Does Twitter (now known as "X") disclosure influence share price?

A research report submitted by

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DECLARATION

I, Courtney Minnaar, declare that this research report is my own work, except as indicated in the references and acknowledgements. It is submitted in partial fulfilment of the requirements for the degree of Master of Commerce in Accountancy at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at this or any other university.

Signed at Houghton, Johannesburg, on the 28th of March 2024

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ABSTRACT

An effective corporate communication strategy is essential for firms to establish and maintain good relationships with capital market participants to ensure continued financial support. Firms are increasingly adopting social media platforms like Twitter as a medium of communication. This study investigates the effectiveness of Twitter as a channel for firms to disclose financial performance and enhance their overall information environment, thereby improving share price performance. In doing so, this study seeks to establish whether JSE-firms that tweet about financial performance experience better share price performance. Additionally, this study aims to determine whether share price performance varies depending on the nature of the news, favourable or unfavourable, contained in the tweets about financial performance. This study employs ordinary least squares (OLS) regression analyses using Twitter and share price data of 148 JSE-listed firms over their 2022 fiscal year. This study reveals a positive relationship between the frequency of firms' tweets about financial performance and changes in share price. Additionally, a positive relationship exists between the type of news disclosed in tweets about financial performance and changes in share price. The findings of this study contribute to Agency Theory, Internet Investor Relations (IIR) and dialogic communication literature, as it provides evidence of the benefits of utilising social media as a dialogic communication channel to effectively communicate with capital market participants to improve the firm's information environment to obtain and maintain their continued financial support.

Key words: “Twitter”, “X”, “tweet”, “information environment”, “investor relations”

GLOSSARY OF TERMS

Term	Explanation	Citation
Twitter (now known as “X”)	A micro-blogging social media site with interpersonal communication features called tweets, with a maximum length of 280 characters.	Nyakurukwa and Seetharam (2022)
Information environment	A firm's information environment is the aggregate body of idiosyncratic information about a firm made accessible to investors.	Chen et al. (2018)
Information asymmetry	In the context of capital markets, information asymmetry occurs when certain market participants possess more or superior information about a security than others, which can lead to potential disadvantages for less-informed participants and impact the efficiency and fairness of the market.	Connelly et al. (2011)
Dialogic corporate communication	The two-way interactive dialogue between firms and their audiences, exchanging ideas and opinions to reach a consensus about firms' economic events.	Brennan and Merkl-Davies (2018)

1. INTRODUCTION

Information asymmetry is a fundamental issue in stock markets that exists between a firm's management and capital market participants (Frankel & Li, 2004). Firms are incentivised to reduce information asymmetry to improve their information environment, as it may reduce a firm's cost of capital, thereby increasing share price (Barth et al., 2017; Diamond & Verrecchia, 1991). To this end, firms convey information to the public in various forms, such as reports, press releases, social media posts and investor or analyst days (Brennan & Merkl-Davies, 2018).

Accounting may be viewed as a communication process connecting accountants with users of financial statements, enabling the latter to understand a firm's economic events. As a result, the accountant may considered the communicator in this instance. Chambers (2006) takes it further, contending that accounting encompasses communication and measurement. Lee (1982) argues that regardless of how effective the accounting quantification processes used by firms are, the resultant data is deemed less useful if not communicated effectively. Accounting researchers commonly employ the term 'reporting' to denote communication between firms and their audiences, including corporate reporting and financial reporting (Brennan & Merkl-Davies, 2018). Such communication is grounded in a monologic perspective involving a one-directional flow of information, with the accountant as the communicator and users of reports as passive recipients of information (Brennan & Merkl-Davies, 2018).

Numerous studies examine the impact of corporate disclosures on a firm's information environment. The overall findings suggest that firms may improve their information environment through mandatory and voluntary disclosures and the quality or informativeness of such disclosures. Frankel and Li (2004) find that more informative financial reporting disclosures are associated with lower analyst activity, news reports, and frequency of insider buy transactions. Similarly, Barth et al. (2017) find that for South African firms, where integrated reporting is mandatory, integrated report quality, measured using the EY scoring system, is positively associated with liquidity and expected future cash flows, evidencing an improvement in firms' information environment.

Increasingly, social media is becoming a popular communication channel for firms to communicate information (Blankespoor et al., 2014; Brennan & Merkl-Davies, 2018). One social media site of particular interest is Twitter, a micro-blogging site with interpersonal communication features called tweets, with a maximum length of 280 characters (Nyakurukwa & Seetharam, 2022). Twitter is the most widely used social media site by firms to disclose financial information (Elliott et al., 2018). Since Twitter's launch date, 21 March 2006, it has

grown exponentially (Zhang et al., 2011), reaching approximately 368.40 million users worldwide at the end of 2022 (Turner, 2023).

Twitter's growing popularity has led numerous influential business leaders, investors and analysts, such as Elon Musk, Warren Buffett, Carl Icahn and David Shapiro, to engage with their followers on the platform actively and to provide investment advice and opinions (Gu & Kurov, 2020; Liao et al., 2014). As a result, Twitter has evolved into a notable influence within stock markets, where users have formed virtual financial investment communities. Within these communities, participants communicate, share ideas, and offer stock trading advice to one another (Sprenger et al., 2014).

Twitter has become a source of information for capital market participants to inform their investment decisions (Blankespoor et al., 2014), as prior research suggests that tweets contain useful information with predictive value for future stock returns. Dhar and Bose (2020) found that the mood expressed in firms' tweets was significantly associated with share prices. Vogel and Xie (2022) examine this concept from a different angle, in which they find that positive disclosures via Twitter are associated with higher levels and changes in institutional ownership. These findings imply that positive disclosure contains more information than negative disclosure, distinguishing Twitter from other disclosure channels. A plausible explanation is that management may seek to postpone or evade the disclosure of unfavourable news through a fast-paced channel like Twitter and instead use alternative communication channels. Moreover, when negative disclosure eventually surfaces on Twitter, it tends to contain less substantially new information. Tweets by users other than firms have also been found to influence future stock returns (Bollen et al., 2011; Nyakurukwa & Seetharam, 2022; Sprenger et al., 2014; Zhang et al., 2011).

In the context of this study, the impact of firm disclosures via social media, particularly Twitter, over and above traditional channels of communication, such as annual reports and SENS announcements are of particular interest, as such traditional disclosures are relatively standardised (Vogel & Xie, 2022). Moreover, such disclosure mediums fall under monologic communication, whereas Twitter possess dialogic communication properties that enable two-directional flows of information that may improve the effectiveness of corporate communication (Brennan & Merkl-Davies, 2018; Rybalko & Seltzer, 2010). Prior literature has primarily focused on the impact of management forecasts, conference calls, conference presentations, investor or analyst days or roadshows as mediums for corporate communication (Vogel & Xie, 2022). More recently, the focus has shifted to examining firms' use of Twitter, now known as "X", to disclose financial information to reduce information asymmetry. For example, Blankespoor et al. (2014) find that firm communication via Twitter reduced information

asymmetry, as shown by lower abnormal bid-ask spreads and greater abnormal returns. Additionally, Vogel and Xie (2022) find that changes in institutional ownership are positively related to voluntary disclosures on Twitter, implying that institutional investors show a greater interest in companies that provide more information voluntarily. The higher level of disclosures is associated with reduced information asymmetry and investment risk (Vogel & Xie, 2022).

1.1 Purpose of the research

The research aims to determine whether Twitter is an effective channel for firms to disclose financial performance to improve their overall information environment. For dialogic corporate communication channels, which includes the use of social media sites by firms, the effectiveness of such a channel is characterised by connectivity, i.e. how well the form of communication is at “linking information and connecting firms with their audiences” (Brennan & Merkl-Davies, 2018, p. 558). In doing so, the research aims to determine whether a significant relationship exists between JSE-listed firms’ tweets about their financial performance and share price performance. Additionally, the research aims to determine whether the type of news, favourable or unfavourable, contained in JSE-listed firms’ tweets about their financial performance will have a significantly positive or negative impact on their share price performance.

1.2 Statement of the problem

Empirical research indicates that improved disclosures can improve a firm's information environment, thereby reducing a firm's cost of capital and increasing share price (Chung et al., 2016; Hussainey & Walker, 2009; Jizi et al., 2016; Lambert et al., 2007). Twitter is considered an important communication channel and a source of information for investors regarding firms' disclosures (Blankespoor et al., 2014). Prior research has found that disclosures by firms on Twitter may improve firms' information environment (Blankespoor et al., 2014; Dhar & Bose, 2020; Vogel & Xie, 2022). For example, using a regression, Vogel and Xie (2022) studied the relationship between firm disclosures on Twitter and a change in institutional ownership. Dhar and Bose (2020) examined the impact of the emotions conveyed in firms' tweets on share prices during the Covid-19 pandemic. Blankespoor et al. (2014) employed an event study to examine the impact of firms' tweets about earnings announcements on bid-ask spreads, abnormal returns and liquidity. However, It appears that there is a gap in the research that examines the overall disclosure value of Twitter for firms, which is how it may impact share price performance (Vogel & Xie, 2022).

The research questions are as follows:

RQ_1: Do JSE-listed firms with a Twitter account, regardless of what they tweet about, improve the information environment?

RQ_2: Does the information on financial performance disclosed by JSE-listed firms on Twitter improve the information environment? This question is disaggregated into two sub-research questions, which are as follows:

$RQ_{2.1}$: Do JSE-listed firms, who use Twitter as a means of communication about their financial performance, experience better share price performance than firms who do not?

$RQ_{2.2}$: For JSE-listed firms that tweet about financial performance, does the share price performance vary depending on whether the tweets contain favourable or unfavourable news about financial performance?

With the above being said, the researcher does not intend for the study to be an event study. Instead, this study looks at whether a firm tweets about its financial performance as a characteristic, more like an indicator of its corporate governance practices.

1.3 Significance of the research

In a recent article, Vogel and Xie (2022) highlight how disclosures by firms on Twitter improve firms' information environment, as evidenced by changes in institutional ownership. The authors call for further research that examines the importance of Twitter disclosures for the overall information environment of firms. The present study answers the call by Vogel and Xie (2022) by examining whether disclosures by firms on Twitter about financial performance improve firms' information environment, thereby resulting in better share price performance.

This research may interest the management of South African firms and investors. If tweeting about financial performance on Twitter is found to have a positive impact on share price performance, management of South African firms may be incentivised to disclose the firms' financial performance on Twitter, over and above their monologic, statutory reporting requirements, and to engage in dialogue with audiences on the platform on an active basis. On the other hand, if tweeting about financial performance on Twitter is found to have a negative or nil effect on share price performance, management may decide not to incorporate Twitter as a communication channel for corporate information. From an investor perspective, the findings of this study could give valuable insights into the implications of using Twitter as part of a communication strategy with investors. Lastly, suppose firms tweeting about their financial performance is known to impact their share price performance. In that case, investors

may incorporate analysing social media content in their investment decision process to maximise their returns (Gu & Kurov, 2020).

1.4 Assumptions, limitations and delimitations

This study only focuses on firms listed on the JSE. As such, other stock markets within South Africa and the rest of the world are not considered. Consequently, the findings of this study may not be generalisable for firms listed on exchanges other than the JSE, which have fundamentally different reporting and corporate governance requirements to the JSE.

This study exclusively focuses on one social media site, Twitter, for each firm's 2022 fiscal year. Other well-known social media sites, such as Facebook, LinkedIn, YouTube and Instagram, are deliberately excluded from consideration in this study. The rationale behind this narrow focus lies in the inherent logic of examining firms' social media usage through the lens of Twitter. This choice is informed by Twitter's widespread popularity among businesses and their clientele, coupled with its direct link to business activities, as highlighted in the work of Mumi et al. (2019). Moreover, the wide availability of data from Twitter compared to other social media sites makes Twitter the apparent choice for this type of study (Mumi et al., 2019). However, the above limits the applicability of the study's findings to other social media platforms.

Using cross-sectional data for one period captures a snapshot at a specific point in time, providing a static view of the variables under investigation, which allows the researcher to control for changes in the economic cycle. However, using cross-sectional data for one period limits the researcher's ability to understand the dynamics and changes that occur over time, resulting in certain phenomena, trends, or fluctuations being overlooked or misunderstood. Additionally, the results of this study may not be generalisable to other periods.

This study measures the change in share price between the beginning and the end of the firms' financial year to determine whether firms' tweets about financial performance influence share price. In doing so, the study may be subject to look-ahead bias, in that variables predict a change in share price that occurs during the financial year. However, information for these variables is only available at the end of the firms' financial year.

The only variables considered in the study are whether firms have a Twitter account, tweets about financial performance, the type of news, favourable or unfavourable, firm size, profitability, investment and operating cash flows. Research on the determinants of share price performance is vast, and including all variables that may affect share price is beyond the scope of any study. Instead, this study includes variables accepted as drivers of share price

performance from seminal research (Fama & French, 2015; Mumi et al., 2019; Vedd & Yassinski, 2015). Additionally, the present study does not distinguish firms by industry sector. The aforementioned is due to the limited number of firms that do not tweet about their results.

