# Relevance of Financial and Non-Financial Measures to Financial Analysts: Experimental Evidence

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## Abstract

This research explores the role of financial and non-financial measures on analysts' recommendations. Specifically, we examine for different combinations of favorable and unfavorable financial and non-financial measures (a) how analysts' recommendations ratings to invest in a firm are influenced by these measures - an outcome variable, and (b) two process variables, the *weights* put on these measures and the effect of these measures on analysts' *time horizon* when making their recommendations. The last issue examined is how the two measures are weighted in conjunction with the time horizon in making the recommendations when the favorableness of the measures vary or are consistent. The participants were 119 financial analysts. The results indicate financial and non-financial measures have a complementary effect on analysts' ratings to invest in firms. Also, favorableness of the measures affects the weights assigned to them and the time horizon of the analysts' recommendation. Further, when non-financial measures are favorable, the interaction of the weights analysts put on these measures and recommendations' time horizon significantly influences their ratings.



**Keywords:** *financial measures, non-financial measures, financial analysts*

**Data Availability:** *Please contact the authors*.

## 1. INRODUCTION

Companies develop key performance measures for a variety of reasons. When describing their performances, however, companies almost uniformly do so through the lens of traditional financial measures (e.g., earnings per share, operating profits, etc.). But because of certain limitations of financial measures[1], firms augment them with non-financial measures that drive share-holder value, such as customer satisfaction, innovation, quality of management, etc (Fisher 1995, Ittner and Larcker 1998, Baker et al. 1994, Ittner and Larcker 2001, Said et al. 2003). Thus, since many companies have adopted internal performance evaluation frameworks incorporating non-financial measures, there is a demand for external reporting of these measures (Ittner et al. 2003, Kaplan and Norton 1996). Anecdotal evidence suggests that many firms already do so voluntarily (see Eccles et al. 2001) because they realize the value external stakeholders place on non-financial information.[2]

One group of such external stakeholders are financial analysts who often use non-financial measures in their company assessment reports (Previts et al 1994) to evaluate the long term performance of a firm (Dempsey et al. 1997) and estimate its future earnings (Rajgopalan, Shevlin and Venkatachalam 2003). Analysts considers non-financial measures useful because ". . . they both reflect and affect financial value" (p. 5), and they effectively help link management actions and company's financial results (Epstein and Palepu 1999). In spite of the relevance of these measures to analysts', there is little research on how they use non-financial measures in conjunction with financial measures to make their buy or sell

[1] Financial measures were developed to meet regulatory and financial reporting requirements; hence, they are better used to report on the stewardship of money entrusted to management's care than to chart the strategic direction of the business (Conference Board 1998). Financial measures are also criticized for being backward looking and being disconnected with firm's long-term goals (Lev 2001; Ittner and Larcker 2001).

[2] For example, California Public Employees Retirement System (CalPERS), the largest pension fund in US, s workplace practices of firms to screen potential investments.

recommendations. For example, do they give equal considerations to financial measures and non-financial measures? Also, given the differences in accuracy and bias in analysts' earnings forecast of loss-making firms compared with analysts' earnings forecast of non-loss firms (Das 1998), how does the two measures influence analysts' recommendations when the measures vary or are consistent on their favorableness? The answers to these questions are unclear and, hence, the focus of this research. Specifically, we examine for different combinations of favorable and unfavorable financial and non-financial measures (a) how analysts' recommendations ratings to invest in a firm are influenced by these measures - an outcome variable, and (b) two process variables, the *weights* put on these measures and the effect of these measures on analysts' *time horizon* when making their recommendations. In reality, the favorableness of the measures, weights assigned to them, and time horizon are all intertwined by analysts when making their recommendations. So, the last issue examined is how the two measures are weighted in conjunction with the time horizon in making the recommendations when the favorableness of the measures vary or are consistent.

The participants were 119 financial analysts. The results indicate financial and non-financial measures have a complementary effect on financial analysts' recommendation ratings to invest in firms as observed in prior archival research (Amir and Lev 1996; Nagar and Rajan 2001). However, while the effect of financial (non-financial) measures on ratings changes depend on whether the non-financial (financial) measures are favorable or not, the effect on the ratings is significantly greater from improved favorableness of financial measures than from improved favorableness of non-financial measures.

Moving beyond examining the effect of measures' favorableness on ratings to the two *processes* on how the measures are used, the results indicate that when financial measures are *unfavorable*, analysts explicitly weighted them significantly *more* than they did to non-

financial measures, irrespective of whether these were favorable or unfavorable. However, when the financial measures are *favorable*, they are weighted significantly *less* than non-financial measures. So, overall, both the implicit weights derived from the earlier analysis on ratings as well as the explicit weights obtained here indicates a greater influence of financial measures over non-financial measures in analysts' ratings recommendations.

When analysts consider the time horizon of their recommendations, the results indicate that non-financial measures are given greater importance than financial measures. Finally, we examined how the measures' favorableness, the weights assigned to them and time horizon mutually affect each other in influencing analysts' ratings. Results indicate that when non-financial measures are favorable, the interaction of the weights put on these measures and time horizon significantly influences analysts' ratings. That is, the future value-creating implications of non-financial measures are encapsulated in both the time horizon and the weightings of these measures when analysts rate their recommendations to invest in a firm. Further, the interaction of time horizon and the weights assigned to financial measures is significant *only* when the non-financial measures are favorable. Thus, it appears that the presence of favorable non-financial measures gives favorable financial measures a sense of having some future value-creating implications. This is similar to Amir and Lev (1996) who found the value relevance of financial measures for stock prices emerging only when combined with the non-financial information. Overall, the results underline the importance of both financial and non-financial measures to analysts.

The current research makes at least two contributions to the performance measures literature. First, as far as we know, this is the first research which systematically examines the influence of financial and non-financial measures on analysts' recommendation ratings. Second, this research broadens the relevance of non-financial measures research scope

beyond just incentives and evaluations of managers. And third, we provide evidence of the informativeness of non-financial measures in capital market assessment of firms and financial analysts' recommendations. In other words, the results give credence to the arguments for greater external communication of non-financial information.

The rest of the paper is as follows. The next section discusses the theory and the research expectations. Section three discusses the research method, section four presents the results and the last section contains concluding remarks.

## 2. THEORY and HYPOTHESES

There is considerable research on non-financial measures vis-à-vis managers' performance evaluation and the provision of incentives in firms (Baker et al. 1994, Prendergast 1999, Ittner et al, 2003; Gibbs et al. 2004). In contrast, the research on financial analysts and their use of non-financial measures is still evolving. The following discussion leading up to the hypotheses is based on this limited research on non-financial measures and analysts. However, when appropriate, some of the theory development discussion draws on research done on incentive design and the use of non-financial measures.

### A. Financial Measures, Non-financial Measures and Analysts' Recommendations:

In the incentive literature, a measure is used in a contract only if it is "incrementally informative" about the manager's action that produce stochastic profits (Holmstrom 1979). This informativeness logic can be extended to the analysts' use of non-financial measures to assess firm performance and make recommendations: adding an "incrementally informative" measure to assess a firm reduces analysts' payoff risks to their clients.

