

**THE JOINT EFFECT OF ANIMATED GRAPHS AND MOTION VERBS
ON INVESTOR JUDGMENTS**

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Summary

Within the context of accounting disclosures, firms often have significant control over the manner in which data is presented and the language used to present these disclosures. I examine two features of the disclosure setting. I predict that the use of animated graphs or static graphs in accounting disclosures can influence investor investment judgments, but the effect of this depends on the type of language used in the disclosure. I experimentally test my prediction using an investor day transcript in which the graphs used are either animated or static, and the language used either contains motion verbs or does not. I further add two additional control conditions in which I keep the vividness of the language low in order to examine the effects of animated or static graphs. As predicted, I find that animated graphs result in more favorable investment judgments than when static graphs are used, but only when used in conjunction with motion verbs. I identify a new data visualization feature in the accounting disclosure setting, the animation of graphs, and how it influences investor judgments.

I. INTRODUCTION

Recent advances in data visualization and analytics technology have made powerful data visualization tools increasingly ubiquitous. A survey conducted found that adoption of such data analytics technology soared from 17% of firms polled in 2018 to 59% of firms polled in 2018 (Columbus 2018). A hallmark of such data analytics tools is the ability to present data simply in the form of data visualizations. This dissertation reports an experimental examination of the joint influence of the type of data visualizations and language type on investors' investment judgments about a firm. Specifically, I examine whether the use of static graphs versus animated graphs and whether the firm makes use of motion verbs in presenting the graphs interactively influence an investor's general willingness to invest in a firm.

I examine this question within the investor day setting. The recent decade has seen a stark increase in the number of firm-organized investor days, with the number of firms organizing such investor days rising to 624 in 2016 (Park, 2019). Understanding the impact of the information presented at such investor-day events is important, given that there is an observed three-day abnormal absolute return and three-day abnormal share turnover increase by about 29 percent and 27 percent, respectively, from the estimation period (Kirk and Markov 2016). Furthermore, while attendance at investor days has traditionally been limited to analysts and institutional investors, retail investors have in recent years increasingly gained access to such events as firms are more likely to cast these events over the web. Discussions of such events are also increasingly gaining traction on social media. For example, a discussion thread about Disney's 2020 investor day (held on December 10, 2020) on Reddit saw 2700 comments, and a similar discussion thread on Tesla's Autonomy Investor Day on 23rd April 2019 saw about 500 comments. Investor-day events still represent an understudied disclosure channel by academic researchers relative to other channels such as earnings calls and conference presentations even though practitioners view investor days as an important disclosure channel.

As the organization of investor days is less constrained by SEC requirements and less structured, firms have substantially more control over the timing of the event, information content presented at the event, format, as well as the duration of the event. With the advent of advances in data visualizations, firms are increasingly using animated charts at investor days to help visualize data such as trends and forecasts. In such circumstances, investors rarely have all the information they need to make a decision and resort to using visual information to make cognitive inferences (Raghubir and Das 1999). Given that individuals use such visual information to make cognitive inferences, the use of data visualization techniques can systematically influence investor judgments. Though not specifically in relation to investor days, the SEC is at least aware of this possibility. The SEC recommends that investment advisers and dealers use “*charts, graphs, and other graphics* or text features to explain the required information so long as the information does not, because of the nature, quantity, or *manner of presentation*, obscure or impede understanding of the information that must be included” (SEC 2018 p. 21553).

One form of data visualization that is more commonly used during investor days is the use of animation to highlight recent trends or forecasts in the specific type of financial or non-financial data that is presented. The use of such animations in data visualization can influence the ability of individuals to recognize data values and trends (Heer and Robertson 2007), recall data values more accurately (Robertson et al 2008), and perceive volatility in time-varying data values (Kim and Lakshmanan 2021). Theory suggests that the use of animations in data visualizations can then influence investors’ ability to perceive trends, as well as make such trends more salient for investors (Duclos 2015). However, extant literature also finds that the effects of animated graphs can be attenuated under high cognitive load (Goldstein et al. 2014; Robertson et al. 2008). Processing financial information coupled with graphs is typically a high cognitive load task due to the amount of information readers are tasked to recall and

process. Hence, whether animated graphs influence viewers within the financial disclosure setting remains an open question. However, investors are unlikely to view such graphs, whether static or animated, independent of any other contextual features of the disclosure. Within an investor day setting, speakers are likely to be talking about the information presented within the graphs while the graphs are displayed. This raises the possibility that the language used in the presentation might moderate the effect of using animated graphs.

A burgeoning literature in financial reporting has examined how the tone of printed and spoken words in financial reporting influences investors' response to non-numerical corporate disclosures (see Li 2010 and Loughran and McDonald 2016 for a review). While accounting rules serve to constrain how numbers convey information about a company's financial performance, there are few such rules on the use of language to convey information, even in conference calls or earnings releases. One such stream of literature (see Hales, Kuang, and Venkataraman 2010; Bochkay, Hales, and Chava 2020) has examined how managers can make use of more extreme language to describe positive earnings growth (e.g., soaring beyond analyst expectations or surpassing analyst expectations). Prior studies examining the use of vivid language have conceived of vivid language as a singular construct that spans a spectrum of more vivid to less vivid. However, the linguistics literature suggests that vivid language is made up of both figurative and literal language.

Figurative language refers to the use of words or phrases in a way other than the usual or literal meaning to conjure a mental image (Lazar 1996). Such language often invokes the use of motion verbs in conveying abstract motion (Matlock 2004). I investigate whether the use of motion verbs in describing events interacts with the use of animated graphs in influencing investor judgments, compared to when non-motion verbs are used. My view is informed by the extensive literature examining the use of motion verbs in embodied cognition. Language processing often involves the action, emotion, and perception systems (Horchak, Giger, Cabral,

and Pochwatko 2014), which suggests that readers ‘simulate’ what they read in sentences by activating the neurons involved in perception, action, or observation of an action in a process known as embodied cognition. The embodied cognition literature posits that exposure to motion verbs activates regions of the brain that are involved in the representation of action and action plans (Van Dam et al. 2017), which makes the reader more perceptive to motion (Meteyard, Bahrami, and Vigliocco 2007). I argue that animated graphs inherently contain motion signals as the line graph unfurls across the screen over time. Hence, I posit that when investors are exposed to motion verbs, they become more sensitive to the motion of the graph, reinforcing the effects of animated graphs.

To test my predictions and theoretical arguments, I conduct a 2 (animated or static graph) x 2 (motion verbs or no motion verbs) + 4 (pallid-positive and pallid-neutral language conditions for animated and static graphs as control conditions) between-participants experiment, and recruit participants from Prolific, a web-based crowdsourcing marketplace. I manipulate the type of language used in a short extract of an earnings release transcript where a CEO briefly discusses the firm’s performance and either uses or does not use motion verbs. After that, I display two graphs depicting the firm’s historical revenue and EPS performance over the previous eight quarters. These graphs are either animated, such that the graph unfolds over time, or are static, such that the graph is displayed in its entirety all at once. Participants are then asked to evaluate the attractiveness of the investment, indicate their willingness to invest in the firm, as well as indicate a dollar amount out of an inheritance that they receive that they would be willing to invest in the firm. Consistent with my hypotheses, I find that the use of motion verbs magnifies the effect of animated graphs compared to static graphs on investor willingness to invest.

This paper contributes to the accounting literature on the use of infographics in accounting contexts. Extant literature has examined how investor relations officers and managers can use

more vivid infographics in digital annual reports as compared to more pallid forms (Zhang 2020) or the use of pictures to depict non-GAAP information but none to date have examined the use of animated graphs in an accounting context. As such, this study is the first to examine the use of animated graphs within the accounting context and how the use of such graphs influences investor judgments. While the SEC has cautioned against the use of using graphs to influence investor perceptions, our results demonstrate that simply animating the graph can influence investor perceptions more favorably when paired with the appropriate use of motion verbs. The theory and findings in this study help managers better understand how to match the types of graphs used to the type of language used. At the same time, the results also help investors to be more conscious about the effect that the type of language used and animated charts have on their investment judgments. While this study is motivated by and examines the use of animated graphs within the context of investor days, it is plausible that the use of animated graphs may occur in other financial disclosure settings like conference calls. While conference calls are now largely audio-only and do not involve the use of any presentation tools, companies are increasingly moving to stream video of conference calls that allows for companies to make use of more effective presentation tools. For example, Axon Inc and Zoom Inc recently held their earnings calls over Zoom, which supports the use of powerful presentation tools. Practitioner literature is calling for companies to present data at earnings calls that help understand trends in the companies' data at earnings calls (Deloitte 2017). It is plausible that as companies increasingly make use of earnings calls over video, they may start making use of data visualizations to answer the call to help investors understand the data at earnings conference calls.

This paper also contributes to the literature examining investor days. Prior literature has found that firms are increasingly making use of such investor days where they have greater control over the way information is presented, and the format of the discussion. Such investor

days often result in substantial abnormal returns, where the one-day window abnormal return around such investor days is 29 percent larger than abnormal absolute returns over the estimation period (Kirk and Markov 2016). Whilst the impact of investor days on market return is examined, it is still relatively less understood how elements of the investor day influence investor decisions. By examining two facets of the investor day – the type of data visualization and language used, this study provides a deeper understanding of how investor days can be used to facilitate the shaping of investor perceptions.

This paper contributes to the stream of literature examining variations in language used in accounting disclosures. Previous studies have examined the use of vivid language within the accounting context and found that vivid language has an effect on investor judgments when investors are motivated to be sensitive to vivid language (Hales et al. 2016). While prior literature has examined how differences in vividness influence judgments, I try to control vividness and show that within vivid language, there are other variations in the language that can influence investor judgments. I introduce the concept of motion verbs to the accounting literature and show that the use of such verbs can have an additional effect on investor judgments in addition to the vivid language. I further show that the use of such language can interact with other elements in accounting disclosures to influence investor judgments. To my knowledge, this is the first paper examining the effect of motion verbs on graph comprehension.

