provides support for a human-capital explanation in which charterholders improve their productivity during the CFA program. Finally, we show that the market reaction for smaller firms is stronger for charterholders than non-charterholders after controlling for timeliness, boldness, accuracy, and optimism. This result provides evidence consistent with "credentialism," a variant of signaling theory in which a professional's education level provides a signal about the professional's quality to his or her clients.

Keywords: *analyst forecasts; analyst performance; human capital; signaling; credentialism.*

Data Availability: *Data are available from sources identified in the paper.*

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I. INTRODUCTION

Financial professionals, broadly defined to include analysts, investment managers, traders, brokers, financial executives, accountants, and academics, can choose to join CFA Institute. Passing a series of examinations, along with meeting other criteria, earns them the right to be called a Chartered Financial Analyst (CFA) charterholder (hereafter, charterholders). The demand for the CFA designation has grown tremendously in recent years. According to CFA Institute (2006a, 2006b, 2008), there were 10,000 charterholders in 1990. As of 2008, more than 89,000 charterholders work in 134 countries and 92,000 candidates were enrolled to take the CFA examinations. Given their large numbers, CFA charterholders and candidates wield significant influence in the global capital markets and financial decisions of corporations. For example, in the United States, regulators have awarded special status to charterholders.[1]

Our research objective is to understand the economic role of the CFA designation. In particular, this article compares sell-side equity analysts with a CFA charter to those without one. We consider two non-mutually exclusive theories of education to explain the CFA phenomenon. The human-capital view, as illustrated by Mincer (1974) and Becker (1975), is that people improve their productivity as a result of the knowledge and skills they acquire as part of their education. In our setting, this theory leads to an expectation that charterholders acquire additional financial knowledge and skills via the CFA program, which in turn leads to improved performance. The signaling view of education, presented in Spence (1973), Arrow (1973), and Stiglitz (1975), characterizes an equilibrium in which individuals obtain costly educational credentials correlated with their innate ability. An external party conditions its decision on the individual's education signal because it cannot easily observe the individual's innate ability. In the case of the CFA charter, analysts acquire the designation to signal their ability, and external parties use the CFA designation as a cue when making decisions about the analysts. Both theories lead to a prediction that, all else being equal, charterholders achieve higher levels of performance than do other analysts. Our first set of analyses tests this prediction.

Rich and publicly available data on analysts allow us to explore performance-related hypotheses about charterholders. We use the term ''performance'' broadly to include properties of forecasts studied in the analyst literature. Our two primary measures of performance are timeliness and accuracy, which measure the ability of analysts to use and generate information. We also study boldness, which along with timeliness measures analysts' independence and herding behavior. Our fourth measure is optimism, which is related to accuracy and captures whether the forecast is unbiased. For all four measures, we conduct a multivariate regression analysis. For the three measures excluding timeliness, we also use a matched-pair design in which we directly match charterholder and non-charterholder forecasts for the same firm, the same forecast period, and the same day. Controlling for the day of the forecast is particularly important because less-skilled analysts can simply wait a day and mimic the forecasts of more skilled analysts. In all tests, we compare analysts with a CFA charter to those without a charter, controlling for firm and time effects. The sample underlying these tests includes 798,272 annual forecasts for 4,920 firms issued by 909 charterholder and 2,794 non-charterholder analysts for the period January 1, 1999 to December 31, 2005. All our tests include controls for the forecast horizon, size of the

[1] As of March 2005, a NASD rule approved by the SEC requires all sell-side analysts to pass a Research Analyst Qualification Examination (NASD 2004). Those analysts who have passed Level I and Level II of the CFA examination are exempted from the Analysis section (Part I) of the NASD exam.

analyst's brokerage firm, firm-specific experience, forecast frequency, and the number of companies and industries followed.

We find evidence that charterholder forecasts are timelier than those of non-charterholders. The results for accuracy are mixed. Charterholders' forecasts are more accurate if we control for the day of the forecast and less accurate if we do not. There is some evidence that charterholders act more boldly and less optimistically. While we establish that charterholders perform at statistically significant higher levels than non-charterholders in some tests, the economic significance of these differences is questionable. The actual differences in empirical performance measures are in the range of 4 percent or less. This result is interesting because of the significant time and effort that people spend to become charterholders. This relative lack of economic significance could simply be because analysts obtain the CFA designation and training to overcome a relative deficiency with respect to other analysts. Non-charterholders could have acquired skills in accounting, finance, and economics via M.B.A. or undergraduate business degrees. Non-charterholders could also have degrees and skills more relevant to particular industries. For example, they could have degrees such as a Ph.D. or M.D., industry work experience, or a large network of industry contacts.

In our next set of analyses, we take advantage of our unique setting to measure performance both *before* and *after* charterholders obtain their CFA designation to attempt to determine whether one or both theories of education can explain the CFA phenomenon. In this set of tests, we restrict the sample to charterholders with forecasts available in both a pre- and post-CFA period. We match each charterholder with a non-charterholder who begins and ends forecasting in the same year and who is employed by a broker closest in size to the charterholder's employer at the beginning of the period. Through this matching we control for experience and broker size. We are able to successfully match 519 charterholders with a non-charterholder. These tests focus on timeliness and accuracy as our two primary performance measures.

In the period prior to charterholders obtaining their CFA designation, the forecasts of future charterholders are timelier than non-charterholder forecasts. Since this result is sensitive to the exclusion of forecasts issued in the three years immediately before attaining the CFA charter, it is not possible to completely attribute this difference to signaling theory. We also find evidence that charterholders become timelier relative to non-charterholders in the period after obtaining their charter. These results provide support for a human-capital explanation, in which CFA charterholders improve their productivity during the CFA program. We find no evidence consistent with either signaling or human capital theory when examining analyst accuracy.

In the last analyses, we investigate whether investors condition their decisions on whether analysts hold a CFA designation. Abnormal returns surrounding forecast revisions suggest that investors react more strongly to analyst forecasts issued by charterholders than those issued by non-charterholders, after controlling for timeliness, accuracy, boldness, and optimism. This finding holds for smaller firms only, which represent a less economically important group of firms. This overall result is consistent with the idea of ''credentialism,'' a variant of signaling theory put forward by Lazear (1977), in which a professional's education credentials provide signals to his or her clients.

This paper contributes to the literature in four ways. First, we contribute to the literature that has studied whether various *ex ante* mechanisms such as Institutional Investor All-Star team selection (e.g., Stickel 1992) or prior performance (e.g., Sinha et al. 1997) predict the future performance of sell-side analysts. The CFA designation provides some potential

advantages over these other measures. Since it is based on standardized tests administered by one organization, it is objective; it is also an option available to all analysts, including those who work for small brokerage firms.

Second, our results speak to the debate in theories of education. Although much research has been conducted on the role of primary school, secondary school, and university programs, research on the role of professional training and credentials is scarce. Furthermore, the extant educational literature provides only weak or mixed evidence in support of both human-capital and signaling theories. In contrast, our research setting provides unique tests of both theories by measuring performance both before and after the professional training. In addition we contribute to the limited research on credentialism.

Third, this study complements the limited literature on charterholders. The majority of this research studies buy-side analysts, uses small samples, and makes no attempt to determine alternative explanations for the popularity of the CFA designation.[2] Fourth, as mentioned above, the CFA designation is available to individuals who work in a variety of financial roles. In our particular setting, the benefits of signaling are reduced because sell-side analysts operate in the public domain and because much of their output (e.g., forecasts) is quantifiable and can be measured against benchmarks (e.g., actual earnings or forecasts issued by other analysts). The CFA designation as a signaling mechanism could be more important for professionals who operate in fields in which their output is intangible or private.

