Equity Analyst and the Market's Assessment of Risk

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Abstract: This paper examines the market reaction to changes in analysts' equity risk ratings and the type of information conveyed by such changes. We find that stock prices increase (decrease) when analysts change their risk ratings toward lower (higher) risk controlling for changes in stock recommendations, price targets, earnings forecasts and contemporaneous news about corporate events. We also find that changes in risk ratings toward lower (higher) risk are followed by decreases (increases) in Fama-French factor loadings. The combined evidence suggests that the market reacts to new information about equity risk.

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1. Introduction

One potentially important piece of information in equity analysts' research reports is the assessment of equity risk, which can be quantitative or qualitative. Although initially voluntary, these risk assessments are now required by NYSE's Rule 472 and NASD's Rule 2210, which state that analysts' reports must disclose "the valuation methods used, and any price objectives must have a reasonable basis and include a discussion of risks" (Exchange Act Release # 48252 (July 29, 2003)).[1] Despite the central role of analysts as information intermediaries, and of risk in asset pricing and investment decisions, these risk assessments have received little attention in the academic literature. An exception is Lui et al. (2007) who show that analysts' quantitative risk assessments (risk ratings) incorporate publicly available information about various measures of equity risk and help predict future total volatility.

If aggregating public information into a summary statistic and forecasting future volatility are activities valued by investors, Lui et al.'s (2007) evidence suggests that the dissemination of risk ratings is an important analyst activity. To better assess their overall significance, however, it is necessary to investigate the relation between risk ratings and stock prices. Evidence that prices react to the dissemination of risk ratings would suggest that they expand the information set upon which prices are set, and thus, strongly validate the dissemination of risk ratings as a major information event in equity markets.

The primary objective of our study is to address this question by investigating the market reaction to changes in risk ratings. Our sample consists of 13,472 risk ratings

[1] Since the introduction of NYSE's Rule 472 and NASD's rule 2210, several brokerages have been sanctioned for, among other things, deficient disclosure of risks associated with an investment in the securities covered. See, for example, NASD Case #E8A2005007601 (Feldman Securities Group, L.L.C.) and NASD Case#EAF0401490001 (Credit Suisse Securities).

(*Low*, *Medium*, *High*, and *Speculative*) on 1,157 firms issued over the period 2000-2006 by Salomon Smith Barney, now Citigroup Investment Research. Risk ratings changes are not frequent: of the 13,472 observations, 378 are changes toward higher risk and 321 toward lower risk. We find that these unusual events are accompanied by unusual returns, volatility, and trading volume. For example, in our sample of risk rating increases (decreases), we document a 3-day cumulative average market-adjusted return of -3.3% (1.36%), a reaction comparable to the market reaction to changes in analyst recommendations and price targets (Womack, 1996; Brav and Lehavy, 2003).

To ensure that the documented market reaction is distinct from the market reaction to contemporaneous information provided *within* or *outside* the analyst report, we control for contemporaneous (i) revisions in stock recommendations, price targets, and earnings forecasts, (ii) earnings announcements, and (iii) news about corporate events likely to change firm risk. We still document a significant 3-day market response of 2.57% to announcements of risk rating changes.

In principle, any market reaction is consistent with two explanations: the market changes its assessment of risk or the market changes its assessment of future cash flows.[2] To distinguish between these two explanations, we examine actual changes in risk, as measured by Fama-French factor loadings, and actual earnings growth for our samples of stocks experiencing risk rating increases and risk rating decreases.

We find that the changes in factor loadings are generally consistent with the hypothesis that the nature of the information conveyed is about equity risk. For example, the market loading increases by 11% when analysts assess a higher risk, and decreases by

[2] Section 5 offers arguments about why changes in the market assessment of cash flows is a reasonable alternative explanation.

8% when analysts assess a lower risk. The increase in the size factor loading when analysts assess a higher risk is even larger, ranging from 54% to 100%. Finally, the book-to-market factor loading decreases by 34% when analysts assess lower risk.

We also find that the sample of firms with increases in risk ratings experience greater earnings growth than the sample of firms with decreases in risk ratings. This result is inconsistent with the changes in cash flow explanation: if the market believes that risk rating increases reflect bad news about future earnings and that decreases reflect good news about future earnings, then the actual earnings growth should be smaller for firms experiencing increases in risk ratings (assuming the market expectations are right). As pointed out above, we find the opposite.

Overall, our evidence is consistent with the hypothesis that the market reacts to information about changes in equity risk, as measured by the Fama-French factors, rather than to information about changes in expected cash flows.

Our study makes two contributions. First, it broadens our understanding of how analyst provided information influences price formation by examining the market reaction to changes in analyst risk ratings – an information output that has been largely overlooked in the prior literature. Analysts' risk assessments are now required by NYSE's Rule 472 and NASD's Rule 2210; hence, understanding their pricing implications is of crucial importance. Second, and more generally, our study is the first to present evidence consistent with the hypothesis that equity analysts provide new information about equity risk as opposed to future cash flows. This is a novel hypothesis as prior literature has solely explored the role of analysts as providers of new information about future cash flows. It is also an important hypothesis since assessing systematic risk is as critical to the formation of equity prices and to portfolio allocation decisions as assessing future cash flows.

The rest of the paper is organized as follows. In Section 2, we discuss prior evidence and its implications for our study. Section 3 describes the sample and section 4 presents the empirical analyses. Section 5 concludes the paper.

2. Prior evidence and its implications

Evidence on the role of analysts as providers of information about risk is scarce. To our knowledge only Lui et al. (2007) have examined analysts' risk ratings. They document that risk ratings are related to various stock characteristics commonly viewed as measures of systematic and unsystematic risk. Analysts rate stocks with high leverage, high book-to-market, and low market capitalization as riskier. Their evidence on beta is weaker but suggests that high-beta stocks are considered riskier by analysts. Finally, the risk ratings also incorporate earnings-based measures of risk, such as accounting losses and earnings quality. Overall, analysts' notion of risk seems to be multidimensional and related to common risk factors.

Lui et al. also show that analysts' risk ratings are useful for forecasting future volatility after controlling for various predictors of future volatility. In particular, they show that the risk ratings alone explain almost 50% of the cross-sectional variation in future return volatility. Controlling for past volatility and other stock characteristics, they document a difference in future monthly volatility between *Low* and *Speculative* risk stocks of 1.56% per month, which is economically important given a cross-sectional standard deviation of future return volatility of 7.79% per month.

While Lui et al.'s evidence makes a contribution toward understanding the significance of analysts' risk ratings, it does not imply that they influence price formation. Assuming market efficiency, only dissemination of new information useful for assessing future cash flows or systematic risk leads to a market reaction.[3] From this perspective, Lui et al.'s first result establishes what public information the risk ratings incorporate. Their second result sheds light on whether the risk ratings contain new information useful for forecasting future return volatility. However, even if the risk ratings incorporate new information useful for forecasting total volatility, this does not imply that this information is priced because the information may not be about future cash flows or systematic risk. Inferences about whether a particular piece of information influences price formation are best made on the basis of an event study (Fama et al., 1969), that is, after identifying days on which risk ratings change, analyzing market behavior in event time, and controlling for concurrent events.

In sum, Lui et al. provide evidence about what public information risk ratings incorporate and show that the risk ratings are useful for forecasting future volatility. In contrast, we investigate whether the market reacts to the dissemination of risk ratings, and the nature of this reaction.

3. Sample Description

3.1. Sample Selection

Well-known information providers such as IBES, First Call, and Zacks gather and make available in electronic form various types of information provided by analysts, but

[3] New in the sense of expanding the relevant set of information used to determine equity prices.

not their risk assessments. Hence, we hand-collected analysts' risk ratings from analysts' research reports. We examined research reports by several major brokerage houses and found that four of them (Salomon Smith Barney (now Citigroup), Merrill Lynch, Credit Suisse First Boston and Morgan Stanley) provide risk ratings. The other three brokerages (Bear Stearns, Deutsche Bank and Warburg Dillon Read) do not provide risk ratings but do provide qualitative risk assessments.[4]

Our sample consists of risk ratings provided by one of these major brokerages, Citigroup. We limit our analysis to Citigroup reports because we require a long time series of disclosures (since risk ratings do not change often) and such a series is only publicly available for Citigroup.[5] Given this data limitation, there may be some concerns about the generalizability of our results. Lui et. al (2007) show that similar stock characteristics (beta, size, book-to-market, leverage, earnings quality and accounting losses) determine the cross-sectional variation in the risk ratings provided by Salomon Smith Barney (now Citigroup), Merrill Lynch and Value Line analysts.[6] This, in our view, alleviates the generalizability concern but we acknowledge that our evidence may not generalize to other investment research providers (see also the discussion in Lui et al, 2007).