Lastly, this paper also contributes to the linguistics literature examining how people perceive motion verbs. The literature has largely examined how people process motion verbs and have investigated the connection between fictive motion and how people perceive time and space (See Huette and Matlock 2016 for a review). However, these studies have focused on varying the use of motion verbs and examining how people process these. This study

demonstrates that the use of motion verbs within a document can affect how people process other elements of the document.

The rest of the dissertation is organized as follows. Section II reviews related literature and develops the hypotheses. Section III describes the experimental procedures and manipulations, and results of the experiment. Section IV concludes.

II. LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

Background

A corporate disclosure channel can be defined as “any medium of expression through which a firm describes its economic condition” (Mayew 2012). An extensive literature has examined the impact of management communication with investors through various channels that typically offer little or zero interaction with investors, examples of which include financial reports, earnings releases, and earnings conference calls. These channels often enable firms to disseminate information to a wider audience while being more constrained in forms of structure. Of these media, corporate conference calls enable managers to provide information in a manner less constrained than that of earnings releases and financial statements (Matsumoto, Pronk, and Roelofsen 2011). Such conference calls often consist of a presentation segment where management more often than not tends to regurgitate important items in the earnings press release, followed by a question-and-answer component during which time information not contained in the press release is disclosed (Kimbrough 2005). However, such conference calls typically take place verbally and are still limited in ways through which investors and analysts can interact with management.

Increasingly, firms are turning to corporate disclosure channels that facilitate greater opportunities for formal and informal face-to-face interaction between company management

and investors. In line with a growing perception that investors and analysts value increased access to management (Brinkley 2012), researchers have recently begun to focus on such channels, examples of which include broker conferences, site visits, and investor days. Investor days are a voluntary disclosure medium that is increasingly gaining traction, particularly amongst larger firms. Such investor days are viewed by practitioners as an important corporate disclosure and investor relations activity (Rossi 2010; Buckley 2011). The increasing prevalence of investor days can be attributed to the control that firms have over the format of such investor days. Unlike other disclosure channels, firms are responsible for planning and organizing an investor day, which gives managers greater control over the information presented and how it is presented. Such investor days do provide additional new information to the market beyond that conveyed by conventional disclosure channels, with an increase of 29% in three-day absolute abnormal return (Kirk and Markov 2016). Whilst we understand the impact that investor days have on market returns, little is known about how individual elements of the investor day influence investors. Practitioners highlight that presentation formats are an important component of investor days, with calls for management to “get and hold people’s attention more quickly” and to “make the case a bit more quickly” (Motley 2015), all of which can be facilitated by the use of more vivid infographics such as data visualizations.

I develop and test the theory that the use of animated data visualizations during such investor days can interact with the use of motion verbs to lead to more favorable impressions of the firm, leading to greater attractiveness of the firm as an investment. Importantly, I examine this research question in the context of positive results for three reasons. Firstly, firms are likely to use more vivid types of financial disclosures such as animated graphs and vivid language to play up positive results, as opposed to highlighting negative results. Secondly, the positive share returns around investor days suggest that firms are likely to use this disclosure channel to disclose positive information, as opposed to negative information. Lastly,

practitioner literature suggests that it would be advantageous for management to hold such investor days “after their strongest quarter” (Motley 2015).

How Does The Use Of Animated Graphs In Time-Varying Data Influence Investors?

Retail investors and managers often make decisions based on time-varying data such as stock prices, revenue figures, EPS, and exchange rates. The ubiquity of time-varying data in numerous domains is reflected in studies examining how to effectively present such data, and the literature has examined aspects such as colors, the type of graphs used, grids, and scales (Benbasat and Dexter, 1985; Cleveland, 1993; Duclos, 2015; Zacks and Tversky 1999). Of these, the method most commonly used to convey performance over time is by way of graphs (Raghubir and Das, 2010). Graphical displays help to instill a sense of continuity over time when used to view time-varying data since each new day (or data point) on a graph tracking such data is difficult to distinguish from another. This continuity makes it easier to expect or visualize the consistency of a trend over a period, which makes trends more salient to investors (Duclos, 2015). The salience of a particular attribute refers to the availability of specific information about that attribute. As a result, graphs are more effective at holding the attention of readers and enable readers to make decisions more quickly (Yates, 1985). Given the ubiquity of graphs within the context of disclosures and information, there are also a number of studies within the accounting context examining the influence of graphical presentations on investors (Zhang, 2020; Pesci et al., 2020). Relatedly, Zhang (2020) examines the influence of the use of vividly presented infographics on investor judgments. He varies whether the graphs used in digital annual reports are colorfully presented (i.e., have bright colors and logos on top of the graphs) or pallidly presented (plain bar charts) and finds that using more vivid graphics to display graphs results in more favorable investor judgments when the earnings news has a positive valence.

However, these studies have largely focused on the attributes of static graph displays. Recent advances in multimedia technology and data visualization software such as Tableau and PowerBI have made the use of animations to visualize data increasingly commonplace within the business context. Numerous industry players also enable consumers to choose how financial information is visually presented to them, which makes it increasingly important to understand how the use of such visualizations influences investor judgments.

Some early studies in the use of data visualizations provide evidence that the use of dynamic display modes can enhance users' involvement with a product (Roggeveen et al. 2015) or shape impressions of advertisement design (Kim and Lakshmanan 2015). Other studies have also examined how changing visual elements of data visualization such as color, size, and line thickness can enhance the salience of spatial dimensions. One possible element of data visualizations that can be varied is the animation of the graphic itself. Animating objects in various settings have increasingly gained traction as animations are regarded as intuitive and engaging as it is easily perceived, even within peripheral vision, and therefore useful for directing attention to points of interest. At its heart, an animated graphic depicts a series of scenes that combine sequentially to form a dynamic visual image, thus showing how a narrative evolves over time (Kim and Lakshmanan 2021).

Early work has shown that animation has been used within the design of various visualization types to convey changes in various types of information such as: 1) demonstrating transitioning from one type of data to another type of data in understanding hierarchical relationships (Robertson, Cameron, Czerwinski, and Robbins 2002); 2) illustrating how algorithms or complex systems work (Zongker and Salesin 2003; Hegarty, Narayanan, and Freitas 2002); or more recently, 3) using animations to illustrate trends (Robertson et al. 2008; Archambault, Purchase, Pinault 2010). Conventional wisdom has posited several reasons why animations are an ideal medium for displaying trends. The congruence principle of graphic

design suggests that the cognitive correspondence between the graphic and mental representations of a dynamic process facilitates the processing of the graphic representation (Tversky, Morrison, and Betrancourt 2002). Drawing on this, Griffin et al. (2006) posit that since animations explicitly depict temporal changes, the use of animations should enhance the ability of individuals to understand dynamic processes. Another posited channel through which animation should help with the effective portrayal of trends is that animation evokes an emergent property of grouping where associated elements that are dispersed are easily recognized together as they move in generally the same direction (Bartram 1998).

In addition to making trends in data more salient, animated graphs also have the effect of being more vivid, compared to static graphs. Graphical vividness is defined as graphics that are “emotionally interesting”, “concrete and imagery provoking”, and “proximate in a sensory, temporal, or spatial way.” The use of an animated graph is arguably more imagery-provoking and more appealing than a static graph because of the dynamism conveyed by the motion of the graph (Sundar and Kalyanaraman 2004). Such vivid information is more likely to be stored and remembered than pallid information. Following this, it is to be expected that animated graphs would conceptually be a good tool to animate trends as points in the graph are presented sequentially over time, thus enabling investors to observe the physical movement of the data points as the animation moves sequentially. This aspect of animation can help to enhance the salience of the temporal dimension of data change, reinforcing the effect of temporal variations or trends. Early studies in animated graphs supported this notion. Robertson et al. (2008) examine the use of animations to visualize trends in a bubble graph and find that the use of animation when participants are passively viewing the graphs (i.e., as they would in a conference presentation), animation leads to more accurate recall of data. They also find that participants in the animated condition complete the task faster. Heer and Robertson (2007) find that participants are better at recognizing how data points have moved after having viewed

animated graphs than static graphs. Jardine, Ondov, and Elmqvist (2019) find that using animated graphs compared to static graphs leads to greater accuracy in identifying magnitude changes and also quicker task performance times.

Though there are empirical studies suggesting that animated graphs are preferable to static graphs in portraying trends, the bulk of the studies examining the effectiveness of animated graphs focus on basic graph comprehension outcomes such as response times and recall. As a result, it is relatively less well understood how the use of animated graphs can influence judgments and decision-making. In one such study, Kim and Lakshmanan (2021) examine the effect of animated graphs on investors' risk judgments and find that investors perceive investment in a stock to be riskier when a graph of its stock price over time is animated compared to when it is static, and they attribute it to animation making daily transitions in stock prices becoming more salient to investors. My study differs from theirs in a number of ways. Firstly, the graphs used in their study use large fluctuations in stock prices from day to day over a 30-day period and find that animations lead to viewers perceiving these fluctuations as more salient and therefore perceiving the stock as riskier. On the other hand, I examine how animated graphs make a simple trend more salient, therefore resulting in more favorable investment judgments from investors. Additionally, in their study, the authors posit that animation is unlikely to have an effect on making trends more salient (though they do not test this). I argue instead that animating graphs can still serve to make trends salient when combined with other features of the accounting disclosure setting that makes the effect of animations stronger. Secondly, their study is performed in a lower cognitive load setting. In their experiment, participants just view either static or animation versions of the above graph with no other information presented to them. Based on this graph, participants then indicate how risky they perceive an investment to be. In contrast, in my setting, participants are asked to perform a higher cognitive load task that involves reading a financial disclosure and processing

greater amounts of information. This greater cognitive load can render any trend effect less salient, creating tension in my predictions.

