Assessing investor sentiment through content analytics: The market signaling capacity of written and visual charismatic leadership tactics

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ABSTRACT:

We investigate the market signaling capacity of Chief Executive Officer (CEO) charismatic rhetoric within CEO letters to shareholders. We rely on signaling theory and embodiment theory of charismatic leadership to develop and test the hypothesis that written and visual charismatic signals have a positive influence on investor sentiment. Evaluating CEO letters of S&P100-listed firms from 2012-2015, we find strong evidence of the presence and interactive effects of both written and visual charismatic signals on investor sentiment. This relationship is moderated by perceived firm uncertainty such that when firm uncertainty is low, written and visual charismatic appeals enhance investor sentiment. In the case when firm uncertainty is high, however, the relationship is reversed, which we attribute to false signaling. Additionally, CEO compensation acts to amplify the market signaling capacity of the combination of written and visual charismatic signals.

Keywords: voluntary disclosures, charismatic leadership, signaling theory, investor sentiment, CEO letters to shareholders

JEL: G02, G34, D81, M41

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1. INTRODUCTION

Conventional wisdom and empirical research have argued that Chief Executive Officers (CEOs) play a significant role in the overall success of organizations (Quigley & Hambrick, 2015; Reinganum, 1985). As firms continue to operate in an increasingly dynamic and competitive environment, CEOs are faced with a proliferation of options that they can pursue to seek growth and profitability. This level of responsibility, in turn results in organizational leaders being granted a considerable level of status and influence (Quigley & Hambrick, 2015).

The superordinate role of CEOs in determining the future direction of their organization (Finkelstein, Hambrick, & Cannella, 2009; Hambrick, & Mason, 1984), ensure that few in our society have their words and actions more heavily scrutinized for meaning and symbolism (Fanelli, Misangyi, & Tosi, 2009; Pfeffer, 1981). This, paired with the reality that many organizational stakeholders have little direct contact with organizational executives, suggests that leader attributions are often based on a few representative or prototypical pieces of information (e.g., Tversky & Kahneman, 1974). Thus, charismatic or rhetorical skill plays a critical role in signaling effective leadership to others, particularly external stakeholders (e.g., Shamir, 1995). In this paper, we seek to better understand the signaling capacity of charismatic rhetoric on one key audience: investors.

An abundance of research studies have focused on the influence of leader charisma on both employee and organizational outcomes (e.g., Lowe, Kroeck, & Sivasubramaniam, 1996). Viewed as a set of attributes that are both easily identifiable and prized regardless of culture (Den Hartog et al., 1999), charismatic leaders influence followers by fostering excitement around transformation and change (House, 1977). They do so by challenging the status quo (Bass,

1985), promoting collective ideologies (Shamir, House, & Arthur, 1993), and arousing positive emotions (Fiset & Boies, 2019).

In this article, we use signaling theory (Grabo, Spisak, & van Vugt, 2017; Spence, 2002) and embodiment theory of charismatic leadership (Reh, Van Quaquebeke, & Giessner, 2017) to investigate and test a conceptual model put forward by Fanelli and Misangyi (F&M) (2006), which proposes that CEO charismatic signals influence investor sentiment, defined as investor responses to "pseudosignals" (which encompasses charismatic signaling), rather than "trading on fundamentals" (De Long, Shleifer, Summers, & Waldmann, 1990, p. 735). We further adopt Antonakis, Bastardoz, Jacquart, and Shamir's (2016) definition of charisma as "values-based, symbolic, and emotion-laden leader signaling" (p. 304), for it connotes the importance of signaling as the central means of charismatic dissemination. Together, these theories assert that charismatic signals can be transmitted into the environment through both written and non-verbal means (Reh et al., 2017). One mechanism by which CEOs signal charisma to external parties is through their annual letter to shareholders (hereafter, CEO letters), generally part of the firm's annual report. We explore how written and visual charismatic leadership tactics (or 'charismatic signals'), which we define as "potent devices that affect followers' emotions and information processing" (Antonakis, Fenley, & Liechti, 2011, p. 376), in CEO letters transmit charisma to outside observers and contribute to investor sentiment (Antonakis et al., 2016; Reh et al., 2017).

Using a sample of CEO letters from 84 S&P100 listed firms over the period 2012-2015, we report strong evidence of the combined impact of both written and visual charismatic signals on investor sentiment. We also explore an alternative explanation that CEO charismatic rhetoric is an impression management-based response to poor performance in the previous year, but we find no evidence for this explanation in the data. We do, however, find support for a relationship

between charismatic rhetoric and subsequent year investor sentiment that is moderated by perceived firm uncertainty such that when perceived firm uncertainty is low, written and visual charismatic appeals follow our expectations by enhancing investor sentiment. Yet in the case when firm uncertainty is high, the relationship is reversed, which is counter to our hypotheses. We also develop, test, and find evidence in support of the hypothesis that CEO compensation acts as a signal amplifier but only when the signal combines written and visual charismatic tactics. Overall, our study finds evidence that charismatic tactics act as an effective market signal but underscore the importance of the interaction of written and visual cues in influencing investor sentiment.

The current study makes two contributions to the literature. First, we explore the effects of CEO charisma on investors by taking a novel approach of combining machine learning-based text analysis with photographic analysis—two reliable methods of measuring charisma (Antonakis et al., 2011; Awamleh & Gardiner, 1999; Simonton, 2003)—to assess the independent and interactive effects of written and visual charismatic signals embedded within CEO letters on investor sentiment. We anticipate that CEO letters will serve as an effective platform for charismatic signaling, as they are publicly available, widely read, and bear the signature of the CEO (Eggers & Kaplan, 2009; Li, 2008; Wang, Li, & Cao, 2012). This is consistent with a rise in the number and length of annual reports over time (Campbell, McPhail, & Slack, 2009) and a growing focus on the importance of written and visual rhetoric in annual reports (Fanelli et al., 2009; Greenwood, Jack, & Haylock, 2019). These voluntary CEO disclosures also provide an idiosyncratic glimpse into the concerns and aspirations of the organization through the eyes of the organization's top executive (Schnitzer, 2017). Thus, CEO

letters fulfil an important objective in persuading key stakeholders about the future direction of the organization (Amernic et al., 2010; Conrad & Poole, 2005).

Second, we compare our current conceptual model of CEO charismatic leadership that integrates the embodiment perspective and signaling theory (Grabo et al., 2017; Reh et al., 2017) with a countervailing view that CEO letters act as a form of public impression management (e.g., Hooghiemstra, 2000; Patelli & Pedrini, 2014). In so doing, we evaluate whether charismatic elements of these letters serve to reinterpret previous organizational performance in a different light (i.e., impression management) or inspire shareholders to believe the CEO's plans for future performance (i.e., signaling).

2. THEORY DEVELOPMENT

2.1 Charismatic Leadership: A Background

In its original conceptualization, Weber (1947) argued that charisma is a form of mythical power that enabled leaders motivate and inspire followers (e.g., Beyer, 1999; House, 1999). Scholars have proposed that charisma contributes to organizational performance through its ability to signal prototypical leader effectiveness (Brodbeck et al., 2000; Den Hartog et al., 1999), strategic dynamism (Wowak, Mannor, Arrfelt, & Mcnamara, 2016), and a collective sense of organizational identity (Boehm, Dwertmann, Bruch, & Shamir, 2015; Nohe, Michaelis, Menges, Zhang, & Sonntag, 2013). A recent meta-analysis by Banks, Engemann, Williams, Gooty, McCauley, & Medaugh (2017) explored the specific impact of charismatic leadership on a number of objective outcomes. Of particular note, they observed that charisma contributed to individual, group, and firm-level performance. Thus, charismatic leadership, through various observable and consensual rhetorical displays (e.g., Tskhay, Zhu, Zou, & Rule, 2018), signal the

salience and excitement of shared objectives (Shamir et al., 1993), thus contributing to organizational performance.

To date, most research on the impact of CEO charisma on performance has focused on intra-firm effects that influence collective motivation (e.g., de Hoogh et al., 2004; Waldman, Ramirez, House, & Puranam, 2001). Questions remain, however, regarding the means by which CEO charisma contributes to firm performance. Existing empirical work on this relationship have been inconclusive with studies showing a positive effect (e.g., Flynn & Staw, 2004; Ruvio, Rosenblatt, & Hertz-Lazarowitz, 2010; Waldman, Javidan, & Varella, 2004), while others demonstrate no effect (e.g., Agle, Nagarajan, Sonnenfeld, & Srinivasan, 2006; Tosi, Misangyi, Fanelli, Waldman, & Yammarino, 2004). This has led researchers to conclude that better measures are required to evaluate the charismatic qualities of top executives that are both unobtrusive and objective (Antonakis et al., 2016). In addition to the demand for improved measures, there have been recent calls for further investigations of extra-firm effects of CEO charisma, specifically, the effect of charismatic signals on external stakeholders, including the target of CEO letters—investors (e.g., F&M, 2006). The current research responds to both calls. We use objective and multi-dimensional measures of CEO charisma, and we evaluate the effect of CEO charisma on investor sentiment.