There is a long history of analysts using financial measures with research showing they are functionally fixated on these measures (Lipe 1998). But analysts also work closely with management and are likely to have valuable information in assessing the firm's

activities. This assessment can be improved by including non-financial measures instead of using only financial measures because non-financial measures are "incrementally informative" about the manager's actions or decisions. Non-financial measures also reduce "distortions" in financial measures; hence, use of non-financial measures complements the use of financial measures by mitigating some of the limitations of imperfect financial measures (Baker et al. 1994; Murphy and Oyer 2003).

Prior archival research documents the complementary relation between non-financial and financial measures. To illustrate, Amir and Lev (1996) examine two non-financial measures used in the cellular telephone industry: total population in a service area, a measure of potential growth, and the ratio of subscribers to total population, measures of operating and competitive success. They found both measures to be positively associated with stock prices. They also found a complementary relation between non-financial and financial measures, with the value relevance of financial measures (e.g., earnings and book value) emerging only when combined with the non-financial information. But their sample included both profitable and loss-making firms, making it difficult to assess the complementary relations. Nagar and Rajan (2001) examined the relation between future sales, current non-financial (defects and on-time delivery) and financial (internal and external costs) measures of quality. They found non-financial measures and financial measures separately were significant predictors of one-quarter-ahead sales; however, when both were included in the same regression, non-financial measures dominated the predictive ability of financial measures. But by four-quarter-ahead sales, both measures when included in the same regression had almost equal explanatory power, suggesting the measures perhaps complemented each other.

The complementary relations occur because non-financial measures bring to light a different dimension of firm performance by focusing on its future, as opposed to the historical focus of financial measures. Luft and Shields (2002) argue that non-financial measures cause individuals to attend more closely to relations involving future financial outcomes thereby increasing the prediction accuracy of non-financial measures. In support of their argument, the authors find that individuals' forecasts of future profits are more accurate when they base their forecasts on the current percentage of defects in a production process (a non-financial measure) rather than on current rework and spoilage expense (a financial measure). Also recall that in the Ernst & Young's (1997) survey, analysts indicate that they consider non-financial data useful because ". . . they both reflect and affect financial value" (p. 5). Based on the above discussion, the first hypothesis is stated:

$H_1$: Financial and non-financial measures will complement each other to influence analysts' recommendation ratings to invest in a firm.

**B. Weighting of financial and non-financial measures**

If analysts use both financial and non-financial measures in making their recommendations, how do they actually weight the measures when they indicate consistent (i.e., both are favorable or unfavorable) or inconsistent performances (one is favorable but not the other)? While understanding the outcome (i.e., the recommendation) is useful, understanding the *process* (i.e., assigning weights to the measures) may be more beneficial.

Analysts use current performance to forecast future firm performance. To measure current firm performance, analysts develop "core earnings" (Barron et al., 2002) - financial measures adjusted in some way to account for non-recurring revenue or expenditures, and for other firm-specific information. Financial measures are the dominant elements in developing core earnings since analysts are fixated on financial information (Lipe 1998). Financial measures, however, are lag indicators - they reflect final outcomes of *earlier* management

decisions (Ittner et al 2003). Thus, *current* unfavorable financial measures will be attributed to previously bad decisions by management (i.e., the outcome effect phenomenon).[3] When these two factors are taken together, it is likely to cause some uncertainty about the firm's *future* performance. Unfavorable performances (Murphy and Cleveland 1995) or high uncertainty (see Lambert 2001) increases the importance of short-term, bottom-line financial measures like ROI or profitability. Thus, analysts are likely to weight unfavorable financial measures more heavily than non-financial measures irrespective of their favorableness when making their investment recommendations. However, if *current* financial measures are favorable, which would be attributed to previously good decisions by the management (once again, the outcome effect phenomenon), the uncertainty of firm's *future* performance would reduce. In which case, analysts may not weight favorable financial measures as heavily and, instead, may shift their weights to non-financial measures. These measures, unlike aggregate financial measures, are more unique and controllable (Ghosh 2005); hence, they are used for exercising greater control by linking them to specific managerial actions (Abernethy et al., 2004). They are also lead indicators, helping management to decide which actions to take *now* that will positively affect firm performance *later*. Thus, the next hypothesis is:

$H_2$: Analysts will weight financial measures more than non-financial measures when financial measures are unfavorable but not otherwise.

**C. Time horizon of the measures**

Both financial and non-financial measures have information content, but they are of a different nature. We briefly discussed earlier that non-financial measures are lead indicators and hence, more informative about long-term firm performance, whereas financial measures

[3] The 'outcome effect' is the influencing of the evaluator's assessment by the outcome knowledge (Hawkins and Hastie 1990): that is, if an outcome is positive (negative), the evaluator tends to assess the evaluatee more positively (negatively) regardless of the actual appropriateness of the evaluatee's initial decision resulting in the outcome (see Ghosh 2005).

are lag or short-term indicators of performance (Kaplan and Norton 2001; Gibbons 1998). Some managerial actions (e.g., pricing and operations decisions) affect contemporaneous accounting performance, while other actions (such as R&D expenditures, developing customer loyalty) will not be reflected in accounting performance in near future.

As per agency models, any costless measure having incremental information on the agents' action should be included to evaluate performance (Lambert 2001). These models, though, say little about what measures to be included. Non-financial measures and the balance scorecard literature (Feltham and Xie 1994; Kaplan and Norton 2001) suggests that financial measures by themselves are incomplete (unlikely to capture contemporaneous financial results), and that other indicators of future performance can provide incremental information about the managers' action (Hemmer 1996; Ittner et al 2003). Luft and Shields (2002) examine the use of financial and non-financial measures in a decision-making context. Their experiment indicates that participants place greater weight on current non-financial information than on current financial information when processing future financial performance. Banker et al. (2000) found positive associations between customer satisfaction measures and future accounting performance. Thus, for the underlying time horizon of analysts' recommendation (since they do not explicitly state how long is their recommendation valid), it is reasonable to predict that non-financial measures are given greater importance since they are more informative about future firm performances and provide greater information on managers' action and firm outcomes. Thus, the hypothesis is:

$H_3$: Analysts' time horizon is affected more by non-financial measures than financial measures.

**D. Recommendation ratings, time horizon of the ratings and weights of measures**

When analysts decide the recommend ratings to invest or not to invest (i.e., the outcome), the process implicitly encapsulates the time horizon of that recommendation and

the weights assigned to the measures. Thus, how are analysts' ratings affected by the interaction of analyst' time horizon and the relative weights placed on the financial and non-financial measures when these measures signal consistent or varying performances?

From informativeness perspective, financial measures are lagged or short-term measures. Thus, irrespective of these measures' favorableness or the weights attached to them, the time horizon of the recommendation should be short. Thus, in general, the effect of the interaction of the weights assigned to financial measures and time horizon on ratings should be insignificant. The only exception to this may be is when the financial measures and the non-financial measures are *both favorable.* Prior research suggests that value relevance of financial measures emerges only when combined with non-financial information (Nagar and Rajan 2001). This occurs because the presence of favorable non-financial measures makes individuals to pay more attention to the future implications of the favorable financial measures (Luft and Shields 2002).