Other existing studies have also pointed out that the effects of animation are likely to disappear or reverse under certain conditions. Of pertinence to this study is the notion that animation typically has attenuated or no effects under high cognitive load. Goldstein et al (2014) find that animations serve as a distraction when participants are asked to process information other than what is contained within the animation. Robertson et al. (2008) also find that when the animated graph is made interactive, participants in the animated graph condition become less accurate than in static graphs. This is relevant here because prior research suggests that higher interactivity corresponds with a higher cognitive load (Foltz 1996). Processing financial disclosures are typically a high cognitive load task since investors are typically presented with more information than they can process. It is plausible then that the effects of animated graphs do not manifest in a financial disclosure setting. However, I posit that variation in the use of such graphs can interact with other forms of information presented at such investor days that reinforce the effects of animated graphs. Such graphs are often used in investor day presentations, where a presenter is simultaneously discussing that particular aspect of the company's financials. Given that investor days are organized by companies, and they, therefore, are less constrained in their language choices, I posit that managers will be more likely to use variations in language choices at investor days to play up positive performances in various areas.

The Joint Effect of Animated Graphs and Motion Verbs

Within the context of the language used in accounting disclosures, existing studies have also shown that managers might carefully choose language to underplay bad performance or to play up other areas (Davis, Piger, and Sedor, 2012). As the language used in accounting

disclosures are subject to far fewer rules than numerical information, there is infinite scope for variation in the language companies use to describe performance. Advances in computing power over recent years have enabled accounting researchers to use textual analysis tools to extract meaning from accounting disclosures to answer questions about the quality and quantity of disclosures, as well as any other unintended revelations (Loughran and McDonald 2016). Research using textual analysis tools to study accounting disclosures can largely be broken down into three major streams. Two of these streams have their roots in the archival accounting literature. The first stream stems from Li's (2008) seminal paper examining how poorly performing firms make disclosures less readable, possibly to obfuscate investors. Stemming from this, research has found that readability can amplify reactions to good and bad news (Rennekamp 2012). The second stream of literature examines sentiment in various information sources (see Kearney and Liu (2013) for a review) but generally finds that increased positive or negative textual sentiment is tied to more favorable or less favorable investor reactions respectively.

The third stream of the language component of accounting disclosures that has been examined has its roots in experimental accounting research – the vividness of language used. The use of vivid language is often pervasive in various forms of business communication to reinforce the content of the message (Brunzel and Van der Oelsnitz 2021). Vivid language is defined as language that “excite[s] the imagination to the extent that it is (a) emotionally interesting, (b) concrete and imagery-provoking, and (c) proximate in a sensory, temporal, or spatial way (Nisbett and Ross 1980). Extant psychology studies have argued that presenting information more vividly can be more persuasive and more influential on judgments, and numerous studies have examined this idea in a wide range of contexts. Though intuitively appealing, the results of these studies have been mixed (see Smith and Shaffer (2000) for a review), suggesting that the effect of vividness is weak, at best.

However, various studies have identified boundary conditions where vividness effects are more dominant. Guadagno et al. (2011) find that vividness can influence persuasion when vivid language is used in the central body of the message as opposed to the peripheral portions of the message, and McGill and Anand (1989) find that when vivid presentation is congruent with the message text, the messages lead to increased attention and deeper information processing. Within the accounting context, Hales et al. (2011) find that vividness of language can influence investor judgments when investors are motivated to be sensitive to vivid language, and Chen and Chang (2017) also find that the use of vivid language in earnings warnings leads to investors perceiving management as more trustworthy.

While prior studies have largely focused on the vividness of the language used as a singular construct, the linguistics literature suggests that vivid language can be broadly broken down further into two subtypes – figurative language and literal language. Literal language refers to the use of everyday linguistic forms – for instance, “It was raining very heavily”. On the other hand, figurative language is used to characterize expressions that differ substantially from everyday norms and often involve the use of hyperbole, metaphors, similes, and other linguistic tropes to drum up more vivid imagery (Huette and Matlock 2016). Examples of such language could look like “It was raining cats and dogs.”. It is generally agreed that figurative language forms part of everyday language, and therefore is no harder to process than literal language (Gibbs 1994). Figurative language in everyday use is replete with descriptions of objects moving in space – e.g., “we’re headed for tough times” – even if the meaning is not literal. Such sentences apply a motion verb to subjects that are not physically capable of moving themselves through physical space. Such sentences are referred to as fictive motion because it refers to the metaphorical motion of an object or abstraction through space (Matlock 2004).

The linguistics literature provides extensive evidence that language can influence how individuals perceive and encode events. In particular, recent theories of cognition have posited

that cognitive representations of events are grounded in mental simulations of these events (Barsalou 1999; Gallese and Lakoff 2005). In such mental simulations, research suggests that people (1) construct models that resemble physical space, (2) simulate objects and movement in these spatial models, and (3) simulate in a way that is to some extent analogous to perceiving physical movement (Matlock 2004). Processing fictive motion sentences which involve no physical change of state of the object (i.e., the perceived object does not physically change state from stationary to moving) can still elicit a temporary simulation of motion in the reader (Matsumoto 1996). Embodied cognition theories posit that such simulations are context-specific, such that processing words relating to motion will activate sensory systems used in processing motion (Zwaan, 2004). In turn, activation of such sensory systems makes comprehenders more sensitive to motion that is congruent with the type of motion described, as measured by quicker reaction times to congruent motion (Meteyard, Bahrami, and Vigliocco 2017).

Within the context of accounting disclosures, companies can opt to describe a good quarter vividly by portraying it as “sales surpassed analyst expectations” or “sales rocketed past analyst expectations,” the second of which involves the use of a motion verb. Please refer to Appendix A for examples of how firms may use motion verbs in Investor Day Presentations. I posit that when such motion verbs are used together with animated graphs, readers mentally simulate the movement contained within the motion verb, thus activating the sensory systems in processing that type of motion. In turn, this serves to make investors more sensitive to the motion inherent in animated graphs, which makes trend salience further enhanced in such a scenario. I formally state my hypothesis below. Figure 1 provides a plot of the predicted means.

H1: Animated graphs result in more favorable investment judgments compared to static graphs, and the effect of animated graphs is larger when they are used together with motion verbs than when they are used with non-motion verbs.

III. METHOD

Participants

I recruit participants from Prolific, a web-based crowdsourcing marketplace. Using pre-screening filters made available in Prolific, a platform that facilitates the creation of research studies on Amazon Mechanical Turk, I limit the participant pool to people who are native English speakers, and are residents of the United States, Germany, France, and the United Kingdom. I also require participants to have stock investment experience and have a previous approval rate of 95% or higher on Prolific. A total of 479 participants participate in the experiment for a payment of US\$1.60. The participant pool breakdown is presented in Table 1.

In the final sample, participants take an average of 10 minutes and 6 seconds to complete the study. The average participant has 9.26 years of investment experience. On average, participants have taken 0.56 accounting courses (ranging from zero to sixteen), 0.64 finance courses (ranging from zero to twenty-five), and 0.54 data analytics courses (ranging from zero to twenty). We ask them to evaluate the frequency they invested in stocks in the past five years on an 11-point scale, with "0" labeled "never" and "10" labeled "frequently." The mean of the answers is 3.92.

Procedure

To test my hypotheses, I conduct a two (animated or static graph) x two (motion verbs or non-motion verbs) + four control (pallid – positive language and pallid – neutral language versions of the animated graph and static graph conditions) between-participants experiment. While the hypotheses relate to differences in the use of motion verbs or not, both the motion verb and non-motion verb conditions are both considered part of vivid language. To examine if the effects of motion verbs on animated graphs are attributable to vividness, I further examine

how the use of pallid language interacts with the use of animated graphs to influence investor judgments. The theory posits that the use of motion verbs enhances readers' receptiveness to animated graphs as compared to when motion verbs are not used. When motion verbs are not used, differences in vividness and tone of the message should not influence the reader's sensitivity to animated graphs as they do not induce the same sense of fictive motion whether the message is more vivid or not. I test this by adding two versions of pallid language in addition to the original motion verb versus non-motion verb manipulation that differ in tone to ensure that any differences between the two vivid language conditions and a pallid language condition are not attributable to tonal differences in the language.¹

Participants are randomly assigned to one of the eight experimental conditions and complete a computer-based task where they are asked to evaluate a hypothetical firm, Innovo Inc., as an investment. At the start of the experiment, participants are asked to assume the role of a prospective investor considering an investment in Innovo Inc. Participants are then presented background information on Innovo Inc where they are informed that Innovo Inc is a "cloud-based data warehousing and analytics" company that engages in allowing users to store data in the cloud and perform data analytics operations on that data. Participants are then presented with an excerpt from an investor day transcript where financial results from the most recent quarter are discussed. In this transcript, the language used either makes use of motion verbs to describe company performance, or it does not. Next, they are presented with two graphs that depict the company's performance for the last eight quarters in revenue and

¹ Before this version of the experiment, an earlier version was run that only had one pallid language condition, that is, the pallid-neutral version in this experiment. This current experiment was run to add an additional pallid-positive version as there were tone differences between the two vivid language conditions and the pallid language condition and any inferences might have been explained by tone differences instead. A second experiment was also conducted in the last round that was aimed at measuring process variables including perceived growth, opinions of management, and ease of processing. These process variables have been included in this current experiment.

earnings per share. These graphs are either animated such that the lines unfold over time or are static such that participants see the data all at once.