The Citigroup risk ratings were collected from disclosures of past investment ratings made in Citigroup analysts' research reports. These disclosures are required by NASD Rule 2711 (h) and NYSE Rule 472 (k), filed in February 2002 and in effect since

[4] We also found some anecdotal evidence suggesting that the risk ratings were provided as early as in 1990 and by smaller brokerages. See, for example, "Brokers moving toward clearer ratings", USA Today, September 24, 1990.
[5] Although both Citigroup (formerly Salomon Smith Barney) and Merrill Lynch have provided risk ratings since at least 1997 and 1998, Merrill Lynch no longer makes its reports available via Investext which is our source for the earliest observations.
[6] We cannot use Value Line data either, because the exact announcement date of their risk ratings, which is needed for our event study, is not available.

July 9, 2002. In particular, each report must include a chart or table that depicts the subject company's price over time and must indicate dates at which the brokerage firm assigned or changed a rating and/or target price.[7] This disclosure applies to companies that have been rated for a period of at least one year. Also, it needs to be as current as the end of the most recent calendar quarter (or the second most recent calendar quarter if the publication date is less than 15 calendar days after the most recent calendar quarter) and does not need to extend to a period longer than three years. In addition, the rule regards ratings as being assigned by the analyst employer and not by the individual analyst. Thus, each report needs to include all the ratings assigned during the period regardless of the identity of the analyst. As the disclosure example in Appendix A indicates, a single report can provide multiple observations on a company.

Citigroup disclosures about past investment ratings can be obtained from a variety of sources. The most recent disclosures can be obtained from its web-site; the summary tables posted there usually go back as far as three years. Older disclosures can be obtained from analysts' research reports available via Investext. There are several types of analyst research reports, including individual company reports, industry reports and morning meeting notes. As their names indicate, company reports focus on a single company while industry reports summarize information about various companies in an industry. Morning meeting notes focus on both individual companies and industries and their coverage of companies is also extensive; most company and industry reports are

[7] The investment rating may consist of a recommendation and a risk rating or a recommendation only. The price is defined as the closing price on the day on which the rating is assigned or changed. If a report covers more than 6 companies, then the report does not need to make these disclosures provided that it directs the reader as to how to obtain them.

preceded by morning meeting notes.[8] Hence, we rely on Citigroup's morning meeting notes to collect the older investment ratings.

Our initial sample consists of 15,215 ratings on 1,248 companies over the period 10/13/1999 through 9/22/2006. We record past investment ratings (recommendations, risk ratings, and price targets) and the dates on which they were issued. The first part of the sample was obtained from the summary tables reported in the morning meeting notes issued by Citigroup analysts in January and February 2003. There are 6,328 ratings on 676 individual companies spanning the period 10/13/1999-2/28/2003 (see Table 1).

The second part of the sample covers the period 3/3/2003 through 9/22/2006, and was obtained from the summary tables published on Citigroup Investment Research's web-site during the months of July, August and September 2006. If the web-site disclosures about a given company did not extend all the way back to the January-February 2003 period (from the first part of our first sample), we searched Investext for additional reports to create a continuing disclosure history for the company. The total number of companies with coverage in July, August and September 2006 is 1,004, and the total number of ratings is 8,887 (Table 1).

As reported in Table 1, we lose 563 observations due to lack of announcement returns and 1,180 observations because we need to compute changes in investment risk ratings for our analyses. Hence, the final sample consists of 13,472 investment ratings on 1,157 companies over the 1/4/2000 to 9/22/2006 period.

An important feature of our sample collection approach is that it relies on disclosures about past ratings made at a point in time. Apart from cost saving

[8] A Morning note is a brief written communication with investors. Legally, it meets the definition of a research report, which triggers various disclosure requirements.

considerations, the advantage of using disclosures about past ratings is the ability to correctly identify the days on which the ratings were changed; to the extent that research providers strictly follow disclosure rules, we can be certain that we have correctly identified such days, which is critical to documenting the existence of a price impact. In contrast, downloading all available reports during the period of 2000 to 2006 may still fail to correctly identify the days on which ratings were changed due to variation in Investext's coverage of analysts' research reports.

A potential disadvantage of our approach is that it produces a sample that includes only companies covered by analysts at a particular point in time (i.e., firms with morning meeting notes available during January and February 2003, and firms with disclosures available on Citigroup's web-site during July, August and September 2006). The omission of companies with discontinued coverage from our sample could be problematic if (i) a large number of companies were dropped over the period, and (ii) the nature of the information conveyed by the risk assessments on companies with continued coverage is different from that on companies with discontinued coverage. We do not think that our inferences are seriously compromised as a result of the exclusion of discontinued companies. First, our sample time period is fairly short and coverage is a highly persistent variable (McNichols and O'Brien, 2001). Second, while the characteristics of the stocks that are no longer covered may be different, we do not have reasons to believe that the information conveyed by their risk ratings will differ as well.

3.2. Definition of risk ratings

Most brokerage firms providing risk ratings (e.g., Citigroup, Merrill Lynch, Credit Suisse First Boston and Morgan Stanley) define risk as expected price volatility.

Citigroup, in particular, describes the risk ratings as "taking into account both price volatility and fundamental criteria". For example, over 1997 to September 2002, Citigroup rated stocks using five categories:

1. "*L (Low risk)*: predictable earnings and dividends, suitable for conservative investor.
2. *M (Medium risk)*: moderately predictable earnings and dividends, suitable for average equity investor.
3. *H (High risk)*: earnings and dividends are less predictable, suitable for aggressive investor.
4. *S (Speculative)*: very low predictability of fundamentals and a high degree of volatility, suitable for sophisticated investors with diversified portfolios that can withstand material losses.
5. *V (Venture)*: indicates a stock with venture capital characteristics that is suitable for sophisticated investors with high tolerance for risk and broadly diversified investment portfolios." [9]

From September 2002 onwards, Citigroup no longer assigned stocks to the *Venture* category; all stocks are now rated as *Low [L]*, *Medium [M]*, *High [H]*, or *Speculative [S]*.[10]

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[9] Spencer Grimes, *Liberty Media Group*, Salomon Smith Barney, December 29, 1998, via Thomson Research/Investext, accessed on January 30, 2006.

[10] Lanny Baker and William Morrison, *Amazon.com*, Citigroup Smith Barney, July 22 2004, via Thomson Research/Investext, accessed on January 30, 2006.

3.3. Descriptive statistics

Panels A and B of Table 2 provide information about the distribution of risk ratings and stock recommendations over three sub-periods: from 10/13/1999 to 09/05/2002, from 09/06/2002 to 09/11/2003, and from 09/12/2003 to 9/22/2006. The partition of the sample period into three sub-periods is based on the existence of three distinct rating regimes. Until September 6, 2002 stocks were rated using five different recommendation categories – *Buy, Outperform, Neutral, Underperform,* and *Sell* – based on the stocks' expected total returns and risk ratings. For example, a *Buy* recommendation was issued to stocks with an expected total return above 15% (30%) for *Low risk* (*Speculative*) stocks. Also, the risk ratings consisted of five categories: *Low, Medium, High, Speculative and Venture,* although none of our observations received a *Venture* rating. On September 6, 2002 the number of recommendation categories was reduced to three and the risk ratings to four. Recommendations were to be based on the stocks' expected performance relative to the industry average and the *Venture* risk rating was eliminated. Starting on September 12, 2003, the basis for recommendations was changed again; recommendations are now based on an assessment of a stock's expected return and risk. The expected return threshold for a *Buy* recommendation is 10% for *Low Risk* stocks, 15% for *Medium Risk* stocks, 20% for *High Risk* stocks, and 35% for *Speculative* stocks (See Table 2's legend for detailed information about rating policies).

Consistent with the evidence in Lui et al. (2007), we find that risk ratings are skewed toward the riskier categories (Panel A of Table 2). Approximately half of the stocks are rated as *High Risk,* and the combined proportion of stocks rated as *High Risk* or *Speculative* is over 60% in all periods.

Panel B shows the distribution of stock recommendations. In the first period analysts rate over 75% of the stocks as *Buy* or *Outperform*, and virtually none of the stocks receive a *Sell* or an *Underperform* recommendation. This asymmetry is reduced, but does not disappear in the second and third time periods. While most of the stocks in these two periods are issued neutral recommendations (*In-line* or *Hold*), still more stocks receive positive than negative recommendations.

