How does the concurrent release of target prices and earnings forecasts affect the informativeness of stock recommendation revisions?

ABSTRACT

This study examines the differential usefulness of recommendation revisions–upgrades and downgrades–conditional on whether they are accompanied by the two key analyst estimates: target prices and earnings forecasts. We find that these estimates add value to recommendation revisions. We document larger market reactions–measured by abnormal returns, abnormal return volatility and abnormal trading volume–compared to standalone recommendation revisions when any of these estimates is accompanying the recommendation with the largest market movements observed for the full-fledged revisions i.e. recommendations supported by both earnings forecasts and target prices. In addition, we document that the largest post recommendation drift is observed for full-fledged upgrades. Finally, examining the qualities of estimates that support recommendations we find that earnings forecasts supporting full-fledged revisions are less optimistically biased and more accurate. On the contrary, and unexpectedly we document that target prices accompanying full-fledged revisions although not more biased they are less accurate.

JEL Classification: G14; G20; G24; G28

Keywords: sell-side analysts, recommendations, target prices, earnings forecasts

How does the concurrent release of target prices and earnings forecasts affect the informativeness of stock recommendation revisions?

1. Introduction

A sell-side analyst's ultimate judgement about a stock's future prospects is the recommendation. Recommendation revisions–upgrades or downgrades–are considered the most important piece of information disseminated by sell-side research analysts (Bradley, Clarke, Lee, & Ornthanalai, 2014). Observing that these recommendation revisions may or may not be backed by the two key analyst estimates i.e. earnings forecasts and target prices we examine whether disclosure or omission of these forecasts affect the information content of the recommendation change. We find that when revisions are supported by both estimates, full-fledged recommendations hereafter, the market exhibits the largest reactions (returns, abnormal return volatility, abnormal volume). The smallest reactions are documented for standalone recommendation revisions. Our findings also suggest that the market reacts more strongly when a recommendation is accompanied by a target price rather than an earnings forecast. In addition, the strongest post-recommendation drift is documented for full-fledged upgrades. Finally, as expected, we find that earnings forecasts that accompany full-fledged recommendations are less optimistically biased and more accurate. On the contrary, and surprisingly, target prices of full-fledged recommendation although not more biased they exhibit less accuracy.

To arrive at the recommendation, analysts typically first process numerous pieces of information and forecast earnings (EF) which are in turn used to compute target prices (TP).[1] These two key quantitative estimates serve as inputs in the process of assigning a succinct "buy", "hold" or "sell" recommendation to a particular stock (Bradshaw M. T., 2009).[2] Of course conclusions are conveyed through various channels and are more complex than a discrete recommendation. Part of the complexity is how the recommendation change is motivated. Ideally, one would expect that when an analyst revises a recommendation (which is the final product) he would cogently support it with revisions of both key quantitative estimates.

[1] Excellent discussions regarding analysts and their forecasts are the commentary of Schipper (1991) and the review papers by Ramnath, Rock, & Shane (2008) and Bradshaw (2011)

[2] Brokerage houses use also other terms that have similar meanings e.g. "out(under)perform" "over(under)weight" "accumulate" "neutral" "reduce" etc.

In reality however, this is often not the case (Bradshaw M. T., 2002; Kecskés, Michaely, & Womack, 2017). It is in the analysts' discretion to disclose or withhold their estimates. Therefore, a recommendation report not only constitutes its formal explanation but is also a reflection of decision processes made by the analyst. As was discussed in Schipper (1991) the report is a lower bound on the information pieces analyzed. In this context, recommendations reports are the final product where EF and TP serve as inputs. However, this final product is not a homogeneous group as some send more than one explicit signal to the market depending on which supportive estimates are disclosed. Thus, some reasonable and interesting questions arise. How often do analysts support their recommendation revisions with these forecasts? How does the disclosure of quantitative measures affect a recommendation revision's value? Which estimate affects more the informativeness of recommendation, TP or EF? Furthermore, does the withholding of information from one estimate actually indicate anything about the quality (e.g. accuracy and bias) of the other reported estimate? These are the questions undertaken by this paper.

Numerous reasons could underlie the decision of analysts to withhold their estimates. These could be innocuous ones e.g. difficulty in valuing a company or uncertain earnings and the recommendation if more the analyst's gut feeling or the result of limited attention due to restraint in resources or complexity of the analyst's portfolio. It could also be the result of reasons arising from conflicts of interests analysts face and therefore withholding their estimates may be a strategic decision in order to mislead investors. Our study does not examine which reasons dominate analyst decisions but rather what are the consequences of non-full disclosure of estimates in support of recommendation revisions as this is reflected in both market reactions and quality of analyst products–bias and accuracy.

Prior literature has shown that when analysts avoid disclosing any of the quantitative estimates the quality of the recommendation is negatively impaired and their value is lessened. Bradshaw (2002) indicates that when analysts choose not disclose a target price in support of the corresponding recommendation could be attributed either to their biases (suppress the TP when it would not support recommendation) or when they are less certain about the underlying EF. A more recent study by Kecskés, Michaely, and Womack (2017) compare recommendation changes that are motivated by earnings revisions versus changes without earnings revisions. They show that the "earnings based" revisions are more informative compared to "non-earnings based" revisions. They attribute their results to be the manifestation of the fact that recommendations supported by "harder and more verifiable

information" are "less affected by analysts' cognitive and incentive biases". In other words, a supportive EF estimate adds credibility to the analyst's recommendation about a stock as well as increases its value to investors.

Our study moves a step further and adds target prices in the mix. This is because all three outputs–earnings forecasts, target prices and recommendations–are considered to be the 'skin and bones' of equity research.[3] However, it is not clear nor assured from prior literature that target prices may add incremental value to recommendation revisions.[4] On the one hand, some early studies suggest TP contain distinct information beyond earnings forecasts and stock recommendations (Brav & Lehavy, 2003; Asquith, Mikhail, & Au, 2005; Da & Schaumburg, 2011). This is in agreement with a more recent study by (Iselin, Park, & Van Buskirk, 2021) that indicates that EF, TP and recommendations seem to be "dinstinct constructs" and thus comovements of these three products is not necessary, nor it is the norm.

On the other hand however, TP have been found to be optimistically biased, erroneous and analysts are not able to systematically provide accurate TP (Asquith, Mikhail, & Au, 2005; Bonini, Zanetti, Bianchini, & Salvi, 2010; Bradshaw, Brown, & Huang, 2013). In addition, anecdotal evidence suggests that TP are largely ignored by investors and that analysts do not put as much effort they do with other outputs. For example, a 2019 Barron's article states that "many professional money managers say they're skeptical that it's anything more than a marketing tool for the brokerage industry to generate interest in a stock".[5] This is also indirectly evident by the fact that the academic literature is overwhelmingly dominated by EF followed by recommendations whereas TP received comparatively very little attention (Bradshaw M. T., 2011). An another indirect evidence, indicating that TP may be generally ignored is the survey paper by Brown, Call, Clement, and Sharp, (2015). The survey revolves solely around EF and stock recommendations without any referral to TP. From this survey it seems that TP do not play a key role in analysts everyday activities, nor are analysts judged based on their TP forecasting abilities. This indirect evidence could indicate that

[3] Bloomberg, 2002 article https://www.bloomberg.com/news/articles/2002-04-24/when-a-stocks-rating-and-target-collide

[4] In fact, even though earnings forecasts received great attention by academics and analysts' career prospects are partly linked to their earnings forecasting abilities, it was still an open question if they add value to recommendations which is the motivation for the Kecskés, et al., 2017 study. Furthermore, the study by (Ho, Brownen-Trinh, & Xu, 2021) is motivated by the mixed results in the literature and the questionable target price informativeness. The authors re-examine target price information content in a more specific context, that is, of mergers and acquisitions.

[5] https://www.barrons.com/articles/wall-street-analyst-stock-price-targets-51561597085

perhaps target prices are to a large extend neglected by these professionals or at least not as meticulously thought as EF and recommendations.

Our study is the first comprehensive study that we are aware of that simultaneously compares and contrasts recommendations' informativeness depending on whether are accompanied by both analyst forecasts, EF or TP. In our analyses we identify four types or recommendations based on their supportive forecasts: Standalone recommendations, recommendations with earnings forecasts only (EF-Recs), recommendations with target prices only (TP-recs) and recommendations with both estimates namely full-fledged (FF-recs). We find that TP and EF add value to recommendation revisions. We document larger market reactions (returns, return volatility, trading volume) when revisions are backed by either estimate compared to standalone revisions. In addition, we also document that the strongest market reactions are when revisions are backed by both estimates

We find that these continuous estimates, target prices and earnings forecasts, add value to recommendation revisions. We document stronger abnormal returns, abnormal return volatility and abnormal trading volume reactions when recommendation changes are supported by these estimates compared to standalone recommendations. Specifically, we document that the most (least) informative recommendation revision category is the full-fledged (standalone) revisions. We also show that initial returns are largely affected by the direction of the revised estimate. Finally, the market reacts more strongly for TP-recs than EF-recs. When it comes to post-recommendation drift our results suggest that this is short lived for downgrades. There is some post-recommendation drift in two cases, EF-Recs upgades and FF-recs upgrades. The latter is found to be statistically larger.

Examining quality properties of earnings forecasts and target prices that accompany recommendation changes we find, as expected, that earnings forecasts are less optimistically biased and more accurate when they are part of FF-recs than EF-recs. Suprisingly, the opposite is true for TP. Target prices when issued in support of FF-recs, although not more biased they are less accurate compared to target prices that are part of TP-recs.

Our study makes several contributions to three streams of sell-side analysts' literature. The first is about what types of recommendations, and reports in general, are more valuable to investors. Prior studies consider factors such as firm characteristics, analysts' characteristics and expertise among others (Jegadeesh, Kim, Krische, & Lee, 2004; Frankel, Kothari, & Weber, 2006; Boni & Womack, 2006; Loh & Stulz, 2011). Our paper is mostly

related to the (Kecskés, Michaely, & Womack, 2017) paper who examine "earnings based" versus "non-earnings based" recommendations. We extend and complement their study by examining the interplay of another key analyst estimate, target prices, in combination with recommendations and earnings forecasts.

Second, our paper adds to the literature that examines the interplay between the three key analyst outputs: recommendations, target prices and earnings forecasts and directly answers the call by Bradshaw (2011) for such kind of research. Whereas other prior studies that examined the information content of recommendations along with EF and TP did not focus on the differential usefulness of different types of recommendations. Instead they focused on examining if the other products contain material information in explaining returns which led them to use only one type or recommendation, e.g. only full-fledged (Stickel, 1995; Francis & Soffer, 1997; Brav & Lehavy, 2003; Asquith, Mikhail, & Au, 2005). Our paper instead, compares and contrasts recommendations' informativeness based on the information that accompanies them.

Finally, our paper adds to the stream of literature that is concerned with the impact on research reports of analyst decisions to selectively report, or censor, their estimates. Bradshaw, (2002) findings suggest that analysts may withhold target prices when they are not justifying the reported recommendations. In addition, Berger, Ham, and Kaplan, (2019) show that analysts may withhold earnings forecasts, to allow the firm to beat the upcoming earnings, but report their optimism through target prices. Although we do not examine reasons for not disclosing TP or EF, and thus we do not make any attempt to penetrate analysts "black box", we document that the market seems to see through this decision process and exhibits higher reliance on full-fledged reports.

Together our results are of special interest to investors, practitioners and other market participants as they pinpoint which recommendation revisions contain the most material information. Our results suggest that a recommendation revision is more valuable when it is supported by both key estimates: target prices and earnings forecasts. There recommendations seem to exhibit the highest post recommendation drift and are accompanied, in general, by more accurate recommendations.

2. Literature Review

Analyst recommendations are considered the ultimate judgment product of sell-side research, the culmination of processing various pieces of information about a particular firm (Schipper, 1991). Their valuations are understood to communicate the underlying firm fundamentals (Stickel, 1995; Womack, 1996)[6]. Typically, analysts' valuation process begins with forecasting earnings. Earnings estimates are in fact the necessary ingredient of all valuation models. The earnings estimate is then used to produce the target price estimate. TP usually occur as a price multiple of earnings (Bradshaw M. T., 2002; Asquith, Mikhail, & Au, 2005). After arriving at the target price the final product is a recommendation which indicates if the stock is mispriced. A discussion and graphical representation of this process is provided in (Bradshaw M. T., 2009).

From all types of recommendations, recommendation revisions are considered by the literature to convey the most material information that moves significantly the market (Francis & Soffer, 1997; Jegadeesh, Kim, Krische, & Lee, 2004; Bradley, Clarke, Lee, & Ornthanalai, 2014). Generally, the common understanding is that a change in a stock recommendation is triggered by changes in the underlying fundamentals e.g. earnings or other factors that would most likely affect TP (e.g. discount rates). Thus, one would expect to observe recommendation revisions to be motivated by at least one of the quantitative estimates. In reality however, this is not the case. Recommendation revisions may or may not be motivated with revisions of these estimates. As a result conclusions about a stock's future potential are more complicated than a simple recommendation and could be communicated differently through various channels such as EF and TP.

Some previous studies were concerned about how analyst forecast estimates and recommendations are linked and what information is conveyed to investors in an effort to break into analysts' "black-box" i.e. how analysts perform their analysis, if and how they use their estimates etc.[7] Analysts seem to incorporate their own earnings forecasts into heuristic valuations (e.g. PEG model) to generate TPs and recommendations (Bradshaw M. T., 2002; Bradshaw M. T., 2004; Asquith, Mikhail, & Au, 2005). Since the information of the three analyst products could overlap some studies have examined whether there is distinct information of these outputs in the presence of each other. These studies seem to agree that both EF and TP possess distinct information over and above recommendations that is also not

[6] See also Ramnath et al. (2008) and Bradshaw (2011)
[7] See also Bradshaw (2011) for a relevant discussion

subsumed by each other (Francis & Soffer, 1997; Brav & Lehavy, 2003; Asquith, Mikhail, & Au, 2005). Extending this line of research (Iselin, Park, & Van Buskirk, 2021) examine the conflicting analyst revisions in the three outputs and conclude that because these outputs are distinct products and as such they do not have to always commove. In our case, this could mean that they ought not to be co-revised either.

