CAN INVESTORS PROFIT FROM THE PROPHETS? SECURITY ANALYST RECOMMENDATIONS AND STOCK RETURNS

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ABSTRACT

In this paper we document that stocks highly recommended by analysts outperform the market, while those that are unfavorably recommended underperform. Our findings are based on an extensive analysis of over 360,000 analyst recommendations from 269 brokerage houses over the period 1986-1996. We show that strategies of purchasing the stocks with the most favorable consensus (average) recommendations or selling short those with the least favorable recommendations, in conjunction with daily portfolio rebalancing and a quick investor response to changes in consensus recommendations, yielded an annual abnormal gross return of more than 4 percent. Less frequent portfolio rebalancing or a delay in reacting to consensus recommendation changes diminished the abnormal returns; however, they did remain significant for the least favorably rated stocks. We also show that quite high trading levels are required to capture the excess returns generated by the strategies we analyze, entailing substantial transactions costs and leading to abnormal net returns that were not reliably greater than zero.

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INTRODUCTION

This study examines whether investors can profit from the publicly available recommendations of security analysts. Academic theory and Wall Street practice are clearly at odds regarding this issue. On the one hand, the semi-strong form of market efficiency posits that investors should not be able to trade profitably on the basis of publicly available information, such as analyst recommendations. On the other hand, research departments of brokerage houses spend large sums of money on security analysis, presumably because these firms and their clients believe its use can generate superior returns.

These observations provide a compelling empirical motivation for our inquiry and distinguish our analysis from many recent studies of stock return anomalies.[1] In contrast to many of these studies, which focus on corporate events, such as stock splits, or firm characteristics, such as recent return performance, that are not directly tied to how people invest their money, we analyze an activity – security analysis – that is undertaken by investment professionals at hundreds of major brokerage houses with the express purpose of improving the return performance of their clients.

The possibility that there could exist profitable investment strategies based on the publicly available recommendations of security analysts is suggested by the findings of Stickel (1995) and Womack (1996), who show that favorable (unfavorable) changes in individual

[1]See Fama (1998) for a review and critique of this body of work.

analyst recommendations are accompanied by positive (negative) returns at the time of their announcement.[2] Additionally, Womack documents a post-recommendation stock price drift lasting up to one month for upgrades and six months for downgrades.[3]

Our paper's perspective, however, is different from that of Stickel and Womack. Their primary goal is to measure the average price reaction to changes in individual analysts' recommendations; therefore, they take an analyst and event-time perspective. This approach can only provide evidence as to whether, absent transactions costs, profitable investment strategies could potentially be designed around those recommendations. In contrast, we take a more investor-oriented, calendar-time perspective. This permits us to directly measure the abnormal gross returns to a number of investment strategies and to estimate portfolio turnover and the associated transactions costs incurred in implementing them. Consequently, we are able to determine whether investors can earn positive abnormal profits on these strategies after accounting for transactions costs.

By measuring turnover and estimating net profitability rather than just the gross returns to various stock market investment strategies our analysis contributes to the market efficiency debate. Our methodology could easily be extended to the study of other strategies (for example, those based on price momentum or the earnings announcement drift) in order to determine whether investors can generate abnormal returns net of trading costs.

We focus on the profitability of investment strategies involving consensus (average)

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[2]Other papers examining the investment performance of security analysts' stock recommendations are Barber and Loeffler (1993), Bidwell (1977), Diefenbach (1972), and Groth, Lewellen, Schlarbaum, and Lease (1979). Copeland and Mayers (1982) studied the investment performance of the *Value Line Investment Survey* while Desai and Jain (1995) analyzed the return from following *Barron's* annual roundtable recommendations.

[3]Stickel also reports the existence of a post-recommendation stock price drift.

analyst recommendations. The consensus is a natural choice, as it takes into account the information implicit in the recommendations of *all* the analysts following a particular stock. It is arguably the analyst statistic that is most easily accessed by investors, as it appears on many Internet financial web sites and is incorporated into the databases of several financial information providers.[4]

The data used in this paper come from the Zacks database for the period 1985-1996, which includes over 360,000 recommendations from 269 brokerage houses and 4,340 analysts. As such, our study uses by far the largest sample of analyst recommendations. Stickel, by comparison, studies the price impact of 16,957 changes in analyst recommendations over the 1988-1991 period, while Womack analyzes the impact of 1,573 changes in analyst recommendations for the top 14 U.S. brokerage research departments during the 1989-1991 period.

With the Zacks database we track in calendar time the investment performance of firms grouped into portfolios according to their consensus analyst recommendations. Every time an analyst is reported as initiating coverage, changing his or her rating of a firm, or dropping coverage, the consensus recommendation of the firm is recalculated and the firm moves between portfolios, if necessary. Any required portfolio rebalancing occurs at the end of the trading day. This means that investors are assumed to react to a change in consensus recommendation at the close of trading on the day that the change took place. Consequently, any return that investors might have earned from advance knowledge of the recommendations (or from trading in the

[4]See, for example, *CBSMarketWatch*, at http://cbs.marketwatch.com, and the *Dow Jones Retrieval Service*. The consensus analyst recommendation data usually comes from either *First Call* or *Zacks Investment Research*.

recommended stocks at the start of the trading day) is excluded from the return calculations.

For our sample period we find that buying the stocks with the most favorable consensus recommendations earned an annualized geometric mean return of 18.8 percent, while buying those with the least favorable consensus recommendations earned only 5.78 percent (see Figure 1). As a benchmark, during the same period an investment in a value-weighted market portfolio earned an annualized geometric mean return of 14.5 percent. Alternatively stated, the most highly recommended stocks outperformed the least favorably recommended ones by 102 basis points *per month*.

After controlling for market risk, size, book-to-market, and price momentum effects a portfolio comprised of the most highly recommended stocks provided an average annual abnormal return of 4.13 percent while a portfolio of the least favorably recommended ones yielded an average annual abnormal return of -4.91 percent. Consequently, purchasing the securities in the top portfolio and selling short those in the lowest portfolio yielded an average abnormal return of 75 basis points per month.[5] By comparison, over the same period high book-to-market stocks outperformed low book-to-market stocks by a mere 17 basis points, while large firms outperformed small firms by 16 basis points per month.[6] Our results are most pronounced for small firms; among the few hundred largest firms we find no reliable differences between the returns of those most highly rated and those least favorably recommended.

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[5]If large institutional clients were to gain access to, and trade on, analysts' recommendations before they were made public, their investment value would be even greater. This is due to the strong market reaction that immediately follows the announcement of a recommendation. (The magnitude of this reaction for our sample of analyst recommendations is documented in Table III.)

[6]The size and book-to-market effects were calculated using portfolios constructed by Fama and French (1993).

Two of the assumptions underlying the calculation of these abnormal returns, that investors react to changes in analysts' consensus recommendations on the same trading day as they occur and that they rebalance their portfolios daily, reflect behavior that, for many smaller investors, is either impractical or infeasible to implement. Consequently, we examine two additional sets of investment strategies. The first entails less frequent portfolio rebalancing – weekly, semi-monthly, or monthly, instead of daily. Since less frequent rebalancing means that investors do not respond to all consensus recommendation changes in a timely fashion, abnormal returns should diminish in magnitude. We find this to be the case. Specifically, the average annual abnormal return to the portfolio of the highest rated stocks declined to between 2 and 2½ percent, numbers that are, for the most part, not reliably greater than zero. In contrast, the average annual abnormal return on the portfolio of the least favorably recommended stocks remained significantly less than zero, although it decreased somewhat, to between -4 and -4½ percent. Apparently, very frequent rebalancing is crucial to capturing the returns on the most highly recommended stocks, but is not as important in generating the returns on those that are least favorably rated.

The second set of alternative strategies involves a delay in investors' reaction to changes in analysts' consensus recommendations – of either one week, a half-month, or a full month. We show that a delay of either one week or a half-month decreased the average annual abnormal return on the portfolio of the most highly recommended stocks to around 2 percent, while a month's delay reduced it to less than 1 percent. None of these returns is reliably greater than zero. In contrast, the average annual abnormal return on the portfolio of the least favorably rated stocks remained significantly negative for all delay periods examined, standing at over -4

percent for a one-week delay and about -2½ percent for either a half-month's or a full month's delay. These results suggest that the returns to the highest rated stocks are concentrated in the few days around consensus recommendation changes, while the returns to the least favorably recommended stocks are more spread out over time. They also highlight the importance to investors of acting quickly in order to capture the returns to the highest rated stocks.

The returns documented thus far are gross of transactions costs, such as the bid-ask spread, brokerage commissions, and the market impact of trading. As we show, under the assumption of daily rebalancing, purchasing the most highly recommended securities or shorting the least favorably recommended ones requires a great deal of trading, with turnover rates at times in excess of 400 percent annually. After accounting for transactions costs, these active trading strategies did not reliably beat a market index. Restricting these trading strategies to the smallest firms (whose abnormal gross returns are shown to be the highest) does not alter this conclusion; transactions costs remained very large, and abnormal net returns were not significantly greater than zero. Rebalancing less frequently does reduce turnover significantly (falling below 300 percent for monthly rebalancing). But, because the abnormal gross returns fall as well, abnormal net returns were still not reliably greater than zero, in general. Despite the lack of positive net returns to the strategies we examine, analyst recommendations do remain valuable to investors who are otherwise considering buying or selling. Ceteris paribus, an investor would be better off purchasing shares in firms with more favorable consensus recommendations and selling shares in those with less favorable consensus ratings.

