



UNSW Business School

Accounting Research Seminar Series Term 3, 2019

The Effect of Gender on Investors' Judgements and Decision Making

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Date: Friday Nov 22, 2019

Time: 3.00pm – 4.00pm

Venue: BUS 119

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November 14, 2019

NOTE: This is a very rough draft of a paper under revision for a top tier accounting journal.
Your identification of problems with it will be most appreciated.

Acknowledgements: We appreciate comments on previous versions of this paper, which employed only undergraduate student participants, from faculty and students at the Smith Doctoral Symposium, Social and Behavioural Brown Bag at Smith School of Business, 2018 CAAA Conference, and 2018 AAA conference. We thank Jeremy Douthit (discussant), Pujawati (Estha) Gondowijoyo, Till-Arne Hahn, Bertrand Malsch, Pam Murphy, Sara Wick (discussant), and Mike Wynes for detailed feedback as well as feedback from the workshop participants at the University of Bristol and Hong Kong Baptist University.

The Effect of Gender on Investors' Judgements and Decision Making

ABSTRACT: We examine whether an unsophisticated investor's own gender and the sell-side analyst's gender jointly affect investor's investment judgment based on the analyst's report. Prior archival research has shown no gender-based differences in the quality of the investment advice provided by sell-side analysts, suggesting there is no real-world basis for a differential reaction. However, prior archival research has also shown that investor's gender affects his (her) personal investment decisions both directly and via the investment set his (her) advisors recommend. We extend this research into the realm of third-party information provider's gender (i.e. analyst's gender). We predict and find the sell-side research report writer's gender and the unsophisticated investor's gender jointly influence the investor's likelihood of investment. Rather than gender stereotypes, we find in-group favouritism among female investors. Specifically, female investors react more strongly than male investors to a female analyst's report. Female investors also react more strongly to a female analyst's report than a male analyst's identical, "sell" type report. However, we also find that by making gender salient through a positive news article about female analysts, female investors are prone to "overcorrection". As a result, reaction to female analyst's report actually decreased when gender is salient. We discuss implications of this gender-based information processing bias on investors' decision-making and on the career prospects of female analysts.

Keywords: Analyst, investor, investment advice, analyst reports, unconscious information processing biases, gender bias, priming

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1. Introduction

Females face two distinct challenges in finance. For unsophisticated individual investors, females are perceived as more risk averse than they actually are, and hence financial advisors offer them a less risky portfolio compared to male investors, generating smaller returns (Grable & Lytton, 1999; Roszkowski & Grable, 2005; Schubert, Brown, Gysler, & Brachinger, 1999; Wang, 1994). For professionals working in finance, the significant gender gap between male and female representation is well known. Among sell-side equity analysts, less than 20% are female, despite female analysts' better performance (Kumar, 2010; Li, Sullivan, Xu, & Gao, 2013). In this study, we use controlled experiments to examine the effect of gender on investors' reaction to an analyst's report.

Individual investors are a significant source of capital in financial markets (Healy & Palepu, 2001; Koonce & Lipe, 2010). In the United States, over ninety million individuals invest in stock markets directly or through mutual funds (NYSE, 2006), owning nearly 34% of all shares outstanding (Bogle, 2005); worldwide the estimated number of individual investors is over half a billion (Grout, Megginson, & Zalewska, 2009). Presence of less sophisticated investors can affect market prices and expectations (e.g., Elliott, Krische, & Peecher, 2010). While numerous sources of information are available to them, individual investors consider sell-side analysts' research reports among the most influential sources for investment decision making (e.g., Kothari, Li, & Short, 2009). However, many individual investors are relatively unsophisticated (Bhattacharya, Black, Christensen, & Larson, 2003; Mayorga & Trotman, 2016) and rely on analysts (among others) to a varying extent to process information for them and to

provide advice that they rely on to make investment decisions (Kelly, Low, Tan, & Tan, 2012; Mikhail, Walther, & Willis, 2007).

Thus, we focus on unsophisticated investors' reaction to analyst's report, and examine whether and how investor's own gender and the analyst's gender affect unsophisticated investor's judgement and investment decisions. We examine these judgment effects in light of the different types of report ("buy" versus "sell") given their implications differ (e.g., Lui, Markov, & Tamayo, 2007). That is, "sell" type report and "buy" type report have different impact on analyst careers (e.g. Hong & Kubik, 2003) and on analyst's access to private information (e.g. Chen & Matsumoto, 2006). "Buy" and "sell" reports also entail different effects on investor wealth (i.e. locking in losses versus missing out potential gains; see Barber & Odean, 2007).

Direct comparisons of gender differences in performance are fraught with data limitations and self-selection biases (Fang & Huang, 2017). Fang & Huang (2017) argue that the relation between gender and performance per se appears to be context-specific and difficult to generalize. For instance, Kumar (2010) finds that female analysts tend to be more accurate than male analysts, and Fang & Huang (2017) find that female analysts are better educated than male ones. However, Green, Jegadeesh, & Tang (2009) find that female analysts are less accurate than their male counterparts. In carefully calibrated controlled experiment settings for competition such as Niederle & Vesterlund (2007), females and males are equally competent. Similarly, real-life trading results in Barber & Odean (2001) suggest that female and male individual investors exhibit the same investment performances.

We draw on the comparative advantage of the experimental method to disentangle the effects of analyst's gender from the set of factors that vary between actual analysts' reports (e.g.,

analyst's age, experience, employer, length of report, among others). In an experiment, we hold constant all these potentially confounding factors and focus on the variable of interest, analyst's gender. While prior archival research suggests there is no difference in male and female analysts' actual recommendations (e.g. Green et al., 2009), unsophisticated individual investors, attributing strongly-held gender stereotypes to analysts, could still interpret otherwise identical reports differently solely based on analyst's gender.

We carry out our study using $2 \times 2 \times 2$ research design with 393 participants recruited online with knowledge comparable to unsophisticated investors (Elliott, Hodge, Kennedy, & Pronk, 2007) who are tasked with making investment judgements based on an analyst's report that either recommends "buy" or "sell."¹ We randomly assign participants to read an otherwise identical report provided by a male or a female analyst, whose gender is identified via a validated name and a silhouette photo. We obtain from our participants, as part of the post-experimental demographic questions, their self-identified gender.

We replicate that, as predicted, participants showed greater belief revision upon reading a "sell" type report compared to a "buy" type report. In addition, female participants showed a greater reaction to analyst's report than male participants, particularly for "sell" type report. Furthermore, our study finds in-group favouritism among female participants, i.e., greater reaction by female investors to a report issued by a female analyst compared to an identical report issued by a male analyst, regardless of the type of the report. We do not find support for the gendered decision to be mediated by differential perceived credibility of the analyst; in fact, adding perceived analyst credibility enhances our main results.

¹ Our participants meet the FASB's (and the IASB's) criteria that users of financial reports "have a reasonable understanding of business and economic activities and are willing to study the information with reasonable diligence" (Elliott, Hodge, Kennedy, & Pronk, 2007; Financial Accounting Standards Board (FASB), 2010).

Because of the widely held perception that gender difference in risk aversion persists even at expert level, we carry out a second experiment where participants read a news article about female analysts' similar level of risk aversion as male analysts prior to making investment decisions. In other words, gender is made salient to participants. We find, unexpectedly, that making gender salient leads to a significantly smaller reaction to a female analyst's report compared to when gender is not made salient. The results suggest that by making gender salient, news coverage on female analysts could inadvertently activate gender stereotypes that are not otherwise present in a standalone investment task, such as in our main experiment. We find that once activated, gender stereotypes lead to smaller reaction to female analyst's report, and this effect is particularly strong among female investors.

This study has implications for investors, analysts, and policymakers. Results from our study suggest female investors amplify a female analyst's influence, which is at least potentially normatively correct as there is support in prior archival literature that female analysts outperform male analysts. This result, combined with the finding that female analysts perform better (Kumar, 2010), suggests that female investors would be able to reap higher financial returns with a higher number of female analysts. However, we also document an unintended consequence of media coverage of female analysts. Our study is the first to document that well-intended media coverage of female analysts could result in negative consequences for them by triggering under-reaction to their reports.

The remainder of this paper proceeds as follows. Section 2 reviews studies on gender leading to our hypotheses. Section 3 presents the research design including the manipulations as well as the measurements of constructs in our experiment. Section 4 presents our results. Section 5 provides the analysis of the effect of an intervention that makes gender salient on our results.

Section 6 concludes with a discussion of the results and their implication for financial analysts and future research.

2. Theory and hypotheses development

Our first two hypotheses seek to establish the baseline conditions, namely, the main effect of the type of analyst's report recommendation, as well as the main effect of investor's own gender, on investor's investment judgement and decision making. Analysts' reports typically contain recommendations such as "buy" or "sell" (Asquith, Mikhail, & Au, 2005), but analysts' forecasts are known to be overoptimistic (Bradshaw, 2011), and analysts are known to be reluctant to issue "sell" type of unfavourable reports. Bosquet, de Goeij, & Smedts (2014) find that analysts are on average optimistic, on average issuing "buy" type report, consistent with upward bias in the distribution of recommendations (Barber, Lehavy, & Trueman, 2007; Chen & Matsumoto, 2006). Investors aware of such a tendency should adjust their own expectations regarding the covered company taking into consideration potential overoptimistic bias by the analysts. However, it is unclear whether unsophisticated investors are aware of and adjust for such potential bias. If they do, when investors revise their belief about the company covered by an unfavourable analyst's report compared to a favourable one, investors would revise their belief to a greater extent to an unfavourable report compared to a favourable report in order to correct for analyst's overoptimistic bias. This is consistent with prior research finding investors to react more strongly to "sell" type reports than to "buy" type reports (Asquith et al., 2005; Hirst, Koonce, & Simko, 1995). Thus, our first hypothesis is a replication of the finding that unsophisticated investors will have greater reaction to a "sell" type report than a "buy" type report.