This study does not focus on impression management using Twitter, although companies may well frame their tweets to influence readers. The theories underpinning impression management research are vast and worthy of a separate study. The present study only categorises tweets as "good" or "bad" news based on pre-defined criteria relating to the financial performance communicated in the tweet.

It must be noted that 28 observations out of 100 have been included as having a Twitter account, even though they may have last tweeted more than 12 months before the start of the analysis period.

Lastly, this study only focuses on tweets about financial performance, not tweets containing other information, such as promotional offers, product and service updates, and social responsibility and sustainability announcements. Additionally, this study only examines tweets made by firms, not tweets made about the firms from other Twitter users.

2. LITERATURE REVIEW

This section provides an overview of the prevailing studies within the specified field of research and the theoretical underpinnings of this study. First, the theoretical framework encompasses the Efficient Market Hypothesis (EMH), Asymmetric Information Theory and Agency Theory to understand how security prices reflect available information and management's rationale for disclosing firm-specific information to the public. Lastly, this section explores prior empirical literature, examining the relationship between corporate communication and a firm's information environment and the link between the sentiment in tweets and market features.

2.1 Theoretical overview

This study finds its theoretical underpinnings in EMH, Agency Theory and information asymmetry. EMH is considered a relevant theory for this study as firms disclose financial performance on Twitter, which is expected to be reflected in their stock prices. Additionally, Agency Theory can be used to explain the rationale of firms for making voluntary disclosures on Twitter, as it may reduce information asymmetry, which is one of the concerns associated with the separation of ownership and control (Nel & Baard, 2019).

The concept of market efficiency first became known in the early 19th century, when Louise Bachelier, a French mathematician, coined the Random Walk Theory in 1901, which suggests

that share price movements are unpredictable (Nyakurukwa & Seetharam, 2022). Similarly, Cowles 3rd (1933) documents that it is impossible to forecast asset prices accurately. Kendall and Hill (1953) introduced the “demon of chance” metaphor, which suggests that asset prices are stochastic in nature, such that the upcoming week’s prices are not dependent on the previous week’s prices, as investors rely solely on blind chance. However, the formalisation of EMH is largely attributable to Fama (1970).

The EMH, proposed by Fama (1970), provides that capital markets are efficient in that asset prices instantaneously fully reflect all available relevant information. The hypothesis provides that introducing new information triggers the correction of stock prices to their fundamental values (Fama, 1970). In an efficient capital market, perfect competition exists, making it impossible to realise abnormal returns through arbitrage when trading using current or past information, as it has already been incorporated into the prices of securities (Fama, 1970). Fama (1970) identified three forms of market efficiency, namely weak-form, semi-strong form and strong-form efficiency, to describe the degree to which asset prices reflect all past, public and private information. Most markets tend to experience a weak form of efficiency, meaning all past information has already been incorporated into asset prices. A semi-strong form of efficiency suggests that asset prices incorporate past information and adjust rapidly to new public information, meaning that investors cannot realise abnormal returns when trading publicly available information (Fama, 1970). Lastly, a strong form of efficiency ensures that all information, past, public, and private, is fully reflected in asset prices. As a result, not even insider information can enable investors to realise abnormal returns (Fama, 1970; Young & Auret, 2018). Empirical evidence suggests that South Africa, particularly the JSE, experiences mixed forms of efficiency, namely a mixture between weak form and semi-strong forms of efficiency (Thompson & Ward, 1995).

In most simplistic terms, information asymmetry arises when “different people know different things” (Stiglitz, 2002, p. 470). A seminal paper by Akerlof (1970) developed the market for lemons theory to explain the information asymmetry between sellers and buyers in markets. Akerlof (1970) used the example of the used car market to explain the theory of quality uncertainty. In the used cars market, the buyer may be uncertain of the quality of the car as the seller has better or more information regarding the car (Akerlof, 1970). The above may result in buyers making decisions based on incomplete and imperfect information and low-quality and high-quality cars being over or under-valued, respectively (Akerlof, 1970).

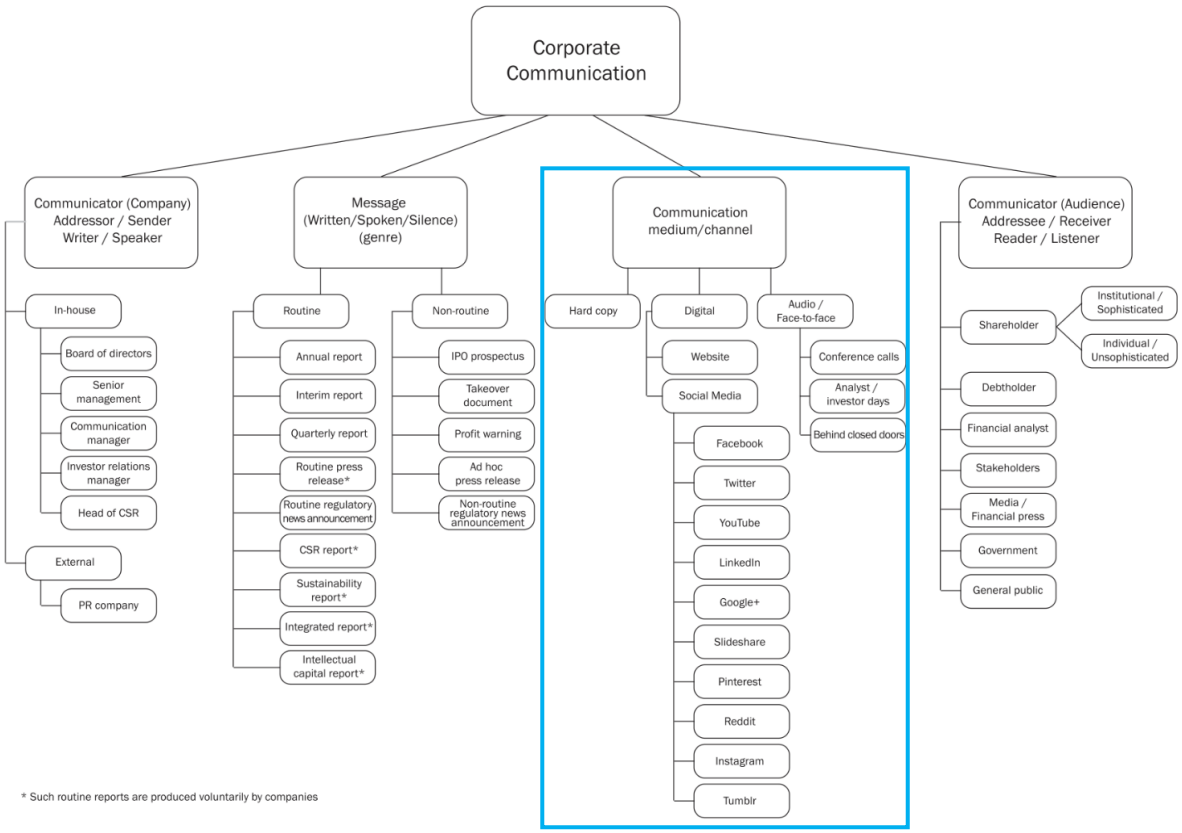
Similarly, in the context of capital markets, it is doubtful that outside capital market participants are as informed as firms’ management (Ang & Cheng, 2011). Information provided by firms affects investors' decision-making process (Connelly et al., 2011). Investment decisions are

either based on public information, freely available to all individuals, or private information, only available to specific individuals (Connelly et al., 2011). As some information is private, individuals who hold this information can make more informed decisions than those who do not (Connelly et al., 2011).

Agency Theory offers a framework for understanding the relationship between principals (owners) and agents (management), which is a modern-day issue arising due to the separation between ownership and control (Nel & Baard, 2019). This theory focuses on the inherent conflict of interest arising when a firm's decision-making authority is delegated from owners to management (Jensen & Meckling, 2019). Information asymmetry may arise when agents possess private information concerning their actions and outcomes, which principals do not (Stiglitz & Weiss, 1981). The previously mentioned factors may result in agency costs, such as moral hazard and adverse selection (Stiglitz & Weiss, 1981). Moral hazard suggests that agents may neglect their responsibilities and participate in riskier activities as they do not bear full accountability for the consequences of their actions (Holmstrom & Milgrom, 1987). Adverse selection arises due to information asymmetry, when principals cannot observe the agents' true agendas, resulting in suboptimal selection of agents to delegate responsibilities to (Akerlof, 1970).

2.2 Corporate communication

In the context of capital markets, corporate communication involves exchanging information about the firm’s economic activities, disclosed both within and beyond the confines of financial statements (Brennan & Merkl-Davies, 2018). Corporate communication can take place in numerous forms, such as reports, press releases, conferences, investor or analyst days and more recently, through social media (see the image below for a complete list of the different types of communication) (Brennan & Merkl-Davies, 2018). The primary objectives of communication are to fulfil accountability obligations to stakeholders, facilitate decision-making and foster relationships with capital market participants to encourage and maintain their financial support (Brennan & Merkl-Davies, 2018). Brennan and Merkl-Davies (2018) broadly conceptualise corporate communication as monologic and dialogic.



As shown in the figure above, Twitter is classified as communication channel which enables two-directional informational flows between firms and stakeholder. Source: Brennan and Merkl-Davies (2018).

2.2.1 Monologic and dialogic corporate communication

Monologic corporate communication is a one-directional flow of information from the firm to its audience about its economic events and their impact on the firm to exercise accountability to capital providers to ensure continued financial support (Brennan & Merkl-Davies, 2018). Financial reporting is a means to communicate useful information to users of financial statements. Such users may include but are not limited to “existing and potential investors, lenders and other creditors” (Bedford & Baladouni, 1962; IASB, 2021, para 8). Financial reporting falls under monologic corporate communication, as it is a one-directional flow of useful information from the firm to users of financial statements and restricts direct feedback from users (Brennan & Merkl-Davies, 2018). As part of the JSE listing requirements, all firms must issue reports and annual financial statements and make SENS announcements (JSE). Such disclosures fall under monologic corporate communication as information is transmitted through such communication mediums to capital market participants, who are passive recipients, as feedback is restricted (Brennan & Merkl-Davies, 2018).

Dialogic corporate communication is the interactive dialogue between firms and their audiences, exchanging ideas and opinions to reach a consensus about the firms' economic events (Brennan & Merkl-Davies, 2018; Kent & Taylor, 1998). From a capital market perspective, the main goal of dialogic communication is to build relationships with capital market participants to secure and maintain their financial support (Brennan & Merkl-Davies, 2018; Kent & Taylor, 1998). For dialogic communication to be effective, dialogic loops or mechanisms must be in place for audiences to provide feedback and for firms to respond to audiences' questions and concerns (Kent & Taylor, 1998).

According to Brennan and Merkl-Davies (2018), connectivity is a vital characteristic underlying an effective dialogic corporate communication strategy. The importance of connectivity lies in that it relates to the ability of a firm to link its financial events and their effects and connect the firm with its audience, such as shareholders and analysts (Brennan & Merkl-Davies, 2018). Brennan and Merkl-Davies (2018) categorise connectivity into three components: textual, intertextual, and relational. Textual connectivity relates to how different parts of a text are coherently linked, enabling readers to fully understand what the text purports to convey (Brennan & Merkl-Davies, 2018). Intertextual connectivity refers to the ability of audiences to understand a given text due to their prior knowledge of the subject matter (Brennan & Merkl-Davies, 2018). For example, users may use their knowledge of a firm's prior earnings announcements or annual financial statements to understand the message communicated in the same firm's most recent annual financial statements. Lastly, relational connectivity infers the ability of a chosen communication strategy to create the opportunity for interactive and customisable dialogue between firms and their audiences (Brennan & Merkl-Davies, 2018)

Digital technology and social media advancements have shaped how firms communicate with capital market participants (Brennan & Merkl-Davies, 2018). Prior studies argue that the internet and social media have the potential to be effective dialogic communication tools (Kent & Taylor, 1998; Rybalko & Seltzer, 2010). For example, Twitter may enhance the intertextual and relational connectivity of corporate communication. Twitter features, such as hyperlinks and hashtags, may improve the intertextual connectivity of corporate communication, as they can be used to direct users to documents on corporate websites to aid audiences' understanding of a particular subject matter and used to group tweets about a specific subject matter, possibly reaching wider audiences and improving audience engagement (Brennan & Merkl-Davies, 2018).

The retweet function on Twitter may improve the relational connectivity of a firm's corporate communication, as it may create opportunities for feedback and dialogue among firms and capital market participants. With Twitter's retweet function, audiences may comment or

provide feedback on information provided by firms, with firms having the ability to respond to such. Therefore, providing feedback loops enables symmetrical two-way communication between firms and their audiences in which such parties can interact with one another in order to reach a consensus on an issue (Brennan & Merkl-Davies, 2018). Additionally, audiences may share information provided by firms. Therefore, it makes it possible for information disseminated by firms to reach wider, diverse audiences (Brennan & Merkl-Davies, 2018).