While a large number of trading strategies were investigated and none were found to yield positive abnormal net returns, our analysis by no means rules out the possibility that such

profitable trading strategies exist. It remains an open question whether other strategies based on analysts' consensus recommendations, or even the same strategies applied to different time periods or different stock recommendation data, will be able to generate positive abnormal net returns.

The plan of this paper is as follows. In Section I we describe the data and our sample selection criteria. A discussion of our research design follows in Section II. In Section III we form portfolios according to consensus analyst recommendations and analyze their returns. In Section IV we estimate the transactions costs of following the strategies of buying the most highly rated stocks and selling short those that are least favorably rated and discuss the profitability of these strategies. We partition our sample by firm size and reexamine the returns to our strategies in Section V. A summary and conclusions section ends the paper.

I. THE DATA, SAMPLE SELECTION CRITERIA, AND DESCRIPTIVE STATISTICS

The analyst recommendations used in this study were provided by *Zacks Investment Research*, who obtains its data from the written and electronic reports of brokerage houses. The recommendations encompass the period 1985 (the year that Zacks began collecting this data) through 1996. Each database record includes, among other items, the recommendation date, identifiers for the brokerage house issuing the recommendation and the analyst writing the report (if the analyst's identity is known), and a rating between 1 and 5. A rating of 1 reflects a strong buy recommendation, 2 a buy, 3 a hold, 4 a sell, and 5 a strong sell. This five-point scale is commonly used by analysts. If an analyst uses a different scale, Zacks converts the analyst's

rating to its five-point scale.[7]

Another characteristic of the database, one that has not been explicitly acknowledged in any prior study as far as we are aware, is that the data made available to academics does not constitute Zacks' complete set of recommendations. According to an official at Zacks, some individual brokerage houses have entered into agreements that preclude their recommendations from being distributed by Zacks to anyone other than the brokerage houses' clients. Consequently, the recommendations of several brokerage houses, including such large ones as Merrill Lynch, Goldman Sachs, and Donaldson, Lufkin, and Jenrette, are not part of this academic database.[8] However, the recommendations of many large and well-known ones, such as Salomon Smith Barney, Morgan Stanley, Bear Stearns, CS First Boston, and Paine Webber, are included.[9]

The Zacks database contains 378,326 observations for the years 1985-1996. Dropping those for the 1,286 firms not appearing on the CRSP file leaves a final sample of 361,620 recommendations. Table I provides descriptive statistics for these recommendations. As shown in column 3, the number of firms covered by Zacks has increased steadily over the years. For the year 1996, 59.8 percent of all firms on the NYSE, AMEX, or NASDAQ had at least one

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[7]Ratings of 6 also appear in the Zacks database and signify termination of coverage.

[8]Supplementary tests performed using the *First Call* database (which includes these large brokerage house recommendations) suggest that this omission does not have a significant effect on our results. See footnote 28.

[9]For the first year in which we compute recommendation returns, 1986, the Zacks database includes the recommendations of 12 of the 20 largest brokerage houses, in terms of capital employed. (Capital levels are taken from the Securities Industry Yearbook, Securities Industry Association, Chicago, IL.) The capital of these 12 brokerage houses comprises 54 percent of the total capital of these largest houses. For the last year of recommendation returns, 1996, the Zacks database includes the recommendations of 12 of the 19 largest brokerage houses (the 20th does not prepare analyst recommendations), whose capital comprises 49 percent of the total capital of these largest houses.

recommendation in the database (column 4). The market capitalization of these firms constituted 95.6 percent of the capitalization of all firms in the market (column 5). This is consistent with the conventional wisdom that analysts tend to cover larger firms, because they offer more liquidity and allow the analysts' clients to more easily take large positions in the firms' shares (which, in turn, generates larger commissions revenues for the brokerage houses).

From 1986 onward, the mean number of analysts per covered firm has generally been increasing (column 6), while the median number has remained constant (column 7). The mean and median number of covered firms per analyst has also been stable (columns 8 and 9). Additionally, the number of brokerage houses contributing recommendations to Zacks and the number of analysts providing forecasts has steadily increased over time (columns 10 and 11). The last column of the table reports the average of all of the analyst ratings, by year. It shows a rather steady decrease over time, indicating that analysts' recommendations have become more favorable.[10]

A 6 x 6 transition matrix of the analysts' recommendations appears in Table II. Each cell {i,j} of the matrix contains two numbers. The top one is the number of observations in the database in which an analyst moved from a recommendation of i to one of j; the bottom number is the median number of calendar days between the announcement of a recommendation of i and a revised recommendation of j. The diagonal elements of the matrix reflect reiterations of analyst recommendations. Most of the entries in this matrix are concentrated in the upper 3 x 3 cells. This is to be expected, given the conventional wisdom that analysts are reluctant to issue

[10]The year 1985 has by far the smallest number of covered firms, brokerage houses, and analysts, likely due to the fact that it is the first year that Zacks began tracking recommendations. Since the 1985 data is so sparse, we do not include the investment returns from that year in our analysis.

sell recommendations. Within this region, the bulk of the observations represent reiterations. The mean time between a recommendation and its reiteration is a little less than 300 days.[11] This is much longer than the mean time between a recommendation and a revision by the analyst to a new rating, which is generally in the low 100-day range.

The line entitled "First Zacks Recommendation" records the first recommendation in the database for a given analyst-company pair. Consistent with McNichols and O'Brien (1998), the first recommendation is usually a buy (1 or 2), less often a hold, and rarely a sell (4 or 5). This again reflects the reluctance of analysts to issue sell recommendations. This observation is also consistent with the numbers in the last two lines of the table. Of all the recommendations in the database 47.1 percent are buys while only 5.7 percent are sells. Excluding observations with a rating of 6, buys constitute 54.1 percent of the total, while sells make up only 6.5 percent.

We also computed the average three-day announcement period return for changes in or initiations of analyst recommendations. These returns are presented in Table III. Similar to the results of Stickel (1995) and Womack (1996) we find that the compound (size-adjusted) return for the three-day period centered on the day a rating change is announced is, in general, significantly positive for upgrades and significantly negative for downgrades.[12] Furthermore, for the set of initial analyst-company recommendations in the database, a buy rating (1 or 2) is

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[11]To the extent that the Zacks database does not record all reiterations, this number will be biased upward.

[12]Using the *First Call* database, Womack (1996) reports three-day returns that are much higher in magnitude than those documented here. This is consistent with his assertion that there are occasional delays in the recording of some of the recommendations in the Zacks database. (The difference may also be due to the fact that Womack's sample consists only of large brokerage house recommendations. If these recommendations are accorded more publicity, this could lead to more of the market reaction being larger in the few days around their announcement.) As we report in footnote 28, though, supplementary tests using *First Call* suggest that any timing issues surrounding Zacks do not have a significant effect on our main results.

accompanied by a significantly positive return, as expected, while a hold or sell rating (3, 4, or 5) is associated with a significantly negative return.

II. RESEARCH DESIGN

A. Portfolio Construction

To determine whether investors can profit from analysts' consensus recommendations, we construct calendar-time portfolios based on the consensus rating of each covered firm. The average analyst rating, $\bar{A}_{i\tau\text{-}1}$, for firm i on date τ-1 is found by summing the individual ratings, $A_{ij\tau\text{-}1}$, of the $j = 1$ to $n_{i\tau\text{-}1}$ analysts who have outstanding recommendations for the firm on that day and dividing by $n_{i\tau\text{-}1}$. Formally,

$$\bar{A}_{i\tau-1} = \frac{1}{n_{i\tau-1}} \sum_{j=1}^{n_{i\tau-1}} A_{ij\tau-1}.$$

Using these average ratings, each covered firm is placed into one of five portfolios as of the close of trading on date τ-1. The first portfolio consists of the most highly recommended stocks, those for which $1 \le \bar{A}_{i\tau\text{-}1} \le 1.5$; the second is comprised of firms for which $1.5 < \bar{A}_{i\tau\text{-}1} \le 2$; the third contains firms for which $2 < \bar{A}_{i\tau\text{-}1} \le 2.5$; the fourth is comprised of firms for which $2.5 < \bar{A}_{i\tau\text{-}1} \le 3$; and the fifth portfolio consists of the least favorably recommended stocks, those for which $\bar{A}_{i\tau\text{-}1} > 3$.[13]

[13] Five portfolios were chosen so as to achieve a high degree of separation across firms in the sample while retaining sufficient power for our tests. The cutoffs, while somewhat arbitrary, were set so that only the bottom portfolio contained firms whose consensus ratings corresponded to hold or sell recommendations, due to the relative infrequency of such ratings. Qualitatively similar results were obtained for our main analysis when (a) the cutoffs for portfolios 1, 2, 3, and 4 each year were set equal to the 20th, 40th, 60th, and 80th percentiles, respectively, of the prior year's distribution of consensus recommendations, and (b) when the first portfolio included only firms with an average rating of one.