H1: When unsophisticated investors revise their beliefs about a company for investment purposes based on an analyst's report, investors have a larger change in belief of prospects for

the covered company following an unfavourable analyst's report relative to a favourable analyst's report.

We next explore the effects of gender on investor decision making. Stereotypes provide quick and easy assumptions that affect behaviour towards members of social groups (Schneider, 2004; Yzerbyt & Demoulin, 2010). Gender stereotypes are ubiquitous, as the social category of gender is fundamental to human cognition and social organization (Eagly, Nater, Miller, Kaufmann, & Sczesny, 2019). Individual's beliefs about social groups derive from their experiences with group members in their typical social roles, in which these group members are overrepresented relative to their members in the general population (Eagly, 1987; Wood & Eagly, 2012). Finance is considered a male dominated area. Less than 20% of equity analysts are female and they issue about 16% of all forecasts (Kumar, 2010).

Experimental studies of investor behaviour suggest that females are disadvantaged (in terms of investment advice received) because gender stereotypes affect how they are perceived (Bigelow, Lundmark, McLean Parks, & Wuebker, 2014; Brooks, Huang, Kearney, & Murray, 2014). Advisors provide more risk averse advice to females than males with the same risk profile leading to lower portfolio returns for female investors. Similarly, in the management literature, Lee & James (2007) find that investors react more negatively to the announcement of a female CEO than the announcement of a male CEO which they attribute to gender stereotypes about risk propensity. Supporting this view, research finds female leaders tend to receive lower evaluations than their male counterparts for the same job related behaviours (Eagly, Ashmore, Makhijani, & Longo, 1991; Heilman, 2001; Heilman, Wallen, Fuchs, & Tamkins, 2004; Kulich, Trojanowski, Ryan, Alexander Haslam, & Renneboog, 2011). This finding is attributed to individuals weighing most heavily those behaviours that they perceive as typical of a group (Tajfel, 1981), such that male stereotypical behaviours are ranked as more important in those evaluations.

Similar to the CEO setting, sell-side analysts work in a male-dominated environment, and the expected behaviour of successful analysts are stereotypically associated with males (e.g., Bloomfield, Rennekamp, Steenhoven, & Stewart, 2019). Therefore, despite the same analyst report content, female analysts may be at a disadvantage compared to male analysts due to attributions by investors about gender stereotypes that successful analysts are male. Because stereotypes are likely to influence perceiver's judgements and behaviour in ambiguous situations (Bodenhausen & Macrae, 1998) which is the case in most investment contexts, investors may be influenced by gender stereotypes (discussed further below) when incorporating information from an analyst's report (Carr & Steele, 2010) in making their investment judgments. Unsophisticated investors in particular may be prone to the influence of stereotypes as research shows professional investment experience mitigates reliance on stereotypes (Bloomfield et al., 2019).

H2: When unsophisticated investors revise their beliefs about a company's prospects for investment based on an analyst's report, investors' change in belief about company prospects in response to a female analyst's report is smaller than to an otherwise equivalent male analyst's report.

H2 is based on the assumption that unsophisticated investors' interpretation of an otherwise identical analyst's report content will be affected by analyst's gender due to investors' stereotypical assumptions about male and female analysts. However, it is possible that the investor's own gender will also affect the interpretation of the analyst's report content (e.g., Meyers-Levy & Maheswaran, 1991; Meyers-Levy & Sternthal, 1991). Research by Eckel and Grossman (2002) and Milkman et al. (2012) hint at differences in perception and subsequent responses to messages based on report recipient's gender. Milkman et al. (2012) describe results, without tabulating tests of significance, that male faculty members respond more slowly to female and minority applicants than female faculty members do, even though male faculty are more willing to meet with all applicant types than female faculty members are. However, the

study did not report explicitly whether there was a joint effect of the sender's gender (i.e., the prospective doctoral student's gender) and the recipient's gender (i.e., the faculty member's gender). Eckel and Grossman's (2002) research on the general population finds that while all participants, men or women, overestimate other women's stereotypical risk aversion, the overestimation of other women's risk aversion by men is greater than that by women. If similar results hold in our investment setting, we would expect that unsophisticated male investors, unconsciously encoding and interpreting (Scott & Brown, 2006) analyst's gender, would overestimate female analyst's risk aversion and hence underreact to an identical report's vis-à-vis female investors.

Further, researchers employing archival, experimental and survey methods have generally found women to be more risk averse than men in making judgments under uncertainty and risk (Barber & Odean, 2001; Byrnes, Miller, & Schafer, 1999; Charness & Gneezy, 2012; Croson & Gneezy, 2009; Eagly, 1995; Eckel & Grossman, 2008). Byrnes, Miller and Schafer (1999) meta-analyze 150 studies and find that men are more risk seeking overall versus females, although the magnitude of the difference varies as a function of domain. Similarly, in the financial area, Croson and Gneezy (2009) and Eckel and Grossman (2008) find that women are more risk averse than men. That is, for a given level of financial risk, women investors perceive the riskiness of an investment as higher than male investors do (see also Hallahan, Faff, & McKenzie, 2004). Charness and Gneezy (2012) and Barber and Odean (2001) document, using archival data, that women investors make smaller investments in risky assets than men do, implying that women investors are financially more risk averse. Accordingly, we hypothesize:

H3a: When unsophisticated male investors revise their beliefs about a company's prospects for investment based on a **female analyst's report** they react less strongly than unsophisticated female investors to the female analyst's report.

H3b: When unsophisticated male and female investors revise their beliefs about a company's prospects for investment based on a **male analyst's report** they will have no differential reaction to the report.

H3s focus on the report writer gender and the differential effects of report writer gender on investor judgment. We next focus on the effects on investor judgment based on investor gender and the analyst report writer's gender. Given that research shows that females hold stronger homophilous preferences, that is, preferences for those of the same gender, (also known as "in-group favouritism") (Rudman & Goodwin, 2004). This is supported by findings that female-led start-ups are more successful with female angel investors than the same observably similar male-led start-ups (Ewens & Townsend, 2019; Solal, 2019). Further, research finds that the automatic in-group favouritism is remarkably stronger in females than in males (Rudman & Goodwin, 2004). Because in-group effects are motivated by preferential treatment of members of the same group rather than hostility towards outgroup members (Brewer, 1999), the existence of in-group favouritism in female participants should lead to increased reaction towards female analyst report contents, rather than reduced reaction to male analyst report contents. Under this line of reasoning, male investors would be indifferent to the gender of the report writer. Thus, we have the following hypotheses regarding investors' gender-based reactions to a female analyst's and a male analyst's otherwise identical reports.

H4a: When unsophisticated investors revise their beliefs about a company's investment prospects based on an analyst's report, **female investors' change in belief in response a female analyst's report** is greater than that to a male analyst's report.

H4b: When unsophisticated investors revise their beliefs about a company's investment prospects based on an analyst's report, **male investors' change in belief in response to a female analyst's report is no different than their response to that of a male analyst's report.**

3. Research design and method

Our main experiment utilizes a $2 \times 2 \times 2$ research design. We manipulate the type of analyst's report ("buy" or "sell") and the analyst's gender. We elicit participant's gender through self-identification.²

3.1. Overview of Research Instrument and Participants³

The research instrument includes the following materials. First, we provide background information on a fictional, publicly-traded company, drawing from the financial and trading data of an actual public company in North America. We elicit participants' initial perception of the company's investment prospects given the background information provided (denoted as the "pre-report judgement"). The information provided is designed to be neutral such that both types of analyst's report ("buy" and "sell"), given in the next part of the instrument, are plausible. Next, we randomly assign participants to an analyst's report containing either a "buy" or a "sell" recommendation. Participants are given the opportunity to review the background information provided previously. Participants then provide judgement on the company's investment prospects again (denoted as the "post-report judgement"). Next, we ask several questions about participants' perception of the analyst's risk attitude and credibility. Finally, participants complete a post-experimental questionnaire including demographic questions and comprehension checks.

² We elicited gender by asking as part of post-experiment questions "My gender is:" and providing responses of "Female, Male, Other, I prefer not to say". To allow for self-identification as other than Female or Male, we asked a follow-up question if they chose "other": "You answered 'Other' to the question 'What is your gender'. Please specify your gender." This allowed participants to self-describe their gender in their own words.

³ Previous versions of this paper featured the results of undergraduate business students who at best could be described as naïve investors. Consistent with expectations, the rerunning of the experiment with true unsophisticated investors (as opposed to naïve undergraduate investor proxies) led to results that varied materially from those of the undergraduates. Hence, results from undergraduate students are not discussed in this paper.