Section II provides an overview of the literature on the human-capital and signaling theories of education. It develops our hypotheses about the role of these theories in explaining the CFA phenomenon. Sections III and IV discuss our sample and variables, respectively. Section V presents our regression and matched-forecast pair tests. The pre- and post-CFA matched-analyst tests are presented in Section VI. In Section VII we provide some additional analyses showing that investors condition their price reaction on the CFA ''signal.'' The last section concludes. The Appendix contains variable definitions.

II. THEORIES OF EDUCATION AND HYPOTHESIS DEVELOPMENT

While more traditional forms of education, such as primary, secondary, and university schooling have been examined, research on the value of professional credentials such as the CFA designation is scarce. To earn the CFA charter, financial professionals must pass a series of three examinations taken in sequential levels, have at least four years of acceptable investment-related professional work experience, and join CFA Institute and comply with all its membership policies. CFA Institute estimates that candidates spend approximately 250 hours preparing for each examination. Since charterholders exert significant effort to complete the program, they must have an expectation that the CFA designation provides some benefit. As mentioned above, both human-capital and signaling theories predict that the CFA designation should be associated with higher-productivity analysts. Our first hypothesis is (in alternative form):

[2] A small literature on charterholders exists, but none of these studies examine sell-side analysts and all use small samples. Shukla and Singh (1994) study the performance of 223 equity mutual funds for the period July 1988 to December 1992. They find that the funds managed by at least one CFA-designated manager were riskier but better diversified, and outperformed on a risk-adjusted basis the funds with no charterholder managers; however, on average they did not outperform the S&P 500 benchmark index. Brockman and Brooks (1998) find that growth over time in the aggregate number of charterholders is positively related to growth in the value of the S&P 500 Index from 1963 to 1995. Based on a survey from 41 U.S. public-sector pension fund administrators, Miller and Tobe (1999) find that the pension funds that employ one or more charterholders as part of their investment management team have lower total investment management costs on average than those that do not employ charterholders; however, they do not examine the relative performance of plan assets.

H1: *Ceteris paribus*, analysts with a CFA designation achieve higher levels of performance compared to analysts who do not hold a CFA designation.

While it is well established in the education literature that more-educated workers have higher productivity, *ceteris paribus*, labor economists such as Weiss (1995) and Riley (2001) have long debated the role of signaling and human-capital theories in explaining this relation. In general, results from studies that try to distinguish between the two theories are weak or mixed.[3] In our setting, we have the advantage of being able to directly measure performance both before and after analysts obtain their CFA designation. Signaling theory predicts that individuals who have higher innate ability will use education to signal this ability. We use performance prior to the CFA program as a proxy for innate ability to test whether signaling is an explanation for the CFA phenomenon. We formalize this in a signaling hypothesis (in alternative form):

H2: Analysts with a CFA designation achieve higher levels of performance in the period prior to obtaining their CFA designation, relative to analysts who do not hold a CFA designation.

The human-capital view of education is that people improve their productivity as a result of the knowledge and skills they acquire as part of their education. If improved human capital is part of the reason analysts obtain a CFA designation, then the performance of charterholders should improve over the period that they obtain their CFA charter. Our human-capital hypothesis is (in alternative form):

H3: Analysts with a CFA designation achieve higher levels of performance in the period after obtaining their CFA designation compared to the prior period, relative to analysts who do not hold a CFA designation.

This hypothesis is in the form of changes, in which we take advantage of the pre-CFA period performance measure to control for differences in innate ability.

III. SAMPLE

Data

From the I/B/E/S Detail History database for the period from January 1, 1999 to December 31, 2003, we generate a list of unique analyst-broker names. For each analyst we search Investext (or if necessary, First Call) for one of his/her reports published after January 1, 1999. If an analyst includes (does not include) the CFA mark after his/her name, then the analyst is placed in the charterholder (non-charterholder) sample. Those analysts for whom we could not find a report are excluded. We exclude analyst teams, which could consist of both charterholders and non-charterholders. The sample after this process includes a total of 4,380 analysts, of which 1,017 are charterholders and 3,363 are non-charterholders. We obtain stock return data and SIC codes from CRSP.

[3] For example, Boissiere et al. (1985) and Chevalier et al. (2004) find empirical support for predictions specific to human-capital theory, while Altonji (1995) and Chiswick et al. (2003) do not. In the case of signaling, Riley (1979) and Miller et al. (2004) present evidence supporting the theory, while contrary results have been presented by Layard and Psacharopoulos (1974), Psacharopoulos (1979), Wolpin (1977), and Chevalier et al. (2004).

Sample of Firms and Forecasts

We require that sample firms be domiciled in the United States and have data available from both I/B/E/S and CRSP for the period January 1, 1999 to December 31, 2005 to calculate our variables. We limit our study to annual forecasts issued within the two-year period prior to the annual earnings announcement date. Each firm in the sample must have at least one charterholder and at least one non-charterholder covering it to mitigate the possibility that our test results are due to charterholders and non-charterholders simply selecting different firms to follow. These restrictions result in a sample of 798,272 forecasts issued for 4,920 firms, of which 227,472 (570,800) forecasts were issued by 909 charterholders (2,794 non-charterholders).

IV. VARIABLE DESCRIPTION AND MEASUREMENT

Measures of Analyst Performance

Timeliness: Following Cooper et al. (2001), our measure of analyst timeliness is based on the pattern of forecasts surrounding the forecast of interest. For each forecast in our sample, we compare the number of days between it and the forecasts by other analysts that precede and follow it. *Leading Days*$_{ijkt}$ (*Following Days*$_{ijkt}$) equals the total number of days between analyst *i*'s forecast of firm *j*'s fiscal period *k* earnings issued on day *t* and the two most recent preceding (following) forecasts of firm *j*'s fiscal period *k* earnings by any other analyst. The *Timeliness* of each forecast is *Leading Days*$_{ijkt}$ scaled by *Following Days*$_{ijkt}$.[4] A timelier forecast is consistent with two scenarios: (1) other analysts reacting to the news in analyst *i*'s forecast, or (2) some public event occurring and analyst *i* interpreting and analyzing the news more quickly than other analysts. In contrast, a less-timely forecast is more consistent with analyst *i* either reacting to the forecasts of other analysts, or interpreting and analyzing the same public news as other analysts, but at a slower rate. As in Cooper et al. (2001), our estimates of *Leading Days* and *Following Days* for a given analyst forecast exclude any additional forecasts by that analyst during the pre- or post-release periods. If another analyst issues a forecast on the same day it is excluded from the computation of *Leading Days*$_{ijkt}$ and *Following Days*$_{ijkt}$.

Accuracy: Analyst forecast accuracy is the absolute value of the forecast error (forecasted EPS less actual EPS reported by I/B/E/S), multiplied by −1 so that higher values of *Accuracy* are associated with more accurate forecasts. Many studies have previously investigated analyst accuracy; some examples are Sinha et al. (1997), Mikhail et al. (1997, 1999), Clement (1999), Jacob et al. (1999), Brown and Mohd (2003), Clement and Tse (2003, 2005), and Malloy (2005).

Boldness: The greater the degree to which an analyst's forecast revision deviates from the pre-revision consensus estimate, the more bold the forecast. Boldness is the absolute value of the forecasted EPS less the consensus EPS. Studies that investigate analyst boldness include Hong et al. (2000), Gleason and Lee (2003), and Clement and Tse (2005).