After determining the composition of each portfolio p as of the close of trading on date τ-1, the value-weighted return for date τ was calculated. Denoted by $R_{p\tau}$ for portfolio p, this return is given by:

$$R_{p\tau} = \sum_{i=1}^{n_{p\tau-1}} x_{i\tau-1} R_{i\tau},$$

where:

$x_{i\tau-1}$ = the market value of equity for firm i as of the close of trading on date τ-1 divided by the aggregate market capitalization of all firms in portfolio p as of the close of trading on that date,

$R_{i\tau}$ = the return on the common stock of firm i on date τ, and

$n_{p\tau-1}$ = the number of firms in portfolio p at the close of trading on date τ-1.

There are two reasons we value-weight rather than equally-weight the securities in each portfolio. First, an equal weighting of daily returns (and the implicit assumption of daily rebalancing) leads to portfolio returns that are severely overstated.[14] Second, a value weighting allows us to better capture the economic significance of our results, as the individual returns of the larger and more important firms will be more heavily represented in the aggregate return than will those of the smaller firms. This may, however, bias against finding evidence of abnormal returns, as markets are likely to be most efficient for the largest securities.

For each month in our sample period, the daily returns for each portfolio p, $R_{p\tau}$, are

[14]This problem arises due to the cycling over time of a firm's closing price between its bid and ask (commonly referred to as the bid-ask bounce). For a more detailed discussion see Barber and Lyon (1997), Blume and Stambaugh (1983), Canina, Michaely, Thaler, and Womack (1998), and Lyon, Barber, and Tsai (1998).

compounded over the *n* trading days of the month to yield a monthly return, R_{pt}:

$$R_{pt} = \prod_{\tau=1}^{n}(1+R_{p\tau}) - 1.$$

In addition to these five portfolios, we construct two other portfolios. The first additional portfolio consists of all covered firms on each date τ (those that had an outstanding rating from at least one analyst in the Zacks database on that day) and the second portfolio consists of neglected firms on that date (those firms on the CRSP daily returns file that did not have any outstanding analyst ratings on that day).[15] The composition of each of these two portfolios is recalculated every day, since firms gain or lose analyst coverage over time.

B. Performance Evaluation

To determine whether profitable investment strategies exist with respect to analysts' consensus recommendations we begin with a simple calculation of market-adjusted returns for each of our constructed portfolios. It is given by $R_{pt} - R_{mt}$ for portfolio *p* in month *t*, where R_{mt} is the month *t* return on the CRSP NYSE/AMEX/NASDAQ value-weighted market index. We next calculate three measures of abnormal performance for each portfolio. First, we employ the theoretical framework of the Capital Asset Pricing Model and estimate the following monthly time-series regression:

$$R_{pt} - R_{ft} = \alpha_p + \beta_p(R_{mt} - R_{ft}) + \epsilon_{pt},$$

[15]Since the academic version of the Zacks database does not include the recommendations of all brokerage houses, it is possible that some of the 'neglected' firms are actually covered by one or more analysts. To the extent this is true, our test for differences in returns between neglected and covered firms is less powerful.

where:

R_{ft} = the month t return on treasury bills having one month until maturity, [16]

α_p = the estimated CAPM intercept (Jensen's alpha),

β_p = the estimated market beta, and

ϵ_{pt} = the regression error term.

This test yields parameter estimates of α_p and β_p.

Second, we employ an intercept test using the three-factor model developed by Fama and French (1993). To evaluate the performance of each portfolio, we estimate the following monthly time-series regression:

$$R_{pt} - R_{ft} = \alpha_p + \beta_p(R_{mt} - R_{ft}) + s_pSMB_t + h_pHML_t + \epsilon_{pt},$$

where:

SMB_t = the difference between the month t returns of a value-weighted portfolio of small stocks and one of large stocks, and

HML_t = the difference between the month t returns of a value-weighted portfolio of high book-to-market stocks and one of low book-to-market stocks. [17]

The regression yields parameter estimates of α_p, β_p, s_p, and h_p.

A third test includes a zero investment portfolio related to price momentum, as follows:

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[16]This return is taken from Stocks, Bonds, Bills, and Inflation, 1997 Yearbook, Ibbotson Associates, Chicago, IL.

[17]The construction of these portfolios is discussed in detail in Fama and French (1993). We thank Ken French for providing us with this data.

$$R_{pt} - R_{ft} = \alpha_p + \beta_p(R_{mt} - R_{ft}) + s_p SMB_t + h_p HML_t + m_p PMOM_t + \epsilon_{pt}.$$

$PMOM_t$ is the equally-weighted month t average return of the firms with the highest 30 percent return over the eleven months through month t-2, less the equally-weighted month t average return of the firms with the lowest 30 percent return over the eleven months through month t-2.[18] In addition to estimates of α_p, β_p, s_p, and h_p, this regression yields a parameter estimate of m_p. This specification will be referred to as the four-characteristic model.

In the analysis below we use these coefficient estimates to provide insights into the nature of the firms in each of the portfolios. A value of β_p greater (less) than one indicates that the firms in portfolio p are, on average, riskier (less risky) than the market. A value of s_p greater (less) than zero signifies a portfolio tilted toward smaller (larger) firms. A value of h_p greater (less) than zero indicates a tilt toward stocks with a high (low) book-to-market ratio. Finally, a value of m_p greater (less) than zero signifies a portfolio with stocks that have, on average, performed well (poorly) in the recent past.[19]

C. Turnover

Both the raw and risk-adjusted returns that are calculated are gross of any trading costs

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[18]The rationale for using price momentum as a factor stems from the work of Jegadeesh and Titman (1993) who show that the strategy of buying stocks that have performed well in the recent past and selling those that have performed poorly generates significant positive returns over three to twelve month holding periods. This measure of price momentum has been used by Carhart (1997). We thank Mark Carhart for providing us with the price momentum data.

[19]Our use of the Fama-French and four-characteristic models does not imply a belief that the small firm, book-to-market, and price momentum effects represent risk factors. Rather, we use these models to assess whether any superior returns that are documented are due to analysts' stock-picking ability or to their choosing stocks with characteristics known to produce positive returns.

arising from the bid-ask spread, brokerage commissions, and the market impact of trading. To assess the size of these costs we calculate a measure of daily turnover for each portfolio. Turnover for portfolio *p* during trading day τ is defined as the percentage of the portfolio's holdings as of the close of trading on date τ-1 that has been sold off as of the close of trading on date τ. That is, it is the percent of the portfolio that has been "turned over" into some other set of stocks during date τ.

Turnover is calculated by following a three-step procedure. First, for each stock *i* in portfolio *p* as of the close of trading on date τ-1 we calculate the fraction it would have comprised of the portfolio at the end of trading on date τ *if there were no portfolio rebalancing*. Denoting this fraction by $G_{i\tau}$, it is given by

$$G_{i\tau} = \frac{x_{i\tau-1}\cdot(1+R_{i\tau})}{\sum_{i=1}^{n_{p\tau-1}} x_{i\tau-1}\cdot(1+R_{i\tau})},$$

where, as before, $x_{i\tau-1}$ is the market value of equity for firm *i* as of the close of trading on date τ-1 divided by the aggregate market capitalization of all firms in portfolio *p* as of the close of trading on that date. Next, $G_{i\tau}$ is compared to the actual fraction firm *i* makes up of portfolio *p* at the end of trading on date τ, denoted by $F_{i\tau}$, taking into account any portfolio rebalancing required as a result of changes in analyst recommendations. Finally, the decrease (if any) in the percentage holding of each of the date τ-1 securities is summed, yielding the day's portfolio turnover. Denoted by $U_{i\tau}$, it is formally given by:

$$U_{i\tau} = \sum_{i=1}^{n_{p\tau}} \max\{G_{i\tau} - F_{i\tau}, 0\}.$$

Annual turnover is then calculated by multiplying $U_{i\tau}$ by the number of trading days in the year.

III. PORTFOLIO CHARACTERISTICS AND RETURNS

Table IV provides descriptive statistics for portfolios formed on the basis of analysts' consensus recommendations. Note first that the average number of firms in the portfolio of the least favorably ranked stocks, portfolio 5 (comprised of stocks with a consensus rating greater than 3 and less than or equal to 5), is less than one-third that of any of the other four portfolios (column 2). This is not surprising, since analysts are reluctant to issue sell recommendations. Given the consensus rating cutoffs we chose for portfolios 1 through 4, the average numbers of firms in these portfolios turn out to be roughly similar. There is considerable variation across portfolios in the average number of analysts per firm, though, ranging from a low of 2.35 for portfolio 1 to a high of 4.93 for portfolio 3 (column 3). The low number of analysts for firms in portfolio 1 may well reflect the difficulty a firm has in attaining an average rating of between 1 and 1.5 if there are many analysts covering it, and leads one to suspect that these firms are relatively small. This is confirmed by the data in column 5, which shows the market capitalization of these firms to be considerably smaller than that of the firms in portfolios 2, 3, and 4. The market capitalization of the firms in portfolio 5 is also small. This is consistent with the conventional wisdom that analysts are more reluctant to issue sell recommendations for the larger firms, as they are more likely to generate future investment banking business.

The annual turnover of each portfolio is given in column 6. It is remarkably stable across the five portfolios, varying from a low of 433 percent for portfolio 2 to a high of 478 percent for portfolio 4. These numbers are relatively high, especially when compared to an annual turnover figure of 12 percent for the portfolio of all covered firms, 70 percent for the neglected firm portfolio, and only 7 percent for a portfolio comprised of all the firms on CRSP. These high turnover numbers are driven by the fact that, conditional on receiving coverage, a firm changes portfolios 3.81 times per year, on average.

