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**The impact of COVID-19 on the South African stock market:
A sectoral-level analysis**

Submitted by

by

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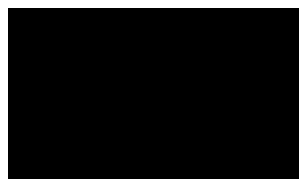
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“If I have the belief that I can do it, I shall surely acquire the capacity to do it even though I may not have it in the beginning.”

~Mahatma Gandhi

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ABSTRACT

The novel 2019 Coronavirus (COVID-19) quickly spread all over the world. It dramatically affected the financial markets in almost every country, creating substantial uncertainty permeating every aspect of life and business. Investors and markets are facing a high degree of volatility regarding the physical and financial impacts of the virus. Behavioural Finance studies are steadily emerging, highlighting the impact of investors' emotions on their investment decisions in stock markets during macroeconomic events. Existing research of the pandemics impact on volatility and/or stock returns have predominantly focused on the overall performance of the South African stock market with limited evidence on the industry specific impact. This study therefore aims to analyse the impact of COVID-19 on the 8 largest industry sectors of the Johannesburg Stock Exchange (JSE). In particular, the study attempts to evaluate the impact of COVID-19 on industry performance, stock returns, trading volume, stock volatility and COVID-related investor sentiment. These research objectives are analysed using a variety of different methodologies, such as an event study, and GARCH (1,1) model. With existing global studies indicating a rise in the importance of industry specific factors which aid in the pricing of equities, a study of this sort is imperative to the South African investor.

The sample in this study consists of daily data from the 8 largest sectors on the JSE and spans the period 1 January 2017 – 30 August 2022. The selected period ensured to include stock market performance before the COVID-19 outbreak, allowing a more accurate comparison of industry performance.

The results of this study suggest that the COVID-19 pandemic had a significant impact on all sectors of the JSE included in this paper, both in the short-term and long-term. Some sectors gained from the impact of the pandemic and others suffered - with the number of the sectors negatively impacted outweighing the number of sectors positively impacted. Furthermore, the findings of this study suggest significant implications for investors and policymakers. For investors, it is suggested that they be cognisant of how industry sector idiosyncrasies affect company performance during crises. Investors who seek a healthy return on their investment should avoid investing in sectors that are more vulnerable in times of crisis and negatively impacted by the COVID-19 pandemic. However, risk-seeking investors may opt to invest in higher-risk sectors since these stocks may generate higher returns due to an increased market risk premium. For policymakers, the findings of this study indicate that the implementation of

strict lockdowns in times of crisis be carefully implemented as many sectors were not able to recover from the implications brought on by this policy, crippling further operation of many companies. Regulators should be cautious of the effect of such policies on industries and the economy as a whole. Policymakers must customise such policies based on the characteristics or nature of each market sector.

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CHAPTER 1 : INTRODUCTION

The global economy and financial markets have been severely impacted by the COVID-19 pandemic, resulting in physical and economic lockdowns, business disruptions, job losses, and industry failure. The first virus case recorded in South Africa was on the 3 March 2020 (National Institute for Communicable Diseases, 2020). The South African economy was already under substantial strain when the World Health Organization (WHO) declared the virus a pandemic on 11 March 2020. In the period preceding COVID-19, economic growth had decreased to 1.5% compared to 3% in 2010, resulting in the economy entering a technical recession by the fourth quarter of 2019 (Statistics South Africa, 2020). The South African government responded to the increasing coronavirus cases by implementing certain emergency intervention measures such as social distancing, travel restrictions, total lockdowns, economic packages, and mandatory quarantines. While these actions were deemed necessary for the pandemic, they still caused great uncertainty regarding their economic impact and overall effectiveness (Ashraf, 2020)

The pandemic's hysteria produced a dramatic drop in worldwide stock markets. On 31 March 2020, the BBC reported that the FTSE 100 and Dow Jones Industrial Average had plummeted by 25% and 23%, respectively – the most significant quarterly drop since 1987 (Uddin et al., 2021). The S&P 500 had also plunged 20%, the greatest loss since the 2008 global financial crisis. On 16 March 2020, the All Share Index (ALSI) closed down 32.6% since the beginning of the year, including one of the biggest single-day drops since 1997. These significant declines may be due to poor healthcare infrastructure, fiscal space, less developed financial sectors, and the lack of resources, particularly in emerging economies like South Africa (Takyyi and Bentum-Ennin, 2020a). The resultant supply and demand shocks to the global economy contributed to increasing panic, declining stock prices, and increasing stock volatility. While some economies have recovered, many countries around the world are still grappling with the pandemic and its economic impact. Forbes (2023) believes that global stock markets will be affected indefinitely by the aftermath of the pandemic, including constraints of COVID-19 resurgences, partial withdrawal of government support measures, and uneven vaccinations.

These spillovers and the influence of COVID-19 on the stock markets are constantly being explored in different financial asset classes and across different economies (Chaudhary et al.,

2020, Dragomirescu-Gaina and Philippas, 2021, Eachempati et al., 2021). To understand how the pandemic has impacted South Africa's financial markets and investment opportunities, a study on the effect of COVID-19 on the stock markets is essential. The pandemic has severely impacted the worldwide economy and financial markets. South Africa is no exception. South African investors may be curious to learn how the pandemic has impacted the nation's stock market indices, trading volume, liquidity, and investment opportunities. This data can aid investors in making educated choices about their portfolios and minimizing losses during times of market volatility. Furthermore, the research may shed light on how the government and regulatory bodies have reacted to the pandemic and its effects on the financial markets. As a result, buyers will be better able to anticipate the effects of policy changes on their portfolios and make strategic decisions.

The central aim of this study is to contribute to existing literature on the impact of the coronavirus on South Africa's stock market in several ways that have not yet been explored.

Firstly, international academic research focused on the COVID-19 pandemic has found evidence of a significant negative impact on both developed and developing countries (Hailu and Vural, 2021), increased volatility (Barry, 2020) and decreased stock market returns (Chowdhury et al., 2021). In particular, studies of the South African stock market have found evidence of a negative impact on stock returns and increased volatility (Hu and Zhang, 2021, Vengesai, 2022). While these studies provide evidence that COVID-19 negatively impacted the South African stock market, evidence of the impact on the individual sectors is limited.

According to Baca et al. (2000), industry-specific factors are increasingly significant in explaining the performance of major equity markets. They discover that sector effects have increased considerably over the last few decades and are now a major source of variation in stock returns. Similarly, Cavaglia et al. (2000) highlight the importance of industry-specific factors as a key driver of equity market performance. The authors argue that traditional macroeconomic factors such as interest rates, inflation, and GDP growth rates are still important, but the increasing globalization of markets and the rise of industry-specific factors have made them less dominant. Industry-specific factors such as technological innovation, regulatory changes, and company-specific news and events have become increasingly important in driving the performance of individual industries and sectors. This has led to greater divergence in performance across industries and sectors, making it increasingly important for investors to consider industry-specific factors when making investment decisions.

With existing global studies indicating the rising importance of industry-specific factors that aid in the pricing of equities, a study of this sort is imperative to South African investors. In addition, the analysis of purely aggregated (i.e., broad-based) market indices may result in missing important relationships as sectors are heterogeneous (Westerlund and Narayan, 2015, Baig et al., 2020). Using a sectoral-level study would guide investors in their trading strategies, providing them a competitive edge when analysing information on how specific market sectors react to disease outbreaks and other Black Swan events.

This paper aims to further add to the literature on the impact COVID-19 has on stock market returns, trading volume and volatility of the various market sectors. Higher stock market volatility is generally associated with greater risk, leading to lower stock market returns. Conversely, investors tend to perceive lower risk when volatility is lower and may be more willing to invest, which can drive up stock market returns. Investor sentiment is also important to the relationship between stock market returns, trading volume and volatility. Investor sentiment is formed based on the individual beliefs of investors regarding the discounted risk associated with their investments, which may not always align with the current objective facts (Baker and Wurgler, 2007). This offers a perspective on market expectations held by traders for the future. Positive investor sentiment typically indicates that investors may be more willing to take on risk, which can lead to higher stock market returns. On the contrary, negative investor sentiment suggests that investors may be more risk-averse, which can lead to lower stock market returns and higher volatility.