2.2.2 Investor relations (IR)

Marston (1996) defines Investor relations (IR) as the channels of communication between firms and financial communities through which firms disclose information to enable the financial community to assess the firm. IR encompasses various disclosure types, including mandatory, voluntary, financial, and non-financial (Marston, 1996). Dolphin (2004) argues that IR is more than a communication channel; it is the ongoing, strategic, purposeful, and consistent marketing efforts to recognise, establish, sustain, and improve relationships between a firm and its current and potential investors, other stakeholders and financial analysts.

As the percentage of institutional investors in capital markets increases, institutional investors are more motivated to express their opinions and question management's practices (Dolphin, 2004). Consequently, the management of firms has an incentive to establish IR practices directed towards furnishing institutional investors with useful information and seeking and maintaining their financial support (Dolphin, 2004). As such, IR has become a strategic marketing tool that firms use to connect with present and potential investors and provide accurate information regarding the firm's performance and future prospects, thereby maintaining a good financial reputation (Dolphin, 2004). Maintaining a good financial reputation benefits firms, as it may improve their overall corporate performance (Dolphin, 2004). Prior literature highlights the benefits of a good financial reputation (Farraghe et al., 1994; Gregory, 1997; Vlittis & Charitou, 2012). Vlittis and Charitou (2012) find that firms announcing the new appointment of a new IR officer or firm experience positive abnormal returns on the day of the announcement. Moreover, such firms experience a significant reduction in information asymmetry, an increase in liquidity, and firm visibility the following year of the announcement (Vlittis & Charitou, 2012). Gregory (1997) links firm image to stock prices, as he finds a correlation between advertising expenditures pursuant to IR activities and stock prices. Farraghe et al. (1994) observe that earnings growth and stock prices fluctuate in line with the rise and fall of corporate image.

With the advent of the internet, there has been substantial growth in communication disclosure channels, providing users with more sources under the direct control of a firm, such as corporate websites (Nel & Baard, 2019) and social media sites. Bollen et al. (2006) find, using a sample of 270 firms listed in Australia, Belgium, France, the Netherlands, South Africa and the UK, a significant relationship between Internet Investor Relations, measured as the level of detail provided in the IR section on corporate websites, and the ratio of market value to book value of a firm. Nel et al. (2019) examined the relationship between the quality of Internet Investor Relations (IIR), measured by the presentation of voluntary disclosures on corporate websites, concerning accessibility, timeliness and navigation, and the cost of equity, cost of debt and the cost of capital. The authors found that, for JSE-listed firms, significant negative relationships existed between the quality of IIR and the cost of equity, cost of debt and cost of capital. Nel et al. (2018) examined the relationship between the quality of internet investor relations (IIR) of corporate website disclosures and information asymmetry, proxied using bid-ask spread, price impact and analyst following for a sample of 85 JSE-listed firms. The authors found a significant negative relationship between IIR and information asymmetry for all three proxies. Nel and Baard (2019) studied the relationship between voluntary corporate website disclosures and information asymmetry, measured as the bid-ask spread, for the smallest JSE-listed firms. The authors found a significant negative relationship between voluntary corporate website disclosures and bid-ask spreads. Moreover, the relationships between voluntary corporate website disclosures, share price volatility and share turnover were insignificant (Nel & Baard, 2019). The above findings indicate that, particularly for firms with a large market capitalisation, voluntary firm disclosures via corporate websites can reduce information asymmetry, thereby reducing a firm's cost of capital.

2.2.3 Corporate communication and the information environment

A growing body of literature demonstrates that improved firm disclosures can increase the market value of a firm's shares (Chung et al., 2016; Hussainey & Walker, 2009; Jizi et al., 2016). Firms may reduce information asymmetry, thereby increasing their share price, by conveying information to the public through direct corporate communication (Ang & Cheng, 2011). For example, Jizi et al. (2016) find that improved disclosures, in the form of corporate social responsibility disclosure, by U.S. national banks improve share price performance. Hussainey and Walker (2009) find that for U.K. non-financial firms, narrative disclosure level in annual reports improves share price anticipation of future earnings. Chung et al. (2016) find that for Canadian firms listed on the Toronto Stock Exchange, higher disclosure levels, in terms of length and size of annual reports, contain value-relevant information that is incorporated more efficiently in share prices.

A large body of literature suggests a link between corporate disclosures and the cost of capital. As firms disclose firm-specific information, information asymmetry between firms and capital market participants decreases, thereby decreasing firms' cost of capital and improving share price performance (Bloomfield & Wilks, 2000; Diamond & Verrecchia, 1991). The previously mentioned suggests that an indirect relationship between information dissemination by firms and information asymmetry exists.

Disclosure can decrease the cost of capital by decreasing a firm's cost of equity or the cost of debt. Theoretical research supporting the negative relationship between disclosure level and the cost of equity can be broken down into two routes: liquidity and estimation risk (Botosan & Plumlee, 2002). The liquidity route refers to improved disclosures resulting in lower transaction costs and increased demand for the firm's shares, leading to an increase in liquidity and a decrease in the cost of equity (Nel et al., 2019). The estimation risk route infers investors' assessments of expected returns (Nel et al., 2019). As a result, improved quality of disclosures may assist investors in making more accurate estimates, as there is less uncertainty surrounding a firm's future cash flows and profitability, thereby reducing non-diversifiable estimation risk and the cost of equity (Nel et al., 2019). Firms may reduce the cost of debt, calculated as the risk-free rate plus default risk, by improving disclosures and increasing transparency. Therefore, creditors may decrease the assessed probability that the firm withholds adverse private information (default risk) (Sengupta, 1998).

The liquidity route is exemplified by the works of Amihud and Mendelson (1986) and Diamond and Verrecchia (1991). Amihud and Mendelson (1986) found, using evidence from the NYSE, that securities with a higher cost of equity experience wider bid-ask spreads, a measure of illiquidity, as investors require a higher rate of return to be compensated for higher transaction costs brought on by adverse selection risk. To mitigate this, firms can disclose information to reduce adverse selection associated with the bid-ask spread and subsequently lower their cost of equity (Amihud & Mendelson, 1986). Diamond and Verrecchia (1991) developed a model suggesting higher quality financial disclosures and transparency by selecting an accounting technique or a policy of making earnings and forecast announcements that may reduce the information revealed after large trades, decreasing the adverse price impact related to such trades. As a result, demand for the firm's securities increases as investors are inclined to take larger positions, thereby increasing security prices and the cost of equity. Bloomfield and Wilks (2000) observed that disclosure quality positively affects share price and future liquidity in a laboratory financial market setting. Additionally, disclosure quality positively affects share prices when investors are subject to demand shocks, which are sudden significant changes in the demand for stocks, causing rapid and often unpredictable movements in stock prices (Bloomfield & Wilks, 2000). The previously-mentioned relationship

occurs as investors may be willing to pay a higher price for higher-quality disclosure securities, as the higher liquidity associated with these securities decreases the pressure exerted by investors on prices if they are forced to sell (Bloomfield & Wilks, 2000).

Botosan (1997, p. 331) found that for firms listed on the NYSE/AMEX with a low analyst following, the level of voluntary disclosure in annual reports, measured as a score reflecting five categories, namely "background information, summary of historical results, key non-financial statistics, projected information and management discussion and analysis" was negatively associated with the cost of equity. Conversely, firms with a high analyst following showed no significant relationship between the level of voluntary disclosure and the cost of equity (Botosan, 1997). Botosan and Plumlee (2002) found a negative association between annual report disclosure level and the cost of equity for firms examined by the Association for Investment Management and Research in their Corporate Information Committee's Annual Reviews of Corporate Reporting Practices (AIMR reports). On the other hand, the authors find a positive association between the level of timely disclosures, such as quarterly reports, and the cost of equity. The previously-mentioned is consistent with managers' claims that increased timely disclosures may increase share price volatility. Similarly, Healy et al. (1999) found that for firms that significantly improved the quality of their disclosures, determined using analysts' ratings, reported in the AIMR reports, experienced increased stock returns, institutional ownership, analyst following, and stock liquidity. Cormier et al. (2009) found that for non-financial firms represented on the Toronto Stock Exchange S&P/TSX index, voluntary social and human capital disclosures reduced information asymmetry, as evidenced by a decrease in share price volatility and an increase in Tobin's Q.

In examining the risk-estimation route, prior literature suggests that investors estimate the parameters of a share's payoff distribution using solely a firm's return history or along with other relevant firm information (Barry & Brown, 1985; Clarkson et al., 1996; Coles & Loewenstein, 1988; Coles et al., 1995; Handa & Linn, 1993; Klein & Bawa, 1976). Using a Bayesian approach, in which investors form predictive distributions reflecting their uncertainty about the true parameters, Barry and Brown (1985), Handa and Linn (1993), and Coles et al. (1995) suggest that estimation risk is non-diversifiable and is not reflected by the market beta of the traditional CAPM, as such, estimates of market beta are too low for low information firms. Although not incorporated in market beta, Clarkson et al. (1996) argue that estimation risk can affect the returns earned from market portfolios. In support of the above, Barry and Brown (1985) suggest that, in the presence of unobservable estimation risk, small, less established firms with low information had high rates of return per unit of estimated beta, with the opposite being true for large, well-established firms with high information. Investors use information firms disclose to forecast the expected future cash flows to determine the present

value of their investments (Poshakwale & Courtis, 2005). Suppose such disclosures contain more relevant and useful information. In that case, it may reduce uncertainty and estimation risk from the investors' perspective, lowering the required rate of return and thereby decreasing the firms' cost of equity (Poshakwale & Courtis, 2005). Poshakwale and Courtis (2005) found that using evidence from 135 banks across Europe, North America and Australia, voluntary disclosure levels were negatively associated with the cost of equity and are positively associated with the number of analysts following, the number of news items, and accuracy of analyst forecasts. Jorgensen and Kirschenheiter (2003) found that firms subject to US Securities and Exchange Commission (SEC) Financial Reporting Release No. 48, which sets out disclosure requirements surrounding risk, which disclose additional risk information beyond what is required, experience lower risk premiums and higher share prices. Hussainey and Mouselli (2010) used the disclosure quality of annual reports of UK companies, being the quantity of future-oriented earnings statements, as a proxy for information risk in asset pricing. The authors found a negative association between disclosure quality and the cost of capital, indicating that higher-quality disclosures in annual reports enable investors to estimate future earnings more accurately. The above prior literature underscores the significance of how information disclosure influences investor perceptions and their ability to accurately estimate a share's payoff distribution, ultimately affecting a firm's cost of equity.

As mentioned earlier, disclosure may decrease a firm's cost of capital by decreasing a firm's cost of debt. Sengupta (1998) found that for a sample of 114 firms in the United States that featured in the Report of the Financial Analysts Federation Corporate Information Committee, the yield to maturity on new debt issues and the total interest cost of new debt are negatively associated with high disclosure quality ratings by financial analysts. Similarly, Guidara et al. (2014) found that for a sample of 20 JSE-listed firms, the extent of voluntary disclosures in annual reports, measured using the disclosure index developed by Chau and Gray (2002), is negatively and significantly associated with the cost of debt. Moreover, the timeliness of disclosures, measured as the lag between the end of the firm's fiscal year and the date of publication of the annual report, has a trivial effect on the cost of debt (Guidara et al., 2014).

2.3 Social media

Social media platforms enable capital market participants to communicate with one another, with peer opinions also playing a crucial role in capital markets, which is evidenced by the rise of numerous influential business leaders, investors and analysts, such as Elon Musk, Warren Buffett, Carl Icahn and David Shapiro providing investment advice and opinions via social media channels (Gu & Kurov, 2020; Hossain et al., 2022; Liao et al., 2014). Hirshleifer and Teoh (2009) argue that social influence through conversational interactions, print and digital

media, amongst capital market participants convey private information but also encompass ideas concerning specific assets and insights into the functioning of capital markets. Numerous studies have studied the impact of one prominent and influential Twitter user, namely Elon Musk. Strauss and Smith (2019) find that the Twitter accounts of Tesla, a media-visible firm, and Elon Musk are valuable sources of market information for day traders and shareholders when making trade decisions. Also, using an event study methodology, Ante (2023) found that Dogecoin, a cryptocurrency, experienced significant positive abnormal returns and trading volume following Elon Musk's tweets regarding the cryptocurrency.

As such, the communication process between firms and capital market participants creates new information, with social media as a facilitator (Hossain et al., 2022). Moreover, surveys conducted by Forbes on the investment habits of younger generations, namely Millennials and Generation Z (commonly referred to as "Gen Z"), show the following: 47% of Gen Z use social media for investment advice, with only 17% that consult with financial advisors and 31% of Millennials use social media for investment advice, with 41% saying they consult with financial advisors (Rose, 2023). In South Africa, surveys show that 3% of Gen Z state that their interest in financial planning or investing has increased, 39% of whom self-educate themselves by following influencers and getting stock information from social media platforms (Joeri et al., 2022). The aforementioned highlights the growing importance of social media platforms as information dissemination channels for stock markets. The possible reason for younger generations utilising social media for investment advice may be attributable to the decreasing attention spans of such individuals. On average, the attention spans of Millennials and Gen Z are 12 and 8 seconds, respectively (Roberto, 2023). The previously mentioned may prove troubling for Millennial and Gen Z individuals when reading long-form disclosures, such as annual or integrated reports. Such individuals are accustomed to consuming information in bite-sized portions, making it challenging to engage with lengthy and detailed documents like annual reports. As a result, social media platforms, like Twitter, may be a preferred choice for such generations, as stock information is provided in short form, with a maximum length of 280 characters.