Table IV also presents the estimated coefficients for the four-characteristic model. The significant coefficients on market risk premium, *SMB*, and *HML* (columns 7-9) for portfolio 1 are indicative of small growth stocks with higher than average market risk. The significant coefficients on *SMB*, *HML*, and *PMOM* (column 10) for portfolio 5 reflect small value firms that have performed poorly in the past. The coefficient on the market risk premium generally decreases as we move from portfolio 1 to portfolio 5 whereas the coefficient on *HML* increases, indicating that less favorable analyst ratings are associated with firms of lower market risk and higher book-to-market ratios. Compared to covered firms as a whole, neglected stocks are smaller, on average, with lower market risk and higher book-to-market ratios.

Table V, columns 2-6, documents the differential gross returns to the various portfolios and suggests the possibility that investment strategies based on publicly available consensus recommendations could be profitable. As shown in columns 2 and 3, there is a monotonic decrease in both raw and market-adjusted returns as we move from more highly to less highly recommended stocks. Over the entire 11 year period, portfolio 1's cumulative market-adjusted return was close to 50 percent, while portfolio 5's cumulative return was nearly -90 percent, a

140 percentage point spread.

One might conjecture that the patterns in market-adjusted returns can be explained by the market risk, size, book-to-market, and price momentum characteristics of the recommended stocks. The intercept tests from the CAPM, the Fama-French three-factor model, and the four-characteristic model provide strong evidence that they cannot. In every case, the intercept tests (presented in columns 4, 5, and 6) indicate that more highly rated stocks had higher abnormal returns than less highly rated stocks.[20] The abnormal gross return on portfolio 1, for example, ranged from a low of 0.201 percent per month, under the CAPM, to a high of 0.352 percent per month, using the Fama-French three-factor model. In contrast, the abnormal gross return on portfolio 5 varied between a low of -0.637 and a high of -0.409 percent per month. The abnormal gross return that can be generated from a strategy of purchasing the most favorably ranked securities and selling short the least favorably ranked ones ranged from a low of 0.753 to a high of 0.989 percent per month.[21]

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[20]As an added control for price momentum, and as a control for earnings momentum, we perform two supplementary tests. The additional test relating to price momentum is run because our four-characteristic model (which does include a control for this factor) implicitly assumes that price momentum is *linearly* related to returns. We control for earnings momentum in order to determine whether the abnormal returns we find are driven by the well-documented post-earnings announcement drift. For each test we divide our sample into low, medium, and high momentum stocks. In unreported results we find that the abnormal return to a portfolio of the most favorably recommended stocks was significantly higher than that of a portfolio of the least favorably recommended ones in each price momentum partition. This provides additional evidence that the differential returns reported in Table V do not simply reflect the effect of price momentum. We also find a significant abnormal return difference for the sample of firms with medium earnings momentum and for those with high earnings momentum. For the firms with low earnings momentum the difference was positive and significant for one of our return models, but was insignificantly positive for the other two. From these results we conclude that the differential returns are not driven solely by the post-earnings announcement drift.

[21]To test our results for robustness we partition our sample into two time periods, the first covering 1986-1990 and the second covering 1991-1996, estimating separate regressions for each. We find the estimated intercepts to be insignificantly different across periods, while the abnormal return on portfolio 1 remained significantly greater than that of portfolio 5. We also partition our sample period into bull and bear market months, where a bull (bear) month is defined as one in which the CRSP value-weighted market index return is positive (negative). The estimated intercepts were insignificantly different across markets, and the abnormal return on portfolio 1 remained significantly

Table V also reveals that a portfolio of all covered stocks earned positive and significant abnormal gross returns, while the abnormal returns of neglected stocks were negative and significant. The abnormal gross return to purchasing the covered firms and selling short the neglected stocks ranged from a low of 0.298 percent per month, using the four-characteristic model, to a high of 0.330 percent, under the CAPM. The underperformance of neglected stocks is consistent with evidence in McNichols and O'Brien (1998) that analysts tend to drop coverage of firms that they expect to do poorly, rather than retain them and issue negative comments. In contrast to our empirical findings, Arbel, Carvel and Strebel (1983) document that during the 1970's neglected firms actually earned superior returns. There are a few possible explanations for these seemingly contradictory results. First, Arbel et. al. restricted their attention to large firms (the S&P 500), whereas our neglected firms are relatively small.[22] Second, some of their 'neglected' firms actually had an analyst following them. Third, they did not control for possible book-to-market effects. (As we show, neglected firms have higher book-to-market ratios.) During their sample period of 1970-1979, high book-to-market firms outperformed low book-to-market firms by 57 basis points per month.

To generate these large abnormal returns on the most highly rated and least favorably recommended stocks we have assumed that investors react quickly (at the end of the trading day) to changes in analysts' consensus recommendations and that their portfolios are rebalanced daily. However, many retail investors only gain access to consensus recommendations after a

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higher than that on portfolio 5.

[22]That the neglected stocks are mostly small is reflected by our finding that they comprise only 9.7 percent of total market capitalization.

several-day delay and find it either impractical or infeasible to engage in daily portfolio rebalancing. Consequently, we examine two additional sets of investment strategies. The first entails less frequent portfolio rebalancing – weekly, semi-monthly, or monthly, instead of daily. Since less frequent rebalancing implies that investors do not respond to all consensus recommendation changes in a timely fashion, abnormal returns should diminish in magnitude.[23]

Aside from a change in the rebalancing period, the methodology used to test for the profitability of these investment strategies is identical to that employed earlier. With weekly rebalancing, for example, the consensus recommendation of each covered stock is calculated as of the close of trading each Monday and the stock assigned to the appropriate portfolio at that time. Stock assignments then remains fixed until the following Monday, when the consensus recommendations are recalculated and stocks are moved between portfolios, as necessary. Portfolio turnover is again calculated as described in Section II.C. Portfolio composition and turnover are similarly calculated for the other rebalancing periods.[24]

Table VI, columns 4-6, reports the abnormal gross returns to portfolios 1 and 5 under these alternative investment strategies. Compared to daily rebalancing, the abnormal gross returns for portfolio 1 were lower for all rebalancing periods, as expected. Under the CAPM abnormal returns were near zero and insignificant, while under the Fama-French three-factor model and the four-characteristic model the returns varied between 0.181 and 0.234 percent per month, and were of mixed significance. Also as expected, turnover decreased significantly as

[23]We also examine quarterly and semi-annual rebalancing periods. Results are qualitatively similar, but less significant, than those reported here.

[24]Semi-monthly rebalancing is assumed to occur at the close of trading on the 15th of the month as well as on the last day of the month. Monthly rebalancing occurs at the close of trading on the last day of the month. (Monthly rebalancing is alternatively calculated as of the 15th of each month, yielding qualitatively similar results.)

the rebalancing period lengthened, declining from 458 percent with daily rebalancing to 274 percent for monthly rebalancing (column 7). In contrast to the loss of significance for portfolio 1's returns, the abnormal gross return for portfolio 5 remained significant across all rebalancing periods, varying between -0.329 percent and -0.599 percent monthly. Again, turnover declined substantially, from 465 percent with daily rebalancing to 294 percent under monthly rebalancing.

The second set of alternative strategies assumes a delayed reaction by investors to analyst consensus recommendation changes (but again allows for daily rebalancing). Table VII documents the abnormal gross returns generated if investors' reaction is delayed by one week (panel A), a half-month (panel B), or a full month (panel C). For each of these three delay intervals the abnormal gross return for portfolio 1 was insignificantly different from zero, and never exceeded 0.2 percent per month. In contrast, the abnormal gross return for portfolio 5 remained significantly negative for all delay windows.[25] With a one-week delay the abnormal gross return varied from -0.335 to -0.518 percent monthly. With a month's delay the abnormal gross return still remained sizeable, ranging from -0.229 to -0.388 percent per month. Apparently, the abnormal gross returns generated by the least favorably recommended stocks dissipate much more slowly than those of the most highly rated ones, giving investors more time to take advantage of a potentially profitable trading opportunity.

IV. THE IMPACT OF TRANSACTIONS COSTS

All returns presented thus far have been gross of the transactions costs associated with

[25]Stickel (1995) and Womack (1996) also find the post-recommendation stock drifts in their samples to be stronger for the least favorably recommended stocks.

the bid-ask spread, brokerage commissions, and the market impact of trading. Keim and Madhavan (1998) provide an estimate of the total round-trip transactions costs incurred by institutions in trading exchange-listed and NASDAQ stocks, broken down by firm size quintile. Using their numbers, we estimate round-trip transactions costs for the large, medium, and small stocks in our sample at 0.727, 1.94, and 4.12 percent of share value traded, respectively.[26] Weighting these percentages by the fraction that each firm size classification makes up of total market capitalization (large firms comprise 70 percent of the total, medium-sized firms 20 percent, and small firms 10 percent), we estimate average round-trip transactions costs for our portfolios at 1.31 percent of share value traded.[27] (To the extent that our portfolios are more heavily weighted toward small stocks, this estimate will be conservative.) In conjunction with the calculated turnover for each portfolio, these percentages can be used to provide an estimate of the impact of transactions costs on investment returns. (The method for computing turnover was described in Section II.C.) Most of the following discussion will focus on the returns generated by strategies which involve daily portfolio rebalancing and an immediate (end-of-day) investor reaction to analyst consensus recommendation changes.