The financial data and performance of the company are deliberately kept ambiguous by contrasting a small increase in net profit compared to the previous financial year against a drop in cash flow for the period. Additionally, both graphs that participants view show a dip over four quarters before recovering to where it started. I opt to keep the data ambiguous in order to prevent participants from simply choosing to invest in an obvious trend. After viewing the graphs, participants are asked to make their final investment judgments. Finally, participants answer manipulation check questions and demographic questions.

Manipulations

Use Of Motion Verbs

To manipulate the type of language used, I change the type of language in the headline and the CEO’s comments used in the excerpt from the investor day transcript as presented below. The full transcripts for each language condition can be found in Appendix B.

<p>Motion Condition</p>	<p><i>Verb</i></p> <p><i>Headline:</i> Innovo Inc revenue growth rockets up, up, and away for FY22</p> <p><i>Ceo’s Comments:</i> Innovo Inc’s results leaped, with an increase in many key metrics like product revenue, revenue retention rate, and significant customer commitments” said Innovo Chairman and CEO Dave Morgan. “Our last quarter’s results give us a roaring start and we will continue to conquer new heights in the second half of FY 2022.”</p>
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<p>Non-Motion Verb condition</p>	<p><i>Headline:</i> Sunny days for Innovo Inc on back of revenue growth for FY22</p> <p><i>Ceo's Comments:</i> “Innovo’s results sparkled, with increases in many key metrics like product revenue, revenue retention rate, and significant customer commitments,” said Innovo Chairman and CEO Dave Morgan. “Our last quarter’s results give us a brilliant start and we will continue to see bright days in the second half of FY 2022.</p>
<p>Pallid – Positive Condition</p>	<p><i>Headline:</i> Innovo Inc reports healthy revenue growth for FY22</p> <p><i>CEO's Comments:</i> “Innovo Inc’s results grew rapidly, with increases in many key metrics like product revenue, revenue retention rate, and significant customer commitments,” said Innovo Chairman and CEO Dave Morgan. “Our last quarter’s results give us a solid start and we will continue to deliver strong growth in the second half of FY 2022.”</p>
<p>Pallid – Neutral Condition</p>	<p><i>Headline:</i> Innovo Inc reports revenue growth for FY22</p> <p><i>CEO's Comments:</i> Innovo Inc’s results rose, with increases in many key metrics like product revenue, revenue retention rate, and significant customer commitments” said Innovo Chairman and CEO Dave Morgan. “Our last quarter’s results give us a satisfactory start and we will continue to manage for growth in the second half of FY 2022.</p>

Animated and Static Graphs

To manipulate the type of graphs that participants see, I vary the way the line graphs are shown to participants. In both conditions, participants view two line graphs that depict Innovo Inc's revenue and EPS performance over the previous eight quarters. In the animated condition, the line graph will slowly unfold over three seconds, whereas in the static graph, the line graph is shown all at once as shown in Appendix C.

I match the minimum amount of time participants must spend looking at the graphs to mitigate concerns that participants in each condition may spend a different amount of time staring at the graphs, since in the static condition participants see the graph in full from the start, while participants in the animated condition have to wait for the graphs to be drawn out over three seconds. Thus, participants in the animated graph conditions are only allowed to move on to the next graph or next section only after five seconds. Similarly, participants in the static graph condition are only allowed to advance after five seconds are up.

Dependent Variable

To measure participants' judgments, I ask them to evaluate 1) how willing are they to invest in Innovo Inc 2) How attractive an investment in Innovo Inc is and 3) how much of a \$10,000 inheritance would they be willing to invest in Innovo Inc, with any amount not invested being placed in a money-market fund. The experimental instrument is presented in full in Appendix D.

Following prior literature (Barcellos and Kadous 2021), I rescale all three variables on a 101-point scale and combine them into a single willingness to invest (WTI) measure (Cronbach's Alpha of 0.862). A principal component analysis reveals that the three variables load in the expected direction onto a single component, which explains 79.8% of the variance and has an eigenvalue of 2.39. I report results based on the average of the three measures, though inferences are unchanged if I use responses to each of the three questions individually

Analyses are also unchanged both directionally and in significance if I use the extracted factor score.

Results

Manipulation Checks

To assess whether the animated graph and static graph manipulations are successful, I ask participants to identify if the graphs they had seen were animated or static. 78% of the participants answer this question correctly, which is broadly in line with other studies using online participant recruitment platforms (e.g., Owens and Hawkins, 2019). This suggests that the manipulation was largely effective. I exclude participants who fail the manipulation checks as appropriately recognizing the type of graphs that they have been exposed to is crucial to my test of hypotheses. Inferences from my results are unchanged directionally and in significance when I include the manipulation check failures.

Hypothesis One

My main prediction in H1 is that participants will have more favorable investment judgments when they see an animated graph as compared to a static graph, but the difference is larger in the motion verb condition than in the non-motion verb condition. The descriptive statistics of the participants' investment judgments are presented in Table 2, Panel A. A plot of the means is provided in Figure 2. The results show that in the motion verb condition, participants' judgments are more favorable in the animated graph condition than in the static graph condition (means of 57.05 and 49.41, $t = 2.090$, $df = 99$, $p = 0.019$, one-tailed equivalent).² However, the difference between the animated and static conditions in the non-motion verb condition is insignificant (means of 49.16 and 51.92, $t = -0.579$, $df = 85$, $p =$

² All reported p-values are two-tailed unless indicated otherwise.

0.564). Results of the simple effects tests are presented in Table 2, Panel C. I run a two-way ANOVA with the investment judgment as the dependent variable and find a marginally significant interaction effect ($F_{1,184} = 3.084$, $p=0.081$, one-tailed equivalent). I find no main effects of either graph type ($F_{1,146} = 0.679$, $p = 0.411$, one-tailed) or language type ($F_{1,146} = 0.829$, $p = 0.364$, one-tailed). The results of the two-way ANOVA are presented in Table 2, panel B.³

Besides the above motion and non-motion verb conditions, two additional pallid language conditions are used as controls. Within both pallid control conditions, there are no significant effects of animated graphs on investor judgments compared to static graphs (for the pallid-positive condition - means of 55.64 vs 54.95, $t = 0.179$, $df = 87$, $p = 0.858$; for the pallid-neutral condition - means of 56.29 vs 56.04, $t = 0.073$, and $df = 98$, $p = 0.942$). All pairwise comparisons between the four control group conditions and the four conditions in the main interaction are insignificant (all $p > 0.182$). When collapsed across graph conditions, it is noteworthy that the means in the two pallid conditions are similar to or higher than those of the other language conditions.⁴ A plausible explanation for this is that the use of a neutral tone in a setting like the one here where performance is more ambiguous can lead to higher perceived credibility (Han and Tan 2010), resulting in participants in the pallid language reacting more favorably to the disclosure. Importantly, neither the non-motion verbs nor the pallid language condition moderates the effect of animated graphs on investor judgments, lending support to

³ When manipulation check failures are included, participants in the motion verb condition are similarly more likely to be more willing to invest when they view animated graphs as compared to when they view static graphs (means of 55.72 vs 50.72, $t = 1.492$, $df = 121$, $p = 0.065$, one-tailed equivalent). In all other language conditions, participants report no differences in willingness to invest whether they view animated graphs or static graphs (all $p > 0.342$). The ANOVA interaction is insignificant at $p = 0.227$.

⁴ I find no significant differences in means between the motion verb and the control or between the non-motion verb and the pallid-positive condition (all $p > 0.136$). However, participants in pallid-neutral condition were marginally more willing to invest in the company than participants in the non-motion verb condition (means of 50.71 vs 56.17, $t = -1.925$, $df = 85$, $p = 0.06$). The high mean of the pallid-neutral condition could be due to it being the most neutral of the four language conditions, leading to participants perceiving it as more credible.

the notion that animated graphs have minimal effect on investors within a high cognitive load task like processing financial disclosures, but only has an effect when investors are exposed to motion verbs.

I next run a mediation analysis to test the overarching theory that readers who read motion verbs are more sensitive to the motion inherent in an animated graph, and therefore are likely to perceive the trends projected in an animated graph as more salient. Past research shows that investors are likely to extrapolate trends (DeBondt 1993), and this tendency is stronger when trends are made more salient. If the theory holds that the combination of motion verbs and animated graphs makes trends more salient, they should extrapolate the trend forward (i.e., if the trend is upwards, then readers should expect that the firm will keep growing). While the ANOVA interaction effect in the main results provides evidence consistent with my theory, I further test whether participants' perception of the growth of the firm mediates the effect of language type and graph type on their willingness to invest. I measure participants' perception of the growth of the firm by asking questions about what they perceive the growth of the company to be like. Specifically, participants are asked the following five questions: 1) To what extent did you think that Innovo Inc grew its EPS and Revenue over the last four quarters? 2) How quickly do you think that Innovo Inc will continue growing? 3) How fast do you think Innovo Inc is moving on its strategy? 4) How do you think Innovo Inc's revenue will perform next quarter? 5) How do you think Innovo Inc's EPS will perform next quarter? As a principal components analysis shows that these five questions load on one common factor with an Eigenvalue of 3.097 that explains 61.9% of the variance, I combine these into a single variable by taking the average of the five measures (Cronbach's Alpha = 0.843).

I use a bootstrapping-based analysis to test for mediation (Preacher and Hayes 2008) (Model 4) within the treatment conditions as the theory only posits an interaction effect in the treatment conditions. Following Bauer and Brown (2021), I separately analyze the link between

graph type and growth for the motion verb and non-motion verb conditions. I expect that there will be a significant link between the graph type on perceived growth for the motion verb condition, but not in the non-motion verb condition. See Figure 3 for a graphical depiction of this model.