In response to the growing prevalence of social media, firms are adjusting their behaviour by incorporating social media into their corporate disclosure policies (Blankespoor et al., 2014; Brennan & Merkl-Davies, 2018). Dhar and Bose (2020) find that in crises, such as the COVID-19 pandemic, firms use Twitter to manage public perceptions, as evidenced by the significant increase in the use of Twitter during the pandemic and a positive association between firm tweets and share price. Due to the growing popularity of social media, regulatory agencies, such as the SEC, have concluded that posting on social media is a valid communication channel and have adopted rules to govern disclosure requirements for firms on social media

platforms (Hossain et al., 2022). Additionally, Mumi et al. (2019) conclude that Twitter is an effective signalling strategy for firms during their initial public offerings, as the number of tweets is positively related to IPO value.

2.4 Drivers of share price performance

Share prices stocks fluctuate daily in stock markets (Al-Tamimi et al., 2011). It is evident that share price fluctuations are not always random, and there are noticeable patterns, such as morning appreciations, especially during certain times of the year (Al-Tamimi et al., 2011). These fluctuations occur due to supply and demand forces (Al-Tamimi et al., 2011). Despite efforts to predict, there is no foolproof system for accurately forecasting stock movements (Al-Tamimi et al., 2011). That said, potential factors that may impact share price movements encompass various factors, including company fundamentals, external factors and market dynamics (Al-Tamimi et al., 2011).

Company fundamentals, such as performance, changes in the board of directors, new management appointments, and changes in assets, dividends, and earnings, play a crucial role in shaping stock prices (Al-Tamimi et al., 2011). External factors, such as government regulations, inflation, economic conditions, investor behaviour, market conditions, money supply, competition, and unforeseen natural or environmental events impacting production, also contribute to stock price movements (Al-Tamimi et al., 2011). Furthermore, the behaviour of market participants significantly influences stock price.

Fama and French (1993) introduced a three-factor asset pricing model that builds on the traditional Capital Asset Pricing Model (CAPM) to explain stock returns better. The model and empirical findings suggest that stock returns are not just influenced by market risk, which the CAPM only incorporates. Instead, they are also influenced by company fundamentals such as firm size and the value of stocks, measured by a firm's book-to-market ratio (Fama & French, 1993). In 2015, Fama and French (2015) revisited the three-factor model and introduced two additional variables: profitability and investment growth. The empirical findings suggested that the new five-factor model better captured the cross-sectional variation in stock returns and provided more accurate estimates of expected returns for different types of stocks (Fama & French, 2015).

Prior literature suggests that an investor's perception of a firm's ability to generate cash, particularly operating cash flows, is a significant predictor of share prices (Rayburn, 1986; Vedd & Yassinski, 2015). Rayburn (1986) found that for 175 firms listed on various US stock exchanges over the period 1963 to 1982, operating cash flows are significantly associated with abnormal returns. Conversely, for a sample of 717 firms listed on the largest stock markets

in Latin America, namely the “Bolsa Mexicana de Valores in Mexico, Bolsa de Valores de Colombia in Colombia, Rio de Janeiro Stock Exchange in Brazil, and the Santiago Stock Exchange in Chile”, over the period 2004 to 2013, Vedd and Yassinski (2015, p. 15) find that operating cash flows have a negative impact on share prices.

2.5 Nuance of the South African stock markets

South African stock markets underwent two distinct transitional phases (Hearn et al., 2010). The first phase occurred prior to 1995, during which the market was inaccessible to foreign investors, primarily due to global sanctions (Hearn et al., 2010). Additionally, investors were legally obligated to invest in domestic equities rather than money or bond market instruments under the National Party's prescribed assets regulation (Grandes & Pinaud, 2004). At the same time, global financial markets were prevalent (Helleiner, 1995). As such, the above nuance differed from stock markets in other parts of the world, allowing foreign investment and the freedom to invest in diverse securities. The next phase, starting after the dissolution of apartheid in 1995, led to the financial liberalisation of South African stock markets, enabling foreign investment and the resultant implementation of formal legislation to ensure international standards of corporate governance (Hearn et al., 2010).

The Johannesburg Stock Exchange (JSE) is Africa's oldest, most expansive, well-developed, and meticulously regulated market (Hearn et al., 2010; Jefferis & Okeahalam, 2000). In its initial years, the JSE largely raised capital to develop gold mines (Jefferis & Okeahalam, 2000). Since then, the JSE has grown steadily and become increasingly more diversified. However, the JSE is still heavily influenced by the mining sector (Jefferis & Smith, 2005). The above differs from other stock markets; for example, the technology sector is the most prevalent in American stock markets (John & Paulina, 2023).

Despite the JSE’s classification as an emerging market, the JSE is historically illiquid, in comparison to global standards, due to being primarily dominated by a small number of institutional investors, thereby resulting in a substantial portion of the shares quoted on the JSE not being available for sale to the public (Hearn et al., 2010; Jefferis & Okeahalam, 2000). The above can potentially have negative implications for the efficiency of the JSE (Jefferis & Okeahalam, 2000).

From an efficient markets perspective, African stock markets are generally institutionally weak, exhibit low liquidity and are small in size and market capitalisation (Afego, 2015). Empirical studies testing the efficiency of the JSE produce mixed results. Based on a review of prior literature, Thompson and Ward (1995) observed mixed results regarding the efficiency of the JSE, with no general conclusion being reached. Jefferis and Okeahalam (1999) found, using

unit root tests on stock price indices from 1989 to 1996, that the JSE was efficient. Similarly, using an event study, Okeahalam and Jefferis (1999) find that the JSE exhibits semi-strong efficiency when assessing how individual stock prices react to information announcements. Whereas, neighbouring stock markets, namely the Botswana Stock Exchange (BSE) and Zimbabwe Stock Exchange (BSE) did not show semi-strong efficiency (Okeahalam & Jefferis, 1999). Conversely, Smith et al. (2002) find, using multiple variance ratio tests, that the JSE follows a random walk, signifying that the JSE exhibits weak-form efficiency. Magnusson and Wydick (2002) find that by using independent but not identically distributed (INID) price changes, the JSE experiences a weak form of efficiency. Jefferis and Smith (2005) infer that most studies assess the JSE's efficiency at a point in time and do not assess gradual changes in efficiency. In the early stages of a stock market, it takes time for informational efficiency to develop (Jefferis & Smith, 2005). As a market continues to function and its microstructures evolve, the emerging stock market is expected to become more efficient over time (Jefferis & Smith, 2005).Using a GARCH approach with time-varying parameters over January 1990 and June 2001, Jefferis and Smith (2005) find that the JSE has a weak form of efficiency, with no tendency to change over time. The overall empirical findings present a mixed picture regarding the efficiency of the JSE. The evidence suggests instances of both weak and semi-strong forms of efficiency, impacting the timeliness of information incorporation into asset prices on the JSE. The above implications for this study are that the information in tweets about financial performance should be reflected in JSE-listed firms' share prices. However, due to the JSE being characterised as experiencing weak and semi-strong forms at different times, the information contained in tweets may take longer to be incorporated into share prices.

Many studies in the field focus on stock markets in the United States or Europe. The above nuances make South African stock markets, particularly the JSE, unique, and the study of them is of particular interest.

2.6 Hypothesis development

2.6.1 Twitter communication

Twitter has become a source of information dissemination and disclosure for capital market participants, enabling them to obtain relevant and timely firm-specific information (Blankespoor et al., 2014; Ravaonorohanta & Sayumwe, 2020). Twitter is considered a voluntary disclosure channel, which adds to what firms already use (Ravaonorohanta & Sayumwe, 2020; Vogel & Xie, 2022). Prior studies have found that firm disclosures on Twitter can improve the information environment of firms (Blankespoor et al., 2014; Mumi et al., 2019; Vogel & Xie, 2022). Blankespoor et al. (2014) examined whether additional voluntary disclosures by technology firms on Twitter improved their information environment. The

authors found that firm disclosures on Twitter resulted in lower abnormal bid-ask spreads, greater abnormal returns and increased liquidity, which indicate reduced information asymmetry. Mumi et al. (2019) found that for firms that went public in the USA from 2014 to 2015, the number of firm tweets prior to the IPO was positively related to the firm's IPO value, measured as the total capital raised less underwriter fees. Moreover, the relationship between the number of firm tweets was mediated by audience responses, measured as the number of retweets (Mumi et al., 2019). Vogel and Xie (2022) also examined firm disclosures on Twitter but used changes in institutional ownership as a proxy for information asymmetry. The authors found that firms with a higher frequency of Twitter usage had higher levels of institutional ownership, which indicates that increased transparency provided by disclosures on Twitter improves the information environment of firms, which is attractive to institutional investors (Vogel & Xie, 2022).

Based on all the above, the first two hypotheses for the present study is:

H_1: JSE-listed firms with a Twitter account experience better share price performance.

H_2: JSE-listed firms with a higher frequency of tweets about financial performance experience better share price performance.

2.6.2 The predictive value of Twitter

Numerous studies have examined whether tweets by users other than firms contain useful information with predictive value for future stock returns (Bollen et al., 2011; Sprenger et al., 2014; Zhang et al., 2011). For example, Bollen et al. (2011) found that moods expressed in tweets predicted the Dow Jones Industrial Average (DJIA) closing values with significant accuracy. Similarly, Zhang et al. (2011) found a negative correlation between 'emotional' tweets and stock market indices, such as the DJIA, S&P 500 and NASDAQ. Sprenger et al. (2014) and Nyakurukwa and Seetharam (2022) evaluated the relationship between tweet features, such as bullishness, message volume and investor agreement, and stock market features, such as stock returns, volatility and trading volume. Sprenger et al. (2014) found that, when using daily intervals, sentiment in tweets is associated with stock market features. Nyakurukwa and Seetharam (2022) found that for companies listed on the FTSE/JSE All Share Index, the past values of tweet features can predict future stock returns using weekly and monthly data, not daily data. Overall, the findings of the above studies indicate a potential link between social media activity, specifically tweets, and stock market behaviour.

The management of firms may strategically disseminate news on Twitter to shape the firm's information environment and influence the firm's share price (Lee, 2001). Dhar and Bose (2020) measured the emotion expressed in firms' tweets and found that it significantly

predicted future stock prices. Due to the dynamic nature of Twitter, firms are less likely to disclose unfavourable financial performance on Twitter and instead convey this information through other channels (Vogel & Xie, 2022), such as reports, annual financial statements or SENS announcements, with the opposite expected for favourable financial performance (Vogel & Xie, 2022). Vogel and Xie (2022) found that changes in institutional ownership were more significant for positive firm disclosures than negative firm disclosures on Twitter. Overall, the findings highlight the strategic use of Twitter in shaping a firm's information environment and potentially impacting stock prices.

As a result, the second hypothesis for the present study is:

H_3: JSE-listed firms that tweet about favourable (unfavourable) financial performance experience an increase (decrease) in share price.

2.7 Synopsis

Direct corporate communication is a means for firms to reduce information asymmetry between management and other capital market participants (Ang & Cheng, 2011). Brennan and Merkl-Davies (2018) state that corporate communication can be monologic or dialogic. Twitter possesses features that enable dialogic communication (Ang & Cheng, 2011). Brennan and Merkl-Davies (2018) argue that it may enhance the effectiveness and connectivity of corporate communication. Prior literature suggests that firm disclosures on Twitter can enhance information dissemination and improve a firm's information environment. Blankespoor et al. (2014) found that firms that made tweets containing hyperlinks to press releases are associated with lower abnormal bid-ask spreads, greater abnormal returns and increased liquidity for a sample technology firms. Mumi et al. (2019) found a positive relationship between the number of firm tweets before their IPO and the firm's IPO value. Additionally, retweets, in which audiences responded to and shared firms' tweets, mediated the previously-mentioned relationship (Mumi et al., 2019). Vogel and Xie (2022) found a positive relationship between a firm's frequency of Twitter usage and level of institutional ownership. The above findings underscore the significance of direct corporate communication through Twitter in reducing information asymmetry between firms and capital market participants. Features that enable dialogic communication on Twitter are seen as enhancing the effectiveness of corporate communication (Brennan & Merkl-Davies, 2018; Mumi et al., 2019). Moreover, using Twitter for financial communication reaches wider audiences and facilitates dialogic communication, potentially reducing the cost of capital and increasing firms' share prices.

Additionally, prior literature suggests that the type of news and emotion expressed in firms' tweets influence share price and institutional investors' behaviour. Dhar and Bose (2020) found that the emotion expressed in firms' tweets predicts future stock prices significantly. Vogel and Xie (2022) found a significant relationship between changes in institutional ownership and tweets disclosing favourable financial performance. Therefore, the type of news in firms' tweets about financial performance, favourable or unfavourable, may be incorporated into share prices. The above findings indicate that the content and emotional tone of a firm's tweets can influence investors' perception of the firm, thereby playing a role in shaping stock prices.