A round-trip transactions cost of 1.31 percent implies, for each portfolio, total annual

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[26]As will be discussed in Section V our firm size classifications are defined in terms of deciles, rather than quintiles; therefore, we cannot directly use the cost numbers provided in Keim and Madhavan. To estimate the cost for our largest firms, given our size definitions, we take a weighted average of the costs of the top two quintiles of Keim and Madhavan, with the top quintile receiving double the weight of the second quintile. The cost for our medium-sized firms is estimated as a weighted average of the costs of quintiles 2-4, with quintile 3 receiving twice the weight of the other two. For our small firms the cost is estimated as a weighted average of the costs of quintiles 4 and 5, with quintile 5 receiving twice the weight of quintile 4. All of our calculations also assume an equal weighting of exchange-listed and NASDAQ firms. Keim and Madhavan find the costs for trading NASDAQ stocks to be higher than the costs for trading exchange-listed stocks (except in the top quintile). Since the majority of our sample are NASDAQ firms, our estimate of transactions costs is likely to be conservative.

[27]Other papers have estimated the round-trip cost of the bid-ask spread alone to be 1 percent for mutual funds (Carhart (1997)) as well as for individual investors (Barber and Odean (1998)).

transactions costs equal to 1.31 percent of its annual turnover. Transactions costs, therefore, reduced the annual return from holding portfolio 1 by 6 percent, given its 458 percent annual turnover. As a consequence, an active strategy of buying the most highly recommended stocks yielded a negative abnormal net annual return ranging between -3.59 and -1.77 percent (see columns 8, 9, and 10 of Table V). Transactions costs associated with a strategy of selling short the stocks in portfolio 5 reduced annual return by 6.09 percent, given portfolio turnover of 465 percent. This implies an abnormal net annual return that varies from a low of -1.18 percent to a high of 1.55 percent – returns that are, at best, insignificantly different from zero. In sum, neither of these strategies designed to take advantage of the consensus recommendations earned significant abnormal returns, after accounting for transactions costs.[28]

These results can be viewed another way, by calculating the "threshold" round-trip transactions costs below which the net abnormal returns become positive and significant. For the purposes of these calculations we choose a confidence interval of 95 percent and assume that the standard deviation of each portfolio's net abnormal return is equal to that of its gross abnormal return.[29] We find that for portfolio 1, this threshold transactions cost is 0.35 percent

[28]To test whether our results are significantly affected by the omission by Zacks of the recommendations of some of the large brokerage houses and by possible delays in the recording of some of the reported recommendations (Womack (1996)), we repeat our main tests using the *First Call* database. This database records the date and time that analyst recommendations are released to investors and includes the recommendations of most of the large brokerage houses that are omitted from Zacks. Using *First Call* we again construct five portfolios of stock recommendations (allocating stocks to portfolios based on the stocks' consensus ratings) and calculate the average monthly abnormal returns to each portfolio, for the period from July 1995 - December 1998. (We choose to begin with July 1995 because The *First Call* database records very few real-time recommendations before then.) The most significant difference between these results and those of Zacks pertains to portfolio 5 – the gross abnormal returns were approximately twice as great in magnitude for the *First Call* recommendations. Even so, none of the five portfolios generated positive and significant net abnormal returns.

[29]Given that there is variability in portfolio turnover, the standard deviation of a portfolio's net abnormal return should be greater than that of its gross abnormal return. Consequently, the threshold transactions cost levels we calculate here overstate the level of transactions cost at which the net abnormal returns become significantly positive.

for the Fama-French three-factor model and 0.30 percent for the four-characteristic model.[30] For portfolio 5, the threshold ranges between 0.38 percent and 0.93 percent. Given the estimates of Keim and Madhavan, it is very unlikely that actual round-trip transactions costs fall below these threshold levels (especially given the fact that portfolios 1 and 5 are comprised of relatively small stocks, for which transactions costs tend to be higher).

Table V also provides insights into the profitability of trading strategies involving the portfolios of the all-covered and neglected stocks. A strategy of purchasing a portfolio of all the covered firms had an annual abnormal gross return of between 0.52 and 0.66 percent and cost 0.16 percent annually, given portfolio turnover of 12 percent. The abnormal net return, therefore, was a maximum of 0.50 percent annually. While this return is significantly greater than zero, it is economically small. Selling short the neglected stocks yielded an annual abnormal gross return of between 3.05 and 3.32 percent. This strategy cost 2.88 percent, given turnover of 70 percent and using a transactions cost rate of 4.12 percent (given that these firms are mostly of small size). Consequently, the abnormal net return to this strategy was insignificantly different from zero.

One way to lower the high transactions costs associated with buying the stocks in portfolio 1 or selling short those in portfolio 5 is to rebalance less frequently. As columns 8-10 of Table VI make clear, though, the reduction in turnover for portfolio 1 isn't enough to offset the decrease in abnormal gross returns that comes with less frequent rebalancing. For all rebalancing periods and all pricing models, portfolio 1's abnormal net return was negative. In contrast, the abnormal net return from short-selling portfolio 5 was, in most cases, positive,

[30]There is no level of transactions cost at which the net abnormal return will be positive under the CAPM.

ranging as high as 3 percent annually. However, with the exception of marginal significance for monthly rebalancing and the Fama-French three-factor model, no abnormal net return was found to be reliably greater than zero. On the whole, then, our investment strategies did not provide significant profits to investors after a reasonable accounting for transactions costs, regardless of the frequency with which their portfolios were rebalanced.[31]

V. PORTFOLIOS PARTITIONED ACCORDING TO FIRM SIZE

In this section we investigate whether investment strategies based on consensus recommendations can generate significant abnormal net returns for either the small, medium, or large firm subset of our sample. There are several reasons to undertake this analysis. First, to the extent that there is less information publicly available about smaller firms, we would expect the investment performance of analysts' consensus recommendations to be greater for them.[32] Further, consistent with Shleifer and Vishny (1997) and Pontiff (1996), it is likely that investors' ability to arbitrage away any excess returns will be lowest for these firms.[33] Finally, it is important to understand the extent to which analysts' consensus recommendations can generate

[31]We also examine two other sets of strategies that are based on consensus recommendations. The first set involves purchasing the securities in portfolios 1 and 2 and selling short those in portfolios 4 and 5. These strategies result in somewhat reduced turnover (263 percent for the stocks in portfolios 1 and 2 and 365 percent for those in portfolios 4 and 5), since investors' holdings are unaffected by a stock that moves between portfolios 1 and 2 or between 4 and 5. However, the gross investment return was also reduced significantly, and the abnormal net return was not significantly greater than zero. The second set of strategies involve dropping recommendations that are more than 60 days old, so that the consensus is composed of only the most recent recommendations. While abnormal gross returns were not significantly affected by the imposition of this requirement, turnover rates jumped to more than 1,500 percent, making this set of strategies prohibitively expensive.

[32]Womack shows that the price reaction to individual analyst upgrades and downgrades, as well as the post-recommendation price drift, are more pronounced for small stocks.

[33]Shleifer and Vishny (1997) argue that arbitrage has only a limited ability to align prices with fundamental values and that this limitation is greatest among securities with high volatility (such as small stocks). Pontiff (1996) adds that arbitrage will be limited when transaction costs are relatively high (as is again the case for small stocks).

excess returns for the larger firms, as they represent a greater share of the investment opportunities available in the market.

Table VIII presents the returns for our size partition.[34] (Due to space constraints the table presents only the findings from the four-characteristic model. The other models yield similar results.) Following the criteria used by Fama and French (1993), size deciles are formed on the basis of NYSE firm-size cutoffs and are adjusted annually, in December. Each AMEX and NASDAQ firm is placed in the appropriate NYSE size decile based on the market value of its equity as of the end of December. Big firms (B) are defined as those in the top three deciles, small firms (S) are those in the bottom three deciles, and medium firms (M) are those in the middle four. Of all covered stocks, the number of small firms in our sample averages 1,957 per month, the number of medium firms averages 827, and the number of big firms averages 339.