Optimism: We measure the optimistic bias in analysts' forecasts using the signed forecast error. Analyst optimism is well documented in studies such as Brown (2001), Gu and

[4] Cooper et al. (2001) provides an example calculation. Analysts C and D issue forecasts that precede analyst *i*'s forecast by 10 and 9 days respectively, so that *Leading Days* equals 19. In contrast, analysts X and Y's forecasts follow quickly, 1 and 2 days respectively, after analyst *i*'s forecast so that *Following Days* equals 3. *Timeliness* for this example is 6.33 (i.e., (10 + 9)/(1 + 2)) and analyst *i*'s forecast would be considered timely. Now assume that the opposite pattern of forecasts holds. In this case *Timeliness* is 3/19, consistent with a less timely forecast.

Wu (2003), and Richardson et al. (2004). Studies that investigate the reasons for this optimism include Francis and Philbrick (1993), McNichols and O'Brien (1997), Das et al. (1998), Lin and McNichols (1998), Michaely and Womack (1999), and Dechow et al. (2000).

Analyst Characteristics

Prior research such as Clement (1999), Clement and Tse (2003, 2005), and Malloy (2005) documents that differences in analyst performance can be partially explained by analyst characteristics. Analysts' characteristics are defined as follows. *Fcst Horizon* is the number of days from analyst *i*'s forecast on day *t* to firm *j*'s fiscal period *k* end date. *Broker Size* is the number of analysts employed by the brokerage firm employing analyst *i* in the 12-month period prior to day *t*. *Fcst Frequency* is the total number of firm *j* forecasts for fiscal period *k* made by analyst *i*. *Firm Experience* is the number of years from the first forecast day of firm *j* earnings by analyst *i* to day *t*.[5] *Companies* is the number of companies followed by analyst *i* in the 12-month period prior to day *t*. *Industries* is the number of unique two-digit SICs of all the companies followed by analyst *i* in the 12-month period prior to day *t*.

Variable Standardization

To facilitate comparisons across observations, we follow Clement and Tse (2003, 2005) and standardize each of the performance and characteristic variables to range from 0 to 1 using a transformation that maintains the relative distances between each variable's measures for firm *j* in fiscal year *k*. A high value for the standardized variable indicates that on day *t*, analyst *i* attains a high value for that variable relative to other analysts who issue forecasts of firm *j*'s fiscal period *k* earnings. This standardization results in a relative measure for all analysts who follow the same firm for the same fiscal period and thus controls for systematic firm year differences in the variables.

Descriptive Statistics

Table 1, Panels A and B present the distribution of the analyst characteristics variables before and after they are standardized, respectively. The measures are first calculated per forecast and then aggregated by analyst. When calculating the mean, median, and differences, each analyst contributes one observation. The means and medians, broken out separately for charterholders and non-charterholders, are generally similar to those in previous studies by Clement and Tse (2003, 2005) with the following exceptions. The average brokerage size is larger in our study than in previous studies. Untabulated analysis indicates that this is due to the later time period of our sample. The forecast horizon is greater and the forecast frequency is higher in our study because previous studies limit their samples to the last forecast made by the analyst per firm year. The differences between charterholders and non-charterholders are presented in the last columns. Charterholders issue forecasts with longer horizons, work for smaller brokerage firms, forecast more frequently, have

[5] We use firm-specific experience throughout our tests. An alternative measure used by Clement (1999) and Clement and Tse (2005) is general experience, which is likely correlated with analyst age and is defined as the number of years of analyst forecasting experience for any firm. General experience is highly correlated with firm-specific experience. Untabulated analysis reveals that the correlation coefficient between these two measures is 0.72. Our test results are unchanged if we include general experience as an additional control variable.

TABLE 1
Descriptive Statistics
Analyst Characteristics

Characteristic	Charterholders (n = 909) Mean	Charterholders (n = 909) Median	Non-Charterholders (n = 2,794) Mean	Non-Charterholders (n = 2,794) Median	Difference Mean	Difference t-statistic	Difference Median	Difference z-statistic
Panel A: Raw (Not Standardized) Analyst Characteristics[a]								
Fcst Horizon	267.5	271.3	261.6	269.1	5.9***	2.91	2.2**	2.14
Broker Size	62.1	43.9	73.5	54.0	−11.4***	−5.28	−10.1***	−4.39
Fcst Frequency	4.6	4.5	4.5	4.3	0.1	1.28	0.2***	2.54
Firm Experience	1.8	1.1	1.4	0.9	0.4***	6.32	0.2***	6.91
Companies	10.4	10.0	9.3	8.8	1.1***	4.69	1.2***	6.00
Industries	3.3	2.9	2.8	2.3	0.5***	7.01	0.6***	7.13
Panel B: Standardized Analyst Characteristics[b]								
Fcst Horizon	0.4759	0.4630	0.4697	0.4576	0.0062	1.21	0.0054	1.58
Broker Size	0.3718	0.3037	0.4193	0.3501	−0.0475***	−3.92	−0.0464***	−3.28
Fcst Frequency	0.4134	0.4371	0.3858	0.4000	0.0276***	3.57	0.0371***	3.99
Firm Experience	0.3039	0.2806	0.2622	0.2262	0.0417***	5.75	0.0544***	6.42
Companies	0.3152	0.2945	0.2699	0.2258	0.0453***	5.11	0.0687***	5.62
Industries	0.3402	0.3126	0.2786	0.2405	0.0616***	6.44	0.0721***	6.52

***, **, * Indicate significance at the 1 percent, 5 percent, and 10 percent levels respectively. Variables are defined in the Appendix.

This table reports descriptive statistics about analyst characteristics for both CFA charterholder and non-charterholder analysts. The underlying sample of forecasts consists of 798,272 forecast observations for 4,920 firms over the period January 1, 1999 to December 31, 2005. Analyst characteristics are derived from detailed I/B/E/S data. The measures are first calculated per forecast and then aggregated by analyst. When calculating the mean, median, and differences, each analyst contributes one observation to the analysis.

[a] Panel A compares the mean and median values of raw (not standardized) characteristics between CFA charterholders and non-charterholders.

[b] Panel B compares the mean and median values of standardized characteristics between CFA charterholders and non-charterholders.

more firm-specific experience, and follow more companies and industries than do non-charterholders.[6]

V. CFA CHARTERHOLDER PERFORMANCE TESTS

Multivariate Regression Tests and Results

To test for differences in charterholders' performance, we estimate:

$$Performance_{ijkt} = \alpha + \beta CFAd_{ijkt} + \gamma Analyst\ Characteristics + \varepsilon_{ijkt}. \quad (1)$$

Performance is one of the four analyst performance measures. *CFAd* is an indicator variable that equals 1 if analyst *i* is a CFA charterholder, and 0 otherwise. Consistent with our hypotheses, we expect that forecasts issued by analysts who hold a CFA charter to be timelier, more accurate, bolder, and less optimistic relative to those issued by analysts without a charter, *ceteris paribus*.

We use the full sample of forecasts for the accuracy, boldness, and optimism tests. For timeliness, we follow Cooper et al. (2001) and further restrict the sample. We control for the tendency of analysts to revise forecasts following firms' release of earnings by eliminating forecast revisions that occur within the three-day window centered on earnings announcements. We also require two forecasts prior to and two forecasts after a forecast observation. As an alternative test, for each measure, we also provide results using a sample restricted to the last annual forecast issued at least 30 days before the fiscal year-end by each analyst for each firm each fiscal year, consistent with Clement and Tse (2005).

Throughout our analysis, we estimate these equations on a monthly basis using ordinary least squares and then present mean coefficients as in Fama and MacBeth (1973). This allows for any cross-sectional correlation of unknown form across analysts, firms, and industries. We correct the standard errors using the Newey and West (1987) adjustment with 12 lags for serial dependence in the coefficients. This adjustment assumes that there is no correlation among coefficients that are more than 12 months apart.