Another group of studies is considering simultaneously recommendations with one of EF or TP in an effort to generate more profitable strategies based on two signals. This research is exploiting the simultaneous information stemming from two signals, the recommendation and one of the quantitative estimates, to identify which recommendations offer better future prospects. For example, Loh and Mian (2006) examine the usefulness of EF and show that recommendations from analysts who issue more accurate EF are more profitable. With regards to target prices Brav and Lehavy (2003) show that TP revisions convey information about future returns beyond recommendations and Huang, Mian, and Sankaraguruswamy (2009) show that investment strategies based on changes of both consensus recommendations and target prices earn higher abnormal returns compared to those based on only one of these outputs. The above studies demonstrate the value of combining information from multiple signals from analysts. However, because they test recommendations with one of the estimates their results may be–perhaps partially–assigned to information conveyed in the forecast omitted from the analysis.

The early studies of Brav and Lehavy (2003) and Asquith et al. (2005) did not measure the differential effect in case the two key analyst estimates are not visible to support recommendations. The fact that earnings forecasts and target prices contain distinct information not subsumed by recommendations doesn't automatically mean that when disclosed, recommendations become more useful to investors. The study by Kecskés et al. (2017) is motivated to provide answer to this question, however only for EF. Authors distinguish recommendation changes that are accompanied by earnings forecast revisions, namely "earnings based" from those that are not accompanied by earnings forecast revisions, namely "non-earnings" based. They document a differential initial price reaction between the two groups for both recommendation upgrades ($+3.64\%$ versus $+2.21\%$) and downgrades (-5.06% versus -1.77%). They also document a geater postrecommendation drift for the "earnings based" recommendations. Collectively they attribute their findings that the "earnings based" recommendation revisions are more informative because they "contain

harder, more verifiable information" and thus are "less affected by analysts' cognitive and incentive biases".

Our study simultaneously considers all three key outputs and compares and contrasts the value of recommendation revisions conditional on whether they are backed by both estimates. Although Kecskés et al. (2017) document that recommendations revisions are more useful to investors when issued with EF they do not control for the presence of target prices. There are three possibilities. One, their results could remain unaffected when controlling for TP. In other words TP do not provide additional value to recommendation revisions. Two, their results could be entirely driven by the presence of TP. In other words, TP and not EF are adding value to recommendation revisions. Three, both TP and EF add differential value to recommendation revisions. All possibilities are plausible based on the mixed results provided by literature–as is explained below–with the least plausible being the second one.

Could TP add value to recommendation revisions? Academic literature as well as the financial press offer mixed views with regards to the usefulness of TP. On the one hand, anecdotal evidence suggest that analysts do not devote as much effort estimating TP as they do with EF and therefore investors have difficulty believing TP and largely ignore them.[8] This view is also indirectly evident in the academic literature since TP have received nowhere close the attention that EF and recommendations have. Additional, indirect evidence that TP do not receive any attention is the survey paper by Brown, Call, Clement, and Sharp (2015). Analysts were asked about their earnings forecasts and recommendation activities and nothing about target prices. Analysts' responses in this survey suggest that the performance of analysts seems to be somewhat judged based on their EF accuracy and nothing is inferred with regards to TP accuracy. Perhaps the fact that analysts are not judged based on their TP estimates could explain the well-documented fact that TP are erroneous, noisy, optimistically biased but also the fact there are no analysts that systematically provide more accurate target prices (Asquith, Mikhail, & Au, 2005; Bradshaw, Brown, & Huang, 2013; Bradshaw, Huang, & Tan, 2019).

[8] Except the Barron's 2019 article mentioned earlier see also an article by *The Globe and Mail* in 2012, and another in *Real Money* in 2021
https://www.theglobeandmail.com/globe-investor/investor-education/what-every-investor-should-know-about-analysts-price-targets/article627565/
https://realmoney.thestreet.com/investing/price-targets-how-they-mislead-and-how-they-can-be-used-15546017

On the other hand however, some early studies have shown that TP contain distinct material information not subsumed by recommendations or earnings forecasts (Brav & Lehavy, 2003; Asquith, Mikhail, & Au, 2005). The same conclusion was reached also by some more recent studies that examined all three outputs in different settings (Ho, Brownen-Trinh, & Xu, 2021; Iselin, Park, & Van Buskirk, 2021). The mixed results in the literature were actually the motivation for the recent study of Iselin et al., (2021). This mixed view of TP is also evident in the financial press. For example, an article in Investopedia in 2020 suggests that for evaluation purposes TP can be more useful than recommendations.[9]

Furthermore, target prices seem to have a somewhat important role for a lot of brokerage houses. A lot of them define their recommendation based on a target price estimate, especially if the recommendation is a favorable one.[10] For example, Bank of America Merrill Lynch assigns a "Buy" recommendation to "stocks that are expected to have a total return of at least 10%". Similarly Citi designates a "Buy" recommendation for stocks with "expected total return of 15% or more or 25% or more for High risk stocks". Citi also adds that "for stocks rated Neutral… [the analyst] may elect with the approval of Citi Research management not to assign a target price". Finally, Goldman Sachs in addition to its regular ratings a stock could also be assigned in the "Current Investment List". For this designation only Goldman Sachs "requires a 12-month price target".[11] If brokers themselves require a TP to support a favorable recommendation−which are considered to be the ones mostly affected by conflicts of interest−then it is reasonable to assume that either brokerage firms believe that target prices add credibility to favorable recommendations or there exists demand by investors to provide such estimates in support of recommendations. Whatever the case, it is clear from this discussion, that TP could enhance the value and usefulness of a stock recommendation.

Finally, the basic argument of Kecskés et al. (2017) that earnings forecasts are "harder and verifiable" information applies for TP as well. TP are a continuous measure, it is visible to investors and thus TP accuracy as well. In fact since the SRO Rules of 2002 there is more information surrounding TP rather than EF. Specifically, analysts are required to disclose on every report (i) a graph depicting historical stock prices and target prices, (ii) the valuation

[9] https://www.investopedia.com/investing/target-prices-and-sound-investing/

[10] Brokerage houses are required to disclose their recommendation definitions on analyst reports after the implementation of the SRO Rules in 2002; see Kadan et al. (2009)

[11] Another example: Zacks Investment Research suggests that "investors should use price targets and recommendations from analysts as one of several data points", https://finance.zacks.com/relationship-between-value-companys-stock-its-stock-price-5164.html

method used to derermining the TP and (iii) risk factors that could impede the achievement of the TP. In other words, on every report an investor can see the track record of the analyst's TP estimates as well as information to assess the credibility of the reported TP. None of thes information are available for EF. The fact that regulators made specific provisions regarding TP estimates is another indication of the importance of TP in investors' portfolio building decisions.

From the above discussion it seems possible that both target prices as well as earnings forecasts add distinct and incremental value to recommendation revisions. In fact, theoretically speaking, TP by definition should add more value to recommendation revisions as they enclose more information compared to EF. In practice however, it could be a different story. To explore this possibility we classify recommendations into four categories based on their supportive estimates: standalone recommendations, recommendations with EF only (EF-recs), recommendations with TP only (TP-recs), and full-fledged recommendations (FF-recs). What we are particularly interested in examining is the differential usefulness of recommendation revisions between these four groups and which estimate, if any, do investors find more useful in support of recommendation revisions. We measure the differential usefulness by measuring initial market reactions (returns, abnormal return volatility and abnormal volume) as well as the post-recommendation drift up to a month after the recommendation revision announcement.

Why analyst may choose not to report some of their estimates? Prior literature suggests that the complexity of the environment analysts work in as well as the various conflicts of interest (either within the institution they work for or external such as maintaining amicable relations with a firm's management) may lead them to censor some of their estimates. For example, Bradshaw (2002) examines 103 analysts' reports to document differences between stock recommendations with and without target prices. His evidence suggest that when analysts choose not to disclose target prices they do so when either the target price would not support the recommendation or when they more uncertain about the underlying EF. Furthermore, the findings of Berger, Ham and Kaplan (2019) suggest that analysts selectively update forecasts to convey information about earnings without revisiting their current quarter earnings forecasts. One of those forecasts are also target prices. They document several reasons that analysts choose to do. One of them is to issue earnings forecasts that managers will meet or beat in order to maintain their access to firm's management. The takeaway from these studies is that analysts could use their forecast outputs

as partial substitutes for one another and that the published report reflects their disclosure choices and is the lower bound of the information processed by analysts (Schipper, 1991).

Of course there are a number of other simpler reasons that could lead analysts to withhold their TP or EF estimates. For example, there may be uncertainty about future earnings or valuation of the firm is challenging and the revision is based mostly on guesswork; or there are changes only in discount rates, leading to the revision of only the TP (see Kecskés, et al., 2017). Another reason could be "half-hearted" coverage i.e. the analyst although is following the particular stock, she is not really paying much attention to compute all estimates before providing the recommendation revision. Prior literature sheds some light on this scope by indicating that analysts' limited attenton, career concerns, limited time and resources induces them to not treat all firms in their coverage equally (Harford, Jiang, Wang, & Xie, 2019; Driskill, Kirk, & Tucker, 2020).

It is not the scope of this study to directly test any of the aforementioned analyst motivation for not including all estimates. However, it can be inferred from the discussion above that irrespective of whether it is difficulty of valuation or limited attention or strategically estimates are omitted the outcome should be a negative impact on the quality of analyst products. In other words, regardless of the underlying reason censoring estimates are likely to be reflected in lower quality of analyst products. Of course there is also the possibility that analysts do not selectively suppress any information. In such case we should not be able to detect any impact on the quality of their estimates.

One qualitative characteristic could be the long term profitability of the recommendation revisions. Although, we do provide such evidence by looking at one month ahead abnormal returns, examining the profitability of these revisions for long term windows possesses several challenges. Firstly, it is not clear whether the post recommendation drift should be associated with higher or lower information content of recommendations (Kecskés, Michaely, & Womack, 2017). If the information that the recommendation report conveys is not well supported then the market should exhibit incomplete initial reaction which would lead to larger post-recommendation drift. If this is the case then the drift should be the largest for standalone recommendation revisions and the smallest for full-fledged revision. On the other hand, it has been well documented that the market underreacts to firm informational releases. Perhaps the most highlighted example that has drawn a vast attention by academics is the earnings announcements and the post-earnings announcement drift which was firstly

documented by (Ball & Brown, 1968). Secondly, assessing the long-run profitability of recommendation revisions could be dubious without knowing broker definitions for each recommendation as indicated by (Kadan, Madureira, Wang, & Zach, 2020).

Therefore, to formally examine the conjecture that withholding estimates may be an indication of lower quality of the publicly disclosed estimates we test two qualitative characteristics of earnings forecasts and target prices, namely, bias and error.[12] Specifically we compare bias and error of earnings forecasts (target prices) when they accompany a recommendation, versus, earnings forecasts (target prices) when they are issued in a full-fledged reports. On the one hand, if analysts strategically suppress their estimates then we expect this to be manifested in more optimistic bias in their estimates. On the other hand, if analysts do not reveal their estimates due to difficulties in calculating them–e.g. high uncertainty or half-hearted coverage–then we expect to observe less accurate forecasts, that is, higher error. Finally, if analysts reveal all their estimates and do not withhold any information then we expect to see no difference in bias and error of these estimates.

3. Research Design

3.1 Information Content Metrics – Dependent Variables

We investigate differences in the informativeness of analyst recommendation revisions by investigating differences in investors' reactions to their announcement. For this purpose we employ daily buy-and-hold returns for a number of event windows spanning from trading day –1 to +21. We go up to 21 trading days after the announcement to measure the post-recommendation drift and its association to recommendation types. Day 0 is the event day, which is the announcement of an analysts' report and is defined as follows: If the announcement time of the report was after the close of the U.S. stock market i.e. after 4pm we consider the event to occur the following day. If the report is announced before 4pm we consider the event to be the same as the announcement date. We use two types or returns to measure the informativeness of recommendation revisions. We employ risk-adjusted (abnormal) returns (*BHAR)* based on the Fama and French (1993) three-factor model augmented with a momentum factor (Carhart, 1997). We will refer to this model as the Fama French four factor model (FF4). The estimation window for calculating the FF4 abnormal

[12] In fact, the study by (Iselin, Park, & Van Buskirk, 2021) is undertaking a similar approach for the same reasons that we point out.

returns is using 60 monthly returns in the period $[-60,-1]$, with month zero being the event month.[13]

Moreover for our short term analysis we use another two proxies for information content namely abnormal trading volume and abnormal return volatility that were first developed by (Beaver, 1968). Our metrics follow the Landsman, Maydew, and Thornock (2012) version. The event period is the three trading days surrounding the event $[-1,+1]$. Following Landsman and Maydew, (2002) the estimation period is $[-255,-10]$ and $[+10,+255]$ (trading days). Abnormal volume, $AVOL$ and cumulative abnormal volume, $CAVOL$ are defined as:

$$AVOL_{it} = V_{it}/\bar{V}_i, \quad CAVOL_{it} = ln(\overline{AVOL}_{it})$$

where, V_{it} is the number of shares of firm i traded during day t, divided by the shares outstanding of firm i during day t; $\bar{V}_i$ is the mean daily trading volume for firm i calculated in the estimation window and $\overline{AVOL}_{it}$ is the average $AVOL_{it}$ during the event-period. Similarly, the definitions of (cumulative) abnormal return volatility $AVAL(CAVAL)$ are:

$$AVAL_{it} = AR_{it}^2/\sigma_i^2, \quad CAVAL_{it} = ln(\overline{AVAL}_{it})$$

where, AR_{it} is the FF4 model abnormal return, and σ_i^2 is the variance of FF4 residuals of firm i calculated in the estimation window. Finally, $\overline{AVAL}_{it}$ is the average $AVAL_{it}$ during the event-period.