3. METHODOLOGY

This research investigates whether a relationship exists between JSE-listed firms' tweets about their financial performance and share price performance. Additionally, the research aims to determine whether the type of news, favourable or unfavourable, contained in JSE-listed firms' tweets about their financial performance will have a subsequent positive or negative impact on their share price performance. The remainder of this section describes the data sample tested and outlines the model utilised. This study follows a quantitative research method by employing Ordinary Least Squares (OLS) regression because the impact of firms' tweets about financial performance on share price is examined. The methodology of this research is primarily based on the research and model used by Mumi et al. (2019); it also incorporates the findings of seminal works, such as Fama and French (2015), regarding determinants of share price performance.

3.1 Data collection

In order to address the research questions and test the hypotheses, data was collected from multiple sources for each firm's 2022 fiscal year. Financial data, such as share prices, total revenue, return on equity, change in fixed assets and operating cash flows, were collected for each firm using the EquityRT database (equityrt.com). Each firm's Twitter account information was manually located using their corporate websites and Google search engine. The researcher manually collected Twitter data, such as whether each firm had a Twitter account, firms' tweets about financial performance, from each firm's Twitter account page on Twitter's

website[1]. Once financial and Twitter-related data were collected, it was stored on an Excel spreadsheet on the researcher's laptop, which is password protected.

3.2 Population and study sample

The data collection process was challenging considering the recent changes to Twitter's API, restricting access by all third-party applications. Additionally, viewing historical data such as tweets and retweets is limited to 2400 daily posts. This limitation may make it difficult to access tweets before 2021. Only firms that tweeted about financial performance in their 2022 fiscal year will be considered to address this limitation. 273 firms are listed on the JSE (Listcorp., 2024). However, this study focused on firms with large and small market capitalisation for coverage. Therefore, 102 firms with the largest market capitalisation and 71 with the smallest market capitalisation, measured using the EquityRT database, were considered for the sample. The sample excludes spin-off firms with more than one listing on the JSE. Additionally, this study does not consider Electronic Transfer Funds (ETFs) in the sample as it may result in double counting firms already listed on the JSE if the ETF holds its shares in its portfolio. The focus is not on ETFs but on firms with specific corporate governance practices. As a result, a sample of 148 firms was selected. Only 100 firms have Twitter accounts, and 34 firms have tweeted about their financial performance in the 2022 fiscal year. As a result, the sample for model (1) consists of 173 firms with and without Twitter accounts. The model (2) sample consists of 100 firms with Twitter accounts. Lastly, the model (3) sample consists of 34 firms that tweeted about their financial performance. 139 tweets about financial performance were collected, 124 containing favourable news and 24 containing unfavourable news. All of the above aligns with the central limit theorem, which requires a minimum of 30 firms that tweeted about their financial performance and 30 firms that did not tweet about their financial performance in the sample (Kwak & Kim, 2017).

Table 1: Sample selection

	Number of firms
Firms listed on the JSE with a large market capitalisation	102
Firms listed on the JSE with a small market capitalisation	71
Total number of firms listed on the JSE considered	173

[1] Due to data restrictions imposed by Twitter's recent API changes, third-party data-crawling websites, such as Twitonomy, as used in Mumi et al. (2019), could not be used in this study. Instead, all tweets made by firms were be obtained directly from Twitter's website.

Exclude: spin-off firms with multiple listings on the JSE, ETFs and insufficient financial data	(25)
Total number of JSE-listed firms with and without Twitter accounts	148
Exclude firms without Twitter accounts as at the beginning of their respective 2022 fiscal year	(48)
Total number of JSE-listed firms with Twitter accounts	100
Exclude firms that did not tweet about financial performance	(66)
Total number of firms that did tweet about financial performance	34

Adapted from Blankespoor et al. (2014)

Table 2: Classification of tweets about financial performance	
	Number of observations
Total number of tweets about financial performance	139
Number of good news tweets	124
Number of bad news tweets	24

3.3 Data analysis

Ordinary Least Squares (OLS) regressions were employed for all models. This study does not use the models from Mumi et al. (2019) but rather draws on the concept of incorporating an independent Twitter variable, namely the frequency of tweets. Additionally, the independent variables of frequency of tweets and the type of news, favourable or unfavourable, contained in tweets are consistent with Vogel and Xie (2022). The measurement of variables follows precedent from prior research, as indicated in Table 3. The models are as follows:

Model 1:

$$\Delta\ Share\ price_i = \beta_0 + \beta_1(TA)_i + \beta_2(Size)_i + \beta_3(Profitability)_i + \beta_4(Inv)_i + \beta_5(OCF)_i + \mathcal{E} \quad (1)$$

To address RQ_1 and H_1, a regression analysis, as seen in the model (1), is conducted for all firms included in the sample, irrespective of whether firms tweeted about financial performance or not, to evaluate whether firms having a Twitter account have an impact on their information environment. To distinguish between firms with and without Twitter accounts, the independent variable, "*TA*", is a binary variable calculated as 1 for firms with a Twitter account and 0 for firms without a Twitter account, which aligns with Mumi et al. (2019).

Model 2:

$$\Delta\ Share\ price_i = \beta_0 + \beta_1(TFP)_i + \beta_2(Size)_i + \beta_3(Profitability)_i + \beta_4(Inv)_i + \beta_5(OCF)_i + \mathcal{E} \quad (2)$$

To address $RQ_{2.1}$ and H_2, a regression analysis, as seen in model (2), is conducted for all firms included in the sample, irrespective of favourable or unfavourable financial performance, to examine the effect on the information environment. The independent variable, "*TFP*", will be the frequency of firms' tweets about financial performance throughout its fiscal year (Mumi et al., 2019; Vogel & Xie, 2022).

Model 3:

$$\Delta\ Share\ price_i = \beta_0 + \beta_1(News)_i + \beta_2(Size)_i + \beta_3(Profitability)_i + \beta_4(Inv)_i + \beta_5(OCF)_i + \mathcal{E} \quad (3)$$

To address $RQ_{2.2}$ and H_3, a regression analysis, as seen in model (3), is only conducted for firms that tweeted about financial performance. Model (3) is used to determine whether favourable (unfavourable) news in tweets about financial performance will result in an increase or (decrease) in share price performance. Using a similar measurement method as Vogel and Xie (2022), the independent variable, "*News*", is a scale variable calculated as +1 for favourable financial performance and -1 for unfavourable financial performance. The scores of all the tweets for the period will be added to give a total "*News*" score. Vogel and Xie (2022) examined the sentiment of all tweets by firms. In contrast, this study only focuses on the type of news, favourable or unfavourable, in tweets about financial performance. Similar studies like Dhar and Bose (2020) and Vogel and Xie (2022) utilised machine learning artificial intelligence tools to extract the type of sentiment contained in tweets. Due to restricted access to such tools, tweets about financial performance are manually examined using key phrases, as shown in Table 3. As the tweets are manually examined, subjectivity is involved on the researcher's part. The classification of the type of news contained in each tweet is restricted to 8 key phrases, as shown in Table 3, to address the researcher's potential subjectivity and simplify the classification method. For each tweet, only one of the below phrases needs to be present. Based on the Twitter data captured, no conflicting types of financial performance were disclosed. For example, there were no instances where headline earnings (or headline earnings per share) increased from the prior period while earnings (or earnings per share) decreased, and vice versa. Using the key phrases mentioned in Table 3, see Appendix 6.11 for examples of how tweets about financial performance were classified as favourable or unfavourable news and consequently coded to determine the overall news score variable.

Table 3: Classification of favourable or unfavourable financial performance in tweets

Favourable financial performance	**Unfavourable financial performance**
Headline earnings per share (HEPS) increased from the prior period.	Headline earnings per share (HEPS) decreased from the prior period.

Headline earnings (HE) increased from the prior period.	Headline earnings (HE) decreased from the prior period.
Earnings per share (EPS) increased from the prior period.	Earnings per share (EPS) decreased from the prior period.
Earnings increased from the prior period.	Earnings decreased from the prior period.

For models (1), (2) and (3), β_0 is the constant, and $\mathcal{E}$ is the error term. The control variables in all three of the models are firm size, profitability, investment, and operating cash flows. Seminal research indicates that such variables influence share price performance (Fama & French, 2015; Mumi et al., 2019; Vedd & Yassinski, 2015). As a result, by controlling for firm size, profitability, investment, and operating cash flows, the impact of the Twitter variables on share price performance in all models was isolated and analysed. Refer to Table 4 for a description of how these control variables were measured.

Table 4: Definition of the variables in both models

Variable	Type	Measurement	Precedent
Δ Share price	Dependent (ratio)	The change in share price is measured as the difference between the share price on T_0 and the share price on T_1, scaled by the share price on T_0.	Gelb and Zarowin (2002)
Firms with Twitter "TA"	Independent (binary)	In model (1), to distinguish between firms with and without Twitter accounts, the variable is measured as a binary variable, firms with a Twitter account are assigned a 1 and firms without Twitter accounts are assigned a 0.	Mumi et al. (2019)
Frequency of tweets "*TFP*"	Independent (scale)	In model (2), the frequency of tweets is measured as the number of tweets by the company about its financial performance throughout each firm's fiscal year as at T_1.	Vogel and Xie (2022)
Tweets disclosing favourable or	Independent (scale)	In model (3), tweets about financial performance throughout each firm's fiscal year are measured as a scale	Vogel and Xie (2022)

unfavourable financial performance "*News*"		variable, calculated as 1 for favourable financial performance and -1 for unfavourable performance for each tweet. The scores of all the tweets for the period will be added to give a total "News" score.	
Firm size	Control (scale)	Firm size is measured as the natural logarithm of total revenue, as T_1.	Lemma and Negash (2011)
Profitability	Control (ratio)	The profitability variable is measured as the return on assets, as at T_1.	Gelb and Zarowin (2002)
Investment	Control (ratio)	The investment variable is measured as the difference between fixed assets at T_0 and fixed assets at T_1, scaled by fixed assets at T_0.	Fama and French (2015)
Operating cash flows "*OCF*"	Control (ratio)	The operating cash flows variable is measured as the cash flows from operations divided by total revenue, as at T_1.	Vedd and Yassinski (2015)

3.4 Validity and reliability

The assumptions of the regression were tested to ensure the internal validity and reliability of the results obtained in this study. Robustness tests for homoskedasticity, normality, and multicollinearity were undertaken. Similarly to Mumi et al. (2019), Breusch and Pagan (1979)'s and White (1980)'s tests for heteroskedasticity were conducted (Osborne & Waters, 2002). Additionally, each model's variance factor (VIF) was calculated to address multicollinearity issues (Mumi et al., 2019). Following prior studies, a VIF value of 10 or less is acceptable (Hair, 1995; Kutner et al., 2004; Mumi et al., 2019). The linearity of the relationship between the independent variables and the dependent variable was tested using a scatter plot with each independent variable against the dependent variable to identify any non-linear patterns. A Kolmogorov-Smirnov test was performed over each independent variable against the dependent variable to determine whether variables are normally distributed. Additionally, the variables utilised in the regression are commonly used in accredited prior research papers, such as, Fama and French (2015) and Mumi et al. (2019).

4. RESULTS

4.1 Descriptive statistics

The summary of information for each variable, including their correlations, for both models, is shown in Tables 5, 6 and 7.

RQ_1: Do firms with a Twitter account, regardless of what they tweet about, improve the information environment?

> **H_1: JSE-listed firms with a Twitter account experience better share price performance.**

The results in Table 5 show that a change in share price and firms with a Twitter account are negatively and insignificantly correlated ($r = -0.023$, $p<0.05$). Merely having a Twitter account, regardless of whether firms tweeted about financial performance, does not impact share price performance. As a result, *hypothesis 1* is rejected.

RQ_2: Does the information on financial performance disclosed by JSE-listed firms on Twitter improve the information environment? This question is disaggregated into two sub-research questions, which are as follows:

$RQ_{2.1}$: Do JSE-listed firms, who use Twitter as a means of communication about their financial performance, experience better share price performance than firms who do not?

> **H_2: JSE-listed firms with a higher frequency of tweets about financial performance experience better share price performance.**

The results in Table 6 show that the change in share price is significantly positively correlated with the frequency of tweets about financial performance ($r = 0.398$, $p<0.05$). As a result, *hypothesis 2* is accepted. The findings of this study are in line with prior studies. Similar to Mumi et al. (2019), who found that the frequency of tweets about a firm's IPO is positively and significantly correlated with IPO value, measured as the net capital raised less underwriters' fee, this study finds that firms that tweet more about financial performance experience better share price performance than firms who do not tweet or tweet less about financial performance. Additionally, the above result is similar to Dhar and Bose (2020), who also found a significant, positive correlation between the volume of tweets and stock price performance.

$RQ_{2.2}$: For JSE-listed firms that tweet about financial performance, does the share price performance vary depending on whether the tweets contain favourable or unfavourable news about financial performance?