For all firm sizes, the most highly recommended stocks earned positive abnormal gross returns, while the least favorably recommended ones earned negative abnormal gross returns. The small stocks exhibited the most positive portfolio 1 returns, at 6.90 percent annually, and the most negative portfolio 5 annual returns, at -11.1 percent. Annual turnover for each of the five small, medium-sized, and large firm portfolios is also presented in Table VIII. For small firms (which have the most extreme abnormal gross returns), the most highly recommended stocks had an annual turnover of 265 percent, while the least favorably recommended ones had an annual turnover of 357 percent. With an estimated round-trip transactions cost of 4.12 percent for these firms (recall the discussion in Section IV), the total transactions costs generated

[34]Once again, we assume daily portfolio rebalancing and no delay in investors' reaction to analyst consensus recommendation changes.

by these turnover rates reduced annual portfolio returns by 10.92 and 14.71 percent for portfolios 1 and 5, respectively. Subtracting these costs, the abnormal net return to purchasing the most favorably rated small stocks or selling short the least favorably rated ones becomes negative.[35] Using an estimated round-trip transactions cost of 1.94 and 0.727 percent for medium-sized and large firms, respectively, it is apparent that they, too, did not provide profitable trading opportunities for investors.[36]

VI. SUMMARY AND CONCLUSIONS

The goal of this paper has been to estimate the abnormal returns, both gross and net of trading costs, that can be earned on each of several investment strategies designed to take advantage of analysts' stock recommendations. We document that over the 1986-1996 period a portfolio of the stocks with the most (least) favorable consensus analyst recommendations provided an average annual abnormal gross return of 4.13 (-4.91) percent, after controlling for market risk, size, book-to-market, and price momentum effects. Consequently, a strategy of purchasing stocks that are most highly recommended by security analysts and selling short those that are least favorably recommended yielded an abnormal gross return of 75 basis points *per*

[35]We also calculate portfolio returns separately for each of the three small firm deciles (again using the four-characteristic model). The most positive gross annual return on portfolio 1, 10.7 percent, is found in the lowest decile (smallest) stocks. (Annual turnover for that portfolio is 271 percent.) The most negative gross annual return on portfolio 5, 16.7 percent, is found for the middle decile stocks. (Annual turnover is 382 percent.) After subtracting transactions costs, neither return is significantly greater than zero. In order for a long position in portfolio 1 (short position in portfolio 5) to yield significant positive net abnormal returns, the round-trip transactions cost must be no more than 1.69 (1.91) percent. Given the findings of Keim and Madhavan, it is unlikely that actual transactions costs fall below these levels.

[36]In order for a long position in portfolio 1 (short position in portfolio 5) of the medium-sized stocks to generate significantly positive net abnormal returns, the round-trip transactions cost must be less than 0.32 (0.83) percent. Again, given the estimates of Keim and Madhavan, it is unlikely that actual transactions costs are this low. For the large stocks there is no transactions cost that yields positive net abnormal returns to either portfolio 1 or 5.

month. This return decreased if investors did not rebalance their portfolios daily or if they delayed acting on changes in analysts' consensus recommendations.

There are three potential explanations for our findings: (1) random chance (that is, data-snooping), (2) a poor model of asset pricing, or (3) a market that is semi-strong form inefficient in the sense that investors can profitably exploit the publicly available consensus recommendations, absent transactions costs.[37]

Many financial economists (for example, Fama (1998)) argue that the reported anomalies are simply a result of extensive data-snooping by academics. It is unlikely that our findings are due to random chance, for three reasons. First, the t-statistics associated with our portfolio returns are, in general, very high. Second, our results are robust to several different partitions of the data. Third, Stickel (1995) and Womack (1996), although not directly measuring the returns to investment strategies, also find there to be a significantly positive (negative) abnormal return associated with individual analyst upgrades (downgrades).

It is also unlikely that our results can be attributed to a poor asset pricing model. If they were, this would imply that highly recommended stocks, which earn higher average returns, are riskier than less favorably recommended stocks, which earn lower average returns. However, there is no obvious source of increased risk from holding a well-diversified portfolio of highly recommended stocks. Furthermore, if increased risk really could explain the higher returns earned by highly recommended stocks, this risk must be fleeting, since much of the higher average returns disappear a week after the change in consensus analyst recommendation. We

[37]While we refer to a market as semi-strong inefficient whenever there are profitable opportunities to trade in the absence of transactions costs, others consider a market to be inefficient only if profits remain after subtracting these costs.

believe it most likely that our results are evidence of a market that is semi-strong inefficient. Consistent with this notion, we find the difference between the returns of the most highly rated and least favorably recommended stocks to be most pronounced for small and medium-sized firms, where publicly-available information is less likely to be widely disseminated.[38]

As we show, our investment strategies which are designed to take advantage of analyst recommendations require a great deal of trading, and correspondingly high transactions costs. After accounting for these costs, we find that none of our strategies generated an abnormal net return that is reliably greater than zero. This strongly suggests that, although market inefficiencies exist, they are not exploitable by traders, thereby allowing them to persist (see Pontiff (1996)).[39]

While traders cannot successfully exploit these market inefficiencies through the various active investment strategies we examine, there is one group of investors who can take advantage of them – those who are otherwise considering buying or selling, and so will be incurring the transactions costs in any case. For them, analyst recommendations remain valuable. All else the same, these investors would be better off purchasing shares in firms with more favorable consensus recommendations and selling shares in those with less favorable ratings.

[38]Neither of the competing explanations for our findings (data mining or a poor model of asset pricing) would lead us to expect stronger results among small and medium-sized firms.

[39]Others might state our conclusion somewhat differently – that the market is *efficient*, given that traders cannot profit from the publicly available consensus recommendations.

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Table I
Descriptive Statistics on Analyst Recommendations from the Zacks Database, 1985-1996

The number of listed firms includes all firms listed on the CRSP NYSE/AMEX/NASDAQ stock return file, by year. The number of covered firms is the number of firms with at least one valid recommendation in the Zacks database, by year. The number of covered firms is also expressed as the % of the number of listed firms. The market capitalization of covered firms as a percent of the total market capitalization is the average daily ratio between the sum of the market capitalizations of all covered firms and the market value of all securities used in the CRSP daily value-weighted indices. The mean and median number of analysts issuing recommendations for each covered firm is shown, as is the mean and median number of firms covered by each analyst in the database, by year. This is followed by the number of brokerage houses and number of analysts with at least one recommendation during the year. The last column is the average of all analyst recommendations in the database for the year.

		Covered Firms			Analysts per Covered Firm		Covered Firms per Analyst				
Year	No. of Listed Firms	No. of Covered Firms	As a % of Listed Firms	Market Cap. As % of Market	Mean	Median	Mean	Median	No. of Brokers	No. of Analysts	Average Rating
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
1985	6,826	1,841	27.0	68.8	2.66	2	10	7	26	492	2.52
1986	7,281	2,989	41.1	85.3	4.25	3	13	10	61	960	2.37
1987	7,575	3,163	41.8	89.0	4.53	3	13	10	74	1,080	2.28
1988	7,573	3,226	42.6	90.5	4.75	3	13	10	96	1,171	2.32
1989	7,304	3,066	42.0	91.2	4.15	3	12	9	95	1,032	2.35
1990	7,138	3,105	43.5	92.3	4.50	3	13	10	98	1,082	2.34
1991	7,171	3,201	44.6	93.0	5.18	3	13	11	120	1,270	2.36
1992	7,459	3,546	47.5	93.8	5.09	3	12	10	131	1,452	2.23
1993	7,964	4,097	51.4	93.5	5.50	3	13	11	151	1,700	2.22
1994	8,494	4,611	54.3	93.9	5.61	3	13	11	169	2,007	2.09
1995	8,857	5,129	57.9	94.6	5.37	3	13	11	188	2,144	2.11
1996	9,408	5,628	59.8	95.6	5.27	3	13	11	195	2,367	2.04
Average All Years	7,754	3,634	46.1	90.1	4.74	3	13	10	117	1,396	2.27

Table II

Transition Matrix of Analyst Recommendations (Number, Median Calendar Days), 1985-1996

This table shows the number and the median calendar days between changes in or reiterations of recommendations. The first row reports all changes from a recommendation of 1 ("strong buy") to 1, 2 ("buy"), 3 ("hold"), 4 ("sell"), 5 ("strong sell") or discontinuation of coverage, and the total across the columns. The sixth and seventh rows identify recommendations for firms that were previously dropped from coverage and for firms for which coverage was initiated in the database. Fractional recommendations are rounded to the nearest whole value.

	To Recommendation of:						
From Rec.:	**1**	**2**	**3**	**4**	**5**	**Dropped**	**Total**
1	34,939	15,269	16,887	538	805	9,802	78,240
	293	109	128	140	135	121	
2	14,010	21,936	17,581	1,349	468	8,177	63,521
	95	299	115	106	111	121	
3	12,945	14,492	52,813	3,971	2,958	15,332	102,511
	113	112	291	114	116	123	
4	480	1,180	3,913	2,936	668	1,097	10,274
	132	103	98	245	98	135	
5	396	316	2,739	439	1,409	1,143	6,442
	95	105	94	90	301	99	
Dropped	4,951	3,507	5,999	546	400	5,013	20,416
	73	65	92	102	110	59	
First Zacks Rec.	26,053	19,817	24,458	2,392	1,531	5,965	80,216
Total	93,774	76,517	124,390	12,171	8,239	46,529	361,620
% of Total	25.9	21.2	34.4	3.4	2.3	12.9	
% of Non-Drops	29.8	24.3	39.5	3.9	2.6	.	

Table III

Three Day Percentage Size-Adjusted Returns Associated with Announcements of Changes in and Reiterations of Analyst Recommendations, 1985-1996

This table shows the percentage size-adjusted returns measured for the day before, the day of and the day following changes in and reiterations of analyst recommendations. For example, the first row reports the returns associated with all changes from a recommendation of 1 (strong buy) to 1, 2 (buy), 3 (hold), 4 (sell), 5 (strong sell), or discontinuation of coverage. Returns are measured as the three-day buy and hold return less the return on a value-weighted NYSE/AMEX/NASDAQ index. The sixth and seventh rows show the returns associated with recommendations for firms that were previously dropped from coverage, and for firms for which coverage was initiated, respectively. Fractional recommendations are rounded to the nearest whole value. t-statistics, estimated using cross-sectional standard errors, are shown below the returns. Each t-statistic pertains to the hypothesis that the mean size-adjusted abnormal return is zero. (The number of observations in each cell is shown in Table 2.)

