

https://dspace.org/

Evaluating the relationship between retail and technology companies' share prices with earnings and net cash flow in the context of South Africa and America (USA)

Tiquin, Cal

2023
University of the Witwatersrand, Johannesburg
https://hdl.handle.net/10539/38724
Tiquin, Cal. (2023). Evaluating the relationship between retail and technology companies' share prices with earnings and net cash flow in the context of South Africa and America (USA) [Master's dissertation, University of the Witwatersrand, Johannesburg]. WireDSpace. https://hdl.handle.net/10539/38724

Downloaded from a DSpace repository. https://dspace.org/

Evaluating the relationship between retail and technology companies' share prices with earnings and net cash flow in the context of South Africa and America (USA)



A research report prepared by

Cal Tiquin

Student number: 1833758

Cell: 082 448 6890

Email: 1833758@students.wits.ac.za

Date Submitted: 26 March 2023

Supervisor: Y. Brahmbhatt

In partial fulfilment of the degree of

Master of Commerce

University of the Witwatersrand

Declaration

I, Cal Jaiden Tiquin, 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.



_____ Cal Jaiden Tiquin

Signed at …Northcliff, Johannesburg……

On the …26…….. Day of …March…… 20…23...

Dedication and acknowledgements

This research report, although written solely by the researcher, was achieved through the guidance and support of numerous individuals from both personal and academic relations. As such, I would like to thank the following persons and organisations for their contributions towards this thesis:

- To my family and friends, for their continued belief in my abilities and their understanding of my commitments and priorities. Their support of my perseverance was instrumental in finishing this research report.
- To Yogesh Brahmbhatt, for his thorough yet flexible supervision of this thesis. His assistance allowed this thesis to be completed while juggling numerous other commitments and responsibilities.
- To Avani Sebastian, for her assistance in both developing a robust methodology and interpreting the statistical results of this research report.
- To the University of Witwatersrand's School of Accounting, for allowing me the opportunity to further my academic knowledge and understanding of accountancy at an in-depth level.

Table of contents

Declaration 1

Dedication and acknowledgements 2

Abstract 8

1. Introduction 9

1.1 Research problem 10

1.2 Purpose 12

1.3 Significance of the study 12

1.4 Research question and hypothesis 15

1.5 Assumptions of the study 15

1.6 Delimitations of the study 16

1.7 Limitations of the study 16

1.8 Definition of terms 17

2. Literature review 18

2.1 Theoretical frameworks 18

2.1.1 Efficient Market Hypothesis 18

2.1.2 Value relevance theory 20

2.2 Value relevance of accounting information 20

2.2.1 Models employed 21

2.2.2 Studies based on independent variables 23

2.2.3 Studies based on sector 31

2.3 Measurement period and date 35

2.4 Aggregated accounting information 36

2.5 Non-traditional studies in value relevance 37

2.6 Justification for this study 42

3. Research methodology 44

3.1 Research method and approach 44

3.2 Population and study sample 44

3.3 Sampling technique 45

3.4 Sample size 46

3.5 Data collection method 47
3.6 Source and handling of data 48
3.7 Data analysis method, model, reliability, and validity 48
4. Data analysis and results 54
4.1 Overview of the population and sample 54
4.2 Analysis of the distribution and normality of the data 54
4.3 Analysis of multicollinearity 58
4.4 Descriptive statistics 60
4.5 Statistical correlation analysis 61
4.5.1 JSE technology results 62
4.5.2 JSE retail results 63
4.5.3 NYSE technology results 64
4.5.4 NYSE retail results 65
4.6 Statistical regression analysis 66
4.6.1 JSE technology results 66
4.6.2 JSE retail results 68
4.6.3 NYSE technology results 69
4.6.4 NYSE retail results 71
4.7 Summary of the regression results 72
5. Conclusion 75
6. Recommendations for further research 77
7. Appendix 78
7.1 Appendix 1 78
7.2 Appendix 2 82
8. Reference list 83

List of acronyms/abbreviations:

AAR	Abnormal Annual Return
AltX	Alternative Exchange
BVPS	Book Value per Share
CAAR	Cumulative Abnormal Annual Returns
CFI	Cash flow from Investing Activities
CFO	Cash flow from Operations
CPI	Consumer Price Index
DPS	Dividends per Share
EBIT	Earnings before Interest and Tax
EPS	Earnings per Share
ESG	Environmental, Social and Governance
EVA	Economic Value Added
FASB	Financial Accounting Standards Board
GAAP	Generally Accepted Accounting Principles
I/B/E/S	Institutional Brokers Estimate System
IAS	International Accounting Standards
ICT	Information Communication Technology
IFRS	International Financial Reporting Standards
IPO	Initial Public Offering
IR	Integrated Reporting
JSE	Johannesburg Stock Exchange
LID	Linear Information Dynamics
NASDAQ	National Association of Securities Dealers Automated Quotations
NAV	Net Asset Value
NYSE	New York Stock Exchange
OLS	Ordinary Least Squares
PE	Price-Earnings ratio
PEAD	Post Earnings Announcement Drift
R&D	Research and Development
REIT	Real Estate Investment Trust
RIM	Residual Income Model
ROE	Return on Investment
SOX	Sarbanes-Oxley (Act)
SUE	Standardised, Unexpected Earnings
UK	United Kingdom
US/USA	United States of America
VIF	Variance Inflation Factor

List of figures:

Figure	Page number
Figure 1: Q-Q Plot representing the distribution of data for the JSE technology sample	56
Figure 2: Q-Q Plot representing the distribution of data for the JSE retail sample	57
Figure 3: Q-Q Plot representing the distribution of data for the NYSE technology sample	57
Figure 4: Q-Q Plot representing the distribution of data for the NYSE retail sample	58
Figure 5: Histogram and scatter plot for the JSE technology regression sample data	78
Figure 6: Histogram and scatter plot for the JSE retail regression sample data	79
Figure 7: Histogram and scatter plot for the NYSE technology regression sample data	80
Figure 8: Histogram and scatter plot for the NYSE retail regression sample data	81

List of tables:

Table	Page number
Table 1: Breakdown of population per sector of the two exchanges	44
Table 2: VIF test results for the variables in the JSE technology regression sample	59
Table 3: VIF test results for the variables in the JSE retail regression sample	59
Table 4: VIF test results for the variables in the NYSE technology regression sample	59
Table 5: VIF test results for the variables in the NYSE retail regression sample	59
Table 6: Descriptive statistics for the JSE technology regression sample	60
Table 7: Descriptive statistics for the JSE retail regression sample	60
Table 8: Descriptive statistics for the NYSE technology regression sample	61
Table 9: Descriptive statistics for the NYSE retail regression sample	61
Table 10: The correlation matrix for the JSE technology sample	62
Table 11: The correlation matrix for the JSE retail sample	63
Table 12: The correlation matrix for the NYSE technology sample	64
Table 13: The correlation matrix for the NYSE retail sample	65
Table 14: The regression model summary for the JSE technology sample	66
Table 15: The regression coefficients for the JSE technology sample	67
Table 16: The regression model summary for the JSE retail sample	68
Table 17: The regression coefficients for the JSE retail sample	68
Table 18: The regression model summary for the NYSE technology sample	69
Table 19: The regression coefficients for the NYSE technology sample	69
Table 20: The regression model summary for the NYSE retail sample	71
Table 21: The regression coefficients for the NYSE retail sample	71
Table 22: VIF test results for the variables in the JSE technology regression sample	82
Table 23: VIF test results for the variables in the JSE retail regression sample	82
Table 24: VIF test results for the variables in the NYSE technology regression sample	82
Table 25: VIF test results for the variables in the NYSE retail regression sample	82

Abstract

Background: The informational value of accounting information is becoming increasingly important within the context of the modern information age. Research in this regard is lacking within the South African context, and within the technological sector.

Purpose: The purpose of this research study is to test if the explanatory power of net earnings and cash flow differed for separate sectors of stock exchanges.

Methodology: Four samples, representing the technology and retail sectors of both the JSE and the NYSE were collected and analysed in terms of an Ohlson (1995) model for a five year time period, from 2017 to 2021 (inclusive). Using a linear panel data regression model with secondary data, the explanatory power of both cash flow and earnings were compared between the different sectors.

Findings: The results showed that the explanatory power of cash flow was greater than the explanatory power of net earnings on the NYSE for the technology sector, while the opposite was true for a traditional, retail sector. No significant regression results were attained for the JSE.

Implications: The findings of this research provide valuable insight into the informational value of accounting information, and how it may differ between sectors. It may also assist regulatory bodies, Stock exchanges and investors in determining if different accounting information should be presented or prioritised for different sectors.

Key words: Cash Flow, Earnings, Explanatory power, JSE, NYSE, Ohlson model, Predictive power, Retail sector, Share price, Technology sector, Value relevance

1. Introduction

The Technology sector is of paramount importance to many listed exchanges, with the S&P 500 index obtaining 22% of its total value from five different technology stocks in 2020 (Levy, 2020). The technology and telecommunications sector in South Africa is no different and has experienced rapid growth of its own over the past decades. As a result, South Africa has become one of the largest Information, Communication and Technology (ICT) markets on the African continent, with an estimated annual market value of R270 billion in 2017. As such, this sector is a valid inclusion in any investor's diversified portfolio simply due to its sheer size and growth potential (Administration, 2021; ICASA, 2021).

This sector is, however, not immune to economic and social crises. In line with the economic cycles, this sector has experienced a recent reduction in annual demand and a consequential shrinkage (ICASA, 2021).

Interestingly, the share prices of technology companies were less reactive to decreases in earnings than the share prices of retail firms during these recent periods. Multiple JSE-listed technology companies traded at a higher closing share price at the end of 2020 than they did in 2019 – despite a reduced profit (Mybroadband.co.za, 2023). The increased disregard for earnings figures by investors seems to suggest that the earnings figure may not be an absolute determinant of stock price movements – particularly in the technology sector (Mybroadband.co.za, 2022).

In exploring this phenomenon, this study aimed to identify if, and the extent to which, cash flow figures influence stock prices – specifically highlighting how this influence differs between technology and retail sector companies. A different association value may provide evidence in support of the fact that the technology sector should be treated differently from other historical sectors – which is why the inclusion of an influential, major American exchange (the New York Stock Exchange) warranted inclusion in this study.

The inspiration for this study stems from a Harvard Business Review article released in 2018 titled: Why financial statements don't work for digital companies. This article outlines the justifications for evaluating digital (technological) companies in a differing manner to those of traditional businesses. Key evidence suggested in this article is the fact that many large US-based digital corporates were able to attract multi-billion-dollar initial public offerings (IPO) despite the fact that they were grossly unprofitable for years prior to their IPO. This fact supports a lack of value relevance with regards to earnings or losses of digital firms. A significant failing of modern financial accounting suggested by the authors is the lack of understanding of intangible assets and their value – where it is suggested that they could enhance value over time rather than depreciate over time like an ordinary asset (Vijay Govindarajan, 2018).

The theoretical framework underpinning this study is the value relevance theory. In harmony with this theory, this study aims to showcase which accounting information figure investors value more between the different sectors of listed exchanges.

The value relevance theory used in this study assumes that the efficient market hypothesis holds true. Furthermore, the efficient market hypothesis is used to match the share price changes that occur as a result of changes in accounting information – establishing that said accounting information ultimately does embody value relevance.

1.1 Research problem

This study explores the extent to which variations in cash flow and earnings (profits) explains variations in share prices for technology and telecommunications companies compared to retail companies in South Africa and the United States of America.

Prior research suggests that accounting information has a significant impact on the traded stock prices of listed entities. Accordingly, this study aimed to determine to what extent earnings and cash flows (individually) explain future stock prices for technology and telecommunication companies listed on the NYSE (New York Stock Exchange) and the JSE

(Johannesburg Stock Exchange) (Amahalu, Abiahu, Chinyere & Nweze; 2018). This relationship was then compared to the retail sector in an attempt to identify if investor's prioritise earnings and cash flows movements differently for one sector than the other. The retail sector was selected as a basis for comparison as it is a traditional sector which differs to that of a technology sector firm through the type of assets which drive growth (physical vs intangible), the different nature of its significant cash flows and the differing strategy required for successful and sustainable operations.

Sadorsky (2003) affirmed that share prices reflect the anticipated value of future profits of listed companies. A similar opinion is suggested by Ariff, Loh & Chew (1997). Ariff et al., (1997) proved this view by establishing that an initial link between share price and future dividends, a secondary link between future dividends and future earnings and a final link between future earnings and current earnings is evidence enough. This relationship has been unequivocally documented by prior studies (Ariff et al., 1997).

Adequate studies have investigated and concluded that there is a significant link between earnings and share price movements, especially in developed or Anglo-Saxon countries. There is, however, a lack of studies encompassing net cash flows as a variable predicting and explaining share price movements, as well as a lack of studies measuring the magnitude of this relationship (Ariff et al., 1997; Muniroh & Yuliati, 2021).

Only over the last 20 years or so has the technology sector's role in expanding economic opportunities emerged – driven by significant levels of investment, development and innovation. The importance of this industry is illustrated by the fact that 75% of all IPO's (Initial Public Offerings) on the New York Stock Exchange since 2014 consisted of technology companies. Due to the increased significance of the technology sector as the global economy continues to move towards an information-driven paradigm, this study aimed to focus on this sector as one which had not received sufficient academic attention in this topic of literature up to this point in time (Levy, 2020; NYSE, 2022).

1.2 Purpose

The main goal of this study was to discover what the magnitude of the explanatory relationship between cash flows or accounting earnings and share prices was in the context of the technological sector in comparison to the retail sector for both an emerging (South Africa) and a developed market (United States of America).

1.3 Significance of the study

Technological companies differ from most retail companies in a number of ways, one of which is the nature and extent of their investments in research and development (R&D) projects to further the growth and relevance of their business. R&D costs are currently separated in terms of the International Financial Reporting Standards – the mandatory reporting standards for JSE listed entities. Under International Accounting Standard (IAS) 38, research costs are to be expensed and development costs are to be capitalised as an intangible asset. The lack of capitalisation of research-specific costs under IAS 38 leads to increased expenses recognised in the income statements of companies with large investments in R&D – for example, technology companies. As a result, the earnings/ profit-based measures of these companies may be distorted when compared to companies which are focussed on more traditional, tangible assets – for example, retail companies. This distortion may be illustrated by the fact that investors often seem to consider R&D information when trading in active shares (Deng, Lev & Narin, 1999; IASB, 1998).

Chan, Lakhonishok & Sougiannis (2001) studied the extent to which stock price adjustments correlate with the value and spending on R&D activities. They suggested that large levels of R&D spending by companies may lead to significant distortions in share prices resulting from the expensing (instead of capitalising) of R&D costs. No significant evidence was found to suggest that a relationship existed between the level of sales (and thus resultant earnings) and the level of R&D intensity undertaken by the company. However, even though the expensing of R&D items is filtered into the final earnings figure, it is possible that investors

and shareholders do additionally consider the level of R&D intensity, as it was ultimately found to be correlated to greater share price volatility in listed companies (Chan et al., 2001).

In keeping with this principle, this research proposed that the measure of net cash flows may individually be of great significance to investors, and thus significantly influence share prices for the technology sector. The relevance of this measure may suggest that share prices are less impacted by earnings for technology companies than retail companies.

The technology sector warranted the focus of this study as it has differentiated itself from other sectors: This sector has evolved and developed above average over the past two decades, it has had a high degree of R&D expenditure, its cash flows have been plagued by frequent mergers and acquisitions, and it has represented a significant proportion of most listed exchange's total market capitalisation (Adegoke, 2022; NYSE, 2022; Sava, 2018).

Although significant research has occurred in this topic of financial literature, there has been a lack of conformity within conclusions with regards to the use of cash flow as a significant influence on stock price movements. Additionally, there has been a large absence of research on the technology sector for this topic, both in developed and emerging markets – a sector which the researcher believes is of significant individual importance as the global economy shifts from an industrial age to an information age.

A key hallmark of this study was the comparison between the JSE and the NYSE. The American stock markets are more developed, longer standing and have notably different reporting requirements. A larger proportion of America's top exchanges encompass technology companies. The American innovation levels are evident in the significance and quantity of patents registered in the US – a measure representative of significant R&D spending and innovative growth. US investors are often more aware of news and economic changes and are thus less reactive to earnings announcements than investors in emerging markets. In line with this, the US is globally ranked as number four in technological expertise and number one in quality innovation – it is thus no surprise that large technology

conglomerates often choose to list there, making the US a better representation of the global technology sector than a singular emerging market (NYSE, 2022; Radu, 2019). This inclusion is supported by Hall, Mairesse, Branstetter & Crepon (1998, pg. 2), where they stated that:

> "Our findings are that both investment and R&D are more highly sensitive to cash flow and sales in the United States than in France and Japan."

As this study sought to build on the value relevance line of literature, it may provide valuable contributions and insights into the South African technological sector which existing and future finance and accounting academic researchers may find useful.

Furthermore, as IFRS standards aim to provide relevant, useful information to the users of financial statements, this study may be beneficial to financial accounting standard setting bodies (such as the FASB and the IASB). These bodies may want to consider re-evaluating their requirements for capitalisation of research costs in an attempt to make earnings a more useful, relevant figure to investors. Another potential consideration is the relative conformity which is currently present across different sectors in disclosing and formatting financial reports – standard setting bodies may want to consider a sector-specific framework or disclosure which can be tailored to highlight the most relevant accounts (IASB, 1998).

As the users of financial statements are not only considered to be investors; this study may prove to be valuable to other forms of users (such as employees, suppliers, debt providers). This value could be found in the indirect impact that stock prices have on these user groups – which compounds the impact which the financial reports have on them. Employee job security, wage increases and potential for growth and promotion are impacted by the health of a firm's trading stock price. This is particularly significant to employees with stock options yet to vest. Additionally, the likelihood of the listed company staying afloat and being able to settle its debt obligations are also impacted by the firm's trading stock price.

As listing boards (such as the JSE and NYSE) regulate the requirements and release of financial reports and announcements of their listed clients, this study may also provide value

to them. This study may highlight the need for renewed or updated release and reporting requirements, while also showcasing the variables which may be important for these listed firms to disclose.

1.4 Research question and hypothesis

Do movements in net cash flow and earnings explain share price movements?

In accordance with the purpose of the study, these alternative hypotheses were developed:

H_1: A movement in accounting earnings explains a movement in share price.

H_2: A movement in cash flow from operations explains a movement in share price.

H_3: A movement in cash flow from investing activities explains a movement in share price.

H_4: Cash flow information has a larger impact on the share price of technology companies than retail companies.

1.5 Assumptions of the study

This study could not verify the quality of accounting data obtained. Retrospectively restated accounting data as well as changes in accounting treatment mandated by accounting standard setters is not taken into consideration for this study. As such, it was assumed that the secondary data obtained from the databases, annual reports and exchanges was reliable and accurate.

This study did not seek to test the efficiency of the Johannesburg Stock Exchange or the New York Stock Exchange. Consequently, it assumed that these markets are at the very least weak form efficient.

The sample used in this study was assumed to represent the characteristics of the entire population. Additionally, it was assumed that the instrument used in this study encompassed validity and actually measured the desired constructs.