The results of estimating Equation (1) for each of the four performance measures are summarized in Table 2. In the first two columns, the coefficient on *CFAd* is positive and significantly different from zero, consistent with charterholders producing timelier forecasts than those of non-charterholders. We also find that forecast timeliness is positively related to analysts' brokerage size, forecast frequency, firm-specific experience, and number of companies followed. These results complement Clement and Tse (2005), who find that these four analyst characteristics are positively correlated with forecast boldness.

The tests for accuracy are reported in Columns 3 and 4. The *CFAd* coefficient is negative and significantly different from zero, the opposite of what we predicted, using the full sample of forecasts and is not significantly different from zero using the restricted sample. (We discuss this issue below.) In our findings, accuracy is negatively related to the forecast horizon and the number of industries followed, consistent with Clement and Tse (2003, 2005) and Malloy (2005). Accuracy is decreasing in forecast frequency for the full sample

[6] We caution against making inferences from these differences because of multiple possible interpretations. For example, analysts who work for larger brokers likely receive higher compensation. If charterholders perform more strongly, then one might expect that charterholders are more likely to be employed by larger brokerage firms. But, the decision to obtain a CFA charter is not exogenous. The benefit of the CFA designation could be greater for analysts working at smaller brokers because these analysts cannot rely on the prestige of their employer as an alternative credential. This effect leads to a negative predicted relation. Attempts to distinguish between these alternative interpretations by modeling these differences are beyond the scope of the paper.

TABLE 2
Analyst Performance Regression Analysis

	Performance = Timeliness			Performance = Accuracy			Performance = Boldness			Performance = Optimism		
	Pred.	Full Sample (1)	Restricted Sample (2)	Pred.	Full Sample (3)	Restricted Sample (4)	Pred.	Full Sample (5)	Restricted Sample (6)	Pred.	Full Sample (7)	Restricted Sample (8)
Intercept	+	0.1385***	0.2376***	+	0.9243***	0.7619***	+	0.1835***	0.2796***	+	0.4466***	0.4927***
		(7.47)	(17.93)		(71.21)	(48.52)		(8.07)	(7.91)		(13.63)	(20.16)
CFAd	+	0.0064***	0.0153***	+	−0.0061***	−0.0001	+	0.0085***	0.0067***	−	0.0013	−0.0071**
		(11.13)	(3.80)		(−3.90)	(−0.05)		(9.12)	(3.71)		(0.36)	(−2.24)
Fcst Horizon	?	−0.0227	−0.0047	−	−0.5715***	−0.3941***	+	0.1080***	0.2116***	+	0.1257***	0.0439
		(−0.89)	(−0.16)		(−74.77)	(−14.79)		(3.07)	(15.03)		(2.99)	(1.16)
Broker Size	?	0.0244***	0.0673***	+	0.0039	0.0012	+	0.0253***	0.0346***	−	−0.0083***	−0.0104***
		(3.67)	(5.47)		(1.09)	(0.15)		(6.71)	(4.76)		(−2.82)	(−2.79)
Fcst Frequency	?	0.0121***	0.0349***	+	−0.0215***	0.0439***	+	0.0113***	0.0362***	?	−0.0047	−0.0190***
		(9.34)	(7.14)		(−6.25)	(9.68)		(4.72)	(5.12)		(−1.52)	(−2.65)
Firm Experience	?	0.0156***	0.0360***	+	0.0025	−0.0028	+	0.0227***	0.0184***	−	−0.0048*	0.0050
		(8.38)	(8.11)		(0.90)	(−0.46)		(16.89)	(2.95)		(−1.43)	(1.07)
Companies	?	0.0043**	0.0194***	−	−0.0055	0.0110	+	0.0136***	0.0080**	?	−0.0072**	−0.0063
		(2.21)	(2.60)		(−1.28)	(1.23)		(6.43)	(1.64)		(−2.28)	(−1.05)
Industries	?	−0.0001	0.0076***	−	−0.0105***	−0.0225***	−	0.0059***	0.0023	?	0.0021	0.0081
		(−0.09)	(2.62)		(−3.98)	(−6.31)		(3.19)	(0.46)		(0.51)	(1.51)
No. of Obs.		8,288	1,493		9,503	1,515		9,503	1,515		9,503	1,515
Adj. R^2 (%)		0.70	1.40		25.44	17.00		2.61	4.62		2.96	2.03

***, **, * Indicate significance at the 1 percent, 5 percent, and 10 percent levels, respectively. Variables are defined in the Appendix.

This table reports the test results of the difference in performance between CFA charterholder and non-charterholder analysts. We estimate:

$$Performance_{ijkt} = \alpha + \beta CFAd_{ijkt} + \gamma Analyst\ Characteristics + \varepsilon_{ijkt}.$$

Performance takes on one of four dimensions: *Timeliness*, *Accuracy*, *Boldness*, and *Optimism*. The Full Sample includes all forecasts and the Restricted Sample includes only the last forecast issued by an analyst per firm year. We estimate regressions on a monthly basis and present the average value of the 84 monthly coefficients for the period of January 1, 1999 to December 31, 2005 as in Fama and MacBeth (1973). The number of observations is the average number of forecasts per month. Standard errors are calculated based on the monthly coefficients and are corrected for autocorrelation by the method of Newey and West (1987) with a lag of 12. Coefficient t-statistics are in parentheses. Significance levels are based on one-tailed tests where there is a prediction for the sign of the coefficient and based on two-tailed tests otherwise.

regression, which differs from the results in Clement and Tse (2003, 2005). When we restrict the sample to the last annual forecast in Column 4 as they do, the coefficient on forecast frequency is positive and consistent with their results.

In Columns 5 and 6 of Table 2, the coefficient on *CFAd* is positive and significantly different from zero, consistent with charterholders producing forecasts that are bolder than those of non-charterholders. We find that boldness is positively related to the forecast horizon, brokerage size, forecast frequency, firm experience, and number of companies followed, consistent with the research of Clement and Tse (2005). In our tests using the full sample, boldness is positively related to the number of industries followed. Although Clement and Tse (2005) find a negative empirical relation, they make no clear *ex ante* prediction for it.

In the last two columns, we find no evidence that optimism is different for charterholders using the full sample, but do find that charterholders are less optimistic than expected for the restricted sample. Consistent with studies by Kang et al. (1994) and Lim (2001), we find that optimism is positively related to forecast horizon and negatively related to brokerage size and firm experience. In our tests, optimism is negatively related to the number of companies followed.

We use two approaches to gauge the economic significance of our results. Using the full-sample results, in the first approach we compare our *CFAd* coefficient to the coefficient on broker size. Given that the broker size variable is standardized between 0 and 1, the coefficient on broker size represents the difference in performance of an analyst at one of the largest brokerage firms compared to an analyst at one of the smallest brokerage firms. In the case of the timeliness, the *CFAd* coefficient of 0.006 is about one-fourth the size of the 0.024 coefficient on broker size, which implies that moving from the smallest to the largest size brokerage firm is about four times as important as having a CFA charter. In the case of boldness, the coefficients imply that broker size is about three times as important as being a charterholder.