Panel C provides information about analysts' expectations of future annual returns defined as the difference between target price and current market price scaled by current market price.[11] Citibank defines target price as analysts' expected stock price appreciation in the next 12 months. We report mean and median expected returns as well as the frequency of positive and negative expected returns for every year in our sample period. Both mean and median expected returns are quite large in the first three years of our sample period but decline substantially in 2003. Mean (median) annual expected returns trend down from 32% (23%) in 2000 to 15% (11%) in 2003. From 2004 onward, mean (median) expected returns range between 16% and 17% (11% and 14%). The percentage of negative expected returns also increases dramatically in 2003 (from 7% in 2000 to 21% in 2003) and remains around 14% at the end of the sample period. Overall, our mean expected returns are similar to what Brav et al. (2005) find for a larger sample of Value Line expected returns over the period from 1975 to 2001, 21%.

Panel D presents the correlations between risk ratings, recommendations, and expected returns. Risk ratings are positively correlated with stock recommendations and expected returns. Pearson correlations are 0.1 and 0.06 respectively (recall that Buys and

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[11] These statistics understate total expected returns for dividend paying stocks by the amount of the dividend yield.

Low risk ratings are both coded as 1). The positive correlation between expected returns and risk ratings suggests that analysts are indeed making the trade-off between risk and return. In other words, analysts believe that stocks viewed as riskier ought to yield greater returns. The positive correlation between risk ratings and stock recommendations means that analysts believe that, on average, high risk stocks do not compensate investors for the additional risk borne (hence, the less positive recommendation). Finally, we observe a significant Pearson (Spearman) correlation of -0.32 (-0.62) between expected returns and stock recommendations. This is a reflection of the investment policy to issue *Sell* recommendations for stocks with negative expected returns and *Hold* or *Buy* recommendations for stocks with positive expected returns. Overall, the correlations between risk ratings, stock recommendations and expected returns are not large, which enhances our ability to document risk ratings' incremental information content.

Finally, Table 3 reports transition matrixes and the number of days between research reports with new and old risk ratings and stock recommendations. As mentioned above, there are three distinct rating regimes over our sample period. We view the policy adopted on 09/06/2002 as a more substantial regime shift than the policy adopted on 09/12/2003, as it changes not only the definition of recommendations, but also the number of categories from five to three. Because of the greater importance of the 09/06/2002 policy and for the sake of brevity, Table 3 highlights how the ratings change before 09/06/2002, on 09/06/2002, and after 09/06/2002.

Risk ratings appear to be highly persistent at every category (Panel A of Table 3). For example, the probability that a *Speculative* rating will be re-iterated is as high as 97% before 09/06/2002 and 94% after 09/06/2002. The *Low risk* rating is slightly less persistent at 84% before 09/06/2002 and at 94% after 09/06/2002. Finally, we find an interesting pattern in the number of days between old and new risk ratings in the period after 09/06/2002. In particular, we find that it takes longer to revise the risk ratings toward lower risk than higher risk. It takes 84 days on average to change the risk rating from *Medium* to *Low* and 68.5 days from *Low* to *Medium*. Similarly it takes 93.5 (122) days to go from *High* to *Medium* (*Speculative* to *High*) and 70 (70) days from *Medium* to *High* (*High* to *Speculative*).

Panel B of Table 3 contains the transition matrix of stock recommendations. Consistent with prior literature, the recommendations in our sample are also highly persistent (Barber et al., 2001). The frequency of re-iterations ranges from 80% for *Sell* in the period after 09/06/2002 to 86% for *Buy* in that same period. We find a pattern in how long analysts take to revise their recommendations only in the period before 09/06/2002 when analysts consistently take longer to downgrade a stock than to upgrade it. It takes 84 (80) days for the recommendation to change from a *Buy* to an *Outperform* (*Outperform* to *Neutral*) and 64.5 (70) days to change from *Outperform* to *Buy* (*Neutral* to *Outperform*).

4. Market reaction analyses

This section explores the existence of a market reaction to changes in analysts' risk ratings and its uniqueness. We first examine the overall market impact and then examine the existence of abnormal returns after controlling for contemporaneous information.

4.1 Event time analysis

To provide a complete picture of how the market responds to changes in risk ratings, we measure market impact using three different metrics: daily market-adjusted returns, standardized absolute returns, and standardized trading volume.[12] We standardize absolute returns and trading volume (total number of shares traded divided by total number of shares outstanding) to remove the effects of time- and cross-sectional variation in volatility and trading volume.[13] We examine the market impact for two samples: (i) *Risk increase sample* (when risk ratings change toward riskier categories), and (ii) *Risk decrease sample* (when risk ratings change toward less risky categories).

Table 4 reports the mean values of the three metrics, and the results from testing the null hypothesis that the mean values are zero for each day in the event period [-10, +10], where day 0 is the event day. We control for heteroscedasticity and cross-correlations in daily returns due to event clustering. We find that the market reacts positively to decreases in risk ratings and negatively to increases. The market-adjusted return is about 0.5% per day for three days [-1 to +1] when analysts lower their risk ratings. Investors react more strongly, however, to risk rating increases. On the event day alone prices drop by over 2%. Furthermore, the market reaction to increases in risk starts as early as day -4: the market-adjusted return on that day is -0.65%.

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[12] Volume and volatility-based measures of market impact have been widely used in research on earnings announcements (Beaver, 1968; Landsman and Maydew, 2002) and analyst-provided information (Gintschel and Markov, 2004; Irvine, 2007).

[13] We standardize the absolute abnormal returns and trading volume by first subtracting the corresponding means and then dividing by the corresponding standard deviations calculated over 120 trading days (minimum 60 days) prior to the event. If a minimum of 60 trading days of pre-event data is not available, we use post-event data. We exclude trading days falling in the 21-day window around a firm's earnings announcements and the issuance of its research reports when computing the means and standard deviations of the corresponding firm.

The pattern in absolute returns and trading volume around the risk rating change event is also interesting. For both the *Risk increase* and *Risk decrease* samples, absolute returns and trading volume peak on the event day. The increases in absolute returns and volume are substantial; for example, on the event day, volume is 3.5 standard deviations larger for the *Risk increase* sample and one standard deviation larger for the *Risk decrease* sample.[14] The corresponding effects for absolute returns are a bit smaller but still considerable (two standard deviations larger for the *Risk increase* sample and half a standard deviation for the *Risk decrease* sample). Finally, we find that absolute returns and trading volume both respond earlier and remain unusually high following the event. For example, in the *Risk increase* sample, volume is unusually high in all days in the event window.

Overall, the combined evidence from the analysis of market-adjusted returns, absolute returns, and trading volume suggests that risk ratings have a significant market impact.

4.2 Controlling for changes in price targets and stock recommendations

In this section, we examine whether the abnormal return evidence discussed above is robust to controlling for contemporaneous information provided *within* the analyst report. In particular, we control for changes in stock recommendations and price targets provided by Citigroup's analysts. We use 3-day cumulative market-adjusted

[14] Recall that absolute returns and volume are standardized. Hence, the numbers reported in Table 4 reflect the change in absolute returns/volume measured relative to the standard deviation of the variables.

returns as a measure of new information because in both samples we document unusual returns over days from -1 and +1.[15]

Panel A of Table 5 provides information about the 3-day cumulative market-adjusted returns centered on dates on which analysts change their risk ratings toward lower risk (*Risk decrease* sample), higher risk (*Risk increase* sample), or re-iterate their risk ratings (*Re-iterations*). The number of observations in the *Risk decrease* sample is 321, with 290 unique firms and 182 event dates. For the *Risk increase* sample, the number of observations is 378, with 330 unique firms and 246 event dates. We find that the stock price reactions to changes in risk ratings are statistically and economically significant: 1.63% mean returns for *Risk decrease* and -3.34% for *Risk increase*. Median returns are less extreme, 0.95% and -1.71% respectively, but still statistically and economically significant. We provide mean and median returns to *Re-iterations* solely as a benchmark against which to judge the price impact of changes in risk ratings. We expect the stock price reaction to *Re-iterations* to be zero for two reasons. First, we average over risk categories. Second, *Re-iterations* are highly predictable. As expected, we find relatively low announcement returns, -0.11% for the mean and 0.16% for the median.