Link 1 is positive and significant ($p < 0.01$) for the motion verb condition and is insignificant for the non-motion verb condition ($p = 0.95$). Link 2 is positive and significant ($p < 0.01$). The 95 percent bootstrapped, bias-corrected confidence interval for the indirect path via links one and two does not contain zero for the motion verb condition (-10.98, -1.74) but contains zero for the non-motion verb condition (-6.44, 6.01), indicating significance for the former but not the latter (Preacher and Hayes 2008). Hence, readers who view an animated graph after reading motion verbs are more likely to perceive a company as growing when there is an upwards trend, and in turn, be more willing to invest, but not when they read non-motion verbs.

Supplemental Analyses

Investor Experience. If effects of the interaction of animated graphs and motion verbs indeed do occur as theorized – due to motion verbs making the effect of animated graphs stronger, and therefore overcoming the reduced effects of animated graphs due to the high cognitive load of processing financial disclosures - this effect should be stronger in more-experienced investors. More-experienced investors are more likely to possess such cognitive capacity in a high cognitive load task such as processing financial information since they likely have the requisite knowledge to process such disclosures. More-experienced investors are more capable of engaging in systematic processing of the information contained within the disclosure and are therefore more able to make use of the information in the animated graph. In contrast, less experienced investors are unlikely to possess the ability or experience needed to process

financial disclosures, and therefore will have less available cognitive capacity to process animated graphs. In such high cognitive load situations, animated graphics can instead serve as an added distraction that impedes information processing. As a result, the enhanced salience of the animated graph stemming from the interaction of the use of animated graphs and motion verbs is less likely to manifest in less-experienced investors.

I ask participants are asked to indicate their number of years of experience. I split participants into more-experienced and less-experienced investors based on the median years of investing experience. The mean years of investment experience are 2.19 years for the less-experienced group and 15.14 years for the more-experienced group. Within the more-experienced group, there is a significant difference between the animated graph and the static graph conditions within the motion verb condition (means of 56.50 vs 40.18, $t = 2.574$, $df = 40$, $p = 0.014$, one-tailed). However, there is no such difference between the animated and static conditions in the no-motion verb condition (means of 45.34 vs 51.49, $t = -0.819$, $df = 42$, $p = 0.417$) or for the pallid-positive condition (means of 56.71 vs 58.07, $t = -0.260$, $df = 41$, $p = 0.796$) or for the pallid-neutral condition (means of 54.14 vs 54.01, $t = 0.023$, $df = 44$, $p = 0.982$). In the less-experienced group, all such comparisons are insignificant (all $p > 0.417$). These results suggest that more experienced investors are more likely to be influenced by the use of animated graphs, and therefore be more willing to invest compared to inexperienced investors.

Ease of Processing Using Tan, Wang, and Zhou's (2014) and Elliott, Grant, and Rennekamp's (2017) measures, I also check participants' information processing fluency by asking them to self-report their level of agreement with three statements on 11-point scales: the information is (1) easy to process, (2) difficult to understand (reverse-scored), and (3) easy to read. I create a single measure of fluency by averaging the responses to these three questions (Cronbach's alpha = 0.882).

Participants within the motion-verb language, and pallid-neutral language conditions are more likely to find processing the information easier when they view animated graphs than when they view static graphs (means of 1.54 vs 0.61, $t = 2.300$, $df = 99$, $p = 0.024$; means of 1.81 vs 0.69, $t = 2.517$, $df = 98$, $p = 0.013$, respectively). Participants in the other two language conditions report no such differences (all $p > 0.584$). When collapsed across the language conditions, participants in the animated graph condition report higher processing fluency than those in the static graph condition (means of 1.48 vs 0.85, $t = 2.773$, $df = 375$, $p = 0.006$). This result suggests that participants may find the information and the trend indicated in an animated graph easier to understand and process than in a static graph.

Other Supplemental Measures. I also ask participants to indicate their opinions about the Company's prospects by asking them to respond to the following questions on an 11 – point Likert scale. Participants are asked to respond to the question: “To what extent are you optimistic about the prospects of Innovo Inc?”. Within the motion verb condition, participants who see the animated graph are significantly more optimistic about the prospects of the Company than participants who see the static graph (means = 2.29 vs 1.62, $t = 1.967$, $df = 99$, $p = 0.05$). A similar comparison in the non-motion verb condition is insignificant (means = 1.74 vs 1.71, $t = 0.056$, $df = 85$, $p = 0.956$). This suggests that participants exposed to animated graphs after seeing motion verbs view the growth of the company as more salient, and therefore are more optimistic about the prospects of the company.

Participants also respond to questions about their perceptions of the firm's management. Participants are asked “To what extent do they think Innovo Inc's management is competent” and “To what extent are you confident in the management of Innovo Inc”. The responses to the two questions are highly correlated ($r = 0.797$), hence I take the average of the responses to the two questions (Cronbach's Alpha = 0.887). Within the motion verb condition, participants who view animated graphs are marginally more likely to perceive management as

more credible (means of 2.40 vs 1.91, $t = 1.694$, $df = 99$, $p = 0.09$). In all other language conditions, such a comparison yields insignificant differences (all $p > 0.114$).

Participants are asked about how they perceive management's outlook on the company. They are asked to respond to "To what extent do you think Innovo Inc's management is confident about the prospects of Innovo Inc?" and "To what extent do you think INNOVO INC's management is optimistic about the prospects of Innovo Inc?". The responses to the two questions are highly correlated ($r = 0.774$), hence I take the average of the responses to the two questions (Cronbach's Alpha = 0.848). Across all four language conditions, there were no differences between animated graph and static graph conditions in how they perceived management's outlook on the company (all $p > 0.497$).

Lastly, participants are asked about their willingness to rely on and use the information provided to them in the transcript in two questions – 1) To what extent do you think you can rely on Innovo Inc's presentation to make your investment decisions? 2) Please indicate the extent to which you are comfortable with making investment decisions based on presentations similar to the one you received. Participants' responses to the two questions are highly correlated (Pearson's correlation of 0.701), hence I combine the two questions into one by taking the average of the two responses (Cronbach's Alpha = 0.815). Participants in the motion-verb condition are more likely to rely on the information in the presentation when they view animated graphs, compared to when they view static graphs (means of 1.67 vs 0.68, $t = 2.579$, $df = 97$, $p = 0.011$). In all other language conditions, participants report no such differences (all $p > 0.148$).

Ruling out alternative explanations

Vividness effects. Following Hales et al. (2011) I ask participants to rate how vivid they found reading the transcript was and participants respond on an 11-point Likert scale with

the endpoints – 5 (“less vivid”) and 5 (“more vivid”). When collapsed across graph conditions, participants in both the motion verb and non-motion verb conditions rated the vividness similarly (means of 1.11 and 1.04, $t = 0.258$, $df = 186$, $p = 0.797$). Participants in these two conditions also did not rate the vividness of the presentation differently than participants in the two pallid language conditions (all $p > 0.450$). These results suggest that the effects of motion verbs on animated graphs are not attributable to differences in perceived vividness between motion verbs and non-motion verbs. This also further suggests that given that there are no differences in how non-motion verbs and how pallid language interacts with the use of animated graphs, the vividness of language alone is unlikely to influence how animated graphs shape investor perceptions.

Tone Effects. Participants are asked to rate the tone of the transcript on an 11-point Likert scale with the endpoints -5 (“Not positive at all”) to 5 (“Very positive”). Participants in the motion verb condition did not rate the presentation as more positive than participants in the non-motion verb condition and the pallid – neutral condition (all $p > 0.473$), though they did rate it more positively than participants in the pallid – positive condition ($p = 0.06$). However, tone differences between the motion-verb condition and the pallid-positive condition do not account for the pattern of results observed in the main two by two experiment (motion verbs by graph type). Importantly, participants perceive no difference in tone between the motion verb and the non-motion verb conditions, suggesting that the observed pattern of results is not attributable to tone.

Discussion

In this experiment, I examine how the use of motion verbs influence how investors perceive animated graphs and static graphs. In line with the theory that the use of motion verbs makes investors more sensitive to trend salience in animated graphs, and therefore more willing to

invest in a firm when the graph trends upwards, I find that investors who read a transcript making use of motion verbs are more willing to invest in a firm when they view animated graphs compared when they view static graphs. Furthermore, such investors are more likely to view the growth trend of the company as more salient and therefore be more likely to perceive the company as growing. Investors who view a transcript that make use of non-motion verbs, as well as the two pallid language types, do not reflect such differences in their responses.

IV. Conclusion

I examine the joint influence of the use of animated charts and motion verbs on investor judgments. In my study, I investigate the impact of using animated graphs or static graphs and motion verbs (e.g., rockets, leaped) versus no motion verbs (sparkled, brilliant) on investor judgments. My first experiment shows that investors judge a firm more favorably when animated charts are used compared to when static charts are used, but this effect is present only when motion verbs are used compared to when they are not.

The findings are of interest to firm management. Firms are increasingly making use of investor days as an additional disclosure channel between firms and investors, where firm management has greater control over the presentation formats, media, and language used. The variation in animated graphs and static graphs is minor in the grander scheme of things, but both types of graphs enable management to present identical information, but only the *manner* of presentation of this information is varied. My findings inform management that using animated graphs instead of static graphs can result in more favorable investment judgments from investors, and more particularly when they make use of more motion verbs to describe firm performance. These findings also inform the SEC about how such data visualization formats can impact investor judgments where firms are allowed to vary the use of such tools.