Non-financial measures are lead or forward-looking measures of firm value. Thus, when these measures are favorable and analysts recommend investing, the weights attached to these measures should increase, but more so if analysts' time horizon of the recommendation is also of a longer duration. That is, the interaction of non-financial weights and time horizon on ratings should be significant when non-financial measures are favorable. However, when non-financial measures are unfavorable, future firm value is unclear; in which case, the above weights-time interaction on ratings should be insignificant.

$H_{4a}$: When non-financial measures are favorable (unfavorable), the interaction of the weights assigned to non-financial measures and the time horizon of the recommendation affect (do not affect) analysts' investment recommendation ratings.

$H_{4b}$: The interaction of the weights assigned to financial measures and the time horizon of the recommendation will affect analysts' investment recommendation *only* in the presence of favorable non-financial measures.

## 3. RESEARCH METHOD

### A. Design and Instrument Development

The experiment employed a 2 x 2 between-subjects design. The independent variables were financial measures (favorable/unfavorable) and non-financial measures (favorable/ unfavorable). Selecting the financial and non-financial measures went through several steps.

What constituted favorable and unfavorable *financial* measures were determined using Altman's model (1968; also see Foster 1986) to predict corporate bankruptcy. Altman's multivariate model derived a *Z* score using the following ratios (with different weights for each ratio): Sales/Total Assets, Working Capital/Total Assets, Earnings before Interest and Taxes/Total Assets, Retained Earnings/Total Assets, and Market value of equity/Book value of total debt. A firm with a *Z* score below 1.81 (above 2.99) is considered to be a prime candidate for failure (not to fail) (see Altman 1968). The model's percentage-correct classification rate is 94 percent. To ensure the appropriateness of using the ratios in Altman's model for this research, we examined the literature on the ratios used by financial analysts. A common method of studying analysts' use of financial ratios is surveys wherein the analysts are typically asked to indicate the selected ratios' significance in their investment decisions or analyzing a firm. Subsequent to receiving the responses, the ratios are classified into groups such as profitability, leverage, turnover, etc. While the specific ratios selected differed among surveys, all the ratios in Altman's model were found to be significant in surveys in which they were considered (Gibson 1987; Matsumoto et al. 1995; Dempsey et al. 1997). Thus, the ratios of Altman's model were used as performance measures and the *Z* score was used to delineate between favorable and unfavorable performances. For this research, two firms were selected from the general industry machinery group (SIC code 3561)

whose resultant *Z* values indicated one of them likely to fail (i.e., unfavorable financial measures with $Z < 1.81$) and the other not likely to fail (i.e., favorable financial measures with $Z > 2.99$). These two firms' ratio numbers were subsequently used in the experimental materials to identify unfavorable and favorable financial performances. To avoid any ambiguity with the favorableness of the firms' ratios, for favorable (unfavorable) financial performances the participants were told that compared to industry standards, all the financial ratios are rated as excellent (poor).

The initial set of *non-financial* measures was selected from the Ernst and Young (1999) survey of non-financial measures which analysts' value most in share valuation: Management Quality, Product Quality, Innovativeness, Market Share, and Ability to Attract Talented People. These ratios were also ranked very high in Dempsey et al. (1997) survey of analysts on their use of strategic performance measures (in addition to the use of traditional financial measures). For this research, to identify favorable or unfavorable performances, the non-financial measures for the firm were termed as either 'excellent' or 'poor,' respectively.

The instrument was pilot tested on six analysts from a financial institution (not a site for the final experiment). One of the questions posed to them was their assessment of the relevance of the initial financial and non-financial measures in their investment recommendations to clients. One of financial ratios initially identified from the Altman's model [Retained earning/Total assets] was considered unimportant by all the analysts and was dropped; the non-financial measure of Market Share received ambivalent support and was also dropped. Thus, the final instrument (discussed below) consisted of four financial measures and four non-financial measures. Prior research indicates that to make absolute judgments, individuals typically use seven, plus or minus two cues (Miller 1956). Our use of eight measures is consistent with prior research on information cues and decision making.

Survey results indicate that senior managers have concerns using nontraditional performance measures because of quality and reliability reasons (Ittner and Larcker 2001). To address this concern, participants were told that in response to the management's request to provide assurance on the relevance and reliability of the non-financial measures, the firm's auditor gave an unqualified opinion in their report.

**B. Participants and Procedure**

The experimental materials were sent to the head of the financial analysts' unit in four separate financial institutions (Note: they were all previously contacted to request their participation). That person then distributed the materials to the analysts in his or her unit who returned them directly to the researchers on completion of the experiment.

Each analyst was provided with a set of four financial performance measures and a set of four non-financial measures (mentioned above) to describe a firm's performance in one of four combinations: both set of financial and non-financial measures are favorable, both sets of measures are unfavorable, the financial set is favorable but the non-financial is unfavorable, or vice versa. To avoid any biases, the firm's name and the industry to which the firm belonged was not disclosed, and the order in which the measures appeared in the instrument was randomized. The analysts were asked to rate the firm as a recommendation to buy (on an 11-point scale with 0 as "no chance of a recommendation to buy," to 10 "definite recommendation to buy") and if they did recommend, to indicate how long is the time horizon (e.g., 1-3 months, 3-6 months, etc.) of their rating. Next, they were asked to estimate the overall importance of the financial and the non-financial measures in terms of their percentage weights assigned to each set (totaling to 100 percent). Then they assessed the importance of each of the eight (four financial and four non-financial) measures in their decisions on a seven point scale (where 1 was "Not Important" and 7 was "Extremely

Important"). In the experiment, favorable/unfavorable performances of the non-financial measures for the firm were described qualitatively as either 'Excellent' or 'Poor.' To check whether the financial measures, which were expressed quantitatively (as ratio numbers) as well as qualitatively, were also perceived by the analysts as favorable or unfavorable, they rated the financial measures on a five-point scale (scaled as poor, fair, good, very good or excellent). Next, the analysts were asked to assess the overall reliability of the financial and non-financial measures on a seven point scale (where 1 was "Not at all reliable" and 7 was "Completely Reliable"). Finally, they completed a debriefing questionnaire. The Appendix contains the experimental materials.

## 4. DATA ANALYSES

In all, of the 135 financial analysts receiving the experimental materials, 119 participated in this study by completing the materials. The responses of the early and late responses (split based on the mid-point of the days between the first and last respondent) were examined and were not found to be significantly different from each other with reference to the variables of interest in this study. The 16 analysts who did not participate in the study were spread over all the four financial institutions.

The descriptive statistics of the research variables for each combination of financial and non-financial measures (i.e., both favorable, etc) are in Table 1 (Part 1). Note that the number of responses (i.e., n) is different in three of the four cells for the rating recommendation (or RATE) and the TIME horizon of that rating (cells #1- cell#3). That is because if the analysts rated the firm as "no chance of a recommendation to invest" in their initial decision, then the TIME horizon of their recommendation is irrelevant.