2.2 CEO Charisma and External Shareholders

The established work of F&M (2006) serves as the foundation for our own model and testable hypotheses. F&M (2006) suggest that organizational effectiveness corresponds to both intra- and extra-firm factors, both which are likely loosely-related. Accordantly, the theory describes the processes through which CEO charisma affects performance through extra-firm

stakeholders. They define external stakeholders as those that contribute to organizational effectiveness by electing to participate, such as regulators, equity analysts, and investors. F&M (2006) theorize that similar to the effect on internal stakeholders (e.g., employees), a CEO's charisma serves to increase identification among external stakeholders, given that CEOs are the most visible member of the organization (Scott & Lane, 2000; F&M, 2006). Particularly because external stakeholders are at an informational disadvantage, CEO charisma serves as a way for investors to reduce complexity and uncertainty, while also enhancing firm participation. CEO charismatic messaging simplifies the message in an information-dense environment and directly influences outsiders' positive sentiment towards the firm, which, in turn, affects their decision to participate. These effects also work in an indirect fashion, such that external stakeholders will 'refract' the CEO behaviors and amplify the message on other external stakeholders, which increases overall identification and willingness to participate. Altogether, the theory asserts that CEO charisma stands to influence the identification and participation processes of external stakeholders, which have the potential to impact organizational effectiveness (Dukerich, Golden, & Shortell, 2002).

A growing number of studies assess the impact of CEO letter optimism, tone, and readability on analyst and investor evaluations (Lehavy, Li, & Merkley, 2004; Patelli & Pedrini, 2014; Tan, Wang, & Zhou, 2014). Additionally, there is a small body of work that empirically assesses the assertions of F&M's (2006) theory, that CEO charisma has an impact on external shareholders, though most work has focused on equity analyst evaluations of CEO charisma (Fanelli et al., 2009; Yan, Aerts, & Thewissen, 2019). Relevant to our research are two studies prior to F&M (2006) that test the relationship between CEO charisma and investor behavior. First, Tosi et al. (2004) examine the relationship between perceived CEO charisma and

shareholder value, reporting evidence that perceived CEO charisma influences stock price valuation, particularly under high environmental uncertainty. Second, Flynn and Staw (2004) develop, test, and provide evidence in support of the premise that CEO charisma can influence external endorsement for the firm, thereby making it more attractive to investors and increasing external investment in the firm.

2.3 Investor Behavior under Uncertainty: Signaling Theory

We briefly depart from theories of charismatic behavior in order to review signaling theory. Signaling theory is primarily concerned with using observable signals to reduce information asymmetry between two parties (Connelly Certo, Ireland, & Reutzel, 2011; Spence 2002). Although signaling theory was originally developed to clarify asymmetries in the labor market (Spence, 1973), it has been used to explain investor responses to public disclosures of novel information, including voluntary disclosure in corporate reporting (e.g., Ross, 1977). The theory develops the role of signaling in understanding how parties resolve information asymmetries about latent and unobservable qualities. A key attribute of signaling theory is that there is a cost associated with the signal, which works to maintain the effectiveness of the signal by thwarting imitations (i.e., false signals). As a result of the information asymmetry problem that exists between firm leadership and outside stakeholders, signaling theory asserts that leaders purposefully signal information about firm quality to investors to improve their position vis-a-vis competitors for the purpose of attracting investment and enhancing reputation (Verrecchia, 1983). Finance research has observed several examples of corporate signaling of firm quality around firm debt (Ross, 1973), stock repurchases (Bartov, 1991), and dividends (Bhattacharya, 1979), which influence outsiders' perceptions of the firm and subsequent trading behavior.

The relevant components to signaling theory are the signaler, the signal, and the receiver (Connelly, et al., 2011). In the context of the current study, the signaler is the CEO with insider information that provides him/her with an advantageous perspective on the underlying quality of the company. Important is that this perspective may reveal positive or negative information, though signaling theory has its primary focus on the former. The signal itself is voluntary communication aimed at enhancing outsiders' perception of organizational quality. An effective signal must be noticeable by outsiders, particularly in an information rich environment where receivers' attention is a scarce cognitive resource (Kahneman, 1973). The strength or attention to the signal has been found to be dependent upon noise or concurrent signalers in the same environment (Janney & Folta, 2006; Park & Mezias, 2005) as well as the credibility of the signaler (Certo, Daily, & Dalton, 2001). The signal receiver is a firm outsiders who is at an informational disadvantage and upon receipt and evaluation of the information, can choose to make a decision on the quality of the signaler.

One documented signal source related to the current study is the organization's executive team, including, for example, characteristics of the CEO's shareholdings (Zhang & Wiersema, 2009), speeches (Kiessling, Martin, & Yasar, 2017), or strategic decisions (Miller & Rock, 1985). External stakeholders, with less information than insiders, may make assessments of quality based on select prototypical pieces of information elicited by the leader, such as CEO charismatic signals (Tversky & Kahneman, 1974).

3. Model and Testable Hypotheses

Investors are often the intended audience of a corporate signal of quality, and a wealth of research in finance and accounting has documented the effectiveness of a range of market

signals, including, for example, capital structure, (Lee, Thakor, & Vora, 1983), stock repurchases (Vermaelen, 1981), and acquisition deal structure (Stoughton, 1988). In this paper, we are concerned with CEO charismatic signals that are received and acted upon by investors during the year following the signal's release. A regular and noticeable signal like CEO charisma can be viewed as a heuristic upon which investors rely upon when evaluating unobservable firm quality under conditions of asymmetric information and information overload. Similarly, F&M (2006) contend that CEO charismatic signals provide "outsiders with a cognitive shortcut that allows them to reduce their evaluative uncertainty by triggering identification with the CEO and organization" (p. 1053).

We now draw upon the F&M (2006) theory of CEO charisma and external stakeholders to build a model that describes the market signaling capacity of CEO charisma. We assume the view that rhetorical skill and charisma is a purposeful CEO tactic that plays an important role in signaling effective leadership (Antonakis et al., 2016). Our model, depicted in Figure 1, layers the propositions of signaling theory (Spence, 2002) onto F&M's theory, while also drawing upon the assertions of embodiment theory of charismatic leadership (Reh et al., 2017). Together, this established work serves as the foundation for our testable hypotheses, which are delineated by solid arrows in Figure 1.

INSERT FIGURE 1 ABOUT HERE

3.1 CEO Charismatic Rhetoric: The Signal

3.1.1 CEO charismatic written rhetoric

Top executives who manage large organizations must use every available tool to promote their message and develop a collective sense of organizational identity (Shamir et al., 1993). A

critical element in attempting to construct and disseminate a collective vision of the organization's future is through CEO discourse (e.g., Den Hartog & Verberg, 1997; Heracleous & Barrett, 2001). Relatedly, F&M (2006) suggest that leaders can transmit specific charismatic actions through their word choices by signaling strong values and articulating a desirable vision of the future. Thus, rhetorical language skills play an essential role in leading organizations (Fairhurst, 2007).

At the same time, investors, who are outside observers of CEO letters, are also interested in evaluating linguistic and discursive characteristics for charismatic signals (Fanelli et al., 2009) to inform their decision to buy, sell, or hold their position in the firm (Certo et al., 2001). Subsequent investor responses to the CEO charismatic editorializing can be classified as investor sentiment, a construct generally viewed as "a belief about future cash flows and investment risks that is not justified by the facts at hand" (Baker & Wurgler, 2007, p. 129). Counter to traditional economic thought, investor sentiment has been shown to have a direct impact on stock prices and movements (Baker & Wurgler, 2007).

Recently, Antonakis and colleagues (Antonakis et al., 2011; Antonakis et al., 2016) identified and tested a number of charismatic signals that contribute to making leaders more charismatic. These signals include the use of various rhetorical techniques such as metaphors as well as more substantive statements, such as expressing moral conviction. These charismatic signals, in turn, are anticipated to help external stakeholders interpret organizational-specific information through an optimistic and appealing frame of reference (Yan et al., in press). Consistent with signaling theory and embodiment theory of charismatic leadership, we hypothesize that CEO written rhetorical charismatic signals will contribute to higher investor

confidence (Grabo et al., 2017; Reh et al., 2017), enhancing investors' perception of firm quality, thereby influencing investor sentiment.

H1: CEO written charismatic signals will be positively associated with investor sentiment.