Four hundred and sixty-four individuals with stock investing experience participated in the anonymous study online through Prolific platform.⁴ Mean (median) time for participants to complete the study is 26 minutes (16 minutes).⁵ Ninety percent of participants spent between 8 minutes and 42 minutes to complete the study. Therefore, we consider those participants who completed the entire study under 10 minutes combined with any other indication of lack of attention (such as failed comprehension check or out-of-range numerical estimation) as not providing meaningful responses. Thus, we limit our analysis to 393 participants (85%) out of the 464 potential participants, as documented in Table 1, Panel A.⁶ These 393 participants spend on average 26 minutes to complete the study. On average, those participants have 16 years of work experience and 9 years of investment experience.⁷ Ninety-four percent of participants plan to invest in stock markets in future. Comparing male and female participants, we find significant ($p < 0.05$) differences in work experience, investment experience, plan to invest in future, and knowledge about analysts' reports (including self-rated familiarity and experience with analysts' reports). Where these background differences make a difference in statistical inferences, we note

⁴ Following suggestions from Leiby, Rennekamp, & Trotman (2019), we use multiple screening criteria: the individual resides in United States or Canada; the individual has made investments in the common stock or shares of a company; the individual has invested in stock market in the past; when evaluating a company's stock as a potential investment, the individual examines a company's financial statements ("sometimes", "most of the time", or "always"); the individual has obtained at least 98% approval rate in their past studies. The study has obtained Research Ethics Board (i.e., IRB) approval from the authors' institution.

⁵ There is no difference in terms of time spent on the study between participants who are provided with a "buy" versus a "sell" type report. Further, there is no difference in manipulation check pass rates. Thus, it is unlikely that participants given "buy" reports engaged in peripheral route processing while those given "sell" reports engaged in central route processing. Time difference spent on task has been shown by basic research as being associated with central versus peripheral route processing (Petty & Cacioppo, 1986) where central processing requires more time on task.

⁶ Three out of the 464 potential participants declined to provide their gender. None of the participants chose "other."

⁷ We measure participants' investment experience and their financial literacy following suggestions from Krische (2019). On average, participants correctly answer 60% on an accounting knowledge test. Thus, use of those participants is justified as our experiment focuses on unsophisticated investors and requires only basic familiarity with accounting and investing (see Libby, Bloomfield, & Nelson, 2002, 803). Furthermore, using quiz scores as a covariate yields qualitatively similar results as reported in the paper.

them in our analysis.⁸ Finally, consistent with literature finding gender-based differences in risk aversion among the general population, our female participants rated themselves as significantly ($p<0.05$) more risk-averse than male participants, indicating that we had a reasonable sample from the population of interest. There are no other significant differences in demographic variables. See Table 1, Panel B for demographic information.

[Insert Table 1 here]

3.2. Analyst's Report

Based on our hypotheses, we manipulate both gender of the analyst (male and female) and type of analyst's report ("buy" and "sell") recommendation. After background information on the company and the first measurement, but prior to providing the participant with the analyst's report, we provide a short introduction to (re)familiarize participants with the role of sell-side analysts and the analyst's report. In addition, participants were informed that the brokerage that the analyst is affiliated with does not have an investment banking relationship with the covered company, nor was it involved in the initial public offering of the covered company. We provide this information to hold constant factors that prior research suggests would influence investor's reactions to analysts' reports (Hirst et al., 1995; Michaely & Womack, 1999), but are not of interest in this study.

The analyst's report provided to participants includes the analyst's recommendation, target price and earnings per share ("EPS") forecast, a risk assessment and justification for the risk assessment, and a summary statement on the outlook of the covered company. Each of these

⁸ We include work experience and investment experience as covariates, as those are objective measures that do not vary with experimental manipulations. Other subjective measures such as self-rated risk attitudes may vary with the experimental conditions due to priming, particularly in female population (Chatard, Guimond, & Selimbegovic, 2007; Steele & Ambady, 2006; Schmader, 2002), and thus are not covariates. Indeed, consistent with the self rating literature, untabulated results find that both male and female participants' self-rated risk attitudes differ significantly between those who viewed "buy" type report versus those who viewed "sell" type report.

types of information have been found to be incrementally informative in explaining stock price movements (Beyer, Cohen, Lys, & Walther, 2010). We built a consistent profile for the two report types. That is, a “buy” (“sell”) type report always had optimistic (pessimistic) price and EPS estimation, low (high) risk assessment and summary statements indicating strong (limited) growth potential. We kept the distance between current price (EPS) and estimated future price (EPS) equal but of opposite sign for “buy” versus “sell” reports.

All reports contain identical descriptions of the analyst’s education background, work experience and job title. We manipulate gender of the analyst by selecting male and female names based on the survey results in Milkman et al. (2012). They found the names “Steven Smith” and “Claire Smith” had a 100% rate of gender and race recognition as Caucasian male and Caucasian female, and the highest net gender recognition rates among their set of tested names. In addition, we use equal-sized, generic black-and-white silhouette portraits of a male (female) wearing suits and tie (a business suit and blouse). As silhouette portraits, the pictures do not contain any facial features or expressions while reinforcing gender of the analyst. We used silhouette pictures instead of real pictures of analysts to avoid introducing other variables such as the perceived attractiveness of the analyst, one that is known to influence decisions in other contexts (Eagly et al., 1991), but that is not the focus of our study. See Appendix A for a copy of “buy” report by male versus female analyst.

3.3. Dependent Variables

Investor’s beliefs about the company as a potential investment are elicited twice, after the background information on the company is given but before the analyst’s report is provided (“pre-report judgement”), as well as after the analyst’s report is provided (“post-report judgement”). We use multiple measures to elicit beliefs about the company’s prospects as a

potential investment: riskiness of the company's shares as an investment (reverse coded), attractiveness of the company's shares as an investment, likelihood to invest in the company's shares, and price appreciation potential of the company's shares.⁹ See Table 2 for all elicitation questions.

[Insert Table 2 here]

For the four items elicited on scales, the differences between the pre-report judgement and post-report judgement is denoted as the change in investors' beliefs about the company's investment prospects. These belief change measures are the main dependent variables and allow each participant to be their own control.¹⁰ This approach reduces the likelihood of the plausible alternative hypothesis that results are driven by differences in participants' initial preferences rather than information contained in the analysts' reports (Shadish, Cook, & Campbell, 2002). We perform a principal component factor analysis on the four change measurements (i.e., change in riskiness, change in attractiveness, change in price increase potential and change in likelihood to invest) to ensure that investors' belief changes in the firm's investment prospects conceptually captures one construct. Factor analysis using the four items shows only one common factor, which accounts for 72.5% of the variance, and is the only factor with eigenvalue greater than 1.00. All four items load to the same factor at 0.75 or greater. Cronbach's alpha for the four items is 0.87 suggesting the scale is reliable (Nunnally, 1978). Thus, we create a new composite variable, change in belief about the company's investment prospects, by taking the average of these four change items.¹¹ See Table 3, Panel A for descriptive statistics.

⁹ Those measures are taken from previous experimental literature on analysts' reports: see Hirst, Koonce, & Simko, (1995); Kadous, Mercer, & Thayer, (2009); Kelly, Low, Tan, & Tan, (2012).

¹⁰ We obtain stronger results when we use the final judgment for each of the four measures as the dependent variable.

¹¹ Decomposing the results by individual measure leads to a similar pattern of results with some fluctuations in levels of statistical significance dependent on the test.

To account for potential ceiling effect and floor effect (i.e., where participants' pre-report judgement of the company is so favourable or unfavourable that there is little room to react to analyst's report), we also examine participants' pre-report judgement about the company. We do not find evidence suggestive of either ceiling effect or floor effect, as mean (median) rating of the company's investment prospect is 6.00 (6.25) on a scale of 0 to 10.¹² For our results we find similar results when partitioning participants by their pre-report expectation (above or below mean), therefore we do not discuss these results in detail.¹³

[Insert Table 3 here]

4. Results

4.1. Comprehension Checks and descriptive statistics

We had participants indicate gender of the analyst who wrote the report they read.¹⁴ Twelve (3%) participants did not recall correctly the analyst's gender. As dispositional inference takes place automatically (Devine, 1989; Greenwald & Banaji, 1995), the low rate of failed comprehension checks suggests that analyst's gender is processed and recalled by our experimental participants.¹⁵ Since inferences remain the same whether we include or exclude these 12 participants, we include all participants in our analysis.

Table 3, Panel A reports the descriptive statistics of our four belief revision individual items and the composite average belief revision by report type ("buy" versus "sell"), and shows

¹² Similar to the main dependent variables, we perform a principal component factor analysis on the first measurements (i.e., riskiness, attractiveness, price increase potential and likelihood to invest). Factor analysis using the four items shows only one common factor, and is the only factor with eigenvalue greater than 1.00. All four items load to the same factor at 0.62 or greater. Cronbach's alpha for the four items is 0.84 suggesting the scale is reliable (Nunnally, 1978).

¹³ Further, the four measures of initial likelihood to invest and the average of those four were equal prior to the introduction of the analyst report, again supporting the success of random assignment and equivalent interpretation of the base case data (i.e. prior to analyst report).

¹⁴ The options are: male, female, not specified, and I do not remember.