Lastly, this study assumed that the trading stock price was accurate and represented the intrinsic firm value which investors have determined through demand and supply of the stock.

1.6 Delimitations of the study

The aim of this study was specifically focussed on the South African and American context. The results of this study cannot, therefore, be said to represent all emerging and developed markets.

This study did not aim to determine which accounting measure or modified measure will have the strongest explanatory relationship with share prices, but specifically looks at cash flows and earnings.

Additionally, this study did not aim to generate a new, unique measure which may impact share prices.

This study specifically focussed on the technology and telecommunications sector, with a key comparison to the retail sector. The results of this research cannot be generalised to other sectors as they were not included in this specific study.

1.7 Limitations of the study

This study did not attempt to search for financial information news releases of the sampled companies prior to the annual financial statement announcement date on the registered exchange and the impact of these announcements on their share price.

This study assumed that the market microstructures of both the Johannesburg Stock Exchange and New York Stock Exchange were the same.

This study only assessed a sample of 90 companies. A sampling risk arose as a result. This risk was reduced through the use of a longitudinal study approach by looking at each company over a 5 year period. At the same time, companies were selected randomly within market capitalisation spheres – as such the representation of market capitalisation of the sample should closely resemble that of the population.

The sampling method did not incorporate a consideration for company age as this data was not readily available and accurate for the researcher at the time of the study. This was exacerbated by the fact that the age of the firm is often impacted by mergers and splits.

The study data included periods which were impacted by the covid-19 pandemic and periods which were not impacted by the pandemic. The differing informational value of the variables before and during/after the pandemic were not explored.

1.8 Definition of terms

Accounting earnings: Net profit after tax earned during the year (measured at the end of the reporting year).

Cash flow from operations: The total cash flows generated from operations during the year (as measured at the end of the reporting year).

Cash flow from investing activities: The total cash flows generated from investing activities during the year (as measured at the end of the reporting year).

*All of the above definitions are as determined by the IFRS or FASB standards applicable at financial reporting date.

2. Literature review

This literature review begins with detailed research into the theories underpinning the research performed, where the acceptability of the efficient market hypothesis was both highlighted and justified. Additionally, the use of the Ohlson (1995) model as a significant and relevant tool which has been thoroughly researched, was outlined.

The above theories are followed by the academic evolution of the informational value of accounting information on stock prices as it pertains to this study – starting with early versions of earnings-based studies, moving on to include additional accounting variables and then later expanding to sector-specific studies. This flow is intended to show the significance and necessity of the present study.

The informational value of accounting information as a whole is then touched on before exploring non-traditional forms of research within this line of literature: detailing other factors which may impact share price movements, including: ESG, internet reporting, firm life cycle, macroeconomic variables, IFRS adoption, legislation and Integrated Reporting. The main purpose of including this form of literature is to showcase that non-accounting variables could also impact share prices; as well as offering potential reasons for variances being observed within the results of prior studies of a similar context to the one performed.

2.1 Theoretical frameworks

2.1.1 Efficient Market Hypothesis

Early on in value relevance literature, Aharony and Swary (1980) asserted that senior managers of a listed firm may potentially use accounting information (primarily earnings) as a signal to investors to convey information about the health and prosperity of the company. They concluded by suggesting that these earnings announcements are likely to be reflected in stock prices almost immediately after announcement date, supporting the efficient market hypothesis (Aharony & Swary, 1980).

The appropriateness of the Efficient Market Hypothesis was further supported by Jefferis & Smith (2005), when they found that the JSE, the main focal point of the present study, seemed to be at the very least weak form efficient, while other African stock markets (like Nigeria) are moving towards weak form efficiency, although they were not there yet (Jefferis & Smith, 2005). Mlambo and Biepke (2007) also rejected weak form efficiency for many of Africa's listed exchanges, with the exception of Namibia, Zimbabwe, Kenya and South Africa. The JSE's efficiency was fairly prominent, as it was only due to Namibia and Zimbabwe's correlation with the JSE that they could be said to be weak form efficient (Mlambo & Biekpe, 2007).

Additional research done by Wafubwa (2014) in Nairobi over a 4-year period analysed the effect of the release of financial statements on stock prices. Although this research found no significant influence, they also found that the Nairobi Stock Exchange, an emerging African stock market similar to South Africa's, illustrated semi-strong form efficiency (Wafubwa, 2014).

Lastly, a South African study on the JSE was published in 2011 which tested the explanatory power of earnings announcements (not individual earnings) with regards to their impact on stock prices in an attempt to test the relative efficiency of the JSE Alternate Exchange (AltX). Using data collected for only one year, the results of that study indicated that AltX (a more thinly-traded market than the JSE main board) exhibited weak form efficiency (Mlonzi, Kruger & Ntheosane, 2011).

Although African stock markets, in general, did not always seem to prove the efficient market hypothesis, the vast majority of JSE-based studies seem to agree that it illustrates weak form efficiency at a minimum. As successive price changes measured within a value relevance study require the existence of an efficient market, it is assumed that the market which they are researching is efficient – an assumption which appears to hold true for large, active exchanges like the JSE and NYSE (Fama, Fisher, Jensen & Roll, 1969; Richardson & Tinaikar, 2004).

Consequently, the lion's share of research within this topic of literature stated that the market is assumed to be efficient – regardless of whether the research occurred in an emerging Asian

market like Bangladesh, or a developed market like America (Adittya, 2017). The only prominent study which failed to assume that the underlying market was efficient, was performed by (Dechow, 1994).

2.1.2 Value relevance theory

The value relevance line of literature is one which has been around for over half a decade now. In this time, there have been two main areas of development which studies have focussed on – developing accurate and reliable models to represent the relationship between accounting information and share price movements, and secondly the measurement and modification of these models within specific countries, sectors and with differing variables. Although both of these developments are significantly important to this study, the majority of prior literature referred to was in relation to the second development as this is the branch of value relevance which the researcher aimed to progress with the study being performed. Importantly, this study did not seek to determine a causal relationship with a new model.

2.2 Value relevance of accounting information

Studies on the relationship between accounting 'earnings' information and share prices date back as early as 1968 – when there was an increased drive to determine which variables significantly influenced share price data. A primary result determined by Beaver (1968) found that investors do, in fact, use released accounting information when deciding to trade stocks. These studies paved the way towards a new topic in financial literature, one which is still being investigated and developed to the present day (Adittya, 2017; Watson & Wells, 2005). The majority of these studies made use of causation and regression analysis models to conclude that accounting information significantly influences share price returns – thus classifying it as value relevant (Ball & Brown, 1968; Beaver, 1968).

2.2.1 Models employed

Within equity valuation literature lie two schools of thought, the historic and the forecasted accounting information schools. The majority of the models developed in past literature as well as the adapted literature used in this research are based on historic accounting information as their independent variable (Omokhudu & Ibadin, 2015; Richardson & Tinaikar, 2004).

A significant number of studies were found to rely on the Ohlson (1995) model which was further modified to include their study-specific control variables and their study-specific independent variables.

Although the Ohlson (1995) model only came about in 1995, the work towards developing a model explaining share price determinants by Ohlson and fellow academics began many years prior. In 1979, Ohlson developed a 'linear information dynamics (LID)' framework which built upon the idea that accounting information influenced stock prices. Within this framework he highlighted that the most important characteristics of financial accounting variables were their behaviour over time, as he argued that this behaviour underlines their predictive nature with regards to an entity's stock prices (Faseruk, 2008; Ohlson, 1979).

Feltham and Ohlson (1995) built upon these principles and argued in 1995 that financial earnings (profit) data measured over a period of time could be stochastically modelled as an auto-regressive process (Faseruk, 2008; Feltham & Ohlson, 1995).

Later on in 1995, Ohlson (1995) used all of his previous research and knowledge to determine one of the most significant contributions to the value relevance line of literature – the Ohlson 1995 Residual Income Model (RIM) (Ohlson, 1995).

Various studies have used and modified the Ohlson (1995) model in both emerging and developed markets within this topic of literature, including but not limited to: Bauman (1996); Vafeas, Trigeorgis & Georgiou (1998); Entwistle, Feltham & Mbagwu (2010); Albring, Caban-Garcia & Reck (2010); Omokhudu & Ibadin (2015) as well as Sixpence & Adeyeye (2019).

In 1996, Bauman (1996) developed a modified equity valuation method focussing on fundamental analysis. Bauman's paper focussed on expanding the dividend-based valuation model proposed by Ohlson (1990 and 1995) as well as the Feltham and Ohlson (1995) model (Bauman, 1996; Feltham & Ohlson, 1995; Ohlson, 1995).

Later, a Cyprus-based study published in 1998 used the Ohlson (1995) model in an emerging market, modifying it to include cash flow as a main independent variable (Vafeas et al., 1998).

Albring et al., (2010) also used the Ohlson (1995) model to assess the value relevance of earnings, while expanding the model to include both GAAP and non-GAAP earnings (Albring et al., 2010).

Similarly, Omokhudu & Ibadin (2015) used the 1995 Ohlson model as their base in a Nigerian study, incorporating both cash flow and dividends as independent variables in an attempt to create a more detailed explanatory model (Omokhudu & Ibadin, 2015).

2019 brought a South African study which used earnings (EBIT) and book values in line with the 1995 Ohlson model as their base to assess the value relevance of accounting information within the JSE – the major focus market of this study (Sixpence & Adeyeye, 2019).

Although not as common, the only significant alternative used reasonably often is the Feltham-Ohlson clean surplus accounting model, based on the Feltham-Ohlson (1995) paper within the same topic of literature. Entwistle et al., (2010) is an example of a study which based their detailed earnings relationship on the Feltham-Ohlson clean surplus accounting model rather than the Ohlson (1995) residual income model (Entwistle et al., 2010).

Myers (1999) was a particularly interesting study in this regard, as they used both the Ohlson (1995) and Feltham-Ohlson (1995) models with LID parameters to observe whether intrinsic equity values were better at explaining stock prices than accounting equity book values. Interestingly, they found that intrinsic values were no better than historic, accounting information (such as book values) at explaining stock price movements (Myers, 1999).

2.2.2 Studies based on independent variables

Earnings as a variable

The prominence of earnings as a variable dates as far back as the research into accounting information relevance itself, with Ball and Brown (1968) exploring earnings as the only independent variable in their study. Their research was focussed on measuring the correlation between unexpected earnings and stock price movements which had been normalised by the opening period stock price. For statistical and practical purposes, unexpected earnings were measured as the change in earnings throughout the period (Ball & Brown, 1968; Faseruk, 2008).

Since then, many academic studies have ensued in support of earnings being significantly influential on the share prices of listed entities across the globe (Nissim & Penman, 2001; Wang et al., 2013). Al-Attar & Hussain (2004) went one step further, by examining the relationship between accounting earnings and actual future cash flows instead of share price movements (Al-Attar & Hussain, 2004).

Glezakos, Mylonakis & Kafouros (2012) meanwhile, assessed the traditional earnings relationship explored under the Ohlson model within a modern, emerging market. Using both earnings and book values as the independent variables, they found that earnings played an increasingly smaller role in explaining stock price movements within Greece (Glezakos et al., 2012).

The bulk of these earnings studies simply assessed the informational content value of earnings or compared the value of earnings to that of another variable. However, some studies, such as the one performed by Entwistle et al., (2010) tried to break down the different earnings components and assess if their value relevance differs. In doing so, Entwistle et al., (2010) assessed pro-forma earnings, GAAP earnings and I/B/E/S (Institutional Brokers Estimate System) earnings as independent variables. They reasoned that earnings deserved further explanation as it is an appropriate measure of a company's current and future

operational performance. The results of their study showed that all 3 earnings variables were value relevant, with pro-forma earnings being the most relevant (Entwistle et al., 2010).

A 1993 study attempted to break down earnings in order to more accurately explain stock price movements: this time using operating income, net income (earnings) as well as comprehensive income. With a sample of 922 firms over 18 years assessed under a regression model, operating income was found to be the variable which offers the greatest explanatory power, with net income a close second (Agnes Cheng, Cheung & Gopalakrishnan, 1993).

The explanatory power of earnings with differing reporting period lengths has also been explored by Warfield and Wild (1992). Their study measured how the explanatory power of earnings differed for annual, semi-annual and quarterly reporting period lengths. The results showed that annual reporting lengths, as is used in the present study, yielded the greatest explanatory power with regards to stock price movements (Warfield & Wild, 1992).

The market reaction to earnings announcements for interim and annual earnings was later investigated by Gajewski & Quéré (2001). In their French study, they found that annual earnings announcements received a greater share price reaction than interim announcements, suggesting that this could be due to differing information relevance or due to earnings management practices at play within their sample (Gajewski & Quéré, 2001).

Although the major statistical models used were generally similar between prior studies, some studies – such as the one performed by Agnes Cheng & Yang (2003) – used different sampling techniques and share price measurement models to draw a conclusion. Agnes Cheng & Yang (2003), for example, selected a sample with many companies which could be considered data extremes.

Although research into the explanatory value of earnings in relation to stock prices has come in various forms and contained differing variables, the ability of earnings to explain stock price

movements is, on average, supported by many prior studies (Agnes Cheng et al., 1993; Entwistle et al., 2010; Glezakos et al., 2012).

A significant criticism of the early studies, which focussed solely on earnings as a variable, was their inability to isolate the impact of earnings movements on stock prices – since there are many financial variables released within an annual financial statement, multiple other variables could also have had an impact on the change in stock prices (Menike & Man, 2013).

Other variables

As this growing body of research became more and more important, researchers attempted to delve into the detail and tailor their studies to find which specific accounting variables were either impacting, explaining or predicting stock prices, as well as which of those contained the greatest content value – rather than just using net profit as the earlier studies did.

One of the earliest studies into the behaviour of stock prices included a multitude of variables. This study was performed by Collins (1957), where he studied the behaviour of bank stocks and found that book values, dividends, net profit and operating earnings all impacted stock prices. Although the study was premature in this line of literature and did not develop a model explaining how and which factors impacted stock price movements, its contribution to the idea of studying multiple variables was significant (Collins, 1957).

Some studies, such as those performed by Anggraini, Setiawati & Desembriarto (2004) and Abarbanell & Bushee (1998) assessed out-of-the-ordinary financial variables – such as inventory, accounts receivable and gross profit (Abarbanell & Bushee, 1998; Anggraini et al., 2004). Anggraini et al.'s (2004) study was significantly different in that it analysed those variables in both crisis and non-crisis time periods. The results of their study showed that during a crisis period, only gross profit impacted stock returns, while in a non-crisis period many more variables were influential. This result added to the growing list of reasons as to why conclusions in this line of literature differ over time (Anggraini et al., 2004).

The differing value relevance of non-GAAP and GAAP financial metrics in America was also assessed for 518 American S&P 500 companies over a 5-year period by Albring et al., (2010). The main reason their research was pursued was to assess if earnings would have greater value relevance if less management discretion was allowed. Their results show that as the global economy moves towards an information age, non-GAAP measures become more relevant than GAAP-based financial measures (Albring et al., 2010).

In the Middle East, a Bahrain study by Sharif, Purohit & Pillai (2015) was performed in order to find the main determinants impacting stock prices. Using the data of 41 companies over a 5-year period, the results showed that ROE, book value, DPS, firm size, dividend yield and PE ratio all had a significant influence on stock prices. An important result of their modern study was the fact that, although a large number of financial variables were used as independent variables, only 80% of the movements in stock prices were explained by the independent variables – leaving substantial room open for future research within modern value relevance literature (Sharif et al., 2015).

Venter, Emanuel & Cahan (2014) was a South African study which also assessed the value relevance of non-GAAP earnings, this time evaluating the relevance of mandatory non-GAAP earnings. A sample of 424 JSE listed firms over 8 years was used, with share prices measured 4 months after year-end. South Africa was used for their study as mandatory non-GAAP disclosures were required in South Africa while they weren't mandatory in America (where a significant amount of discretion was allowed). Using the 1995 Ohlson model and a price-level regression analysis, their study showed that non-GAAP earnings under a mandatory regime had a greater value relevance than GAAP earnings (Venter et al., 2014).

Another South African (JSE) study assessing 4 years of data for 14 listed companies explored the various factors that impacted and determined market share prices, with DPS, EPS and PE as their independent variables. Using multiple regression analyses, all 3 variables were found to play a significant role in determining stock price movements. Collectively, however, these 3 variables only accounted for 57,8% of the stock price movements for JSE firms – leaving room

for additional accounting and macroeconomic variables within the South African market (Enow & Brijlal, 2016).

Using NAV per share and average debt-to-equity (leverage) as control variables, a 2019 study delved into the value relevance of earnings (EBIT) and book values – the traditional Ohlson model variables. The 2019 study used a sample of 27 JSE listed firms, comprising of both high and low market capitalisation firms for a period of 8 years ending in 2017. EBIT was the only accounting variable within the original Ohlson model which was found to be value relevant on the JSE at the time of this recent study (Sixpence & Adeyeye, 2019).

A possible reason for the reduced interest in modified or developed accounting measures as an independent variable was suggested by Wu (2000). Their study proposed that, although accounting information is required by investors, these investors may not understand such detailed information. This viewpoint was supported by Wang, Fu & Luo (2013) – where it was rather suggested that cash flow, a figure requiring no complex computations, may also be considered to have a positive association with share price movements (Ball, Robin & Wu, 2000).

Their belief was reiterated by Graham & Knight (2000), who suggested that accrual-based figures (earnings) are more easily manipulated than cash flow figures (Graham & Knight, 2000).

Cash flow as a variable

Some studies, such as those performed by Bernard, Stober and Dechow (1994) and Sloan (1996) began to study both earnings and operating cash flow as independent variables. These two research papers found that earnings were more associated with share prices than cash flow but did not make up an absolute measure of the total share price movement. The authors suggested that the favourable result for earnings may potentially be due to the incorporation of the accrual basis of accounting into the earnings figure within financial reporting regulations (Dechow, 1994; Sloan, 1996; Wang et al., 2013).

Soon after those two studies, a study within an emerging market (Cyprus) occurred, using a univariate regression model with a 12-month observation period to assess 37 firms over a 10-year duration ending 1994. This early study in an emerging market also delved into the explanatory power of both earnings and operating cash flows – where they found that operating cash flow (back then) showed no informational content other than its effect on earnings. An important observation their study made was that earnings became more and more relevant as time went on (Vafeas et al., 1998).

Cash flow under both IFRS and GAAP can be broken down into investing, operating and financing activities. Although the study performed in Cyprus showed that there was no explanatory power of operating cash flows, an Indian study in the mid-1990s wanted to test whether this was true for all cash flow activities. The results of that study showed that all 3 cash-based variables did not significantly correlate to share price movements, but that this correlation was becoming increasingly stronger for every year of their sample. Their conclusion supports the belief that accounting information, especially cash flow, is becoming increasingly prominent, and that it should be assessed regardless of the fact that some prior studies found its relationship with share prices to be insignificant (Manurung, 1998).

Although most studies used the Ohlson (1995) model as their base, the Feltham-Ohlson (1995) clean surplus accounting model has also been used in studies such as the one by Callen and Segal (2004). Their study differs from prior ones in that it attempted to identify whether accrual news, cash flow news or expected return news had the greatest value relevance. Their study did this by breaking down net profit (earnings) into its accrual and cash flow components and then assessing the explanatory value of these segmented components. The results of their research showed that in 2004, all 3 variables were value relevant, with accruals still being the most relevant (Callen & Segal, 2004; Feltham & Ohlson, 1995).