Adding these two metrics in our analysis is important for two reasons. First, we confirm the findings of prior literature about conflicting signals in analysts' reports e.g. recommendation and TP upgrade but with an EF downgrade (see Section 4 for more details) (e.g. Kecskés, et al., 2017). Because this conflicting information, in general, seems to be reliable (Iselin, Park, & Van Buskirk, 2021) but it is difficult and not obvious to a priori classify a revision as favorable or unfavorable–which in turn we would expect to induce positive or negative returns respectively–when it is supported by a conflicting estimate. Thus, the above metrics facilitate us to assess the informativeness without regard of the price direction. Second, Beaver (1968) observes that price changes reflect the average change in investors' beliefs whereas trading volume reflects idiosyncratic changes in investors' beliefs. An analyst report could have not affected the stock price but, may have led investors to trade

[13] If 60 months of returns are not available we require at least 45 months of returns to estimate the FF4 model.

in response to the information conveyed in the report. In this case the research report may have induced differential volume and price reactions (Beaver, 1968; Bamber & Cheon, 1995; Loh & Stulz, 2011).

3.3 Measures of Accuracy and Bias – Dependent Variables

To examine if there are qualitative differences among various recommendations types we focus on two characteristics of the recommendation supportive estimates, namely, bias and accuracy of TP and EF.

We measure the EF bias as the difference between the forecast and the actual earnings reported on IBES. We deflate by the actual earnings. The EF error is simply the absolute value of the EF bias:

$$EF\_Bias = \frac{EF - Actual\ Earnings}{Actual\ Earnings} \quad \text{and} \quad EF\_Error = |EF\_Bias|$$

Higher values of EF bias indicate that the analyst was optimistic when issuing the earnings forecasts whereas higher values of the EF error reflect less accurate forecasts.

In a similar manner we define TP bias and error the difference between the target price and the stock price 6 and 12 months ahead of the release of the TP, deflated by the stock price one day before the TP announcement:

$$TP\_Bias = \frac{TP_t - Price_{t+6\ or\ 12-months}}{Price_{t-1}} \quad \text{and} \quad TP\_Error = |TP\_Bias|$$

The choice of the 12-month ahead stock price is the obvious one since officially TP are issued with a 12-month horizon[14]. However, based on our sample the mean (median) target price revision horizon is 91 (77) days. Thus, following (Bradshaw, Huang, & Tan, 2019) we choose also the 6-month horizon for our tests and present results for both cases. Larger values of TP bias (error) indicate greater optimistic (error) in the forecasted estimate.

3.3 Independent and Control Variables

The first set of independent variables consists of indicator variables to control for recommendation types. As all recommendations are classified into one of four categories depending on the supportive information we use four indicator variables: STANDALONE for standalone recommendations, REC_ EF for recommendations with earnings forecasts only,

[14] We drop the few observations in IBES that are for different horizons, see Sample and Data section

REC_TP for recommendations with target prices only and REC_TP_EF for full-fledged recommendations (with both estimates). Within those groups we separate recommendations even further based on if the supportive information is upgrade or downgrade. For example $REC\_TP_{up}\_EF_{dn}$ is an indicator variable of a full-fledged recommendation that is accompanied with a TP upgrade and an EF downgrade. As such we have nine groups for recommendation upgrades and another nine for recommendation downgrades.

Target price estimates except being revised upwards or downwards, they could convey material information to investors based on whether the TP is above or below the current stock price. In other words, analyst's expectations about a stock could be communicated through the TP level and not the TP revision. We examine this possibility as well by including indicator variables that capture target price levels. So similarly to before the indicator variable $REC\_TP_{above}\_EF_{dn}$ is an indicator variable of a full-fledged recommendation that is accompanied with a TP that is above the current stock price and an EF downgrade. Classifying recommendation changes based on TP levels and EF revisions yields again nine categories for each recommendation revision category.

The second set of independent variables consists again of indicator variables that capture concurrent firm specific news. As concurrent news we consider the events that occur in the three trading day window $[-1, +1]$. We employ three indicator variables that equal 1 if there is a quarterly earnings announcement; more than one recommendation change; other firm-specific news documented in RavenPack.

We also control for a number of factors that prior research has shown to be related to returns as these may relate to the differential reactions to analyst recommendations, i.e. firm characteristics and the firm's information environment. With regards to firm characteristics we include standard control variables i.e. market capitalization (*log_markcap*), book-to-market (*log_booktmark*), firm momentum (*firm_momentum*), stock return volatility (*firm_volatility*), return on assets (*ROA*) and firm leverage (*leverage*). Control variables that capture the firm's information environment are analyst following (*log_analyst_follow*) and institutional ownership (*instown_perc*).

We also control for and broker/analyst characteristics as these play a role in how informative is a recommendation revision. We thus include broker size (*log_brokersize*) and analyst firm-specific experience (*log_analyst_firm_experience*) in our models (Mikhail, Walther, & Willis, 1997; Mikhail, Walther, & Willis, 2007).

Finally, since our period is relatively long and market conditions may affect analyst activities we include in the model controls for market effects captured by prior market performance (*mkt_momentum*) and market volatility (*mkt_volatility*) (Kadan, Madureira, Wang, & Zach, 2009; Bradshaw, Brown, & Huang, 2013). We also include an indicator variable (*crisis*) that takes the value of 1 if the recommendations announcement date falls within the financial crisis i.e. from December 2007 to June 2009.[15] All variables sources and definitions are presented in detail in Appendix 1.

3.4 Empirical Models

3.4.1 Differential Informativeness of recommendation revisions conditional on the concurrent release of target prices and earnings forecasts?

To examine the differential usefulness among the nine groups we run the following model:

$$BHAR = \alpha_0 + \alpha_1 REC\_TP_{up} + \alpha_2 REC\_TP_{dn} + \beta_1 REC\_EF_{up} + \beta_2 REC\_EF_{dn}$$
$$+ \gamma_1 REC\_TP_{up}\_EF_{up} + \gamma_2 REC\_TP_{up}\_EF_{dn} + \gamma_3 REC\_TP_{dn}\_EF_{up} + \gamma_4 REC\_TP_{dn}\_EF_{dn}$$
$$+ \delta_i Controls + Year\_FE + Broker\_FE \quad (1)$$

The model is run separately for recommendation upgrades and downgrades. The variables of interest are the nine indicator variables that represent the direction of the estimate, if any, that was concurrent with the recommendation revision. The above model is run both with and without year and broker fixed effects. When the fixed effects are omitted the constant term represents the average return of the base category i.e. the standalone revisions. The coefficients on the other indicator variables indicate if the other categories exhibit differential information content from the standalone revisions. The control variables are the ones described in section 3.3.

As said earlier in the text target price estimates could convey material information to investors based on TP levels. To examine this possibility as well we run a similar to the above model but substitute the indicator variables to be based on whether the TP is above or below the current stock price,

$$BHAR = \alpha_0 + \alpha_1 REC\_TP_{above} + \alpha_2 REC\_TP_{below} + \beta_1 REC\_EF_{up} + \beta_2 REC\_EF_{dn}$$

[15] National Bureau of Economic Research (NBER) https://www.nber.org/cycles.html

$$+\gamma_1 REC\_TP_{above\_}EF_{up} + \gamma_2 REC\_TP_{above\_}EF_{dn}$$

$$+\gamma_3 REC\_TP_{below\_}EF_{up} + \gamma_4 REC\_TP_{below\_}EF_{dn}$$

$$+\delta_i Controls + Year\_FE + Broker\_FE \quad (2)$$

Model (2) is run both with and without fixed effects and the interpretations of the coefficients of the indicator variables are analogous to model (1).

Finally, to mitigate the effects of heteroscedasticity and serial correlation we run all models by clustering errors by brokerage, quarter-year and firm. Also, to reduce the influence of extreme values we winsorize all continuous variables at the 1% and 99% levels.

3.4.2 Which estimate adds more value to recommendation revisions; target prices or earnings forecasts?

To investigate whether recommendation revisions are more valuable to investors depending on the supporting forecast we employ our non-signed metrics i.e. abnormal volatility and volume. Because we are now not interested in directional movements of TP or EF we retain only indicator variables representing the presence of these signals. We run the following model:

$$CAVAL\ or\ CAVOL = \alpha_0 + \alpha_1 REC\_TP + \beta_1 REC\_EF + \gamma_1 REC\_TP\_EF$$

$$+\delta_i Controls + Year\_FE + Broker\_FE \quad (3)$$

Again the model is run separately for recommendation upgrades and downgrades. The model is run with and without fixed effects. In the latter case the constant term represents the market reaction, volatility or volume, to the base case i.e. standalone revision. The coefficients of the other three indicator variables are the main interest here as they will denote if there is differential reaction to the revisions supported by target prices or earnings forecasts.

Again, we run all models by clustering errors by brokerage, quarter-year and firm and winsorize continuous variables at the 1% and 99% levels.

3.4.3 Does the omission of an estimate indicate lower quality of the reported estimate?

As explained earlier it is likely that withholding one estimate could reveal lower quality of the estimate that is reported. The qualitative characteristics that we explore are the bias and accuracy of earnings forecasts and target prices.

To examine the EF bias and error we keep the two categories of recommendation revisions that are supported with an EF estimate i.e. recommendations with EF only and full-fledged recommendations. To run our regression model we choose the base case to be the former. The regression model in this case is the following:

$$EF\_BIAS \text{ or } EF\_ERROR = \alpha_0 + \gamma_1 Full\_Fledged + Log\_EF\_horizon + \delta_i Controls + Year\_FE + Broker\_FE \quad (4)$$

Since the horizon of the earnings forecasts is strongly and negatively associated with their accuracy we include in the regression model the variable *Log_EF_horizon* which is defined as the natural logarithm of number of days between the estimate and the actual earnings announcement date (Richardson, Teoh, & Wysocki, 2004). If EF that are supporting full-fledged recommendations are either less optimistically biased or more accurate than the EF on the base category then we expect the coefficient γ_1 to be negative i.e.

In order to investigate the TP bias and error we follow a similar procedure. Now, the default category is recommendation revisions supported by TP only and is compared again against the full-fledged revisions. The model in this case is:

$$TP\_Bias \text{ or } TP\_Error = \alpha_0 + \gamma_1 Full\_Fledged + \delta_i Controls + Year\_FE + Broker\_FE \quad (5)$$

If full-fledged recommendations are of better quality and thus the corresponding TP are less biased and more accurate than TP of the base category then again this should be reflected in a negative γ_1 coefficient.

4. Sample and Data

We collect analyst recommendations, target prices and earnings forecasts from IBES for the period January 1, 2004 to December 31, 2017. We begin our sample period in 2004 to avoid changes in the informativeness of analyst reports relating to the passage of Global

Settlement and related regulations (Kadan, Madureira, Wang, & Zach, 2009). For a broker to be included we require to have at least 50 recommendations within our period. We place this requirement to have enough data points when running our regressions and to avoid in our dataset possible small, non-visible brokerage firms. Also we keep only recommendation revisions i.e. upgrades and downgrades as these have been identified to contain valuable information by the literature. A recommendation is considered a revision when there is an outstanding prior recommendation within the last two years from the same broker. To examine whether the differential informativeness recommendation revisions conditional on whether they are supported by a target price or earnings forecast we identify if there are any of these estimates within one week of the recommendation (same firm and analyst), specifically in the window $[-5, +1]$ (trading days, 0 is the recommendation issuance date). We delete recommendations, target prices or earnings forecasts for which the analyst is unknown and there are conflicting recommendations within the event window $[0, +1]$ (Loh & Stulz, 2011; Kecskés, Michaely, & Womack, 2017). Also we require that when a recommendation is issued with a target price or earnings forecast these estimates should reflect an increase or decrease compared to the previous forecast (Kecskés, et al., 2017). The revision in the earnings forecast is the difference of the current annual forecast–that accompanies the recommendation revision–to the previously available annual earnings forecast issued by the same analyst for the same firm. For our analysis we keep the revision with the shortest forecast horizon (IBES FPI code 1 or 2).

Market data for U.S. public companies were retrieved from the Center for Research and Security Prices (CRSP). Following Kecskés, et al., 2017 we keep only firms with CRSP share coded 10 or 11. Institutional ownership data was retrieved from Thomson Reuters (13F) Institutional Holdings. Accounting data was obtained from COMPUSTAT North America.

The final sample consists of 90,946 recommendation revisions; 42,090 upgrades and 48,856 downgrades. Table 1, Panel A displays our sample distribution. For both upgrades and downgrades, full-fledged recommendations are what analyst issue more often. However, this figure is higher for upgrades compared to downgrades i.e. 46% vs 37%. As said earlier this could be an artifact of some broker policies to support their favorable recommendations with a target price estimate. The second most common category is recommendations with only earnings forecasts–about one fourth of the upgrades and about one third for downgrades–whereas the least common category is when recommendations issued with target prices only. The descriptive statistics of Table 1 provide a first indication that the most common

recommendation revision group is the full-fledged one, as one would expect as explained earlier. Finally, whereas in Kecskés, et al., (2017) sample recommendation revisions that were supported by EFs was about 50% of both upgrades and downgrades, in our sample this figure is higher, about 70% for both.