Panel B of Table 5 reports the results from the regression analysis where we control for contemporaneous information provided *within* the analyst report. The dependent variable is the 3-day (-1, +1) cumulative market-adjusted return centered on dates on which risk ratings are announced. The independent variable of interest is the change in risk rating or *Chrr,* defined as the difference between current and previous risk

[15] We focus on signed returns as our measure of new information because we have a specific prediction about how changes in risk ratings affect mean abnormal returns.

ratings. Positive (negative) values of *Chrr* represent an increase (a decrease) in risk. We also include: (i) *Chrec*, the change in recommendation, defined as current minus previous recommendation, and (ii) *Chexpret*, defined as the current expected return (current target price less current market price scaled by current market price) minus the previous expected return, defined analogously. Positive (negative) values of *Chrec* represent changes toward less (more) favorable recommendations. We report standard errors that are heteroscedasticity-consistent and adjusted to account for cross-correlation in daily returns due to event clustering (the number of unique days is substantially lower than the number of events as shown in Panel A of Table 5).

In the first specification we regress the 3-day cumulative market-adjusted returns only on the change in risk ratings variable, *Chrr*. The coefficient is statistically and economically different from zero. An increase in risk by 1 (e.g., from *Low* to *Medium risk*) results in a stock price reaction of -2.5%. In specifications (2) and (3) we incorporate the control variables *Chrec* and *Chexpret*. The coefficient on *Chrr* in these specifications is lower than in model (1), -2.06% and -1.98%, but still statistically and economically significant. Overall, the information content of the risk ratings changes is not subsumed by changes in recommendations and expected returns.

Specifications (4) and (5) examine the robustness of our results to eliminating observations occurring on days on which Citibank changed its policies on investment ratings, 09/06/02 and 09/12/03. On 09/06/02 Citibank adopted a 3-tier recommendation system and on 09/12/03 it changed the definition of the recommendations (see table 2 for more information). We find that the additional sample restrictions strengthen the evidence that changes in risk ratings affect stock returns. The coefficients on *Chrr* in specifications (4) and (5) are higher at -2.12% and -2.36%, respectively, while the coefficients on *Chrec* and *Chexpret* now have lower magnitudes. The results do not change when we use alternative return windows, such as a 7 day window (-3, +3), reported in the last column of the table, or just the announcement date (0), untabulated for brevity.

4.3. Controlling for contemporaneous information provided *outside* the analyst's report

So far, we have shown the existence of a price reaction controlling for changes in analysts' own stock recommendations and price targets. However, it is possible that, concurrent with the risk ratings, information about future cash flows and/or risk from other sources is disseminated and priced by the market. To address this general concern, we examine whether our results are robust to (i) including consensus earnings forecast revisions as a measure of concurrent news about the levels of future cash flows, (ii) excluding days on which earnings are announced, and (iii) excluding days with risk-related news.

i) Controlling for concurrent news about the levels of future cash flows

First, we consider the possibility that the observed market reaction is a reaction to concurrent news about the levels of future cash flows and that, somehow, the risk ratings change is correlated with it. Our proxy for news about future cash flows is based on analyst earnings forecasts, *Chforecast*. It is constructed as follows. We take the average of all (IBES) earnings per share forecasts disseminated in the 3-day window (current consensus). We then take the average of all IBES forecasts issued in a period of three months prior to the event (previous consensus). Finally, we subtract the previous consensus from the current consensus and scale the difference by the share price at the beginning of the fiscal year.[16]

The first column of Panel C of Table 5 reports the results from the analysis when we include *Chforecast*. The number of observations in this regression drops from 7,698 (column 5 of Panel B of Table 5) to 5,470 (116 risk increases and 101 risk decreases) due to the unavailability of earnings forecasts over the 3-day event window. The coefficient on *Chforecast* is positive and statistically significant at 1% level, which suggests that information about news about future cash flows is indeed conveyed to the market on event days. More importantly, all coefficients from the previous specifications retain their statistical and economic significance. If anything, the coefficient on risk rating increases slightly from -2.36% to -2.49%.

ii) Excluding earnings announcement days

Another possibility is that analysts tend to revise their risk ratings around earnings announcement days. If analysts revise their risk ratings toward higher (lower) risk on days on which earnings convey bad (good) news, then we will draw erroneous conclusions about the existence of a market reaction to changes in analyst risk ratings. To preclude this scenario, we exclude observations with earnings announcements occurring in the 3-day event window.

[16] The results do not change when previous consensus is defined to include only forecasts issued by analysts whose forecasts comprise the current consensus.

The results after imposing this additional requirement are reported in the second column of Panel C of Table 5. Excluding earnings announcements from the sample does not diminish the incremental information of the risk ratings (the magnitude of the coefficient is -2.53%) but does diminish the information content of our empirical proxy of changes in expected cash flows. The coefficient on *Chforecast* drops from 8.91% to 5.48%, (significant now at 5% level), which suggests that the information content of *Chforecast* overlaps with that of the earnings announcements.

iii) Excluding days with risk-related news

A final possibility is that analysts change their risk ratings on days in which important corporate events influence company risk and/or the levels of future cash flows, and the market is reacting to these events rather than to the changes in risk ratings. To address this possibility, we searched the major newswires (Dow Jones, Reuters and Press Release) for news that could affect risk and/or cash flows. In particular, we searched for news about changes in dividend policies, changes in investment policies (merger and acquisition activities, divestures, asset sales, new project undertakings, joint ventures), changes in financing policies (debt and equity offerings and retirements/repurchases), changes in credit ratings and lawsuits. We conducted this search only for the sample of firms with risk ratings changes because this is where we observe a market reaction and to minimize our data collection cost.

The last column of Panel C of Table 5 reports our results after excluding 33 observations (22 risk increases and 11 risk decreases) with confounding events over a [-

1,1] window. [17] The most common confounding events are: lawsuits (11), changes in investment policies (10, merger and acquisitions and disposals.), downgrade in credit ratings/rating outlook (5) and changes in financial policies (5, debt/equity issuance or redemption). Our final sample consists of 3,046 observations, of which 169 are observations with changes in risk ratings (72 risk increases and 64 risk decreases). The exclusion of confounding events does not affect the market impact of analysts risk ratings; the coefficient on *Chrr* is -0.0257, and is still economically and statistically significant.

In sum, we find that the market reacts to changes in analysts' risk ratings controlling for (i) news about future cash flows, as measured by the revisions in the consensus earnings forecasts, (ii) news disseminated during earnings announcements, and (iii) news about corporate events that could potentially affect company risk or cash flows.

5. Exploring the nature of the market reaction

While the role of analysts as providers of new information about cash flows is well documented and accepted in the academic literature, their role as providers of new information about systematic risk is yet to be established. Our evidence that the market reacts to changes in risk ratings and Lui et al.'s (2007) evidence that the risk ratings incorporate public information of firm characteristics associated with risk are suggestive of such a role, but far from conclusive. The reason is that the observed market reaction is also consistent with the hypothesis that the risk rating changes, or other elements of the research report uncontrolled for in our regressions, convey new information about future

[17] We also conducted our analysis after excluding 50 observations with confounding events over a [-4,+4] window and our results remain the same. For the sake of brevity, these analyses are untabulated.

cash flows.[18] Since the alternative explanation is grounded in the traditional view of analysts as providers of cash flow information, it requires serious consideration.

To further distinguish between the two interpretations of the market reaction - (1) it is due to the dissemination of new information about future cash flows and (2) it is due to the dissemination of information about equity risk - we explore whether the Fama-French factor loadings increase (decrease) around risk rating increase (decrease) events and whether there are differences in realized earnings growth between the *Risk Increase* and *Risk Decrease* samples. In other words, we use realized earnings growth and risk changes to draw inferences about the nature of the information priced by the market and to distinguish between alternative explanations. This approach is common in studies that analyze the nature of the market reaction to a corporate or an information event (e.g., primary stocks offers, Healy and Palepu, 1990; additions to the S&P index, Denis et al., 2003; Barberis et al., 2005). Its justification is that, if the market reaction is based on an unbiased estimate of future earnings and/or risk changes, subsequent realizations of these variables provide direct evidence on the nature of the information inferred by the market (p. 28, Healy and Palepu, 1990).