¹⁵ In comparison, 65% of participants correctly recalled the level of education of the analyst, 83% of participants correctly recalled the type of recommendation in the report ("buy", "hold", "sell").

that investors react significantly to the analyst's report by revising their belief of the underlying company's investment prospects. Given our predictions are contingent on type of analyst's report, we perform $2 \times 2 \times 2$ MANOVA analysis on report type, analyst's gender and investor's self-identified gender to see whether the individual belief change measures react to our experimental manipulation. Results in Table 3, Panel B suggest that gender of the participant may matter given the marginally significant interaction of gender and report type ($p < 0.07$). The MANOVA also shows a statistically significant ($p = 0.000$) main effect for report type, consistent with our prediction. We report results from 2×2 MANOVA analysis, dividing our sample by analyst's gender, in Table 3, Panel C. Suggestive of analyst's gender having differential effects on participants, the interaction of participant's gender and report type is marginally significant ($p < 0.055$) for female analyst's reports but not significant for male analyst's reports. These results provide initial support that unsophisticated male and female investors react differently to an identical analyst's report. In untabulated analysis, we include as control variables the objective measures identified as differing across participant gender (i.e., investment experience and work experience), and the results remain the same.

4.2. Tests of Hypotheses

Our **H1** states that investors' belief revision will be greater following a "sell" type report, compared to a "buy" type report. Recall the purpose of H1 is to replicate prior results that investors respond more strongly to unfavourable reports than otherwise equivalent favourable reports. Consistent with our hypothesis, in Table 4, Panels A to C, we find a highly significant main effect of report type in all of our three-way and two-way ANOVA tests. Furthermore, we find that participants' reaction to a "sell" type report is significantly greater than to a "buy" type

report (-2.04 vs. 0.76, $t = 8.54$, $p < 0.000$, see Table 4, Panel E).¹⁶ Therefore, as illustrated in Figure 1, our **H1** is supported.

[Insert Figure 1 here]

H2 predicts that investors underreact to female analyst's reports based on stereotypical beliefs about analysts' successful traits. An examination of the means in Table 4, Panel E, in the row marked *TOTAL*, shows this hypothesis is not supported. In both the "buy" and "sell" report conditions, investors react more strongly to female analysts' reports than to male analysts' identical reports, albeit the opposite directional results to **H2** are not significant at conventional levels.

Our **H3s** focus on the effect of analyst report writer's gender. **H3a** argues that male investors, compared to female investors, underreact to female analyst's report. **H3b** argues that such differential reaction does not apply to male analyst's report. Consistent with the existence of gendered reaction, the three-way ANOVA (analyst gender, participant gender, type of report) in Table 4, Panel A shows a marginally significant ($p < 0.055$) interaction of analyst gender, participant gender and report type on investor's belief revision. This interaction is supported by a marginally significant ($p < 0.081$) interaction of analyst gender and report type.

To better understand the results, we separate the analysis by analyst's gender to directly test **H3a** and **H3b**. Table 4, Panel B shows the results. We find the interaction of participant gender and report type to be highly significant in response to a female analyst's report ($p < 0.009$), but not to a male analyst's report ($p > 0.900$). Thus, consistent with our gender-based theories, gendered reaction is concentrated on female analyst's report, rather than the male analyst's report and that differential reaction is contingent on the type of report ("buy" versus "sell"). This

¹⁶ Same results are obtained if one first takes the absolute value of the changes.

finding provides support for **H3a** and **H3b**. Consistent with that contingency, further analysis in Table 4, Panel D shows the results of the two-way ANOVA (participant gender, analyst gender) divided by report type. This analysis shows that the effects are concentrated in the “buy” type report whereas there is no differential reaction to the “sell” type report.

To investigate further the overall marginally significant three-way interaction in Table 4, Panel A, we also note that there is an overall marginally significant two-way interaction of participant gender and report type ($p<0.074$). Thus, we consider whether in-group favouritism (**H4a** and **H4b**) is at work by focusing on investor’s self-identified gender. Table 4, Panel C shows the results when we divide our sample by participant’s self-identified gender. We find the interaction of analyst gender and report type to be significant ($p<0.028$) among female participants, but not among male participants ($p>0.850$). Consistent with **H4a**, female participants react more strongly to female analyst than to male analyst. Given an identical “buy” report (see *Female* row under “Buy” condition of Table 4, Panel E), female participants revise their belief of the covered company more if the report is written by a female analyst than a male analyst (1.25 vs. 0.60, $p<0.039$). Given an identical “sell” report (see *Female* row under “Sell” condition of Table 4, Panel E), female participants’ differential belief revision to a female versus male analyst report is marginally significant (-2.46 vs. -1.96, $p<0.063$). Thus, female participants exhibit in-group favouritism, particularly if the analyst’s report recommends “buy.” As can be seen in the *Male* row of Table 4, Panel E, for both “buy” and “sell” types of report, male participants exhibit no differential responses (both p -values > 0.75) to a report by male versus female analyst, consistent with **H4b**. Overall, as illustrated in Figure 2, our results are in support of **H4s**, namely, female investors exhibit in-group favouritism: given an otherwise

identical report, female investors react more strongly if the report is written by a female analyst than if the report is written by a male analyst.

[Insert Figure 2 here]

4.3 Perception of analyst credibility

In our additional analysis, we first seek to understand whether investor's greater belief revision is driven by greater perceived credibility of the analyst. Consistent with prior literature in accounting (Kadous, Mercer, & Thayer, 2009; Mercer, 2005) and psychology (Berlo, Lemert, & Mertz, 1969; McCroskey, 1966), we measure perceived source credibility by asking participants to assess analyst's competence, knowledge, and qualification for providing the report, as well as analyst's trustworthiness, honesty, and truthfulness in his (her) report. In addition, consistent with Hirst, Koonce, & Venkataraman (2007), we ask participants to assess the overall believability of the report and the analyst.

Factor analysis shows the existence of only one factor with eigenvalue greater than 1.00. Reliability analysis shows a Cronbach's alpha of 0.88 for the six items noted above, suggesting that the scale is reliable (Nunnally, 1978). Consequently, we form a composite measure of perceived analyst credibility by taking the average of participants' responses to the six questions, consistent with Mercer (2005) and Hirst et al., (2007). Table 5, Panel A presents descriptive statistics for the six individual items as well as the two overall measures by report type. Table 5, Panel B presents descriptive statistics for the composite measure by analyst gender, participant gender and report type. We find no significant effect for analyst's gender, participant's gender, or report type on perceived analyst credibility. In fact, adding the perceived creditability measure to our overall ANOVAs only strengthens the reported results in the previous section. Hence, our results suggest that the gendered reaction to female analyst's report is not driven by conscious

assessment of analyst's credibility. Our results are consistent with unconscious reaction to gender of the analysts.

[Insert Table 5 here]

5. Experiment 2: The effect of making gender salient

To further explore whether gendered reaction in our results are driven by an unconscious process, we turn to the priming paradigm (see Fazio, Sanbonmatsu, Powell, & Kardes, 1986). We base our priming manipulation on the observation that in recent years, there has been an increasing amount of attention from mainstream media on barriers to women in finance (e.g., Kramer, 2019). Alongside noting a gender gap, media often emphasize that female leaders actually perform as well as, if not better than, their male counterparts.¹⁷ This type of news story provides the basis for our priming manipulation.

There are two possible reactions to such a prime. If the prime causes investors to bring into consciousness by effortful processing of gender-based information such that said information is incorporated into their investment decision making, then both male and female investors should have a similar reaction to a female analyst's report. In other words, since the gendered reaction in our main experiment appears to be unconscious, a gender news prompt that makes the process conscious should equalize the reaction across male and female investors to a female analyst's report.

¹⁷ See, for example, coverage in Financial Times alone: "Do women really make better investors than men?" (2019, <https://www.ft.com/content/f3835072-66a6-11e9-9adc-98bf1d35a056>), the byline of which reads "numerous studies suggest [females] outperform on returns"; "Female leaders boost the bottom line" (2017, <https://www.ft.com/content/f88a7c58-96ff-11e7-8c5c-c8d8fa6961bb>); "36% better return on equity for boards with more women" (2015, <https://www.ft.com/content/7325af98-9a9d-11e5-a5c1-ca5db4add713>); "Are men really hard-wired to take risks?" (2012, <https://www.ft.com/content/dffca01c-1017-11e8-8cb6-b9ccc4c4dbbb>). Likewise, McKinsey & Company consistently report a correlation between the presence of women in top management and / or governance and corporate financial performance in their annual "Women Matter" reports.

Second, the prime may activate gender stereotypes. That is, the prime may highlight the “maleness” of the equity analysts domain, and thus triggers existing but potentially latent (given we did not find evidence consistent with gender stereotypes in our main experiment) gender stereotypes. In particular, previous research in psychology has found that females are particularly prone to priming effects in traditionally male-dominated areas such as math (Chatard, Guimond, & Selimbegovic, 2007; Schmader, 2002; Steele & Ambady, 2006), where priming activates gender stereotypes, leading to female participants’ worse performance in those areas.

We consider the effect of gender salience for “sell” type report for two reasons. First, in our main experiment, participants exhibit greater reaction to a “sell” type report than “buy” type report. Second, we ask participants in our main experiment to assess how risk seeking (risk averse) they access the analyst to be. We find that male participants, compared to female participants, assess female analyst to be significantly more risk averse when the report recommends “sell” (2.58 vs. 3.63, $t = 2.18$, $p = 0.016$), but such difference does not exist in “buy” type report.

We run two additional conditions with a “gender news prompt”, where participants read a news article about female analysts before reading the same “sell” report by female or male analyst as in the previous experiment. The gender news prompt, adapted from a real news article (<https://www.cnbc.com/2018/03/08/research-finds-female-analysts-are-more-accurate-make-bolder-calls.html>), describes research finding that female analysts are not more risk averse than male analysts. Everything else in the experiment is kept the same.