3.1.2 Visual rhetoric

Charismatic leaders also impact stakeholders through symbolism, a concept consistent with the definition of charisma (Anonakis et al., 2016). These symbols, in turn, serve to redirect attention towards collective efforts (e.g., Shamir, Arthur, & House, 1994; Shamir et al., 1993). One such symbol that has attracted increased attention in the literature are the portrait of the CEO in their annual report letter. CEO photographs have been used to make a number of inferences about leaders including overconfidence (Schrand & Zechman, 2012), power (Rule & Ambady, 2008), and narcissism (e.g., Chatterjee & Hambrick, 2007), indicating the potential for these photographs to strengthen the rhetorical strength of the CEO's message (Reh et al., 2017).

Consistent with embodiment theory of charismatic leadership (Reh et al., 2017), leaders can transmit symbolic meaning through non-verbal body language (e.g., Antonakis et al., 2016; Awamleh & Gardner, 1999). To capture the attention of observers, leaders can enact a series of signals, such as facial expressions and body gestures, by which followers can infer charismatic tendencies (Küpers, 2013; Rule & Ambady, 2008) and project higher levels of power and dynamism (e.g., House, 1977). Facial features and body language charismatic signals will be evaluated favourably and will contribute to investor confidence (e.g., Trichas & Schyns, 2012). These cues, grounded in body language and expressions, increase the likelihood of attracting the attention of outside observers (Reh et al., 2017).

Even more, the cognitive and attention limitations of signal receivers (Kahneman, 1973), along with an oftentimes information-dense setting, means that non-verbal signaling by leaders permits stakeholders the opportunity to make expeditious assessments on firm quality (Spence, 1973; Van Vugt, Hogan, & Kaiser, 2008). Thus, we argue that certain bodily states including animated facial expressions, hand gestures, open body language, and direct eye contact will effectively signal leader charisma to investors, a signal that will be easily recognized and positively influence subsequent investor behavior (Awamleh & Gardner, 1999; Frese, Beimel, & Schoenborn, 2003; Jacquart & Antonakis, 2015).

H2: CEO visual charismatic signals will be positively associated with investor sentiment.

3.1.3 Interaction of written and visual rhetoric

A number of studies have identified a high level of interrelatedness between written and visual charismatic signals (e.g., Antonakis et al., 2011; Towler, 2003). For example, Antonakis et al. (2011) found that discursive and visual charismatic rhetoric were interdependent and often complemented one another, such that leaders who expressed high levels of rhetorical charisma were similarly expressive with their non-verbal behaviors. Thus, as identified in Figure 1, we anticipate that both written and visual charismatic signals will interact to amplify the effect of CEO charisma on external stakeholders. This relationship will be such that high levels of both rhetorical and physical displays of charismatic symbolism will improve the CEO's ability to signal firm quality through the development of a more coherent message that consistently (i.e., consciously and unconsciously) embodies charismatic leadership (e.g., Reh et al., 2017; Towler, 2003).

H3: The interaction of CEO written and visual charismatic signals will be positively associated with investor sentiment.

3.2 CEO Charismatic Signal-Investor Sentiment Relationship Moderators

3.2.1 Firm uncertainty

Investors do not respond symmetrically to signals. Counter to the traditional view of maxmin expected utility (Gilboa & Schmeidler, 1989), investors tend to overreact to bad news and underreact to good news in times of significant uncertainty, which makes investor assessments of firm quality more challenging (Bird & Yeung, 2012; Williams, 2014). Furthermore, research shows that investors are more attuned to signals under conditions of high information asymmetry and uncertainty (Higgins & Gulati, 2006; Sanders & Boivie, 2004).

Particular to the market signaling capacity of CEO charisma, Staw and Flynn (2004) report evidence that the effect of charismatic leadership is heightened under difficult economic conditions. Thus as charismatic CEOs forge a shared frame of reference and collective understanding (Shamir et al., 1993), charismatic signaling will contribute to increased confidence among followers, which provide leaders additional consideration and leniency in highly uncertain situation (e.g., Jacquart & Antonakis, 2015). As such, we argue that the symbolism of charismatic CEOs will be amplified under conditions of high perceived firm uncertainty.

H4: Firm uncertainty will moderate the relationship between CEO charismatic written and visual appeals and investor sentiment.

3.2.2 CEO compensation

Understanding the mechanisms underlying CEO pay has been an area of interest for scholars for many years (for a review see Wowak, Gomez-Mejia, & Steinback, 2017). For the most part, this work has used agency theory to argue that compensation practices ensure that CEOs and shareholders' interests align (e.g., Fulmer, 2009). In the context of the current study, previous work has argued that boards of directors both value and justify high compensation based on the charismatic and symbolic actions of CEOs (Fanelli & Grasselli, 2006; Zajac & Westphal, 1995). In addition, several studies have demonstrated how CEO charisma signals influence external stakeholders and contribute both to increased compensation and market outcomes (Tosi et al., 2004; Waldman et al., 2001). Thus, we argue that investor sentiment will be more responsive when highly compensated CEOs demonstrate charismatic symbolism compared to CEOs who are compensated to a lesser extent.

H5: CEO compensation will moderate the relationship between CEO charismatic written and visual appeals and investor sentiment.

4. SAMPLE & METHODOLOGY

4.1 Sample

In our study, we assess the research question, how do charismatic signals contribute to favorable external investor ratings? To accomplish our aims, we evaluate both written and visual charismatic signals, and interactions thereof, in CEO letters of firms included in the S&P100 index from 2012-2015. This is a relevant sampling period because charismatic signals articulated in the CEO's letter will signal to stakeholders a growing sense of confidence and optimism as firms emerge from the 2008 financial crisis. We delete firms from our sample that do not include

a CEO letter in their annual report or had insufficient market data, and we adjust the sample based on additions or deletions to the S&P100 index during the window of observation. The result is an unbalanced sample of 84 firm CEO letters, written by 122 CEOs, and a total of 304 firm-year observations. During this sampling period, firms experienced very low CEO turnover, with only 9.5% of CEO letters in our sample written by a different CEO than the year prior.

4.2 Variable Measurement

4.2.1 Charismatic signals variables

CEO letters are a key instrument to broadcast the leader's intentions to the public, as significant amounts of time and effort are placed on the rhetorical and visual components of these documents (Schnitzer, 2017). As the most read section of the annual report (Courtis, 1998), both analysts and investors look to the interpretations and messaging put forward by the CEO to make investment decisions (e.g., Abrahamson & Amir, 1996; Feldman, Govindaraj, Livnat, & Segal, 2010). In the current study, we exploit CEO letters as systematic and widely-used vehicles of shareholder communication, in order to document and explore the effectiveness of written and visual charismatic signals.

To measure the use of written charismatic signals in CEO annual report letters, we use a novel approach advocated by Garner, Bornet, Loupi, Antonakis & Rohner (2019), which integrates charismatic leadership theory with machine learning. Specifically, this method uses computer software to reliably infer charismatic signals in CEO letters (e.g., Antonakis, et al., 2011; Jacquart & Antonakis, 2015). The charismatic signals included in the current study are separated into rhetorical aspects focused on framing the leader's arguments (e.g., the use of metaphors, rhetorical questions, stories and anecdotes, contrasts, and three-part lists) and

substantive, inspirational statements (e.g., expressing moral convictions and sentiments of the collective, setting ambitious goals, and creating confidence around the achievability of each objective). The presence of the nine identified charismatic signals were tabulated in each sentence to form a final score, denoted as *TScore*. All variables are also defined in Appendix B.

Following the embodiment perspective of leadership (Reh et al., 2017), we evaluate CEO letter photographs using two of the three non-verbal charismatic signals (facial expressions and body gestures) identified by Antonakis et al. (2011). We did not include the third charismatic signal of animated voice tone, as it was not possible to assess using the current dataset. In each case, two trained coders unfamiliar with the objectives of the research, coded CEO portraits. When more than one photo was included in the CEO letter, the first photograph was coded. For facial expressions, coders assessed the extent to which the CEO engaged in direct eye contact (1 = direct eye contact, 0 = indirect or averted eye contact), and showed an animated mien (1 = animated facial expression or smile, 0 = no animated facial expression or smile). Body gestures were evaluated using hand movements (1 = waving, pointing, pounding fist, open hand gestures; 0 = no hand movement or hands are now shown in photograph) and body language of the CEO (1 = open body language; 0 = closed body language or body blocked by obstacle, i.e., desk).Upon independent completion of the coding process, the two coders met to compare scores. Inter-rater agreement in coding was evaluated to be 91% pre-discussion and full consensus was reached post-discussion. The four aforementioned measures were tabulated to form a final visual charismatic signal composite score denoted as *PScore*. The use of such a composite index is appropriate, as we expected the items to form a final visual charismatic signal score (Antonakis et al., 2011; Podsakoff, Mackenzie, Podsakoff, & Lee, 2003).