On an average, the participants were involved with analyzing companies for 6.44 years and have been financial analysts for 3.8 years. Majority (84/119) of the participants are

"buy-side" analysts. Their time horizon in most of their investment decisions is about 1.3 years. In response to the question about the importance of the eight measures provided to the analysts in rating the investment decisions, each of them were rated very high (Table 1, Part 2A). Since the financial measures were quantitative in nature and the non-financial measures were qualitative in natures (i.e., poor or excellent), the analysts were asked to assess the performances of the financial measures on a scale ranging from "poor" to "excellent." An overwhelming majority of the analysts assessed the financial measures as excellent when they were favorable and poor when they were unfavorable (Table 1, Part 2B). There were no significant differences among these attributes across the four participating firms. On an average, analysts rated the overall reliability of the financial measures at 6.42 (on a seven point scale) and at 5.96 for the non-financial measures; these ratings were not significantly different from each other. Also, none of the dependent variables were affected by non-theoretical variables, namely, work experience, gender, institutional affiliation, or the participants being sell-side or buy-side analysts.

**Hypotheses Testing**

**A. Financial Measures, Non-financial Measures and Analysts' Recommendations**

The first hypothesis stated that financial and non-financial measures will have a complementary effect on analysts' recommendation ratings. This expectation was examined by using the following regression equation[4]:

$$RATE = \alpha_0 + \beta_1 FIN + \beta_2 NFIN + \beta_3 FIN*NFIN \quad (1)$$

Where:
*RATE* = the analysts' rating of the firm as a recommendation to buy
*FIN* = Financial measures (coded '0' when unfavorable and '1' when favorable)
*NFIN* = Non-financial measures (coded '0' when unfavorable and '1' when favorable), and
*FIN*NFIN*= interaction of financial and non-financial measures.

[4] Regression was used instead of ANOVA to analyze the experimental data because we also wanted to examine on some occasions the partial $R^2$ of the independent variables in an equation. This can be done using (step-wise) regression but not ANOVA.

The results (Table 2, Part 1) indicate the overall regression model was significant (F=42.87; p=0.0001). An examination of the source variables show that while both FIN and NFIN were significant, their interaction was also significant, suggesting that RATE differed according to the levels (i.e., favorable or unfavorable) of the two measures and consistent with the expectation that FIN and NFIN complement each other to affect RATE.

To understand the above interaction, two follow-up analyses were done. The first was a step-wise (forward) regression. The results show (Table 2, Part 2) that the interaction variable (i.e., FIN*NFIN) enters the model first followed by FIN and then NFIN. Second, the least mean squares (Note: This was used since the # of analysts in each combination of the measures' favorableness is unequal) of RATE was examined (Table 2, Parts 3A and 3B). The results show that RATE was the lowest when both measures are unfavorable (mean=1.60), next to lowest when FIN was unfavorable but NFIN was favorable (mean=3.13), followed by when FIN was favorable but NFIN was unfavorable (mean=4.28), and the highest when both measures were favorable (mean=7.03). All means were significantly different from each other. In conclusion, the results are consistent with the expectations of $H_1$that FIN and NFIN measures have complementary effect on analysts' ratings.

*Additional Analysis:* This was done to assess the differential impact of FIN and NFIN on RATE given each measure's favorableness – that is, the nature of the complementary effect. First the *changes* in RATE were determined holding the favorableness of one measure constant while varying the favorableness of the other measure. Next, the *differences* in the changes were compared (Table 2, Parts 4A and 4B). The results indicate that when NFIN is unfavorable, the increase in RATE when FIN goes from unfavorable to favorable (RATE change of 2.69) is significantly greater compared to when FIN is unfavorable and NFIN goes from unfavorable to favorable (RATE change of 1.53)[t-score=6.67; p=0.0001). Likewise,

when NFIN is favorable, the increase in RATE when FIN goes from unfavorable to favorable (RATE change of 3.90) is significantly greater when FIN is favorable and NFIN goes from unfavorable to favorable (RATE change of 2.74)[t-score = 6.15; p=0.0001). In short, the effect on RATE is significantly greater from improved favorableness of FIN than NFIN measures, which is in line with earlier results which show FIN has greater explanatory power than NFIN measures on RATE.

**B. Weighting of financial and non-financial measures**

While $H_1$tells us the effect of measures favorableness on RATE (an outcome), it provides us with no insight on the process by which the measures were used. Thus, the next question examined is the weights attached to FIN and NFIN measures when they both are favorable or unfavorable, or one is favorable but the other is not. Hypothesis $H_2$ suggests that when FIN is unfavorable, analysts are likely to weigh FIN more than NFIN when making their recommendations, but not otherwise. This was tested using the following regression:

$$WTDIFF = \alpha_0 + \beta_1 FIN + \beta_2 NFIN \quad (2)$$

Where:
*WTDIFF* = the *difference* in weights (WTDIFF) given to FIN and NFIN by the analysts in making their recommendation, and
$\beta_1 FIN$ and $\beta_2 NFIN$ are same as in equation (1).

The results (refer Table 3, Part 1) indicate that the overall model was significant (F=3.37; p=0.0378) as well as the interaction of FIN and NFIN (t value=1.92; p=0.0546). An examination of the means of WTDIFF by different favorableness configuration of FIN and NFIN measures [Cell#1 – both FIN and NFIN are unfavorable, Cell #2 – FIN is unfavorable but NFIN is favorable, Cell #3 – FIN is favorable but NFIN is unfavorable, and Cell #4 – both FIN and NFIN are favorable] provides additional insights (Table 3, Parts 2A and 2B). When FIN measures were *unfavorable* (i.e., cells #1 and #2), the weights attached to these measures were significantly *more* than the weights attached to NFIN measures irrespective of

whether NFIN are favorable or unfavorable (thus, the means of the WTDIFF in cells #1 and #2 are not significantly different from each other – see Table 3, Part 2B). When FIN measures are favorable (cells #3 and #4), they are weighted *less* than NFIN measures irrespective of whether NFIN measures are favorable or unfavorable (thus, the means of the WTDIFF in cells # 3 and 4 are not significantly different from each other – see Table 3, Part 2B). Also, it should be noted that the absolute value in WTDIFF when FIN is *unfavorable* is considerably higher (average WTDIFF = 10.33) compared to when FIN measures are *favorable* (average WTDIFF = 3.55). The step-wise (forward) regression show (Table 3, Part 3) that only FIN enters the model, further providing evidence the dominant role of favorable/unfavorable role FIN plays in analysts' recommendations. Overall, the results are consistent with the expectations of $H_2$ that unfavorable FIN measures are likely to be more heavily weighted than NFIN measures by analysts. In addition, we see that when FIN measures of a firm are favorable, analysts weight them less heavily and are also amenable to greater use of NFIN measures.

**C. Time horizon of financial and non-financial measures**

Our third hypothesis was that for analysts' time horizon, NFIN measures are given greater importance than FIN measures since NFIN are more informative about managers' actions and future firm performance. Two analyses were done to examine this prediction. First, we examined the effect of the favorableness of FIN/NFIN measures on time horizon. Since NFIN are lead measures, their favorableness should have a greater effect on time horizon than FIN. However, that is an indirect assessment of the importance of NFIN on time. A more direct test is to examine the association of the weights assigned by the analysts to FIN and NFIN and the time horizon of their recommendations.