> **H_3: JSE-listed firms that tweet about favourable (unfavourable) financial performance experience an increase (decrease) in share price.**

The results in Table 7 show that the change in share price is significantly positively correlated with the total news score of tweets about financial performance ($r = 0.409$, $p<0.05$). These findings suggest that when firms tweet about favourable (unfavourable) financial performance, they experience an increase (decrease) in share price. As a result, *hypothesis 3* is accepted. The above findings are similar to those of Dhar and Bose (2020), who find that the emotions expressed in a firm's tweets are significantly correlated to share price.

The results in all three tables also reveal that firm size and profitability are positively, but not significantly, correlated with the change in share price and investment. Operating cash flows are positively, but not significantly correlated, with the change in share price in models (1) and (2) and are negatively and insignificantly correlated with share price in model (3).

In model (1), the Twitter account variable is positively and significantly correlated with firm size ($r = 0.364$, $p<0.05$) and profitability ($r = 0.312$, $p<0.05$). In model (2), the frequency of tweets about financial performance is positively and significantly correlated with the investment ($r = 0.188$, $p<0.05$) and operating cash flows ($r = 0.191$, $p<0.05$) variables in model (2). In all three models, the firm size and profitability variables are significantly and positively correlated with one another in all three models ($r_{model\ 1}= 0.398$, $p<0.05$, $r_{model\ 2}=0.463$, $p<0.05$, $r_{model\ 3}= 0.463$, $p <0.05$).

Table 5: Summary statistics and Pearson correlation matrix for model (1)									
		Mean	**SD**	**1**	**2**	**3**	**4**	**5**	**6**
1	Change in share price	0.129	0.452	1					
2	Twitter account	0.680	0.470	-0.023	1				
3	Firm size	21.910	4.931	0.024	0.364*	1			
4	Profitability	11.917	22.515	0.020	0.312*	0.289*	1		
5	Investment	0.122	0.733	-0.070	-0.049	-0.222*	-0.049	1	
6	Operating cash flows	-0.525	8.255	0.018	0.120	0.206*	0.053	0.010	1

N = 148

* Coefficient estimates are significantly different from zero at the 5% level

Table 6: Summary statistics and Pearson correlation matrix for model (2)									
		Mean	**SD**	**1**	**2**	**3**	**4**	**5**	**6**
1	Change in share price	0.121	0.433	1					
2	Frequency of tweets	1.390	3.081	0.398*	1				
3	Firm size	23.147	3.297	0.059	0.104	1			
4	Profitability	16.764	18.142	0.114	0.061	0.272*	1		
5	Investment	0.097	0.487	-0.320	0.188*	0.017	-0.029	1	
6	Operating cash flows	0.160	0.339	0.120	0.191*	0.150	0.254*	-0.071	1

N = 148

* Coefficient estimates are significantly different from zero at the 5% level

Table 7: Summary statistics and Pearson correlation matrix for model (3)									
		Mean	**SD**	**1**	**2**	**3**	**4**	**5**	**6**
1	Change in share price	0.170	0.550	1					
2	Total news score	2.940	3.884	0.409*	1				
3	Firm size	24.118	2.394	0.033	0.121	1			
4	Profitability	17.151	11.026	0.190	0.193	0.463*	1		
5	Investment	0.132	0.0635	0.080	0.023	-0.257	-0.164	1	
6	Operating cash flows	0.293	0.479	-0.007	-0.010	-0.082	-0.068	-0.088	1

N = 34

* Coefficient estimates are significantly different from zero at the 5% level

The differences between firms with Twitter accounts and those without were also compared, as shown in Table 8. The results from the t-tests show that, on average, firms with a Twitter account do not have a higher change in share price than firms without a Twitter account (t = -0.282, p>0.05). This result supports the notion that merely having a Twitter account does not improve a firm's information environment, but tweeting about useful information, such as financial performance, may improve it. Additionally, the results also show that, on average, firms with a Twitter account have significantly higher firm size (t = 3.806, p<0.01) and operating cash flows (t = 1.011, p<0.01). Lastly, there is no significant difference between firms with and without a Twitter account regarding the profitability and investment variables.

Table 8: T-Test of various variables between Firm's with and without a Twitter account

	Firm with Twitter (N=100)		**Firm without Twitter (N=48)**		
	Mean	**SD**	**Mean**	**SD**	**t-test**
Change in share price	0.121	0.433	0.144	0.495	-0.282
Firm size	23.148	3.297	19.330	6.564	3.806***
Profitability	16.764	18.142	1.819	27.168	3.965
Investment	0.097	0.487	0.174	1.085	-0.592
Operating cash flows	0.160	0.339	-1.954	14.485	1.011***

*** Coefficient estimates are significantly different from zero at the 1% level

4.2 Validity and reliability

In this study, an OLS regression was employed to test the hypotheses. The assumptions of a regression were tested to ensure the validity and reliability of the regressions employed. Before testing the regressions employed for normality, the firm size control variable, measured as total revenue at T1, was transformed using the natural logarithm. The normal P-P plots of models (1), (2) and (3) are shown in Appendices 6.7, 6.8 and 6.9 and indicate that both models are sufficiently normally distributed. Additionally, robust standard errors are disclosed.

Tables 9, 10 and 11 presents the VIFs for models (1), (2) and (3), respectively. The primary purpose of focusing on VIFs in the preliminary inferential statistics is to ensure a sufficiently low level of multicollinearity among the independent variables. This approach was adopted to ensure the validity and accuracy of the findings, which follows Mumi et al. (2019). As noted in Table 9, all VIFs are significantly less than 10, with the highest VIF value being 1.303 for the firm size variable. In Table 10, all VIFs are significantly less than 10, with the highest VIF value being 1.137 for the profitability control variable. In Table 11, all VIFs are significantly less than 10, with the highest VIF value being 1.341 for the firm size control variable. The previously

mentioned indicated a low multicollinearity level among the independent variables in both models. The average VIFs are 1.1574, 1.0988 and 1.1624 for models (1), (2) and (3), respectively, indicating that all three models are likely unbiased. These findings support the notion that the level of multicollinearity among the independent variables is acceptably low, thereby ensuring the validity and accuracy of this study's results.

Table 9: VIFs for model (1)	
	Collinearity statistics
	VIF
(Constant)	
Twitter account	1.222
Firm size	1.303
Profitability	1.154
Investment	1.057
Operating cash flows	1.051

Table 10: VIFs for model (2)	
	Collinearity statistics
	VIF
(Constant)	
Frequency of tweets	1.089
Firm size	1.095
Profitability	1.137
Investment	1.050
Operating cash flows	1.123

Table 11: VIFs for model (3)	
	Collinearity statistics
	VIF
(Constant)	
Total news score	1.044
Firm size	1.341
Profitability	1.312
Investment	1.093
Operating cash flows	1.022

4.3 Regression analysis

Regression analyses were conducted to determine whether a relationship exists between the change in share price and the Twitter-related variables. The results of the regression analyses are provided in Table 12.

Similar to Mumi et al. (2019), the first model analysed represents the base regression, which regresses only the control variables, namely firm size, profitability, investment and operating cash flows against the change in share price, using the sample of 148 firms with and without Twitter accounts. The results indicate that the base regression has no predictive power, as displayed by R-squared and adjusted R-squared figures of 0.006 and -0.022, respectively. The firm size and profitability variables are positively related to the change in share price, and the investment and operating cash flow variables are negatively related to the change in share price. However, all the relationships are statistically insignificant ($p > 0.05$).

In model (1), to test *Hypothesis 1*, firms with a Twitter account are added to the regression, using the sample of 148 firms with and without Twitter accounts. The results still indicate that the model does not have predictive power, as shown by R-squared and adjusted R-squared figures of 0.007 and -0.028, respectively. However, the model's predictive power improved after including the Twitter-related variable. A statistically insignificant negative relationship between the Twitter account variable and the change in share price exists ($\beta = -0.39$, $p > 0.05$), which contradicts Mumi et al. (2019), who found a positive statistically significant relationship between firms with a Twitter account and IPO value. The results suggest that merely participating in social media with a Twitter account does not improve share price performance. Similar to the base regression model, a statistically insignificant positive relationship exists between firm size and profitability with the change in share price, and a negative relationship exists between investment and operating cash flows with the change in share price.

Model (2) uses a subsample of 100 firms with a Twitter account to test *Hypotheses 2*. The results indicate that the regression has moderate predictive power, as displayed by R-squared and adjusted R-squared figures of 0.195 and 0.152, respectively. The previously mentioned suggests that the model predicts a 19.5% variation in the change in share price. If the statistical model had been derived from the entire population from which the sample was selected, it would account for 15.2% of the variation in the change in share price. According to the results, the frequency of firms' tweets about financial performance is positively and significantly related to the change in share price ($\beta = 0.420$, $p < 0.01$), which provides evidence in supporting *Hypothesis 2* and is similar to the findings of Mumi et al. (2019). Similar to the previous models, the firm size and profitability variables are positively and insignificantly related to the change

in share price, and the investment and operating cash flow variables are negatively and insignificantly related to the change in share price.

Lastly, to test *Hypothesis 3*, model (3) employs regression analyses using the subsample of 34 firms that tweeted about financial performance. The R-squared and adjusted R-squared figures are 0.192 and 0.048, respectively, indicating that the model predicts 19.2% of the variation in the change in share price. If the statistical model had been derived from the entire population from which the sample was selected, it would account for 4.8% of the variation in the change in share price. The previously mentioned indicates that the model has moderate predictive power, which is lower than that of model (2). The results of model (3) provide that the total news score of firms' tweets about financial performance throughout their fiscal year is positively and significantly related to the change in share price ($\beta = 0.384$, $p < 0.01$), which provides evidence supporting *Hypothesis 3* and is similar to the findings of Dhar and Bose (2020). Contrary to the previous models, firm size is insignificantly negatively related to the change in share price and profitability, and investment and operating cash flows are insignificantly positively related to the change in share price.

Table 12: The standardised coefficients from regression analysis of change in share price				
	Base	**Model 1**	**Model 2**	**Model 3**
Constant	0.113	0.113	0.412	0.222
	(0.185)	(0.185)	(0.288)	(1.043)
Independent variables				
Twitter account		-0.39		
		(0.089)		
Frequency of tweets			0.420***	
			(0.014)	
News score				0.384**
				(0.025)
Control variables				
Firm size	0.008	0.020	-0.136	-0.065
	(0.008)	(0.009)	(0.013)	(0.045)
Profitability	0.016	0.024	0.116	0.160
	(0.002)	(0.002)	(0.002)	(0.010)
Investment	-0.067	-0.066	-0.104	0.082
	(0.053)	(0.053)	(0.084)	(0.154)
Operating cash flows	-0.020	-0.018	0.023	0.009
	(0.005)	(0.005)	(0.125)	(0.197)
Observations	148	148	100	34
R-squared	0.006	0.007	0.195	0.192
Adjusted R-squared	-0.022	-0.028	0.152	0.048
F-score	0.201	0.196	4.540	1.332

a. Dependent variable: ∆ Share price

Standard errors in parentheses

***p<0.01, **p<0.05, *p<0.1

4.4 Robustness analyses

Endogeneity is a prevailing concern in finance research (Hossain et al., 2022). Endogeneity issues may arise when a relevant variable, which is correlated with the dependent and independent variables, is omitted from the model, leading to biased and inefficient estimates of the parameters in a model and affecting the validity of statistical tests. As Barth et al. (2017) state, the present study does not intend to draw causal inferences. Nonetheless, in further analysis, this study employed a two-stage least squares (2SLS) regression using an instrumental variable of the number of Twitter followers. A discussion of the analysis and its results are contained in Appendix 6.12 of this study.

4.5 Summary of results and discussion

In this chapter, the statistical findings for a sample of 148 JSE-listed firms were presented and analysed to determine whether a statistically significant relationship existed between Twitter-related variables, namely whether a firm has a Twitter account, the frequency of firm tweets about financial performance and the total news score of firms' tweets about financial performance throughout their fiscal year and share price performance. Based on the results of the P-P plots for all three models (refer to appendices 6.7, 6.8 and 6.9), the data is sufficiently normally distributed. Additionally, robust standard errors were produced for all three models, as shown in Table 12, indicating heteroscedasticity is not an issue. Both models showed low R-squared figures, as shown in Table 12 (refer to appendices 6.1, 6.2 and 6.3 for more information regarding the tests for heteroscedasticity for all three models). As such, although noteworthy findings emerged, readers should interpret the study's results cautiously.

This study aimed to enhance our understanding of how firms can use Twitter as a financial disclosure channel to improve their information environment, thereby improving share price performance. The findings are consistent with prior literature, affirming the positive impact of social media engagement by firms on their information environment, evidenced by other proxies of information asymmetry.

As anticipated, the findings indicate that the frequency of tweets about financial performance from a firm can positively impact its share price performance, which suggests that social media serves as an effective communication channel for firms to address issues related to information asymmetry. By applying Agency Theory to the evolving landscape of social media, this study offers supporting evidence for the agency role of social media, presenting substantial advantages for firms. This contribution enriches the growing body of literature on

the diverse uses of social media, which has traditionally focused on product promotion and customer relationship management (Laroche et al., 2013).