4.2.2 Investor sentiment variables

In our model, we consider effective CEO charismatic signals as those that attracts subsequent investor participation. We contend that the participation associated with a positive signal of CEO charisma occurs because investors make trades based on sentiment (in our study, the affective response to charismatic appeals) rather than fundamental information (De Long et al., 1990).

Investor sentiment, however, is a challenging construct to measure. As Fisher and Statman (2000) observe, "investors are not all alike, and neither are their sentiments" (p. 16). To confront this complexity and to enhance the robustness of our results, we assess the firm's stock price during the year following the release of a CEO letter in three ways in order to evaluate investor sentiment. All stock market data was collected using *CRSP/Compustat*. We first evaluate the stock valuation effects of CEO letters, since we expect that investors who recognize and act upon positive charismatic signals will, in aggregate, have greater confidence in the firm and transact into the stock, causing the stock to appreciate in value. Consistent with finance and accounting studies observing stock performance effects over long windows of observation (e.g., Gleason, Madura, & Pennathur, 2006), we calculate buy-and-hold abnormal returns (*BHAR*, Barber & Lyon, 1997), which is a metric that captures the holding period returns experienced by an investor over a given period. Thus, the appeal of using BHAR is that buy-and-hold returns provide a more accurate representation of investors' actual investment experience than periodic (monthly) rebalancing assumption embedded in risk-adjusted performance methodologies (Kothari & Warner, 2007). We use market performance, proxied by the returns on the S&P500 index, as the matched benchmark portfolio.

In addition, we observe the stock's trading volume and price volatility in the year following the CEO letter's release. Both measures have been used often in finance and accounting research and practice to assess the underlying confidence (or fear) among the investor base, with lower observations of trading volume and price volatility being associated with greater investor confidence (Baker & Wurgler, 2007; Pan, Wang, & Weisbach, 2015). Trading volume (*tradingvolume*) is calculated as the logarithm of average daily trading volume over a given year, and price volatility (*stockvolatility*) is calculated as the standard deviation of monthly market-adjusted returns over the given year. Given the construction of our hypotheses, we expect a negative relationship between CEO charismatic rhetoric and *tradingvolume* and *stockvolatility*.

4.2.3 Control variables

Our multivariate analyses include a number of controls. First, previous research has found that charismatic leadership influences analysts' recommendations to buy, hold, or sell the company's stock (e.g., Fanelli et al. (2009)), but in this study, we focus on the direct signal from CEOs to investors (F&M, 2006). As such, we control for the number of analysts (*analyst)* issuing recommendations or forecasts for each firm using data hand-collected using *Bloomberg*. Second, to control for the length of each CEO letter and to correct for measure aggregation of *TScore*, we follow the recommendations of Garner et al. (2019) for analyzing CEO letter charismatic signals and control for the number of sentences (*sentence*) contained in each letter. Third, we also control for the number of discrete CEO photos published in each annual report (*CEOphoto*), with the same logic as the recommendations of Antonakis et al. (2011). Finally, we control for organizational size (*size)* with the logarithm of total assets a choice consistent with arguments that leader distance may contribute to perceptions of prototypical charismatic behavior (e.g.,

Shamir, 1995). In our panel model estimations, we also include year and industry dummies as controls.

4.3 Analytical Method

To test our first three hypotheses (*H1*, *H2*, and *H3*), we construct Equations (1), (2), and (3) to explore the association between prior year's performance and charisma variables as well as their interactions.

$$BHAR_{t+1} = \beta_0 + \beta_1 Tscore_t + \beta_2 Pscore_t + \beta_3 analyst_t + \beta_4 sentence_t + \beta_5 CEOphoto_t + \beta_6 size_t + \sum Year + \sum Industry + \varepsilon_t \quad (1)$$

$$stockvolatility_{t+1} = \beta_0 + \beta_1 Tscore_t + \beta_2 Pscore_t + \beta_3 analyst_t + \beta_4 sentence_t + \beta_5 CEOphoto_t + \beta_6 size_t + \sum Year + \sum Industry + \varepsilon_t \quad (2)$$

$$tradingvolume_{t+1} = \beta_0 + \beta_1 Tscore_t + \beta_2 Pscore_t + \beta_3 analyst_t + \beta_4 sentence_t + \beta_5 CEOphoto_t + \beta_6 size_t + \sum Year + \sum Industry + \varepsilon_t \quad (3)$$

In order to test the effect of moderators (*H4* and *H5*), we assess the Equations (1), (2) and (3), while splitting the samples into above and below median CEO compensation and firm uncertainty to evaluate the stability of our model on the sub-samples.

A panel regression method is used to analyze the data. Before testing, a Hausman test was utilized to determine whether group means would be best represented in a fixed-effect (FE) or random-effect (RE) model in the subsequent regression analysis. Given our theoretical and econometric models, endogeneity concerns are minimal for this study. Specifically, it is unlikely that lagged charismatic elements of the CEO letter are determined by market variables, so our independent variables are not expected to be correlated with the model's error term.

5. RESULTS

5.1 Summary Statistics

CEO charismatic signaling variables are summarized in Panels A and B of Table 1. The mean score for written charisma (*TScore*) is 53.35 and visual charisma is 0.89, both of which are different than zero at a significance level of less than 1%. In addition, the components that constitute both scores are also statistically significant. Together, these results provide evidence of charismatic written and visual rhetoric use in the current sample of CEO letters, and support for the notion that CEOs take these letters as an opportunity employ charismatic signals as part of their discourse with stakeholders (e.g., Fanelli et al., 2009). Furthermore, the results in Table 1 demonstrate that charismatic signals vary substantially between companies, meanwhile, varying very little across years within the same company, which points to individualized use of charismatic signals by each CEO (e.g., Jacquart & Antonakis, 2015), as turnover was low during the observed years (9.5%).

INSERT TABLE 1 ABOUT HERE

The investor sentiment summary statistics, which aim to capture investor recognition and responses to CEO charismatic signaling, are provided in Panel A of Table 2. Annualized observations of investor sentiments are significantly different from zero across measures and years. Panel B of Table 2 displays the summary statistics of model controls, which shows that CEO letters have an average length of 83.76 (standard deviation = 93.44) sentences, and CEO letters in our sample include an average of 0.7 CEO photos.

INSERT TABLE 2 ABOUT HERE

Table 3 provides the correlation structure among independent, dependent, and control variables of our econometric models. *TScore* exhibits a significant, albeit low, correlation with

PScore, which suggests that these two tactics are related, but not consistently used by CEOs in tandem. As expected, *TScore* and *Pscore* are both highly correlated with most control variables, thereby justifying their inclusion on our models. Based on the results in this table, we reject any concerns of multicollinearity that might disrupt our multivariate analyses.

INSERT TABLE 3 ABOUT HERE

5.2 Multivariate Analyses

The finance, accounting, and management literatures have typically considered CEO letters to be a means of managing the reputation of both the top management team and organization by obfuscating failures and emphasizing successes (e.g., Kuhn, 2008). For example, a recent study by Boudt and Thewissen (2019) argued that sentiment-based rhetoric in CEO letters act as a form of impression management. The authors report evidence of the strategic placement of positive words in CEO letters as a means of managing investor perceptions of past decisions, though their evidence indicates the effect on stock prices is not permanent. Patelli and Pedrini (2014), however, challenge this hypothesis, arguing with supporting evidence, that CEO letters constitute strategic action and that the language of CEO letters is intended to signal future expectations and exert influence on stakeholders.

INSERT TABLE 4 ABOUT HERE

Given that the impression management hypothesis suggests that the information within CEO discourse is distorted in a systematic way to influence investor perceptions and therefore, stock price, we first test if charismatic signals act primarily as an impression management tool. Under the impression management hypothesis, we would expect that CEO charismatic signals will be associated with investor sentiment towards the firm in the year prior to the construction

of the CEO letter (*t-1*), and this conjecture is tested with equations (4), (5), and (6) of Table 4. The results in Table 4 shows no association with *ex ante* investor sentiment and rhetorical charismatic tactics thus, no support was found for the contention that CEO charismatic signals are a response investor sentiment. The results in Table 4, therefore, reject the impression management explanation of CEO charismatic rhetoric. As such, we are able to proceed with testing our forward-looking, signaling hypothesis, that written and rhetoric charismatic signals act to communicate firm quality in a way that is recognized and acted upon by external stakeholders (see Figure 1).