Trading volume is a crucial factor in price discovery. Higher trading volumes may indicate more active price discovery, as market participants react to new information and adjust their positions accordingly. Examining trading volume during the pandemic can provide insights into how efficiently prices were adjusting to changing economic conditions. Additionally, trading volume is often linked to investor sentiment. High trading volumes can signal increased investor activity, potentially reflecting heightened emotions and reactions to news or events. By studying trading volume patterns, you can gain a better understanding of how investor sentiment evolved during the pandemic. Understanding industry-specific factors is important for investors because it allows them to make more informed investment decisions and manage their portfolio risks. Investors who identify the key drivers of equity market performance within specific industries and sectors can potentially outperform the broader market and achieve their investment goals.

Contemporary studies have investigated varying features of stock market responses to the pandemic, which include investor behaviour (Espinosa-Méndez and Arias, 2021, Dhall and Singh, 2020), contagion (Hedström et al., 2020), growth expectations with dividends as a measure (Gormsen and Koijen, 2020), as well as a market response to COVID-19 related deaths and cases (Adekoya and Kofi Nti, 2020, Alfaro et al., 2020, Al-Awadhi et al., 2020).

Several recent studies have explored the influence of uncertainty stemming from the COVID-19 pandemic on stock markets. These studies have utilised Google search trends as a measure of this uncertainty (Capelle-Blancard and Desroziers, 2020, Szczygielski et al., 2021a).

1.1 Problem Statement

Statement: The COVID-19 pandemic, which originated in late 2019, has significantly disrupted global financial markets, with its effects echoing prominently in the South African stock market. While general studies have explored the overall impact of the pandemic on financial systems, a gap persists in understanding the nuanced sectoral-level implications within the South African context. This thesis aims to delve into the intricate dynamics of how individual sectors within the South African stock market have been affected by the pandemic, considering factors such as market volatility, sector-specific vulnerabilities, and potential adaptive strategies. The problem at hand lies in the absence of a detailed sectoral-level analysis, hindering the development of targeted policies, investment strategies, and risk management practices that can address the diverse challenges faced by different sectors in the aftermath of COVID-19. By addressing this gap, the research endeavors to provide valuable insights that can contribute to the resilience and recovery of the South African stock market in the face of ongoing uncertainties.

The equity market is a crucial factor that contributes to a nation's Gross Domestic Product (GDP) and overall economic prosperity, as it facilitates the financing of corporate ventures, including research and development and other avenues of business growth. The influx of capital into companies through the equity market can spur job creation, augment production, and ultimately bolster economic growth. Stock markets are integral to economic development as they provide a platform for investors to purchase and divest in securities of corporate entities, thus enabling them to partake in the economy's progress. The global stock market serves as an opportunity for investors to diversify their investment portfolios and mitigate risk. Significant

effects that macro-occurrences, such as the COVID-19 pandemic, have on the stock market and, consequently, the progression of growth should not be disregarded.

The global outbreak of the novel coronavirus has caused substantial economic disruption, which has manifested in the form of supply chain dysfunctions, suppressed consumer expenditure, and diminished corporate investment. Decreased corporate profits resulting from these factors can have a detrimental effect on stock market performance. Furthermore, the instability and unsteadiness of the stock market can cause a decrease in investors' assurance, consequently leading to a decline in expenditure and further economic decline. Governmental regulations and programs, for example, fiscal and monetary incentive initiatives, can be employed to reduce the detrimental effects of macro-occurrences on the equity market and the macroeconomy.

Dramatic occurrences that present significant external macroeconomic risks to the financial sector have exhibited a recurring pattern, as evidenced by notable instances such as the European sovereign debt crisis in 2011, the financial crisis of 2008, the SARS epidemic in 2002, the dotcom bubble in 2001, the Asian-Russian crisis spanning 1997-1998, and the Black Monday event in 1987. Irrespective of their frequency, every incident or crisis possesses a unique origin, evolutionary trajectory, and resolution in relation to its effects on different sectors of the stock market and society at large. Insurers and regulators often modify their risk management and supervisory frameworks following a catastrophe to incorporate the particular insights gained from the most recent event, owing to its unique characteristics. However, due to the novelty of the COVID-19 pandemic, hedging against macroeconomic risks is a challenge that governments and policymakers have faced. It is important to make use of available stock market data to guide policymakers and investors on the stock markets' reaction, the industry sector's reaction, and investors' sentiment to the pandemic and monitor the policy and investment implications that may portend to academics, investors, and economic policymakers.

COVID-19 has affected South Africa during a time of considerable build-up in economic vulnerabilities. The South African economy was already subject to a plethora of difficulties, which have since been exacerbated in the face of the pandemic. In recent years, South Africa has seen stagnation in economic growth, high unemployment levels, and high levels of inequality, among other socio-economic issues. However, the COVID-19 pandemic brought additional challenges to the South African economy. The country experienced a significant

economic contraction in 2020, with GDP declining by 7% and the pandemic significantly impacting key sectors such as tourism, manufacturing, and mining (Statistics South Africa, 2020). Unemployment rates have also increased, and the government has had to implement various stimulus measures to support businesses and individuals affected by the pandemic. In addition, the pandemic has highlighted existing structural issues in the South African economy, such as the lack of investment in infrastructure, high levels of debt, and a reliance on commodity exports (Kharas et al., 2020).

Existing theoretical reviews of the pandemic's impact on South Africa's stock market primarily focus on the overall impact and conclude with similar results – Stock returns exhibit high volatility. After governments announced the pandemic, stock market performance declined, reflecting negative returns (Szczygielski et al., 2021b). A significant sell-off of equities could explain this as investors reacted to the uncertainty and disruption caused by the pandemic, which ultimately led to a decline in market capitalization and a significant outflow of foreign investment from the South African stock market. However, the market has shown resilience, and some sectors have experienced growth despite the pandemic – such as the health and technology sectors (Takyi and Bentum-Ennin, 2020b, Singh et al., 2020, Kusumahadi and Permana, 2021).

With the above taken into consideration, a research gap has been identified to determine the industry-specific impact of the COVID-19 pandemic on the South African stock market by making use of a sectoral level analysis. This will be accomplished by investigating the pandemic's impact on South Africa's top ten industries, with the primary goal of measuring stock market performance, investor sentiment, and volatility, respectively. This will provide an extension to existing finance literature regarding stock market reactions during such extreme events.

1.2 Research Objectives

- To evaluate the short-term impact that COVID-19 had on stock market performance of the different industry sectors on the JSE.
- To evaluate the long-term impact that COVID-19 had on stock market returns of the different industry sectors on the JSE.
- To evaluate the impact that COVID-19 had on COVID-related investor sentiment of investors within the different industry sectors.
- To evaluate the impact COVID-19 had on the volatility of the different industry sectors on the JSE.
- To evaluate the impact COVID-19 had on trading volume of the different industry sectors on the JSE.

1.3 Research Questions

- What was the immediate response of the different industry sectors to the COVID-19 pandemic?
- What is the long-term impact of COVID-19 on the different industry sectors of the JSE?
- What effect does COVID-19 have on COVID-related investor sentiment on the different industry sectors of the JSE?
- What effect does COVID-19 have on volatility of the different industry sectors on the JSE?
- What effect does COVID-19 have on trading volume of the different industry sectors on the JSE?

1.4 Structure of This Thesis

This thesis consists of six chapters, the details of which are contained below:

- **Chapter 1: Introduction**

In the opening chapter, the focus is on presenting the problem statement that serves as the driving force behind the present study. Additionally, Chapter 1 provides an overview of the study's objectives, scope, and methodology.

- **Chapter 2: Theoretical Review**

Chapter 2 looks at the theoretical evidence that exists for evaluating stock market performance, COVID-related investor sentiment, and volatility. The chapter begins with a discussion on the Efficient Market Hypothesis (EMH). This is followed by the Behavioural Finance Theory and its function during financial crises.