Furthermore, our research underscores that mere involvement in social media with a Twitter account may not constitute an effective IIR strategy. The effectiveness of communicating financial information via Twitter is likely derived from the engagement of the public audience in response to the firm's social media participation, as Twitter possesses dialogic communication properties. This discovery aligns with the proposition by Brennan and Merkl-Davies (2018) that advancements in digital technology and social media necessitate a new perspective on corporate communication, stemming from their ability to act as efficient communication channels reaching a wider range of stakeholders. Moreover, communication via social media may be more effective as it facilitates connectivity, namely textual, intertextual and relational (Brennan & Merkl-Davies, 2018).

The total news score showed a significant positive relationship with the change in share price. As the news score was a scale variable measured as the scores of all tweets, favourable or unfavourable, added, the results indicate that firms, overall, disclosing favourable financial performance via Twitter experienced an improvement in share price performance. Firms that actively communicate favourable news about financial performance via Twitter can create a positive perception of the firm among investors and the public. Those above may increase confidence in the firm's prospects, potentially resulting in higher demand for its stock and subsequent positive share price changes.

As mentioned in the literature review, the EMH is categorised into three forms: weak, semi-strong, and strong. The results indicate that the frequency of firms' tweets about financial performance is positively and significantly related to the change in share price ($\beta = 0.420$, $p < 0.01$). This finding supports the idea that information contained in tweets is relevant for predicting share price changes. However, the moderate predictive power of the model suggests that only a portion of the share price variation is explained by the model. Historical tweet data (information) has some predictive power for future share prices in the context of weak form efficiency.

Furthermore, the results show that the total news score of firms' tweets about financial performance throughout their fiscal year is positively and significantly related to the change in share price ($\beta = 0.384$, $p < 0.01$). This finding implies that the type of news embedded in firms' tweets significantly predicts share price changes. However, the relatively low predictive power of the model suggests that the model's ability to predict share price changes is limited. In the context of semi-strong form efficiency, this indicates that while there is some predictive power, it may not be strong enough to exploit for above-average returns consistently. In addition to

the above, certain variables such as firm size, profitability, investment, and operating cash flows, which, based on prior literature, are determinants of share price (Fama & French, 2015; Mumi et al., 2019; Vedd & Yassinski, 2015), are found to be insignificantly related to the change in share price in the various models employed, suggests that traditional financial indicators may not play a significant role in explaining share price movements on the JSE. In summary, the findings provide evidence that information in firms' tweets about financial performance has some predictive power for changes in share prices. However, the moderate predictive power and the insignificance of certain traditional financial variables may also indicate that the market is not entirely efficient, yielding mixed results of weak or semi-strong efficiency, similar to Thompson and Ward (1995).

5. CONCLUSION

5.1 Review of the study

Prior literature provides that a good investor relations policy, which encompasses communication with investors, is essential to maintaining a good financial reputation and overall corporate performance for firms (Dolphin, 2004). With the advent of the internet and advancements in social media, it is evident that firms are increasingly utilising social media as a communication channel with investors and the public (Blankespoor et al., 2014; Brennan & Merkl-Davies, 2018; Nel & Baard, 2019). This study offers insight into the relationship between using social media, particularly Twitter, and its financial benefits concerning share price performance.

By investigating the relationship between Twitter variables, namely the frequency of firm tweets about financial performance and the total news score of firms tweets about financial performance throughout their fiscal year, and share price performance, the findings of this study indicate that significant positive relationships exist between the Twitter variables and the change in share price. As a result, both hypotheses were accepted. The findings of this study, similar to Blankespoor et al. (2014), Mumi et al. (2019) and Vogel and Xie (2022) suggest that firms should realise the importance of using social media as a communication channel to disclose firm-specific information over and above traditional and mandatory disclosure channels, to enhance transparency regarding the financial well-being of the firm and built trust with investors (Vogel & Xie, 2022).

Most studies examining the relationship between disclosure and information asymmetry have used data from stock exchanges in developed countries. Moreover, most studies did not examine the above relationship using the change in share price as a proxy for improvements in a firm’s information environment. This study contributes to the existing research by

examining the impact of firm disclosures, via social, on share price performance. Additionally, this study highlights the importance of incorporating social media into a firm's Internet investor relations policy (Mumi et al., 2019; Nel & Baard, 2019; Vogel & Xie, 2022).

The findings of this study also support Agency Theory and the Efficient Markets Hypothesis (EMH). Firms using social media to directly and timely disclose useful information to investors can help reduce information asymmetry and improve a firm's information environment. Moreover, due to the dialogic communication properties that Twitter possesses, firms and their audiences can interactively exchange information to reach a consensus on the firm's financial well-being, as well as enable investors to play a more active role in holding management accountable for their decisions. In terms of EMH, the findings of this study suggest that firms' tweets about financial performance hold some predictive power in predicting share price changes. However, such predictive power is moderate. Coupled with other variables, such as firm size, profitability, investment, and operating cash flows, which, based on prior literature, are determinants of share price (Fama & French, 2015; Mumi et al., 2019; Vedd & Yassinski, 2015), not being statistically significant in predicting share price changes, suggests that the JSE yields mixed results of efficiency, being a weak form or at best, a semi-strong efficiency.

5.2 Areas of future research

While the findings of this study support the incorporation of social media by firms as an effective communication strategy, the study is subject to a few limitations, which may provide potential avenues for future research in this field. This study only considers one particular social media platform, Twitter, and does not consider other popular social media platforms, such as Facebook, LinkedIn, YouTube and Instagram. Firms might convey various messages across different social media platforms, which could differ from those using micro-blogging platforms like Twitter. Similar to Twitter, other social media sites have functions that enable dialogic communication, such as hashtags, comments, and reshare options. However, characteristics of Twitter, such as Twitter's 280-character limit, text-based content and ability to seamlessly share website links, may change how firms present information compared to other social media sites (Dee, 2023). Additionally, the nature of posts made by users on Twitter includes a wide range of posts, from personal and purely social type posts to investing and corporate posts. In contrast, other social media sites typically fall into one category (Dee, 2023). As a result, firms may tailor their content according to the types of audiences on different social media sites. Consequently, future research should explore and compare the effectiveness of communication across a range of social media platforms.

Secondly, this study employed a relatively small sample size due to several data constraints. While the results offer sufficient support for the assertions made regarding the advantages of social media, a larger sample size would still enhance the findings' reliability and validity. Therefore, future research should incorporate a larger sample of JSE-listed firms.

Third, this study only focuses on the JSE. The JSE has numerous characteristics that make it unique in comparison to other stock exchanges, namely that the mining sector heavily influences it, it is historically illiquid as it is dominated by a small number of institutional investors. From a market efficiency perspective, the JSE moves between weak and semi-strong forms of efficiency which may impact the timeliness of information incorporation into asset prices on the JSE. Lastly the JSE only started allowing foreign investment in 1995 after the dissolution of Apartheid (see **section 2.5. Nuance of the South African stock markets**). As such, the results of this study may not be generalisable to other stock exchanges. Additionally, social media utilisation and constraints can differ significantly across various countries and cultures. As a result, future research should examine the relationships between social media and firms' share prices across various nations.

The statistical analyses show that none of the control variables, known drivers of share price based on prior literature, were significantly correlated with the change in share price. The above may be due to the particular nuances of the JSE, as mentioned in **section 2.5. Nuance of the South African stock markets**, resulting in such control variables not being significant drivers of share price for firms listed on the JSE. Therefore, future research should include other control variables based on research performed on determinants of share price on JSE to strengthen the results obtained in the study. One control variable in particular that may enhance the significance of the model for future studies is the incorporation of a market risk factor, namely beta.

This study only uses cross-sectional data for one period, namely the 2022 fiscal year for each firm in the sample. Although this allows the researcher to control for changes in the economic cycle, the researcher's ability to understand the dynamics and changes that occur over time in a firm's social media usage and its impact on the firm's information environment is limited. As a result, future research should examine a firm's disclosure activity over a period longer than one year.

This study examines whether Twitter is an effective dialogic communication channel for firms by its impact on share price performance. Other possible methods can also be employed in examining the dialogic communication functions of Twitter, such as the number of comments and retweets on a firm’s Twitter post. As a result, future research should examine the impact

of the number of tweets about firms' tweets about financial performance and the number of comments and retweets on such tweets on share price performance.

Lastly, in this study, the researcher tested both the frequency of firms' tweets about financial performance and whether the tweets contain favourable or unfavourable news. However, there is still a need for further research that decouples the medium of communication, which is Twitter, from the information, being the message.

6. APPENDICES

6.1 Table A1: Tests for heteroscedasticity for model (1)

	Chi-Square	df	Sig.
White test	5.377	19	0.999
Modified Breusch-Pagan	0.432	1	0.511

6.2 Table A2: Tests for heteroscedasticity for model (2)

	Chi-Square	df	Sig.
White test	41.072	20	0.004
Modified Breusch-Pagan	10.797	1	0.001

6.3 Table A3: Tests for heteroscedasticity for model (3)

	Chi-Square	df	Sig.
White test	25.710	20	0.176
Modified Breusch-Pagan	6.413	1	0.011

6.4 Table B1: Tests for normality for model (1)

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	t-statistic	Df	p-value	t-statistic	df	p-value
Δ Share price	0.24	148	<0.001	0.843	148	<0.001

a. Lilliefors Significance Correction

6.5 Table B2: Tests for normality for model (2)

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	t-statistic	Df	p-value	t-statistic	df	p-value
Δ Share price	0.114	100	0.003	0.842	100	<0.001

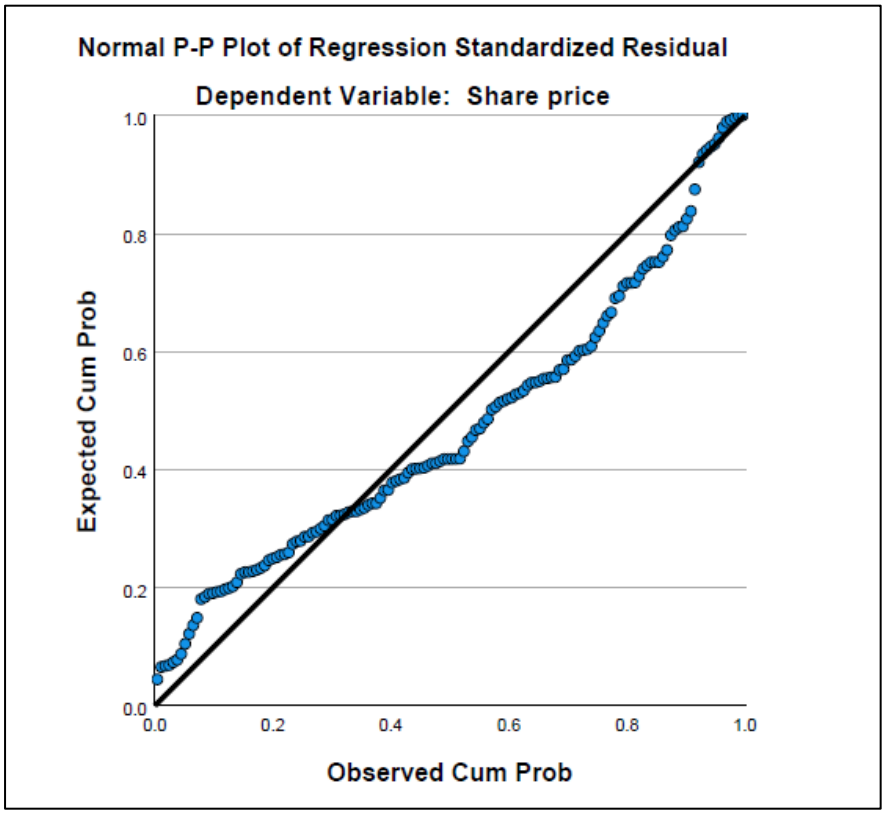
b. Lilliefors Significance Correction

6.6 Table B3: Tests for normality for model (3)

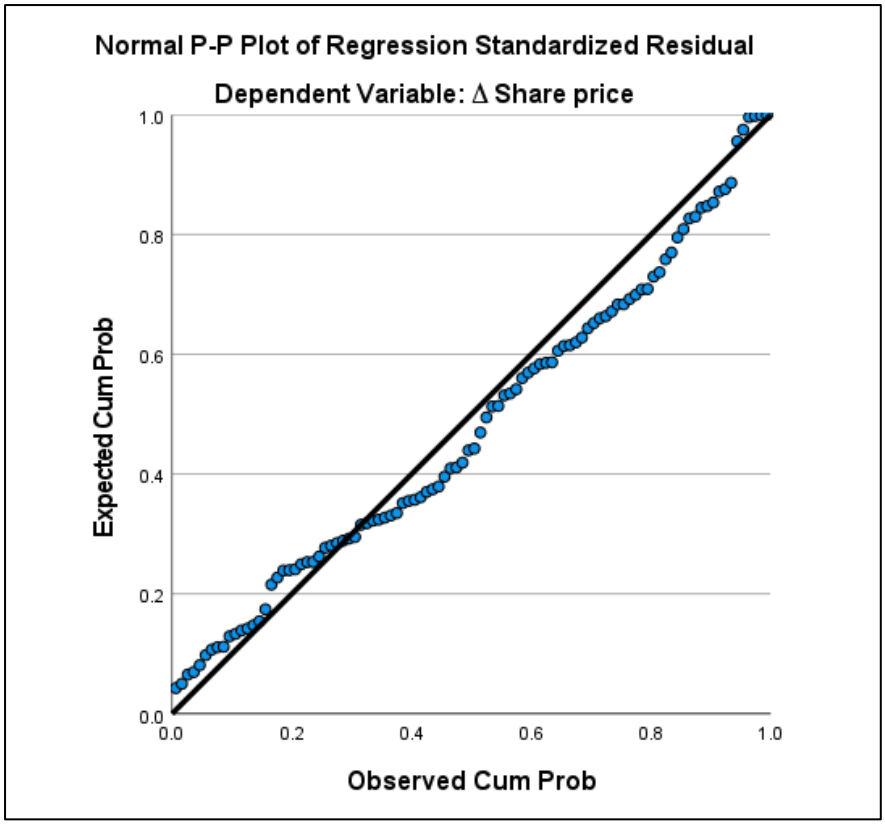
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	t-statistic	Df	p-value	t-statistic	df	p-value
Δ Share price	0.17	34	0.014	0.754	34	<0.001