Hollister, Shoaf & Tully (2002) furthered this cash flow driven line of thought, broadening their study to include shares from companies listed in the United States (US), United Kingdom (UK), Germany and Japan – developed markets. The increased geographical sample was

considered in order to assess whether the greater reporting requirements on taxable income for developed nations (outside the US) would lead to those investors placing increased reliance on cash flow figures (Hollister et al., 2002).

A similar form of study was performed by Al-Attar & Hussain (2004). Their research within a developed market broke down accounting information into the cash flow and accrual (earnings) elements in the context of entities listed in the United Kingdom (Al-Attar & Hussain, 2004).

The national differences highlighted by Hollister, Shoaf & Tully (2002) showcased the potential need to include emerging markets into this topic of literature. Additionally, a specific focus on the South African market may also prove beneficial, as Aras & Yilmaz (2008) showed that South Africa is different to other emerging markets – it was the only country in their study that yielded a significant, positive correlation between a Price Earnings (P/E) multiple and share prices (Aras & Yilmaz, 2008; Hollister et al., 2002).

A few studies performed in India have similarly included cash flow as a variable, including ones performed by Puspa (2006) and Daniati & Suhairi (2006). Cash flow from operations as well as earnings were used as the independent variables in the study by Puspa (2006), where 79 companies were studied over a 5-year period using a regression variance analysis. A 12-month stock return window was utilised and found that both variables were value relevant, with earnings yet again being the more relevant of the two (Puspa, 2006).

The study from 1999 to 2004 by Daniati and Suhairi (2006) also assessed the effect of cash flows on stock prices, but this time found that cash flow from investing activities had a significant effect on stock prices while cash flow from operations did not. The result of their study supports the conclusion made by Manurung (1998), where the increasing explanatory value of cash flows (from investing activities) was noted (Daniati, 2006; Manurung, 1998).

Branching out slightly from within this cash flow line, the intercompany impact of profit or loss on the value relevance of earnings and cash flow was determined in a 2006 study. Finding

that earnings was more relevant than cash flows for profit-making firms, while neither were relevant for loss-making firms in America at the time (Balke & Wohar, 2006).

Additional research supporting the cash flow perspective was performed by Yu & Hong (2016). Although their study was not concerned with evaluating the value relevance of cash flow, they investigated whether the number of patents and the level of research and development spending could explain movements in stock prices. The 2016 study found that both of these variables have explanatory value, but the number of patents (which comes with costly cash flow spending) had the greatest explanatory value (Yu & Hong, 2016).

Moving closer to the study at hand, an African emerging market (Nigeria), very similar in its nature to South Africa, assessed the value relevance of book values, earnings, cash flow from operations and dividend as their accounting variables. The authors argued that traditional accounting financial statements (linked to the historic importance placed on earnings) have lost their value relevance as the world has transitioned from an industrial economy to a high tech, service economy where information and transparency are increasingly valued. Using stock prices 3 months and 6 months post year-end, as well as a pooled regression analysis, they found that all variables excluding book values were significant in explaining stock returns. A distinct feature of their study was the lengthy 20 years of data which was collected for 47 December year-end firms within an African context (Omokhudu & Ibadin, 2015).

In 2009, Elhamawy and Habib (2009) similarly studied the value relevance of cash flows in another prominent African economy, Egypt. They found that a significant positive correlation existed between cash flows and equity stock prices in Egypt at the time – supporting the results obtained by Omokhudu & Ibadin (2015) within Africa. The recognition of cash flow from operations as possessing either explanatory power or a correlation with share price movements within two recent, African studies supports the aim of the study being performed (Elhamawy & Habib, 2009; Omokhudu & Ibadin, 2015).

Akin to the study being performed at present, a comparative study was published in 2001, assessing the impact of both earnings and cash flows on stock prices for two different types of countries: Anglo-Saxon and non-Anglo-Saxon. This comparison was justified by the differing capital availability within these two types of countries: Anglo-Saxon countries usually raised capital from publicly traded exchanges (with less reporting requirements and tax consequences) while non-Anglo-Saxon countries usually raised finances from private sources. Their results indicated that earnings were more important than cash flows within Anglo-Saxon countries, but the same could not be said for non-Anglo-Saxon countries – where other factors (such as reporting requirements) played a contributory role. Their study endeavoured to differentiate itself and improve on the methods used by numerous prior value relevance studies by using each sampled country's earnings and cash flow as an internal benchmark – thereby comparing within a country instead of between countries during their statistical regression (Bartov, Goldberg & Kim, 2001).

Although economic-based cash flows are thought to be value relevant, a recent study performed in 2019 showed that economic measures on the extreme end may not be. The study attempted to delve deeper into the world of economics to determine what influences stock price movements, using traditional earnings, net cash flows and economic value added (EVA) as their independent variables which impact equity values. 71 non-financial firms were analysed in terms of a univariate and multivariate study, where cash flow was eventually found to possess the strongest explanatory power among the variables which were assessed – substantiating the need for a detailed, modern cash flow-based study (Obaidat, 2019).

2.2.3 Studies based on sector

The need to test the generalisability and replicability of value relevance studies in different economies was realised early on in this line of literature. The additional need to develop detailed models including multiple independent variables was also an important evolution and progression which added significant value to this fundamental line of accounting research which focused on the understanding of stock price movements. A more recent branch under

this topic is that of sector-specific research studies, as called for by Begley & Feltham (2002) – where sectors can be identified and studied in singular or multiple economies in order to acquire detailed differences between economies and sectors within one economy (Begley & Feltham, 2002).

Graham & Knight (2000) assessed the cash flow and earnings causal relationship with share prices in terms of the Real Estate Investment Trust (REIT) sector. This sector is grounded in fixed, tangible assets required for the sample companies to operate in their core business. With a distinct lack of required R&D spending in this sector, it is surprising that they concluded that the cash flow from operations figure provided the best measure for explaining share prices (Graham & Knight, 2000).

Nugraha & Riyadhi (2019) stratified their research study to specifically look at 10 listed State-Owned Enterprises located in Indonesia. This industry is typically not research and technology-intensive in a developing market. As such, their conclusion that the overall net cash flow movements do not have a significant effect on share price movements is not alarming (Nugraha & Riyadhi, 2019).

A multi-variable study considering the value relevance of profitability, leverage, liquidity, cash flows, size and market ratio was performed in Indonesia within the manufacturing sector. Martani, Khairurizka & Khairurizka (2009) only assessed firms with a December year-end and used purposive sampling to select 39 companies across 5 financial years. The stock price movements measured as a result of interim, rather than annual, accounting information represents a key hallmark of the Indonesian study. The results which were obtained indicated that only profitability, turnover and market ratio were found to significantly impact stock prices (Martani et al., 2009). Conversely, additional research performed in Indonesia (although not sector-specific) found cash flow to be value relevant, albeit fairly divisive – where cash flow from investing activities impacted stock returns while cash flow from operations did not (Daniati, 2006).

A study performed by Roswati (2007) also assessed multiple variables within the manufacturing industry, this time breaking down the manufacturing industry sampled into 5 separate sub-categories. Their study used a measurement period varying from 1 to 3 months post annual-financial-report date and found that different variables were significant for the various sub-sectors. Although the primary sample of JSE technology companies used in the present study which has been performed was too small to be broken up into sub-sectors, this prior research supports the need for a sector-specific analysis (Martani et al., 2009).

Both Muniroh & Yulianti (2021) and Asif, Arif & Akbar (2016) also happened to compare the same variables (cash flows and earnings) in a manufacturing-specific context – yet they came to different conclusions. Asif et al., (2016) concluded that earnings was more influential than operating cash flows, but both were individually significant. Muniroh & Yulianti (2021) found that cash flow from investing activities – something not investigated by Asif et al., (2016) – also had a significant influence on share prices. This different result may suggest that informational value exists within cash flows from investing activities. This value relevance could potentially be due to high research and development spending reflecting as outflows from investing activities in the short-term (Asif et al., 2016; Deng et al., 1999; Muniroh & Yuliati, 2021).

A recent study compared the value relevance of accounting information in the manufacturing sector for South Africa and Nigeria – two of the largest emerging markets on the African continent. A total of 62 firms over 10 years were analysed in terms of an ex post facto research design, using an OLS regression model and a Granger Causality test. As cash flow was not an independent variable, it is not of great concern that the only variable found to have a significant positive relationship with share price movements in both countries was dividends per share (DPS) (Ogbodo & Osisioma, 2020).

Girish & Desai (2017) analysed both cash flows and earnings relative to share prices in terms of 10 listed, Indian, pharmaceutical companies over a seven-year period. Although their study concluded that cash flow movements had a smaller impact on share price movements than

earnings, it still indicated that cash flow from operations had a significant influence. This conclusion is important in the context of the industry, as the pharmaceutical industry is often very research intensive – much like the technology and telecommunications sector (Deng et al., 1999; Girish & Desai, 2017).

An Indian study looking at the stock prices of 95 listed companies over a 5-year period was performed by Tandon and Malhotra (2013). Their study used a linear regression model with dividends, book values and earnings as the independent variables impacting stock price movements on a per-share basis. An important distinction of their study is the fact that it broke down the 95 sampled companies into their various sectors. Both the individual variables and their combined effects were assessed using regression analysis as well as statistical T-tests and F-tests. A unique aspect of this study was their use of market price as the dependant variable, measured as the average stock price throughout the financial year (Tandon & Malhotra, 2013).

Amahalu et al., (2018) was a significantly relevant study, focussing on the Information, Communication and Technology (ICT) sector in Nigeria – an African emerging market much like South Africa. Although this sector is closely related, it is not the same as the technology and telecommunications sector of the researcher's present study. Additionally, this study neglected to measure the relationship between cash flow figures and share prices – a key aspect of the study being performed (Amahalu et al., 2018).

A similarly relevant research report was created by Ozturk & Karabulut (2020). Their study focussed on the technology and telecommunications sector of 11 listed Turkish companies. Their study was narrow as it solely focussed on accounting earnings as an independent variable impacting company share prices (Ozturk & Karabulut, 2020).

The above lack of research in the technology sector may be highlighting the lack of research into the correlation between R&D intensity and share price movements as suggested by Szewczyk, Tsetsekos & Zantout, (1996). Szewczyk et al., (1996) found a positive correlation

between the level of R&D intensity of a listed company and their share price volatility – specifically for high R&D companies. Importantly, the technology and telecommunications sector may potentially showcase this relationship as it is believed to be a high R&D sector (Deng et al., 1999; Szewczyk et al., 1996).

2.3 Measurement period and date

In exploring earnings as an independent variable, Ariff et al., (1997) used a predetermined period of 1 month after the expected announcement – being the end of March of the following financial year. This measurement period was used in reference to the Singapore Exchange regulations which required financial results to be published within three months after year-end. This measurement basis does not consider the actual date of the announcement – allowing for more share price externalities than is desirable (Ariff et al., 1997). Wilson (1987), on the other hand, used a set 9-day interval post-announcement date to measure share price movements. This interval is possibly too short, as it may encompass investor 'noise', and not the eventual market sentiment or PEAD as documented by Ball & Brown (Ball & Brown, 1968).

Entwistle et al., (2010) used both a returns and a price-based model to measure their earnings relationship. They did this by using a 3-month post year-end measurement date, with an annual measurement period, believing that financial reports would be released by or before that point in time for regulatory compliance. A resulting issue with this set period is the different durations of reaction measured for each company within their sample, especially for companies which filed for late/delayed releases (Entwistle et al., 2010).

Jordan, Waldron & Clark (2007) also studied cash flow and earnings as independent variables, while incorporating a new, third variable – sales. In their study, focus was only placed on large-sized, US, Fortune 500 companies. This study examined only 2 years of data using a set measurement date of three months after financial year-end to determine annual share price movements for similar reasons to those suggested by Entwistle et al., (2010). Their study concluded that earnings figures were the only significant predictor of share price changes. However, the use of a non-company-specific measurement date of 3 months and a specific

focus on large, Fortune 500 companies leaves room to suggest that their findings may change in a South African, technological setting (Entwistle et al., 2010; Jordan et al., 2007).

Many studies argue for a longer measurement period as a result of a concept first discussed by Ball and Brown (1968) called Post Earnings Announcement Drift (PEAD). This concept is the tendency of a share's cumulative returns to drift in the direction of a recent (unexpected) earnings announcement for several weeks post announcement date – also referred to as standardised, unexpected earnings (SUE) (Ball & Brown, 1968; Mlonzi et al., 2011). As a result, when firms announce earnings that do not exactly match those which were expected, abnormal share returns occur for many weeks or months after the announcement date (Livnat & Mendenhall, 2006; Mlonzi et al., 2011).

2.4 Aggregated accounting information

A 2010 Sri Lankan study assessed the value relevance of EPS, ROE and earnings yield over a 5-year period within their commercial banking industry. The results of that study found that investors generally reacted to the aggregate of accounting information released rather than individual variables, short-term events or unusual events (Perera & Thrikawala, 2010).

The results of the above study performed by Perera & Thrikawala (2010) were tested by Menike & Man (2013), when they used event study methodology with a 21-day window period to assess the commercial banking industry in the same economy over a 5-year period. Interestingly, the latter study performed by Menike & Man (2013) assessed the stock market's response to the release of financial statements in aggregate (instead of specific variables), and found that returns, as well as cumulative annual returns, were positive but insignificant for their sample (Menike et al., 2013).

A similar event study methodology paper was done by Adittya (2017) for the Bangladesh market. A 5-year period with a 21-day event window was used to analyse the secondary data collected. Using an OLS regression model, both cumulative abnormal annual returns (CAAR) and abnormal annual returns (AAR) were positive but not significant – reiterating the results

obtained by Menike & Man (2013) with regards to aggregated accounting information (Adittya, 2017; Menike et al., 2013).

In 2002, an event study in Saudi Arabia also measured the share price reaction to the release of financial statements in aggregate over a 5-year period, with results which opposed those suggested by Menike & Man (2013) as well as Adittya (2017) – indicating that financial statements did significantly influence the behaviour of investors. The differing results are likely due to different national samples being used, with differing time periods selected for measurement (Nasar, 2002).

2.5 Non-traditional studies in value relevance

For the purpose of the researcher's study, the traditional evolution and developments in value relevance are considered to be the inclusion of differing variables, differing economies and differing sectors. Non-traditional evolution in this line of literature describes studies which may explore alternative aspects – a key example of which is the inclusion of non-financial variables (such as ESG variables) impacting the value of a company.

Although considered a traditional form of literature, the study of domestic and international macroeconomic variables and their impact on stock price movements does not form part of the accounting information value relevance line of literature. Research performed in 6 European economies found that numerous macroeconomic variables such as production levels, interest rates, CPI (inflation) and foreign stock prices were all significant factors impacting stock price movements. The significance of these factors has also been supported by value relevance literature which has generally not been able to prove that accounting information explains 100% of the movements in stock prices (Martani et al., 2009; Nasseh & Strauss, 2000; Tandon & Malhotra, 2013).

The multivariate relationship of accounting information and macroeconomic variables impacting stock prices was again highlighted by Cutler, Porteba & Summers (1988), who found

that macroeconomic variables alone explain less than a third of the returns of stock prices (Cutler et al., 1988).

Although inflation is a macroeconomic variable, its impact on financial accounting data has usually been removed through data manipulation instead of being separated and individually studied for some research studies, as seen by Kirkulak & Balsari (2009). They considered the different value of historic and inflation-adjusted data in relation to value relevance within the Turkish market. Their study found both data sources to be valuable, and concluded that the use of both historic and inflation-adjusted data complemented one another in explaining stock price movements (Kirkulak & Balsari, 2009).

Another technological externality which has been found to impact share price responses is the internet. Through an event study methodology with an 11-day window period, a 2007 study determined whether the use of internet financial reporting provided information which is reflected quicker in stock prices. Using a regression model, it was found that firms with a higher degree of information transparency received a higher abnormal stock price return – a result supporting the significance of information timeliness suggested by Beaver (1968). Although this result speaks more to the efficiency of stock markets, it highlights that the assumed efficient market hypothesis employed in the researcher's study is more applicable in the modern world than ever before (Beaver, 1968; Lai, Lin, Lee & Wu, 2007).

A recent study exploring credit rating agency changes as a macroeconomic factor for JSE-listed firms was researched in 2019. Mokoaleli-Mokoteli (2019) completed this paper, by assessing if credit ratings impact stock market returns over a period of 11 years using event study methodology with an 11-day measurement period. The results of that study were fascinating, showing that stock prices reacted with significant negativity as a consequence of credit rating downgrades, while no significant reaction occurred for credit rating upgrades. This lack of a definite reaction may potentially be due to the market already expecting such upgrades, substantiating the efficient market hypothesis (Mokoaleli-Mokoteli, 2019).

Although most studies tend to assume that the market is efficient and that insider trading does not occur, research into the pre-announcement date acquisition of financial data has also been performed by Demski and Feltham (1994). Their study delved into how the value of accounting information induces investors to acquire such information before announcement date, resulting in less representative stock price responses than may have been deserved. This is also referred to as insider trading and influences the accuracy of the relationship within a value relevance study (Demski & Feltham, 1994).

Management's discretion with regards to accounting policies, disclosures and models may also play a role in the relevance of that information. As such, an interesting study assessing the impact of conservative accounting on stock prices was performed by Liu and Ohlson (2000). Their study developed the usual cross-sectional regression model to include the impact of conservative accounting – due to America's GAAP accounting standards utilising this form of accounting. Conservative accounting was considered important as it separates assets into operational and financial, an important distinction due to the fact that the book values of operating assets do not equal the market values of these same operating assets (unlike financial assets) (Liu & Ohlson, 2000).

The mandatory adoption of financial reporting standards (IFRS) plays a significant role in prescribing and standardising the accounting information which is purported by firms all across the world. African studies into the mandatory adoption of IFRS and its impact on the relevance of accounting data have occurred in Tunisia, Nigeria and South Africa. The Nigerian and South African markets were studied by Ighosewe (2022) using an ex post facto research design. Panel data was collected from both countries for a total of 87 Nigerian and 80 South African firms over a 10-year period. Their study used numerous independent variables, including BVPS (Book Value per Share), EPS, cash flow, leverage, size and current ratio. The results obtained differed for these two emerging African markets: Nigeria experienced an increase in value relevance for all variables (except for the current ratio) post IFRS adoption, while South Africa only experienced an increase in value relevance for BVPS, EPS and firm size variables

post IFRS adoption. The results under the Tunisian study by Naceur & Nachi (2007) also supported the conclusion that the value relevance of accounting information improved under mandatory IFRS legislation – legislation which is still present in South Africa at the time of this study (Ighosewe, 2022; Omokhudu & Ibadin, 2015).

Although IFRS financial reporting regulations form the main doctrine for accounting information worldwide, national legislation may also impact the accounting information of firms listed within specific countries, such as the Sarbanes-Oxley Act (SOX) applicable for American firms listed on the NYSE (amongst others). Consequently, Ng, Gul & Mensah (2007) performed a study where they looked at the impact of accounting earnings within the value relevance framework following the introduction of the Sarbanes-Oxley Act (SOX) for a total of 13 986 observations (Ng et al., 2007).