- **Chapter 3: Literature Review**

Chapter three focuses on reviewing the existing literature on the relationship between disease outbreaks (including COVID-19) and Industry performance, COVID-related Investor Sentiment, Volatility, and trading volume, respectively. The chapter begins by reviewing the literature for industry/company performance. Thereafter, the literature on the impact of COVID-19 on COVID-related Investor Sentiment within the equity market is discussed, followed by a discussion of the volatility impacts brought on by disease outbreaks. The chapter concludes with a discussion of the trading volume impacts within in the stock market.

- **Chapter 4: Data and Methodology**

Chapter 4 provides an overview of the sample period, data, and methodology employed in this study. Subsequently, a comprehensive examination is undertaken to elucidate the methodology employed in computation each variable incorporated within the econometric models. This thesis uses a 5-year sample period, which extracts daily data from IRESS. The methodology employs two proxies for measuring the impact COVID-19 has on the South African stock market – event study analysis (OLS Regression) and the GARCH framework.

- **Chapter 5: Data Analysis and Results**

In Chapter 5, a comprehensive examination is conducted to review the outcomes derived from the data analysis. This chapter offers an in-depth exploration and discussion of the findings obtained through the regression analysis utilizing the estimated models.

- **Chapter 6: Conclusions and Recommendations**

The final chapter presents a concise summary to encompass the outcomes derived from the analysis, aiming to address the research questions posed throughout the study.

CHAPTER 2 : THEORETICAL REVIEW

2.1 Introduction

This chapter analyses the existing theoretical framework for evaluating stock market performance, investor sentiment, and volatility. The concept of the Efficient Market Hypothesis (EMH) is discussed, followed by the Behavioural Finance (BF) theory, the Adaptive Market Hypothesis (AMH), and lastly, the Prospect Theory.

2.2 Efficient market hypothesis (EMH)

Traditional financial theories are founded upon two fundamental assumptions: markets' efficiency and individuals' rationality. It is important to acknowledge that the concepts of rationality and market efficiency are not inherently mutually exclusive, as rationality is the fundamental basis for market efficiency. The Rational Choice Theory posits that individuals engaged in market activities employ strategic decision-making and logical problem-solving techniques contingent upon the specific timing and characteristics of the problem (Mushinada, 2020). According to Fama (1965), the concept of market efficiency is predicated on the assumption that all investors possess rationality and engage in well-informed decision-making.

The Efficient Market Hypothesis (EMH) was proposed by Eugene Fama in 1965 and is considered to be one of the cornerstone theories of traditional finance. According to Fama (1970), three prerequisites must be met for the capital market to function efficiently. First off, trading securities should not incur any transaction fees. Second, all participants in the market should have free access to all information. Finally, there should be unanimity among investors regarding their perceptions of the implications of recent information. As a result, information that is not readily available to all market participants, transaction costs, and the existence of diverse beliefs among market participants are potential sources of market inefficiency (Fama, 1970).

The concept of market efficiency encompasses three distinct categories: weak efficiency, semi-strong efficiency, and strong efficiency (Fama, 1970, Le Tran and Leirvik, 2019). According to Fama (1991), the weak form of the Efficient Market Hypothesis (EMH) posits that prevailing asset prices consistently incorporate all relevant historical financial information. The companies' stock prices should react to this kind of information quickly enough to prevent any

investors from seeing an extraordinary return. As a result, traders cannot achieve abnormal returns through technical analysis (Guney and Komba, 2016).

The semi-strong form of EMH suggests that security prices encompass all accessible information, including historical data, at any given moment (Fama, 1991). Consequently, both technical and fundamental analyses would fail to yield a more profitable asset allocation than a randomly selected portfolio of assets, assuming the capital market operates under semi-strong form efficiency (Alexakis et al., 2010). Nonetheless, in the presence of semi-strong and efficient capital markets, insider trading can generate abnormal returns (Del Brio et al., 2002).

The strong form of EMH posits that the price of a financial asset at any given moment incorporates all relevant information pertaining to that asset (Vidal-Tomás and Ibañez, 2018). The strong form of market efficiency asserts that security prices incorporate all historical information, encompassing both publicly available and confidential data. Hence, abnormal returns are deemed implausible within a capital market characterised by strength and efficiency, as suggested by Fama (1970).

Studies on the EMH in more developed and advanced markets such as Tong et al. (2015), analysed the association between market efficiency and long-term stock returns in developed nations. Their findings indicated market inefficiency may exist due to investors' behavioural biases, resulting in predictable long-term return patterns. Similar results were noted by Onour (2009), who examined the Saudi stock market and concluded that the Saudi stock market is inefficient. In the context of the ongoing pandemic, Ozkan (2021) conducted a study to examine the effects of the COVID-19 pandemic on the efficiency of stock markets in six developed nations. The findings reveal that all the stock markets analysed deviated from market efficiency at certain periods during the pandemic, with more pronounced deviations in the US and UK markets.

The number of studies examining market efficiency in emerging markets is limited, but there is a consistent upward trend in their growth. Tokić et al. (2018) examined the financial markets of four developing countries (Croatia, Serbia, Slovenia, Slovakia) and found that all analysed indices support the weak form of the EMH. In a separate investigation conducted by Shankaraiah and Rao (2003), an examination of the weak form of EMH was carried out specifically in relation to the Bahrain stock market. The study's findings led to the conclusion

that the Bahrain stock market exhibits characteristics consistent with weak market efficiency. Similarly, Dickinson and Muragu (1994) demonstrate comparable outcomes for the Nairobi stock market, while Cheung et al. (1993) and Cheung et al. (1994) report similar findings for the markets in Korea, Taiwan, and other Asian regions. In contrast, Gupta and Basu (2007) aimed to observe the weak form efficiency in two primary equity markets in India during the timeframe spanning from 1991 to 2006. The study revealed that the series deviate from the random walk model and exhibit autocorrelation in both markets, invalidating the weak form efficiency hypothesis.

Previous research has explored the efficiency of the Johannesburg Stock Exchange (JSE) in South Africa. For instance, Gilbertson (1976) conducted a study examining 11 South African unit trusts from 1970 to 1976. The findings of this study provided evidence supporting the presence of strong efficiency within the JSE. Knight and Firer (1989) conducted an analysis on 11-unit trusts spanning the period from 1977 to 1986, which contradicted the aforementioned claim. Their findings did not provide any evidence supporting the strong form of efficiency. The weak form efficiency of the Johannesburg Stock Exchange (JSE) was examined and refuted by Hawkins and Jammie (1974) through their empirical investigation of shares listed on the JSE during the period from 1966 to 1973. Affleck-Graves and Money (1975) subsequently presented findings that contradicted the study mentioned above, providing evidence supporting the weak form of efficiency. According to recent research conducted by Sarpong et al. (2016), it has been argued that small-cap companies receive less attention or are completely overlooked by a significant number of analysts and investors. Consequently, the market for small stocks tends to exhibit inefficiencies compared to their large-cap counterparts, resulting in prices deviating from their fair values. This study supports the findings of Smith (2008), which suggest that the JSE does not adhere to the principles of a random walk. In a recent study conducted by Ggayi (2021), an examination of the JSE revealed that the weekly and monthly data displayed indications of weak-form efficiency throughout the study. However, it is imperative to acknowledge that the study also indicates that the JSE does not exhibit strict weak-form efficiency and experiences alternating periods of efficiency and inefficiency. The question of whether the Johannesburg Stock Exchange (JSE) operates efficiently remains unresolved.

2.3 Behavioural Finance

According to the EMH theory, investors are rational, and the prices of stocks represent all available information. However, the EMH cannot explain a number of financial abnormalities (such as excess volatility and systematic over- or under-valuation of stock prices in proportion to their intrinsic worth). This phenomenon can be attributed to irrational behaviour among most investors, who base their financial decisions on subjective factors such as sentiments, opinions, and mental states (Baker and Wurgler, 2007). Therefore, behavioural finance theories can explain these disruptions. Naseer and Bin Tariq (2015) assert that utilising behavioural decision theories enables an understanding of the role of investor sentiment in influencing market tendencies such as under- or overreaction, momentum trading, and reversal patterns.