As another way of gauging economic significance, we use (1) the estimated coefficients from the regressions, (2) the mean standardized values of the control variables, and (3) the mean range and minimum values of the raw performance measure to calculate the predicted raw measure for charterholders and non-charterholders. For example, the predicted raw timeliness measure is 5.25 and 5.04 for charter and non-charterholders respectively, a difference of 4.1 percent.[7] In the case of boldness, if we follow a similar procedure, then charterholder forecasts deviate from the consensus by an average of 31.5 cents while non-charterholders deviate by about 30.6 cents. This difference of approximately 1 cent represents a 3.1 percent difference.[8]

[7] As an illustration, recall from Equation (1) that timeliness is the ratio of leading days to following days. If one were to assume that the number of leading days is fixed at the unconditional sample mean, then the charterholders' (non-charterholders') timeliness ratio would translate into 7.01 (7.30) following days. That is, the ''next'' analyst would follow the charterholder slightly faster (3/10 of a day faster) than the ''next'' analyst would follow the non-charterholder.

[8] We also conduct some untabulated sensitivity analyses. First, to check if the analysts with extreme numbers of forecasts are driving the results, we rank all analysts in our sample by the number of forecasts they issue. We exclude the forecasts issued by analysts in the top 5 percent and the bottom 5 percent of this ranking and re-estimate Table 2. Although the magnitudes of coefficients are smaller, our inferences remain the same. Second, we examine if the charterholder advantage is different for up- versus down-market periods. We split observations into two groups in which the monthly market return is above or below the median monthly market return. We then re-estimate Table 2 for each group and find no differences between the *CFAd* coefficients.

Matched-Pair Tests and Results

In this section, we use a matched-pair design to test whether charterholders perform at higher levels than non-charterholders along the three dimensions of accuracy, boldness, and optimism. Our sample includes pairs of charterholder and non-charterholder forecasts that are issued: (1) on the same day, (2) for the same firm, and, (3) for the same fiscal period. Prior studies by Sinha et al. (1997), Clement (1999), Brown and Mohd (2003), and Clement and Tse (2005) document that controlling for these three factors strongly affects boldness, accuracy, and optimism tests. Given that the analysts forecast on the same day, they have access to the same public information sets. Controlling for the day of the forecast is particularly important because less-skilled analysts can simply wait a day and mimic the forecasts of more-skilled analysts.

Our measure of matched performance difference is created by subtracting the non-charterholder performance value from the charterholder performance value. If more than one charterholder (non-charterholder) issues a forecast of firm *j*'s fiscal period *k* earnings on the same day *t*, then we randomly choose one of the charterholders' (non-charterholders') forecast. This is the first matched-pair measure we use in our tests. Our second matched-pair measure uses the charterholder and non-charterholder residuals from a regression of the performance measure on the analyst characteristics instead of the performance measure itself. The residual from this regression is orthogonal to the analyst characteristics, thereby controlling for such characteristics. We expect that these matched-pair differences are positive for accuracy and boldness, and negative for optimism. Our matched-pair constraints restrict our sample to 68,825 matched-forecast pairs for 3,892 firms. Our inferences rely on the mean values of the performance differences.

Table 3, Panel A shows the mean differences are all in the predicted direction and statistically significant (albeit weakly for boldness and optimism), consistent with charterholders issuing more accurate, bolder, and less optimistic forecasts than non-charterholders, on average. In Panel B, after we control for analyst characteristics the results for accuracy, boldness, and optimism hold similar levels of significance. Non-parametric tests measuring the percentage of times the difference is in the intended direction are presented in both panels as corroborating evidence.

These matched-pair results for accuracy differ from the regression results above. The matched-pair results provide support for a charterholder advantage while the regression results using the full sample are consistent with a charterholder disadvantage. Since we match forecasts on the same day, the effect of timeliness is eliminated in the matched-pair tests. These different results support the idea that charterholders trade improved timeliness for reduced accuracy, as discussed by Cooper et al. (2001) and Schipper (1991), and shown by Shroff et al. (2005). To further support this intuition, in untabulated analysis we find that timeliness is negatively related to accuracy.

In sum, considering both the regression and matched-pair analyses, we find that while charterholders' forecasts are timelier, the results for accuracy are mixed. Charterholders' forecasts are more accurate if we control for the day of the forecast and less accurate if we do not. There is some evidence that charterholders act more boldly and less optimistically. These results provide support for our first hypothesis that charterholders achieve higher levels of performance relative to non-charterholders. The caveat is that although these documented differences between forecasts are often statistically significant, the differences are in the range of 4 percent or less, which implies that the economic significance of the differences is questionable.

TABLE 3
Analyst Performance Matched-Pair Difference Analysis

Panel A: No Controls for Analyst Characteristics[a]

	Pred.	Mean	t-statistic	Significance	% > 0	z-statistic	Significance
Accuracy Difference	+	0.0025***	4.17	<0.01	59.5**	1.75	0.04
Boldness Difference	+	0.0020*	1.42	0.08	53.6	0.66	0.26
Optimism Difference	−	−0.0020*	−1.50	0.07	35.7***	2.62	<0.01

Panel B: Controls for Analyst Characteristics[b]

	Pred.	Mean	t-statistic	Significance	% > 0	z-statistic	Significance
Accuracy Difference	+	0.0017**	2.17	0.02	56.0	1.09	0.14
Boldness Difference	+	0.0031**	1.95	0.03	58.3*	1.53	0.06
Optimism Difference	−	−0.0021*	−1.32	0.10	38.1**	2.18	0.01

***, **, * Indicate significance at the 1 percent, 5 percent, and 10 percent levels respectively. Variables are defined in the Appendix.

This table reports the test results of the difference in forecast accuracy, boldness, and optimism between CFA charterholder and non-charterholder analysts. We estimate mean values on a monthly basis and present the average value of the 84 monthly means for the period of January 1, 1999 to December 31, 2005 as in Fama and MacBeth (1973). The average number of matched-pair observations per month is 819. Each pair includes one charterholder and one non-charterholder forecast issued on the same day, for the same firm, and the same fiscal period. Standard errors are calculated based on the monthly means and are corrected for autocorrelation by the method of Newey and West (1987) with a lag of 12. The last columns present the results for a nonparametric binomial test based on the monthly mean differences. Significance levels are based on one-tailed tests.

[a] Panel A uses the respective standardized performance measure to calculate differences.

[b] Panel B uses standardized performance measures that are orthogonal to the analyst characteristics. First, we estimate:

$$Performance_{ijkt} = \gamma_0 + \gamma_1 Broker\ Size_{ijkt} + \gamma_2 Fcst\ Frequency_{ijkt} + \gamma_3 Firm\ Experience_{ijkt} + \gamma_4 Companies_{ijkt} + \gamma_5 Industries_{ijkt} + \eta_{ikjt}.$$

Performance takes on one of three dimensions: *Accuracy*, *Boldness*, and *Optimism*. We then use the residual from this regression to calculate the matched-pair differences.

VI. PRE- AND POST-CFA CHARTERHOLDER PERFORMANCE TESTS

In this section we test our second and third hypotheses, which attempt to determine if the charterholder performance advantage is attributable to human-capital or signaling theories of education. We rely on tests using timeliness and accuracy, our primary measures of performance.