Financial accounting information may not be the only source of information which is valued by investors and stakeholders when evaluating a firm. As a result, the prevalence of ESG reporting in the modern world has been bolstered by its potential value as the global economy adapts to the latest climate-change laws, regulations and best practices. Accordingly, the significance of ESG reporting on a standalone or combined (within the integrated report) basis was considered by Mervelskemper and Streit (2017). Using book value of assets as a denominator in their model, they found that reporting on ESG within an integrated report provided a greater equity value than a standalone ESG report (Mervelskemper & Streit, 2017).

In keeping with this broader modern-mindset and the additional equity value it may potentially bring, Baboukardos & Rimmel (2016) explored the value relevance of accounting information in terms of an integrated reporting approach for JSE-listed companies following the mandatory KING 3 reporting requirements. Using a study period of 6 years (3 before and 3 after), their study found that the earnings' valuation coefficient sharply increased while the relevance of net assets declined – promoting the use of a broader, integrated reporting framework (Baboukardos & Rimmel, 2016).

Within integrated reporting, a related study performed by Fernando & Hermawan (2019) also determined the value relevance pre- and post- IR implementation. Their study used a much larger sample, with 338 JSE-listed companies over a 12 year period (6 years prior and 6 years post) – showing that value relevance improved as a result of the implementation of mandatory IR under KING 3. This conclusion supports the desire to further research the value relevance of accounting information for JSE-listed companies in the modern world, where informational value is potentially more significant than it has ever been (Fernando & Hermawan, 2019).

Additional research linking the value of accounting information within differing economies was demonstrated by Alford, Leftwich & Zmijewski (1993). They found that the association between earnings and stock price movements was stronger in countries that generally raised capital on listed stock exchanges (developed economies), where weaker links between financial reporting and tax could be found. These results may offer a justification for opposing conclusions between emerging and developed markets due to the nature of their financial planning (Alford et al., 1993).

Anthony and Ramesh (1992) undertook a study which measured the response of the stock market to two unusual independent variables: capital investment and sales growth. Their research found that the stock market response to unexpected sales growth or unexpected capital spending decreased as companies moved away from a growth stage and towards a stagnant stage of life cycle. This result validates internal firm characteristics, such as life cycle phase, as impacting the results of a value relevance study and thus potentially causing deviations between studies (Anthony & Ramesh, 1992).

With a late reference to the significance of the technological sector, the relative information relevance of stock prices as a result of the decision to capitalise R&D expenditure was studied in 2007 by Ozwald and Zarowin (2007). The results of their study support the reasoning in favour of a cash flow measure, as they found that companies with a higher R&D capitalisation rate tended to have more informative stock prices – clearly supporting the study presently being performed (Oswald & Zarowin, 2007).

2.6 Justification for this study

Prominent value relevance studies have been performed in developed countries throughout time, beginning with Collins (1957), Fama (1965), Ball & Brown (1968) and Beaver (1968).

Research in this topic later evolved to include accounting variables beyond normal earnings, while also incorporating emerging markets into their data to broaden the generalisability and applicability of the knowledge gained. Although the cross-border travel was fairly quick, with emerging market studies occurring as early as the 1970's, the inclusion of diverse accounting variables seemed to begin around 20 years later, in the 1990's (Abarbanell & Bushee, 1998; Ang & Pohlman, 1978; Dechow, 1994; Jennergen & Korsvold, 1975; Manurung, 1998; Sloan, 1996).

Excluding the more recent forms of non-traditional value relevance research, the latest branch is the development of sector-specific studies, occurring within a wide variety of economies and sectors within the last two decades.

Consequently, this study attempted to link the 3 aforementioned branches (which have proven to exist within this line of literature) by means of sampling the technology sector, within the South African market, while analysing multiple accounting variables. Furthermore, it was envisaged that by comparing the share price relationship for both technological and retail firms, the differing nature of technological firms would be emphasised. This test was performed by incorporating a measure which is believed to be appropriate for the technological sector, a measure which is also underutilised in emerging markets – cash flow. The relationship was analysed over a five-year period in an attempt to juxtapose the impact on share price between the two sectors (technology and retail) and the two measures (cash flow and earnings).

The inclusion of a cash flow figure as a variable was deemed necessary, as prior literature has not shown a conclusive and consistent result in determining if this accounting value explains share price movements. The significance of including cash flow as a variable was

also supported by the fact that numerous studies suggested that the value relevance of cash flow, and accounting information in general, has been improving.

Lastly, The United States of America is a large base for technological listings, research and development. Accordingly, this study also sought to illustrate the potential differences in association between South African and American listed companies – attempting to quantify how different South African technology shares are from that of a global leader, America.

3. Research methodology

This section unpacks the research methods and research approaches relevant to this specific study. In the below discussion, the researcher will establish the rationale and justification for a quantitative approach which was achieved through the use of panel data analysis.

3.1 Research method and approach

This study attempted to determine the extent of the explanatory relationship between three accounting figures and share prices. The focus of this study was documenting the extent of changes in a numerical share price figure, determined by investor sentiment, through detailed quantitative statistical analysis. Additionally, this research sought to prove or disprove four different alternative hypotheses formulated from past literature. As such, this study was a clear form of statistical, quantitative research (Arghode, 2012; Merriam & Grenier, 2019).

In assessing the explanatory relationship, a panel data regression model was used where multiple statistical tests were performed during the analysis of the data collected.

3.2 Population and study sample

The determined population of this study included all listed firms on the Johannesburg and New York Stock Exchanges. This population was further stratified into technological, telecommunications and retail-based companies listed on the Johannesburg Stock Exchange and the New York Stock Exchange when this research began (Scholes & Johnson, 2001). The stratified population can be broken down as:

Table 1: Breakdown of population per sector of the two exchanges

Exchange sector	**Johannesburg Stock Exchange**	**New York Stock Exchange**
Technology	19	
Telecommunications	7	
Computer and Technology		228
Consumer goods	20	
Consumer services	47	
Consumer discretionary		142
Consumer staple		86
Retail/wholesale		106
Total	**93**	**562**

From the above table: technology and telecommunications firms listed on the Johannesburg Stock Exchange was the initial benchmark against which the other samples would be selected. The Johannesburg Stock Exchange consumer goods and consumer services sectors were selected as proxies for retail firms as their business model and direct customer relationship closely resembled what the researcher views as traditionally retail. For companies listed in New York, both technology and telecommunications firms were listed under the 'computer and technology' sector. Finally, consumer discretionary, consumer staple as well as the retail/wholesale sectors were used as proxies for retail firms – again due to their customer-focussed nature and business model.

The sample study used by the researcher was the entire set of technology and telecommunication companies listed on the Johannesburg Stock Exchange for which data was available, being 23. As this population is small, a reduced sample was not necessary. For all retail entities and New York Stock Exchange technological entities, the sample study was set to match the number of technology and telecommunication companies listed on the JSE (23) – stratified on pre-determined characteristics and then randomly sampled. This sample of companies was analysed for the 2017 until 2021 financial years (inclusive) – representing a longitudinal study. This five-year period of data was selected in order to ensure that sufficient observations exist for the statistical models to be effective, while also limiting the duration in order to reduce the impact of survivorship bias within the population.

The New York Stock Exchange was selected to represent American retail and technological sectors in this study as it is one of the largest stock exchanges by market capitalisation.

3.3 Sampling technique

The sampling technique is the method determined for selecting a data sample from the entire population. These sampling techniques can be split into two separate types – known as

probability sampling (or random sampling) and non-probability sampling (or non-random sampling) (Burger & Silima, 2006).

The probability sampling method was employed by Jordan et al., (2007) when selecting the sample of 100 out of the Fortune 500 companies within the value relevance line of literature (Jordan et al., 2007; Taherdoost, 2016).

Alternatively, a form of non-random sampling, known as purposive sampling, was recently used by Muniroh & Yulianti (2021). This form of sampling involves the inclusion of specific companies in the sample as the researchers of that study believe that those companies warranted inclusion (Muniroh & Yuliati, 2021; Taherdoost, 2016). A consequential result of this non-probability sampling is that the research would not easily be replicated or generalised.

The form of sampling which was used in this study is that which was followed by the majority of prior literatures relevant to this topic: Stratified random sampling (Taherdoost, 2016). In accordance with this sampling technique, all of the population was stratified such that:

1. Companies not listed for the full 5-year duration (2017 until 2021) of the study were not considered.
2. Companies involved in multiple sectors were considered if their primary sector was retail or technology respectively.
3. Companies listed where data was not available were excluded from the sample.

After the population was stratified under these conditions, the sample of each population was selected randomly in a manner which should yield a fair representation of the entire population. This was done in an attempt to sample a wide spread of differing market capitalisation size firms.

3.4 Sample size

The sample size used in this study is 23 companies for each of the four sections of population from which data was extracted. This sample size was determined by the population of JSE technology and telecommunications firms (26) less those for which data was unavailable (3).

As such, 23 listed technological and telecommunications companies and 23 listed retail-related companies were selected from both the Johannesburg and the New York Stock Exchanges respectively. This sample size was selected as it represented the entire population of listed technology and telecommunications companies on the JSE for which data was available when this study began. This sample size was also used for retail companies from each exchange as well as technological companies from the NYSE to allow for accurate comparisons between the observations collected at the end of the research process.

Ultimately only 21 JSE technology and telecommunications firms' data was useable as 2 of the 23 firms were not listed for the entire 5-year period. The remaining three samples were kept at 23 firms for the benefit of reducing the sampling risk, leaving a total sample of 90 firms all in all.

As this study sought to perform quantitative research, a large sample size relative to the size of the population is generally considered desirable. This is done to ensure that sufficient data is obtained to address the research question and to generalise about the population with a significant degree of confidence. As such, the researcher believes that testing the entire population of technology and telecommunication companies listed on the JSE provided complete data from which a conclusion could be determined. The focus on using JSE technology and telecommunications companies as the basis of all four sample sizes was rooted in the fact that this was the primary purpose of this study, as previously stated (Amahalu et al., 2018; Heath & Cowley, 2004; Ozturk & Karabulut, 2020).

The sample size of 90 companies over five financial years yielded around 450 observations – a size which was sufficient to run statistical modelling programmes.

3.5 Data collection method

The New York Stock Exchange started in 1792, while the Johannesburg Stock Exchange was formed in 1887 (CFI, 2022; Sahistory.org.za, 2011). Both of these listed exchanges examined under this study have thus been administering trading for an extended period of time.

Technological, telecommunications and retail companies are not a new business model and have been traded on these listed exchanges for many past decades. Therefore, no reasonable limitation on the availability of share price data hindered this study.

Share price data was collected from databases and portals which keep historic records of share price movements. Annual financial information was extracted for each of the six years from the relevant databases as far as possible. Where necessary, financial information and announcement date information were extracted from company websites and the released reports which they make publicly available.

3.6 Source and handling of data

The determination of sector size and company selection within a sector was through data collected from Listcorp for JSE-listed firms and Macrotrends for NYSE-listed firms (Listcorp, 2022; Macrotrends, 2022).

Share price data was extracted from EquityRT for both New York and Johannesburg Stock Exchange samples. Earnings, as well as cash flow and total asset data, was extracted from the same database – EquityRT for all firms. Annual report announcement dates were also largely collected from EquityRT, but for a few firms the annual reports of the listed companies – as available on their websites – was used to locate these dates. This data is majorly classified as secondary data, since it was collected by the aforementioned counterparts and available to the researchers for the purpose of this study. This classification of the data is not expected to impact the validity or reliability of the study, as the source from which the data was obtained is reputable and commonly used in academic literature (EquityRT, 2022).

3.7 Data analysis method, model, reliability, and validity

The dependant variable in this regression study was determined to be the share price of the individual companies one calendar month after the release date of the financial statements. The independent variables were: accounting earnings, net operating cash flow and net investing cash flow for the preceding financial year. The pooled regression model below was

used to estimate the relative and incremental informational content value of earnings and cash flows for each country and each sector respectively.

Most studies in this line of research rely on the Ohlson model (1995) as the framework underpinning their research:

$P_{it} = \alpha_0 + \beta_1 BVE_{it} + \beta_2 EARN_{it} + e$

Where:

- P is the share price
- β is the coefficient measuring the impact of an independent variable on share price
- BVE is the book value of equity
- E is GAAP-regulated earnings
- e is the stochastic error correctional term

The above model was modified for study-specific variables by Jordan et al., (2007) which included both cash flow and earnings as independent variables:

$P_{it} = \alpha + \beta_1 CFO_{it} + \beta_2 E_{it} + \beta_3 Sales_{it} + e$

Further, using a return-based model, Bartov, Goldberg & Kim (2001) performed their study using a modified Ohlson (1995) model, including both the absolute value and change in earnings and cash flow as independent variables:

$RET_{it} = \alpha_0 + \beta_1 NI_{it} + \beta_2 NICH_{it} + \beta_3 CFO_{it} + \beta_4 CFOCH_{it} + e$

Consequently, this study uses an adapted Ohlson (1995) share price model influenced by the above 2 models – which can be represented as:

$P_{it} = \alpha + \beta_1 CFO_{it} + \beta_2 CFI_{it} + \beta_3 E_{it} + \beta_4 BV_{it} + e$

Where:

- P is the share price
- β is the coefficient measuring the impact of an independent variable on share price

- CFO is the net cash flow from operating activities
- CFI is the net cash flow from investing activities
- E is net profit /earnings
- BV is the book value of total assets (a control variable for SIZE)
- e is the stochastic error correctional term

The control variable which was used was the size of the company measured by total asset book value. The book value of total assets was used as a proxy for firm size, as it was readily available for all sampled companies and has been used for this purpose in prior literature. Additional control variables were not added, as they were not required when running the statistical programmes to determine a robust and fit model. The change in accounting variables was intended to be used for statistical purposes as the share price (dependant variable) was intended to be measured in terms of its movement – thus both representing a percentage and not an absolute figure. This measurement method was later modified for data and normality concerns as discussed in the data analysis and results section of this report.

Although some prior literatures [such as the one performed by (Amahalu et al., 2018)] have used separate models for each independent variable, a combined model was selected as it allowed for this study to show the combined relationship of all independent variables with share price. Additionally, using a combined model allowed for a simple and accurate assessment of multicollinearity – which is likely why the majority of past literature has followed the combined approach (Jordan et al., 2007).

In line with prior research in this line of literature, the sole focus of this study was the explanatory power of financial variables and how they compare among one another in different sectors and different economies. The explanatory power of macroeconomic variables, although present, was therefore not represented as a control or independent variable in the above model.

In order to assess the explanatory power of the independent variables on the dependant variable, statistical linear regression significance tests were conducted, using pre-set significance levels of 5% and 10%. This occurred after performing descriptive statistics and correlation analyses. Once the data had been collected and sorted, outliers were identified (using mahalanobis distances) and removed to improve the normality and generalisability of the results. The data was then tested for normality using both a Q-Q plot and a Kolmogorov-Smirnov test. As the data closely matched the trend line in terms of a Q-Q plot, the data seemed to approximate a normal distribution and the research could thus continue with the proposed form of testing. Included in this analysis is the combined explanatory power of all of the independent variables which is illustrated by the regression model summary. If these statistical correlation and regression-based tests proved the alternative hypotheses, then informational value would be implied.

As a different sample measurement period was used for each company for each financial year based on their respective announcement dates, a panel data OLS regression model was performed using absolute values.

As causality was not the primary focus of this study, a robust linearity test was not performed.

The determined regression model was performed in order to develop a matrix between the different variables. This matrix provided a magnitude of the relationship between the three variables as well as a goodness-of-fit (R^2 coefficient of determination) measure when assessing the validity of the model for each sample. The use of this regression model allowed for multicollinearity between the independent variables to be tested – ensuring a high level of construct validity.

Multiple similar studies, such as the one performed by Asif et al. (2016) assessed for multicollinearity in their panel data regression model. Although they found that multicollinearity was worth mentioning, the statistical tests performed determined it to be an insignificant issue. Additionally, some studies [such as the one performed by Aras & Yilmaz (2008)] assessed for

multicollinearity by means of a variance inflation factor (VIR) test. The results of these tests were lower than the predetermined level and thus were said to yield no significant multicollinearity issues. The variance inflation factor (VIR) test was also performed in this study with the intention of any variables which exceed the acceptable limit being dropped if required. The acceptable limit set for this study was the most conservative generally used for VIF tests, at 5.

As a result of the combination of multiple statistical testing models used, content validity is expected to be sufficient when assessed in line with prior literature. The model used should provide sufficient robustness to address validity issues regardless of the sectors at the focus of this study. The use of a multiple linear regression model should be appropriate for these two sectors as this study sought to assess the relationship of multiple independent variables with share prices.

In order to determine the relationship between share price movements and movements in accounting ratios, specified data analysis tools were used. In reference to this, share price data was collected from one month after the annual financial statement release date. This was then compared to the absolute earnings and net cash flows of the current year's financial statements for a total of 5 financial periods – 2017 until 2021 (The use of multiple financial years yields a longitudinal study). This annual return measurement period used in our panel regression model was very similar to that which was used by Ariff et al., (1997) and numerous prior studies, and should improve the internal validity of the study.

Ultimately, the use of an entire population for a specific sector of this study, coupled with the random sampling method used, will allow for this study to be replicated elsewhere – ensuring reliability.

Once the share price data, announcement date data and financial variables were collected from EquityRT, they were sorted and combined using Microsoft Excel. Following which, the data was inputted into SPSS, a detailed statistical programme capable of performing all the

required data analysis tests and functions for the model to be deemed fit and robust. The main use of SPSS was to perform the regression tests and determine R-squared values for each of the four collected samples.

The R-squared value is a statistical measure of the proportion of the variation in a dependant variable which is explained by the independent variable in a regression model. The R-squared value for this research represents a measure for the proportion of variation in share prices (the dependant variable) that is explained by profits, cash flows and size (the independent variables) (Taylor, 2022).

4. Data analysis and results

The results of this research are presented as follows: first, a brief overview of the population and sample of the study are discussed to understand how representative the sample is. Second, the distribution and normality of the data are analysed. Third, the multicollinearity of the independent variables are assessed using VIF Factors. Finally, the results of the research regression model are presented and discussed with the intention of answering the research question, hypothesis and objectives as laid out in chapter 1 (Introduction). The findings are then summarised and a conclusion is formulated.

4.1 Overview of the population and sample

The purpose of this study was to assess and compare the explanatory power of cash flow and earnings for both an emerging market (South Africa through the JSE) and a developed market (America through the NYSE). Although the inclusion of America may improve the generalisability of the study, these two exchanges cannot be said to fully represent every exchange in every region of the world – restricting the generalisability of the results to securities listed on the NYSE and JSE within the technological and retail sectors only.

The random sampling method applied in this research allowed for a sample which is believed to be representative of the above populations. A sample of 23 companies was selected for each of the four populations in an attempt to prioritise the analysis and comparison between the two focus sectors, being technology and retail. Although this sample size does not represent the majority of all four populations, the use of a random sampling method which includes companies of varying market capitalisation's should allow for sufficient reliability while extrapolating these results to represent the entire population.