From	To Recommendation of:					
Recommendation:	1	2	3	4	5	Dropped
1	0.177	-0.889	-2.192	-1.305	-3.021	-0.020
	7.525	-17.448	-32.841	-4.129	-6.792	-0.364
2	1.059	0.114	-1.415	-0.638	-0.999	0.115
	21.565	3.809	-25.876	-3.154	-2.187	2.135
3	1.488	1.066	0.015	-1.054	-0.976	0.112
	27.895	22.877	0.788	-10.195	-5.926	2.630
4	0.723	0.610	0.610	-0.130	-0.336	0.393
	3.388	4.105	6.908	-1.399	-1.226	2.347
5	0.607	1.296	0.400	-0.283	-0.005	0.207
	2.113	4.384	3.487	-0.964	-0.032	0.999
Dropped	0.637	0.301	0.051	-1.168	-0.474	
	8.586	3.533	-0.810	-4.728	-1.463	
First Zacks Rec.	1.093	0.479	-0.149	-0.209	-0.650	
	29.445	13.150	-4.736	-2.135	-4.384	

Table IV

Descriptive Characteristics for Portfolios Formed on the Basis of Analyst Recommendations, 1986-1996

This table presents descriptive statistics for several portfolios. The first five portfolios are based on the daily average analyst recommendation. Portfolios 1-5 include stocks with average daily recommendations of [1-1.5], (1.5-2], (2-2.5], (2.5-3] and greater than 3, respectively. The difference between returns for portfolios 1 and 5 is shown next. The 'All Covered' portfolio is the set of all stocks in portfolios 1-5, while the 'Neglected' portfolio consists of all stocks on the daily CRSP returns file with no Zacks recommendations for a sample day. The final line shows the difference between returns for the All Covered and Neglected stocks. The average monthly number of firms in each portfolio, the mean number of analysts per firm per day in that portfolio, the average rating and the percent of total market capitalization represented by the firms in the portfolio is shown. Annual turnover is calculated as the average percentage of the portfolio's holdings as of the close of one day's trading that has been sold as of the close of trading on the next trading day, multiplied by the number of trading days in the year. The coefficient estimates are those from a time series regression of the portfolio returns (R_p-R_f) on the market excess return (R_m-R_f), a zero-investment size portfolio (SMB), a zero-investment book-to-market portfolio (HML) and a zero-investment price momentum portfolio (PMOM). t-statistics appear below the coefficient estimates. Each t-statistic pertains to the null hypothesis that the associated coefficient is zero, except for the t-statistics on the coefficient estimate of (R_m-R_f) for portfolios 1-5, and the All Covered and Neglected portfolios, for which the null hypothesis is that the coefficient is one. The t-statistics for coefficients that are significant at a level of 10% or better are shown in bold.

						Coefficient Estimates for the 4-Characteristic Model				
Portfolio	**Monthly Avg No. of Firms** (min, max)	**No. of Analysts**	**Average Rating**	**% of Market Cap.**	**% Annual Turnover**	**$R_m - R_f$**	**SMB**	**HML**	**PMOM**	**Adjusted R-squared**
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
1 (Most Favorable)	760	2.35	1.24	8.5	458	1.055	0.214	-0.313	0.010	94.0
	(189, 1759)					**1.881**	**4.304**	**-5.408**	0.215	
2	810	3.61	1.85	29.7	433	1.030	-0.020	-0.155	0.025	98.2
	(391, 1396)					**2.064**	-0.794	**-5.377**	1.049	
3	646	4.93	2.29	34.2	459	0.988	-0.060	0.070	0.056	98.6
	(237, 948)					-1.055	**-3.110**	**3.118**	**3.023**	
4	804	3.21	2.80	17.6	478	0.958	0.017	0.232	-0.022	95.8
	(522, 1046)					**-2.267**	0.538	**6.221**	-0.737	
5 (Least Favorable)	211	3.58	3.52	3.0	465	0.960	0.260	0.279	-0.293	88.3
	(115, 317)					-1.204	**4.556**	**4.213**	**-5.407**	
P1-P5	971	NA	NA	NA	923	0.095	-0.046	-0.592	0.303	47.2
	(375, 1876)					**1.980**	-0.552	**-6.221**	**3.893**	
All Covered	3231	3.22	2.21	92.1	12	0.994	0.001	-0.004	0.015	99.9
	(1554, 5146)					**-1.698**	0.119	-0.607	**2.682**	
Neglected	3932	NA	NA	9.7	70	0.934	0.402	0.276	-0.024	94.9
	(3537, 4705)					**-3.120**	**11.161**	**6.554**	-0.698	
All Covered-Neglected	7163	NA	NA	NA	82	0.060	-0.402	-0.280	0.039	60.9
	(6259, 8781)					**2.760**	**-10.744**	**-6.441**	1.095	

Table V

Percentage Monthly Returns Earned by Portfolios Formed on the Basis of Analyst Recommendations, 1986-1996

This table presents percentage monthly returns earned by portfolios formed according to average analyst recommendation. Raw returns are the mean percentage monthly returns earned by each portfolio. Market-adjusted returns are the mean raw returns less the return on a value weighted NYSE/AMEX/NASDAQ index. The CAPM intercept is the estimated intercept from a time-series regression of the portfolio return (R_p-R_f) on the market excess return (R_m-R_f). The intercept for the Fama-French three-factor model is the estimated intercept from a time-series regression of the portfolio return on the market excess return (R_m-R_f), a zero-investment size portfolio (SMB), and a zero-investment book-to-market portfolio (HML). The four-characteristic intercept is estimated by adding a zero-investment price momentum portfolio (PMOM) as an independent variable. Annual turnover is calculated as the average percentage of the portfolio's holdings as of the close of one day's trading that has been sold as of the close of trading on the next trading day, multiplied by the number of trading days in the year. The net annual return assumes that portfolios 1 and 2 are purchased, and 3, 4, and 5 are sold short. It is found by multiplying the absolute value of the gross monthly return by 12 and subtracting the annual turnover multiplied by the round trip cost of a trade. This cost is estimated at 1.31% for all portfolios except that of the neglected stocks, where the estimated cost is 4.12%. Each t-statistic pertains to the null hypothesis that the associated return is zero. The t-statistics for returns that are significant at a level of 10% or better are shown in bold.

Portfolio	Mean Raw Return	Mean Market-Adjusted Return	Intercept from			% Annual Turnover	Net Annual Return from		
			CAPM	Fama-French	Four-Characteristic		CAPM	Fama-French	Four-Characteristic
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1 (Most Favorable)	1.576	0.351	0.201	0.352	0.344	458	-3.586	-1.772	-1.867
		2.472	1.475	**3.167**	**2.930**				
2	1.495	0.270	0.184	0.229	0.210	433	-3.470	-2.919	-3.149
		3.999	**2.976**	**4.140**	**3.605**				
3	1.263	0.038	0.029	-0.006	-0.049	459	-5.663	-5.942	-5.422
		0.763	0.592	-0.132	-1.076				
4	1.121	-0.103	-0.053	-0.124	-0.107	478	-5.629	-4.773	-4.982
		-1.180	-0.640	**-1.729**	-1.409				
5 (Least Favorable)	0.558	-0.667	-0.599	-0.637	-0.409	465	1.099	1.552	-1.179
		-3.908	**-3.502**	**-4.513**	**-3.044**				
P1-P5	1.018	1.018	0.800	0.989	0.753	923	-2.491	-0.223	-3.055
	4.160	**4.160**	**3.495**	**5.113**	**3.900**				
All Covered	1.306	0.081	0.053	0.055	0.043	12	0.479	0.502	0.363
		6.432	**3.994**	**4.102**	**3.150**				
Neglected	0.890	-0.334	-0.277	-0.273	-0.254	70	0.443	0.392	0.168
		-2.799	**-2.245**	**-3.371**	**-2.977**				
All Covered-Neglected	0.416	0.416	0.330	0.328	0.298	82	0.922	0.894	0.531
	3.200	**3.200**	**2.606**	**3.910**	**3.374**				

Table VI

Percentage Monthly Returns Earned by Portfolios Formed on the Basis of Analyst Recommendations, by Rebalancing Frequency, 1986-1996

This table presents percentage monthly returns earned by portfolios composed of the most favorably and least favorably ranked stocks, for various rebalancing periods. Panel A presents the returns based on a strategy of rebalancing the portfolios weekly, at the close of trading each Monday. Panel B presents the returns to a strategy of rebalancing the portfolios semi-monthly, at the close of trading on the 15th and last days of the month. Panel C presents the returns to a strategy of rebalancing the portfolios monthly, at the close of trading on the last day of the month. Raw returns are the mean percentage monthly returns earned by each portfolio. Market-adjusted returns are the mean raw returns less the return on a value weighted NYSE/AMEX/NASDAQ index. The CAPM intercept is the estimated intercept from a time-series regression of the portfolio return (R_p-R_f) on the market excess return (R_m-R_f). The intercept for the Fama-French three-factor model is the estimated intercept from a time-series regression of the portfolio return on the market excess return (R_m-R_f), a zero-investment size portfolio (SMB), and a zero-investment book-to-market portfolio (HML). The four-characteristic intercept is estimated by adding a zero-investment price momentum portfolio (PMOM) as an independent variable. Annual turnover is calculated as the average percentage of the portfolio's holdings as of the close of one day's trading that has been sold as of the close of trading on the next trading day, multiplied by the number of trading days in the year. The net annual return assumes that portfolio 1 is purchased and 5 is sold short. It is found by multiplying the absolute value of the gross monthly return by 12 and subtracting the annual turnover multiplied by the round trip cost of a trade. This cost is estimated at 1.31% for all portfolios. Each t-statistic pertains to the null hypothesis that the associated return is zero. The t-statistics for returns that are significant at a level of 10% or better are shown in bold.