These tests use a different sample from those reported earlier. First, for those analysts classified as charterholders, we search through all their reports available on Investext to determine the date they begin to include the CFA mark after their names, which should be soon after they receive their charter. We exclude charterholders who enter the sample period having already obtained their CFA designations because we do not have a pre-CFA period for these analysts. Second, to control for the effects of experience as an analyst, we match each charterholder with a non-charterholder who enters and exits the sample in the same years as the charterholder. For example, if the charterholder is included in our sample for three years prior to attaining the charter, then these three years are considered his/her pre-period. The matched non-charterholder will have the same three years designated as

the pre-period. Third, to control for the effects of broker size, we pick a matched non-charterholder who is employed by a broker that is closest in size to the charterholder's employer in the first year the charterholder appears in the sample. Last, we extend the sample to earlier periods and include forecasts made as early as 1995. This is important because we need a pre-CFA period that provides enough forecasts to allow comparisons with the post-CFA period. After these restrictions, we identify 519 matched-analyst pairs.[9]

Our regression tests include indicator variables for the pre- and post-CFA periods along with a similar set of controls for analyst characteristics as in Equation (1). We estimate:

$$Performance_{ijkt} = \alpha + \beta_1 CFAd_{ijkt} + \beta_2 Post + \beta_3 Post \times CFAd_{ijkt} + \gamma Analyst\ Characteristics + \varepsilon_{ijkt}. \quad (2)$$

Post is an indicator variable that equals 1 if analyst *i* issues a forecast in the post period, and 0 otherwise. In this specification, the intercept represents the performance of the non-charterholder in the pre-CFA period. The β_1 coefficient represents the difference between charterholders and non-charterholders in the pre-CFA period. A positive β_1 coefficient provides evidence that charterholders achieve higher levels of performance even before they obtain their charter, consistent with signaling theory. The β_3 coefficient on the *Post* × *CFAd* interaction captures the change in performance that charterholders experience from the pre to the post period relative to non-charterholders. A positive β_3 coefficient provides evidence that charterholders achieve relatively higher levels of performance in the post period, consistent with human-capital theory.

Handling the years just prior to attainment of the CFA charter is a challenge. At this point, future charterholders have started the CFA program. If part of the CFA-associated difference is because charterholders acquire new skills, then we risk falsely attributing a forecast by a charterholder in the pre-period to his/her innate ability instead of to the learning acquired from the CFA program. This difficulty in attributing forecasts to either theory of education is more of an issue for pre-CFA forecasts produced closer in time to the charter award because the analyst has spent more time in the CFA program. Our solution is to exclude forecasts immediately prior to attainment of the CFA charter. However, as we start to exclude forecasts in the pre-CFA period, the power of our tests diminishes. Given this trade-off, we present our results in two ways: excluding the one-year period and the three-year period immediately prior to attaining the CFA charter.

Table 4 summarizes our results.[10] We first discuss analyst timeliness. In Column 1, the coefficient on *CFAd* is positive and statistically significant, while in Column 2 this coefficient is not significantly different from zero. Given that the forecasts immediately before the attainment of the CFA charter are hard to attribute to human capital or signaling theories and the lack of results when we exclude forecasts issued three years before attaining the CFA charter, we make no inference about the role of signaling in explaining why charterholders are more timely than non-charterholders.

In the case of the *Post* × *CFAd* interaction, the coefficient on this variable is positive and statistically significant in both Columns 1 and 2, although weakly so in Column 2.

[9] Untabulated descriptive statistics show that for this sample there are no significant analyst characteristic differences between charterholders and non-charterholders. The exception is that charterholders cover modestly more industries than non-charterholders.

[10] In untabulated analysis we estimate a specification as in Equation (1) that excludes the *Post* and *Post* × *CFAd* variables but for the revised sample. These results produce identical inferences about charterholders to the Table 2 full-sample results. The coefficients are similar in sign, magnitude, and significance.

TABLE 4
Pre- and Post-CFA Analyst Performance Analysis

	Performance = Timeliness			*Performance = Accuracy*		
	Pred.	**Sample Excludes One Year before CFA Charter (1)**	**Sample Excludes Three Years before CFA Charter (2)**	**Pred.**	**Sample Excludes One Year before CFA Charter (3)**	**Sample Excludes Three Years before CFA Charter (4)**
Intercept	+	0.1386***	0.1352***	+	0.9132***	0.9269***
		(9.32)	(8.16)		(90.04)	(84.41)
CFAd	+	0.0057**	0.0040	+	−0.0095	−0.0156
		(2.22)	(0.76)		(−1.02)	(−1.12)
Post	?	−0.0045**	0.0003	?	0.0034	−0.0086
		(−2.16)	(0.07)		(0.50)	(−0.92)
Post × CFAd	+	0.0053**	0.0070*	+	0.0020	0.0081
		(2.25)	(1.39)		(0.20)	(0.58)
Fcst Horizon	?	−0.0149	−0.0159	−	−0.5550***	−0.5565***
		(−0.69)	(−0.72)		(−51.22)	(51.30)
Broker Size	?	0.0337***	0.0340***	+	0.0058**	0.0048*
		(5.47)	(5.23)		(2.00)	(1.65)
Fcst Frequency	?	0.0121***	0.0121***	+	−0.0274***	−0.0268***
		(7.22)	(6.78)		(−5.30)	(−5.28)
Firm Experience	?	0.0104***	0.0093***	+	0.0078**	0.0069*
		(4.38)	(3.80)		(1.85)	(1.61)
Companies	?	0.0042***	0.0047***	−	−0.0103***	−0.0110***
		(2.48)	(2.67)		(−3.87)	(−3.99)
Industries	?	0.0023	0.0017	−	−0.0105***	−0.0107***
		(0.91)	(0.63)		(−3.19)	(−2.70)
No. of Obs.		2,849	2,605		3,125	2,868
Adj. R^2 (%)		0.89	0.90		27.03	27.13

***, **, * Indicate significance at the 1 percent, 5 percent, and 10 percent levels respectively. Variables are defined in the Appendix.

This table reports the test results of the difference in performance between 519 CFA charterholders matched with non-charterholder analysts. We estimate the following:

$$Performance_{ijkt} = \alpha + \beta_1 CFAd_{ijkt} + \beta_2 Post + \beta_3 Post \times \mathrm{CFAd}_{ijkt} + \gamma Analyst\ Characteristics + \varepsilon_{ijkt}.$$

Performance is either *Timeliness* or *Accuracy*. We present results excluding forecasts issued in the one-year period and the three-year period immediately prior to attaining the CFA charter. We estimate regressions on a monthly basis and present the average value of the 132 monthly coefficients for the period of January 1, 1995 to December 31, 2005 as in Fama and MacBeth (1973). The number of observations is the average number of forecasts per month. Standard errors are calculated based on the monthly coefficients and are corrected for autocorrelation by the method of Newey and West (1987) with a lag of 12. Coefficient t-statistics are in parentheses. Significance levels are based on one-tailed tests where there is a prediction for the sign of the coefficient and based on two-tailed tests otherwise.

Regardless of whether the pre-period forecasts are attributed to human capital or signaling theories, this increase between the pre- and post-CFA period relative to non-charterholders is consistent with a human-capital explanation for why charterholders are more timely. As an additional comment, in the primary analysis in Section V we cannot rule out the possibility that the CFA effect could be driven by unobserved characteristics of analysts, such

as age or education. While these effects could explain differences in the pre-CFA period, these factors would not affect the change in timeliness relative to a non-charterholder over the pre- and post CFA periods.

Turning to our tests of accuracy, the coefficients on *CFAd* and the *Post* × *CFAd* interaction are not significantly different from zero in both columns. This is not surprising given the mixed results for accuracy in our primary analysis in Section V.[11] In summary, we find evidence of human capital theory explaining the CFA difference for timeliness, but neither theory explaining a difference in accuracy.