Behavioural finance theories, in general, investigate how market participants' psychology influences their investment decisions and, ultimately, the markets in which they trade (Dickason and Ferreira, 2018). Since Behavioural Finance is based on psychological theories that explain consumer behaviour, psychologists have important roles to play in its development. Selden (1912), who studied stock market psychology, postulated that investor and trader attitudes play a significant role in how market prices evolve. When investors consider their emotions, the market may fail to reflect economic realities (Goedhart et al., 2005). Although in financial theory it is assumed that market participants are rational, there are times when they act rapidly and without sufficient knowledge or time. As a result, factors such as fear, desire, and emotion affect how investors make judgments (Goedhart et al., 2005).

Therefore, Behavioural Finance clarifies how psychological biases affect investors' decision-making and what repercussions they have. Heuristics and biases have been referred to interchangeably as useful ideas that accelerate systematic estimation (Mousavi and Gigerenzer, 2014). Emotional and cognitive biases are the two categories of bias that have been recognised. The former occurred when decisions were influenced by sentiments rather than facts, whereas the latter occurred as a result of flaws in human perception of reality (Sarpong, 2017). Even though there is ongoing debate about whether or not some of these heuristics are actually irrational, heuristics can lead to systematic departure from rationality (Baker and Ricciardi, 2014).

Investor anxiety has a disincentive impact on investor sentiment when taking risk, fostering a pessimistic vision towards stock market performance and future returns (Baker and Wurgler,

2007). Under these deliberations, it is important to assume that the announcement of a pandemic outbreak would result in an impulsive response among investors, resulting in decision-making processes that are not aligned with previous experiences, therefore threatening compliance with the semi-strong form of EMH. Both institutional investors and individual investors are key role players of stock markets and are constantly examining whether a stocks' price will rise or fall before investing, this may be attributed to the law of demand and supply. Typically, low availability and high demand of a stock would boost its price, whereas high availability and a lower demand reduces its price. This has a direct impact on changing an investors' sentiment towards a specific stock.

Changes in investor sentiment due to external shocks such as disease outbreaks have a direct impact on economic trends. According to Lee et al. (2002), during periods of downward market trends, investors tend to exhibit a pessimistic outlook, resulting in increased volatility and decreased future excess returns. In accordance with Burns et al. (2012), the initial phase of a crisis is frequently characterised by the emergence of negative emotions and the perception of risk among the public, which is often triggered by their engagement with social media, social interactions, and news coverage. Previous market returns are vital sentiment determinants, while investor sentiment changes significantly correlated with present-day market returns. In contrast, the sentiment effect is stronger if hard (easy) to value stocks are positively (negatively) influenced by sentiments (Baker and Wurgler, 2007). Insights of behavioural biases allow us to understand the psychology of investors, which in turn assists in understanding the markets agents better. Consequently, they help understand common errors that investors make, as even the smallest errors can result in a volatile financial market. Thus far, knowledge of financial markets has been enhanced by the area of the behavioural finance theory and is even more promising for the future.

Within South African context, Kwenda et al. (2017) confirmed the presence of managerial overconfidence through the investment cash flow sensitivity of firms listed on the JSE Top 40 Index. This observation aligns with the conclusions drawn by Chuang and Lee (2006), who argue that certain investors, as a result of their excessive confidence, exhibit an exaggerated response to confidential information while disregarding information that is publicly accessible. According to the findings of Yousuf and Makina (2022), it can be inferred that the market returns of the Johannesburg Stock Exchange (JSE) exhibit a random walk pattern and can't be predicted by analysing past returns. This finding aligns with Fama (1965) and Fama (1970), as

cited by Agwu et al. (2020), who asserts that in situations where new pieces of information continuously emerge over time and investors hold inconsistent beliefs, subsequent price movements are likely to be independent.

2.3.1 Behavioural Finance during periods of market crises

The global financial crisis of 2008 was one of the most significant financial crises in recent memory. The crisis's origins can be traced back to the US housing market, where house prices increased by about 85% between 1997 and 2006 (after adjusting for inflation). This was due to the widespread belief among buyers at the time that house prices would continue to rise indefinitely (Shefrin, 2009). Banks were too confident in their ability to lend money, and borrowers were too confident in their ability to pay back their mortgages. In the end, the housing market collapsed, triggering a wave of personal and corporate bankruptcies that eventually swept the globe. Shefrin (2009, p.20) claims that the causes of the crisis were psychological rather than physical, with "risk seeking in the domain of losses, excessive optimism, and confirmation bias were the driving factors behind the crisis." It was also determined that the crisis was significantly influenced by fear of loss, overconfidence, confirmation bias, communal thinking, and the heuristic affect.

In the last few decades, many different diseases have caused significant market shocks and economic impact. Ebola, SARS, and most recently COVID-19 are the most consequential pandemics of the past couple of decades (David et al., 2021). Prior studies have established the theoretical foundation for the commonly held belief that the Ebola epidemic had a significant impact on financial markets, by identifying media coverage and public risk aversion as the mechanisms through which this impact was exerted (Ichev and Marinč, 2018). According to Donadelli et al. (2017), the apprehension surrounding highly contagious illnesses, such as SARS, between 2003 and 2014 had a detrimental impact on the investment outlook of individuals in the United States, resulting in a decline in the performance of the US stock markets. In terms of the COVID-19 pandemic, Cevik et al. (2022) explains that rise in favourable investor sentiment results in a corresponding increase in stock returns, whereas a decline in investor sentiment leads to a reduction in stock returns at the lower quantiles. The presence of negative sentiment has been observed to have a positive correlation with increased volatility, while the presence of positive sentiment has been observed to have a negative correlation with volatility.

The aforementioned pandemics had a notable adverse effect on the stock market and companies. However, they all experienced a swift recovery within a few months, except for COVID-19. Unlike its predecessors, COVID-19 exhibited sustained volatility even after the initial period, posing considerable challenges for financial markets in terms of recuperation. Due to the significant transformations in the social, political, and economic landscape, the COVID-19 pandemic has exerted a more pronounced and expeditious influence on the markets. For instance, the financial markets were less concerned with the Spanish flu because World War I was going on at the time. Additionally, the rapid dissemination and increased accessibility of information today compared to earlier pandemics is a major factor in the difference in impact, leading to more market jumps and higher volatility.

2.3.2 Contradictions between EMH and Behavioural Finance

Sharma (2014) provides an analysis of the disparities observed in the two investment theories, namely EMH and BF. The study examined the rationality of investors, the significance of emotions, the dependability of information, and the impact of demographics as key factors contributing to these inconsistencies. One of EMH's tenets states that the actions of stock market participants are determined by the correct processing of information by rational or intelligent actors. In contrast, the BF variant accounts for the impact of non-cognitive elements on investor behaviour and market activity, such as emotions and moods. Rational assessments do not always confirm investors' decisions, as participants' psychological and emotional traits sometimes go against logic (Sharma, 2014). As a result, investors' irrational behaviour is not always explicable by their ability to rationally digest information.

According to Pompian and Wood (2006), human behaviour is predominantly driven by subjective impulses rather than logic, with emotions playing a significant role. Moreover, the belief held by Behavioural Finance (BF) that investors always have equal access to and immediate reflection of all information in prices contradicts the notions of the Efficient Market Hypothesis (EMH) as being practically unattainable. In response, Pompian and Wood (2006, p.56) astutely remarks, "in the realm of investment, there is an almost infinite amount to know and learn, and even the most successful investors do not master all disciplines." As a result, it is possible that market prices may not effectively capture the incorporation of dependable information. In addition, EMH neglects to acknowledge the existence of variations among investors, as it assumes a uniform rationality in their decision-making processes. Conversely,

the BF framework recognises that investor attitudes are influenced by various factors, including but not limited to gender, age, education, and other demographic variables. Lastly, in a hypothetical scenario where markets exhibit complete efficiency, occurrences of stock market bubbles and crises, commonly attributed to market participants' irrational behaviour, would be eliminated.