Table 1, Panel B shows the distribution of recommendation changes conditional to changes in the other two estimates. Although, a lot of times changes in target prices and earnings forecasts are in the same direction as the corresponding recommendation change we observe that all possibilities may occur. However, there are two notable observations. Whereas for recommendation upgrades with target prices are more likely to be accompanied by a target prices as well this is not the case for recommendation downgrades with target prices. It seems that recommendations with target prices are about equally likely to be supported by either TP upgrade or TP downgrade. Also for recommendation downgrades with earnings forecasts it is more likely to be accompanied by an earnings forecast downgrade this is not the case when the recommendation is upgrade.

In Table 1, Panel C we classify recommendation revisions not based on the change of target price but based on whether the target price was above or below the stock price one day before the issuance of the target price. We see that this classification has some differences with the one in Panel B. Especially in the cases where the TP revision is not in line with the recommendation revision we observe the most changes.

We also inspected the analyst behavior regarding recommendation revisions throughout our sample period and if and how this evolved. Figure 1 provides some pictorial evidence. Panel A (Panel B) displays the proportions of recommendation upgrades (downgrades) that fall in each of the four categories thought the years. It is apparent that the proportion of full-fledged revisions is increasing for both recommendation upgrades and downgrades. This indicates that there is a trend that analysts tend to disclose both TP and EF in the recent years more than they did before. In addition, we see that the proportions of standalone revisions and revisions supported with only EF are declining with time. Finally, the proportion of revisions supported with only TP seems to be stable over the years.

The pictorial evidence of Figure 1 provide the first support to the view that there is demand for more information in support of recommendation revisions and thus analysts increasingly tend to support their recommendation changes with target price and earnings forecasts estimates.

5. Empirical Results

5.1 Stock Returns Conditional on Recommendation Revisions and Revisions in Target Prices and Earnings Forecasts

Our first test whether recommendation changes display differential reactions conditional on whether they are supported with target prices and/or earnings forecast we compute the buy and hold returns for a number of windows beginning on the day of the recommendation issuance and up to 21 trading days. We compute mean returns for each recommendation category and results are shown in Figure 2. We do know from Kecskés, et al., (2017) that revisions based on EFs instigate higher returns. What we are particularly interested here is to obtain some first evidence whether adding TPs in the mix and split recommendation revisions into four groups reveals if these four groups exhibit differential information content or this split is redundant. The pictorial evidence on Figure 2, Panel A indicates that when recommendation revisions are full-fledged the initial market reactions are the strongest whereas standalone revisions exhibit the weakest reactions. In addition, for recommendation upgrades that are issued with one estimate only we find no differential reaction whether the upgrade is TP based or EF based. However, if the revision is a downgrade we find that the initial reaction is stronger if it is backed by an EF instead of a TP.

Because there is the possibility that the market reacts also to the level of the target price, instead of the target price we reclassify recommendations into categories based on whether the issued TP is above or below the current stock price (we compare the TP with the stock price one trading day prior its issuance). We compare recommendation revisions based on TP revision versus TP levels as it is shown on Figure 2, Panel B. We observe that in the case of recommendation upgrades there are no differences between the two classifications. Returns are identical for the whole event window. However, when the recommendation is a downgrade we see that the market reacts stronger when the TP is below the current stock price rather than when the current TP is below the prior TP estimate. This means that partitioning the sample based on TP revision or TP level may convey different results about the information content of the recommendation revision groups that are accompanied by TP. Therefore, to explore our research question in addition to market returns we need to include measures that disregard the directional movements of the estimates and control only for their presence as explained earlier.

Overall, pictorial evidence in both panels of Figure 2 indicate that the stronger market reactions are observed when a recommendation revision is a full-fledged one. Furthermore there seems to be some post recommendation drift in the case of recommendation downgrades but not in the case or recommendation upgrades.

Next we turn to multivariate analysis to control for a number of factors that could explain market reactions. We run model (1) where we control for a number of firm characteristics, broker/analyst characteristics as well as confounding events. Results are shown on Table 2. In Panel A the regression is without fixed effects. As it can be observed from the constant term, that for standalone recommendation revisions (indicated by the constant) instigate short-term reactions and are followed by a post-recommendation drift in the direction of the recommendation revision i.e. positive returns for upgrades and negative returns downgrades.

For recommendation upgrades supported by TP or EF the initial market reaction, column (1), seems to be above the standalone upgrades when there is also upgrade in the supportive estimate. For example, when the recommendation upgrade is also supported by a TP (EF) upgrade there is an additional +1.08 (+0.80) percentage points return compared to standalone upgrades. The strongest market reaction however, is when both these estimates are upgrades. The incremental return is +1.63 percentage points and is also larger and statistically significant when compared to the +1.08 or the +0.80 when there is only a TP or an EF in support of the recommendation. We find no statistically significant difference between the initial reaction of recommendations upgrades when supported with TP upgrade versus when supported by an EF upgrade.

The post-recommendation drift, columns (2) and (3), seems to be larger than standalone recommendations only in two cases: full-fledged reports with upgrades of both TP and EF and recommendations with EF upgrade. However, our tests indicate that the drift in the two groups does not differ statistically.

For the case of recommendation downgrades we again observe that the initial reaction, column (4), is influenced by the direction of the supportive estimate. Similar to upgrades the strongest reaction is when the downgrade is supported by both TP and EF downgrades.

The drift for recommendation downgrades, columns (5) and (6), seems to be large for standalone downgrades e.g. -2.55 percentage points for the one month window. However, there seems to not be much difference in drift among various recommendation categories except the shorter window $[+2, +5]$. Again the drift is present in downgrades with EF and downgrades with both TP and EF when both estimates are in the same direction. Finally we observe two peculiar observations. One is that when both TP and EF are revised upward that is contrary to the downward, the market initially seems to react less negatively compared to standalone downgrades but during the window $[+2, +5]$ the negative reaction is larger compared to standalone downgrades. Two we observe that when all three estimates are revised downward there is a post recommendation drift up to the $+5$ trading day but going further in time, reaching the 21 trading days we see that the return is less negative compared to standalone downgrades. In both these cases it seems that the market initially overreacts to the two estimates and then there is a slight reversal.

To further examine the robustness of the above results we rerun the regression model (1) including year and broker fixed effects. Results are presented in Table 2, Panel B. Beginning from the initial market reactions on upgrades, column (1) we observe that initial reactions are in most cases differential compared to the base category which is the standalone recommendations. We observe a *positive* incremental reaction to standalone recommendation upgrades when the upgrade is supported by:

Case 1: an upward TP revision, $+0.94$ percentage points
Case 2: an upward EF revision, $+0.76$ percentage points,
Case 3: an upward EF revision with a negative TP revision, $+0.78$ percentage points and
Case 4: both upward ET and TP revisions, $+1.53$ percentage points.

Our tests indicate that the coefficient of case 4 when both estimates are revised upward $(+1.53)$ is statistically larger than both coefficients of cases of 1 and 2 where only one estimate is revised upward. The market reaction when there is only a TP upgrade $(+0.94)$ is statistically not different from when there is only an EF upgrade$(+0.76)$. Finally, we observe a negative differential reaction compared to the base category in two cases, when EF or both estimates are revised downward.

For subsequent market reactions, columns (2) and (3), we see that the (positive) post recommendation drift is consistently present in only two cases: recommendation upgrade

supported by an EF upgrade and recommendation upgrade supported by positive upgrades of both EF and TP. The latter case is statistically larger compared to the former only in the one month window $[+2, +21]$.

Turning now to the initial reactions to downgrades, column (4), we again observe differential reactions to recommendation downgrades consistent in most cases with the direction of the revision of the supporting estimate. We observe a *negative* incremental reaction to the standalone downgrade recommendations in the following cases:

Case 1: a downward TP revision, -1.37 percentage points
Case 2: a downward EF revision, -1.53 percentage points,
Case 3: an upward EF revision with a negative TP revision, -0.80 percentage points and
Case 4: both downward ET and TP revisions, -2.25 percentage points.

Our tests show again that the largest differential reaction is to full-fledged downgrades (-2.25) is statistically larger compared to when the revision is supported by only a downward revision of one estimate. Cases 1 and 2 do not exhibit statistically significant differential reactions. Finally, we observe incrementally positive reactions when the downgrade is supported by either a standalone estimate upgrade or both estimates revised upward.

Turning now to columns (5) and (6) we observe that for recommendation downgrades the post-recommendation drift is weaker compared to upgrades. We see that statistically significant returns are present only for the short post-event window $[+2, +5]$. Four cases exhibit (negative) post-recommendation drift: recommendation downgrades accompanied with an EF downgrade, full-fledged downgrades with upgrades of both estimates, full-fledged downgrades with downward revision of TP but upward revision of EF and full-fledged downgrades with concurrent downgrades of both estimates. Interestingly, for the case when the two estimates are moving upwards, although the recommendation is a downgrade we observe a reversal compared to the initial positive reaction. It seems that the market initially underreacts and then it corrects this underreaction

Overall, the results in Table 2 suggest the following: (i) initial reaction directions are highly driven by the directions of supported estimates that accompany the recommendation revision (ii) initial reactions are the largest when recommendations revisions are full-fledged (iii) post-recommendation drift is more evident for recommendation upgrades rather than

downgrades (iv) post-recommendation drift is larger for full-fledged upgrade recommendations.

5.2 Stock Returns Conditional on Recommendation Revisions, Revisions in Earnings Forecasts and Target Price Levels

As indicated earlier by the pictorial evidence of Figure 2 there is the possibility that the market values the information on TPs based on the target price level and not on target price revision. To formally test this we run model (2) where the indicator variables represent the recommendation categories based on target price levels and earnings forecast revisions. Results are shown on Table 3.

Considering first the immediate market reactions to recommendation upgrades, column (1) we observe again that the incremental direction of these reactions, based on the default category the standalone upgrades, are largely in line with the directional movements of the estimates that support them. We observe a *positive* incremental reaction to standalone recommendation upgrades when the upgrade is supported by:

Case 1: a TP above the current price, $+0.86$ percentage points

Case 2: an upward EF revision, $+0.74$ percentage points,

Case 3: an upward EF revision with a TP above the current stock price, $+1.51$ percentage points.

Again we find that the reaction in the full-fledged case 3 is statistically larger than cases 1 and 2 and there is no statistical difference between the last two cases. Finally, the results show that when the TP is below the current stock price, or when the EF revision is downward or when both the TP is below the current stock price and the EF revision is downward then the market reaction is below the base category.

In the post-event windows, columns (2) and (3), we again see that there are continuing positive returns above the base category in the two groups, recommendations with EF upgrades and full-fledged upgrades with TP estimate above current stock price and EF upgrade.

Turning our attention to recommendation downgrades and the initial market reactions, column (4), we again find evidence that the corresponding return is heavily influenced by the accompanied forecast. We distinguish the three cases that are easy to interpret:

Case 1: a TP below the current price, -1.99 percentage points

Case 2: a downward EF revision, -1.48 percentage points,

Case 3: a downward EF revision with a TP below the current stock price, -3.85 percentage points.

Our tests indicate that all these coefficients are not statistically equal. This suggests that the differential reaction of a recommendation downgrade is largest when is accompanied by both a TP below current stock price and an EF downward revision. Reactions to recommendation downgrades are stronger when accompanied by a TP level below current price levels compared to when they are accompanied by a downgrade in EF. Finally, we observe less negative reactions (positive coefficients) in two cases, when the accompanying EF revision is upward and when both EF revision is upward and TP is above current price levels.

When it comes to post-event returns, columns (5) and (6), we again observe that for downgrades there is only (negative) post-recommendation drift in the event window $[+2, +5]$. Similar to Table 2 the two cases where there is post-recommendation drift are recommendation downgrades accompanied by an EF downgrade and full-fledged downgrades accompanied by a downward EF revision and a TP below the current stock price level. However, we find here a negative post-recommendation drift also for the case where TP level is above current stock price but accompanied with a downgrade in EF. Finally, we observe again the reversal in the case of full-fledged downgrades but both signals indicate positive directions.

Overall, the results on Table 2 and Table 3 provide evidence that (i) market reacts to recommendation revisions are largely influenced by the favorable or unfavorable signals conveyed by the accompanying estimates (ii) the largest market reactions are observed when the revision is a full-fledged one with inline estimates (iii) the post-recommendation drift is more prevalent when the recommendation revision is an upgrade and less so for downgrades and (iv) target price levels and revisions seem to convey somewhat different signals to market participants.

5.3 Abnormal Volume and Volatility Conditional on Recommendation Revisions and Supportive Estimates

The pictorial evidence on Figure 2 and regression results on Table 2 and Table 3 indicate that returns are affected by the direction of the TP or EF revision and/or the TP level, that is, if above or below the current price. In addition, it seems that the full-fledged revision carry the most material information. However, from the above analysis since the various

analysts' signals can simultaneously move in opposite directions we cannot yet definitely conclude which recommendation revision category is more informative. In this section we provide more evidence towards answering this question, at least for the immediate market reactions. We thus, use information metrics, found in the literature, which measure the informativeness and are non-signed, namely abnormal return volatility and abnormal trading volume (Beaver, 1968).

Table 4, Panel A presents the results of regression model (3) without broker fixed effects. The first immediate observation is the positive and statistically significant coefficients of the indicator categories in all four columns. This means that when a recommendation revision is supported by any of the two estimates it instigates larger abnormal return volatility and abnormal volume reactions compared to the default category, the standalone revisions.