VII. ADDITIONAL ANALYSIS: THE ROLE OF INVESTORS

Based on the previous analyses, the role of a signaling theory of education is unclear. In this section, we continue to investigate the role of signaling in an alternative setting. Traditional signaling models are about an employer who decides which candidate to hire without knowing the ability of the candidate, but with the ability to observe his or her education level. However, a great deal of public and objective information is available about analysts, such as their historical and current forecasts about many firms, and employers may condition their employment decisions on this other non-CFA information. In a similar spirit, Riley (2001) concludes that the signaling value of education will be less important in sectors in which performance is easy to measure.[12]

For these reasons, we expect that the signaling demand for the CFA designation will arise mainly from investors rather than employers. Investors deal with a large set of analysts and do not have the same incentives as employers to systematically monitor and evaluate individual analysts. Although the public information on analysts is extensive, collecting, aggregating, and processing this information is nontrivial. While sophisticated investors could have more precise expectations of an analyst's ability, there are always less sophisticated or new investors who have imprecise or no prior information about the analyst's ability. The highly visible placement of the CFA mark following the analyst's name in reports to investors is consistent with charterholders' desire to advertise this trait.[13] Our argument is similar to the idea of ''credentialism'' as put forward by Lazear (1977), who argues that customers will use the credentials of the professional as a signal in assessing the professional's service quality. The research on credentialism is limited. Tucker (1987), using a coarse proxy for the demand for credentialism, finds no support for it.

We use the market's price reaction to forecasts issued by analysts with a CFA designation to determine whether investors condition on the CFA designation. If signaling demand for the designation is from investors, then the market should react more strongly to forecasts issued by charterholders after we control for performance. We estimate various specifications of:

[11] In untabulated analysis we estimate Equation (2) using our secondary measures of performance, *Boldness* and *Optimism*. For boldness, we find that the *CFAd* coefficient is positive and statistically significant for both samples, although weakly significant for the sample that excludes forecasts issued three years prior to attaining the CFA charter. The coefficient on *Post* × *CFAd* interaction is not significant for either sample. For optimism, the coefficients on *CFAd* and the *Post* × *CFAd* interaction are not significant for either sample.

[12] Analysts' decisions to obtain the CFA charter could be guided by the signaling value to companies that employed them *prior* to their becoming analysts or by the expected signaling value to *future* employers if they change careers. For example, when analysts decided to obtain their CFA designation in the past, they could have been employed in a sector where performance is more private (e.g., they work for an industrial firm). If they are currently employed as sell-side analysts, they could consider whether the CFA designation would help them were they to pursue other occupations.

[13] Based on our experience in reading analyst names as identified on their research reports, except for the rare qualifications of CPA, Ph.D., or M.D., the CFA mark is often the only item that appears after a name.

$$CAR_{ijkt} = \delta_1 Revision_{ijkt} + \delta_2 Revision_{ijkt} \times CFAd_{ijkt} + \delta_3 Revision_{ijkt} \times Timeliness_{ijkt} + \delta_4 Revision_{ijkt} \times Boldness_{ijkt} + \delta_5 Revision_{ijkt} \times Accuracy_{ijkt} + \delta_6 Revision_{ijkt} \times Optimism_{ijkt} + \varepsilon_{ijkt}. \quad (3)$$

CAR_{ijkt} is size-adjusted returns for firm j cumulated over the three-day window centered on analyst i's forecast of firm j's fiscal period k earnings issued on day t. We winsorize those observations with size-adjusted returns in the top and bottom 1 percent of the distribution. $Revision_{ijkt}$ equals analyst i's I/B/E/S EPS forecast of firm j's fiscal period k earnings on day t less analyst i's previous forecast of firm j's fiscal period k earnings, with this difference scaled by the standard deviation of all forecasts of firm j's fiscal period k earnings issued prior to day t.[14] In this specification, all explanatory variables are interacted with forecast revisions because our research question focuses on explaining the relation between forecast revisions and returns. Our results are insensitive to including all explanatory measures as additional variables in the regression or to controlling for analyst characteristics. We also include firm-year fixed effects to control for differences in returns that are due to firm and time effects, which have been shown to affect the relation between returns and forecast revisions. The sample for these tests is limited to observations with data available to measure all variables. The total number of forecasts used for this test is 489,209 for 3,790 firms, which consists of 139,884 forecasts made by 852 charterholders and 349,325 forecasts made by 2,487 non-charterholders.

Table 5 reports the results of estimating various specifications of Equation (3). The first column excludes the controls for performance and shows that the market reacts more strongly to charterholder forecasts. This result is consistent with the idea that forecasts issued by charterholders contain more information. It also provides triangulating evidence with our previous results that charterholders perform at modestly higher levels than non-charterholders. The second column includes the full model. The market reaction is increasing in timeliness, boldness, and accuracy and decreasing in optimism, consistent with studies by Cooper et al. (2001), Gleason and Lee (2003), and Park and Stice (2000). Interestingly, timely and bold forecasts seem to have an effect that is an order of magnitude larger than that of accuracy and optimism, consistent with the independence of analysts' information being more important to investors than the actual processing of the information into precise or unbiased forecasts. More importantly, the coefficient on *Revision* × *CFAd* remains positive and statistically significant, which shows that performance measures do not subsume the charterholder effect.[15]

In terms of economic significance, using the Column 2 results the non-charterholders' revision coefficient is 1.36 while the charterholders' incremental revision coefficient is 0.21. This implies that, after controlling for the common measures of analyst performance, the

[14] As in Stickel (1992) and Malloy (2005), we set standard deviation values less than \$0.25 equal to \$0.25 to mitigate the effect of small denominators, and scaled forecast revisions are truncated at −200 percent and +200 percent.

[15] We conduct the following untabulated sensitivity analyses. First, it is possible that the best analysts are assigned to follow firms where earnings are the most uncertain, which could bias the results given that we scale revisions by the standard deviation of analyst forecasts. We split observations into two groups, those with below and above the median standard deviation of forecasts, and re-estimate Table 5. Coefficient differences between the two groups are inconsequential and these results are robust to this effect. Second, the results hold if we instead use cumulative abnormal returns multiplied by market capitalization. We also perform similar sensitivity analyses to those discussed in Section V. If we exclude those analysts (the top and bottom 5 percent) with extreme numbers of forecasts, our inferences are the same. We also find that the coefficients on *Revision* × *CFAd* are modestly stronger for down than for up markets.

TABLE 5
Market Reaction to CFA Charterholders' Forecasts

	Pred.	Full Sample (1)	Full Sample (2)	Small Firms (3)	Large Firms (4)
Intercept	?	−0.0480*	−0.0467*	0.0110	−0.1045***
		(−1.43)	(−1.41)	(0.15)	(−3.27)
Revision	+	3.0576***	1.3587***	2.0493***	0.6170***
		(20.54)	(6.97)	(7.63)	(3.02)
Revision × *CFAd*	+	0.2519***	0.2115***	0.3590**	0.0509
		(3.00)	(2.71)	(2.37)	(0.82)
Revision × *Timeliness*	+		3.8175***	3.9778***	3.6143***
			(14.46)	(11.32)	(8.00)
Revision × *Boldness*	+		2.5645***	2.3139***	2.2794***
			(6.87)	(5.84)	(5.23)
Revision × *Accuracy*	+		0.3830**	0.4558**	0.4265*
			(2.13)	(2.27)	(1.65)
Revision × *Optimism*	−		−0.3350*	−0.4430*	0.1012
			(−1.49)	(−1.61)	(0.42)
No. of Obs.		5,824	5,824	2,914	2,910
Adj. R^2 (%)		4.24	5.29	6.50	4.13

***, **, * Indicate significance at the 1 percent, 5 percent, and 10 percent levels respectively. Variables are defined in the Appendix.