INSERT TABLE 5 ABOUT HERE

Table 5 presents the results of the first assessment of our hypotheses, which is the estimation of equations (1), (2), and (3) with our full sample. The results suggest that CEO written and visual charismatic signals enact no direct influence on investor stock returns in the year following the release of the CEO letter. This is counter to both Tosi et al. (2004) and Flynn and Staw (2004), who both report evidence of an association between (perceived) CEO charisma and stock returns. Moreover, we observe two notable, and unexpected outcomes. Both written and visual charismatic signals, when tested independent of the interaction, are significantly associated with declines in investor sentiment, though the visual rhetoric coefficient is small and therefore low in economic significance. We disentangle these results in subsequent analyses, through the introduction of relationship moderators.

While Table 5 provides no support for a direct association between written (*H1*) and visual (*H2*) charismatic rhetoric, we do find evidence of a positive influence from the combination of both written and visual charismatic tactics. When the interaction term (*TScore*PScore*) is introduced into the $stockvolatility_{t+1}$ model, we find that it is negative and

significant (t-stat = -1.97), which lends support for our hypothesis that CEO charismatic written and visual appeals, together, influence investor sentiment (*H3*).

We next test *H4*, which posits that firm uncertainty will moderate the relationship between CEO letter written and visual charismatic signals and subsequent investor sentiment. In order to compare the stability of results across the full sample, we introduce the moderator by splitting the sample into above and below firm uncertainty (standard deviation of monthly market-adjusted returns during the year the CEO letter was released *t-0*). We then evaluate equations (1), (2), and (3) on each sub-sample and compare the sub-sample coefficients. Table 6 displays the results of this estimation. For firms that investors are likely to perceive as highly uncertainty and therefore difficult to assess firm quality (Panel A), we find evidence of significant declines in subsequent year investor sentiment levels, with written charismatic signals being negatively associated with $BHAR_{t+1}$ (t-stat = -2.18) and visual charismatic signals (*PScore*) being positively associated with $stockvolatility_{t+1}$ (t-stat = 1.71). We compare this surprising result with the sub-sample of firms low in uncertainty (Panel B), and the results provide support for our hypotheses *(H4)*. The interaction of written and visual charismatic signals (*TScore***PScore*) conform to our expectations that CEO charismatic appeals will enhance investor sentiment when the perceived firm uncertainty is low.

INSERT TABLE 6 ABOUT HERE

The results of Table 6 suggest that in years with low firm uncertainty, investors recognize and act upon CEO signals and use charismatic signals as a 'cognitive-shortcut' (F&M, 2006), or heuristic (Tversky & Kahneman, 1974), to evaluate the quality of the firm. For high uncertainty firms, the evidence in Table 6 suggests that charismatic signals embedded in CEO letters have a counterproductive effect on subsequent investor sentiment. Specifically, investor sentiment

responses suggest that the CEO's intended signal of firm quality is interpreted as a false signal. While signaling theory contends that the principle of costly signaling eliminates low-quality signalers from the system, some evidence suggests that false market signals do indeed occur. For example, Kracher and Johnson (1997) and Westphal and Zajac (2001) report evidence that some firms signal future stock repurchases but do not actually purchase the stock. Not simply being disregarded as an ineffective trading heuristic, our evidence shows investors negatively respond to charismatic signals when the firm's performance during the CEO letter year is uncertain, suggesting that investors do not respond well when there is a perceived decoupling between signal intent (high firm quality) and an overall assessment of the firm's reality (low firm quality). Thus, investor sentiment suffers, which penalizes the firm for the false signal, a response that is consistent with psychological work on behavioral responses to false signals (Jordan, Sommers, Bloom, & Rand, 2017).

INSERT TABLE 7 ABOUT HERE

Table 7 presents the results of the test of *H5*, which involves the second moderator of the charismatic signal-investor sentiment relationship: CEO compensation. We expect that highly paid CEOs will elicit stronger signals, thereby augmenting the positive investor response to CEO letter charismatic signals. Panel A displays the results of the above-median compensation sub-sample, and the results show that the interaction term of written and visual charismatic signaling (*TScore*PScore*) has a positive influence on two investor sentiment measures—$BHAR_{t+1}$ (t-stat= 1.68) and $stockvolatility_{t+1}$ (t-stat = -2.39). This finding lends support to *H5*. Comparing this result to the below-median compensation sub-sample in Panel B, we find that only visual charismatic signaling (*PScore*) has an influence on stock returns (t-stat = 2.50). Therefore

consistent with the Fanelli and Grasselli (2006) and Zajac and Westphal (1995), well-paid CEOs amplify the strength of well-curated charismatic signals, which may, in part, justify higher pay.

6. DISCUSSION & CONCLUSIONS

As the most high-profile spokesperson for organizations, CEOs must use their broad social power along with rhetorical strategies to signal firm quality to external stakeholders. A primary means of meeting this objective is through signaling to external stakeholders an optimistic view of the current health of the organization and its future direction via CEO annual report letters. In this study, we explore the influence of written and visual forms of charismatic signals expressed in the CEO letters on investor sentiment using a sample of CEO 304 letters from 84 S&P100 firms between 2012 and 2015.

The results suggest that the interactive effect of written (i.e., use of metaphors) and visual (i.e., facial expression of CEO portrait) CEO letter charismatic signals serve to enhance the overall sentiment of the firm's external investor base in the year after the letter was written, thus contributing to improved stock performance and investor confidence. In the absence of the interaction, we find that written or visual charismatic tactics, alone, can have a counterproductive (negative) influence on investor sentiment. This collection of findings is consistent with the conceptual framework put forward by F&M (2006) and suggests that visual and written charismatic signals act in conjunction with one another to play an important role in signaling effective leadership and creating a collective sense of investor confidence, thereby influencing investor sentiment. We also test an alternative explanation whereby CEO use their letters as a form of obfuscation or impression management of past performance (e.g., Kuhn, 2008) and find no association between *ex ante* investor sentiment and charismatic elements of CEO letters.

We also explore the impact of firm uncertainty and CEO compensation as potential moderators. We find a relationship between CEO charismatic signals and investor sentiment such that in times of low firm uncertainty, charismatic signals are recognized as a signal of firm quality and used by investors as trading heuristic. In times of high uncertainty, however, the results suggest that investors view charismatic signals as a false signal, since the signal is decoupled from the reality of the firm's state, and as a result, investor sentiment declines. In addition, consistent with our expectations, well-paid CEOs amplify the strength of the charismatic signaling relative to CEOs who are less well-paid. A potential explanation for this finding is that boards of directors and investors place higher value on charismatic CEOs, which provides a potential justification for the higher pay (e.g., Tosi et al., 2009).

The current study focuses on CEO letters of some of the largest and most well-respected organizations in the U.S. As prior research indicates that CEO letters from the U.S. are more likely to engage in rhetorical impression management (Aerts & Yan, 2017), we suggest that future research explore the generalizability of our findings in other countries. On a related note, the use of CEO letters for our sample precluded us from assessing the animated voice tone of leaders (Antonakis et al., 2011; Frese et al., 2003). Future research should extend the current findings to leadership speeches and earnings calls to assess the impact of this additional charismatic signal on investor sentiment.

Similar to politicians and their relationships with speechwriters (e.g., Mio, Riggio, Levin, & Reese, 2005), it is possible that CEOs will employ the help of investor relations staff or copy editors to further hone their letter (Duriau, Reger, & Pfarrer, 2007). Several researchers, however, have provided evidence CEOs write their letter or at the very least, are highly involved in the construction, proofreading, and final editing of this document (Bowman, 1984; Duriau et

al., 2007). Furthermore, CEOs formalize their fiduciary duty by signing the letter, thereby acting as a direct reflection of the CEOs intentions (Amernic et al., 2010). Future research could further examine this assertion by assessing the extent to which CEOs utilize additional support when writing their annual report letter and assessing the effect that this assistance has on the charismatic signal strength of this document. Similarly, future research could also interview CEO portrait photographers and public relations personnel to identify the process by which organizations decide if and when to include a particular photograph in the CEO letter.

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Table 1: Charismatic signal variables summary statistics

This table reports the descriptive statistics of charismatic signal variables of sample firms over the sample period, 2012-2015, with 304 firm-year observations. Variables measuring written rhetoric variables are located in Panel A, and visual rhetoric variables are located in Panel B. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively. Minimum values in the 'Within' set are calculated by variable X_{it} less the mean of X_i. Variable descriptions are provided in Appendix B.