5.1. Changes in factor loadings

5.1.1 Preliminaries

We explore an empirical implication of the view that changes in risk ratings convey new information about equity risk, which is that equity risk indeed changes around the event. The basic idea that risk changes around some corporate or financial

[18] While Lui et al. (2007) do not investigate the relation between risk ratings and publicly available information about future cash flows, one of their risk determinants, accounting losses, can be easily viewed as a cash flow variable.

reporting event has been tested in various settings (Ibbotson, 1975; Brennan and Copeland, 1988; Ball and Kothari, 1991, among others). The common approach is to estimate CAPM beta in event time. For example, in their analysis of changes in risk around stock splits, Brennan and Copeland (1998) estimate the regression

$$R_{i,t} - RF_{i,t} = \alpha + \beta \times MKT_{i,t} + \varepsilon_{i,t} \qquad (1)$$

using pre-event observations and using post-event observations where $R_{i,t}$ is the return on a sample firm i on day t, $RF_{i,t}$ and $MKT_{i,t}$ are the risk free rate and the market return on day t. The risk-free rate and the market return are indexed by i and t because they pair up with day t's return on security i. The two estimations yield pre-event and post-event beta, which are then compared to assess the extent of variation in risk around the event.

We generally follow Brennan and Copeland's (1998) approach. One difference is that we also consider the size (SMB) and market-to-book (HML) factors as measures of risk in view of their empirical success as determinants of average returns (e.g., Fama and French, 1993). Another difference is that we estimate one regression with indicator variables that identify post-event observations to facilitate the statistical testing of changes in risk.

$$R_{i,t} - RF_{i,t} = \alpha + \beta \times Factor_{i,t} + \alpha_{after} \times I_{i,t} + \beta_{after} \times I_{i,t,after} \times Factor_{i,t} + \varepsilon_{i,t} \qquad (2)$$

where $R_{i,t}$ is the return on sample firm i on day t; $Factor_{i,t}$ is the vector of factor returns on day t; $RF_{i,t}$ is the risk-free rate based on the one month Treasury rate on day t; and $I_{i,t, after}$ is an indicator variable equal to one when day t is after the event day or equal to 0 otherwise.

We estimate equation (2) using observations from the intervals [-90, +90], [-150, 150], and [-210, 210]. The coefficient of interest is β*_after*. It captures the changes in factor loadings from the pre-event period. We also require that a firm has observations on every day of the window analyzed so that any changes in factor loadings are not due to firms entering/leaving the sample. The standard errors are heteroscedasticity-consistent and robust to cross-correlation in contemporaneous returns (Rogers, 1993).[19]

5.1.2 Main results

Our results are reported in Table 6 and are consistent across the three different windows, [-90, +90], [-150, 150], and [-210, 210]. Hence, for brevity, we only discuss the numbers for the shorter window.[20]

Overall, we find that the changes in factor loadings are generally consistent with the hypothesis that the market reacts to information about equity risk. In the *Risk Increase* sample, we find strong evidence that the market and size factor loadings increase; the MKT loading of 1.19 increases by 11% (=0.13/1.19) and the SMB loading of 0.18 increases by 100% (=0.18/0.18). In the *Risk decrease* sample, we document a decline in the loading on the MKT factor of 8% (=-0.08/0.99), but no corresponding decline in the loading on the SMB factor. Finally, the loading on the HML factor decreases by 34% (=-0.12/0.35) in the *Risk decrease* sample but does not change in the *Risk increase* sample. The results for the longer windows are similar although we find stronger effects for the HML factor in the *Risk decrease* sample.

[19] Another approach to documenting changes in risk would be to examine changes in firm characteristics around the event. We did not adopt it for a number of reasons. First, only the estimation of factor loadings allows us to study changes in risk in very close proximity to the event of interest. Second, an analysis of factor loadings around an event naturally complements an analysis of mean returns in event time. The two sets of analyses focus on different aspects of return distributions around an event.

[20] Focusing on a shorter window also allows us to better isolate changes in factor loadings around the event date. This is important given the extensive evidence on time variation in betas (e.g., Shanken, 1991; Harvey and Ferson, 1991; Ghysels, 1998).

We also observe an interesting pattern for the intercepts. The intercepts are negative (positive) for the *Risk increase* (*Risk decrease*) sample before the changes in risk ratings occur but the pattern reverses afterwards. Their magnitude is quite substantial, especially for the *Risk increase* sample: -0.14% daily abnormal return before the change in risk ratings and 0.15% afterwards. It seems that analysts revise their risk ratings upward (downward) after negative (positive) abnormal returns occur.

5.1.3 Sensitivity analyses

In this sub-section we explore the sensitivity of our evidence about changes in factor loadings to (1) the use of other factor loading estimation approaches, and (2) controlling for the well-known ability of past returns to predict changes in equity risk (Chan, 1988; and Ball and Kothari, 1989). The results discussed below are for the [-90, +90] window and are untabulated for brevity.

We estimate factor loadings in two ways: at the portfolio level and at the firm level. In our portfolio analyses, we first form pre-event and post-event return portfolios, and then test for differences in portfolio betas.[21] In our firm level analyses, we first estimate pre-event and post-event beta for each firm experiencing the event, and then test whether the distribution of pre-event betas differs from that of post-event betas.[22]

Overall, the tenor of our results remains. For example, in the *Risk decrease* sample the market loading decreases by 0.14 (portfolio approach) and 0.09 (firm specific

[21] As is common in the literature, we equally weight calendar days. Loughran and Ritter (2000) and Kothari and Warner (2007) point out that equal weighting calendar days may reduce statistical power.
[22] While this approach ignores the existence of cross-correlation, it is important to note that cross-sectional dependence in daily returns is fairly mild. Bernard (1987) reports that the cross-sectional correlation in market-adjusted returns at the daily level is only 0.04 and that it increases monotonically in the return interval to 0.33 at the annual level.

approach), both changes are statistically significant at 1% level. In the *Risk increase* sample the market loading increases by 0.06 (portfolio approach) and 0.06 (firm-specific approach). We also document a statistically significant increase in the SMB factor loadings in the *Risk increase* sample (firm-specific approach), but no evidence that the HML factor loading decreases in the *Risk decrease* sample.

Our second set of sensitivity analyses controls for the ability of past returns to predict changes in equity risk. As documented by Chen (1988) and Ball and Kothari (1989), market risk increases after stocks experience negative returns and decreases after positive returns. Since, on average, the stocks in the *Risk increase* sample experience negative returns in the pre-event window (see previous section), it is possible that our evidence of increases in factor loadings for this sample is driven by this universal phenomenon. Likewise, the decreases in factor loadings for the *Risk decrease* sample could be driven by positive returns in the pre-event period. To preclude this possibility, we estimate the regression after eliminating stocks with negative (positive) returns in the pre-event window from the *Risk increase* (decrease) sample. If our results are driven by prior stock performance, this elimination should reverse our results.

This prediction is not borne out in the data. In particular, the market and the SMB factor loadings still increase for the *Risk increase* sample of 122 firms with positive returns, with the SMB loading change statistically significant at 5%. All three factor loadings decrease in the *Risk decrease* sample of firms with negative returns, with the market and HML loadings statistically significant at 10% level.

Finally, we examine whether the documented change in risk is exclusively driven by days adjacent to the event. We exclude observations in the [-10,+10] window with no effect on our results.

In sum, we find robust evidence that the Fama-French factor loadings, and the market loading, in particular, change around days on which risk ratings are revised. This evidence is consistent with the hypothesis that the documented market reaction to changes in risk ratings (in Table 5) is due to new information about risk.

5.2 Changes in realized earnings growth around *Risk increases* and *Risk decreases*

The pattern of changes in market loadings documented in section 5.1 does not by itself preclude the hypothesis that concurrent arrival of cash flow information drives the observed market reaction. To shed light on this hypothesis, we examine changes in realized earnings growth around *Risk increases* and *Risk decreases* (see Healy and Palepu (1990) for a similar approach). If the positive market reaction in the *Risk decrease* sample is due to the dissemination of information that earnings growth will accelerate, then the change in earnings growth will be positive. Similarly, if the negative market reaction in the *Risk increase* sample is due to the dissemination of information that earnings growth will decelerate, then the change in earnings growth will be negative.

We define earnings growth as seasonally differenced quarterly earnings per share. We scale earnings growth by market price one month prior to the event so that we can pool earnings growth observations on different companies. We drop observations where price is less than $5 to address the small denominator problem, and exclude companies that do not have quarterly earnings observations in each quarter to ensure that changes in the sample composition over time do not affect our results.

Our results are presented in Table 7. We report the mean earnings growth for quarters -4 to +4 (0 is the event quarter) for the two samples and t-statistics from our statistical tests. We test the hypothesis that earnings growth over quarters -4 to -1 is the same as the earnings growth over quarters +1 to +4 in the two samples. We also test whether the change in earnings growth in the *Risk decrease* sample is equal to that in the *Risk increase* sample.