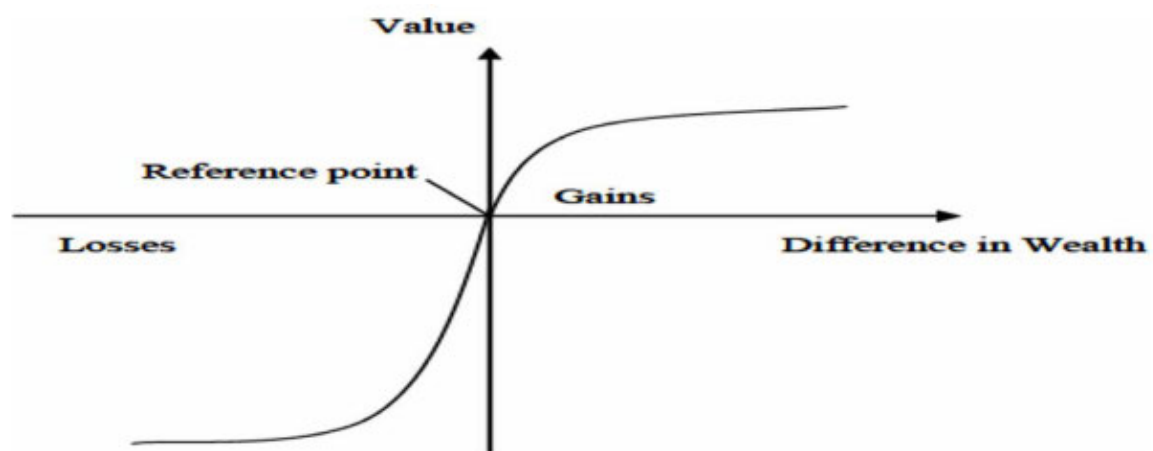
The ongoing debate between advocates of the EMH and proponents of BF remains highly contested, with no clear consensus regarding the prevailing viewpoint or the potential ramifications for investment management and consulting. According to evolutionary principles, a novel framework has been proposed to reconcile the EMH with behavioural biases in a manner that is coherent and intellectually gratifying. This framework posits that the level of market efficiency is influenced by environmental factors that shape the market's ecology. These factors include the number of competitors present in the market, the magnitude of profit opportunities that exist, and the adaptability exhibited by market participants (Lo, 2004a). Behaviouralists argue that the presence of various behavioural biases, such as loss aversion, overconfidence, overreaction, and mental accounting, contradicts the assumption of rationality and challenges the notion of market efficiency. Nevertheless, these instances align with an evolutionary framework wherein individuals acclimatise to a dynamic environment through the utilisation of uncomplicated heuristics (Lo, 2004a).

2.4 Prospect Theory

Various theories in behavioural finance have been formulated based on the Prospect Theory introduced by Kahneman and Tversky in 1979. A central tenet of the Prospect Theory revolves around the principle of loss aversion, denoting a condition wherein the distress from a loss is experienced more intensely than the joy derived from an equivalent gain (Barberis and Huang, 2001). Succinctly, losses exert a more significant impact than equivalent gains. Prospect Theory posits three key aspects (Kahneman and Tversky, 1979). Firstly, individuals exhibit heterogeneous attitudes toward risk (Tversky and Kahneman, 1991). The second aspect involves individuals employing a reference point to evaluate the value of each prospect (Abdellaoui et al., 2008). This reference point, often the individual's current wealth level, determines the gains or losses associated with each prospect (Kahneman and Tversky, 1979). The third facet underscores individuals' aversion to losses, with a tendency to avoid losses more fervently than they pursue gains (Schmidt and Zank, 2012). These three properties give rise to

the formation of an asymmetric 'S'-shaped value function, which is concave for gains, convex for losses, and steeper in the loss domain (List, 2004). Figure (2-1) illustrates this 'S'-shaped value function, representing the approximation of the value assigned by individuals to their gains or losses. Notably, the value function of the Prospect Theory serves as a substitute for the utility function in the standard Expected Utility Theory (EUT henceforth) – theory which suggests that there is a symmetrical response to losses and gains, whereas losses loom larger than gains (Tsaur, 2013).

Figure 2-1: The Value Function



Source: Kahneman and Tversky (1979)

It is evident from the aforementioned literature that the adaptation of traditional finance theories to accommodate behavioural aspects has a longstanding history. An illustration of this adaptation is the Prospect Theory, which offers an alternative to the conventional Expected Utility Theory (EUT). Additional instances of integrating behavioural aspects into standard finance theories encompass the Behavioural Asset Pricing Model (BAPM) and the Behavioural Portfolio Theory (BPT). Introduced by Shefrin and Statman (1994), the BAPM functions as a substitute for the traditional Capital Asset Pricing Model (CAPM). Shefrin and Statman (1994) conceptualize the BAPM within a market framework involving interactions between informational traders and noise traders. Informational traders, characterized as rational traders without cognitive errors, coexist with noise traders who exhibit cognitive errors (Ramiah and Davidson, 2007). Consequently, the presence of noise traders leads to deviations in security prices from their efficient levels. Consequently, the BAPM contends that the equilibrium rate

of return for a security should be computed by considering the influence of noise traders (Shefrin and Statman, 1994).

2.5 Adaptive Market Hypothesis (AMH)

Lo (2004a) suggests that applying the three principles of evolution, namely competition, adaptation, and natural selection, can be used to reconcile or integrate economic theories, specifically the EMH and BF theory. In order to account for both efficiency and inefficiency, this action is undertaken. The following section will discuss the assumptions and implications of the Adaptive Market Hypothesis (AMH).

2.5.1 Conceptualisation of AMH

The Adaptive Market Hypothesis can be characterised as a novel iteration of the Efficient Market Hypothesis, which has emerged from evolutionary perspectives (Lo, 2004a). The AMH is comprised of several key tenets, including the notion that investors or market participants act in their own self-interest, make errors, learn and adapt, are driven by competition to innovate and adapt, and are subject to the shaping forces of natural selection and market ecology, ultimately determined by the forces of evolution (Obalade, 2019).

The debate between proponents of the EMH and BF seems to have been resolved with the introduction of the Adaptive Market Hypothesis (AMH). Lo (2004b) presented the AMH framework, which provides a coherent integration of EMH and BF by considering the evolving level of market efficiency based on the work of Campbell et al. (1998), as well as insights from evolutionary principles. Drawing inspiration from principles of evolution, AMH explains that the degree of market efficiency is influenced by various environmental factors, including the types and number of market participants (such as hedge-fund managers, market-makers, retail investors, and pension funds), the presence of profit opportunities, and the adaptability of market participants themselves (Lo, 2005).

The foundations of AMH rest upon the concepts of socio-biology by Wilson (1975) and bounded rationality by Simon Herbert (1982). AMH suggests that investors make satisfactory decisions by taking the best possible guess and learning through trial and error. This approach accounts for phenomena such as loss aversion (preferring potential gains over potential losses), overconfidence (overestimating one's abilities, judgments, or the likelihood of events),

overreactions to information, and other biases observed in the evolutionary model, where participants adapt to dynamic environments using simple heuristics (Lo, 2005). According to Lo (2012), investors possess intelligence but are fallible. They learn and adjust to changing economic conditions. As a result, markets are not always efficient, but they do show competitiveness and adaptation, with different levels of efficiency as the environment and participants change over time.

recognises that individuals in the market behave based on their own self-interest. In contrast to the EMH which operates under the assumption of a stable and equilibrium market environment devoid of errors, the AMH acknowledges that individuals often make mistakes. However, AMH posits that individuals possess the capacity to learn from these mistakes and subsequently adapt their behaviour accordingly (Lo, 2005). According to AMH, the process of adaptation is facilitated by market competition and the pursuit of innovation. The dynamics between market participants are regulated by the principle of survival of the fittest, which bears resemblance to the concept of natural selection (Lo, 2005). Moreover, the concept of AMH elucidates the intricate dynamics of markets by delineating a series of developmental phases that encompass the evolution from self-interested agents to a state of competition, subsequent adaptation, and ultimately, natural selection in response to prevailing environmental circumstances. The framework for illustrating the ecological dynamics of the market is based on the evolutionary stages observed in biology (Lo, 2005).