	Mean	Std.Dev.	Min	Max
			Overall Between Within	
Panel A: Text variables				
TScore	53.353***	50.869	0.000	349.400
		50.419	0.000	349.400
		16.002	-42.789	113.597
collective	0.672***	1.045	0.000	7.470
		1.107	0.000	7.470
		0.266	-0.564	2.104
contrast	3.999***	5.383	0.000	37.612
		5.522	0.000	36.290
		1.521	-3.189	12.154
goal	6.813***	5.654	0.000	36.183
		5.280	0.000	36.183
		2.114	-2.162	13.728
goal2	5.750***	5.404	0.000	35.440
		5.300	0.000	35.440
		1.663	-1.905	11.343
list	16.541***	16.050	0.000	118.599
		15.128	0.000	118.599
		5.361	-17.854	33.155
metaphor	7.294***	7.592	0.000	50.149
		7.752	0.000	49.642
		2.348	-6.067	16.690
moral	5.979***	5.757	0.000	41.627
		5.547	0.000	41.627
		1.921	-4.878	13.784
question	0.721***	1.495	0.000	7.167
		1.169	0.000	6.794
		1.017	-2.768	5.717
story	5.515***	4.930	0.000	31.525
		4.886	0.000	31.525
		1.987	-6.426	14.743
Panel B: Photo variables				
PScore	0.888***	0.796	0.000	3.000
		0.690	0.000	3.000
		0.429	-0.862	2.388
eyes	0.633***	0.482	0.000	1.000
		0.413	0.000	1.000
		0.260	-0.115	1.385
body	0.118***	0.324	0.000	1.000
		0.267	0.000	1.000
		0.202	-0.632	0.868
hands	0.063***	0.242	0.000	1.000
		0.180	0.000	0.750
		0.162	-0.688	0.813
face	0.076***	0.265	0.000	1.000
		0.224	0.000	1.000
		0.151	-0.674	0.826
Number of firms	84			
Number of years	4			
Obs.	304			

Table 2: Investor sentiment and control variable summary statistics

This table reports the descriptive statistics of investor sentiment variables of the sample for the sample period 2012-2015, for one year before and following the sample period. Panel B summarizes the control variables observations in the year the CEO letter is released (t = 0). We provide the test statistics the t-test to see if the mean observations are different than zero. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively. Variable descriptions are given in Appendix B.

	Mean	Std. Dev.	Min	Max
Panel A: Investor sentiment variables, by year				
Year = 2011				
BHAR	0.000***	0.001	-0.003	0.002
stockvolatility	0.019***	0.012	0.008	0.058
tradingvolume	18.915***	0.807	17.002	21.014
Obs.	69			
Year = 2012				
BHAR	0.000**	0.001	-0.003	0.004
stockvolatility	0.019***	0.012	0.008	0.079
tradingvolume	18.450***	1.991	9.382	21.747
Obs.	78			
Year = 2013				
BHAR	0.001***	0.001	-0.003	0.004
stockvolatility	0.019***	0.012	0.008	0.079
tradingvolume	18.373***	2.106	9.382	21.747
Obs.	79			
Year = 2014				
BHAR	0.001***	0.001	-0.003	0.003
stockvolatility	0.018***	0.010	0.008	0.068
tradingvolume	18.587***	1.489	9.408	21.543
Obs.	78			
Year = 2015				
BHAR	0.000***	0.001	-0.003	0.003
stockvolatility	0.019***	0.011	0.008	0.068
tradingvolume	18.283***	2.298	8.704	21.543
Obs.	79			
Year = 2016				
BHAR	0.000***	0.001	-0.003	0.003
stockvolatility	0.018***	0.010	0.009	0.068
tradingvolume	18.192***	3.762	0.000	21.031
Obs.	78			
Panel B: Control variables in the year of the CEO letter (t)				
$sentence_t$	83.757***	93.436	0.000	625.000
$ceophoto_t$	0.704***	0.505	0.000	2.000
$analyst_t$	28.661***	8.140	5.000	50.000
$size_t$	25.011***	1.112	23.197	28.486
Obs.	304			

Table 3: Correlation matrix

This table reports the correlation matrix of the key variables used in our econometric analyses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively. All variables are defined in Appendix B.

		Mean	StDev	1	2	3	4	5	6	7	8	9	10	11
1	$TScore_t$	53.353	50.869											
2	$PScore_t$	0.888	0.796	0.146**										
3	$BHAR_{t+1}$	0.000	0.001	-0.020	0.066									
4	$stockvolatility_{t+1}$	0.018	0.011	0.001	0.103*	-0.224***								
5	$tradingvolume_{t+1}$	18.277	2.787	0.045	0.064	-0.075	0.149***							
6	$BHAR_{t-1}$	0.001	0.001	-0.063	0.010	0.008	-0.075	-0.061						
7	$stockvolatility_{t-1}$	0.019	0.012	0.080	0.041	0.125**	0.245***	0.031	-0.141**					
8	$tradingvolume_{t-1}$	18.586	1.712	0.039	0.070	-0.013	0.083	0.196***	-0.071	0.267***				
9	$sentence_t$	83.757	93.436	0.984***	0.102*	-0.009	-0.001	0.040	-0.067	0.099*	0.051			
10	$CEOphoto_t$	0.704	0.505	0.085	0.738***	0.072	0.053	0.063	-0.057	0.003	0.068	0.045		
11	$analyst_t$	28.661	8.140	-0.025	-0.048	-0.018	0.008	0.017	0.030	-0.128**	-0.091	-0.057	-0.106*	
12	$size_t$	25.011	1.112	0.517***	0.109*	-0.012	0.029	0.018	-0.047	0.101*	0.050	0.505***	0.059	0.142**

Table 4: Impression management: CEO charisma and past investor sentiment

This table presents the results of the analysis that explores association between prior year's performance and charisma variables, which is a test of the impression management hypothesis. The model used to test this hypothesis is as follows:

$$TScore_t = \alpha_0 + \alpha_1 BHAR_{t-1} + \alpha_2 stockvolatility_{t-1} + \alpha_3 tradingvolume_{t-1} + \alpha_4 analyst_t + \alpha_5 sentence_t + \alpha_6 CEOphoto_t + \alpha_7 size_t + \sum Year + \sum Industry + \varepsilon_t \quad (4)$$

$$PScore_t = \alpha_0 + \alpha_1 BHAR_{t-1} + \alpha_2 stockvolatility_{t-1} + \alpha_3 tradingvolume_{t-1} + \alpha_4 analyst_t + \alpha_5 sentence_t + \alpha_6 CEOphoto_t + \alpha_7 size_t + \sum Year + \sum Industry + \varepsilon_t \quad (5)$$

$$TScore_t * PScore_t = \alpha_0 + \alpha_1 BHAR_{t-1} + \alpha_2 stockvolatility_{t-1} + \alpha_3 tradingvolume_{t-1} + \alpha_4 analyst_t + \alpha_5 sentence_t + \alpha_6 CEOphoto_t + \alpha_7 size_t + \sum Year + \sum Industry + \varepsilon_t \quad (6)$$

We use Hausman tests to determine whether fixed- (FE) or random-effect (RE) model to be used in each regression analysis. For FE models, R-squared as well as F-statistics are reported, and for RE models, the Wald χ^2 values are reported. Coefficient test statistics are shown in brackets.*, **, and *** indicates the significance at the 90%, 95%, and 99% confidence levels, respectively. All variables are defined in Appendix B.

	$TScore_t$	$PScore_t$	$TScoret*PScore_t$
$BHAR_{t-1}$	-71.389	29.778	1819.802
	(-0.19)	(1.25)	(0.46)
$stockvolatility_{t-1}$	-23.048	2.382	-185.769
	(-0.51)	(0.92)	(-0.44)
$tradingvolume_{t-1}$	-0.044	0.005	-0.101
	(-0.20)	(0.27)	(-0.03)
$analyst_t$	0.275	0.011	0.929
	(1.53)	(1.50)	(1.04)
$sentence_t$	0.606***	-0.000	0.569***
	(29.71)	(-0.46)	(7.50)
$CEOphoto_t$	-0.348	1.103***	60.777***
	(-0.26)	(13.68)	(7.50)
$size_t$	3.540*	-0.030	-1.463
	(1.66)	(-0.43)	(-0.19)
Year Dummy?	Yes	Yes	Yes
Industry Dummy?	Yes	Yes	Yes
Constant	-92.223*	0.848	19.283
	(-1.75)	(0.48)	(0.09)
Hausman test	FE	RE	RE
R-squared	0.9131	--	--
F-statistic / Wald χ^2	175.99***	195.32***	215.83***
Obs.	304	304	304

Table 5: Written and visual charisma rhetoric as a market signal

This table presents the regression results of the equations (1), (2), and (3) to explore association between charisma variables and subsequent year's market performance (t+1), thereby testing *H1, H2, and H3*. We use Hausman tests to determine whether fixed- (FE) or random-effect (RE) model to be used in each regression analysis. For FE models, R-squared as well as F-statistics are reported, and for RE models, the Wald χ^2 values are reported. Coefficient test statistics are shown in brackets.*, **, and *** indicates the significance at the 90%, 95%, and 99% confidence levels, respectively. All variables are defined in Appendix B.