For the first analysis, the following regression model was used:

$$Time = \alpha_0 + \beta_1 FIN + \beta_2 NFIN + \beta_3 FIN*NFIN \quad (3)$$

Where:
*Time* = TIME horizon of the analysts' recommendation, and
*FIN, NFIN* and *FIN*NFIN* as in equation (1)

The results (Table 4, Part 1) show the overall model is significant (F=40.51; p=0.0001). The source variables indicate the interaction of FIN and NFIN is significant. This is better explained by examining the least square means of TIME (Table 4, Part 2A and 2B). The results show that TIME was lowest when both measures are unfavorable (mean=1.42), next to lowest when FIN was favorable but NFIN was unfavorable (mean=1.61), followed by when FIN was unfavorable but NFIN was favorable (mean=2.74), and the highest when both measures were favorable (mean=3.87). Barring the first two (i.e., 1.42 versus 1.61 when FIN is unfavorable and favorable, respectively, but NFIN is unfavorable), all means were significantly different from each other. Thus, an increase in favorableness of NFIN is consistently accompanied by an increase in analysts' TIME horizon; increase in favorableness of FIN measures increases TIME only when NFIN is favorable. The dominance of NFIN over FIN with respect to TIME is evidenced in the stepwise (forward selection) regression which shows NFIN as the first variable to enter the model with a partial $R^2$ of 0.45 (p=0.0001), while FIN is the last variable to enter the model with a partial $R^2$ of 0.002 (p=0.4887)[Table 4, Part 3].

The second analysis examines the correlations between TIME, and the weights analysts assigned to the set of FIN and NFIN measures (FINWT and NFINWT, respectively). Recall that the weights assigned are a percentage and they must add up to a 100 percent; thus, increasing weights to one set of measures comes at the expense of other set of measures. The results (Table 4, Part 4) indicate that TIME is positively correlated with NFINWT (and, hence, negatively correlated with FINWT). Thus, the above results are consistent with the

expectations of $H_3$ that analysts' time horizon is affected more by NFIN measures than FIN measures.

**D. Measures' favorableness, ratings, time horizon and weights assigned to measures**

The first three hypotheses looked at the favorableness of the measures on ratings, weights assigned to the measures and analysts' time horizon separately. In reality, they are intertwined in making the rating recommendation. So, the last issue examined is how FIN and NFIN measures are weighted in conjunction with TIME in making the recommendation ratings when the favorableness of the measures varies.

For NFIN measures, hypotheses $H_{4a}$ suggests that only when NFIN is favorable, the effect of NFIN measure's weights on ratings differ depending in the level of analysts' time horizon. That is, weights assigned to favorable NFIN and TIME interaction affect analysts' recommendation ratings irrespective of the favorableness of FIN. However, for FIN measures as per $H_{4b}$, the interaction of the weights assigned to FIN and TIME will affect analysts' recommendation ratings *only* when NFIN is favorable. To test these predictions, first, an overall analysis was done using the following regression model:

$$Ratings = \alpha_0 + \beta_1 TIME*FIN*NFIN*WTDIFF \quad (4)$$

Where:
*Ratings, FIN* and *NFIN* are the same as in equation (1),
*WTDIFF* is the same as in equation (2), and
*TIME* is the same as equation as in (3).

The results indicate (see Table 5, Part 1) show that the overall model is significant (F=10.46; $p$ =0.0016). Further, the four-way interaction of TIME, FIN, NFIN and WTDIFF (t value = -3.23; $p$ = 0.0016) is also significant. To better understand this, we examined the interaction of TIME with the weights assigned to FIN and NFIN for each combination of these measures by their favorableness, using the following regression equation:

$$RATE = \alpha_0 + \beta_1 TIME*FINWT + \beta_2 TIME*NFINWT \quad (5)$$

Where:
*RATE* is the same as in equation #1,
*TIME* is the same as equation as in #3,
*FINWT* = weights assigned by the analysts to financial measures, and
*NFINWT* = weights assigned by the analysts to non-financial measures.

The results appear in Table 5, part 2. Note that the interactions of NFINWT and TIME are significant whenever NFIN measures are favorable (i.e., in cells #2 and #4) and not otherwise. This was predicted in $H_{4a.}$ Regarding FIN measures, FINWT and TIME interaction is significant (at $p$=0.10) *only* in the presence of favorable NFIN. This is also consistent with the expectations of hypothesis $H_{4b.}$

Since both NFINWT x TIME as well as FINWT x TIME on RATE are significant in Cell #4, data from this cell only is graphically examined to better understand these interactions (see Figure 1, parts A and B). The graphs indicate that when both FIN and NFIN measures are favorable, the increase in RATE is greater when the weights attached to the measures go from low to high and the time horizon is **high** compared to the increase in RATE when the weights attached to the measures go from low to high and the time horizon is **low** (note: the graph for NFINWT x TIME for cell #2 is very similar to Figure 1, part A and hence, was not shown here). Thus, favorable NFIN in particular are weighted in conjunction with the TIME when analysts make their recommendation ratings. Favorable FIN also have a similar influence but only when the NFIN is also favorable.

## 5. CONCLUSION

Although there is considerable research on the use of financial and non-financial measures, the primary focus of that research is on the use of these measures to evaluate managers and designing of incentives. The relevance of these measures for external constituents, like financial analysts, has received far less attention even though there is evidence suggesting that analysts value non-financial information in assessing firms for

investment purposes. Therefore, this research explores the role of financial and non-financial performance measures on analysts' recommendations. Specifically, for different combinations of the measures' favorableness, the research examines analysts' recommendation ratings on whether or not to invest in a company, and if yes, then how long is the time horizon of their recommendation, and what overall weights they place on the measures in making the above decisions.

A total of 119 financial analysts participated in this research. As hypothesized in $H_1$, the results indicate financial and non-financial measures have a complementary effect on financial analysts' recommendation ratings to invest in firms. Prior archival research (Amir and Lev 1996; Nagar and Rajan 2001) had also observed this relation between financial and non-financial measures. Further, while the effect of financial (non-financial) measures on ratings changes depending on whether the non-financial (financial) measures are favorable or unfavorable, the effect on the ratings is significantly greater from improved favorableness of financial measures than from improved non-financial measures.

The first hypothesis tells the effect of measures' favorableness on rating (an outcome) but provides us with little insight on the processes on how the measures were used. Thus, the next two questions focused on two process issues separately: the weights assigned to the measures ($H_2$) and the time horizon of the ratings ($H_3$). Hypothesis $H_2$ examined the explicit weights attached to financial and non-financial measures when they are both unfavorable, or both favorable, or one is favorable but the other is unfavorable. Results indicate that favorableness of the measures affects the weights assigned to the measures. More specifically, when financial measures are unfavorable, analysts weighted them more heavily than non-financial measures, irrespective of the latter's favorableness. However, when the financial measures are favorable, they are weighted less heavily than non-financial measures. These

results are consistent with $H_2$. Further, unfavorable financial measures are weighted significantly more than unfavorable non-financial measures. So, both the implicit weights derived from the analysis of hypothesis $H_1$ as well as the explicit weights obtained to test $H_2$ indicates the dominance of financial measures over non-financial measures in analysts' ratings recommendation.