In both samples we document a statistically significant increase in earnings growth. The increase in earnings growth in the *Risk increase* sample is 0.0042 (difference between the mean growth over quarters -4 to -1, -0.0024, and the mean growth over quarters +1 to +4, 0.0018), considerably greater than the increase in the *Risk decrease* sample, 0.0008. This difference is statistically significant at the 1% level. Interestingly, the earnings growth in quarters -4 to 0 in the *Risk increase* sample is not only always lower than the corresponding earnings growth in the *Risk decrease* sample, but also consistently negative. Only in the last two quarters does the earnings growth of the *Risk increase* sample surpass the earnings growth in the *Risk decrease* sample.

Overall, we find no evidence consistent with the hypothesis that the observed market reaction is due to the dissemination of new information about the levels of future cash flows. We conclude that the market reaction to changes in analysts' risk ratings is due to changes in the market assessment of systematic risk.

6. Conclusions

This paper investigates the significance and the nature of the information conveyed by financial analysts' risk assessments. Using a large sample of risk ratings provided by a prominent research provider, we document an economically significant stock price reaction of 2.5% when analysts revise their risk assessments. Our interpretation is that the risk rating changes provide new information to the market about changes in equity risk rather than changes in cash flows. This interpretation is corroborated by evidence that equity risk, as measured by the Fama-French factor loadings, increases (decreases) when analysts revise their ratings toward higher (lower) risk, and evidence showing that the price impact of changes in risk ratings remains after controlling for analysts' forecast revisions, earnings announcements and concurrent news about corporate events.

Important questions remain unexplored. First, since risk ratings, stock recommendations, and price targets are jointly determined, addressing a broader question of how the market uses these information outputs requires researchers to develop a model of how they are formed and related to each other. Second, Lui et al. (2007) report that not all research providers supply risk assessments in the form of ratings, which raises the question about differences in the value added by research providers. Analysts may add value by providing different estimates for items they all forecast (e.g., earnings forecasts and stock recommendations) but also by providing different types of information (e.g., risk ratings). Pursuing this line of research would require a shift in focus away from analyzing information outputs supplied by all or most brokerages toward studying research reports (e.g., Asquith et al., 2005). This may not prove easy though as many prominent brokerages have discontinued the practice of making their research reports available on Investext and tried to limit the dissemination of research reports to paying customers.

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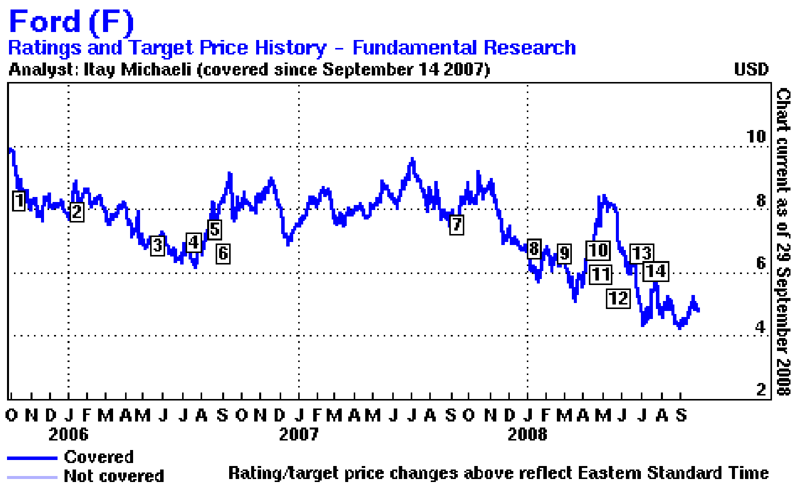
Appendix A. Example of a disclosure about past investment ratings and past prices

Citigroup Investment Research's web site provides a history of investment ratings.[23] The history of Ford's investment ratings, as of December 13, 2006, is provided below. Ratings include a risk rating and a recommendation. Ratings of 1,2, and 3 correspond to Buy, Hold, and Sell recommendations. Ratings of L, M, H, and S represent Low, Medium, High, and Speculative Risk ratings.



#	Date	Rating	Target Price	Closing Price
1:	13 Oct 05	*3H	*7.00	8.99
2:	16 Jan 06	*3S	7.00	8.31
3:	22 May 06	3S	*6.00	6.90
4:	20 Jul 06	3S	*5.00	6.19
5:	21 Aug 06	3S	*6.00	7.47
6:	5 Sep 06	*2S	*9.00	8.39
7:	12 Sep 07	2S	*8.00	7.50
8:	11 Jan 08	2S	*7.00	6.06
9:	2 Mar 08	*3S	*5.50	6.18
10:	24 Apr 08	3S	*6.00	8.40
11:	28 Apr 08	*2S	*8.50	8.21
12:	26 May 08	2S	*7.00	6.80
13:	1 Jul 08	2S	*6.00	4.71
14:	24 Jul 08	2S	*5.50	5.11

*Indicates change.

[23] https://www.citigroupgeo.com/geopublic/Disclosures/disclosure.html

Table 1. Sample Construction

Our sample comes from two sources: (i) Citigroup's morning meeting notes available on Investext, and (ii) Citigroup's web site. The sample obtained from the morning meeting notes consists of firms with coverage in January-February 2003. The sample obtained from Citigroup's web site consists of firms with coverage in July-September 2006. Citigroup's web site provides information on past risk ratings; an example of a disclosure about past ratings is provided in Appendix A. When a firm's investment rating history on the web site does not extend all the way to our January-February 2003 sample, we retrieved additional reports from Investext to create an uninterrupted time-series. We report number of firms, number of risk ratings per firm (average and maximum), total number of ratings and time period of the ratings for our sample.

SAMPLE	Number of firms	Number of Ratings			Ratings period	
		Per firm-Mean	Per firm-Max	Total	Begin	End
Firms from morning meeting notes	676	9.36	26	6,328	10/13/1999	2/28/2003
Firms from Citigroup's web site	1,004	8.85	30	8,887	3/3/2003	9/22/2006
Combined sample	1,248	12.19	56	15,215	10/13/1999	9/22/2006
Of which firms						
With available announcement returns	1,219	12.02	56	14,652	10/14/1999	9/22/2006
And with risk ratings changes	1,157	11.64	55	13,472	1/4/2000	9/22/2006

Table 2. Distribution of Risk ratings, Recommendations and Expected return over time

The number of investment ratings over the periods *Before 09/05/2002*, *09/06/2002-09/11/2003*, and *After 09/11/2003* is 3,639, 2,667, and 7,166 respectively. For each period we report categories used, the total number and the percentage of risk ratings (Panel A) and recommendations (Panel B) falling in a particular category.

Before 09/06/2002, recommendations had five categories: Buy (1), Outperform (2), Neutral (3), Underperform (4) and Sell (5) where Buy indicates an expected total return ranging from 15% or more for Low-Risk stock to 30% or more for Speculative stock; Outperform indicates expected return ranging from 5% to 15% (Low risk) to 10% to 30% (Speculative); Neutral indicates an expected total return ranging from -5% to 5% (Low risk) to -10% to 10% (Speculative); Underperform indicates expected return ranging from -5% to -15% (Low risk) to -10% to -20% (Speculative). Between 09/06/2002 and 09/11/2003 analysts rated stocks using three categories: Outperform (1), In-line (2), and Underperform (3) depending on whether the analyst believe the stock will outperform, perform in-line with, or underperform stocks in analyst's industry coverage universe. After 09/11/2003 analysts rate stocks using three categories: Buy (1)-expected return of 10% or more for Low risk stocks, 15% or more for Medium risk stocks, 20% or more for High risk stocks, and 35% or more for Speculative stocks; Hold (2)-between 0% and 10% for Low risk stocks, 0% and 15% for Medium risk stocks, 0% and 20% for High risk stocks, and 0% and 35% for Speculative stocks, and Sell (3)-Negative expected return.

Panel C reports analysts' expected return over the sample period 2000-2006. We define expected return as the ratio of the difference between target price and current market price to current market price. Target price is analysts' expectation of the 12-month ahead stock price. Panel D shows the correlation between analysts' risk ratings, stock recommendations, and expected return.