4.2 Analysis of the distribution and normality of the data

To ensure that the data collected for each of the four samples was suitable for the statistical tests and regression models which the researcher sought to perform in order to answer the

research question within the SPSS software programme, an analysis of the distribution of data was required.

The study being performed made use of inferential statistical tests, such as: t-tests, p-values, ANOVA matrices and linear panel data regression analysis. These statistical tests rely on the assumption that the collected and sorted dataset is normally distributed. Performing these tests on a non-normally distributed dataset would yield inaccurate and/or useless results.

Prior to testing the data for normality, the dataset was analysed to identify outliers. This was performed using Mahalanobis distances within SPSS. As the desired regression model contained four predictive/ independent variables, a degree of freedom of four was selected for the process of identifying outliers. To determine if the distance for each data point was statistically significant, the p-values (which correspond with a Chi-squared value) were calculated. Data points which exhibited a p-value less than 0.001 were considered to be outliers. These outliers were then removed from the dataset entirely before the regression analysis was performed. Using this method, two outlier companies were removed from the data samples for both the New York Stock Exchange technology sample and for the Johannesburg Stock Exchange technology sample (4 companies in total) – across all five years of the longitudinal study. No such outliers were found for the NYSE or JSE retail sector dataset samples. The removal of these outliers assisted in ensuring the generalisability of the results, but also improved the normality of the dataset (Zach, 2020).

The researcher intended to collect absolute numerical data points for all independent and dependant variables, and measure the relationship by calculating the change in these variables from one period to another; as significant prior studies have done (Bartov et al., 2001; Jordan et al., 2007; Muniroh & Yuliati, 2021). This method, however, yielded a dataset which was not normally distributed. In order to overcome this issue, a model using absolute numerical data points (rather than changes) was favoured as it made use of data which approximated a normal distribution. This, therefore, allowed the researcher to continue with the desired inferential statistical tests. As an absolute model was resorted to, end share price

was used to represent the dependant variable for the same principle reasons why it was selected as a measurement date.

Lastly, to improve the normality of the dataset to a level where the results of inferential statistical tests would be reliable, the share price data was transformed using a logarithmic function. This did not change the fundamentals of the data, but transformed it in an attempt to enhance the normality of the dataset for each of the four samples.

The distribution of the data for each sample is represented in figures 1 - 4 below:

Figure 1: Q-Q Plot representing the distribution of data for the JSE technology sample

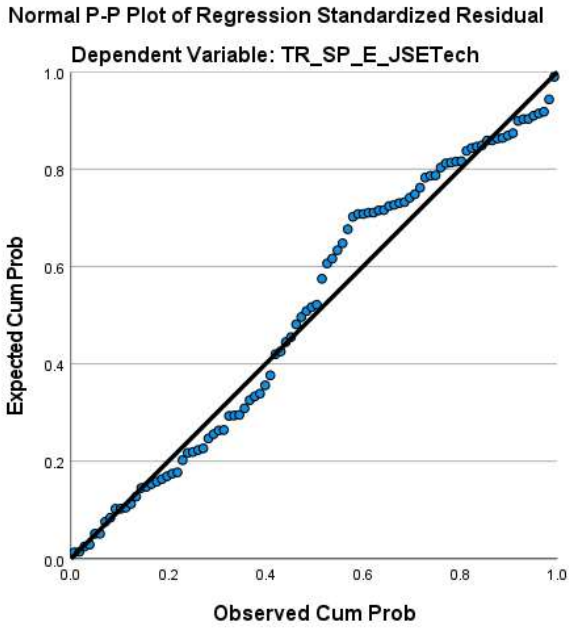


Figure 2: Q-Q Plot representing the distribution of data for the JSE retail sample

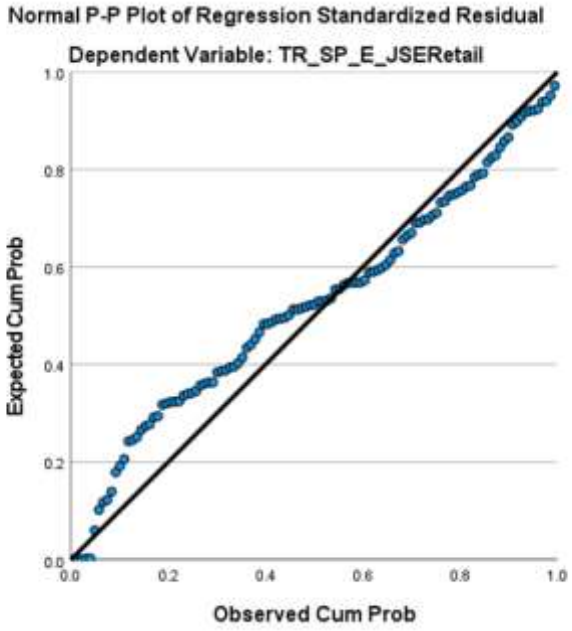


Figure 3: Q-Q Plot representing the distribution of data for the NYSE technology sample

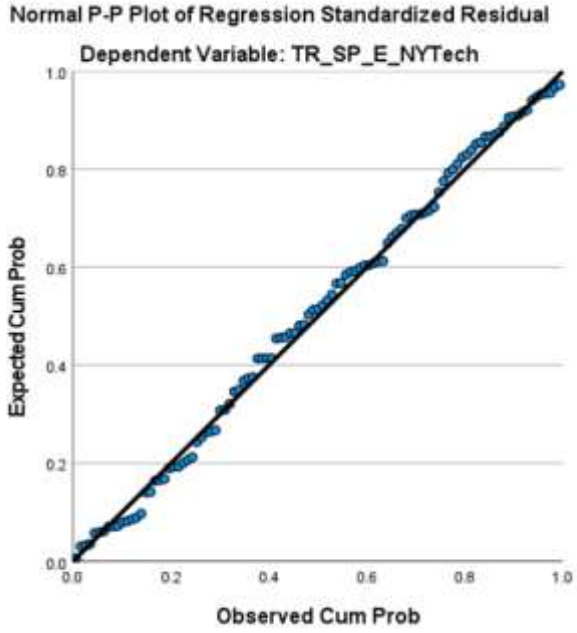
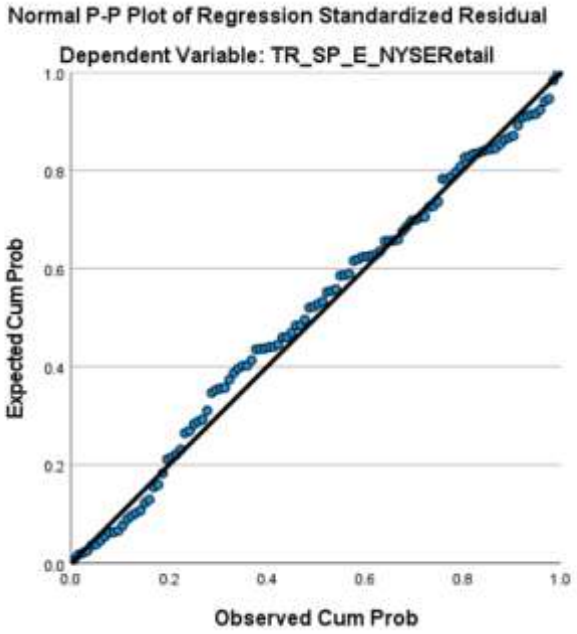


Figure 4: Q-Q Plot representing the distribution of data for the NYSE retail sample



The Q-Q Plots illustrated in figures 1 - 4 observe the data for all four samples to approximate a normal distribution, allowing the researcher to proceed with the desired inferential statistical tests. The use of a Kolmogorov-Smirnov test to assess normality of the dataset was not performed as a result of the Q-Q Plots approximating a normal distribution. Finally, a partial least squares regression (or any regression besides linear OLS regression) was not required as the dataset approximated a normal distribution.

The histogram and scatter plots for each regression sample are shown in figures 5 - 8 in Appendix 1.

4.3 Analysis of multicollinearity

The Variance Inflation Factor (VIF) is a robust test used to measure the degree of multicollinearity of a specific independent variable with all of the other independent variables within the regression model. The VIF test results are shown in tables 2 - 5 below:

Table 2: VIF test results for the variables in the JSE technology regression sample

Independent variable	Statistical VIF
Net Earnings	3.624
CFI	2.681
Total Assets	4.431

Table 3: VIF test results for the variables in the JSE retail regression sample

Independent variable	Statistical VIF
Net Earnings	2.819
CFI	2.093
Total Assets	1.738

Table 4: VIF test results for the variables in the NYSE technology regression sample

Independent variable	Statistical VIF
Net Earnings	1.663
CFI	1.557
Total Assets	2.163

Table 5: VIF test results for the variables in the NYSE retail regression sample

Independent variable	Statistical VIF
Net Earnings	1.873
CFI	2.434
Total Assets	3.204

The initial model which included cash flow from operations yielded very high VIF factors, which were outside of the tolerable maximum of 5 – as represented by tables 22 - 25 in Appendix 2. The large VIF scores under the initial model seemed to be a result of similarities between CFO and Net Earnings as independent variables, and justified the removal of CFO as an independent variable. Importantly, the researcher believes that the removal of this variable did not significantly impact the results and analysis of this study, as CFI still remained and was thus able to illustrate the desired differences between cash flow and profits. The removal of outliers detailed in section 4.2 also assisted in lowering the VIF test results to an acceptable level. The final VIF test results (after the exclusion of CFO as a variable) represented by tables

2 - 5 above found the multicollinearity of the updated model to be acceptable, with all statistical VIF values below 5 – a stringent tolerance measure of acceptable multicollinearity.

4.4 Descriptive statistics

Descriptive statistical analysis is the first step to statistical analysis, but is not the main focus of this study. The descriptive statistics for each regression sample are illustrated by tables 6 - 9 below: (rounded to 2 decimal places)

Table 6: Descriptive statistics for the JSE technology regression sample

Descriptive Statistics			
	Mean	Std. Deviation	N
TR_SP_E_JSETech	6.11	1.75	94
Net earnings	1045.72	3782.97	94
CFI	-955.13	2981.09	94
Total assets	15533.10	35354.90	94

Key: TR_SP_E_JSETech: The transformed end of measurement period share price for JSE Technology firms

Table 7: Descriptive statistics for the JSE retail regression sample

Descriptive Statistics			
	Mean	Std. Deviation	N
TR_SP_E_JSERetail	8.20	1.58	115
Net earnings	1426.06	3992.60	115
CFI	-929.98	2163.13	115
Total assets	23499.79	32447.86	115

Key: TR_SP_E_JSERetail: The transformed end of measurement period share price for JSE Retail firms

Table 8: Descriptive statistics for the NYSE technology regression sample

Descriptive Statistics			
	Mean	Std. Deviation	N
TR_SP_E_NYTech	3.69	1.22	105
Net earnings	125.77	319.34	105
CFI	-215.07	553.24	105
Total assets	4041.29	7201.06	105

Key: TR_SP_E_NYTech: The transformed end of measurement period share price for NYSE Technology firms

Table 9: Descriptive statistics for the NYSE retail regression sample

Descriptive Statistics			
	Mean	Std. Deviation	N
TR_SP_E_NYSERetail	3.65	1.10	110
Net earnings	1192.21	3697.19	110
CFI	-1271.73	3223.38	110
Total assets	29764.88	9223.37	110

Key: TR_SP_E_NYSERetail: The transformed end of measurement period share price for NYSE Retail firms

4.5 Statistical correlation analysis

Correlation analysis is the second step in statistical analysis. The correlation matrix for each dataset sample is illustrated by tables 10 – 13 below:

4.5.1 JSE technology results

Table 10: The correlation matrix for the JSE technology sample

Correlations					
		TR_SP_E_JSETech	Net earnings	CFI	Total assets
Pearson Correlation	TR_SP_E_JSETech	1.000	.497	-.534	.650
	Net earnings	.497	1.000	-.725	.845
	CFI	-.534	-.725	1.000	-.783
	Total assets	.650	.845	-.783	1.000
Sig. (1-tailed)	TR_SP_E_JSETech	.	<.001	<.001	<.001
	Net earnings	.000	.	.000	.000
	CFI	.000	.000	.	.000
	Total assets	.000	.000	.000	.
N	TR_SP_E_JSETech	94	94	94	94
	Net earnings	94	94	94	94
	CFI	94	94	94	94
	Total assets	94	94	94	94

The correlation matrix results in table 10 show that share price (TR_SP_E_JSETech) has a positive relationship with both net earnings (profitability) and total assets (firm size), and a negative relationship with CFI. This difference in correlation direction is interesting as net earnings and total assets are both proxies of variables included in the original Ohlson (1995) model while CFI is a modification to the model. The noteworthy positive correlation between earnings and share price within a technological sector in an African emerging market supports the results obtained by Amahalu et al., (2018) within the Nigerian market (Amahalu et al., 2018; Ohlson, 1995).

The p-value of all 3 independent variables are below the 5% level, and thus their relationship with share price is statistically significant. A one-sided significance test was performed as the data is directional – investors cannot go back into the past to react with share price announcements.

4.5.2 JSE retail results

Table 11: The correlation matrix for the JSE retail sample

Correlations					
		TR_SP_E_JSERetail	Net earnings	CFI	Total assets
Pearson Correlation	TR_SP_E_JSERetail	1.000	.441	-.322	.600
	Net earnings	.441	1.000	-.723	.652
	CFI	-.322	-.723	1.000	-.474
	Total assets	.600	.652	-.474	1.000
Sig. (1-tailed)	TR_SP_E_JSERetail	.	<.001	<.001	<.001
	Net earnings	.000	.	.000	.000
	CFI	.000	.000	.	.000
	Total assets	.000	.000	.000	.
N	TR_SP_E_JSERetail	115	115	115	115
	Net earnings	115	115	115	115
	CFI	115	115	115	115
	Total assets	115	115	115	115

The correlation matrix results in table 11 show that share price (TR_SP_E_JSERetail) has a positive relationship with both net earnings (profitability) and total assets (firm size), and a negative relationship with CFI. When compared to the Pearson correlation results of JSE technology firms, all 3 of the independent variables possessed a stronger relationship for the technology sample than the retail sample – with the greatest deviation experienced by CFI.

The p-value of all 3 independent variables are below the 5% level, and thus their relationship with share price is statistically significant.

4.5.3 NYSE technology results

Table 12: The correlation matrix for the NYSE technology sample

Correlations					
		TR_SP_E_NYTech	Net earnings	CFI	Total assets
Pearson Correlation	TR_SP_E_NYTech	1.000	.230	-.259	.188
	Net earnings	.230	1.000	-.404	.631
	CFI	-.259	-.404	1.000	-.597
	Total assets	.188	.631	-.597	1.000
Sig. (1-tailed)	TR_SP_E_NYTech	.	.009	.004	.027
	Net earnings	.009	.	.000	.000
	CFI	.004	.000	.	.000
	Total assets	.027	.000	.000	.
N	TR_SP_E_NYTech	105	105	105	105
	Net earnings	105	105	105	105
	CFI	105	105	105	105
	Total assets	105	105	105	105

The correlation matrix results in table 12 show that share price (TR_SP_E_NYTech) has a positive relationship with both net earnings (profitability) and total assets (firm size), and a negative relationship with CFI. When compared to the Pearson correlation results of both JSE technology and JSE retail firms, all 3 of the independent variables possessed a weaker relationship for the NYSE technology sample than the two JSE samples.

The p-value of all 3 independent variables are below the 5% level, and thus their relationship with share price is statistically significant.

4.5.4 NYSE retail results

Table 13: The correlation matrix for the NYSE retail sample

Correlations					
		TR_SP_E_NYSERetail	Net earnings	CFI	Total assets
Pearson Correlation	TR_SP_E_NYSERetail	1.000	.312	-.225	.275
	Net earnings	.312	1.000	-.544	.682
	CFI	-.225	-.544	1.000	-.767
	Total assets	.275	.682	-.767	1.000
Sig. (1-tailed)	TR_SP_E_NYSERetail	.	<.001	.009	.002
	Net earnings	.000	.	.000	.000
	CFI	.009	.000	.	.000
	Total assets	.002	.000	.000	.
N	TR_SP_E_NYSERetail	110	110	110	110
	Net earnings	110	110	110	110
	CFI	110	110	110	110
	Total assets	110	110	110	110

The correlation matrix results in table 13 show that share price (TR_SP_E_NYSERetail) has a positive relationship with both net earnings (profitability) and total assets (firm size), and a negative relationship with CFI. When compared to the Pearson correlation results of NYSE technology firms, both net earnings and total assets exhibited a stronger relationship for retail firms, while the same cannot be said for CFI – which was very similar across the two NYSE sectors.

The p-value of all 3 independent variables are below the 5% level, and thus their relationship with share price is statistically significant.

Summary comparisons:

All of the independent variables showcased a statistically significant relationship with share prices, replicating the conclusions reached by Muniroh & Yulianti (2021) in the Indonesian market. Additionally, on average, the Pearson correlations illustrated a stronger relationship between the independent variables and share prices for the JSE over the NYSE, regardless of sectors. Furthermore, on average, the relationship between share prices and independent variables for JSE technology companies was stronger than that of JSE retail companies, while the opposite holds true for NYSE companies (where retail firms possess the stronger relationship). Lastly, the only variable which was consistently stronger across firms in the technology sample for both JSE and NYSE companies was CFI – supporting one of the main hypotheses of this study. The negative cash flow relationship and positive earnings relationship is consistent with the results of Jordan, Waldron & Clark (2007), while the stronger earnings relationship (when compared to the CFI relationship) supports the conclusions made by Wang, Fu & Luo (2013).

4.6 Statistical regression analysis

The final step in statistical analysis is regression analysis – a tool allowing a researcher to deeply analyse the relationship between a dependant variable and independent variables. The regression model results and coefficients for each dataset sample are illustrated by tables 14 – 21 below:

4.6.1 JSE technology results

Table 14: The regression model summary for the JSE technology sample

Model Summary[b]					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.660[a]	.435	.417	1.33364	.467
a. Predictors: (Constant), Total assets, CFI, Net earnings					
b. Dependent Variable: TR_SP_E_JSETech					

Table 15: The regression coefficients for the JSE technology sample

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	5.583	.152		36.644	<.001
	Net earnings	-9.318E-5	.000	-.202	-1.339	.184
	CFI	-5.716E-5	.000	-.098	-.753	.454
	Total assets	3.676E-5	.000	.744	4.464	<.001

The coefficient of determination (R-squared value) is 0.435, while the adjusted R-squared value is 0.417. The adjusted R-squared value was preferred in this study as it takes into consideration the quantity of independent variables included in the model. The adjusted R-squared value indicates that 41,7% of the variation in the dependant variable (share price) is explained by the variation in the independent variables (being net earnings, CFI and total assets). Furthermore, the standard error of estimate value of 1.33364 is considered low – signifying an accurate model.

As the Durbin-Watson value of 0.467 is between 0 and 2, a positive autocorrelation is present. This means that the current year's share price was positively correlated with prior year share prices. This value also illustrates that the data does not exhibit serial correlation.