a. Lilliefors Significance Correction

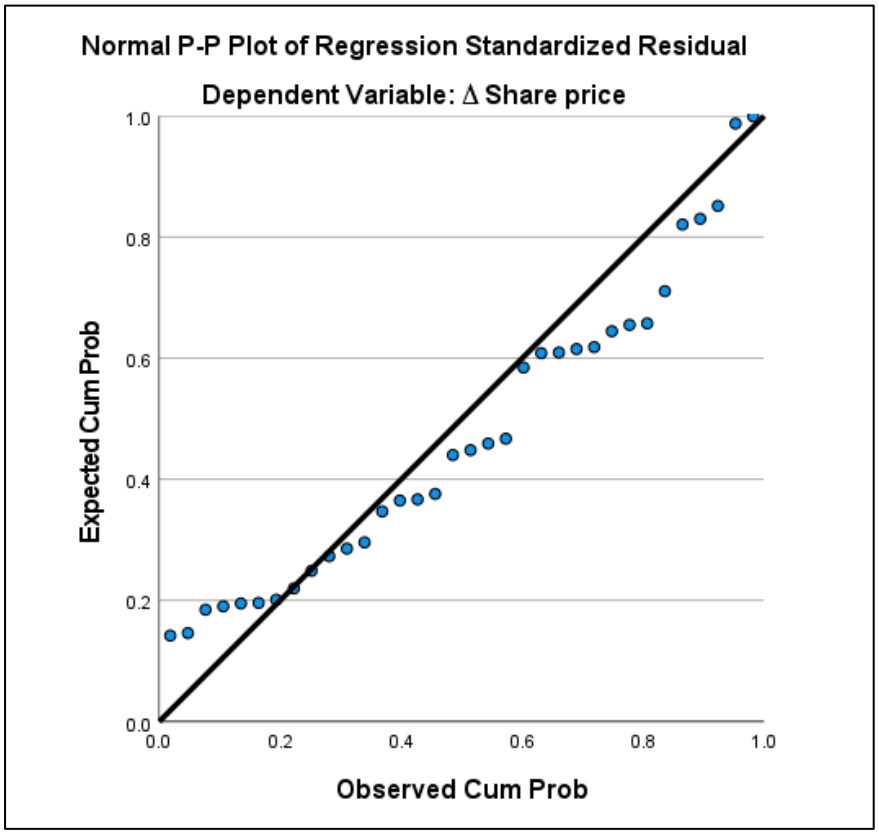
6.7 Normal P-P Plot for model (1)



6.8 Normal P-P Plot for model (2)



6.9 Normal P-P Plot for model (3)



6.10 Table C1: Independent Samples Tests

Levene's Test for Equality of Variances				t-test for Equality of Means
		Sig.	t	Significance Two-sided p
Change in share price	Equal variances assumed	0.525	-0.282	0.778
	Equal variances not assumed		-0.269	0.789
Firm size	Equal variances assumed	0.001	4.718	<0.001
	Equal variances not assumed		3.806	<0.001
Profitability	Equal variances assumed	0.361	3.965	<0.001
	Equal variances not assumed		3.459	<0.001
Investment	Equal variances assumed	0.083	-0.592	0.555
	Equal variances not assumed		-0.466	0.643
Operating cash flows	Equal variances assumed	0.006	1.464	0.145
	Equal variances not assumed		1.011	0.317

6.11 Coding example for classification of news in tweets

PSG Financial Services

@PSGKonsult

Apr 15, 2021

Our annual results are out on SENS. A **10% increase in recurring headline earnings per share**, a return on equity of 20% and a gross final dividend of 16.5c per share were announced.

Read more here: https://psg.co.za/investor-relations/financial-information/

#annualresults #psgannualresults #PSGfinancialadvice

The above tweet was awarded a +1 score for favourable news about financial performance.

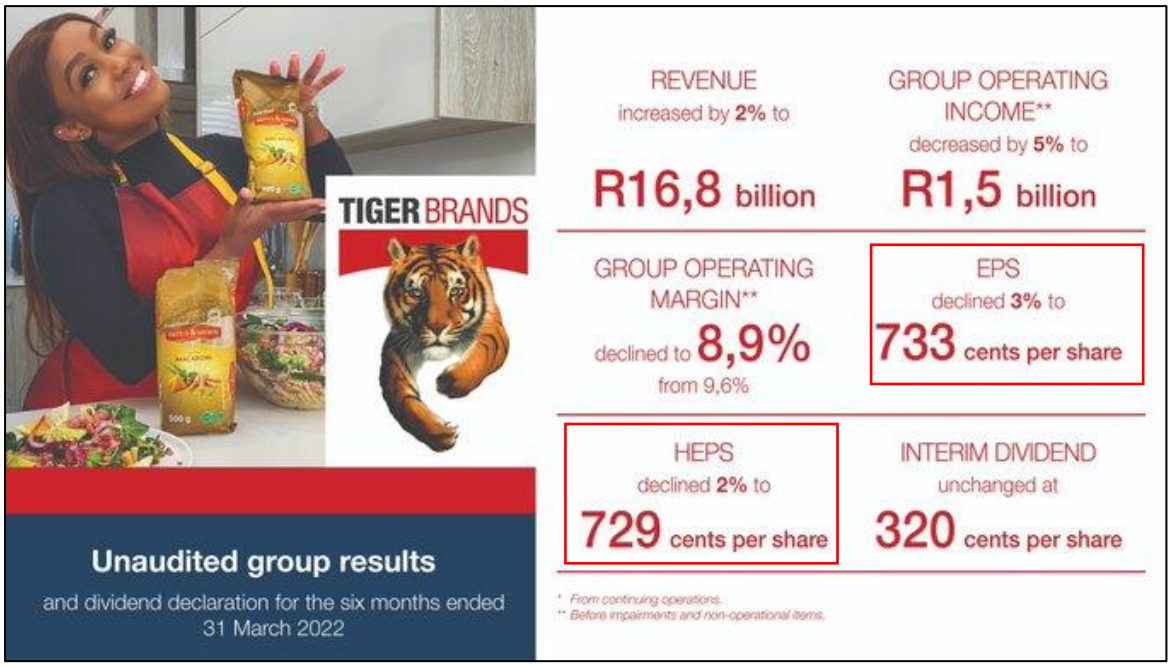
Tiger Brands

@TigerBrands

May 25, 2022

@TigerBrands

announces results for the half-year ended 31 March 2022. To view the announcement visit: http://bit.ly/38fYPJV



(Image above was included in the tweet)

The above tweet was awarded a -1 score for unfavourable news about financial performance.

Tiger Brands

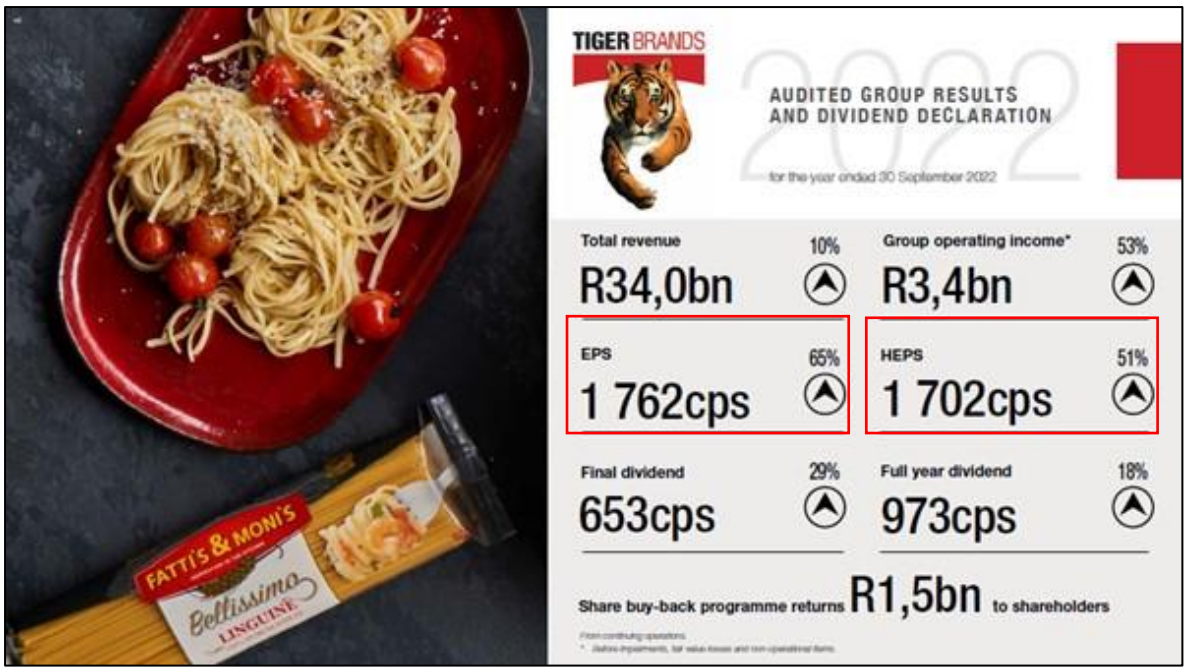
@TigerBrands

Dec 2, 2022

@TigerBrands

announces results for the year ended 30 September 2022. To view the announcement, visit https://tigerbrands.com/investor/resultscentre

#jse | #NourishAndNurture



(Image above was included in the tweet)

The above tweet was awarded a +1 was favourable news about financial performance.

6.12 Two-stage ordinary least squares regression analyses (2SLS)

Instrumental variable estimation

The instrumental variable is the number of Twitter followers for each firm's corporate Twitter account. The rationale behind using the number of Twitter followers is that it has been used in a similar study by Hossain et al. (2022) and that the higher number of Twitter followers a firm has may result in a higher number of tweets about financial performance and management may be less likely to tweet about unfavourable financial performance (Vogel & Xie, 2022), but not a higher share price. The results of the 2SLS regression are provided in Table 13.

2SLS regression analyses were performed on the change in share price as the dependent variable, the frequency of tweets and the total news score as the explanatory variables and the number of Twitter followers as the instrumental variable. According to the results presented in Table 13 model (1), the frequency of tweets is negatively, but not significantly, related to the number of Twitter followers ($\beta = -0.049$, $p > 0.05$). In Table 13 model (2), the total news score is negatively, but not significantly, related to the number of Twitter followers ($\beta = -0.068$, $p > 0.05$). The results of the 2SLS regression analyses support the validity and reliability of the results of the baseline analyses and lessen the likelihood of endogeneity issues.

Table 13: The standardised coefficients from the two-stage regression analysis of change in share price, with the number of Twitter followers as the instrumental variable		
	(1) **Model 1**	**(2)** **Model 2**
Constant	0.189	0.189
	(0.192)	(0.193)
Frequency of tweets	-0.049	
	(0.133)	
News score		-0.068
		(0.186)
Observations	100	34
R-squared	0.001	0.001
Adjusted R-squared	-0.009	-0.009
F-stat	0.135	0.133

Standard errors in parentheses

***p<0.01, **p<0.05, *p<0.1

This table presents the two-stage least squares (2SLS) regression results. The 2SLS model employs the instrumental variable approach, and the instrumental variable is the number of Twitter followers, which is defined as the number of followers of each firm's corporate Twitter account. Column 1 shows the results of the 2SLS for model (1), where the frequency of tweets is the explanatory variable and the number of Twitter followers is the instrumental variable. Next, column 2 shows the results of the 2SLS for model (2), where the total news score is the explanatory variable, and the number of Twitter followers is the instrumental variable.

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