Portfolio	Mean Raw Return	Mean Market-Adjusted Return	Intercept from			% Annual Turnover	Net Annual Return from		
			CAPM	Fama-French	Four-Characteristic		CAPM	Fama-French	Four-Characteristic
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Panel A: Weekly Rebalancing									
P1 (Most Favorable)	1.483	0.258	0.079	0.233	0.182	395.2	-4.232	-2.386	-2.996
		1.699	0.560	**1.997**	1.487				
P5 (Least Favorable)	0.687	-0.538	-0.479	-0.526	-0.329	377.5	0.805	1.370	-0.995
		-3.168	**-2.794**	**-3.791**	**-2.427**				
P1 - P5	0.796	0.796	0.558	0.759	0.511	772.7	-3.427	-1.016	-3.990
	3.072	**3.072**	**2.316**	**3.770**	**2.544**				
Panel B: Semi-Monthly Rebalancing									
P1 (Most Favorable)	1.479	0.255	0.082	0.234	0.212	346.4	-3.555	-1.727	-1.995
		1.708	0.591	**2.037**	**1.745**				
P5 (Least Favorable)	0.609	-0.615	-0.555	-0.599	-0.368	349.3	2.089	2.612	-0.157
		-3.606	**-3.233**	**-4.175**	**-2.692**				
P1 - P5	0.870	0.870	0.637	0.833	0.580	695.7	-1.465	0.884	-2.152
	3.421	**3.421**	**2.694**	**4.227**	**2.966**				
Panel C: Monthly Rebalancing									
P1 (Most Favorable)	1.417	0.192	0.031	0.188	0.181	273.5	-3.205	-1.326	-1.412
		1.278	0.221	1.591	1.448				
P5 (Least Favorable)	0.627	-0.598	-0.535	-0.577	-0.378	293.5	2.570	3.080	0.692
		-3.621	**-3.223**	**-4.240**	**-2.857**				
P1 - P5	0.790	0.790	0.566	0.765	0.559	567	-0.635	1.754	-0.720
	3.197	**3.197**	**2.457**	**4.020**	**2.904**				

Table VII

Percentage Monthly Returns Earned by Portfolios Formed on the Basis of Analyst Recommendations, by Delay in Investment, 1986-1996

This table presents percentage monthly returns earned by portfolios composed of the most favorable and least favorable ranked stocks, where investment is delayed beyond the close of trading on the date the average recommendation changes. Panel A presents the results for a one week delay, Panel B for a half-month delay, and Panel C for a one month delay. Raw returns are the mean percentage monthly returns earned by each portfolio. Market-adjusted returns are the mean raw returns less the return on a value weighted NYSE/ASE/NASDAQ index. The CAPM intercept is the estimated intercept from a time-series regression of the portfolio return (R_p-R_f) on the market excess return (R_m-R_f). The intercept for the Fama-French three-factor model is the estimated intercept from a time-series regression of the portfolio return on the market excess return (R_m-R_f), a zero-investment size portfolio (SMB), and a zero-investment book-to-market portfolio (HML). The four-characteristic intercept is estimated by adding a zero-investment momentum portfolio (PMOM) as an independent variable. Each t-statistic pertains to the null hypothesis that the associated return is zero. The t-statistics for returns that are significant at a level of 10% or better are shown in bold.

Portfolio	Mean Raw Return	Mean Market-Adjusted Return	Intercept from		
			CAPM	Fama-French	Four-Characteristic
(1)	(2)	(3)	(4)	(5)	(6)
Panel A: One Week Delay					
P1 (Most Favorable)	1.422	0.198	0.025	0.174	0.158
		1.267	0.170	1.394	1.198
P5 (Least Favorable)	0.699	-0.526	-0.467	-0.518	-0.335
		-3.118	**-2.750**	**-3.767**	**-2.468**
P1 - P5	0.723	0.723	0.492	0.692	0.493
	2.838	**2.838**	**2.073**	**3.450**	**2.412**
Panel B: Semi-Monthly Delay					
P1 (Most Favorable)	1.408	0.181	0.034	0.177	0.181
		1.273	0.249	1.524	1.478
P5 (Least Favorable)	0.809	-0.418	-0.359	-0.403	-0.223
		-2.541	**-2.170**	**-3.008**	-1.693
P1 - P5	0.599	0.599	0.393	0.580	0.404
	2.467	**2.467**	1.716	**3.015**	**2.054**
Panel C: One Month Delay					
P1 (Most Favorable)	1.283	0.056	-0.081	0.077	0.084
		0.386	-0.566	0.659	0.681
P5 (Least Favorable)	0.854	-0.373	-0.331	-0.388	-0.229
		-2.329	**-2.032**	**-3.234**	-1.940
P1 - P5	0.429	0.429	0.251	0.465	0.313
	1.797	1.797	1.090	**2.539**	1.662

Table VIII

Percentage Gross Monthly and Net Annual Returns Earned by Portfolios Formed on the Basis of Analyst Recommendations and Size, 1986-1996

This table presents the percentage gross monthly and net annual returns earned by portfolios formed by average analyst recommendations and firm size. The large (small) firm sample, B (S), includes firms with market capitalizations in the top (bottom) 30 percent of NYSE firms. The medium-sized firm sample, M, includes firms with market capitalizations between the 30th and 70th percentile of NYSE firms. Raw returns are the mean percentage monthly returns earned by each portfolio. (Underneath each of the raw returns for portfolios 1-5 is the average monthly number of firms in that portfolio.) Market-adjusted returns are the mean raw returns less the return on a value weighted NYSE/AMEX/NASDAQ index. The gross monthly return for the four-characteristic model is the estimated intercept from a time-series regression of the portfolio excess return on the market excess return (R_m-R_f), a zero-investment size portfolio (SMB), a zero-investment book-to-market portfolio (HML), and a zero-investment price momentum portfolio (PMOM). Annual turnover is calculated as the average percentage of the portfolio's holdings as of the close of one day's trading that has been sold as of the close of trading on the next trading day, multiplied by the number of trading days in the year. The net annual return assumes that portfolios 1 and 2 are purchased, and 3, 4, and 5 are sold short. It is found by multiplying the absolute value of the gross monthly return by 12 and subtracting the annual turnover multiplied by the round trip cost of a trade. This cost is estimated at 0.727% for big firms, 1.94% for medium-sized firms, and 4.12% for small firms. Each t-statistic pertains to the null hypothesis that the associated return is zero. The t-statistics for returns that are significant at a level of 10% or better are shown in bold.

Portfolio	Mean Raw Return			Mean Market-Adjusted Return			Gross Monthly Return from Four-Characteristic Model			% Annual Turnover			Net Annual Return from Four-Characteristic Model		
	S	M	B	S	M	B	S	M	B	S	M	B	S	M	B
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
1 (Most Favorable)	1.800	1.654	1.468	0.575	0.430	0.244	0.575	0.387	0.251	265	409	618	-4.014	-3.285	-1.479
	560	114	17	**2.283**	**2.253**	1.213	**5.615**	**2.715**	1.293						
2	1.478	1.589	1.482	0.253	0.365	0.257	0.327	0.226	0.212	384	450	462	-11.895	-6.021	-0.819
	475	216	95	1.155	**2.557**	**2.843**	**3.602**	**2.314**	**2.730**						
3	1.253	1.309	1.270	0.029	0.084	0.045	-0.004	-0.027	-0.022	497	458	487	-20.425	-8.558	-3.272
	261	238	141	0.142	0.837	0.561	-0.041	-0.347	-0.366						
4	0.796	1.061	1.200	-0.429	-0.164	-0.025	-0.275	-0.169	-0.032	309	406	575	-9.426	-5.843	-3.792
	523	200	72	**-2.363**	**-1.585**	-0.193	**-3.717**	**-1.932**	-0.305						
5 (Least Favorable)	0.040	0.675	0.716	-1.184	-0.550	-0.508	-0.926	-0.596	-0.017	357	403	638	-3.594	-0.661	-4.434
	139	59	12	**-4.234**	**-2.960**	**-1.818**	**-5.057**	**-3.695**	-0.066						
P1-P5	1.759	0.979	0.752	1.759	0.979	0.752	1.502	0.984	0.268	622	812	1256	-7.608	-3.946	-5.913
	6.893	**4.025**	**2.040**	**6.893**	**4.025**	**2.040**	**7.302**	**4.516**	0.799						

Figure 1

Annualized Geometric Mean Percentage Gross Return Earned by Portfolios Formed on the Basis of Consensus Analyst Recommendations, 1986-1996