	$BHAR_{t+1}$		$stockvolatility_{t+1}$		$tradingvolume_{t+1}$	
$TScore_t$	-0.000	-0.000	-0.000	-0.000	0.056**	0.034
	(-1.41)	(-1.53)	(-0.63)	(-0.50)	(2.00)	(1.43)
$PScore_t$	0.000	0.000	0.001	0.003*	0.183	0.395
	(0.75)	(0.08)	(1.06)	(1.70)	(0.49)	(0.94)
$TScore_t$*$PScore_t$	--	1.03e-06	--	-0.000**	--	-0.003
		(0.89)		(-1.97)		(-0.97)
$analyst_t$	1.81e-06	1.85e-06	-0.000	-0.000	0.104	0.033
	(0.15)	(0.16)	(-0.99)	(-1.38)	(1.47)	(0.82)
$sentence_t$	7.41e-06	7.47e-06	0.000	0.000	-0.029	-0.016
	(1.37)	(1.38)	(0.27)	(0.26)	(-1.62)	(-1.11)
$CEOphoto_t$	0.000	0.000	0.001	0.000	0.165	-0.249
	(0.63)	(0.82)	(0.43)	(0.13)	(0.26)	(-0.43)
$size_t$	0.000	0.000	-0.000	-0.000	-0.996	-0.180
	(0.18)	(0.17)	(-0.26)	(-0.30)	(-1.01)	(-0.48)
Year Dummy?	Yes	Yes	Yes	Yes	Yes	Yes
Industry Dummy?	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.000	0.000	0.027	0.025	39.201	21.650**
	(0.09)	(0.11)	(0.98)	(1.23)	(1.57)	(2.31)
Hausman test	RE	RE	RE	RE	FE	RE
R-squared	--	--	--	--	0.0523	--
F-statistic / Wald χ^2	21.64	22.42	38.93	41.94	1.29	37.95
Obs.	304	304	304	304	304	304

Table 6: Firm uncertainty as a moderator of CEO charisma and market signaling

This table presents the regression results of the equation (1) to equation (3) to explore the effect of firm uncertainty on the association between charisma variables and subsequent year's investor sentiment variables (*t+1*), while separating the sample into high and low firm uncertainty (*H4*). Firm uncertainty is measured as the volatility in stock prices during the year of letter writing. Panels A and B present the results of our analyses of above and below median CEO uncertainty, respectively. We use Hausman tests to determine whether fixed- (FE) or random-effect (RE) model to be used in each regression analysis. For FE models, R-squared as well as F-statistics are reported, and for RE models, the Wald χ^2 values are reported. Coefficient test statistics are shown in brackets.*, **, and *** indicates the significance at the 90%, 95%, and 99% confidence levels, respectively. All variables are defined in Appendix B.

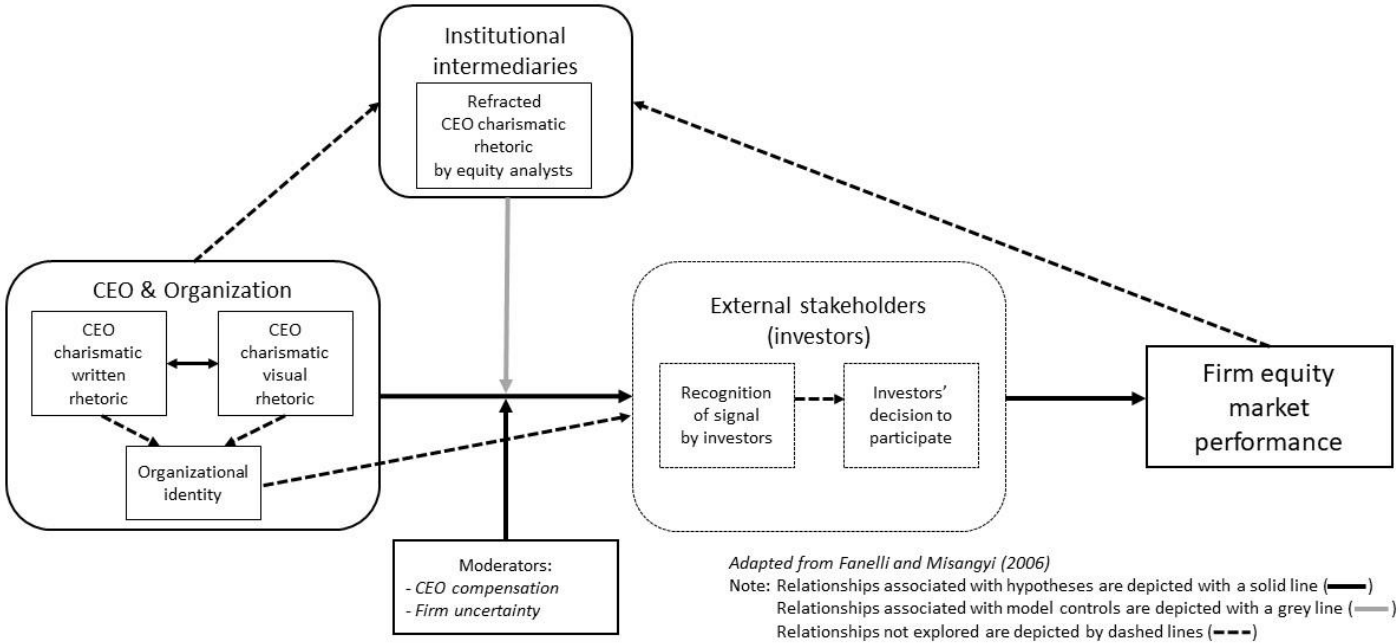
	$BHAR_{t+1}$		$stockvolatility_{t+1}$		$tradingvolume_{t+1}$	
Panel A: Above median firm uncertainty						
$TScore_t$	-0.000**	-0.000**	-0.000	-9.89e-06	0.078	0.078
	(-2.18)	(-2.12)	(-0.17)	(-0.10)	(1.41)	(0.158)
$PScore_t$	0.000*	0.000	0.002	0.004*	-0.148	-0.146
	(1.64)	(1.51)	(1.58)	(1.71)	(-0.31)	(0.82)
$TScore_t$*$PScore_t$	--	-1.05e-06	--	-0.000	--	-0.000
		(-0.39)		(-1.09)		(-0.01)
$analyst_t$	-0.000	-0.000	-0.000	-0.000	-0.009	-0.009
	(-1.00)	(-0.99)	(-0.17)	(-0.54)	(-0.17)	(-0.17)
$sentence_t$	0.000**	0.000**	-0.000	-0.000	-0.050	-0.050
	(2.14)	(2.21)	(-0.30)	(-0.22)	(-1.44)	(-1.44)
$CEOphoto_t$	0.000	0.000	-0.001	-0.001	0.290	0.291
	(0.40)	(0.37)	(-0.24)	(-0.31)	(0.58)	(0.60)
$size_t$	0.000	0.000	-0.001	-0.000	-3.077	-3.076
	(1.01)	(1.09)	(-1.15)	(-1.09)	(-1.52)	(-1.50)
Year Dummy?	Yes	Yes	Yes	Yes	Yes	Yes
Industry Dummy?	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-0.003	-0.003	0.045*	0.041*	95.657*	95.641*
	(-0.73)	(-0.81)	(1.94)	(1.78)	(1.87)	(1.840
Hausman test	RE	RE	RE	RE	FE	FE
R-squared	--	--	--	--	0.1771	0.1771
F-statistic / Wald χ^2	23.25	182.88***	61.06***	61.92***	0.73	0.65
Obs.	152	152	152	152	152	152
Panel B: Below median firm uncertainty						
$TScore_t$	-6.04e-06	4.42e-06	-0.000	-0.000	0.091	0.092
	(-0.36)	(0.41)	(-0.83)	(-0.65)	(1.60)	(1.59)
$PScore_t$	0.000	-0.000	-0.000	0.001	0.727	0.973
	(0.23)	(-0.39)	(-0.24)	(0.44)	(1.24)	(1.47)
$TScore_t$*$PScore_t$	--	9.91e-07*	--	-9.05e-06**	--	-0.001
		(1.69)		(-2.16)		(-1.12)
$analyst_t$	-0.000	-4.93e-07	-0.000	-0.000	0.265**	0.267
	(-1.17)	(-0.03)	(-0.53)	(-0.82)	(1.19)	(-1.46)
$sentence_t$	5.62e-06	-3.54e-06	0.000	0.000	-0.050	-0.051
	(0.50)	(-0.53)	(0.77)	(0.68)	(-1.28)	(-1.48)
$CEOphoto_t$	0.000	0.000	0.001	-0.000	-0.169	-0.330
	(0.38)	(1.13)	(0.30)	(-0.08)	(-0.16)	(-0.63)
$size_t$	0.001**	0.000	0.001	0.000	-1.170	-1.207
	(2.11)	(0.54)	(0.37)	(0.35)	(-0.71)	(-0.90)
Year Dummy?	Yes	Yes	Yes	Yes	Yes	Yes
Industry Dummy?	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-0.025*	-0.002	0.008	0.010	37.858	38.704
	(-1.95)	(-0.31)	(0.25)	(0.31)	(1.18)	(1.19)
Hausman test	FE	RE	RE	RE	FE	FE
R-squared	0.0798	--	--	--	0.1645	0.1670
F-statistic / Wald χ^2	1.27	17.87	29.48	30.39	1.68	0.83
Obs.	152	152	152	152	152	152