For comparison among the recommendation revision purposes we run model (3) including fixed effects and the results are shown on Table 4, Panel B. First, in the case of recommendation upgrades (column 1) our tests show that recommendations accompanied with EF instigate smaller return volatility reactions compared to recommendations with TP or full-fledged (*p*-values 0.0157 and 0.0002 respectively). The last two categories do not instigate statistically different reactions (*p*-value 0.1343). In the case, of abnormal volume (column 3) our tests show that full-fledged upgrades instigate the largest volume reactions (both *p*-values<0.001) whereas the other two categories do not exhibit statistically different reactions (*p*-value 0.8666).

Turning our attention to recommendation downgrades and abnormal volatility reactions (column 2) our tests show that the largest and statistically significant reactions are when the downgrade is a full-fledged one (both *p*-values<0.001). The other two categories do not differ statistically (*p*-value 0.2054). Finally, for volume reactions (column 4) our tests indicate that all coefficients differ statistically. Therefore, the largest volume reactions are when the downgrade is a full-fledged report, followed by recommendations with TP, followed by recommendations with EF.

Overall, the results in Table 4 suggest that both estimates, TP and EF, add value to recommendation revisions. They also show that when both are included the full-fledged recommendation revisions exhibit the highest information content as they trigger the largest abnormal return volatility and abnormal trading volume. Finally, recommendation revisions

that are backed by TP are somewhat more informative compared to their counterparts that are backed by EF.

5.4 Bias and Accuracy of the visible Target Prices and Earnings Forecasts?

As explained in more detail in Section 2 there are a number of different reasons why analysts would not support their recommendation revisions with TP or EF or both. This could be the outcome of simple reasons e.g. uncertain earnings or difficulties in the valuation process and the recommendation revision is more the intuition of the analyst or could be just the result of analysts' limited time, energy and resources that leads to limited attention (Harford, Jiang, Wang, & Xie, 2019; Driskill, Kirk, & Tucker, 2020). Of course, we cannot preclude more "sinister" reasons that stem from conflicts of interest e.g. analysts are trying to mislead investors to benefit the firm they work for or to maintain access to the covered firm's management (Bradshaw M. T., 2002; Kadan, Madureira, Wang, & Zach, 2009; Malmendier & Shanthikumar, 2014; Kecskés, Michaely, & Womack, 2017).

Although we do not directly and formally test any of the above reasons we argue that if any of these reasons underlies analyst decision processes then it should be manifested in lower-quality of analyst products. In other words, if analysts intentionally suppress some of their estimates then the outcome of all the aforementioned analyst intentions would result in lower quality of their recommendations and forecasts. As quality measures for EF and TP we employ bias and error of these estimates as outlined in Section 3.3.

Regression results of model (4) are shown in Table 5. Panel A, displays the bias and error results for earnings forecasts. We observe that for the case of upgrades, columns (1) and (2), the coefficients of the full-fledged revisions are negative and statistically significant for both EF bias and error. This means that EF that accompany the full-fledged upgrades are less optimistically biased and more accurate compared to the EF that accompany upgrades and the TP is not disclosed. This is not true for recommendation downgrades, columns (3) and (4), where the coefficients of the Full_Fledged indicator variable are not statistically significant (although negative). Consistent with the conjecture that full-fledged recommendations are more well-though or more reliable as all estimates are disclosed, results on Table 5, Panel A we see that EF are less biased and more accurate, at least for recommendation upgrades. Another observation from Panel A is that the horizon of the EF is strongly positively associated with EF bias and error. In other words, the longer the time interval to the announcement of the actual earnings the EF are more optimistically biased and less accurate.

This is consistent with prior literature that suggests that analysts walk down their EF as they actual earnings announcement date approaches (Richardson, Teoh, & Wysocki, 2004).

Table 5 Panel B, displays regression results of model (5) that is concerned with TP bias and error. We perform tests for two TP horizons, 6-months and 12-months. The observations are the same for both recommendation upgrades and downgrades. What we see is that TP under full-fledged recommendation are not more nor less optimistically biased compared to the TP issued with recommendations only, since the coefficients of the Full_Fledged indicator variable are not statistically significant (odd-numbered columns).

Surprisingly though, the coefficients on full-fledged when the dependent variable is that TP error (even-numbered columns) are positive and statistically significant. This finding suggests that target prices when issued with both EF and recommendations are less accurate than TP that are issued only with recommendations.

Overall, results on Table 5 indicate that when analysts issue recommendation revisions the supportive information could also be an indication of the quality of the supporting estimates. When recommendation revisions are full-fledged the supportive EF are more accurate and less biased compared to EF issued with recommendations only (when TP is missing), as expected. On the contrary, and unexpectedly TP under full-fledged revisions, although not more biased they are less accurate compare to TP when issued with recommendations only.

6. Conclusions

Recommendation revisions are the most valuable piece of information to investors and they are well known to instigate market reactions and also followed by a post recommendation drift. However, recommendation revisions are not a homogeneous group as they can be issued alone–standalone recommendations–or may be supported by a target price (TP) or an earnings forecast (EF) or both. We compare and contrast four recommendation categories defined based on the supportive information: Standalone recommendations, recommendations with earnings forecasts only (EF-recs), recommendations with target prices only (TP-recs) and recommendations with both estimates namely full-fledged (FF-recs). We find that TP and EF add value to recommendation revisions.

We find that these continuous estimates, target prices and earnings forecasts, add value to recommendation revisions. We find stronger abnormal returns, abnormal return volatility and abnormal trading volume reactions when recommendation changes are supported by these estimates. In particular we document that the most (least) informative recommendation revision category is the full-fledged (standalone) revisions. We also document that initial returns are largely affected by the direction of the revised estimate. Finally, the market initial reactions are stronger for TP-recs than EF-recs. When it comes to post-recommendation drift we document that this is short lived for recommendation downgrades. There is some post-recommendation drift in the case of EF-recs upgades and FF-recs upgrades with the latter being statistically larger.

These findings suggest that both key analyst estimates TP and EF add informational value to recommendation revisions. The market values recommendation revisions differently based on the estimate that is supporting the revision and values highly revisions that are accompanied by both forecasts.

In theory, FF-recs should be the most credible revisions as they signal that the analyst has done a thorough research and provides both key estimates. There are a number of reasons why an analyst may chose to not accompany a recommendation revision with a TP or EF. Although we do not test which is the underlying reason we examine what is the impact of such choices. As expected we find that earnings forecasts are less optimistically biased and more accurate when they are issued in support of full-fledged recommendations than EF-recs. On the contrary, and unexpectedly TP although not more biased are less accurate when issued to accompany FF-recs than TP-recs.

In general, our results suggest that supportive EF or TP add informational value to recommendation revisions and the market sees through the various analyst choices in disclosing or not reporting their estimates.

References

Asquith, P., Mikhail, M. B., & Au, A. S. (2005). Information content of equity analyst reports. *Journal of Financial Economics, 75*, 245-282.

Ball, R., & Brown, P. (1968). An Empirical Evaluation of Accounting Income Numbers. *Journal of Accounting Research, 6*(2), 159-178.

Bamber, L. S., & Cheon, Y. S. (1995). Differential Price and Volume Reactions to Accounting Earnings Announcements. *The Accounting Review, 70*(3), 417-441.

Beaver, W. H. (1968). The Information Content of Annual Earnings Announcements. *Journal of Announting Research*, 67-92.

Berger, P. G., Ham, C. G., & Kaplan, Z. R. (2019). Do analysts say anything about earnings without revising their earnings forecasts? *The Accounting Review, 94*(2), 29-52.

Boni, L., & Womack, K. (2006). Analysts, industries, and price momentum. *Journal of Financial and Quantitative analysis, 41*(1), 85-109.

Bonini, S., Zanetti, L., Bianchini, R., & Salvi, A. (2010). Target price accuracy in equity research. *Journal of Business Finance & Accounting, 37*(9-10), 1177-1217.

Bradley, D., Clarke, J., Lee, S., & Ornthanalai, C. (2014). Are Analysts' Recommendations Informative? Intraday Evidence on the Impact of Time Stamp Delays. *The Journal of Finance, LXIX*(2), 645-673.

Bradshaw, M. T. (2002). The use of target prices to justify sell-side analysts' stock recommendations. *Accounting Horizons, 16*, 27-41.

Bradshaw, M. T. (2004). How do analysts use their earnings forecasts in generating stock recommendations? *The Accounting Review, 79*(1), 25-50.

Bradshaw, M. T. (2009). Analyst information processing, financial regulation, and academic research. *The Accounting Review , 84*(4), 1073-1083.

Bradshaw, M. T. (2011). Analysts' Forecasts: What Do We Know after Decades of Work? *Working Paper*, 55.

Bradshaw, M. T., Brown, L. D., & Huang, K. (2013). Do sell-side analysts exhibit differential target price forecasting ability? *Review of Accounting Studies, 18*(4), 930–955.

Bradshaw, M. T., Huang, A. G., & Tan, H. (2019). The Effects of Analyst-Country Institutions on Biased Research: Evidence from Target Prices. *Journal of Accounting Research, 57*(1), 85-120.

Brav, A., & Lehavy, R. (2003). An empirical analysis of analysts' target prices: Short-term informativeness and long-term dynamics. *The Journal of Finance, 58*(5), 1933-1967.

Brown, L. D., Call, A. C., Clement, M. B., & Sharp, N. Y. (2015). Inside the "black box" of sell-side financial analysts. *Journal of Accounting Research, 53*(1), 1-47.

Carhart, M. M. (1997). On persistence in mutual fund performance. *Journal of Finance, 52*, 57–82.

Da, Z., & Schaumburg, E. (2011). Relative valuation and analyst target price forecasts. *Journal of Financial Markets , 14*(1), 161-192.

Driskill, M., Kirk, M. P., & Tucker, J. W. (2020). Concurrent earnings announcements and analysts' information production. *The Accounting Review, 95*(1), 165-189.

Fama, E. F., & French, K. R. (1993). Common risk factors in the returns of stocks and bonds. *Journal of Financial Economics, 33*, 3-56.

Francis, J., & Soffer, L. (1997). The relative informativeness of analysts' stock recommendations and earnings forecast revisions. *Journal of Accounting Research, 35*(2), 193-211.

Frankel, R., Kothari, S. P., & Weber, J. (2006). Determinants of the informativeness of analyst research. *Journal of Accounting and Economics, 41*(1-2), 29-54.

Harford, J., Jiang, F., Wang, R., & Xie, F. (2019). Analyst career concerns, effort allocation, and firms' information environment. *The Review of Financial Studies, 32*(6), 2179-2224.

Ho, T., Brownen-Trinh, R., & Xu, F. (2021). The Information Content of Target Price Forecasts: Evidence from Mergers and Acquisitions. *Journal of Business Finance & Accounting.*

Iselin, M., Park, M., & Van Buskirk, A. (2021). Seemingly inconsistent analyst revisions. *Journal of Accounting and Economics, 71*(1), 101339.

Jegadeesh, N., Kim, J., Krische, S. D., & Lee, C. M. (2004). Analyzing the analysts: When do recommendations add value? *The Journal of Finance, 59*(3), 1083-1124.

Kadan, O., Madureira, L., Wang, R., & Zach, T. (2009). Conflicts of Interest and Stock Recommendations: The Effects of the Global Settlement and Related Regulations. *The Review of Financial Studies, 22*(10).

Kadan, O., Madureira, L., Wang, R., & Zach, T. (2020). Sell-Side Analysts' Benchmarks. *The Accounting Review, 95*(1), 211-232.

Kecskés, A., Michaely, R., & Womack, K. L. (2017). Do Earnings Estimates Add Value to Sell-Side Analysts' Investment Recommendations? *Management Science, 63*(6), 1855–1871.

Loh, R. K., & Stulz, R. M. (2011). When Are Analyst Recommendation Changes Influential? *The Review of Financial Studies, 24*(2), 593–627.

Malmendier, U., & Shanthikumar, D. (2014). Do Security analysts speak in two tongues? *Review of Financial Studies, 27*(5), 1287-1322.

Schipper, K. (1991). Analysts' forecasts. *Accounting horizons, 5*(4), 105.

Stickel, S. E. (1995). The anatomy of the performance of buy and sell recommendations. *Financial Analysts Journal, 51*(5), 25-39.

Womack, K. (1996). Do brokerage analysts' recommendations have investment value? *The Journal of Finance, L1*, 137-167.