As the constant error term and total assets are both below the common confidence level of 5%, they are significant explanatory variables. As both net earnings and CFI are above the common confidence level of 5%, they are not significant explanatory variables. Although not significant, net earnings does possess a greater coefficient than CFI within this sector of the JSE, supporting numerous prior literature conclusions that EPS/profits exhibited the greatest coefficient among cash flows and profits (Asif et al., 2016; Nugraha & Riyadhi, 2019; Ozturk & Karabulut, 2020). However, the lack of significance of net earnings is inconsistent with

Amahalu et al., (2018), as they found EPS to be a significant explanatory variable for ICT companies in Nigeria.

4.6.2 JSE retail results

Table 16: The regression model summary for the JSE retail sample

Model Summary[b]					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.604[a]	.365	.347	1.27507	.590
a. Predictors: (Constant), Total assets, CFI, Net earnings					
b. Dependent Variable: TR_SP_E_JSERetail					

Table 17: The regression coefficients for the JSE retail sample

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	7.533	.151		49.895	<.001
	Net earnings	3.387E-5	.000	.086	.674	.501
	CFI	-1.356E-6	.000	-.002	-.017	.986
	Total assets	2.643E-5	.000	.543	5.449	<.001

The coefficient of determination (R-squared value) is 0.365, while the adjusted R-squared value is 0.347. The adjusted R-squared value indicates that 34,7% of the variation in the dependant variable (share price) is explained by the variation in the independent variables. Furthermore, the standard error of estimate value of 1.27507 is considered low – signifying an accurate model.

As the Durbin-Watson value of 0.590 is between 0 and 2, a positive autocorrelation is present. This means that the current year's share price is positively correlated with prior year share prices. This value also illustrates that the data does not exhibit serial correlation.

As the constant error term and total assets are both below the common confidence level of 5%, they are significant explanatory variables. As both net earnings and CFI are above the common confidence level of 5%, they are not significant explanatory variables. Although not significant, net earnings does possess a greater coefficient than CFI within this sector of the JSE.

When compared to the JSE technology sample results: both the coefficients of net earnings, CFI and total assets as well as the overall model contains a greater explanatory value for JSE technology firms than JSE retail firms.

4.6.3 NYSE technology results

Table 18: The regression model summary for the NYSE technology sample

Model Summary[b]					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.295[a]	.087	.060	1.18386	.342
a. Predictors: (Constant), Total assets, CFI, Net earnings					
b. Dependent Variable: TR_SP_E_NYTech					

Table 19: The regression coefficients for the NYSE technology sample

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.539	.133		26.616	<.001
	Net earnings	.001	.000	.175	1.428	.156
	CFI	.000	.000	-.220	-1.854	.067
	Total assets	-9.097E-6	.000	-.054	-.384	.702

The coefficient of determination (R-squared value) is 0.087, while the adjusted R-squared value is 0.060. The adjusted R-squared value indicates that 6,0% of the variation in the dependant variable (share price) is explained by the variation in the independent variables.

Furthermore, the standard error of estimate value of 1.18386 is considered low – signifying an accurate model.

As the Durbin-Watson value of 0.342 is between 0 and 2, a positive autocorrelation is present. This means that the current year's share price is positively correlated with prior year share prices. This value also illustrates that the data does not exhibit serial correlation.

As the constant error term is below the common confidence level of 5%, it is a significant explanatory variable. Additionally, CFI is a significant explanatory variable at the 10% confidence level. As both net earnings and total assets are above the common confidence levels of 5% and 10%, they are not significant explanatory variables. Although not significant, net earnings does possess a greater coefficient than total assets within this sector of the NYSE – with CFI possessing the greatest coefficient of the independent variables.

When compared to the JSE technology sample results: The only similarity is that the constant error term is a significant explanatory variable. Overall, the JSE technology sector has a significantly stronger adjusted R-squared value, meaning that the model explains more variations in the JSE technology firm share price movements than the NYSE share price movements. Additionally, total assets is the most significant explanatory variable in the JSE technology sample (with CFI being the least significant) – while the opposite is true for the NYSE technology sample.

Although differing in both sector selection and form of cash flow, the superiority of CFI may be in agreement with the superiority of CFO found in a study on the REIT sector in the year 2000 (Graham & Knight, 2000). Additionally, the superiority of cash flows over earnings is not in compliance with the superiority of earnings achieved by a study of the Shanghai Stock Exchange – although these two markets differ substantially in their nature (Wang et al., 2013).

4.6.4 NYSE retail results

Table 20: The regression model summary for the NYSE retail sample

Model Summary[b]					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.324[a]	.105	.079	1.05342	.639
a. Predictors: (Constant), Total assets, Net earnings, CFI					
b. Dependent Variable: TR_SP_E_NYSERetail					

Table 21: The regression coefficients for the NYSE retail sample

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.497	.113		30.841	<.001
	Net earnings	6.883E-5	.000	.232	1.843	.068
	CFI	-8.080E-6	.000	-.024	-.165	.869
	Total assets	1.892E-6	.000	.099	.600	.550

The coefficient of determination (R-squared value) is 0.105, while the adjusted R-squared value is 0.079. The adjusted R-squared value indicates that 7,9% of the variation in the dependant variable (share price) is explained by the variation in the independent variables. Furthermore, the standard error of estimate value of 1.05342 is considered low – signifying an accurate model.

As the Durbin-Watson value of 0.639 is between 0 and 2, a positive autocorrelation is present. This means that the current year's share price is positively correlated with prior year share prices. This value also illustrates that the data does not exhibit serial correlation.

As the constant error term is below the common confidence level of 5%, it is a significant explanatory variable. Additionally, net earnings is considered a significant explanatory variable at the 10% confidence level. As both CFI and total assets are above the common confidence levels of 5% and 10%, they are not significant explanatory variables. Although not significant, CFI possesses the lowest coefficient of all the explanatory variables in this sector of the NYSE.

When compared to the NYSE technology sample: the only similarity is that the constant error term is a significant explanatory variable for both sectors. For the NYSE technology sector, the only other variable which is significant at the 10% confidence level is CFI; while the only other significant variable at the 10% confidence level for the NYSE retail sector is net earnings – supporting the research question and hypothesis of this study.

4.7 Summary of the regression results

The R-squared values of the model for all four samples were less than 0, 5 and as such are all not statistically significant. A positive autocorrelation is present in all four of the sample's data, and all four models have a low standard estimation of error value. Furthermore, the only variable which was significant for every sample was the constant error term.

For both JSE technology and JSE retail samples, total assets was the only significant explanatory variable, while net earnings always obtained a stronger coefficient than CFI.

For the NYSE technology and NYSE retail samples, the results differ substantially. For the technology sample, the only independent variable which was significant (at the 10% confidence level) was CFI, while the only significant independent variable (at the 10% confidence level) for the retail sample was net earnings. Although the results achieved by the NYSE retail sample may support Jordan et al., (2007)'s conclusion that earnings is the most significant variable, the NYSE technology sample opposes their conclusion. This difference may be due to a time lag, a different sample selection or a lack of sector stratification by Jordan et al., (2007). The combined significance of CFI and net earnings, although for different NYSE sectors, is in synergy with the conclusions reached in an Indonesian study on the food and

beverage manufacturing sector (Muniroh & Yuliati, 2021). Notably, the differing conclusions reached for different sectors supports the statement made by Bartov et al., (2001), where they found that the superiority of earnings over cash flow is, importantly, not universal.

Lastly, both the JSE technology and JSE retail samples contained the greater adjusted R-squared values when compared to their NYSE counterparts. Furthermore, the only significant variable in both JSE samples was total assets, which was not significant in the two NYSE samples. In fact, the NYSE experienced differing significant independent variables for different sectors, supporting the research question underpinning this study.

Hypothesis testing:

Hypothesis H_1 is only accepted for the NYSE retail sample at the 10% confidence level, and is rejected for all other 3 samples as net earnings was not significant for those regression models. Hypothesis H_2 is not testable, as CFO was removed from the final model to address multicollinearity concerns. Hypothesis H_3 is only accepted for the NYSE technology sample at the 10% confidence level, and is rejected for all other 3 samples as CFI was not significant for those regression models. Finally, Hypothesis H_4 is rejected for JSE sample companies, as both net earnings and CFI were insignificant – with net earnings always containing the greater coefficient among the two variables. While Hypothesis H_4 is accepted for the NYSE sample companies, since the net earnings contained greater explanatory (informational) value for retail firms while CFI contained greater informational value for technological firms.

The majority of the rejections witnessed in relation to hypothesis 1 – 3 may be due to a variety of reasons. As the study performed only assessed specific sectors within the JSE and NYSE markets, the explanatory power of both earnings and cash flow may be realistically different to the results determined by prior studies, due to the differing sample scope, time period and measurement date.

Moreover, the lack of inclusive, additional accounting measures was decided upon in order to focus on the goals of the study; but may provide a reason for the low R-squared values

determined. The exclusion of macroeconomic variables within the statistical model employed is likely to have reduced the overall R-squared values of each sample which was tested.

The lack of superiority of CFI over earnings within the JSE sample may be as a result of the increasing informational value of cash flow lagging within a developed country when compared to that of a developed one (NYSE). The JSE has significantly less technology firm listings, cash spending, and market capitalisation. This reasoning is supported by the fact that the US was rated as one of the most innovative and advanced nations on the globe at the time of this study. Further, differing legislation, financial reporting requirements and business practices exist within these two markets. Last of all, the differing compositions of CFI as determined by the IFRS (JSE) and GAAP (NYSE) standards may also play a role in explaining the conflicting results achieved (Bartov et al., 2001; Levy, 2020; NYSE, 2022).

5. Conclusion

The informational content value of accounting information has been a significant focus area of finance research within the purview of accounting in academics. Since the introduction of this topic by Ball & Brown (1968), Fama (1965) and Beaver (1968), detailed academic research within this topic has dramatically expanded. First, this line of literature began by assessing the explanatory informational value of earnings in relation to share price variations. This research was valuable to investors, regulatory bodies, stock exchanges and other users of financial statements as the relevance and necessity of accounting information was quantified in terms of a regression model. Later, in an attempt to develop a model encompassing more diverse accounting variables; total assets, cash flow and other financial variables were included. This broadening was later assisted by the development of sophisticated and detailed asset pricing models; such as the Ohlson (1995), Feltham-Ohlson (1995) and Fama & French (1995) models. Lastly, in a more recent branch within this topic, the differing information value between and within specific sectors has been explored.

Although the scope of prior literature within this topic has been fairly extensive, the results have often yielded inconclusive and contradictory conclusions. Additionally, research within an emerging South African market; and research within the technological sector, are not commonly found. Furthermore, as the nature of cash flows and profitability in the technology sector differs substantially from traditional sectors, the researcher believes that this sector has been neglected in prior research. Lastly, as the technology sector is inextricably linked to global hubs like New York, a comparison between the JSE and NYSE was also included. This research study performed such an analysis by assessing the explanatory power of both earnings and cash flow (CFI) within a modified Ohlson (1995) regression model for two sectors of each stock exchange.

The results of the correlation analysis show that all three independent variables, net earnings (1), total assets (2) and CFI (3), contain a significant correlation relationship with share prices. Net earnings always exhibited a positive relationship with share prices while CFI always

exhibited a negative relationship with share prices. On average, all independent variables showed a stronger correlation for JSE technology firms than JSE retail firms, while the opposite was true for NYSE firms. Importantly, the only variable which consistently illustrated a stronger relationship for technology firms than retail firms was that of CFI – supporting the basis of this research study.

For both the correlation and regression analysis, the independent variables for JSE samples exhibited stronger relationships with share prices than the NYSE samples.

The results of the regression analysis show that the model for all four samples was not statistically significant as a whole. Although the JSE samples only showed total assets as a significant explanatory variable, the NYSE regression showcased important results: The NYSE technology sample only found CFI to be a statistically significant explanatory variable while the NYSE retail sample only found net earnings to be a statistically significant explanatory variable. These results support the differing informational content value between sectors.

Overall, the results of the correlation and regression analysis, although not perfect, support the belief that different accounting variables possess differing informational value for differing sectors. This conclusion, highlighted by the significance of CFI on the NYSE, may justify the technology sector of listed exchanges to be treated differently.

6. Recommendations for further research

- Since the results of the regression analysis differ for the South African and American markets, further research within the qualitative field could explore the reasons for this difference.
- Within the same line of thought, the differing nature of the technological sector as well as potential favourable accounting variables could be explored in terms of a qualitative study performed on the users of financial statements.
- As the overall regression models in the samples were not found to be statistically significant, a regression model incorporating both accounting and macroeconomic variables could provide valuable insights within these two listed exchanges.
- As this study found interesting results for the NYSE, a study into the explanatory power of earnings and cash flows across differing sectors of the NASDAQ exchange may provide useful results for comparison.

7. Appendix

7.1 Appendix 1

Figure 5: Histogram and scatter plot for the JSE technology regression sample data

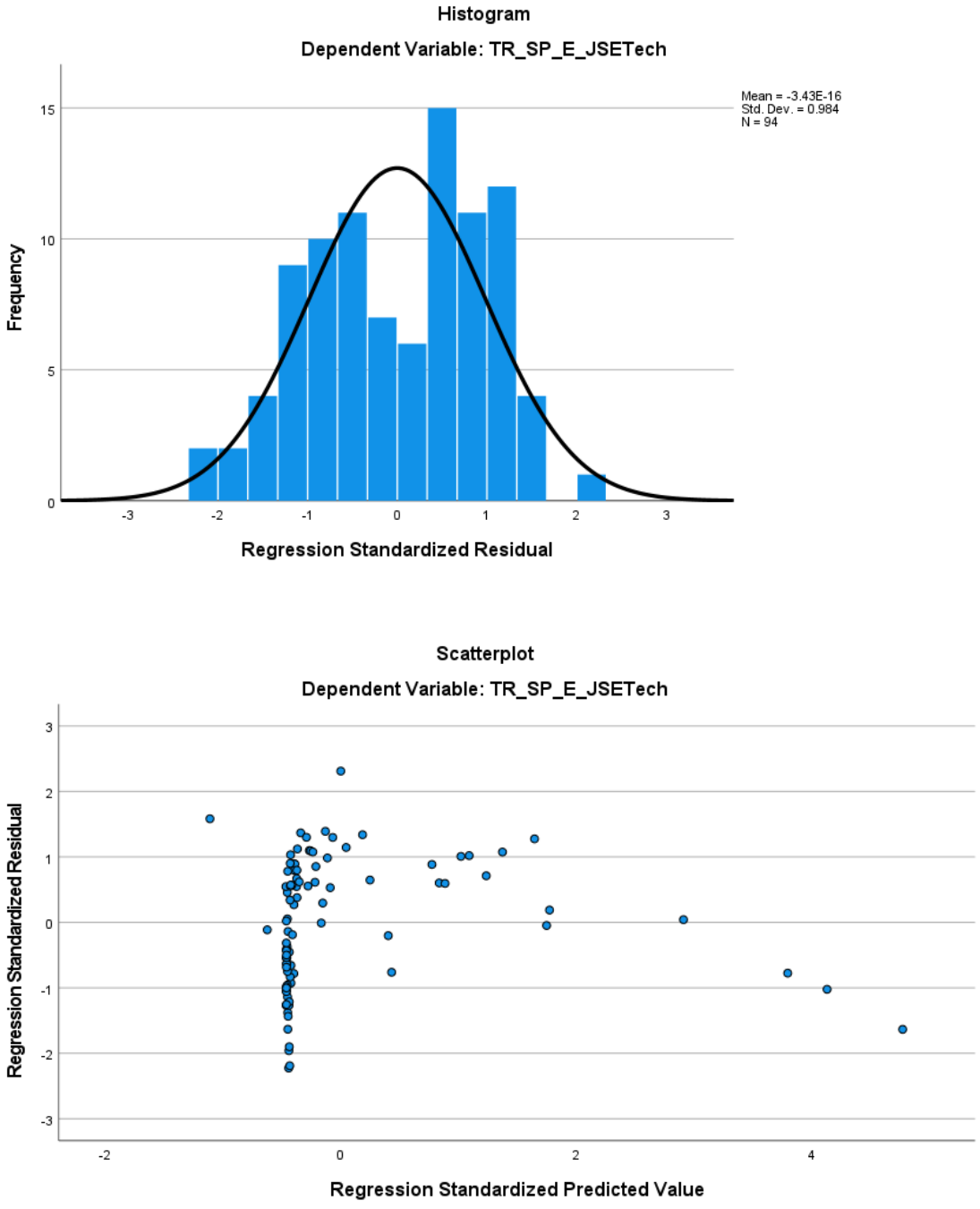
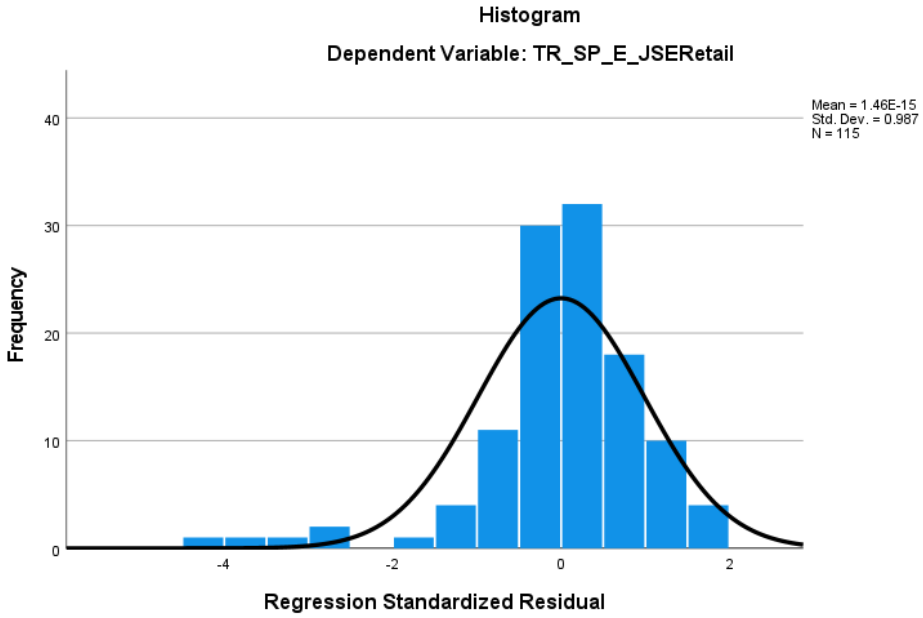