This table reports the test results of the difference in the market reaction between CFA charterholder and non-charterholder analysts. We estimate various specifications of the following:

$$CAR_{ijkt} = \delta_1 Revision_{ijkt} + \delta_2 Revision_{ijkt} \times CFAd_{ijkt} + \delta_3 Revision_{ijkt} \times Timeliness_{ijkt} + \delta_4 Revision_{ijkt} \times Boldness_{ijkt} + \delta_5 Revision_{ijkt} \times Accuracy_{ijkt} + \delta_6 Revision_{ijkt} \times Optimisim_{ijkt} + \varepsilon_{ijkt}.$$

Columns 1 and 2 use the full sample of forecasts. Columns 3 and 4 present the results for samples of forecasts issued about firms below and above the median firm size. We estimate regressions on a monthly basis and present the average value of the 84 monthly coefficients for the period of January 1, 1999 to December 31, 2005 as in Fama and MacBeth (1973). The number of observations is the average number of forecasts per month. Standard errors are calculated based on the monthly coefficients and are corrected for autocorrelation by the method of Newey and West (1987) with a lag of 12. Coefficient t-statistics are in parentheses. Significance levels are based on one-tailed tests where there is a prediction for the sign of the coefficient and based on two-tailed tests otherwise.

charterholder's market reaction is about 15 percent greater than that for non-charterholders. Given that the mean positive and negative revision in our sample is about 0.03 and −0.15, respectively, the market reaction is about 0.66 percent (0.22 * 0.03) more positive and 3.30 percent (0.22 * −0.15) more negative for charterholders.

This 15 percent difference in market reaction for charterholders is larger than the percentage differences in performance measures such as timeliness and boldness established above. We investigate whether these results are driven by smaller firms. Stickel (1992) and Malloy (2005) show that firm size is related to the return response to forecast revisions. In Columns 3 and 4, we partition the sample into forecasts for firms that are smaller and larger, respectively, than the median firm in terms of market capitalization. The regression coefficient on *Revision* × *CFAd* is positive and statistically significant in Column 3, while it is not significant in Column 4. This implies that charterholders' market-reaction effect is greatest for smaller firms, which represent a less economically important group of firms.

Overall, these results are consistent with investors in smaller firms placing part of the weight on the observed performance measures (such as timeliness, accuracy) and part of the weight on the CFA designation because they both proxy for analysts' true performance with error. These results provide support for the notion that the CFA designation acts as a signal to investors and that a professional's credentials are important to their clients.

VIII. CONCLUSION

This study compares the performance of sell-side equity analysts with and without a CFA designation. Using a large sample of forecasts, our tests indicate that CFA charterholders issue forecasts that are timelier than those of non-charterholders. The results for accuracy are mixed. There is some evidence that charterholders act more boldly and less optimistically. While we establish that charterholders perform at statistically significant higher levels than non-charterholders in some tests, the economic significance of these differences is questionable.

For a subsample of analysts, we are able to measure charterholders' performance both before and after obtaining their CFA charter. This allows us the opportunity to provide unique tests of human-capital and signaling theories. We find evidence that charterholders improve along the dimension of timeliness after they receive their charter. This result provides support for a human-capital explanation, in which charterholders improve their productivity during the CFA program.

Last, we show that the market reaction for smaller firms is stronger for charterholders after controlling for timeliness, boldness, accuracy, and optimism. This result provides evidence consistent with ''credentialism,'' a variant of signaling theory in which a professional's education level provides a signal about the professional's quality to his or her clients.

A caveat of our analysis is that the decision to obtain a charterholder is complex, and in our paper this decision is unmodeled. We caution readers that in our primary tests the charterholder difference we document could be influenced by unobserved characteristics of analysts such as age or education.

APPENDIX
VARIABLE DEFINITIONS

Variable	Definition
Standardized[a]	
Timeliness	= $Leading\ Days_{ijkt}/Following\ Days_{ijkt}$, where $Leading\ Days_{ijkt}$ ($Following\ Days_{ijkt}$) equals the total number of days between analyst *i*'s forecast of firm *j*'s fiscal period *k* earnings issued on day *t* and the two most recent preceding (following) forecasts of firm *j*'s fiscal period *k* earnings by any other analyst.
Boldness	= $\lvert Fcst\ EPS_{ijkt} - Consensus\ EPS_{jkt}\rvert$, where $Fcst\ EPS_{itj}$ is analyst *i*'s I/B/E/S forecast of firm *j*'s fiscal period *k* earnings on day *t* and $Consensus\ EPS_{jkt}$ is the mean of all analysts' most recent forecasts of firm *j*'s fiscal period *k* earnings issued during the 90-day period prior to day *t*.
Accuracy	= $\lvert Fcst\ EPS_{ijkt} - Actual\ EPS_{jk}\rvert \times -1$, where $Fcst\ EPS_{itj}$ is analyst *i*'s I/B/E/S forecast of firm *j*'s fiscal period *k* earnings on day *t* and $Actual\ EPS_{jk}$ is the actual amount announced by firm *j* for fiscal period *k* as reported by I/B/E/S.

Optimism	=	*Fcst EPS*$_{ijkt}$ − *Actual EPS*$_{jk}$, where *Fcst EPS*$_{itj}$ is analyst *i*'s I/B/E/S forecast of firm *j*'s fiscal period *k* earnings on day *t* and *Actual EPS*$_{jk}$ is the actual amount announced by firm *j* for fiscal period *k* as reported by I/B/E/S.
Fcst Horizon	=	time from the forecast date to the end of the fiscal period, calculated as the number of days from analyst *i*'s forecast on day *t* to firm *j*'s fiscal period *k* end date.
Broker Size	=	analyst's brokerage size, calculated as the number of analysts employed by the brokerage firm employing analyst *i* in the 12-month period prior to day *t*.
Fcst Frequency	=	analyst's forecast frequency, calculated as the total number of firm *j* forecasts for fiscal period *k* made by analyst *i*.
Firm Experience	=	analyst's firm-specific experience, calculated as the number of years from the first forecast day of firm *j* earnings by analyst *i* to day *t*.
Companies	=	number of companies covered by the analyst, calculated as the number of companies followed by analyst *i* in the 12-month period prior to day *t*.
Industries	=	number of industries covered by the analyst, calculated as the number of unique two-digit SICs of all the companies followed by analyst *i* in the 12-month period prior to day *t*.
Not Standardized		
CFAd	=	indicator variable that equals 1 if analyst *i* is a CFA charterholder, and 0 otherwise.
Post	=	indicator variable that equals 1 if analyst *i* issues a forecast in the post period, and 0 otherwise.
CAR	=	size-adjusted returns for firm *j* cumulated over the three-day window centered on analyst *i*'s forecast of firm *j*'s fiscal period *k* earnings issued on day *t*. Size-adjusted returns equal firm raw returns less the CRSP size-matched decile index returns.
Revision	=	analyst *i*'s I/B/E/S EPS forecast of firm *j*'s fiscal period *k* earnings on day *t* less analyst *i*'s previous forecast of firm *j*'s fiscal period *k* earnings, with this difference scaled by the standard deviation of all forecasts of firm *j*'s fiscal period *k* earnings issued prior to day *t*.

[a] Standardized variables are adjusted to range from 0 to 1 using a transformation that maintains the relative distances among each variable's measures for firm *j* in fiscal year *k*. The scaled variables for analyst *i* on day *t* take the form:

$$\text{Standardized Variable}_{ijkt} = \frac{\text{Raw Variable}_{ijkt} - \text{Raw Variable min}_{jk}}{\text{Raw Variable max}_{jk} - \text{Raw Variable min}_{jk}}.$$

Raw Variable max$_{jk}$ and Raw Variable min$_{jk}$ are the original maximum and minimum values respectively of a characteristic for firm *j*'s fiscal year *k*.

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