Appendix 1

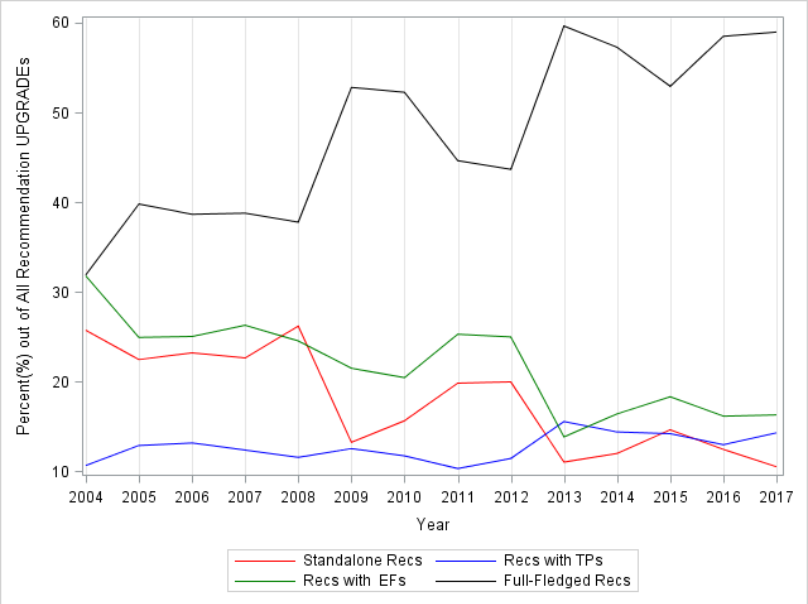
This table presents variable definitions and sources of data

Dependent Variable	Variable Name	Variable Description and Data Sources
BHAR	*Buy-and-Hold Abnormal Returns*	Buy-and-hold returns are calculated over the three-day window $[-1,+1]$ for a firm *j* where day zero is the report release date. Abnormal returns are estimated Fama and French three factor model plus momentum factor (FF4-returns). Estimation period is 60 monthly returns in the period $[-60,-1]$. Data Source: CRSP
$TP\_Bias = \frac{TP_t - Price_{t+365}}{Price_{t-1}}$	*Target price Bias*	Is the difference between the analyst's target price (TP) and the stock price (Price) a year after the issuance of the target price deflated by the stock price one day before the announcement of TP.
$TP\_Error = \lvert TP\_Bias \rvert$	*Target price Error*	Is the absolute value of target price bias Data Sources: IBES, CRSP
$EF\_Bias = \frac{EF - Actual\ Earnings}{Actual\ Earnings}$	*Earnings forecast Bias*	Is the difference between the analyst's earnings forecast (EF) and the actual earnings as reported on IBES. We deflate by the actual earnings.
$EF\_Error = \lvert EF\_Bias \rvert$	*Earnings forecast Error*	Is the absolute value of earnings forecast bias Data Source: IBES
Main Independent Variable	**Variable Name**	**Variable Description and Data Sources**
Rec_TP	*Recommendation supported by a target price revision*	Indicator variables, take the value of 1 if it is supported with a target price, 0 otherwise. Data Source: IBES
Rec_EF	*Recommendation supported by an earnings forecast revision*	Indicator variables, take the value of 1 if it is supported with an earnings forecast, 0 otherwise. Data Source: IBES.
Rec_TP_EF	*Full-fledged Recommendation*	Indicator variables, take the value of 1 if it is a full-fledged recommendation i.e. supported by both a target price and an earnings forecast revision, 0 otherwise. Data Source: IBES
$TP_{up/down}$ *or* $EF_{up/down}$ *or* ↑/↓	*Target price or earnings forecast revision upward/downward*	If the target price or earnings forecast is revised upward (downward) it is denoted by the subscript up (down) or using arrows ↑ (↓). Data Source: IBES
$TP_{above/down}$	*Target price above/below current stock price*	If the target price is above/below the stock price one (trading) day before the target price announcement date Data Source: IBES

Control Variable	Variable Name	Variable Description and Data Sources
log_analyst_follow	*Log Analyst Following*	Natural log of one plus the number of analysts that issue at least one (one-quarter or one-year-ahead) earnings forecast for the firm during the announcement quarter. Data Source: IBES Summary
firm_momentum	*Firm Momentum*	The six month buy-and-hold abnormal return (FF4) prior to the event i.e. the return of $[-125.-2]$ trading days (day 0 the event day). Data Source: CRSP
firm_volatility	*Firm Volatility*	It is the standard deviation of the one month prior to the event abnormal returns (FF4) i.e. of the of $[-22.-2]$ trading days (day 0 the event day) Data Source: CRSP, Eventus
instown_perc	*% of institutional ownership*	Percentage of shares held by institutional shareholders measured at the latest report date before the event Data Source: Thomson Financial
log_markcap	*Log Market Capitalization*	The market value of equity of a firm announced for the quarter prior to the event. It is the natural logarithm of the product of the volume of outstanding shares times the share price. Data Source: COMPUSTAT
log_booktmark	*Log Book to Market*	The natural logarithm of book value of a firm divided to its market value Data Source: COMPUSTAT
ROA	*Return on Assets*	The ratio of net income to total assets Data Source: COMPUSTAT
leverage	*Leverage*	The ratio of total liabilities to stockholder's equity Data Source: COMPUSTAT
mkt_momentum	*Market Momentum*	Is the cumulative value-weighted market return six months prior to the announcement of the analyst's report Data Source: CRSP
mkt_volatility	*Market volatility*	The standard deviation of the daily returns of S&P 500 index one month prior to the analyst's report Data Source: CRSP
log_brokersize	*Broker Size*	Is the log of the number of analysts employed by the brokerage firm employing analyst in the 12-month period Data Source: IBES
log_analyst_firm_experience	*Analyst Firm Experience*	The log of one plus the number of quarters the analyst has appeared in IBES following the specific firm Data Source: IBES
Log_EF_Horizon	*EF horizon to actual earnings*	The natural logarithm of number of days between the estimate and the actual earnings announcement date from COMPUSTAT. Data Source: IBES, COMPUSTAT

Indicator Variable	Variable Name	Variable Description and Data Sources
Confound_recommendation	*Confounding Recommendation*	Takes the value of 1 if within the event window $[-1,+1]$ there is more than one recommendation from different analysts for the same firm, 0 otherwise.
Confound_qearns_announcement	*Confounding Earnings announcement*	Takes the value of 1 if within the event window $[-1,+1]$ there is a concurrent quarterly earnings announcement Data Source: COMPUSTAT
Confound_news_event	*Confounding firm news*	Takes the value of 1 if within the event window $[-1,+1]$ there are firm events documented on RavenPack Data Source: RavenPack
Crisis	*Crisis period*	Takes the value of 1 if the recommendation is announced in the period is from December 2007 to June 2009, zero otherwise

Figure 1: Distribution of recommendation revisions with supportive forecasts per year
Panel A: Plot of recommendation upgrades
The plot below shows the percentage of recommendation upgrades per recommendation category per year. The four recommendation categories are formed based on the supportive forecast (target price or earnings estimate) issued along with the recommendation: standalone recommendations, recommendations with target prices (TPs), recommendations with earnings forecasts (EFs), and full-fledged recommendations (issued with both TP and EF).



Panel B: Plot of recommendation downgrades
The plot below shows the percentage of recommendation downgrades per recommendation category per year. The four recommendation categories are formed based on the supportive forecast (target price or earnings estimate) issued along with the recommendation: standalone recommendations, recommendations with target prices (TPs), recommendations with earnings forecasts (EFs), and full-fledged recommendations (issued with both TP and EF).

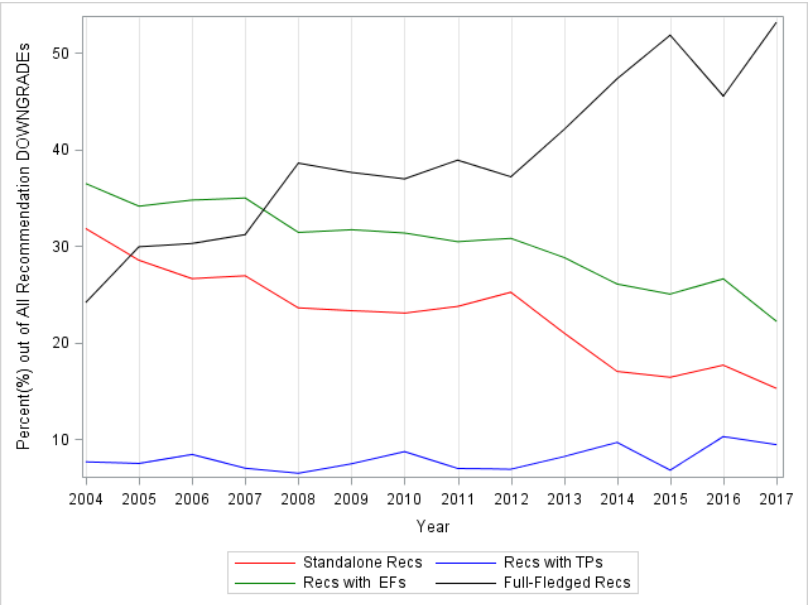
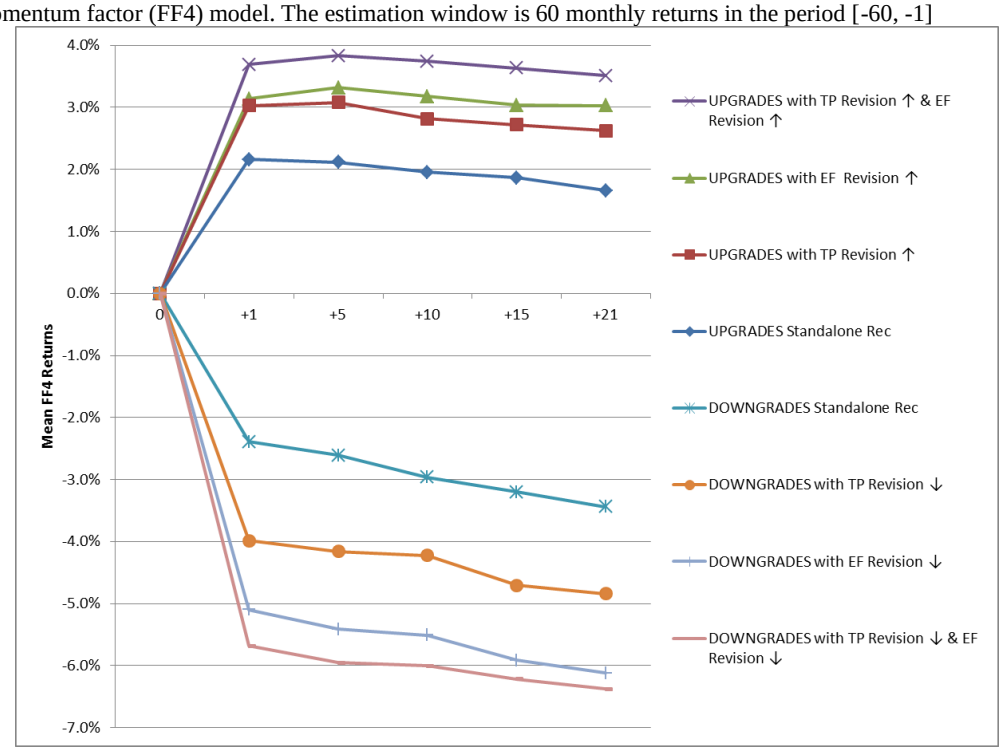


Figure 2: Univariate analysis of buy-and-hold abnormal returns per recommendation category
Panel A: Recommendation revision categories based on earnings forecasts and target price revisions
The figure below shows the average buy-and-hold abnormal returns for a number of windows following the issuance of recommendation revisions and for each recommendation category. We used Fama and French three-factor model augmented by the momentum factor (FF4) model. The estimation window is 60 monthly returns in the period [-60, -1]



Panel B: Comparison of recommendation revision categories based target price revisions and whether target price is above or below the current stock price
The figure below shows the average buy-and-hold abnormal returns for a number of windows following the issuance of recommendation revisions and for each recommendation category that contain target prices. We distinguish cases base on either the target price revision or comparing the target price with the current stock price (above or below)

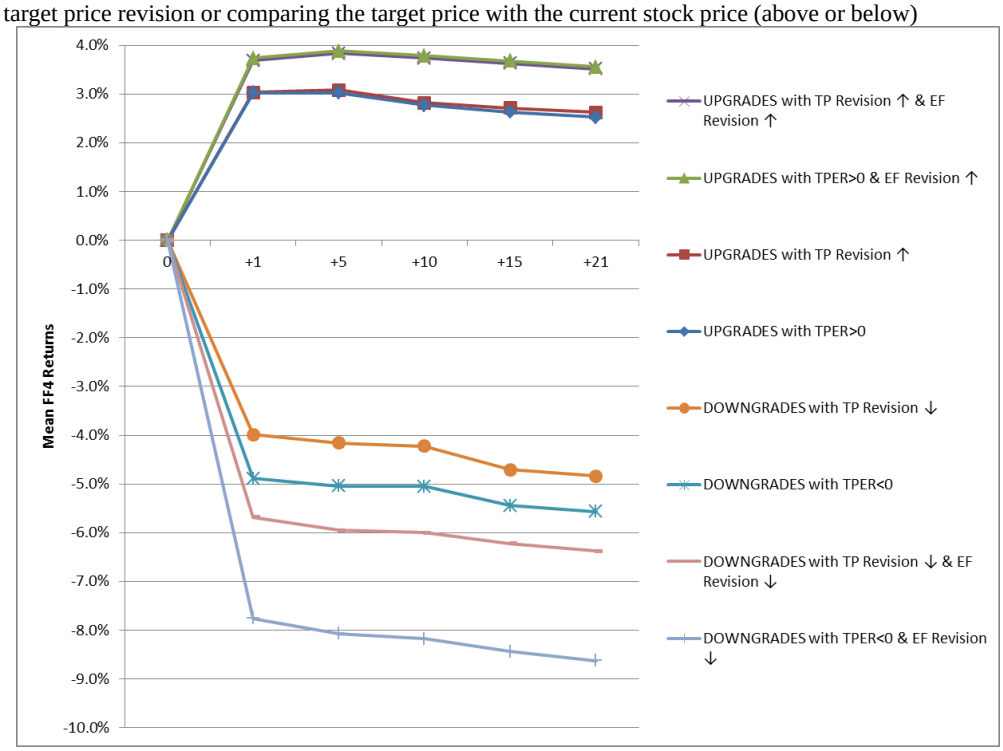


Table 1: Descriptive Statistics

Panel A: Recommendation revisions with supportive forecasts

The sample consists of 90,946 recommendation revisions; 42,090 upgrades and 48,856 downgrades. A recommendation is classified into four groups: (i) standalone recommendations, (ii) recommendations issued with target prices, (iii) recommendations issued with earnings forecasts and, (iv) full-fledged recommendations i.e. issued with both forecasts. Our definition are based on whether there is a target price or an earnings forecast issued in the window $[-5, +1]$ (trading days) where 0 is the recommendation announcement date.