Figure 6: Histogram and scatter plot for the JSE retail regression sample data



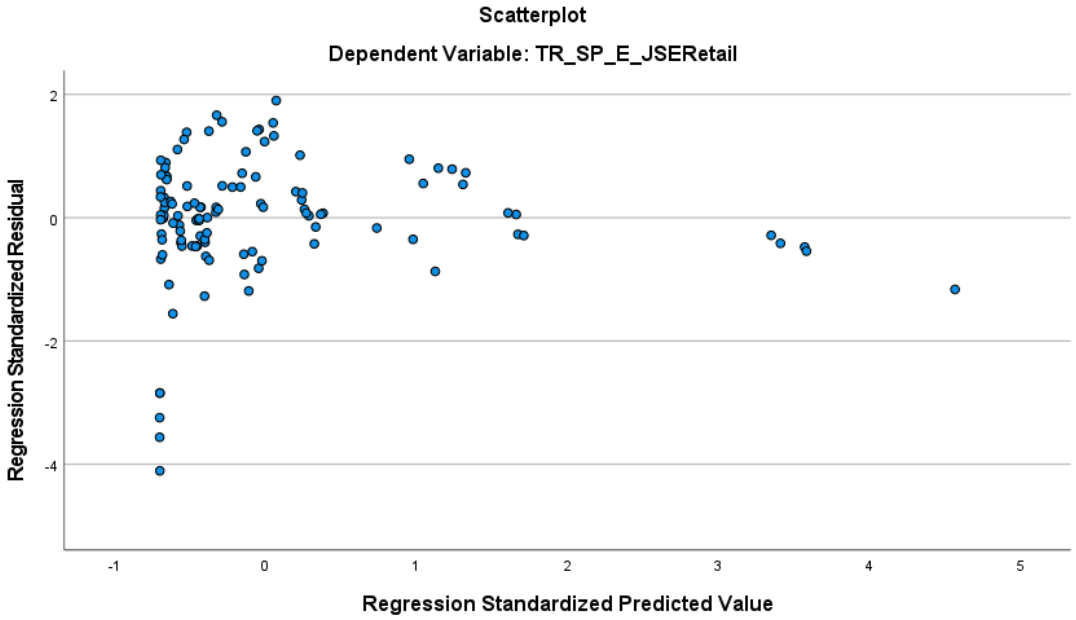
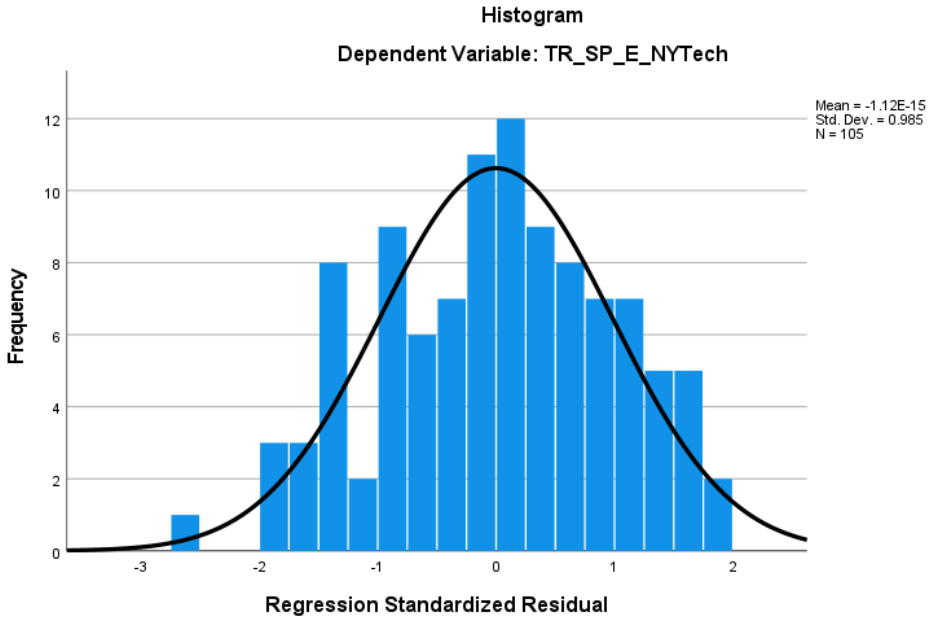


Figure 7: Histogram and scatter plot for the NYSE technology regression sample data



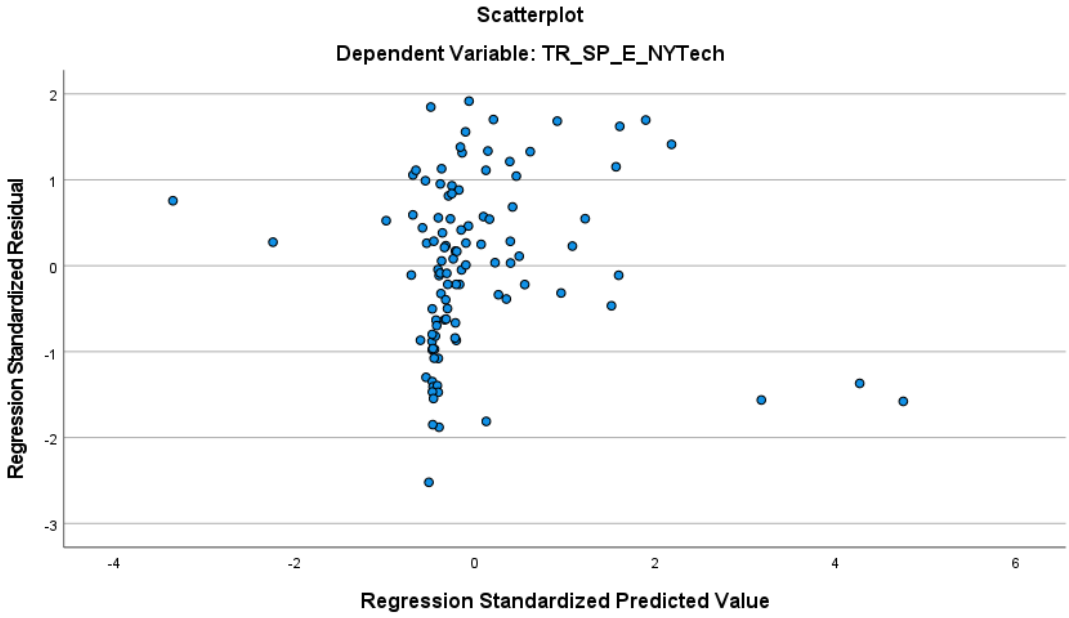
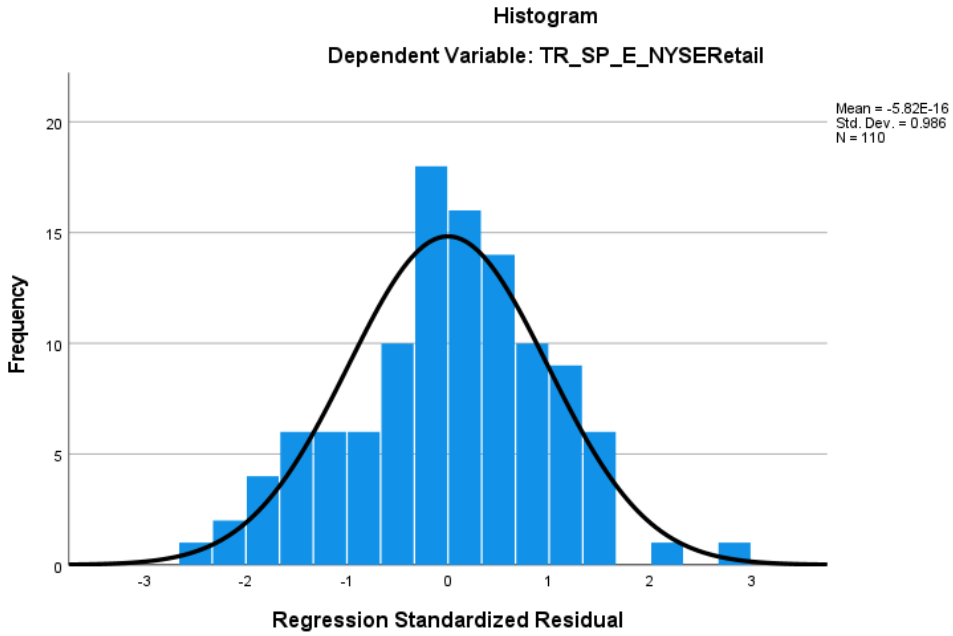
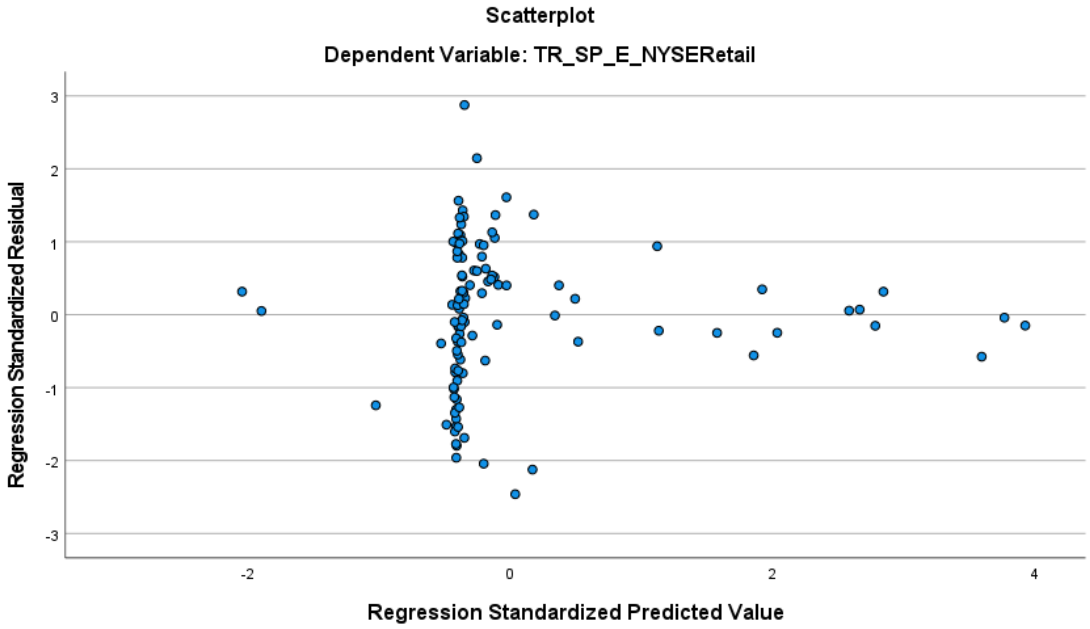


Figure 8: Histogram and scatter plot for the NYSE retail regression sample data





7.2 Appendix 2

The results of the VIF tests for each sample using the initial regression model (which included CFO as an independent variable) are shown in tables 22 – 25 below:

Table 22: VIF test results for the variables in the JSE technology regression sample

Independent variable	Statistical VIF
Net Earnings	5.659
CFO	20.493
CFI	3.308
Total Assets	10.578

Table 23: VIF test results for the variables in the JSE retail regression sample

Independent variable	Statistical VIF
Net Earnings	2.840
CFO	4.110
CFI	2.372
Total Assets	5.243

Table 24: VIF test results for the variables in the NYSE technology regression sample

Independent variable	Statistical VIF
Net Earnings	2.054
CFO	9.392
CFI	5.704
Total Assets	2.678

Table 25: VIF test results for the variables in the NYSE retail regression sample

Independent variable	Statistical VIF
Net Earnings	4.539
CFO	12.266
CFI	3.747
Total Assets	4.294

8. Reference list

Abarbanell, J. S., & Bushee, B. J. (1997). Fundamental analysis, future earnings, and stock prices. *Journal of Accounting research*, *35*(1), 1-24.

Abarbanell, J. S., & Bushee, B. J. (1998). Abnormal returns to a fundamental analysis strategy. *Accounting review*, 19-45.

Adegoke, Y. (2022). *Buy or get bought: African tech is on a mergers and acquisitions spree*. Retrieved 18 May from https://restofworld.org/2022/buy-or-get-bought-african-tech-is-on-a-mergers-and-acquisitions-spree/

Adittya, M. (2017). Stock Price Behavior around the Release of Financial Statements: A Study of Banks Enlisted in the DSE. *Journal of Business*, *10*(1), 37.

Administration, U. S. I. T. (2021). *South Africa - Country Commercial Guide*. Retrieved 05 May from https://www.trade.gov/knowledge-product/south-africa-information-technology

Agnes Cheng, C., & Yang, S. S. (2003). The incremental information content of earnings and cash flows from operations affected by their extremity. *Journal of business finance & accounting*, *30*(1-2), 73-116.

Agnes Cheng, C. S., Cheung, J. K., & Gopalakrishnan, V. (1993). On the Usefulness of Operating Income, Net Income and Comprehensive Income in Explaining Security Returns. *Accounting and Business Research*, *23*(91), 195-203. https://doi.org/10.1080/00014788.1993.9729879

Aharony, J., & Swary, I. (1980). Quarterly dividend and earnings announcements and stockholders' returns: An empirical analysis. *The Journal of finance*, *35*(1), 1-12.

Al-Attar, A., & Hussain, S. (2004). Corporate data and future cash flows. *Journal of business finance & accounting*, *31*(7-8), 861-903.

Alawneh, A. M. (2019). Effect of Net Cash Flows on Investors' Decisions on Companies Listed in Amman Stock Exchange during the Period of 2001–2017: A Case Study on Industry and Service Sectors. *Universal Journal of Accounting and Finance*, *7*(2), 50-65.

Albring, S. M., Cabán-García, M. T., & Reck, J. L. (2010). The value relevance of a non-GAAP performance metric to the capital markets. *Review of Accounting and Finance*.

Alford, A., Jones, J., Leftwich, R., & Zmijewski, M. (1993). The relative informativeness of accounting disclosures in different countries. *Journal of Accounting research*, *31*, 183-223.

Amahalu, N., Abiahu, M.-F. C., Chinyere, O., & Nweze, C. (2018). Effect of accounting information on market share price of selected firms listed on Nigeria stock exchange. *International Journal of Recent Advances in Multidisciplinary Research*, *5*(01), 3366-3374.

Ang, J. S., & Pohlman, R. A. (1978). A note on the price behavior of Far Eastern stocks. *Journal of International Business Studies*, 103-107.

Anggraini, R., Setiawati, L., & Desembriarto, D. (2004). The Role of Fundamental Analysis and Financial Statements on Economic Crisis in Indonesia. J. National Symposium on Accounting. Indonesia. Bahasa translated version,

Anthony, J. H., & Ramesh, K. (1992). Association between accounting performance measures and stock prices: A test of the life cycle hypothesis. *Journal of accounting & economics*, *15*(2), 203-227. https://doi.org/10.1016/0165-4101(92)90018-W

Aras, G., & Yilmaz, M. K. (2008). Price-Earnings ratio, dividend yield, and market-to-book ratio to predict return on stock market: Evidence from the emerging markets. *Journal of Global Business & Technology*, *4*(1).

Arghode, V. (2012). Qualitative and Quantitative Research: Paradigmatic Differences. *Global Education Journal*, *2012*(4).

Ariff, M., Loh, A. L., & Chew, P. M. (1997). The impact of accounting earnings disclosures on stock prices in Singapore. *Asia Pacific Journal of Management*, *14*(1), 17-29.

Asif, M., Arif, K., & Akbar, W. (2016). Impact of accounting information on share price: Empirical evidence from Pakistan stock exchange. *International Finance and Banking*, *3*(1), 124-135.

Baboukardos, D., & Rimmel, G. (2016). Value relevance of accounting information under an integrated reporting approach: A research note. *Journal of Accounting and Public policy*, *35*(4), 437-452.

Balke, N. S., & Wohar, M. E. (2006). What drives stock prices? Identifying the determinants of stock price movements. *Southern Economic Journal*, *73*(1), 55-78.

Ball, R., & Brown, P. (1968). An empirical evaluation of accounting income numbers. *Journal of Accounting research*, 159-178.

Ball, R., Robin, A., & Wu, J. S. (2000). Accounting standards, the institutional environment and issuer incentives: Effect on timely loss recognition in China. *Asia-Pacific journal of accounting & economics*, *7*(2), 71-96.

Barth, M. E., Cram, D. P., & Nelson, K. K. (2001). Accruals and the Prediction of Future Cash Flows. *The Accounting review*, *76*(1), 27-58. https://doi.org/10.2308/accr.2001.76.1.27

Bartov, E., Goldberg, S. R., & Kim, M. S. (2001). The valuation-relevance of earnings and cash flows: an international perspective. *Journal of International Financial Management & Accounting*, *12*(2), 103-132.

Bauman, M. P. (1996). A review of fundamental analysis research in accounting. *Journal of Accounting Literature*, *15*, 1.

Beaver, W., Kettler, P., & Scholes, M. (1970). The association between market determined and accounting determined risk measures. *The Accounting review*, *45*(4), 654-682.

Beaver, W. H. (1968). The information content of annual earnings announcements. *Journal of Accounting research*, 67-92.

Beaver, W. H. (2002). Perspectives on recent capital market research. *The Accounting review*, *77*(2), 453-474.

Begley, J., & Feltham, G. A. (2002). The relation between market values, earnings forecasts, and reported earnings. *Contemporary Accounting Research*, *19*(1), 1-48.

Bhana, N. (1995). The share market reaction to earnings announcements—a test of the efficiency of the Johannesburg Stock Exchange. *Investment Analysts Journal*, *24*(42), 45-57.

Blount, G., & Davidson, S. (1996). Stock market responses to corporate unbundling in South Africa. *De Ratione*, *10*(1), 63-73.

Board, J., & Day, J. (1989). The information content of cash flow figures. *Accounting and Business Research*, *20*(77), 3-11.

Bowman, R. G. (1983). Understanding and conducting event studies. *Journal of business finance & accounting*, *10*(4), 561-584.

Brief, R. P., & Zarowin, P. (1999). The value relevance of dividends, book value and earnings. *New York University Dept. of Accounting Working Paper*(99-3).

Bruner, R. F. (2002). Does M&A pay? A survey of evidence for the decision-maker. *Journal of applied Finance*, *12*(1), 48-68.

Burger, A., & Silima, T. (2006). Sampling and sampling design. *Journal of public administration*, *41*(3), 656-668.

Callen, J. L., & Segal, D. (2004). Do accruals drive firm-level stock returns? A variance decomposition analysis. *Journal of Accounting research*, *42*(3), 527-560.

CFI. (2022). *New York Stock Exchange (NYSE)*. Retrieved 31 December from https://corporatefinanceinstitute.com/resources/equities/new-york-stock-exchange-nyse/

Chan, L. K., Lakonishok, J., & Sougiannis, T. (2001). The stock market valuation of research and development expenditures. *The Journal of finance*, *56*(6), 2431-2456.

Clubb, C. D. (1995). An empirical study of the information content of accounting earnings, funds flows and cash flows in the UK. *Journal of business finance & accounting*, *22*(1), 35-52.

Clubb, C. D. (1996). Valuation and clean surplus accounting: Some implications of the Feltham and Ohlson model for the relative information content of earnings and cash flows. *Contemporary Accounting Research*, *13*(1), 329-337.

Collins, J. (1957). How to study the behavior of bank stocks. *Financial Analysts Journal*, *13*(2), 109-113.

Cutler, D. M., Poterba, J. M., & Summers, L. H. (1988). What moves stock prices? In: National Bureau of Economic Research Cambridge, Mass., USA.

Daniati, N. (2006). Pengaruh kandungan informasi komponen laporan arus kas, laba kotor, dan size perusahaan terhadap expected return saham. *Simposium Nasional Akuntansi*, *9*, 1-16.

Danovaro, R., Carugati, L., Corinaldesi, C., Gambi, C., Guilini, K., Pusceddu, A., & Vanreusel, A. (2013). Multiple spatial scale analyses provide new clues on patterns and drivers of deep-sea nematode diversity. *Deep Sea Research Part II: Topical Studies in Oceanography*, *92*, 97-106.