I contribute to prior work examining variations in the type of infographics and language used in financial disclosures by examining a new type of infographic and new variation in non-financial information in these disclosures. This study also shows that these two components of disclosure channels can interact with each other to further influence investor judgments.

This study also extends work done in marketing literature examining the use of animations. Prior studies in this area have found that animated graphs increase recall rates (Robertson et al. 2008) and that the use of animations in a cognitively demanding context can instead attenuate any benefits of using animations (Goldstein et al. 2014). I extend this finding in this study by demonstrating that this effect extends within the accounting context and can occur for plainer animations such as an animated graph.

In this experiment, the information is delivered to participants in English, and participants are restricted to native English speakers. However, as prior studies in linguistics examining the use of motion verbs across different languages find that different languages may lead readers to encode this information differently, future research may examine the effect of the use of motion verbs in languages other than English, or test it in cross-language settings (e.g., presenting the information in English where the recipients are not native English speakers). Furthermore, in this study, I only examine the animation of a line chart. Practically, firms have an enormous pool of types of visualizations to choose from (e.g., bar graphs, bubble charts, geographic charts). Future research can examine if the effects of animation extend to the use of different types of charts as well. Lastly, words used in the treatment conditions in this study such as “leapt” and “sparkled” may be less commonly used in actual earnings calls and investor days, as they lie on the more vivid spectrum of language. Inferences drawn from the use of the words in the treatment conditions in this study may not be fully generalizable to words that are less vivid, and therefore more commonly used. Future research may examine

the impact of such less vivid language on how investors react to the use of animated graphs in such settings.

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APPENDIX A: EXCERPTS OF INVESTOR DAY TRANSCRIPTS USING MOTION

VERBS

Firm (Date of Transcript)	Excerpt	Motion Verbs Used
Lululemon Athletica Inc (22 April, 2022)	... provide a solid foundation as we begin our next five-year journey and deliver against our new Power of Three ×2 growth plan. I want to thank our teams around the world for remaining agile and continuing to execute at a high level to achieve our goals, while successfully navigating the challenges within the macro environment. We look forward to all that lies ahead for lululemon as we continue to grow the brand.	Navigating, grow, begin a journey
Nike Inc (25 October, 2017)	...expectations continue to skyrocket, we have an opportunity to bring the power of our brand to more people in more meaningful and personal ways. ...leapfrogged many of the stages of physical and digital retail development that we've undergone here in the U.S.	Skyrocket, leapfrogged
JP Morgan Inc (3 May 2022)	..., it's a leader in forest investing, just as the interest in this asset class has skyrocketed. And then the most recent announcement is Global Shares	Skyrocketed
Snap Inc	We estimate that the year over year growth in Operating Expenses will rise from approximately 25 percent year over year	Rise

(23 February, 2021)	growth in 2020 to year over year percentage growth in the mid-30s in 2021.	
Logitech Inc (3 March, 2022)	... huge leap forward in fixing the remote worker experience of seeing better conference room and doing it seamlessly and automatically	Leap
ViacomCBS (24 March, 2022)	... unlock the power of the combined company, build strong operating momentum, and accelerate our streaming strategy	Accelerate, momentum
AT&T (11 March, 2022)	We expect broadband service revenue growth to accelerate from 2022 levels as we benefit from the expansion of our fiber footprint. Last year, we added 2.6 million new fiber locations	Accelerate

APPENDIX B: LANGUAGE MANIPULATION

Non-Motion Verbs

Sunny days for Innovo Inc on back of revenue growth for FY22

Motion Verbs

Innovo Inc’s revenue growth rockets up, up, and away for FY22

Pallid Positive

Innovo Inc reports healthy revenue growth for FY22

Pallid Neutral

Innovo Inc reports revenue growth for FY22

Innovo Inc (NYSE: INNV), the Data company, today announced financial results for its second quarter of fiscal year 2022, ended April 30, 2022.

- Product revenue of \$55.6 million, representing 6% year-over-year growth
- Remaining performance obligations of \$601 Million, representing 8% year-over-year growth
- 1062 total customers
- Net revenue retention rate of 88%
- 116 customers with trailing 12-month product revenue greater than \$1 million

The company saw revenue increase 5.5% year on year to \$78.3 million for this quarter. This was due to a 6% year-on-year increase in Product revenue to \$55.6 million. The remaining performance obligations were \$601 million, representing 8% year-over-year growth. This revenue growth was attributable to our existing customer base, as demonstrated by our net revenue retention rate of 88% as of Apr 30, 2022. Innovo Inc now has 1062 total customers and 116 customers with trailing 12-month product revenue greater than \$1 million. Adjusted sales, general and administrative expenses increased 7% from Q2 2021 largely due to increased stock-based compensation expenses.

	21Q2	22Q2	y-o-y change
Reported EPS	(0.09)	0.05	NA
Revenue	73,990	78,320	5.5%

Operating Margin	19.8%	22.6%	
Free Cash Flow	242	32	

Non-Motion Verb

“Innovo’s results sparkled, with increases in many key metrics like product revenue, revenue retention rate, and significant customer commitments,” said Innovo Chairman and CEO Dave Morgan. “Our last quarter’s results give us a brilliant start and we will continue to see bright days in the second half of FY 2022.”

Motion Verb

“Innovo Inc’s results leaped, with an increase in many key metrics like product revenue, revenue retention rate, and significant customer commitments,” said Innovo Chairman and CEO Dave Morgan. “Our last quarter’s results give us a roaring start and we will continue to conquer new heights in the second half of FY 2022.”

Pallid - Positive

“Innovo Inc’s results grew rapidly, with increases in many key metrics like product revenue, revenue retention rate, and significant customer commitments,” said Innovo Chairman and CEO Dave Morgan. “Our last quarter’s results give us a solid start and we will continue to deliver strong growth in the second half of FY 2022.”

Pallid - Neutral

“Innovo Inc’s results improved, with increases in many key metrics like product revenue, revenue retention rate, and significant customer commitments,” said Innovo Chairman and CEO Dave Morgan. “Our last quarter’s results give us a good start and we will continue to deliver growth in the second half of FY 2022.”

APPENDIX C: GRAPH MANIPULATION

Static Versions Only

Revenue Performance



Historical Earnings



APPENDIX D: EXPERIMENTAL INSTRUMENT

Informed Consent Form

You are being invited to participate in a research study conducted by Prof. Tan Hun Tong and Mr. Ian Chan from Nanyang Business School, Nanyang Technological University.

The purpose of this research study is to learn more about investor judgment and decision-making processes. If you agree to take part in this study, you will be asked to complete an online case study. In this case study, we would like you to assume the role of a general investor and make decisions based on the information in the enclosed materials. We have limited the amount of information presented to limit the time necessary to complete the study. This study will take approximately 20 minutes. We will offer reimbursement of \$6 per hour for participants who complete the study which will be paid through the online platform you are working with.

You may not directly benefit from this research; however, we hope that your participation in the study may help researchers better understand investors' decisions making.

We believe there are no known risks associated with this research study beyond those that exist in daily life; however, as with any online related activity the risk of a breach of confidentiality is always possible. Your answers will be kept strictly anonymous, and will be analyzed after being aggregated with responses from other respondents. Under no circumstance will any individual information be identified with the results. Your responses will be anonymous, and IP addresses will not be collected to guarantee complete anonymity. Possible outlets of dissemination may be an academic journal.

Your participation in this study is completely voluntary and you can withdraw at any time without penalty. If you do not wish to complete this survey, just close your browser. You are free to skip any question that you choose. Any incomplete response will be excluded from our analysis.

If you have questions about this project or if you have a research-related problem, you may contact the following researchers:

- Principal Investigator: Tan Hun Tong, Block S3-01C-78, Nanyang Technological University, 639798 Singapore. Email: ahttan@ntu.edu.sg
- Co-Investigator: Ian Chan, Block S3-01B-73, Nanyang Technological University, 639798 Singapore. Email: hchan009@e.ntu.edu.sg

This project has been reviewed and approved by NTU-Institutional Review Board. If you have any questions concerning your rights as a research subject, you may contact NTU Institutional Review Board (IRB): Block N2.1 B4-07, Nanyang Technological University, 637331 Singapore. Email: irb@ntu.edu.sg. All reports or correspondence will be kept confidential.

By clicking "I agree" below you are indicating that you are at least 21 years old, have read and understood this consent form and agree to participate in this research study. Please print a copy of this page for your records.

I Agree

I Do Not
Agree

GENERAL INSTRUCTIONS

The attached case materials contain background information on a company called Innovo Inc and its latest quarterly earnings presentation. Assume that you have received an inheritance of \$10,000 and are considering making an investment in shares of Innovo Inc. You will be asked to provide a series of investment related judgments. In addition, you will be asked a number of questions about your judgments and your experience.

The information included in the case is not intended to be completely representative of what would normally be available when evaluating a company. Providing you with that level of detail would require more time to complete the case than could realistically be requested. Please make the best judgments you can based on the information provided in these materials. If you have any questions during the study, do not hesitate to email me at hchan009@e.ntu.edu.sg. You may now start the study. Thank you again for your participation in this study.

Please read the following from INNOVO INC's Background Information carefully and answer the following questions. You will be asked attention check questions later.

BACKGROUND INFORMATION

Innovo Inc is a cloud-based data warehousing and analytics company founded in 2012 that offers “data warehouse-as-a-service”. Innovo Inc allows corporate users to store data in native formats and perform data analytics operations on that data using cloud-based hardware and software.

Innovo Inc’s cloud-based data warehousing platform was born from the idea of taking the capabilities of a traditional data warehouse while at the same time allowing users to benefit from the elasticity and scalability of cloud computing without worrying about added costs, performance or complexity. This enables users to scale up and down data storage needs while benefiting from improved performance of the cloud. Innovo Inc offers customers of its cloud-based data warehousing platform on-demand pricing, which means that customers are charged for actual utilization of data warehousing services, and they can opt to suspend the service when the data warehouse is inactive.