Table 6 reports the results. Three-way ANOVA (participant gender, analyst gender, and gender news prompt) shows a marginally significant main effect of gender news prompt as well as a marginally significant interaction of gender news prompt and analyst’s gender (Table 6,

Panel A). We further divide our sample by analyst gender in Table 6, Panel B. Two-way ANOVAs (participant gender and gender news prompt) shows that the effect of gender news prompt is concentrated in female analyst: there is a strong main effect for gender news prompt and a marginally significant interaction for the gender news prompt by investor gender for female analyst, but not for male analyst. However, contrary to the information processing effect which would equalize reaction to male and female analyst's reports, the form of the interaction suggests that the prime activates gender stereotypes, such that investors, and female investors in particular, discount female analyst's report given the gender news prompt (see Figure 3). A post hoc contrast test (adjusted for work experience, $F(2, 267) = 4.67$, $p < 0.02$) finds that female analyst's report spurs weakest reaction from investors when there is a gender news prompt (-1.74 vs -2.05, $F(1, 267) = 3.11$, $p < 0.08$). See Table 6, Panel C for the adjusted (for work experience) mean effects and Panel D for all mean effects.

To probe these results further, and consistent with prior research that suggests priming will result in stronger gender stereotypes in female participants, we compare the reaction of female investor participants with a gender news prompt to all other conditions. We find a significant overall contrast effect ($F(2, 267) = 4.08$, $p < 0.01$) when, as above, we adjust for the work experience covariate. The specific contrast between female investors with gender news prompt and all other conditions is marginally significant (-1.31 vs -1.95, $F(1, 267) = 3.78$, $p < 0.055$).

[Insert Table 6 here]

[Insert Figure 3 here]

Thus, our additional analysis documents an unexpected negative consequence of media exposure about female analyst abilities being equal to those of male analysts. Namely, when

gender is made salient to unsophisticated female investors, they “over-correct” their in-group favouritism, resulting in a smaller reaction to female analyst’s report compared to male analyst’s identical report. Our finding echoes previous calls that it is important for us to better understand interventions designed to de-bias gender stereotypes in decision-making (Abraham, 2017; Dencker, 2008).

6. Conclusion

In this study, we employ experimental methods to examine the joint effects of unsophisticated investor’s self-identified gender and analyst report writer’s gender on investor’s reaction to an analyst’s report. The experimental method gives us the comparative advantage by providing a “clean” test of theory as it allows for strong experimental control over differences in the information set that confounds market-level studies (even if the archival data were available) on this topic. While previous research finds that unsophisticated investors process various information items found in analysts’ reports (Hirst et al., 1995; Kelly et al., 2012; Maines, 1995; Winchel, 2015), there is no prior research on whether investors interpret such reports through a gendered lens with consequences for their investment decision making. We replicate previous research by predicting and finding that unsophisticated investors react more strongly to “sell” type report than to “buy” type report and in particular, given a “sell” type report, unsophisticated female investors react more strongly than unsophisticated male investors. We further find that unsophisticated investor’s self-identified gender and the analyst’s gender jointly influence investors’ judgments about a company’s investment prospects. We find in-group favouritism among female investors, as unsophisticated female investors react more strongly to a female analyst’s report compared to an identical report by a male analyst.

Previous literature finds that female investors are less risk averse when their financial advisor is female than when their financial advisor is male (Baeckstrom, Marsh, & Silvester, 2019). Our finding that female investors exhibit greater reaction to female analysts, combined with the finding that female analysts perform better (Kumar, 2010), suggests that female investors would be better off through higher financial returns when a higher number of female analysts are available. However, we also find that a deliberate focus on analyst gender does not have the effect of neutralizing investors' gendered reaction to analyst's report. We find that when gender is made salient through a news article emphasizing female analysts' similar attributes compared to male analysts, such a prompt actually leads to lower reaction to female analyst's report compared to when no such prompt is present. Furthermore, this effect is especially pronounced among unsophisticated female investors.

This paper also contributes to psychology research on gender. Our finding suggests that message recipient's gender and message sender's gender interact to influence the message recipient's interpretation of the message contents. Psychology research to date has only documented that gender of the message sender affects responses of the message recipient (e.g., Milkman et al., 2012) but has not explored the interaction of sender's gender and recipient's gender, nor the question of whether the content of the message matters.

Of course, there are limitations to our research. First, we use only one company in our experiment. To the extent that participant reaction to this company is not typical compared to their normal reactions, the results may be biased. However, an archival researcher who has read hundreds of analysts' reports reviewed our experiment material and found it consistent with the contents of actual reports. Second, our analyst's gender manipulation employed Caucasian names. We leave it to future research to see if such results generalize to other racial groups, or if

such implicit bias exists across racial groups. Third, given the use of a third-party provider of unsophisticated investors, as compared to using a more controlled experimental setting with students, we may have unintendedly induced more noise into the experimental data. However, given the sharp differences in reactions from our extensive pilot tests with upper-level undergraduate business students who have little investment experience, we believe the trade-off of control for investor experience is appropriate.

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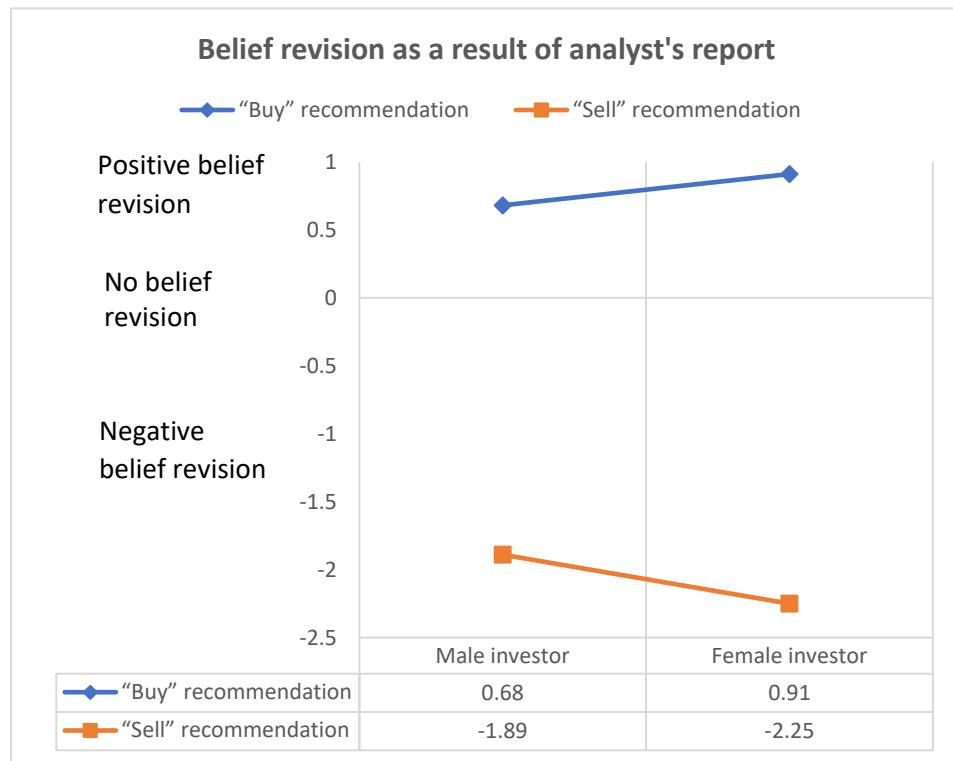
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Figure 1 The effect of report type and investor gender on investor's belief revision about company's investment prospects after reading analyst's report

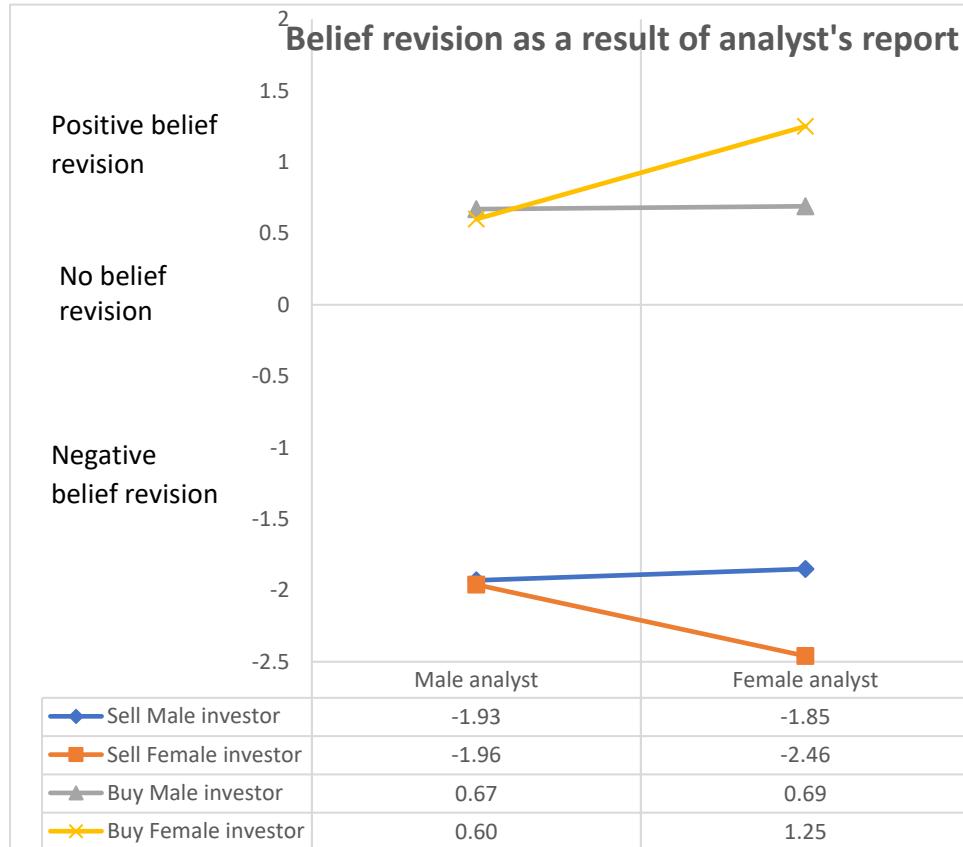


Belief revision is measured as differences between each participant's initial, pre-report assessment of the company and their post-report assessment of the company. Participants indicate on a scale from 0 to 10 how attractive is the company's stock as an investment, the price increase potential of the company's stock, their likelihood to invest in the company's stock, and the riskiness of the investment. Pre-report (post-report) belief about the company's investment prospective is calculated as average of the responses to these four questions. Higher positive values and lower negative values indicate greater belief revision in the positive and negative directions, respectively.