When analysts consider the time horizon of their recommendations, non-financial measures are given greater importance than financial measures. Examining the effect of the favorableness of the financial and non-financial measures on the time horizon of analysts' recommendation as well as the correlation of the weights assigned to these measures and time horizon indicate the greater importance of non-financial measures, as predicted in $H_3$.

The first three hypotheses look at the favorableness, weights and time horizon separately. The last hypotheses examine how they are intertwined; that is, how the measures' favorableness, the weights assigned to them and time horizon mutually affect each other in influencing analysts' ratings. Results indicate that when non-financial measures are favorable, the interaction of the weights analysts put on these measures and recommendations' time horizon significantly influences their ratings. That is, the future value-creating implications of non-financial measures are encapsulated in both the time horizon and the weightings of these measures when analysts rate their recommendations to invest in a firm, as hypothesized in $H_{4a}$. There is also support for $H_{4b}$ - the interaction of time horizon and the weights assigned to financial measures is significant *only* when the non-financial measures are favorable. Thus, it appears that the presence of favorable non-financial measures gives favorable financial measures a sense of having some future value-creating implications. This is similar to Amir and Lev (1996) who found the value relevance of financial measures for stock prices emerging only when combined with the non-financial information. Overall, the

results underline the importance of both financial and non-financial measures to financial analysts (see Maines et al. 2002).

Our experiment is subject to the typical limitations of any experimental study. We acknowledge that analysts often deal with more firm-specific and industry-specific information when making investment recommendations which we did not provide. Our findings are also parameterized by design features, such as the specific measures used and that the favorableness of the measures was aggregated (i.e., the measures were either *all* favorable or *all* unfavorable). Perhaps other specific non-financial measures, especially industry-specific non-financial measures, may affect firm valuation different than the measures used in this study.

Future research needs to capture different dimensions of firms' exogenous and endogenous variables which affect the use of non-financial measures, such as strategy of the firm, industry characteristics (i.e., high or low tech), growth opportunities, ownership characteristics, etc., and examine how they affect the decisions of financial analysts. Using the proxy text files of Lexis/Nexis, it is possible to identify the use of non-financial measures by firms (see Ittner et al. 1997) and it is possible that the information content of these measures is already impacted in analysts' recommendations. Future research, thus, can examine non-financial measures which are publicly available with those measures shown to be important via survey and assess the incremental contribution of either group of non-financial measures on analysts' recommendations.

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## Table 1
## Descriptive Statistics

A. By each combination of measures.

| | | | Non-financial Measures: Unfavorable | | | Non-financial Measures: Favorable | |
|---|---|---|---|---|---|---|---|
| | | | Cell #1 | | Cell #2 | | |
| | | | Mean. | s.d. | | Mean. | s.d. |
| | | Time (n=21) | 1.43 | 0.59 | Time (n=27) | 2.74 | 1.09 |
| | **Unfav** | Rate (n=30) | 1.60 | 1.26 | Rate (n=30) | 3.13 | 1.94 |
| | | Weights: Financial | 55.33 | 13.19 | Weights: Financial | 55.00 | 13.11 |
| | | Non-Fin | 44.67 | 13.19 | Non-Fin | 45.00 | 13.11 |
| **Financial Measures** | | | | | | | |
| | | | Cell #3 | | Cell #4 | | |
| | | | Mean. | s.d. | | Mean. | s.d. |
| | | Time (n=26) | 1.62 | 0.71 | Time (n=30) | 3.87 | 1.07 |
| | **Fav** | Rate (n=29) | 4.28 | 2.61 | Rate (n=30) | 7.03 | 1.56 |
| | | Weights: Financial | 48.45 | 13.92 | Weights: Financial | 48.00 | 14.66 |
| | | Non-Fin | 51.55 | 13.92 | Non-Fin | 52.00 | 14.66 |

B. Overall (n=119)

1. Importance of the Measures (Scale: 0 is "Not Important"; 7 is "Extremely Important")

| | | |
|---|---|---|
| Financial | a. Sales/Total assets | 5.56 (0.86) |
| | b. Working capital/Total assets | 5.61 (0.48) |
| | c. Earnings before interest and taxes/Total assets | 5.98 (0.36) |
| | d Market value of equity/Book value of total debt | 5.39 (0.54) |
| Non-Financial | a. Management quality | 6.06 (0.52) |
| | b. Product quality | 6.01 (0.32) |
| | c. Innovativeness | 5.80 (0.44) |
| | d. Ability to attract and retain talented people | 5.63 (0.68) |

2. Financial Measure Assessment (Scale: Poor, Fair, Good, Very-Good, Excellent)

i. When Favorable

| | Very Good | Excellent |
|---|---|---|
| a. Sales/Total assets | 4.2% (5/119) | 95.8% (114/119) |
| b. Working capital/Total assets | 5.1% (6/119) | 94.9% (113/119) |
| c. Earnings before interest and taxes/Total assets | 6.7% (8/119) | 93.2% (111/119) |
| d Market value of equity/Book value of total debt | 2.5% (3/119) | 97.5% (116/119) |

ii. When Unfavorable

| | Fair | Poor |
|---|---|---|
| a. Sales/Total assets | 1.7% (2/119) | 98.3% (117/119) |
| b. Working capital/Total assets | 3.4% (4/119) | 96.6% (115/119) |
| c. Earnings before interest and taxes/Total assets | 6.7% (8/119) | 93.3% (111/119) |
| d Market value of equity/Book value of total debt | 5.0% (6/119) | 95.0% (113/119) |

**Table 2**
**Financial Measures, Non-financial Measures and Outcomes of Analysts' Recommendations**

1. Regression Analysis (n=119)

| Source | df | SS | MS | F Value | p | Adj, R2 |
|---|---|---|---|---|---|---|
| Model | 3 | 473.57 | 157.86 | 42.87 | .0001 | .5156 |

| Variable | df | Para. Est. | Std. Error | t score | p |
|---|---|---|---|---|---|
| Intercept | 1 | 1.60 | 0.35 | 4.57 | 0.0001 |
| Fin | 1 | 2.67 | 0.50 | 5.35 | 0.0001 |
| NFin | 1 | 1.53 | 0.50 | 3.09 | 0.0025 |
| Fin x NFin | 1 | 1.23 | 0.70 | 1.92 | 0.0546 |

2 Regression: Summary of Forward Selection:

| Step | Variable Entered | Partial R-Square | Model R-Square | F Value | P |
|---|---|---|---|---|---|
| 1 | Fin x NFin | 0.4092 | 0.4092 | 81.03 | 0.0001 |
| 2 | Fin | 0.0794 | 0.4886 | 18.02 | 0.0001 |
| 3 | NFin | 0.0393 | 0.5279 | 9.58 | 0.0025 |

3A: Least Square Means (LSM) by FIN and NFIN Measures, Favorableness

| FIN | NFIN | Cell # | Rate LSM |
|---|---|---|---|
| Unfav | Unfav | 1 | 1.60 |
| Unfav | Fav | 2 | 3.13 |
| Fav | Unfav | 3 | 4.28 |
| Fav | Fav | 4 | 7.03 |