Recommendation Category	Upgrades		Downgrades	
	N	%	N	%
Total	42,090		48,856	
Standalone Recs	7,919	19%	11,699	24%
Recs with Target Prices	5,213	12%	3,797	8%
Recs with Earnings Forecasts	9,615	23%	15,323	31%
Full-fledged recommendations	19,343	46%	18,037	37%

Panel B: Recommendation revisions with supportive earnings forecasts and target price changes

This panel shows the distribution of recommendation revisions based on revisions of earnings forecasts and target prices.

Recommendation Category	Upgrades		Downgrades	
	N	%	N	%
Standalone RECs	7,919	19%	11,699	24%
Rec with TP upgrade	4,358	10%	1,352	3%
Rec with TP downgrade	855	2%	2,445	5%
Rec with EF upgrade	5,539	13%	4,306	9%
Rec with EF downgrade	4,076	10%	11,017	23%
Full-fledged with TP upgrade + EF upgrade	12,110	29%	2,327	5%
Full-fledged with TP upgrade + EF downgrade	4,187	10%	1,295	3%
Full-fledged with TP downgrade + EF upgrade	915	2%	2,144	4%
Full-fledged with TP downgrade + EF downgrade	2,131	5%	12,271	25%

Panel C: Recommendation revisions with supportive earnings forecasts changes and target price levels

This panel shows the distribution of recommendation revisions based on revisions of earnings forecasts and whether the target price is above or below the current price.

Recommendation Category	Upgrades		Downgrades	
	N	%	N	%
Standalone RECs	7,919	19%	11,699	24%
Rec with TP > Current Price	4,885	12%	2,567	5%
Rec with TP < Current Price	328	1%	1,230	3%
Rec with EF upgrade	5,539	13%	4,306	9%
Rec with EF downgrade	4,076	10%	11,017	23%
Full-fledged with TP > Current Price + EF upgrade	12,224	29%	3,112	6%
Full-fledged with TP > Current Price + EF downgrade	5,871	14%	8,018	16%
Full-fledged with TP < Current Price + EF upgrade	801	2%	1,359	3%
Full-fledged with TP < Current Price + EF downgrade	447	1%	5,548	11%

Table 2: Stock returns and recommendation revision categories based on earnings forecasts and target price revisions

The tables present the regression results of equation (1), $BHAR = a_0 + \sum Rec\_category\_indicators + \sum Controls + Broker\_FE$. The dependent variables are the buy-and-hold abnormal returns (*BHAR*) over a number of event windows with 0 being the recommendation revision date. We used Fama and French three-factor model augmented by the momentum factor (FF4) model. The estimation window is 60 monthly returns in the period [-60, -1]. The variables of interest are the nine recommendation categories that are all the combinations based on whether the recommendation revision is accompanied by revisions in earnings forecast (EF) and/or a target price (TP) where the directions are indicated by the corresponding arrows. Panel A displays results when fixed effects are omitted. Panel B includes the fixed effects and the base category is the standalone recommendation revisions. The rest of the control variables are defined in Appendix 1. Standard errors are robust, clustered at quarter-year, firm and brokerage levels and presented in parentheses. *, **, *** represent significance levels of 10%, 5% and 1% respectively.

Panel A: Regression of equation (1) without fixed effects

	Upgrades			**Downgrades**		
	(1)	(2)	(3)	(4)	(5)	(6)
	[0 +1]	[+2 +5]	[+2 +21]	[0 +1]	[+2 +5]	[+2 +21]
Constant	5.5751***	0.8078***	0.9105**	-6.3046***	-0.7624***	-2.5506***
	(0.4981)	(0.1923)	(0.4628)	(0.5086)	(0.2231)	(0.7077)
Rec + TP ↑	1.0771***	0.1105	0.1874	0.4252**	0.0021	-0.0930
	(0.1680)	(0.0757)	(0.2391)	(0.1754)	(0.0950)	(0.3241)
Rec + TP ↓	0.2157	-0.2789	-0.5034	-1.4655***	-0.0292	0.2778
	(0.1866)	(0.2071)	(0.5110)	(0.2035)	(0.1094)	(0.2267)
Rec + EF ↑	0.8087***	0.1991***	0.4628***	0.6488***	-0.0360	-0.0002
	(0.1519)	(0.0651)	(0.1686)	(0.0997)	(0.0898)	(0.2010)
Rec + EF ↓	-0.6176***	0.0621	0.0631	-1.6836***	-0.1508*	0.0862
	(0.1426)	(0.1047)	(0.2139)	(0.1729)	(0.0780)	(0.1568)
Full-Fledged + TP ↑ + EF ↑	1.6257***	0.2195***	0.3922**	1.1177***	-0.1901*	0.0767
	(0.1940)	(0.0722)	(0.1688)	(0.1981)	(0.1118)	(0.2367)
Full-Fledged + TP ↑ + EF ↓	0.3189	0.0698	0.2597	0.2221	-0.1130	0.0211
	(0.1953)	(0.0905)	(0.2207)	(0.1685)	(0.1577)	(0.2887)
Full-Fledged + TP ↓ + EF ↑	0.9890***	0.1325	0.1060	-0.8257***	-0.1594	0.3480
	(0.3118)	(0.1455)	(0.4901)	(0.2125)	(0.1041)	(0.2711)
Full-Fledged + TP ↓ + EF ↓	-0.9636***	-0.2063	-0.0541	-2.3012***	-0.1548**	0.3270*
	(0.2090)	(0.1352)	(0.1981)	(0.2178)	(0.0758)	(0.1708)
confound_recomm	2.1424***	-0.0072	0.0780	-5.1945***	0.0618	0.0922
	(0.1374)	(0.0816)	(0.1451)	(0.2831)	(0.0878)	(0.1809)
confound_qearns_announc	0.6565***	0.1219	0.2076	-0.3528**	0.2097***	0.2932
	(0.1234)	(0.0813)	(0.1636)	(0.1456)	(0.0614)	(0.1950)
confound _news_event	0.2324***	0.0755	0.1577	-0.7837***	0.1849***	0.3395**
	(0.0819)	(0.0700)	(0.1470)	(0.1078)	(0.0690)	(0.1482)
firm_momentum	-1.1799***	0.4005**	2.0319***	0.8218***	-0.0419	1.1164**
	(0.2236)	(0.1705)	(0.4960)	(0.2276)	(0.2195)	(0.5134)
firm_volatility	33.3378***	-0.8053	-10.4676	-28.1712***	-10.4919***	-17.5128
	(4.3310)	(3.4813)	(11.9482)	(4.9331)	(3.3355)	(10.8899)
instown_perc	0.2234	-0.0681	-0.1964	-0.4969*	0.2925*	1.2982***
	(0.1899)	(0.0876)	(0.3260)	(0.2734)	(0.1537)	(0.3398)
log_markcap	-0.5848***	-0.0045	-0.0127	0.7911***	-0.0121	0.0785
	(0.0492)	(0.0286)	(0.0766)	(0.0581)	(0.0304)	(0.0934)
log_booktmark	-0.1772***	0.2444***	1.0200***	1.2352***	0.2225***	1.0477***
	(0.0593)	(0.0437)	(0.1409)	(0.1004)	(0.0489)	(0.1311)
ROA	-2.9530**	2.6470*	7.1654**	19.2450***	1.6928	8.7600**
	(1.2946)	(1.4562)	(2.8943)	(2.7495)	(1.5905)	(3.8337)
leverage	-0.0350	0.0326	0.1141**	0.1948***	-0.0098	0.0990**
	(0.0216)	(0.0202)	(0.0486)	(0.0370)	(0.0152)	(0.0497)
log_analyst_follow	-0.6132***	-0.3279***	-0.5832***	0.7793***	0.2978***	0.3268
	(0.0834)	(0.0685)	(0.1951)	(0.1385)	(0.0767)	(0.2356)
log_brokersize	0.2610***	-0.0184	0.1675***	-0.2940***	0.0138	0.0543
	(0.0603)	(0.0261)	(0.0437)	(0.0650)	(0.0203)	(0.0488)
log_analyst_firm_experience	0.1508***	0.0408*	0.1808***	-0.1460***	0.0303	0.0247
	(0.0423)	(0.0232)	(0.0525)	(0.0453)	(0.0202)	(0.0451)
mkt_momentum	-1.4914**	-0.7017	-2.6558**	0.9197	-1.0377***	-3.0371**
	(0.6654)	(0.4558)	(1.0973)	(1.0490)	(0.3684)	(1.3121)
mkt_volatility	-15.4982	12.7683*	17.5084	7.8515	-17.6277*	-22.4042
	(10.9462)	(7.6640)	(13.2835)	(11.9987)	(9.8511)	(17.8897)
crisis	0.7012***	-0.0697	-0.0564	-0.4047	0.2555	0.3505
	(0.2207)	(0.2043)	(0.5072)	(0.2589)	(0.2193)	(0.8510)
Controls	YES	YES	YES	YES	YES	YES
Year & Broker Fixed Effects	NO	NO	NO	NO	NO	NO
Observations	42,090	42,090	42,090	48,856	48,856	48,856
Adjusted R-squared	0.1245	0.0070	0.0135	0.2301	0.0058	0.0110

Panel B: Regression of equation (1) with fixed effects

	Upgrades			Downgrades		
	(1)	(2)	(3)	(4)	(5)	(6)
	[0 +1]	[+2 +5]	[+2 +21]	[0 +1]	[+2 +5]	[+2 +21]
Rec + TP ↑	0.9376***	0.1438	0.2335	0.3222**	-0.0330	-0.1490
	(0.1208)	(0.0866)	(0.2491)	(0.1461)	(0.0938)	(0.3109)
Rec + TP ↓	0.1171	-0.2171	-0.4826	-1.3692***	-0.0478	0.1768
	(0.1589)	(0.2190)	(0.5149)	(0.1776)	(0.1143)	(0.2492)
Rec + EF ↑	0.7601***	0.1765**	0.3803**	0.6323***	-0.0298	0.0046
	(0.1168)	(0.0743)	(0.1663)	(0.0986)	(0.0915)	(0.2050)
Rec + EF ↓	-0.6073***	0.0441	0.0119	-1.5301***	-0.1554*	0.0684
	(0.1253)	(0.1106)	(0.2283)	(0.1438)	(0.0810)	(0.1648)
Full-Fledged + TP ↑ + EF ↑	1.5276***	0.2749***	0.5237***	1.0299***	-0.2089*	-0.0355
	(0.1303)	(0.0852)	(0.1839)	(0.1737)	(0.1175)	(0.2532)
Full-Fledged + TP ↑ + EF ↓	0.2311	0.1094	0.3695	0.0986	-0.1577	-0.1600
	(0.1389)	(0.0995)	(0.2243)	(0.1480)	(0.1597)	(0.2827)
Full-Fledged + TP ↓ + EF ↑	0.7785***	0.1774	0.1542	-0.8003***	-0.1971*	0.1606
	(0.2798)	(0.1528)	(0.4770)	(0.1698)	(0.1024)	(0.2788)
Full-Fledged + TP ↓ + EF ↓	-1.0050***	-0.1502	0.0497	-2.2477***	-0.1840**	0.1368
	(0.1604)	(0.1309)	(0.1993)	(0.1660)	(0.0840)	(0.1735)
confound_recomm	2.0743***	0.0081	0.1181	-4.9950***	0.0860	0.2080
	(0.1368)	(0.0853)	(0.1489)	(0.2810)	(0.0859)	(0.1708)
confound_qearns_announc	0.6461***	0.0951	0.1889	-0.3638***	0.2290***	0.2955
	(0.1039)	(0.0776)	(0.1590)	(0.1228)	(0.0618)	(0.1768)
confound _news_event	0.2418***	0.0473	0.0902	-0.7349***	0.1667**	0.2374
	(0.0766)	(0.0710)	(0.1505)	(0.1032)	(0.0672)	(0.1422)
firm_momentum	-1.0704***	0.3519**	1.9385***	0.6390***	-0.0704	0.9681*
	(0.2207)	(0.1751)	(0.4879)	(0.2042)	(0.2204)	(0.5201)
firm_volatility	29.3927***	-0.6581	-9.6727	-28.3173***	-9.7627***	-14.5711
	(4.6297)	(3.3599)	(11.4054)	(4.6266)	(3.2244)	(10.3491)
instown_perc	-0.0938	-0.1064	-0.3211	-0.1187	0.2674	1.0932***
	(0.1600)	(0.0852)	(0.3192)	(0.2405)	(0.1663)	(0.3427)
log_markcap	-0.5562***	-0.0134	-0.0511	0.7058***	-0.0155	0.0097
	(0.0609)	(0.0292)	(0.0823)	(0.0619)	(0.0311)	(0.0948)
log_booktmark	-0.0326	0.2535***	1.0500***	1.0457***	0.2202***	1.0272***
	(0.0610)	(0.0419)	(0.1470)	(0.0951)	(0.0466)	(0.1308)
ROA	-2.1690*	2.7740*	6.8864**	19.3620***	1.8233	9.6104***
	(1.2065)	(1.4716)	(2.9535)	(2.6390)	(1.5321)	(3.5961)
leverage	-0.0059	0.0372	0.1155**	0.1515***	-0.0109	0.0903*
	(0.0198)	(0.0245)	(0.0447)	(0.0325)	(0.0176)	(0.0529)
log_analyst_follow	-0.5901***	-0.3461***	-0.5761***	0.7749***	0.3059***	0.3201
	(0.0764)	(0.0696)	(0.1889)	(0.1181)	(0.0828)	(0.2525)
log_brokersize	0.1530	-0.0191	0.1275	0.0427	-0.0905	-0.4261**
	(0.1209)	(0.0847)	(0.1587)	(0.1808)	(0.0600)	(0.1798)
log_analyst_firm_experience	0.0734**	0.0344	0.1500***	-0.0579*	0.0252	0.0010
	(0.0332)	(0.0253)	(0.0562)	(0.0333)	(0.0211)	(0.0433)
mkt_momentum	-1.1655**	-0.4467	-1.8593	1.2830*	-1.2473**	-4.1021***
	(0.5015)	(0.6122)	(1.5516)	(0.6881)	(0.5466)	(1.3057)
mkt_volatility	-1.1456	15.9123*	30.8773	7.0237	-20.5304*	-37.4558
	(5.0059)	(8.8062)	(19.0186)	(7.9613)	(11.6181)	(27.4196)
crisis	0.2512	0.0263	0.0081	0.6575	0.2504	-0.4446
	(0.2253)	(0.3541)	(0.8163)	(0.4567)	(0.2550)	(0.5121)
Controls	YES	YES	YES	YES	YES	YES
Year & Broker Fixed Effects	YES	YES	YES	YES	YES	YES
Observations	42,090	42,090	42,090	48,856	48,856	48,856
Adjusted R-squared	0.1432	0.0093	0.0162	0.2489	0.0068	0.0158