Participants are randomly assigned to read one of four types of analyst's report: a "buy" type report issued by a female analyst; a "buy" type report issued by a male analyst; a "sell" type report issued by a female analyst; a "sell" type report issued by a male analyst.

See Table 4, Panel E for detailed descriptive statistics.

Figure 2 The effect of report type, analyst gender and investor gender on investor's belief revision about company's investment prospects after reading analyst's report

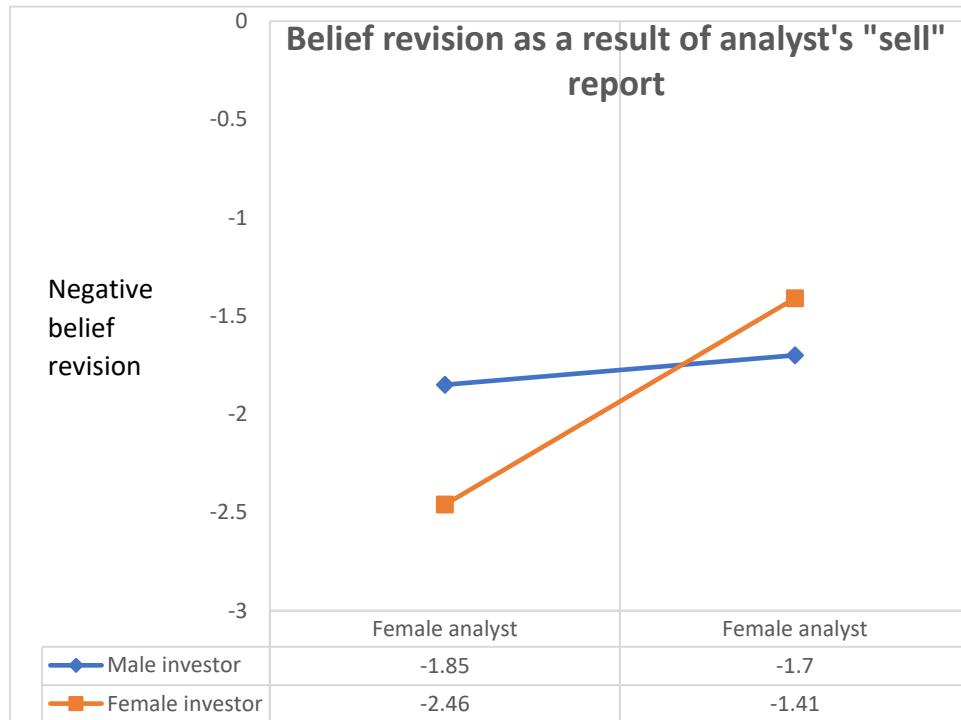


Belief revision is measured as differences between each participant's initial, pre-report assessment of the company and their post-report assessment of the company. Participants indicate on a scale from 0 to 10 how attractive is the company's stock as an investment, the price increase potential of the company's stock, their likelihood to invest in the company's stock, and the riskiness of the investment. Pre-report (post-report) belief about the company's investment prospective is calculated as average of the responses to these four questions. Higher positive values and lower negative values indicate greater belief revision in the positive and negative directions, respectively.

Participants are randomly assigned to read one of four types of analyst's report: a "buy" type report issued by a female analyst; a "buy" type report issued by a male analyst; a "sell" type report issued by a female analyst; a "sell" type report issued by a male analyst. Participant identify their own gender in post-experimental questionnaire.

See Table 4, Panel E for detailed descriptive statistics.

Figure 3 The effect of report type, investor gender, and gender news prompt on investor's belief revision about company's investment prospects after reading analyst's "sell" type report



Belief revision is measured as differences between each participant's initial, pre-report assessment of the company and their post-report assessment of the company. Participants indicate on a scale from 0 to 10 how attractive is the company's stock as an investment, the price increase potential of the company's stock, their likelihood to invest in the company's stock, and the riskiness of the investment. Pre-report (post-report) belief about the company's investment prospective is calculated as average of the responses to these four questions. Lower negative values indicate greater belief revision in a negative direction.

In the "with gender news prompt" conditions, participants read a news article about female analysts' similar risk aversion to male analyst prior to reading analyst's report.

See Table 6, Panel D for detailed descriptive statistics.

Table 1 Participant inclusion criteria, and demographic information**Panel A:** Effective Sample Size

Total potential participants	464
Incomplete answers (missing dependent variables)	(56)
Answers indicating lack of processing based on time and comprehension checks	
Completed the study in less than 10 minutes ¹⁸ and failed comprehension check question on analyst's gender	(3)
Completed the study in less than 10 minutes and failed comprehension check question on analyst's recommendation	(7)
Completed the study in less than 10 minutes and first EPS estimate smaller than \$1.4 or greater than \$4 ¹⁹	(2)
Missing participant gender	(3)
Effective sample size	393
Distributed among conditions:	
Experimental (bias-unconscious conditions)	
• Analyst recommendation – “Buy”	122
• Analyst recommendation – “Sell”	134
Total experimental main test (bias-unconscious conditions)	256
Total supplemental test (bias-conscious conditions)	137

Panel B: Demographic information mean (SD) where **p<0.05** for difference between male and female participants (included as covariates in the following ANOVA analysis) (Note 1)

	Male participants	Female participants	Total / Average
Gender	246	147	393
Work experience in years	14.43 (10.95)	19.54 (12.49)	16.35 (11.80)
Investment experience in years	8.72 (7.85)	10.57 (9.14)	9.41 (8.39)
Plan to invest in future	98% (0.14)	88% (0.32)	94% (0.23)
Familiarity with analyst's reports (Note 2)	6.15 (2.10)	5.35 (2.36)	5.85 (2.23)
Read analyst's reports before	93% (0.25)	88% (0.33)	91% (0.29)
Self-reported risk aversion (Note 3)	5.39 (2.36)	4.51 (2.27)	5.06 (2.36)

¹⁸ On average, participants spent 27 minutes to complete the study. 90% of participants spent between 9 minutes and 42 minutes.

¹⁹ Given EPS from Q1 to Q3 sums to \$2.85, a full-year EPS estimate greater than \$4 or smaller than \$1.4 would imply that Q4's EPS is less than \$(1.45) or greater than \$1.2, neither of which appears reasonable given 10 quarters of historical information. Furthermore, the two participants both entered a round number, which, combined with short completion time, is suggestive of lack of processing.

Self-reported risk aversion in financial domain (Note 4)	5.73 (2.33)	4.63 (2.44)	5.32 (2.42)
-------------------------------------------------------------	----------------	----------------	----------------

Note 1: Untabulated analysis shows that none of the demographic variables differs significantly by recommendation or by analyst's gender (the only exception is that familiarity with analyst's report is higher for female analyst condition compared to male analyst condition, $p = 0.036$), indicating successful randomization across conditions.

Note 2: Participants are asked to indicate how familiar they are with analyst's reports on a scale of 0 (not familiar at all) to 10 (very familiar).

Note 3: Participants are asked to report how risk averse (risk seeking) they are on a scale of -5 (very risk averse) to 5 (very risk seeking) with 0 labeled as risk neutral. We recoded the results to values 0 to 10 for our analysis.

Note 4: Participants are asked to report how risk averse (risk seeking) they are when it comes to investing in the stock market on a scale of -5 (very risk averse) to 5 (very risk seeking) with 0 labeled as risk neutral. We recoded the results to values 0 to 10 for our analysis.

Table 2 Variables and measures elicited

Panel A: Dependent variables

Belief about company's investment prospects (elicited twice, pre- and post-report)	
Riskiness	How risky an investment are Northeast's shares if purchased today?* 0 (not risky at all) to 10 (very risky)
Attractive-ness	How attractive or unattractive are Northeast's shares to you as a potential investment today? ** -5 (very unattractive) to 5 (very attractive)
Price increase potential	The company is currently trading at \$112. What is the potential that the price of Northeast's shares will increase over the next 12 months? 0 (no potential at all) to 10 (very strong potential)
Likelihood to invest	How likely are you to invest in Northeast's shares today? 0 (not at all likely) to 10 (definitely)
Prediction estimates ((elicited twice, pre- and post-report)	
EPS prediction	EPS to date from Q1 to Q3 is \$2.85. What do you predict will be Northeast's annual earnings per share (EPS) for the year ended January 31, 2019? Please enter a number, ignoring dollar sign.