Spurred by the development of competitors offering cloud-based data analytics services, Innovo Inc launched its own data analytics service called InnoSight. Similar to Innovo’s cloud based data warehouse offering, InnoSight operates purely in the cloud and allows customers to benefit from the scalability and flexibility of cloud computing in performing analytics operations. InnoSight also offers support for semi-structured data, which reduces the data management load for clients, and enables clients to get insights faster. Centralised releases of updates also allows for Innovo to accelerate time-to-market of new features and allows Innovo to handle the infrastructure complexity of data analytics.

Innovo aims to focus on growing its customer base by ensuring that they continue to provide access to cutting-edge data management tools. Part of this plan includes moving into expanding its AI capabilities as well as geographic expansion. The company is due to provide a progress report on this plan to shareholders and the market in its upcoming earnings announcement. All eyes will be on this upcoming earnings announcement see if Innovo Inc can continue to execute this plan.

Please click the arrow below to view Innovo's investor day transcript.

Non-Motion Verbs

Sunny days for Innovo Inc on back of revenue growth for FY22

Motion Verbs

Innovo Inc's revenue growth rockets up, up, and away for FY22

Pallid Positive

Innovo Inc reports healthy revenue growth for FY22

Pallid Neutral

Innovo Inc reports revenue growth for FY22

Innovo Inc (NYSE: INNV), the Data company, today announced financial results for its second quarter of fiscal year 2022, ended October 31, 2021.

- Product revenue of \$55.6 million, representing 6% year-over-year growth
- Remaining performance obligations of \$601 Million, representing 8% year-over-year growth
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- Net revenue retention rate of 88%
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The company saw revenue increase 5.5% year on year to \$78.3 million for this quarter. This was due to a 6% year-on-year increase in Product revenue to \$55.6 million. The remaining performance obligations were \$601 million, representing 8% year-over-year growth. This revenue growth was attributable to our existing customer base, as demonstrated by our net revenue retention rate of 88% as of Oct 31, 2021. Innovo Inc now has 1062 total customers and 116 customers with trailing 12-month product revenue greater than \$1 million. Adjusted sales, general and administrative expenses increased 7% from Q2 2020 largely due to increased stock-based compensation expenses.

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Pallid - Positive

“Innovo Inc’s results grew rapidly, with increases in many key metrics like product revenue, revenue retention rate, and significant customer commitments,” said Innovo Chairman and CEO Dave Morgan. “Our last quarter’s results give us a solid start and we will continue to deliver strong growth in the second half of FY 2022.”

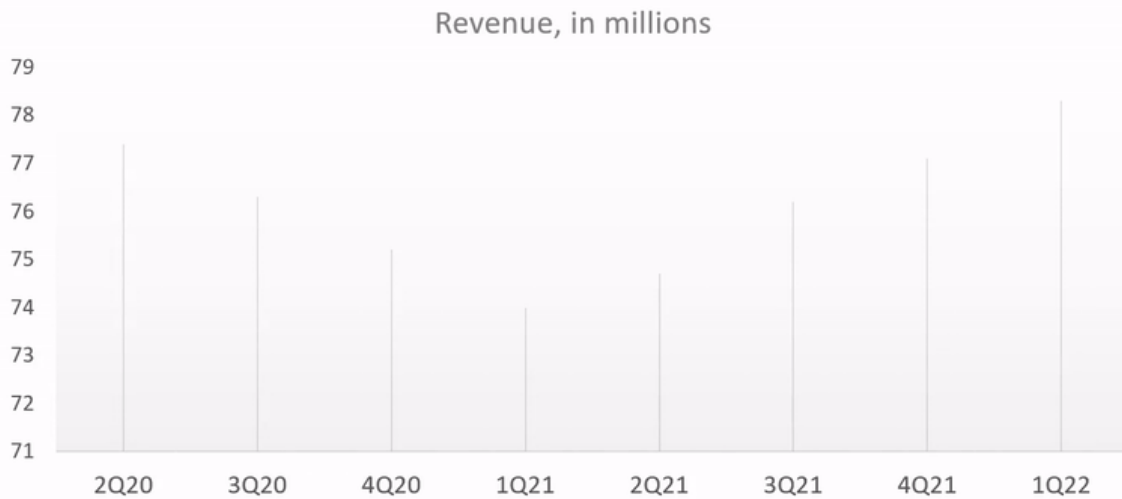
Pallid - Neutral

“Innovo Inc’s results improved, with increases in many key metrics like product revenue, revenue retention rate, and significant customer commitments,” said Innovo Chairman and CEO Dave Morgan. “Our last quarter’s results give us a good start and we will continue to deliver growth in the second half of FY 2022.”

[Insert a Page Break Here]

Animated

Revenue Performance



Historical Earnings



[Insert a Page Break Here]

Static

Revenue Performance



Historical Earnings



Insert a Page Break Here!

Assuming that you are evaluating Innovo Inc in light of the above information, please answer the following questions.

Question 1

How willing are you to invest in Innovo Inc's stock?

-5 -4 -3 -2 -1 0 1 2 3 4 5
Absolutely Absolutely
NOT WILLING
WILLING to invest
to invest

Question 2

Please assess the attractiveness of Innovo Inc's stock.

-5 -4 -3 -2 -1 0 1 2 3 4 5
Not at All Absolutely
ATTRACTIVE ATTRACTIVE

Question 3

Please assess the valuation of Innovo Inc's stock.

-5 -4 -3 -2 -1 0 1 2 3 4 5
Not at All Absolutely
OVERPRICED OVERPRICED

Question 4

How much of the \$10,000 inheritance are you willing to invest in Innovo Inc's stock? Any amount not invested in INNOVO INC stock will be placed in a money market account.

0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000

Insert a Page Break Here

Question 1

Please write down what you recall from the earnings release, including any words or short phrase

Question 2

To what extent did you think that Innovo Inc grew its revenue over the last four quarters?

-5	-4	-3	-2	-1	0	1	2	3	4	5
Did not grow at all										Grew a lot

Question 3

How quickly do you think that Innovo Inc will continue growing?

-5	-4	-3	-2	-1	0	1	2	3	4	5
Will not grow at all										Grow very quickly

Question 4

How fast do you think Innovo Inc is moving on its strategy?

-5	-4	-3	-2	-1	0	1	2	3	4	5
Not moving at all										Moving very quickly

Question 5

How do you think Innovo Inc's revenue will perform next quarter?

-5	-4	-3	-2	-1	0	1	2	3	4	5
Will decrease										Will increase

Question 6

How do you think Innovo Inc's EPS will perform next quarter?

-5	-4	-3	-2	-1	0	1	2	3	4	5
Will decrease										Will increase

QUESTIONS ABOUT YOU

1. How frequently do you invest in the stock market? (*Circle a number*)
0 1 2 3 4 5 6 7 8 9 10
NEVER With HIGH
FREQUENCY

2. How frequently do you read companies' earnings releases (or announcements)? (*Circle a number*)
0 1 2 3 4 5 6 7 8 9 10
NEVER With HIGH
FREQUENCY

3. How frequently do you read companies' annual reports? (*Circle a number*)
0 1 2 3 4 5 6 7 8 9 10
NEVER With HIGH
FREQUENCY

4. Years of investment experience: _____

5. Is English your native language? (*Circle one*) YES / NO

6. How would you evaluate your reading ability in English?
-5 -4 -3 -2 -1 0 1 2 3 4 5
Very LOW Very HIGH

7. Rate your familiarity with, or your level of expertise on, issues relating to **data companies**. (*Circle a number*)
0 1 2 3 4 5 6 7 8 9 10
VERY LOW VERY HIGH

8. Please indicate the number of courses (undergraduate and graduate level) you have taken or have currently enrolled in:
Accounting courses: ____;
Finance courses: ____;
Journalism: ____;
Marketings: ____;
Other courses related to investing: _____.

Thank You for Participating in Our Study.