Panel A. Risk Ratings over time

Time Period	Risk Rating	Total number	%
Before 09/06/2002	1 (Low)	112	3.08%
	2 (Medium)	1,292	35.50%
	3 (High)	1,857	51.03%
	4 (Speculative)	378	10.39%
09/06/2002-09/11/2003	1 (Low)	44	1.65%
	2 (Medium)	835	31.31%
	3 (High)	1,387	52.01%
	4 (Speculative)	401	15.04%
After 09/11/2003	1 (Low)	414	5.78%
	2 (Medium)	2,294	32.01%
	3 (High)	3,493	48.74%
	4 (Speculative)	965	13.47%

Panel B. Stock Recommendations over time

Time Period	Recommendation	Total number	%
Before 09/06/2002	1 Buy	1,448	39.79%
	2 Outperform	1,301	35.75%
	3 Neutral	875	24.05%
	4 Underperform	13	0.36%
	5 Sell	2	0.06%
09/06/2002-09/11/2003	1 Outperform	944	35.40%
	2 In-line	1,090	40.87%
	3 Underperform	633	23.74%
After 09/11/2003	1 Buy	2,853	39.81%
	2 Hold	3,511	49.00%
	3 Sell	802	11.19%

Panel C. Expected return over time

Year	Mean	Median	% positive	% negative	Total number
2000	31.52%	22.80%	93%	7%	898
2001	27.03%	19.35%	93%	7%	1,426
2002	23.09%	16.88%	89%	11%	2,636
2003	14.59%	10.72%	79%	21%	2,181
2004	16.63%	11.16%	83%	17%	2,157
2005	16.71%	12.53%	86%	14%	2,633
2006	17.62%	13.75%	86%	14%	1,420

Panel D. Correlation between analysts' risk ratings, stock recommendations, and expected return.
Upper triangle: Pearson correlation, lower triangle: Spearman correlation

	Risk ratings	Stock recommendations	Expected Return
Risk ratings		0.10718	0.06051
		<0.0001	<0.0001
Stock recommendations	0.09656		-0.31749
	<0.0001		<0.0001
Expected return	0.11841	-0.62133	
	<0.0001	<0.0001	

Table 3. Risk ratings and Recommendations transition matrixes

This table provides transition matrixes for risk ratings (Panel A) and stock recommendations (Panel B) for three sub-samples. The first sub-sample includes 3,639 observations where the dates of the old and new investment ratings are before 09/06/2002. On 09/06/2002 Citigroup Investment Research changed its stock ratings system from a 5-category system to a 3-category system. The second sub-sample includes 574 observations where the date of the new investment ratings is on 09/06/2002, the date the new policy is adopted. The third sub-sample includes 9,259 observations where the dates of old and new investment ratings are after 09/06/2002. We report the number and the percentage of transitions from old to new rating, and the median number of days between old and new ratings.

Panel A. Risk Ratings

TO	Before 09/06/2002				On 09/06/2002				After 09/06/2002			
FROM	1	2	3	4	1	2	3	4	1	2	3	4
1 (Low)	107	19	2		10	2			395	26	1	
	83.59%	14.84%	1.56%		83.33%	16.67%			93.60%	6.16%	0.24%	
	102	168	99		43	75			82	68.5	21	
2 (Medium)	5	1,248	63	4	1	182	7	1	51	2,769	125	4
	0.38%	94.55%	4.77%	0.30%	0.52%	95.29%	3.67%	0.52%	1.73%	93.90%	4.24%	0.13%
	105	83	113	129.5	43	52	43	36	84	72	70	113.5
3 (High)		25	1,782	39		8	279	6	1	138	4,390	79
		1.35%	96.53%	2.11%		2.73%	95.22%	2.05%	0.02%	2.99%	95.27%	1.72%
		121	75	99		44.5	52	48.5	43	93.5	65	70
4(Speculative)			10	335		1	3	74		3	75	1,202
			2.90%	97.10%		1.28%	3.85%	94.87%		0.23%	5.86%	93.91%
			116.5	70		165	32	49		488	122	69

Panel B. Stock recommendations

FROM \ TO	Before 09/06/2002					On 09/06/2002			After 09/06/2002		
	1	2	3	4	5	1	2	3	1	2	3
1 (Favorable)	1,255	195	76			160	22	3	3,066	465	30
	82.24%	12.78%	4.98%			86.49%	11.89%	1.62%	86.10%	13.06%	0.84%
	79	84	88.5			53	53	52	63	78	91
2	154	1,011	145		1	50	108	18	487	3,678	181
	11.75%	77.12%	11.06%		0.08%	28.41%	61.36%	10.23%	11.21%	84.63%	4.16%
	64.5	74	80		85	50.5	54.5	50	68	74	78
3	39	95	653	9	1	4	81	117	30	246	1,076
	4.89%	11.92%	81.93%	1.13%	0.13%	1.98%	40.10%	57.92%	2.21%	18.20%	79.59%
	84	70	88	91	189	16.5	50	50	104.5	83	65
4			1	4			1	8			
			20.00%	80.00%			11.11%	88.89%			
			73	243			21	39			
5 (Unfavorable)								2			
								100.00%			
								30			

Table 4. Market impact of changes in risk ratings

We report the mean market-adjusted return, absolute return, and volume traded in the 21-day window (-10 to +10) around changes in risk rating events. Market-adjusted return is a stock's daily return less the equally-weighted market return on the same day; absolute return is a stock's unsigned daily return; volume is a stock's daily trading volume (in number of shares) scaled by its total number of shares outstanding. Absolute returns and volume are standardized by first subtracting the mean and then dividing the difference by the standard deviation of their normal values. Normal absolute return and trading volume are estimated using 120 trading days (minimum 60 days) of data ending 20 days prior to the event, supplemented by post-event data if pre-event data are unavailable. We exclude trading days in the 21-day window around quarterly earnings announcements and the issuance of another risk rating report in computing normal values. We conduct T-test of the null hypothesis that the mean is equal to zero. Standard errors for the T-test are heteroscedasticity-consistent and adjusted to account for cross-correlation in daily returns. ***, **, * denote statistical significance at 1%, 5%, and 10%.

	Risk Decrease (321 obs, 290 firms, 1,345 days)			Risk Increase (377 obs, 329 firms, 1,555 days)		
Event day	Market-adj. returns	Absolute returns	Volume	Market-adj. returns	Absolute returns	Volume
-10	-0.0002	-0.0887	0.0740	-0.0033*	0.1807	0.4696***
-9	-0.0009	-0.0494	0.0893	-0.0020	0.1671	0.4719***
-8	0.0003	0.0136	0.1213	-0.0026	0.1663**	0.3533***
-7	0.0018	0.0741	0.2258**	-0.0016	0.1965***	0.3606***
-6	0.0013	0.0691	0.1672*	-0.0039	0.2653**	0.4925***
-5	0.0007	0.0335	0.0944	-0.0003	0.3475**	0.4789**
-4	0.0002	-0.0372	0.0537	-0.0065***	0.3696***	0.5054***
-3	-0.0019*	0.0584	0.0950	-0.0063**	0.6096***	0.7003***
-2	0.0001	-0.0006	0.1144	-0.0081***	0.4025***	0.7869***
-1	0.0046**	0.2252*	0.5051**	-0.0114***	1.0624***	1.7512***
0	0.0051**	0.4817***	0.9385***	-0.0202***	2.0137***	3.5983***
1	0.0042***	0.1103	0.6771***	-0.0039	0.9493***	2.9273***
2	-0.0006	-0.0286	0.3831***	-0.0011	0.5515***	1.5129***
3	-0.0009	-0.1008	0.1580	-0.0015	0.2821**	1.2482***
4	0.0002	0.0558	0.2829***	0.0017	0.2965***	1.1806***
5	-0.0002	-0.0862	0.2625***	0.0012	0.4132***	0.9466***
6	-0.0007	0.0675	0.1585	0.0033	0.5272***	1.0768***
7	0.0000	0.0820	0.2673***	0.0020	0.1909*	0.7219***
8	0.0013	0.0868	0.3032***	0.0014	0.3269***	0.7289***
9	-0.0013	-0.0324	0.1252*	0.0033	0.2413*	0.7006***
10	0.0010	0.0049	0.2436***	0.0022	0.5135***	0.8515***

Table 5. Event study

Panel A. Descriptive statistics

This table reports Mean, Median, Standard Deviation (STD), Skewness and Kurtosis of the three-day market-adjusted cumulative returns around days on which analysts change their risk ratings (Increase or Decrease in risk) or re-iterate their risk ratings (Re-iteration). For each sample we report number of observations, number of unique firms and number of unique dates. We conduct T-test and Wilcoxon Singned Rank test of the null hypothesis that the mean or median are equal to zero. ***, **, ** denote statistical significance at 1%, 5%, and 10%.