Panel B: Measures elicited post-report

1. Perception of analyst credibility **

How believable or unbelievable is Steven / Claire Smith as an analyst? -5 (not at all believable) to 5 (very believable)
How believable or unbelievable is Steven / Claire Smith's analyst report? -5 (not at all believable) to 5 (very believable)
Steven / Claire Smith is a very competent sell-side analyst. -5 (strongly disagree) to 5 (strongly agree)
Steven / Claire Smith has little knowledge about how to write a useful analyst report for companies in this industry. * -5 (strongly disagree) to 5 (strongly agree)
Steven / Claire Smith is highly qualified to write analyst reports for companies in this industry. -5 (strongly disagree) to 5 (strongly agree)
I believe that Steven / Claire Smith is very honest. -5 (strongly disagree) to 5 (strongly agree)
I believe that Steven / Claire Smith may not be truthful in their analyst's report. * -5 (strongly disagree) to 5 (strongly agree)

Steven / Claire Smith's analyst report on Northeast is:
-5 (not at all trustworthy) to 5 (very trustworthy)

2. Perception of analyst risk attitude

Considering Steven / Claire Smith's risk attitude, he / she seems to be: **

-5 (very risk averse) to 5 (very risk seeking)

Considering Steven / Claire Smith's analyst report, the report seems to be: **

-5 (very risk averse) to 5 (very risk seeking)

Compared to your expectations, Steven / Claire Smith's analyst's report on Northeast is: **

-5 (not at all consistent with expectations) to 5 (very consistent with expectations)

Steven / Claire Smith's analyst's report on Northeast Beverage Co. is: **

-5 (very pessimistic) to 5 (very optimistic)

Steven / Claire Smith's incentives to issue reports with the type of recommendation contained in the report for Northeast is: **

-5 (very low) to 5 (very high)

Steven / Claire Smith's analyst's report on Northeast is:

0 (not bold at all) to 10 (very bold)

* Reverse coded in our analysis

** All items with a scale of -5 to 5 are recoded to values 0 to 10 for our analysis

Table 3 Dependent variables descriptive statistics

Panel A: Mean (standard deviation) beliefs about company's investment prospects by report type (Note 1, Note 2)

“Buy” recommendation	Before “buy” recommendation	After “buy” recommendation	Change in belief about company’s investment prospects
Riskiness	5.30 (1.85)	6.31 (1.88)	1.02*** (1.62)
Attractiveness	6.63 (1.81)	7.28 (1.79)	0.65*** (1.25)
Price increase potential	6.42 (1.88)	7.16 (1.77)	0.75*** (1.38)
Likelihood to invest	5.65 (2.27)	6.29 (2.38)	0.64*** (1.18)
Average	6.00 (1.60)	6.76 (1.65)	0.76*** (0.88)

“Sell” Recommendation	Before “sell” recommendation	After “sell” recommendation	Change in belief about company’s investment prospects
Riskiness	5.29 (1.84)	3.71 (1.89)	-1.58*** (1.89)
Attractiveness	6.70 (1.91)	4.32 (2.26)	-2.38*** (1.96)
Price increase potential	6.45 (1.98)	4.53 (2.03)	-1.92*** (1.86)
Likelihood to invest	5.57 (2.36)	3.87 (2.27)	-1.69*** (1.73)
Average	5.93 (1.65)	3.89 (1.72)	-2.04*** (1.46)

*** t-test against null hypothesis of no change in belief p<0.01

Note 1: Participants are asked to judge the company before and after reading an analyst’s report. The report writer is either a female or male analyst; the report either recommends “buy” or “sell”. Participants provide their responses to the following four items on an 11-point scale: riskiness, attractiveness, price increase potential and likelihood to invest. All scales are recoded to 0 to 10.

Note 2: Factor analysis on the four scale-based variables (riskiness, attractiveness, price increase potential and likelihood to invest) indicates only one factor with eigenvalue greater than 1. All variables have greater than 0.75 factor loadings. Cronbach’s alpha for the four items is 0.870, indicating the scale is reliable (Nunnally, 1978).

Panel B: Three-way (participant gender, analyst gender and report type) MANOVA results for four belief change measures about company's investment prospects#

Independent variables	Wilk's lambda	df	F-value	p-value
Model	0.38	7	9.63	0.000
Report type	0.43	1	82.17	0.000
Analyst gender	0.99	1	0.76	0.555
Participant gender	0.98	1	1.14	0.336
Analyst gender × report type	0.98	1	1.24	0.297
Analyst gender × participant gender	0.99	1	0.17	0.956
<i>Participant gender × report type</i>	<i>0.96</i>	<i>1</i>	<i>2.26</i>	<i>0.063</i>
Analyst gender × participant gender × report type	0.98	1	1.26	0.287

Panel C: Two-way (participant gender, report type) MANOVA results for four belief change measures about company's investment prospect by analyst's gender#

Female analyst

Independent variables	Wilk's lambda	df	F-value	p-value
Model	0.36	3	13.46	0.000
Report type	0.38	1	52.30	0.000
Participant gender	0.98	1	0.83	0.511
<i>Participant gender × report type</i>	<i>0.93</i>	<i>1</i>	<i>2.39</i>	<i>0.054</i>

Male analyst

Independent variables	Wilk's lambda	df	F-value	p-value
Model	0.42	3	9.78	0.000
Report type	0.46	1	33.78	0.000
Participant gender	0.98	1	0.47	0.761
Participant gender × report type	0.96	1	1.09	0.363

all statistical tests reported here and in the paper are two tailed unless otherwise noted

Table 4 Investor's belief revisions as a result of reading analyst's report

Panel A: Three-way (participant gender, analyst gender and report type) ANOVA results for average belief change about company's investment prospects#

Source of Variation	df	MS	F-value	p-value
Model	7	73.49	50.13	0.000
Report type	1	487.21	332.38	0.000
Analyst gender	1	0.22	0.15	0.702
Participant gender	1	0.08	0.06	0.815
Analyst gender × participant gender	1	0.01	0.01	0.925
<i>Analyst gender × report type</i>	<i>1</i>	<i>4.51</i>	<i>3.07</i>	<i>0.081</i>
<i>Participant gender × report type</i>	<i>1</i>	<i>4.74</i>	<i>3.23</i>	<i>0.073</i>
<i>Analyst gender × participant gender × report type</i>	<i>1</i>	<i>5.50</i>	<i>3.75</i>	<i>0.054</i>
Residual	212	1.46		

Panel B: Two-way (participant gender, report type) ANOVA results for **average belief revision** about company's investment prospect by analyst's gender#

Female analyst

Source of Variation	df	MS	F-value	p-value
Model	3	104.25	70.25	0.000
Report type	1	307.58	207.27	0.000
Participant gender	1	0.02	0.01	0.920
Report type × participant gender	1	10.75	7.24	0.008
Residual	132	1.48		

Male analyst

Source of Variation	df	MS	F-value	p-value
Model	3	66.79	46.22	0.000
Report type	1	189.83	131.36	0.000
Participant gender	1	0.08	0.05	0.819
Report type × participant gender	1	0.01	0.01	0.923
Residual	116	1.445		

Panel C: Two-way (analyst's gender, report type) ANOVA results for **average belief revision** about company's investment prospect by participant gender#

Female participant

Source of Variation	df	MS	F-value	p-value
Model	3	84.45	53.31	0.000
Report type	1	239.47	151.18	0.000
Analyst gender	1	0.14	0.09	0.770
Report type × analyst gender	1	8.13	5.13	0.026
Residual	96	1.58		

Male participant

Source of Variation	df	MS	F-value	p-value
Model	3	85.72	61.62	0.000
Report type	1	256.32	184.25	0.000
Analyst gender	1	0.08	0.06	0.812
Report type × analyst gender	1	0.03	0.02	0.880
Residual	152	1.39		

Panel D: Two-way (analyst's gender, participant gender) ANOVA results for average belief revision about company's investment prospects by report type#

Buy Report

Source of Variation	df	MS	F-value	p-value
Model	3	2.05	2.75	0.046
Analyst gender	1	3.13	4.20	0.043
Participant gender	1	1.68	2.25	0.136
<i>Analyst gender × participant gender</i>	<i>1</i>	<i>2.84</i>	<i>3.80</i>	<i>0.054</i>
Residual	118	0.75		

Sell Report

Source of Variation	df	MS	F-value	p-value
Model	3	2.58	1.22	0.306
Analyst gender	1	1.47	0.70	0.406
Participant gender	1	3.24	1.53	0.218
<i>Analyst gender × participant gender</i>	<i>1</i>	<i>2.67</i>	<i>1.26</i>	<i>0.264</i>
Residual	130	2.12		

Panel E: Average belief revision about company's investment prospects mean (standard deviation) by analyst report type, analyst gender and participant gender