***p*-values of tests of equality of regression coefficients**			
Upgrades	[0 +1]	[+2 +5]	[+2 +21]
Rec + TP ↑ *vs* Rec + EF ↑	0.2112	0.7210	0.7565
Rec + TP ↑ *vs* Full-Fledged + TP ↑ + EF ↑	**0.0000**	0.1334	0.1211
Rec + EF ↑ vs Full-Fledged + TP ↑ + EF ↑	**0.0000**	0.2046	**0.0403**

Downgrades	[0 +1]	[+2 +5]	[+2 +21]
Rec + TP ↓ *vs* Rec + EF ↓	0.4842	0.3786	0.6616
Rec + TP ↓ *vs* Full-Fledged + TP ↓ + EF ↓	**0.0000**	0.2468	0.8835
Rec + EF ↓ vs Full-Fledged + TP ↓ + EF ↓	**0.0005**	0.7212	0.5974

Table 3: Stock returns and recommendation revision categories based on earnings forecasts revisions and target price levels
This table presents regression results of equation (2), $BHAR = a_0 + \sum Rec\_category\_indicators + \sum Controls + Broker\_FE$. The dependent variables are the buy-and-hold abnormal returns (*BHAR*) over a number of event windows with 0 being the recommendation revision date. We used Fama and French three-factor model augmented by the momentum factor (FF4) model. The estimation window is 60 monthly returns in the period [-60, -1]. The variables of interest are the nine recommendation categories that are all the combinations based on whether the recommendation revision is accompanied by revisions in earnings forecast (EF) and/or the target price level compared to the current stock price (above or below). Earnings forecast revision direction is indicated by the corresponding arrows. The base category is the standalone recommendation revisions. The rest of the control variables are defined in Appendix 1. Standard errors are robust, clustered at quarter-year, firm and brokerage levels and presented in parentheses. *, **, *** represent significance levels of 10%, 5% and 1% respectively.

	Upgrades			**Downgrades**		
	(1)	(2)	(3)	(4)	(5)	(6)
	[0 +1]	[+2 +5]	[+2 +21]	[0 +1]	[+2 +5]	[+2 +21]
Rec + TP above	0.8629***	0.1244	0.1285	-0.1659	-0.0644	-0.1325
	(0.1063)	(0.0898)	(0.2596)	(0.1232)	(0.0774)	(0.2171)
Rec + TP below	-0.6536***	-0.6438**	-0.3161	-1.9932***	0.0031	0.4528
	(0.2345)	(0.2671)	(0.6358)	(0.2106)	(0.1799)	(0.4370)
Rec + EF ↑	0.7356***	0.1714**	0.3701**	0.6272***	-0.0299	0.0052
	(0.1121)	(0.0744)	(0.1675)	(0.0974)	(0.0914)	(0.2050)
Rec + EF ↓	-0.6011***	0.0459	0.0140	-1.4756***	-0.1553*	0.0599
	(0.1248)	(0.1109)	(0.2260)	(0.1413)	(0.0816)	(0.1604)
Full-Fledged + TP above + EF ↑	1.5133***	0.2716***	0.5094***	0.7656***	-0.2336**	-0.0651
	(0.1331)	(0.0854)	(0.1816)	(0.1471)	(0.0931)	(0.2560)
Full-Fledged + TP above + EF ↓	-0.0801	0.0390	0.3154*	-0.6492***	-0.1529*	0.1192
	(0.1273)	(0.0943)	(0.1852)	(0.1310)	(0.0775)	(0.1534)
Full-Fledged + TP below + EF ↑	-0.2563	-0.0597	-0.1770	-1.2634***	-0.1337	0.3388
	(0.1566)	(0.1622)	(0.3780)	(0.2414)	(0.1326)	(0.2990)
Full-Fledged + TP below + EF ↓	-1.8875***	-0.2802	-0.5925	-3.8532***	-0.2228*	0.0597
	(0.2408)	(0.2550)	(0.5317)	(0.2596)	(0.1169)	(0.2460)
Controls	YES	YES	YES	YES	YES	YES
Year & Broker Fixed Effects	YES	YES	YES	YES	YES	YES
Observations	42,090	42,090	42,090	48,856	48,856	48,856
Adjusted R-squared	0.1446	0.0095	0.0163	0.2602	0.0068	0.0158

***p*-values of tests of equality of regression coefficients**			
Upgrades	[0 +1]	[+2 +5]	[+2 +21]
Rec + TP ↑ *vs* Rec + EF ↑	0.3043	0.6153	0.8605
Rec + TP ↑ *vs* Full-Fledged + TP ↑ + EF ↑	**0.0000**	**0.0691**	**0.0522**
Rec + EF ↑ vs Full-Fledged + TP ↑ + EF ↑	**0.0000**	0.1854	**0.0590**

Downgrades	[0 +1]	[+2 +5]	[+2 +21]
Rec + TP ↓ *vs* Rec + EF ↓	**0.0388**	0.4239	0.4332
Rec + TP ↓ *vs* Full-Fledged + TP ↓ + EF ↓	**0.0000**	0.2980	0.4523
Rec + EF ↓ vs Full-Fledged + TP ↓ + EF ↓	**0.0000**	0.5304	0.9992

Table 4: Abnormal return volatility and abnormal trading volume reactions to recommendation revision categories
This table presents regression results of equation (2), $CAVAL\ or\ CAVOL = a_0 + \sum Rec\_category\_indicators + \sum Controls + Broker\_FE$. The dependent variables are abnormal return volatility and abnormal trading volume and are defined as $CAVAL_{it} = ln\left(\overline{AR}_{it}^2/\sigma_{i\ it}^2\right)$ and $CAVOL_{it} = ln(\bar{V}_{it}/\bar{V}_i)$ respectively. AR_{it} is the FF4 model abnormal return, $\overline{AR}_{it}^2$ is the the average AR_{it}^2 during the event-period, and σ_i^2 is the variance of FF4 residuals of firm i calculated in the estimation window; V_{it} is the number of shares of firm i traded during day t, divided by the shares outstanding of firm i during day t; $\bar{V}_i$ is the mean daily trading volume for firm i calculated in the estimation window and $\bar{V}_{it}$ is the average V_{it} during the event-period. The event period is during the three-day event window $[-1, +1]$ centered on the event day. The estimation period is [-255,-10] and [+10,+255] (trading days). The variables of interest are the four recommendation categories that are all the combinations based on whether the recommendation revision is accompanied by revisions in earnings forecast (EF) and/or a target price (TP). Panel A displays results when fixed effects are omitted. Panel B includes the fixed effects and the base category is the standalone recommendation revisions. The rest of the control variables are defined in Appendix 1. Standard errors are robust, clustered at quarter-year, firm and brokerage levels and presented in parentheses. *, **, *** represent significance levels of 10%, 5% and 1% respectively

Panel A: Regression of equation (2) without fixed effects

	CAVAL		CAVOL	
	(1)	(2)	(3)	(4)
	UPGRADE	DOWNGRADE	UPGRADE	DOWNGRADE
	[-1 +1]	[-1 +1]	[-1 +1]	[-1 +1]
Constant	0.7907***	0.5171***	0.3065***	0.3586***
	(0.1248)	(0.1091)	(0.0523)	(0.0528)
Rec + TP	0.2202***	0.2117***	0.0526***	0.1044***
	(0.0283)	(0.0324)	(0.0097)	(0.0134)
Rec + EF	0.0855**	0.1941***	0.0375***	0.0904***
	(0.0395)	(0.0352)	(0.0131)	(0.0145)
Full-Fledged	0.2418***	0.3274***	0.0766***	0.1436***
	(0.0294)	(0.0329)	(0.0096)	(0.0132)
Controls	YES	YES	YES	YES
Year & Broker FE	NO	NO	NO	NO
Observations	42,090	48,856	42,090	48,856
Adjusted R-squared	0.1581	0.2254	0.1849	0.2728

Panel B: Regression of equation (2) with fixed effects

	CAVAL		CAVOL	
	(1)	(2)	(3)	(4)
	UPGRADE	DOWNGRADE	UPGRADE	DOWNGRADE
	[-1 +1]	[-1 +1]	[-1 +1]	[-1 +1]
Rec + TP	0.1835***	0.2210***	0.0450***	0.1201***
	(0.0304)	(0.0338)	(0.0098)	(0.0136)
Rec + EF	0.0962**	0.1686***	0.0430***	0.0783***
	(0.0389)	(0.0360)	(0.0133)	(0.0148)
Full-Fledged	0.2196***	0.3441***	0.0771***	0.1639***
	(0.0307)	(0.0328)	(0.0103)	(0.0138)
Controls	YES	YES	YES	YES
Year & Broker FE	YES	YES	YES	YES
Observations	42,090	48,856	42,090	48,856
Adjusted R-squared	0.1785	0.2470	0.2031	0.2954

***p*-values of tests of equality of regression coefficients**				
	CAVAL		CAVOL	
	(1)	(2)	(3)	(4)
	UPGRADE	DOWNGRADE	UPGRADE	DOWNGRADE
Rec + TP *vs* Rec + EF	**0.0157**	0.2054	0.8666	**0.0135**
Rec + TP *vs* Full-Fledged	0.1343	**0.0000**	**0.0002**	**0.0000**
Rec + EF *vs* Full-Fledged	**0.0002**	**0.0000**	**0.0008**	**0.0000**

Table 5: Regression results on bias and error of analyst estimates

Panel A: Bias and error of the accompanying earnings forecasts

This table shows the results of the regression model (5), $EF\_BIAS\ or\ EF\_ERROR = \alpha_0 + \gamma_1 Full\_Fledged + Log\_EF\_horizon + \delta_i Controls + Year\_FE + Broker\_FE$. EF_BIAS is the difference between the analyst's earnings forecast and the actual earnings as reported on IBES, deflated by the actual earnings. EF_ERROR is the absolute value of EF_BIAS. $Full\_Fledged$ is an indicator variable that equal 1 if the recommendation is supported by both an earnings forecast and a target price, zero otherwise. The default category is recommendations supported only by earnings forecasts. $Log\_EF\_Horizon$ is defined as the natural logarithm of the number of days between the forecast announcement date and the earnings announcement. The control variables are defined in Appendix 1. Standard errors are robust, clustered at quarter-year, firm and brokerage levels and presented in parentheses. *, **, *** represent significance levels of 10%, 5% and 1% respectively

	UPGRADE		DOWNGRADE	
	(1)	(2)	(3)	(4)
	BIAS	ERROR	BIAS	ERROR
Full_Fledged	-0.0287*	-0.0421**	-0.0164	-0.0311
	(0.0158)	(0.0191)	(0.0175)	(0.0200)
Log_EF_Horizon	0.1224***	0.1516***	0.1591***	0.2210***
	(0.0129)	(0.0147)	(0.0170)	(0.0153)
Controls	YES	YES	YES	YES
Year & Broker FE	YES	YES	YES	YES
Observations	28,726	28,726	33,033	33,033
Adjusted R-squared	0.0510	0.0834	0.0563	0.0832

Panel B: Bias and error of the accompanying target prices

This table shows the results of the regression model (6), $TP\_BIAS\ or\ TP\_ERROR = \alpha_0 + \gamma_1 Full\_Fledged + \delta_i Controls + Year\_FE + Broker\_FE$. TF_BIAS is the difference between the analyst's target price and the stock price 6-months or 12-months ahead of the target price issuance date, deflated by the stock price one day before the issuance date. Both horizon results are shown on the table below. TP_ERROR is the absolute value of TP_BIAS. $Full\_Fledged$ is an indicator variable that equal 1 if the recommendation is supported by both an earnings forecast and a target price, zero otherwise. The default category is recommendations supported only by target prices.The control variables are defined in Appendix 1. Standard errors are robust, clustered at quarter-year, firm and brokerage levels and presented in parentheses. *, **, *** represent significance levels of 10%, 5% and 1% respectively.

	UPGRADE				DOWNGRADE			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	BIAS-6	ERROR-6	BIAS-12	ERROR-12	BIAS-6	ERROR-6	BIAS-12	ERROR-12
Full_Fledged	0.0043	0.0078*	-0.0014	0.0129**	-0.0086	0.0089*	-0.0060	0.0143***
	(0.0068)	(0.0039)	(0.0096)	(0.0050)	(0.0067)	(0.0045)	(0.0088)	(0.0053)
Controls	YES	YES	YES	YES	YES	YES	YES	YES
Year & Broker FE	YES	YES	YES	YES	YES	YES	YES	YES
Observations	20,779	20,779	20,779	20,779	18,296	18,296	18,296	18,296
Adjusted R-squared	0.2046	0.2497	0.2026	0.2161	0.2032	0.2118	0.2292	0.1876