De Bondt, W. F., & Thaler, R. (1985). Does the stock market overreact? *The Journal of finance*, *40*(3), 793-805.

Dechow, P. M. (1994). Accounting earnings and cash flows as measures of firm performance: The role of accounting accruals. *Journal of accounting and economics*, *18*(1), 3-42.

Demski, J. S., & Feltham, G. A. (1994). Market response to financial reports. *Journal of accounting & economics*, *17*(1), 3-40. https://doi.org/10.1016/0165-4101(94)90003-5

Deng, Z., Lev, B., & Narin, F. (1999). Science and technology as predictors of stock performance. *Financial Analysts Journal*, *55*(3), 20-32.

Elhamawy, S. M., & Habib, W. M. (2009). On the Value Relevance of Finance's Cash Flow and Accounting's Accruals: Empirical Evidence from Egypt. *Ain Shams University's Journal of Economic Studies*, *3*, 1-22.

Enow, S. T., & Brijlal, P. (2016). Determinants of share prices: the case of listed firms on Johannesburg Stock Exchange. *The Journal of Accounting and Management*, *6*(1).

Entwistle, G. M., Feltham, G. D., & Mbagwu, C. (2010). The value relevance of alternative earnings measures: a comparison of pro forma, GAAP, and I/B/E/S earnings. *Journal of Accounting, Auditing & Finance*, *25*(2), 261-288.

EquityRT. (2022). *EquityRT* https://0-equityrt-com.innopac.wits.ac.za/global/#/authentication/ip

Etikan, I., & Bala, K. (2017). Sampling and sampling methods. *Biometrics & Biostatistics International Journal*, *5*(6), 00149.

Fama, E. F. (1965). The behavior of stock-market prices. *The Journal of Business*, *38*(1), 34-105.

Fama, E. F., Fisher, L., Jensen, M. C., & Roll, R. (1969). The adjustment of stock prices to new information. *International economic review*, *10*(1), 1-21.

Farshadfar, S. (2012). Further Evidence on the Relative Forecast Ability of Earnings and Cash Flows: An Industry-Level Analysis. *International Research Journal of Finance and Economics*, *97*, 30-45.

Faseruk, A. (2008). A review of accrual accounting and cash flow techniques for use in equity valuation. *Management Research News*.

Feltham, G. A., & Ohlson, J. A. (1995). Valuation and clean surplus accounting for operating and financial activities. *Contemporary Accounting Research*, *11*(2), 689-731.

Fernando, K., & Hermawan, A. A. (2019). Relative and incremental value relevance of accounting information under the integrated reporting approach: evidence from South Africa. Asia Pacific Business and Economics Conference (APBEC 2018),

Gajewski, J.-F., & Quéré, B. P. (2001). The information content of earnings and turnover announcements in France. *European Accounting Review*, *10*(4), 679-704.

Girish, S., & Desai, K. (2017). Impact of cash flow from operating and financial activities information on share price: Empirical evidence from nifty Pharma index companies, India. *International Journal of Management Research and Reviews*, *7*(11), 1029-1033.

Glezakos, M., Mylonakis, J., & Kafouros, C. (2012). The impact of accounting information on stock prices: Evidence from the Athens Stock Exchange. *International Journal of Economics and Finance*, *4*(2), 56-68.

Graham, C., & Knight, J. (2000). Cash flows vs. earnings in the valuation of equity REITs. *Journal of Real Estate Portfolio Management*, *6*(1), 17-25.

Hall, B. H., Mairesse, J., Branstetter, L., & Crepon, B. (1998). Does cash flow cause investment and R&D?: an exploration using panel data for French, Japanese, and United States scientific firms. *An Exploration Using Panel Data for French, Japanese, and United States Scientific Firms (April 1, 1998). IFS Paper*(W98/11), 98-260.

Heath, H., & Cowley, S. (2004). Developing a grounded theory approach: a comparison of Glaser and Strauss. *International journal of nursing studies*, *41*(2), 141-150.

Hidayat, M. S., & Thamrin, H. (2019). Determinant of ROE, CR, EPS, DER, PBV on Share Price on Mining Sector Companies Registered in IDX in 2014–2017. *International Journal of Innovative Science and Research Technology (IJISRT)*, *4*(6), 182-192.

High, S., & Honikman, A. (1995). The efficiency of the south african capital market. *Investment Analysts Journal*, *24*(42), 37-43.

Hollister, J., Shoaf, V., & Tully, G. (2002). An international comparison of accruals and the prediction of future cash flows. *Journal of Accounting and Finance Research*, *10*(6), 1-9.

Holthausen, R. W., & Watts, R. L. (2001). The relevance of the value-relevance literature for financial accounting standard setting. *Journal of accounting and economics*, *31*(1-3), 3-75.

Hussainey, K., Mgbame, C. O., & Chijoke-Mgbame, A. M. (2011). Dividend policy and share price volatility: UK evidence. *The Journal of risk finance*.

IASB. (1998). *IAS 38 — Intangible Assets*. Retrieved 22 March from https://www.iasplus.com/en/standards/ias/ias38

ICASA. (2021). *The State of the ICT Sector Report in South Africa*. Retrieved 04 May from https://www.icasa.org.za/uploads/files/State-of-the-ICT-Sector-Report-March-2021.pdf

Ighosewe, E. F. (2022). Accounting Information and Value Relevance: A Quinquennial Comparison of Pre-and Post-IFRS Adoption of Listed Firms in Nigeria and South Africa. *Modern Economy*, *13*(7), 1006-1023.

Jefferis, K., & Smith, G. (2005). The changing efficiency of African stock markets. *South African Journal of Economics*, *73*(1), 54-67.

Jennergen, L., & Korsvold, P. (1975). The Non-random Character of Norwegian and Swedish Stock Prices," International Capital Market, eds. Elton, EJ and Gruber, MJ Amsterdam: North-Holland.

Jordan, C. E., Waldron, M. A., & Clark, S. J. (2007). An analysis of the comparative predictive abilities of operating cash flows, earnings, and sales. *Journal of Applied Business Research (JABR)*, *23*(3).

Khan, S. H. (2009). Determinants of share price movements in Bangladesh: Dividends and retained earnings. In.

Kim, M., & Kross, W. (2005). The ability of earnings to predict future operating cash flows has been increasing—not decreasing. *Journal of Accounting research*, *43*(5), 753-780.

Kirkulak, B., & Balsari, C. K. (2009). Value relevance of inflation-adjusted equity and income. *The International Journal of Accounting*, *44*(4), 363-377.

Lai, S.-C., Lin, C., Lee, H.-C., & Wu, F. (2007). An empirical study of the impact of internet financial reporting on stock prices. *Available at SSRN 1014140*.

Lemma, T. T., & Negash, M. (2011). Rethinking the antecedents of capital structure of Johannesburg Securities Exchange listed firms. *Afro-Asian Journal of Finance and Accounting*, *2*(4), 299-332.

Lemma, T. T., & Negash, M. (2013). Institutional, macroeconomic and firm-specific determinants of capital structure: The African evidence. *Management Research Review*.

Levy, A. (2020). *Six tech stocks now make up half the value of the Nasdaq 100*. Retrieved 17 May from https://www.cnbc.com/2020/07/22/these-six-tech-stocks-make-up-half-the-nasdaq-100s-value.html

Listcorp. (2022). *Johannesburg Stock Exchange*. Retrieved August from https://www.listcorp.com/jse/sectors/

Liu, J., & Ohlson, J. A. (2000). The Feltham-Ohlson (1995) model: empirical implications. *Journal of Accounting, Auditing & Finance*, *15*(3), 321-331.

Livnat, J., & Mendenhall, R. R. (2006). Comparing the post–earnings announcement drift for surprises calculated from analyst and time series forecasts. *Journal of Accounting research*, *44*(1), 177-205.

Macrotrends. (2022). *Stock Screener*. Retrieved August from https://www.macrotrends.net/stocks/stock-screener

Manurung, A. H. (1998). Analisis Arus Kas terhadap Tingkat Pengembalian Saham di Bursa Efek Jakarta. *Majalah Usahawan*(05).

Martani, D., Khairurizka, R., & Khairurizka, R. (2009). The effect of financial ratios, firm size, and cash flow from operating activities in the interim report to the stock return. *Chinese business review*, *8*(6), 44-55.

Menaje, P. M. (2012). Impact of selected financial variables on share price of publicly listed firms in the Philippines. *American international journal of Contemporary Research*, *2*(9), 98-104.

Menike, M., Man, W., Street, S. D., Dalian, P., & District, S. (2013). Stock market reactions to the release of annual financial statements case of the banking industry in Sri Lanka. *European Journal of Business and Management*, *5*(31), 75-86.

Merriam, S. B., & Grenier, R. S. (2019). *Qualitative research in practice: Examples for discussion and analysis*. John Wiley & Sons.

Mervelskemper, L., & Streit, D. (2017). Enhancing market valuation of ESG performance: is integrated reporting keeping its promise? *Business Strategy and the Environment*, *26*(4), 536-549.

Mlambo, C., & Biekpe, N. (2007). The efficient market hypothesis: Evidence from ten African stock markets. *Investment Analysts Journal*, *36*(66), 5-17.

Mlonzi, V., Kruger, J., & Nthoesane, M. G. (2011). Share price reaction to earnings announcement on the JSE-ALtX: A test for market efficiency. *Southern African Business Review*, *15*(3), 142-166.

Mokoaleli-Mokoteli, T. (2019). The corporate credit rating changes and firm returns in a transitional economy: A case of South Africa. *South African Journal of Business Management*, *50*(1), 1-10.

Muniroh, I., & Yuliati, A. (2021). Do cash flow and accounting profit information affect stock prices? *Journal of Accounting and Strategic Finance*, *4*(1), 108-121.

Mybroadband.co.za. (2022). *Top tech shares on the JSE in 2021 — including two which had over 170% growth*. Retrieved 05 May from https://mybroadband.co.za/news/business/428746-top-tech-shares-on-the-jse-in-2021-including-two-which-had-over-170-growth.html

Mybroadband.co.za. (2023). *How much money you would have if you invested R1,000 in South African tech companies in 2022*. Retrieved 25 February from https://mybroadband.co.za/news/business/475955-how-much-money-you-would-have-if-you-invested-r1000-in-south-african-tech-companies-in-2022.html

Myers, J. N. (1999). Implementing residual income valuation with linear information dynamics. *The Accounting review*, *74*(1), 1-28.

Mzekandaba, S. (2020). *Upswing expected in SA's ICT spending in 2020*. Retrieved 06 May from https://www.itweb.co.za/content/nWJadMb83oGvbjO1

Nasar, K. (2002). Share price reactions to the release of financial statements in emerging stock Markets: The case of Saudia Arabia. *International Financial system and Stock Volatility*, *13*(1), 87-120.

Nasseh, A., & Strauss, J. (2000). Stock prices and domestic and international macroeconomic activity: a cointegration approach. *The quarterly review of economics and finance*, *40*(2), 229-245.

Negash, M. (1995). On the Association Between Market, Perceived and Accounting Risk Measures: Some Counter Evidence. *Studies in Economics and Econometrics*, *19*(1), 87-109.

Ng, A. C., Gul, F. A., & Mensah, Y. M. (2007). Managerial Entrenchment and Value-relevance of Earnings during the Pre-and Post-Sarbanes Oxley Periods. *Available at SSRN 1012746*.

Nissim, D., & Penman, S. H. (2001). Ratio analysis and equity valuation: From research to practice. *Review of accounting studies*, *6*(1), 109-154.

Nti, I. K., Adekoya, A. F., & Weyori, B. A. (2020). A systematic review of fundamental and technical analysis of stock market predictions. *Artificial Intelligence Review*, *53*(4), 3007-3057.

Nugraha, N. M., & Riyadhi, M. R. (2019). The Effect of Cash Flows, Company Size, and Profit on Stock Prices in SOE Companies Listed on Bei For the 2013-2017 Period. *International Journal of Innovation Creativity and Change*, *6*(7), 130-141.

NYSE. (2022). *Technology*. Retrieved 17 May from https://www.nyse.com/network/technology

Obaidat, A. N. (2019). Is economic value added superior to earnings and cash flows in explaining market value added? an empirical study. *International journal of business, accounting, & finance*, *13*(1).

Ogbodo, O., & Osisioma, B. C. (2020). Value Relevance of Accounting Information and Share Price: An Empirical Study on Manufacturing Firms in Nigeria. *Journal DOI*, *6*(12).

Ohlson, J. A. (1979). On financial disclosure and the behavior of security prices. *Journal of accounting and economics*, *1*(3), 211-232.

Ohlson, J. A. (1995). Earnings, book values, and dividends in equity valuation. *Contemporary Accounting Research*, *11*(2), 661-687.

Ohlson, J. A. (2001). Earnings, book values, and dividends in equity valuation: An empirical perspective. *Contemporary Accounting Research*, *18*(1), 107-120.

Omokhudu, O. O., & Ibadin, P. O. (2015). The value relevance of accounting information: Evidence from Nigeria. *Accounting and Finance Research*, *4*(3), 1-20.

Osundina, J. A., Jayeoba, O. O., & Olayinka, I. M. (2016). Impact of accounting information on stock price volatility (a study of selected quoted manufacturing companies in Nigeria). *International Journal of Business and Management Invention*, *5*(11), 41-54.

Oswald, D. R., & Zarowin, P. (2007). Capitalization of R&D and the informativeness of stock prices. *European Accounting Review*, *16*(4), 703-726.

Ozturk, H., & Karabulut, T. A. (2020). Impact of financial ratios on technology and telecommunication stock returns: evidence from an emerging market. *Investment Management and Financial Innovations*, *17*(2), 76-87.

Perera, R., & Thrikawala, S. (2010). An emperical study of the relevance of accounting information on investor's decisions.

Puspa, D. F. (2006). The Value Relevance of Earnings and Cash Flow: Regression-Variation Approach. *Journal of Accounting and Investment*, *7*(2), 158-174.

Radu, S. (2019). *The U.S. Is (Again) Among the World's Top Innovators*. Retrieved 18 May from https://www.usnews.com/news/best-countries/articles/2019-08-08/us-returns-to-top-3-in-global-innovation-ranking

Richardson, G., & Tinaikar, S. (2004). Accounting based valuation models: what have we learned? *Accounting & Finance*, *44*(2), 223-255.

Rosen, R. J. (2006). Merger momentum and investor sentiment: The stock market reaction to merger announcements. *The Journal of Business*, *79*(2), 987-1017.

Sadorsky, P. (2003). The macroeconomic determinants of technology stock price volatility. *Review of Financial economics*, *12*(2), 191-205.

Sahistory.org.za. (2011). *The Johannesburg Stock Exchange is established*. Retrieved 31 December from https://www.sahistory.org.za/dated-event/johannesburg-stock-exchange-established

Sava, J. A. (2018). *Technology industry worldwide: primary uses of cash flows 2006 to 2017*. Retrieved 17 May from https://www.statista.com/statistics/787658/worldwide-technology-industry-cash-flow-primary-use/

Scholes, K., & Johnson, G. (2001). *Exploring public sector strategy*. Pearson Education.

Sharif, T., Purohit, H., & Pillai, R. (2015). Analysis of factors affecting share prices: The case of Bahrain stock exchange. *International Journal of Economics and Finance*, *7*(3), 207-216.

Sixpence, A., & Adeyeye, O. P. (2019). Value relevance of book values and earnings of listed non-financial firms in South Africa: a dynamic panel analysis. *International Journal of Monetary Economics and Finance*, *12*(4), 290-308.

Sloan, R. G. (1996). Do stock prices fully reflect information in accruals and cash flows about future earnings? *Accounting review*, 289-315.

Strauss, N., & Smith, C. H. (2019). Buying on rumors: how financial news flows affect the share price of Tesla. *Corporate Communications: An International Journal*.

Szewczyk, S. H., Tsetsekos, G. P., & Zantout, Z. (1996). The valuation of corporate R&D expenditures: Evidence from investment opportunities and free cash flow. *Financial Management*, 105-110.

Taherdoost, H. (2016). Sampling methods in research methodology; how to choose a sampling technique for research. *How to Choose a Sampling Technique for Research (April 10, 2016)*.

Tandon, K., & Malhotra, N. (2013). Determinants of stock prices: Empirical evidence from NSE 100 companies. *International Journal of Research in Management & Technology*, *3*(3), 2249-9563.

Taylor, S. (2022). *R-Squared*. Retrieved 27 December from https://corporatefinanceinstitute.com/resources/data-science/r-squared/#:~:text=R%2DSquared%20(R%C2%B2%20or%20the,(the%20goodness%20of%20fit).

Utami, R. Noraya. S.(2010). Significance of accounting information in explaining Market and book values: the case of Indonesian banks. *International Research Journal of Finance and Economics*, *55*.

Vafeas, N., Trigeorgis, L., & Georgiou, X. (1998). The usefulness of earnings in explaining stock returns in an emerging market: the case of Cyprus. *European Accounting Review*, *7*(1), 105-124.

Venter, E. R., Emanuel, D., & Cahan, S. F. (2014). The value relevance of mandatory non-GAAP earnings. *Abacus*, *50*(1), 1-24.

Vijay Govindarajan, S. R. a. A. S. (2018). *Why Financial Statements Dont Work for Digital Companies*. Retrieved 31 February from https://hbr.org/2018/02/why-financial-statements-dont-work-for-digital-companies

Vijitha, P., & Nimalathasan, B. (2014). Value relevance of accounting information and share price: A study of listed manufacturing companies in Sri Lanka. *Merit Research Journal of Business and Management*, *2*(1), 1-6.

Wafubwa, J. P. (2014). *The effect of financial performance announcement on share returns of firms listed at the nairobi securities exchange* University of Nairobi].

Wang, J., Fu, G., & Luo, C. (2013). Accounting information and stock price reaction of listed companies—empirical evidence from 60 listed companies in Shanghai Stock Exchange. *Journal of Business & Management*, *2*(2), 11-21.

Warfield, T. D., & Wild, J. J. (1992). Accounting recognition and the relevance of earnings as an explanatory variable for returns. *Accounting review*, 821-842.

Watson, J., & Wells, P. A. (2005). The association between various earnings and cash flow measures of firm performance and stock returns: Some Australian Evidence. *Available at SSRN 815365*.

Wilson, G. P. (1987). 1986 Competitive Manuscript Award: The Incremental Information Content of the Accrual and Funds Components of Earnings After Controlling for Earnings. *Accounting review*, 293-322.

Young, N., & Auret, C. (2018). Liquidity and the convergence to market efficiency. *Investment Analysts Journal*, *47*(3), 209-228.

Yu, G. J., & Hong, K. (2016). Patents and R&D expenditure in explaining stock price movements. *Finance Research Letters*, *19*, 197-203.

Zach. (2020). *How to Calculate Mahalanobis Distance in SPSS*. Retrieved 27 December from https://www.statology.org/mahalanobis-distance-spss/

Zhang, J. (2019). Learning from the Current Research on Non-GAAP Financial Measures. *The CPA Journal*, *89*(7), 32-37.