AMH asserts that prices are influenced by a combination of environmental factors, the presence and characteristics of competitors (species), available profit opportunities (such as food and water), and the adaptability of the market (Lo, 2004a, Lo, 2012). The presence of profitable opportunities incentivizes market entry, resulting in a rise in the number of competitors. As these competitors engage in competition, the potential for profits diminishes. At that juncture, the market achieves efficiency. Certain market participants may choose to withdraw, leading to a reduction in the level of competition. When there is a shift in market conditions, it gives rise to a potential for profit, thereby initiating a new cycle. Furthermore, alongside the influx of new participants, it is anticipated that a portion of the previous participants will reengage, while another portion will cease to exist (Lo, 2005). The cycles will persist in oscillating between states of efficacy and inefficacy.

The application of evolutionary analogies allows us to derive insights into market dynamics, interactions, and innovation. A crucial observation from the AMH, inspired by evolutionary biology theory, is that the attainment of equilibrium is neither guaranteed nor likely at any given time, primarily due to institutional changes and the entry or exit of market participants (Lo, 2005). Consequently, the notion that evolving systems must inevitably move towards a fixed, ideal state is illusory. Changes in business conditions, the influx and departure of market participants, as well as the evolving nature and availability of profit opportunities, contribute to cycles of profitability and loss in investment strategies (Lo, 2005). As opportunities evolve, the composition of the investor population also tends to change in response to these shifting circumstances.

In the South African context, Heymans and Santana (2018) conducted a study which concluded that the JSE all share index exhibits weak-form efficiency. Additionally, their research revealed that the tested indices transition between phases of efficiency and phases of relative predictability. This finding aligns with the existing body of literature on AMH as posited by Lo (2004a), Lo (2004b) and Lo et al. (2005), and supports prior research indicating that emerging markets tend to enhance their efficiency as time progresses (Cajueiro and Tabak, 2004).

2.5.2 Implications of AMH

According to Lo (2005), the new AMH theory has identified four significant implications. Firstly, the AMH proposes that the stock risk premium is not fixed but rather varies over time, influenced by factors such as market size, competitor preferences, and regulatory changes. This implies that natural selection plays a role in determining market participation, as individuals who have experienced large losses in the past tend to exit the market. Consequently, the composition of market participants today differs from that of previous years. Additionally, the theory suggests that the recent path of market prices affects current aggregate risk preferences, regardless of whether prices fully incorporate all available information.

Lo (2005) presents a second key proposition, suggesting that periodic arbitrage opportunities are essential for price discovery to occur. In the absence of such opportunities, market participants would lack the incentive to process information effectively (Grossman and Stiglitz, 1980). As per the evolutionary perspective, a thriving and active market environment

necessitates the presence of fleeting profit opportunities that vanish once they are exploited. However, continuous profits can be generated as market participants exit, new participants enter, and regulatory and business circumstances undergo changes. Contrary to the expected trajectory toward increased efficiency, the AMH provides an explanation for the intricate dynamics observed in real markets, encompassing panics, manias, bubbles, cycles, trends, crashes, and other recurrent characteristics (Lo, 2005).

Thirdly, the AMH introduces the notion that investment strategies can be lucrative in certain conditions while turning unprofitable in others. In contrast to the EMH, which suggests that competitive forces eradicate profit opportunities, the AMH acknowledges that strategies can experience periods of failure followed by a resurgence in profitability when environmental conditions become favourable (Lo, 2005). Although the EMH does not entirely rule out the existence of such cycles, empirical studies rooted in the EMH have neglected to examine their dynamics in real-world markets. Instead, these studies have traditionally assumed a perpetually equilibrium market state (Lo, 2005).

Lastly, the AMH suggests that attributes such as growth and value can serve as risk factors that fluctuate in significance (Lo, 2005). This implies that when the value and growth characteristics are advantageous, they can lead to higher future profits. For instance, during the technology bubble in the United States during the 1990s, growth assets outperformed value securities initially and then experienced a reversal. Such variability poses a significant challenge for the, which categorises characteristics as either risk factors or not, whereas AMH exhibits flexibility in determining what can be considered a risk factor (Lo, 2005). The pricing of a specific characteristic is influenced by the composition of the participant population at any given moment. A growth-factor risk premium arises when the majority of market participants favour growth assets over other options (Lo, 2005). Consequently, reducing the number of investors inclined towards growth assets would diminish the growth premium, potentially leading to other characteristics substituting it (Lo, 2005).

As noted by Lo (2004b), alterations in market efficiency would correspondingly affect the presence of arbitrage opportunities over time. Furthermore, in cases where there are no arbitrage opportunities between markets, it is anticipated that the connections between said markets will be more robust. Conversely, if such opportunities do exist, the linkages between markets are expected to be less strong. During a global economic crisis, the occurrence of

significant and abrupt shocks can lead to structural disruptions in financial markets. These disruptions may have unequal impacts on market efficiency (Managi and Okimoto, 2013).

Since the start of the COVID-19 pandemic, financial markets have been severely disrupted, and there has been a swift global revaluation and adjustment process (Aslam et al., 2020). Oubani (2022) found that market efficiency was time-varying before and during the COVID-19 pandemic. Returns were shown to have short periods of nonlinear dependence and long periods of nonlinear independence, and that the dependence periods corresponded with significant occurrences like the COVID-19 pandemic. According to Oubani (2022), shifts in the level of financial market efficiency may be the result of investors' perceptions of the economy's underlying fundamentals during the crisis, such as fear, uncertainty, loss aversion, pessimism, and herding. Such actions may result in significant autocorrelation and, consequently, a reduction in market efficiency. These results concur with those of Lim et al. (2008) who discovered that the 1997 financial crisis had a negative impact on market efficiency in most Asian stock markets. When there is a great deal of uncertainty, like during a pandemic, the efficiency's trajectory becomes more erratic. Investors can create investment plans to take advantage of market inefficiencies during this time.

2.6 Summary of Theoretical Review

The Efficient Market Hypothesis posits that the return on securities is essentially unpredictable in nature. The theory of the rationality of investors and the efficiency of information implies that the market cannot be outperformed, and no individual has an advantage in forecasting future stock market trends. The EMH gained widespread acceptance in the academic community during the 1960s and 1970s and has since become a cornerstone of contemporary financial theories. Despite facing criticism, the EMH maintains a prominent position within the academic financial literature. The primary factor contributing to this phenomenon is the existence of diverse observed patterns, notably return dependence, which cannot be sufficiently elucidated by rational theories. BF highlights that investors may exhibit irrational reactions or behaviours, as their investment decisions are influenced by a combination of factual information and subjective feelings. Consequently, the EMH continues to be a subject of debate, as market participants strive to enhance their average returns through stock selection. In response, researchers have sought to develop a more suitable model that can account for the behaviour of stock prices or returns.

The Adaptive Market Hypothesis (AMH) presents an argument that market efficiency undergoes cyclical changes in response to shifting market conditions. As stated by Lo (2017, p.2), "it takes a theory to beat a theory". Therefore, it becomes crucial to investigate and model the cyclical dependence, efficiency, and anomalies in alignment with prevailing market conditions. This approach allows for a more comprehensive understanding of market dynamics.

CHAPTER 3 : LITERATURE REVIEW

3.1 Introduction

The previous chapter focused on the theoretical foundations evidence that exists for evaluating stock market performance, COVID-related investor sentiment, and volatility amidst epidemics and pandemics. Chapter three focuses on reviewing the existing literature on the relationship between COVID-19 and Industry performance, COVID-19 and Investor Sentiment, COVID-19 and trading volume, as well as COVID-19 and Volatility. However, the existing literature for the impact COVID-19 on stock markets is limited, especially within a South African context – more so at a sectoral level.