3B. Least Square Means for Effect of FIN x NFIN among Cells
[t for $H_0$: LSMean (cell i ) = LSMean (cell j) / Pr > |t|]

| i/j | Cell 1 | Cell 2 | Cell 3 | Cell 4 |
|---|---|---|---|---|
| Cell1 | - | -3.10 (.0025) | -5.35 (. 0001) | -10.97 (.0001) |
| Cell 2 | | - | 2.29 (.0241) | -7.87 (.0001) |
| Cell 3 | | | - | -5.52 (.0001) |
| Cell 4 | | | | - |

**Table 2 (continued)**

4A: Change in Ratings

| | | Non-financial | | |
|---|---|---|---|---|
| | | Unfavorable | Favorable | Change |
| **Financial** | Unfavorable | 1.60 | 3.13 | 1.53 |
| | Favorable | 4.29 | 7.03 | 2.74 |
| | Change | 2.69 | 3.90 | |

4B: T-Test to Compare the Change

| Changes Compared | Rate Change | t-score | p-value |
|---|---|---|---|
| NFIN unfav; FIN goes from unfav to fav | 2.69 | | |
| V/S | | 6.67 | 0.0001 |
| FIN unfav; NFIN goes from unfav to fav | 1.53 | | |
| NFIN fav; FIN goes from unfav to fav | 3.90 | | |
| V/S | | 6.15 | 00001 |
| FIN fav; NFIN goes from unfav to fav | 2.74 | | |

**Table 3**
**Weighting of Financial and Non-financial Measures**

1. Regression Analysis (n=119); Dependent variable: Weight Difference

| Source | df | SS | MS | F Value | p | R2 |
|---|---|---|---|---|---|---|
| Model | 2 | 5759.65 | 2879.82 | 3.37 | 0.0378 | 0.10 |

| Variable | df | Para. Est. | Std. Error | t score | p |
|---|---|---|---|---|---|
| Intercept | 1 | 10.72 | 4.63 | 2.32 | 0.0223 |
| Fin | 1 | -13.89 | 5.36 | -2.59 | 0.0108 |
| NFin | 1 | -0.78 | 5.36 | -0.15 | 0.8845 |
| Fin x NFin | 1 | 1.23 | 0.70 | 1.92 | 0.0546 |

2A Weights Assigned to Performance Measures

| Fin. Meas | Non-fin Meas | Cell# | FIN weights (1) | NFIN weights (2) | Wt. Diff [1-2] |
|---|---|---|---|---|---|
| Unfavorable | Unfavorable | 1 | 55.33 | 44.67 | 10.66 |
| Unfavorable | Favorable | 2 | 55.00 | 45.00 | 10.00 |
| Favorable | Unfavorable | 3 | 48.45 | 51.55 | -3.10 |
| Favorable | Favorable | 4 | 48.00 | 52.00 | -4.00 |

2B Comparisons of Wt. Diff among Cells [t for $H_0$: LSMean (i) = LSMean (j) / Pr > |t|]

| i/f | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| 1 | - | -0.09<br>(0.9301) | 1.80<br>(0.0543) | 1.94<br>(0.0503) |
| 2 | | - | 1.72<br>(0.0551) | 1.82<br>(0.0522) |
| 3 | | | - | 0.12<br>(0.9069) |
| 4 | | | | - |

3 Regression: Summary of Forward Selection:

| Step | Variable Entered | Partial R-Square | Model R-Square | F Value | P |
|---|---|---|---|---|---|
| 1 | Fin | 0.0547 | 0.0547 | 6.78 | 0.0104 |

**Table 4**
**Time Horizon of the Measures**

1. Regression Analysis (n=119)

| Source | df | SS | MS | F Value | p | Adj, R2 |
|---|---|---|---|---|---|---|
| Model | 3 | 102.01 | 34.00 | 40.51 | .0001 | .5350 |

| Variable | df | Para. Est. | Std. Error | t score | p |
|---|---|---|---|---|---|
| Intercept | 1 | 1.43 | 0.20 | 7.15 | 0.0001 |
| Fin | 1 | 0.19 | 0.27 | 0.69 | 0.4887 |
| NFin | 1 | 1.31 | 0.27 | 4.92 | 0.0001 |
| Fin x NFin | 1 | 0.94 | 0.36 | 2.52 | 0.0110 |

2A: Least Square Means (LSM) of Time Horizon by Measures' Favorableness

| FIN | NFIN | Cell# | Rate LSM |
|---|---|---|---|
| Unfav | Unfav | 1 | 1.43 |
| Unfav | Fav | 2 | 2.74 |
| Fav | Unfav | 3 | 1.62 |
| Fav | Fav | 4 | 3.87 |

2B. Least Square Means for Effect of Fin x Nfin among Cells
[t for $H_0$: LSMean (i) LSMean (j) / Pr > |t|]

| i/f | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| 1 | - | -4.92<br>(.0001) | -0.69<br>(.4887) | -9.35<br>(.0001) |
| 2 | | - | 4.47<br>(.0001) | -4.63<br>(.0001) |
| 3 | | | - | -9.17<br>(.0001) |
| 4 | | | | - |

3. Regression: Summary of Forward Selection

| Step | Variable Entered | Partial R-Square | Model R-Square | F Value | P |
|---|---|---|---|---|---|
| 1 | NFin | 0.4495 | 0.4495 | 83.29 | 0.0001 |
| 2 | Fin x NFin | 0.0969 | 0.5464 | 21.57 | 0.0001 |
| 3 | Fin | 0.0022 | 0.5486 | 0.48 | 0.4887 |

**Table 4 (continued)**

4. Correlation Analysis of TIME and Weights assigned to the Measures

Pearson Correlations Coefficients
Prob > |r| under $H_o$: ρ=0
(Number of Observations)

| | TIME | FINWT | NFINWT |
|---|---|---|---|
| TIME | 1.0000<br>-<br>(n=104) | -0.2802<br>0.0040<br>(n=104) | 0.2802<br>0.0040<br>(n=104) |
| FINWT | | 1.0000<br>-<br>(n=119) | -1.0000<br><0.0001<br>(n=119) |
| NFINWT | | | 1.0000<br>-<br>(n=119) |

**Table 5**
**Recommendation, Time Horizon and Weights of Measures on Ratings**

Part 1: Regression Analysis (n=104)

| Source | df | SS | MS | F Value | p | Adj. R2 |
|---|---|---|---|---|---|---|
| Model | 1 | 59.11 | 59.11 | 10.46 | .0016 | 0.1241 |

| Variables | df | Para. Est. | Std. Error | t score | p |
|---|---|---|---|---|---|
| Intercept | 1 | 4.4237 | 0.24 | 18.64 | 0.0001 |
| Time x Fin x NFin x Wtdiff | 1 | -0.01 | 0.00 | -3.23 | 0.0016 |

Part 2: Regression of time and weights on recommendation ratings by cell

Cell #1 (Both Financial and Non-financial measures are unfavorable)

| Source | df | SS | MS | F Value | p | Adj, R2 |
|---|---|---|---|---|---|---|
| Model | 2 | 5.30 | 2.65 | 0.78 | 0.4680 | 0.0169 |

| Variable | df | Para. Est. | Std. Error | t score | p |
|---|---|---|---|---|---|
| Intercept | 1 | 2.254 | 1.091 | 2.07 | 0.0498 |
| Time x Finwt | 1 | 0.004 | 0.007 | 0.60 | 0.5511 |
| Time x NFin | 1 | 0.004 | 0.004 | 0.91 | 0.3745 |