FIGURE 1: PREDICTED EFFECTS OF ANIMATED GRAPHS AND MOTION VERBS

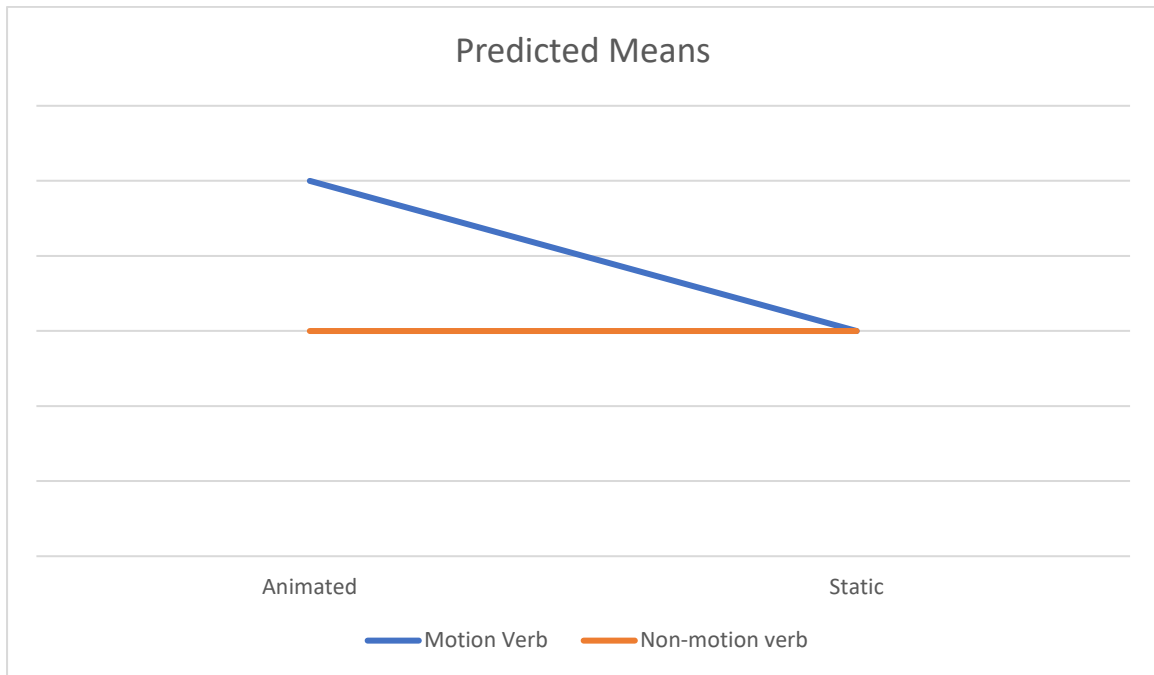


FIGURE 2: INVESTOR WILLINGNESS TO INVEST

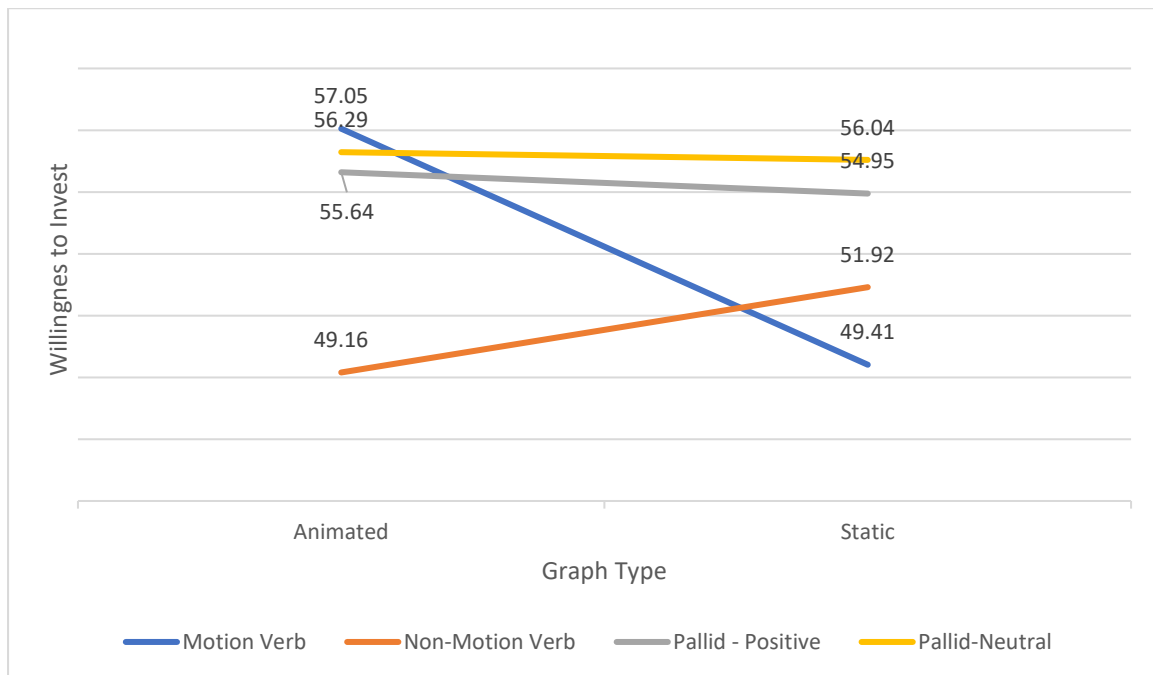
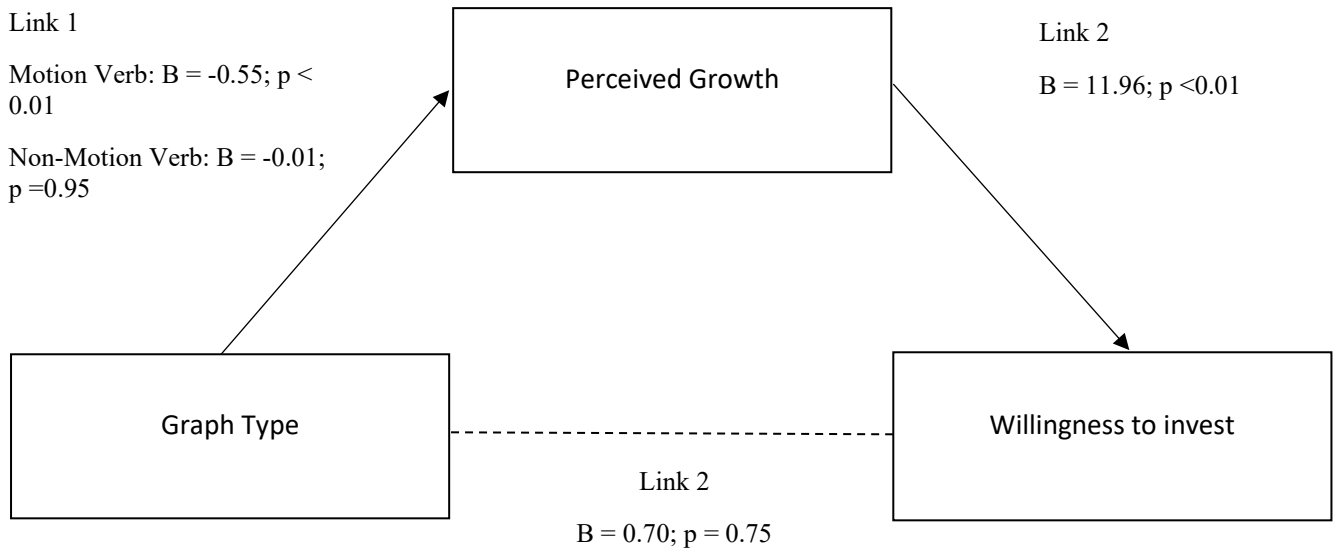


FIGURE 3: INVESTOR WILLINGNESS TO INVEST – MEDIATION ANALYSIS



This figure captures the underlying process for an investor’s willingness to invest in a firm after he views an animated graph, conditional on whether the investor reads motion verbs or reads non-motion verbs, using the Preacher and Hayes (2008) method for testing indirect effects.

TABLE 1: Participants Demographics by Conditions – Frequency or Mean (Standard Deviation)

Condition	Frequency of Investment	Frequency of reading releases	Years of investment experience	Number of accounting and finance courses taken
Animated Graph / No motion verbs	3.08 37 (2.326)	2.54 37 (2.501)	9.26 37 (10.131)	1.18 34 (2.226)
Static Graph / No Motion Verbs	3.71 48 (2.767)	2.501 48 (2.957)	8.84 48 (9.404)	1.84 44 (4.492)
Animated Graph/motion verbs	4.50 48 (2.698)	3.65 48 (2.638)	7.84 48 (10.353)	1.43 42 (2.846)
Static Graph / Motion Verbs	4.15 53 (2.522)	3.13 53 (2.620)	7.85 52 (8.930)	0.899 45 (1.695)
Animated Graph / Pallid-positive language	4.18 34 (3.050)	3.26 34 (3.078)	5.43 35 (5.782)	1.55 31 (4.537)
Static Graph / Pallid-positive language	3.72 53 (2.851)	2.92 53 (2.779)	7.72 53 (7.617)	0.41 51 (0.898)
Animated Graph / Pallid-positive language	3.98 51 (2.328)	3.27 51 (2.515)	8.61 51 (10.414)	1.24 49 (3.031)
Static Graph / Pallid-positive language	3.91 45 (2.429)	2.50 45 (1.677)	8.87 47 (9.378)	0.91 44 (2.066)

TABLE 2: The Effects of Animated Graphs and Motion Verbs on Investor Judgments – H1

Panel A: Descriptive Statistics: Mean, Sample Size, (Standard Deviation)

Type of Language	Chart Type		
	Animated	Static	Overall
No motion verbs	49.16 38 (21.90)	51.92 49 (22.10)	50.71 87 (21.93)
Motion Verbs	57.05 48 (18.02)	49.41 53 (18.58)	53.04 101 (18.62)
Pallid - positive	55.64 35 (18.88)	54.95 54 (17.15)	55.22 89 (17.75)
Pallid - Neutral	56.29 51 (17.38)	56.04 49 (16.23)	56.17 100 (16.74)
Overall	54.79 172 (19.01)	53.05 205 (18.66)	

Panel B: Two-Way ANOVA Test of Between Subject Effects

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	498395.532	1	498395.532	1232.327	0.000
GraphType	274.741	1	274.741	0.679	0.411
Language Type	335.387	1	335.387	0.829	0.364
GraphType * Language Type	1247.444	1	1247.444	3.084	0.081*

Panel C: Simple Effects

<u>Test</u>	<u>T</u>	<u>Df</u>	<u>Sig</u>
Effect of animated graphs versus static graphs in the motion verb condition ^{^*}	2.090	99	0.019
Effect of animated graphs versus static graphs in the non-motion verb condition	-0.579	85	0.564
Effect of animated graphs versus static graphs in the pallid-positive condition	0.179	87	0.858
Effect of animated graphs versus static graphs in the pallid-neutral condition	0.073	98	0.942
Effect of motion verbs vs non-motion verbs in the animated graph condition	-1.831	84	0.071
Effect of motion verbs vs non-motion verbs in the static graph condition	0.620	100	0.537

*This p-value is one-tailed.

[^]This comparison is expected to be significant.