3.2 Empirical Evidence summary of prior pandemics and events' impact to stock markets

This section of the literature review explores a brief insight to the impacts of historical events that share similarities with the COVID-19 pandemic on global stock markets. It is important to note that understanding the repercussions of past crises is crucial for comprehending the dynamics of financial markets during unprecedented events.

While the COVID-19 epidemic is often considered an unforeseen event, the world has encountered other related pandemics, including severe acute respiratory syndrome (SARS), Middle East respiratory syndrome (MERS), and Ebola. Studies conducted by David et al. (2021) observed the impact of these pandemics on global stock markets. Chen et al. (2018) specifically investigated the repercussions of SARS on Asian financial markets, revealing a weakening of stock market integration in the region. Conversely, Nippani and Washer (2004) explored the effects of the SARS pandemic on stock market returns across affected countries, finding no significant negative impact except for China and Vietnam. However, Chen et al. (2007) conducted a sectoral analysis using event study methodology, highlighting a decline in returns for stocks in the hotel industry during the SARS outbreak. Other sectors, such as manufacturing, retail, and banking, did not experience significant effects.

Choe et al. (2021) conducted an inquiry into the repercussions of the Middle East Respiratory Syndrome (MERS) on the Korean tourism sector, revealing a negative impact on its performance and an associated downturn in the Korean economy. The adverse performance

was predominantly attributed to a decrease in the number of tourists visiting the country, resulting in a financial loss of approximately 3.1 billion USD during the period spanning from June 2015 to September 2015. Subsequent analysis by Joo et al. (2019) further demonstrates that the MERS had deleterious effects on other sectors related to tourism, including food and beverages, transportation, and accommodation.

Research examining the impact of the Ebola outbreak on stock market performance indicates that reports of the pandemic's occurrence resulted in an escalation of sell-offs in the affected stock markets, subsequently exerting a negative influence on stock prices (Funck and Gutierrez, 2018, Ichev and Marinč, 2018). This effect was particularly conspicuous within vulnerable and smaller industries, including the airline, food and beverage, and leisure sectors. Ichev and Marinč (2018) further assert that the repercussions of the Ebola outbreak were more pronounced in the United States, Europe, and West Africa. Additionally, their findings suggest that investors' decisions were influenced more by fear and anxiety than by tangible economic factors.

Brounen and Derwall (2010) investigated the repercussions of terrorist attacks on the global stock markets, employing a comprehensive dataset that encompasses significant events linked to major world economies. Utilizing an event-study methodology, the findings suggest that terrorist attacks result in slightly negative price effects. A unique aspect of the study involves comparing these price reactions to those observed after earthquakes, revealing that price declines are more pronounced in the aftermath of terror attacks. The study delves into international and industry-specific nuances, discovering that reactions are particularly robust in local markets and industries directly impacted by the attacks. The outcomes suggest that financial markets exhibit strong initial reactions to terror events but swiftly recover, returning to normalcy shortly after such incidents. Notably, the September 11th attacks stand out as an exceptional case, leading to enduring effects on financial markets, especially concerning industries' systematic risk.

The studies above collectively investigate the impact of various historical events, such as pandemics and terrorist attacks, on global stock markets. The studies use different methodological approaches to assess the consequences of these events. David et al. (2021) and Chen et al. (2018) focus on pandemics like SARS and COVID-19, providing a nuanced understanding by conducting both global and regional analyses. Nippani and Washer (2004)

offer a contrasting view, finding no significant negative impact across affected countries during the SARS pandemic, except for China and Vietnam. Choe et al. (2021) and Joo et al. (2019) explore the impact of MERS on the Korean tourism sector, emphasizing its negative effects on various related industries. Research on the Ebola outbreak by Funck and Gutierrez (2018) and Ichev and Marinč (2018) suggests pronounced sell-offs and negative influences on stock prices, especially in vulnerable industries. Brounen and Derwall (2010) examine the repercussions of terrorist attacks globally, revealing slightly negative price effects and comparing these reactions to earthquakes. The studies collectively suggest that financial markets exhibit strong initial reactions to crises but tend to recover, except for exceptional cases like the enduring effects observed after the September 11th attacks. Methodologically, the articles employ event-study methodologies, but the scope, geographical focus, and nature of events differ, leading to varied findings on the short-term and long-term impacts on stock markets. The critical assessment highlights the strengths and limitations of each study, emphasizing the need to consider event-specific factors, geographical nuances, and psychological influences on investor decisions for a comprehensive understanding of financial market dynamics during crises.

3.3 Empirical Evidence of COVID-19 on company and industry performance

The first and second objectives of this thesis focuses on the impact of COVID-19 on long-and short-term industry stock returns. Therefore, this section provides an overview of related literature.

Investors determine a company's value based on its management's adaptability to the operating environment (Trueman, 1986). The swift spread of the pandemic had a substantial impact on financial markets and global economies (Piccarozzi et al., 2021). The world population was forced to confront the COVID-19 pandemic, which caused significant economic and social disruptions (Piccarozzi et al., 2021). Global organisations have been affected by the pandemic, which has affected virtually every business sector and industry (Wan et al., 2021). Social isolation and confinement were implemented as part of strategies to contain the ongoing COVID-19 pandemic (Karamat et al., 2020). Stakeholders are actively pursuing comprehensive disclosures regarding COVID-19-related data and the effects of the pandemic on businesses from an investor's perspective. According to research conducted by Khatib and

Nour (2021), the pandemic has significantly impacted various business-related factors, including but not limited to governance structure, liquidity, performance and leverage level.

3.3.1 Empirical evidence of COVID-19 within developed countries

A study on stock market performance by Vasileiou (2021) employed a fundamental financial analysis approach, which looked at the effectiveness of the United States stock markets during the COVID-19 outbreak. An examination of the correlation between publicly disseminated news and the fluctuations in the performance of the US stock market amidst the pandemic reveals instances where the potential health hazards were significantly downplayed. Nevertheless, it was noted that the integration of health risk as a determining factor in stock prices did not consistently align with the expectations of the efficient market hypothesis. Run-tests proved that during the examined period, the market was not efficient. The study concludes that COVID-19 had a negative impact on the performance of the US stock market.

A sectoral analysis by Algamdi et al. (2021) focused on modelling the effects of the pandemic on the price of oil in the Saudi Arabia for the period January 2020–June 2020 using the Auto-Regressive Distributed Lag (ARDL) estimation approach. The endogenous variable was the dollar-denominated oil price, and the coronavirus prevalence measure was COVID-19 daily deaths. Their results concluded that COVID-19 deaths substantially affect the price of oil in KSA. However, when analysing the situation in the USA, the study found that COVID-19 had significantly affected their results – COVID-19 deaths had a positive relationship with the price of oil. The result from the study above is shown to have similar effects in the case of South Africa; the pandemic led to a volatile petroleum industry with fuel prices rising from R15.52 at the start of 2020 to R17.61 at the end of September 2021 (South African Petroleum Industry Association, 2022). A decrease in oil prices can harm the financial performance of oil and gas companies, potentially impeding their capacity to allocate resources towards new initiatives and sustain ongoing operations (Zhang et al., 2020).

Conversely, an escalation in oil prices can result in amplified profits for these corporations. A change in oil prices may affect other sectors that rely on the oil and gas industry. For instance, an increase in the cost of oil may result in elevated transportation expenses, thereby affecting the profitability of firms operating within the transportation sector (Kaplanski and Levy, 2010). Ultimately, the research conducted by Algamdi et al. (2021) underscores the noteworthy

influence of the COVID-19 pandemic on oil prices and its consequences for the economy of Saudi Arabia. Furthermore, the study sheds light on the industry-specific effects of the decrease in oil prices on corporations. The findings above offer significant insights into the economic ramifications of the pandemic on the oil industry and its associated sectors.

A Russian study conducted by Urazbaeva et al. (2020) aimed to model the impact of foreign companies and COVID-19 on the value of tech shares. The study used daily share price data from American companies like PayPal, Google, Adobe, Netflix, and Yandex, a Russian company. The econometric analysis was carried out using Vector Auto Regression (VAR) analysis, Granger causality tests, and Impulse Response Functions (IRF). The study concluded that the pandemic created a positive shock for companies in the information and communication technology sector by increasing demand for their services and market capitalization. Both Russian and foreign companies were affected, with the American stock market influencing the share prices of Russian companies.