Report type Analyst gender <i>Participant gender</i>	“Buy” recommendation			“Sell” recommendation		
	Male analyst	Female analyst	TOTAL	Male analyst	Female analyst	TOTAL
<i>Male</i>	0.67 (0.89) N = 38	0.69 (0.90) N = 40	0.68 (0.89) N = 78	-1.93 (1.44) N = 35	-1.85 (1.38) N = 43	-1.89 (1.40) N = 78
<i>Female</i>	0.60 (0.67) N = 23	1.25 (0.94) N = 21	0.91 (0.86) N = 44	-1.96 (1.59) N = 24	-2.46 (1.46) N = 32	-2.25 (1.53) N = 56
<i>TOTAL</i>	0.64 (0.81) N = 61	0.88 (0.94) N = 61	0.76 (0.88) N = 122	-1.94 (1.49) N = 59	-2.11 (1.44) N = 75	-2.04 (1.46) N = 134

all statistical tests reported here and in the paper are two tailed unless otherwise noted

Table 5 Perceived analyst credibility

Panel A: Means (standard deviation) investors perception of analyst credibility by report type

Type: “Buy” recommendation	Male analyst	Female analyst	Difference (std. error)
Analyst knowledge and individual traits evaluation			
Analyst competence	6.62 (1.87)	6.54 (1.85)	0.08 (0.34)
Analyst knowledge of industry	6.89 (2.00)	6.62 (2.69)	0.26 (0.43)
Analyst qualification to write report	6.97 (1.61)	7.16 (1.95)	-0.20 (0.32)
Analyst honest	6.77 (2.22)	7.08 (1.89)	-0.31 (0.37)
Analyst truthful	6.41 (2.49)	6.00 (2.70)	0.41 (0.47)
Analyst trustworthy	7.00 (1.87)	7.10 (1.75)	-0.10 (0.33)
Overall measures			
Analyst believability	7.16 (2.10)	7.34 (1.88)	-0.18 (0.36)
Analyst report believability	7.33 (2.13)	7.31 (2.01)	0.02 (0.38)

Type: “Sell” recommendation – without gender news prompt	Male analyst	Female analyst	Difference (std. error)
Analyst knowledge and individual traits evaluation			
Analyst competence	7.03 (1.90)	6.96 (1.86)	0.07 (0.33)
Analyst knowledge of industry	7.05 (2.37)	7.44 (2.42)	-0.39 (0.42)
Analyst qualification to write report	7.12 (1.72)	7.27 (1.84)	-0.15 (0.31)
Analyst honest	7.31 (1.72)	7.21 (1.84)	0.09 (0.31)
Analyst truthful	6.63 (2.45)	7.04 (2.45)	-0.41 (0.43)
Analyst trustworthy	7.10 (1.72)	7.11 (1.98)	0.00 (0.99)
Overall measures			
Analyst believability	7.47 (1.41)	7.27 (1.99)	0.21 (0.31)
Analyst report believability	7.27 (1.97)	7.39 (2.15)	-0.12 (0.36)

Panel B: Mean (standard deviation) of perceived analyst credibility (using six analyst knowledge and traits) by analyst report type, analyst gender and participant gender

Report type Analyst gender <i>Participant gender</i>	“Buy” recommendation			“Sell” recommendation		
	Male analyst	Female analyst	TOTAL	Male analyst	Female analyst	TOTAL
<i>Male</i>	6.67 (1.52) N = 38	6.70 (1.68) N = 40	6.69 (1.59) N = 78	7.09 (1.67) N = 35	6.91 (1.84) N = 43	6.99 (1.75) N = 78
<i>Female</i>	7.26 (1.51) N = 23	7.27 (1.66) N = 21	7.26 (1.67) N = 44	7.18 (1.23) N = 24	7.61 (1.44) N = 32	7.43 (1.36) N = 56
<i>TOTAL</i>	6.89 (1.53) N = 61	6.90 (1.68) N = 61	6.89 (1.60) N = 122	7.12 (1.49) N = 59	7.21 (1.71) N = 75	7.17 (1.61) N = 134

Table 6 Investor's belief revision with and without gender news prompt

Panel A: Three-way (participant gender, analyst gender and gender news prompt) ANOVA results for average belief change about company's investment prospects measure for sell recommendation with gender news prompt and without gender news prompt#

Source of Variation	df	MS	F-value	p-value
<i>Model</i>	8	3.91	1.87	0.065
<i>Gender news prompt (GNP)</i>	1	6.71	3.21	0.074
Participant gender	1	0.27	0.13	0.718
Analyst gender	1	0.59	0.28	0.595
Analyst gender × Participant gender	1	1.11	0.53	0.466
<i>GNP × Participant gender</i>	1	7.497	3.59	0.059
GNP × Analyst gender	1	0.00	0.00	0.968
GNP × Analyst gender × Participant gender	1	4.99	2.39	0.123
Work experience	1	11.13	5.33	0.022
Residual	261	2.09		

Panel B: Two-way (participant gender, gender news prompt) ANOVA results for average belief revision about the company's investment prospect by analyst gender#

Male analyst

Source	df	MS	F-value	p-value
Model	4	3.39	1.54	0.196
Gender news prompt (GNP)	1	0.02	0.01	0.929
Participant gender	1	0.00	0.00	0.968
Participant gender × GNP	1	0.51	0.23	0.632
Work experience	1	10.76	4.88	0.029
Residual	122	2.21		

Female analyst

Source	df	MS	F-value	p-value
Model	4	4.86	2.45	0.049
Gender news prompt (GNP)	1	13.39	6.74	0.010
Participant gender	1	0.30	0.15	0.697
<i>GNP × Participant gender</i>	1	6.02	3.03	0.084
Work experience	1	2.26	1.14	0.289
Residual	138	1.99		

Panel C: Average belief revision about company's investment prospects adjusted means* (standard error) by analyst report type, participant gender and gender news prompt

Report type	“Sell” recommendation – no prompt		“Sell” recommendation – with gender news prompt	
Analyst gender <i>Participant gender</i>	Male analyst	Female analyst	Male analyst	Female analyst
<i>Male</i>	-1.93 (0.245)	-1.94 (0.223)	-1.83 (0.224)	-1.68 (0.213)
	N = 35	N = 43	N = 44	N = 46
<i>Female</i>	-1.89 (0.297)	-2.41 (0.256)	-2.06 (0.292)	-1.32 (0.310)
	N = 24	N = 32	N = 25	N = 22

*Adjusted mean evaluated at average work experience of 16.2

Panel D: Average belief revision about company's investment prospects unadjusted means (standard deviation) by analyst report type, participant gender and gender news prompt

Report type	“Sell” recommendation – no prompt			“Sell” recommendation – with gender news prompt		
	Male analyst	Female analyst	TOTAL	Male analyst	Female analyst	TOTAL
<i>Male</i>	-1.93 (1.44)	-1.85 (1.38)	-1.89 (1.40)	-1.75 (1.42)	-1.70 (1.41)	-1.73 (1.41)
	N = 35	N = 43	N = 78	N = 44	N = 46	N = 90
<i>Female</i>	-1.96 (1.59)	-2.46 (1.46)	-2.25 (1.53)	-2.16 (1.64)	-1.41 (1.39)	-1.81 (1.56)
	N = 24	N = 32	N = 56	N = 25	N = 22	N = 47
<i>TOTAL</i>	-1.94 (1.49)	-2.11 (1.44)	-2.04 (1.46)	-1.90 (1.51)	-1.61 (1.40)	-1.75 (1.45)
	N = 59	N = 75	N = 134	N = 69	N = 68	N = 137

all statistical tests reported here and in the paper are two tailed unless otherwise noted

Appendix A “Buy” type analyst’s report by a male analyst and a female analyst

Recommendation: Buy



Steven Smith, MBA
Analyst
steven.smith@cimballiant.com

ABOUT THE ANALYST

STEVEN SMITH, MBA, is an equity research analyst specializing in the consumer products sector.

Steven received both Bachelor of Science and M.B.A. from a well-recognized university. He has been an analyst for ten years.

Northeast Beverage Co.

Current Price:	\$112
12-mo. target price:	\$125
Actual EPS for the year ended Jan 31, 2018:	
\$3.83	
Estimated EPS for the year ended Jan 31, 2019:	
\$3.96	

Risk Assessment

Low	Medium	High
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The risk assessment reflects a growing demand for the company’s products that is unlikely to be affected by changes in competition or in the economy. Hence, wide swings are unlikely in demand for the company’s products.

Furthermore, the new beverage products developed and produced for selective holidays and ceremonial dates are innovative and thus expected to be well-received among consumers.

Summary: Northeast Beverage Co. is well-positioned to sustain above market returns. Northeast Beverage shows strong potential for earnings growth hence substantial stock price appreciation. Northeast Beverage will enjoy strong success due to its expansion plans.

Recommendation: Buy



Claire Smith, MBA

Analyst

claire.smith@cimballiant.com

ABOUT THE ANALYST

CLAIRE SMITH, MBA, is an equity research analyst specializing in the consumer products sector.

Claire received both Bachelor of Science and M.B.A. from a well-recognized university. She has been an analyst for ten years.

Northeast Beverage Co.

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12-mo. target price: \$125

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\$3.83

Estimated EPS for the year ended Jan 31, 2019:
\$3.96

Risk Assessment

Low

Medium

High

The risk assessment reflects a growing demand for the company's products that is unlikely to be affected by changes in competition or in the economy. Hence, wide swings are unlikely in demand for the company's products.

Furthermore, the new beverage products developed and produced for selective holidays and ceremonial dates are innovative and thus expected to be well-received among consumers.

Summary: Northeast Beverage Co. is well-positioned to sustain above market returns. Northeast Beverage shows strong potential for earnings growth hence substantial stock price appreciation. Northeast Beverage will enjoy strong success due to its expansion plans.