Cell #2 (Financial is unfavorable, Non-financial is favorable)

| Source | df | SS | MS | F Value | p | Adj, R2 |
|---|---|---|---|---|---|---|
| Model | 2 | 5.20 | 2.60 | 3.59 | 0.0489 | 0.2054 |

| Variable | df | Para. Est. | Std. Error | t score | p |
|---|---|---|---|---|---|
| Intercept | 1 | 1.104 | 0.498 | 2.22 | 0.0397 |
| Time x Finwt | 1 | 0.003 | 0.005 | 0.68 | 0.5056 |
| Time x NFinwt | 1 | 0.014 | 0.006 | 2.26 | 0.0365 |

Cell #3 (Financial is favorable, Non-financial is unfavorable)

| Source | df | SS | MS | F Value | p | Adj. R2 |
|---|---|---|---|---|---|---|
| Model | 2 | 0.04 | 0.02 | 0.00 | 0.9962 | 0.0003 |

| Variable | df | Para. Est. | Std. Error | t score | p |
|---|---|---|---|---|---|
| Intercept | 1 | 4.070 | 1.510 | 3.11 | 0.0049 |
| Time x Finwt | 1 | 0.000 | 0.008 | 0.08 | 0.9364 |
| Time x NFinwt | 1 | 0.000 | 0.020 | 0.00 | 0.9963 |

Cell #4 (Both Financial and Non-financial measures are favorable)

| Source | df | SS | MS | F Value | p | Adj. R2 |
|---|---|---|---|---|---|---|
| Model | 2 | 21.19 | 10.59 | 5.75 | 0.0083 | 0.2466 |

| Variable | df | Para. Est. | Std. Error | t score | p |
|---|---|---|---|---|---|
| Intercept | 1 | 3.346 | 1.391 | 2.40 | 0.0234 |
| Time x Finwt | 1 | 0.012 | 0.004 | 1.70 | 0.1008 |
| Time x NFinwt | 1 | 0.007 | 0.002 | 2.98 | 0.0060 |

## APPENDIX

Please evaluate the firm below based only on the information provided. You have been given selected financial and non-financial information about a firm. The information is purposely limited, but please use any of the eight items you want. The financial information is from the most recently available audited balance sheet and income statement. These four ratios are commonly used in the evaluation of a firm's financial health. In addition, we have included four non-financial measures for the firm obtained from a survey of companies from the same industry as the firm. The survey was conducted by a major independent consulting firm. The respondents of the survey were all financial analysts. This consulting firm used the following scale to assess the opinions about the companies from the analysts:

Poor Fair Good Very Good Excellent

In response to the management's request to provide assurance on the relevance and reliability of the non-financial measures, the firm's auditor gave an unqualified opinion in their report.

**Experimental Manipulations:**

A. When both financial and non-financial measures are <u>unfavorable</u> (cell #1), analysts read the following:

Sales/Total Assets = **0.401**
Working capital/Total assets = **-0. 381**
Earnings before interest and taxes/Total Assets = **-0.217**
Market value of equity/Book value of total debt = **0.981**

Management Quality: **Poor**
Product Quality: **Poor**
Innovativeness: **Poor**
Ability to attract talented people: **Poor**

*Note: Compared to industry standards, all four financial ratios above are rated as poor.*

B: When both financial and non-financial measures are <u>favorable</u> (cell #4), analysts read the following:

Sales/Total Assets = **1.696**
Working capital/Total assets = **0.565**
Earnings before interest and taxes/Total Assets = **0.128**
Market value of equity/Book value of total debt = **2.571**

Management Quality: **Excellent**
Product Quality: **Excellent**
Innovativeness: **Excellent**
Ability to attract talented people: **Excellent**

*Note: Compared to industry standards, all four financial ratios above are rated as excellent.*

C: When financial is favorable and non-financial is unfavorable (cell #2), or vice-versa (cell #3), the analysts read a combination of above financial/non-financial measures, as appropriate, by their favorableness.

1. As you screen companies as an investment or acquisition target, how would you rate the above firm?
(*Please circle the appropriate number*)

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| No chance of a recommendation to buy | | | | | | | | | | Definite recommendation to buy |

2. If you recommended buying the stock (i.e., a judgment other than 0), how long is the time horizon of your rating?

*(Please put an X mark to indicate your answer)*

____ 1 to 3 months
____ 3 to 6 months
____ 6 to 12 months
____ 12 to 18 months
____ 18 to 24 months
____ 24 to 36 months
____ 36 to 48 months
_____ more than 48 months

3. Think about your earlier general decision to invest in the firm. In making that decision, please estimate overall how important you consider financial versus non-financial information about the company.

IMPORTANCE:

| | |
|---|---|
| Financial information | _____% |
| Non-financial information | _____% |
| TOTAL **must** = | **100** % |

4. Considering the percentage you assigned to financial and non-financial measures in question 3 above, how important was each of the following items when you evaluated the company?

*(Please answer using the 1 to 7 scale circling one number for each item)*

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| a. Sales/Total assets | 1 Not Important | 2 | 3 | 4 | 5 | 6 | 7 Extremely Important |
| b. Management quality | 1 Not Important | 2 | 3 | 4 | 5 | 6 | 7 Extremely Important |
| c. Working capital/Total assets | 1 Not Important | 2 | 3 | 4 | 5 | 6 | 7 Extremely Important |
| d. Product quality | 1 Not Important | 2 | 3 | 4 | 5 | 6 | 7 Extremely Important |
| e. Earnings before interest and taxes/Total assets | 1 Not Important | 2 | 3 | 4 | 5 | 6 | 7 Extremely Important |
| f. Innovativeness | 1 Not Important | 2 | 3 | 4 | 5 | 6 | 7 Extremely Important |
| g. Market value of equity/Book value of total debt | 1 Not Important | 2 | 3 | 4 | 5 | 6 | 7 Extremely Important |
| h. Ability to attract and retain talented people | 1 Not Important | 2 | 3 | 4 | 5 | 6 | 7 Extremely Important |

5. Consider the financial ratios of the firm. How would you assess their performance?

*(Please answer using the scale circling one description for each item)*

| | | | | | |
|---|---|---|---|---|---|
| a. Sales/Total assets: | Poor | Fair | Good | Very Good | Excellent |
| b. Working capital/Total assets | Poor | Fair | Good | Very Good | Excellent |
| c. Earnings before interest and taxes/Total Assets | Poor | Fair | Good | Very Good | Excellent |
| d. Market value of equity/Book value of total debt | Poor | Fair | Good | Very Good | Excellent |

6. Consider the selected financial measures and non-financial measures given for the firm. How reliable do you find the firm's measures?

(*Please answer using the 1 to 7 scale circling one number for each measure)*

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Financial Measures: | 1 Not at all reliable | 2 | 3 | 4 | 5 | 6 | 7 Completely reliable |
| Non-Financial Measures: | 1 Not at all reliable | 2 | 3 | 4 | 5 | 6 | 7 Completely reliable |

7. For purposes of analysis we restricted your information set to four ratios and four non-financial pieces of information. What other information you would have liked?