Table 7: CEO compensation as a moderator of CEO charisma and market signaling

This table presents the regression results of the equation (1) to equation (3) to explore the effect of CEO compensation on the association between charisma variables and subsequent year's investor sentiment variables (t+1), while separating the sample into high and low CEO total compensation (*H5*). Panels A and B present the results of our analyses of above and below median CEO compensation, respectively. We use Hausman tests to determine whether fixed- (FE) or random-effect (RE) model to be used in each regression analysis. For FE models, R-squared as well as F-statistics are reported, and for RE models, the Wald χ^2 values are reported. Coefficient test statistics are shown in brackets.*, **, and *** indicates the significance at the 90%, 95%, and 99% confidence levels, respectively. All variables are defined in Appendix B.

	$BHAR_{t+1}$		$stockvolatility_{t+1}$		$tradingvolume_{t+1}$	
Panel A: Above median compensation CEOs						
$TScore_t$	-0.000 （-0.66）	-0.000 (-0.56)	-0.000 (-0.11)	-8.04e-06 (-0.06)	0.038 (1.22)	0.038 (1.22)
$PScore_t$	0.000 (0.50)	-0.000 (-0.28)	0.002 （0.90）	0.004 (1.38)	0.174 (0.45)	0.289 (0.59)
$TScore_t$*$PScore_t$	--	126e-06* (1.68)	--	-0.000** (-2.39)	--	-0.001 (-0.39)
$analyst_t$	-0.000 （-0.95）	-0.000 (-1.43)	0.000 (0.34)	0.000 (0.39)	0.059 (1.52)	0.059 (1.50)
$sentence_t$	7.72e-06 (0.73)	7.05e-06 (0.52)	-0.000 (-0.15)	-6.94e-06 (-0.07)	-0.025 (-1.28)	-0.024 (-1.24)
$CEOphoto_t$	0.000 (0.44)	0.000 (1.08)	0.002 (0.60)	0.000 (0.01)	-0.462 (-0.69)	-0.553 (-0.78)
$size_t$	-0.000 (-0.77)	-0.000 (-0.83)	-0.000 (-0.07)	-0.001 (-0.03)	-0.577 (-1.61)	-0.571 (-1.58)
Year Dummy?	Yes	Yes	Yes	Yes	Yes	Yes
Industry Dummy?	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.005 (0.82)	0.005 (0.97)	0.018 (0.32)	0.014 (0.31)	31.495*** (4.62)	31.302*** (3.53)
Hausman test	RE	RE	RE	RE	RE	RE
R-squared	--	--	--	--	--	--
F-statistic / Wald χ^2	14.77	15.90	21.86	24.57	55.52***	55.27
Obs.	152	152	152	152	152	152
Panel B: Below median compensation CEOs						
$TScore_t$	0.000 (0.60)	0.000 (0.58)	0.000 (0.46)	0.000 (0.44)	0.063 (1.49)	0.072 (0.94)
$PScore_t$	0.000** (2.50)	0.000* (1.89)	0.001 (0.40)	0.001 (0.27)	0.326 (0.57)	0.903 (1.59)
$TScore_t$*$PScore_t$	--	-4.11e-07 (-0.20)	--	1.57e-06 (0.07)	--	-0.010 (-1.32)
$analyst_t$	-9.58e-06 (-0.22)	-9.05e-06 (-0.20)	-0.000 (-0.98)	-0.000 (-0.95)	0.056 (0.95)	0.057 (0.80)
$sentence_t$	-8.31e-06 (-0.67）	-8.25e-06 (-0.66)	-0.000 (-0.51)	-0.000 (-0.50)	-0.027 (-1.08)	-0.030 (-0.82)
$CEOphoto_t$	-0.000 (-0.97)	-0.000 (-0.96)	-0.001 (-0.43)	-0.001 (-0.41)	0.280 (0.29)	0.293 (0.61)
$size_t$	0.001** (2.16)	0.001** (2.15)	-0.000 (-0.21)	-0.000 (-0.21)	-0.050 (-0.08)	-0.037 (-0.08)
Year Dummy?	Yes	Yes	Yes	Yes	Yes	Yes
Industry Dummy?	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-0.028** (-2.04)	-0.028** (-2.03）	0.028 (0.83)	0.028 (1.11)	16.671 (1.07)	15.941 (1.37)
Hausman test	FE	FE	RE	RE	RE	RE
R-squared	0.0861	0.0863	--	--	--	--
F-statistic / Wald χ^2	2.24**	2.04**	53.56***	52.39**	31.90	33.28
Obs.	152	152	152	152	152	152

Appendix A: Figure 1



Appendix B: Variable definitions

Variable	Definition
Charisma variables:	
TScore	Tabulation of (collective+contrast+goal+goal2+list+metaphor+moral+question+story) (Antonakis et al., 2011; Garner et al., 2019)
collective	Sentences that identify similarities between the leader and followers, act to close psychological distance between leaders and followers (Antonakis et al., 2011; Garner et al., 2019)
contrast	Sentences that define the vision in terms of what it should or should not be (Antonakis et al., 2011; Garner et al., 2019)
goal	Sentences that show leader ambition and associates efforts towards achievement of those ambitions (Antonakis et al., 2011; Garner et al., 2019)
goal2	Sentences that raise the belief in self-efficacy (Antonakis et al., 2011; Garner et al., 2019)
list	Sentences that provide the reader with 'proof', thereby focusing attention and shows completeness (Antonakis et al., 2011; Garner et al., 2019)
metaphor	Sentences that simplify the message, elicit an image, making it easy to remember (Antonakis et al., 2011; Garner et al., 2019)
moral	Sentences that makes value systems and justifications clear (Antonakis et al., 2011; Garner et al., 2019)
question	Questions that create an interest in the reader to know the answer to the question (Antonakis et al., 2011; Garner et al., 2019)
story	Sentences that contain stories or anecdotes that elicit an image, create identification with protagonists, condense a message into a moral (Antonakis et al., 2011; Garner et al., 2019)
PScore	Tabulation of (eyes+body+hands+face) (Antonakis et al., 2011)
eyes	CEO engaged in direct eye contact with the reader (1 = direct eye contact, 0 = indirect or averted eye contact) (Antonakis et al., 2011)
body	CEO body language (1 = open body language, leaning forward; 0 = closed body language or body blocked by obstacle, i.e., desk) (Antonakis et al., 2011)
hands	CEO hand movements (1 = waving, pointing, pounding fist, open hand gestures; 0 = no hand movement or hands are now shown in photograph) (Antonakis et al., 2011)
face	CEO displayed an animated mien (1 = showed an animated facial expression or smile, 0 = no animated facial expression or smile) (Antonakis et al., 2011)
Stock market variables:	
BHAR	Buy-and-hold abnormal returns, using S&P500 as the portfolio benchmark (*CRSP/Compustat*)
stockvolatility	Standard deviation of monthly market-adjusted returns (*CRSP/Compustat*)
tradingvolume	Logarithm of average daily trading volume (*CRSP/Compustat*)
Model controls:	
analyst	Number of analysts that cover the stock in the year that the CEO letter was released (*Bloomberg*)
CEOphoto	Number of CEO photos included in the CEO letter
sentence	Number of sentences in the CEO letter
size	Logarithm of total assets (*CRSP/Compustat*)
Moderators:	
Executive compensation	CEO total compensation (fixed and variable) (*Bloomberg*)
Firm uncertainty	Standard deviation of monthly market-adjusted returns (*CRSP/Compustat*)
Year indicators:	
t	The year of the annual report release. The date of annual report release (year-end) less 1 year.
t+1	The year after the annual report release. The date of annual report release (year-end) plus 1 year.
t-1	The year after the annual report release. The date of annual report release (year-end) less two years.