Samlpe	Mean	Median	Stdev.	Skewness	Kurtosis	N of obs	N of firms	N of dates
Risk decrease	0.0163***	0.0095***	0.0502	3.0972	24.7901	321	290	182
Re-iteration	-0.0011	0.0016**	0.0809	-0.2284	12.3388	12,773	1,152	1,712
Risk increase	-0.0334***	-0.0171***	0.1265	-0.9667	7.1769	378	330	246

Panel B. Regression analysis

We report parameter estimates, clustered by calendar day standard errors (in parenthesis), number of observations and adjusted R^2 from a cross-sectional analysis of 3-day cumulative market-adjusted returns on days on which analysts revise their investment ratings. *Chrr* is the difference between new and old Risk ratings; *Chrec* is the difference between new and old recommendations; *Chexpret* is the difference between current expected return (the difference between price target and current market price scaled by share price at the beginning of the fiscal year) and previous expected return. Positive values of *Chrr* and *Chrec* represent changes toward higher risk and less favorable recommendation. In column (4) we exclude observations occurring on 09/06/2002 (the date on which analysts adopt a 3-category recommendation system); in column (5) we further exclude observations occurring on 09/12/2003 (the date on which Citigroup Investment Research changed the definition of their recommendations). In column (6) the dependent variable is market-adjusted returns cumulative returns over the period from day -3 to day +3. Standard errors are. ***, **, and * represent statistical significance at 1%, 5% and 10%.

	(1)	(2)	(3)	(4) Excl. 09/06/02	(5) Excl. 09/12/03	(6) Days -3 to +3
Chrr	-0.0252***	-0.0206***	-0.0198***	-0.0212***	-0.0236***	-0.0309***
	(0.0045)	(0.0040)	(0.0040)	(0.0042)	(0.0045)	(0.0055)
Chrec		-0.0376***	-0.0394***	-0.0362***	-0.0373***	-0.0384***
		(0.0039)	(0.0041)	(0.0026)	(0.0026)	(0.0029)
Chexpret			-0.0164***	-0.0132**	-0.0140***	-0.0197***
			(0.0051)	(0.0051)	(0.0053)	(0.0070)
Constant	-0.0014	-0.0015*	-0.0015	-0.0039***	-0.0045***	-0.0050***
	(0.0009)	(0.0009)	(0.0009)	(0.0012)	(0.0012)	(0.0017)
N of obs	13,472	13,472	13,284	8,307	7,698	7,285
Adjusted R^2	0.0052	0.0503	0.0533	0.0579	0.0623	0.0466

Panel C. Additional analysis

This panel extends Panel B by (1) including a proxy for concurrent news about future cash flows, and eliminating observations contaminated by (2) concurrent earnings announcements and (3) the dissemination of risk-related news. The proxy for concurrent news about future cash flows is the difference between current consensus – the average of all IBES earnings per share estimates disseminated in the [-1, 1] event window – and old consensus, constructed using all forecasts issued in the previous 3-month period. We identify observations with risk related news by searching the Dow Jones, Reuters and Press Release newswires for changes in dividend policies, changes in investment policies (merger and acquisition activities, divestures, asset sales, new project undertakings, joint ventures), changes in financing policies (debt and equity offerings and retirements/repurchases), changes in credit ratings and lawsuits. We conduct the search only for risk increases and risk decreases because this is where we observe a market reaction, and to minimize collection costs.

	(1)	(2)	(3)
		Excluded are observations with	
		Earnings announcements	and risk-related news
Chrr	-0.0249***	-0.0253***	-0.0257***
	(0.0073)	(0.0078)	(0.0087)
Chrec	-0.0497***	-0.0447***	-0.0445***
	(0.0042)	(0.0051)	(0.0051)
Chexpret	-0.0190**	-0.0186*	-0.0200**
	(0.0083)	(0.0101)	(0.0102)
Chforecast	0.0891***	0.0548**	0.0580***
	(0.0176)	(0.0217)	(0.0221)
Constant	-0.0033**	-0.0095***	-0.0095***
	(0.0014)	(0.0018)	(0.0019)
N of obs	5,470	3,079	3,046
Adjusted R^2	0.0668	0.0677	0.0663

Table 6. Changes in Fama-French factor loadings

This table reports changes in Fama-French factor loadings around two events: *Increases in Risk* and *Decreases in Risk* based on panel regression analyses of daily returns from three calendar day event windows: [-90, 90], [-150, 150], and [-210, 210]. We also report the number of events, number of observations, and adjusted R-squared. We regress daily excess returns on the Fama-French factors interacted with a dummy variable equal to 0 when observations come from the pre-event period, [-90, -1] and 1 otherwise. We exclude events for which we do not have daily returns for every day in the corresponding event window. If a firm has multiple events whose event windows overlap, we keep only the first event. Standard errors (in parenthesis) are heteroscedasticity-consistent and adjusted to account for cross-correlation in contemporaneous daily returns (Rogers, 1993). ***, **, and * represent statistical significance at 1%, 5% and 10%.

	[-90,+90]		[-150,+150]		[-210,+210]	
	Decrease in Risk	Increase in Risk	Decrease in Risk	Increase in Risk	Decrease in Risk	Increase in Risk
Intercept	0.0006***	-0.0014***	0.0006***	-0.0011***	0.0005***	-0.0007***
	(0.0002)	(0.0002)	(0.0001)	(0.0002)	(0.0001)	(0.0002)
Intercept_after	-0.0002	0.0015***	-0.0003*	0.0014***	-0.0003**	0.0009***
	(0.0002)	(0.0003)	(0.0002)	(0.0003)	(0.0001)	(0.0002)
MKT	0.9906***	1.1904***	0.9983***	1.1768***	0.9796***	1.1725***
	(0.0240)	(0.0329)	(0.0196)	(0.0252)	(0.0163)	(0.0209)
MKT_after	-0.0779***	0.1264***	-0.0669***	0.1029***	-0.0470**	0.1102***
	(0.0298)	(0.0449)	(0.0239)	(0.0358)	(0.0203)	(0.0317)
SMB	0.1523***	0.1785***	0.1252***	0.2358***	0.1291***	0.2477***
	(0.0344)	(0.0406)	(0.0367)	(0.0325)	(0.0318)	(0.0350)
SMB_after	0.0552	0.1784***	0.0591	0.1313**	0.0587	0.1326***
	(0.0453)	(0.0602)	(0.0430)	(0.0522)	(0.0383)	(0.0473)
HML	0.3531***	0.3433***	0.4183***	0.3407***	0.4074***	0.3545***
	(0.0498)	(0.1020)	(0.0404)	(0.0468)	(0.0324)	(0.0395)
HML_after	-0.1200*	0.1374	-0.1767***	0.0117	-0.1152***	0.0223
	(0.0615)	(0.1097)	(0.0508)	(0.0789)	(0.0436)	(0.0686)
Number of events	313	362	304	344	287	333
Number of observations	54,843	62,445	88,494	99,029	116,617	134,299
Adjusted R-squared	0.1733	0.1494	0.1728	0.1524	0.1712	0.1538

Table 7. Changes in realized earnings growth around Increases in Risk and Decreases in Risk

This table examines the realized earnings per share growth in event time. Earnings growth is seasonally differenced earnings per share obtained from IBES and deflated by the share price of the month prior to the event. We exclude firms whose share price is less than $5 and winsorize the earnings growth variable at the top and bottom 1% level. The same firm needs to have available data throughout all nine quarters to be included in the sample.

We report the average earnings growth across all firms in the *Risk increase/decrease* samples for quarters -4 through +4, where quarter 0 is the event quarter. We also report the average pre- and post-event earnings growth (mean -4 to -1 and mean 1 to 4), and the difference between the two. We test whether such a difference is different from zero in the last two rows. Finally, we also examine the difference in earnings growth between the *Risk increase* and *Risk decrease* samples in the last column. ***, **, and * represent statistical significance at 1%, 5% and 10% for a one-tail test.

Variable: Earnings growth

No. of quarters from analysts' report date	(1) Risk rating decrease N=191	(2) Risk rating increase N=199	(1) - (2)
-4	0.0015	-0.0010	0.0025
-3	0.0016	-0.0022	0.0038
-2	0.0013	-0.0022	0.0035
-1	0.0018	-0.0042	0.0060
0	0.0019	-0.0014	0.0033
1	0.0021	0.0002	0.0019
2	0.0025	0.0012	0.0013
3	0.0020	0.0031	-0.0011
4	0.0026	0.0028	-0.0002
Mean: -4 to -1	0.0016	-0.0024	0.0040
Mean: 1 to 4	0.0023	0.0018	0.0005
Test: Difference = 0	0.0008***	0.0042***	-0.0035***
	p = 0.0044	p = 0.0022	p = 0.0068