Tanrivermis (2020) utilised data on macro-economic change and the real estate sector of Turkey to provide a basis for analysis and generalization of the pandemic's impact on the real estate sector. This information was gathered through reviews of mainstream media content, such as news, comments, and advertisements. He found that the housing market remained stable but the change in commercial real estate markets accelerated. He further indicates that investors will be ambivalent between opting for foreign exchange, deposits, or gold and allocating their equity to new fixed investments. Another Turkish study by Kandel et al. (2020) investigated the impact of the pandemic on the financial markets of Turkey. The event study method was utilised, with the day of the event being March 11, 2020, the day on which the World Health Organization (WHO) declared the COVID-19 outbreak as a pandemic. The study evaluated 26 sectors of the Borsal Istanbul 100 index. A comparison of the sectors' cumulative abnormal returns (CAR) aimed to reveal which sectors of the pandemic were more likely to be affected. The results from this study varied by sector in different estimation periods. However, the pandemic negatively affected indices for the textile, sports, and tourism sectors. Investors' investment in these sectors slowed down drastically. On the other hand, positive CAAR values were realised in the food, chemistry, and banking sectors. The reasoning may stem from these sectors being for fundamental consumption. When faced with extraordinary events such as the COVID-19 pandemic, human nature is to act to meet their basic needs first. For this reason,

cash flow in these sectors tends to grow rapidly, with investors' interest in these sectors being captured.

Tan et al. (2022) conducted an investigation into the repercussions of the COVID-19 pandemic on stock market returns and volatility within the G7 countries – Germany, Japan, Italy, Canada, France, USA and the UK. The research employed a time-varying parameter Bayesian vector autoregression stochastic volatility (TVP-BVAR-SV) model to gauge the dynamic impacts of COVID-19 on stock market returns and volatility. The findings indicated a substantial influence of the pandemic on the stock market returns and volatility of the G7 economies, leading to a decrease in stock market gains and an escalation in volatility across all G7 nations. The magnitude of this impact varied among the G7 economies, with Japan experiencing the most significant effects and Canada being the least affected. In summary, the study presents evidence of the significant and diverse effects of COVID-19 on the stock markets of the G7 economies.

A German study by Engidaw (2022) utilised a survey of German firms to assess the influence of COVID-19 on their performance. The study was conducted in June 2020 and surveyed 1000 firms on sales, profits, investment, and employment during the COVID-19 pandemic. The study concludes that the pandemic significantly negatively affected firm performance, with small and medium-sized businesses suffering the most. The research also reveals that tourism, hospitality, and retail businesses suffered significantly due to the pandemic. Firms that took early action to mitigate the impact of the pandemic, such as by implementing work-from-home policies and investing in digital technologies, were more resilient to the pandemic. This suggests that firms that are able to adapt quickly to change will be better positioned to succeed in the post-pandemic economy.

In a study conducted by Chen (2022), an event analysis approach was employed to empirically examine the Shenwan Pharmaceutical Sector Index (SPSI) and determine the impact of the COVID-19 pandemic on the ability of public enterprises in China's pharmaceutical industry to generate excess returns. The study aimed to assess whether the pandemic had influenced revenue generation in the pharmaceutical sector. To evaluate the significance of the findings, a significance test was conducted on the cumulative excess return, denoted as "CAR_j." The null hypothesis assumed that when the cumulative excess return rate "CAR_j" is zero, the Coronavirus pandemic had no effect on the pharmaceutical industry's revenue. The event

window chosen for the study was [-12, 12], indicating a period of analysis twelve months before and after the event. The results revealed that within the event window, the internal cumulative excess return rate exhibited a positive value of 10.09%, which indicated statistical significance at the 1% confidence level. This finding suggested that the pandemic outbreak had increased investors' expectations for the pharmaceutical industry. Based on the study's conclusions, Chen (2022) recommended increasing medium and long-term funding for prominent national and regional health enterprises. These measures would help capitalise on the heightened investor interest and sustain the growth trajectory in the pharmaceutical industry.

Using the quantile-on-quantile regression (QQ) estimation method proposed by Sim and Zhou (2015), Ullah et al. (2022) analysed the effect of COVID-19 and economic policy uncertainty on Chinese stock markets. This investigation was motivated by the efficient market hypothesis, the prospect theory, and the black swan hypothesis. The study's results indicate that COVID-19 exacerbated economic uncertainty in China and that both the Shanghai and Shenzhen stock markets experienced negative stock returns. The authors hypothesise that COVID-19 produced an unprecedented economic environment that aroused the interest of businesses, policymakers, and individual investors. According to the researchers, future research should investigate the sectoral impact of COVID-19 on the Chinese stock market. This will aid policymakers, particularly portfolio investors, in identifying asymmetries. In order to safeguard investors, policymakers should enact policies that reduce volatility.

3.3.2 Empirical evidence of COVID-19 within developing countries

A Sectoral analysis conducted by Chowdhury et al. (2020) explored the strategies adopted by the food and beverage industry to deal with the impacts of the COVID-19 pandemic. The study focused on a single food and beverage company in Bangladesh and analysed the various measures taken by the company to mitigate the negative impact of the pandemic on its operations. The short-term results indicate that some of the impacts include shortages of working capital, expired stock, and delays in the closure of distributor operations. The authors expect these impacts to continue for an extended period, resulting in job cuts in the industry, a reshuffling of supply chains that focus on online trading, a reduction in ROI, negative relationships with traders, and an overall reduction in the industry's contribution to GDP in the medium-to-long term. The study shows that corporations in the food and beverage industry

need to adopt strategies to mitigate the negative impact of the COVID-19 pandemic on their operations. These strategies could include diversifying their customer base, investing in technology to enable online ordering and delivery, and optimizing production processes to reduce costs.

Tiwari et al. (2022) examined the impact that COVID-19 had on the financial performance of Indian firms. The research utilised a panel data set of Indian businesses from 2017 to 2020. Using a difference-in-differences (DID) approach, the influence of COVID-19 on firm performance was then estimated. The DID method compares the performance of firms affected and unaffected by the pandemic. The pandemic had a significant impact on the sales, profits, and investments of affected businesses. The research revealed that the pandemic had a significant negative effect on the performance of tourism, hospitality, and consumer companies. The study concludes that COVID-19 had a significant negative impact on the financial performance of Indian companies. It is also noted that the pandemic had disparate effects across industries and businesses.

Pathak (2021) explored the influence of COVID-19 on the stock performance of various sectors within India. Data from the Daily Nifty closing index of five sectors was collected. These were: Pharma, Auto, Infrastructure, FMCG, and Media. A pre and post study was constructed using the Paired T-test. The pharmaceutical index showed a positive impact on performance, further explaining that pharmaceutical companies recorded tremendous growth, resulting in their stock returns being significantly influenced. The Automotive industry indicated a negative effect on stock returns—this can be drawn to the fact that amidst the pandemic, automotive companies experienced a significant decline in consumer demand. The Infrastructure Industry showed a negative impact with a decline in stock performance. The FMCG Industry indicates positive growth as demand for FMCG products increases. Customers tend to purchase goods in bulk in periods of disease outbreaks. Lastly, The Media Industry showed positive growth as the media industry gained popularity and was in demand throughout the pandemic. Pathak (2021) concludes that COVID-19 had ultimately shown an adverse impact on the entire economy—despite having a positive impact on certain industries.

In their research, Kharabsheh et al. (2022) conducted an investigation into the repercussions of the COVID-19 pandemic on Jordan's primary indices and corporate returns. The study employed two sets of samples and two levels of analysis to explore this relationship. The initial

sample investigated the impact of daily cumulative confirmed cases of COVID-19 on the daily return of the main index and sub-indices of the Amman Stock Exchange (ASE). This analysis, using daily data, encompassed the ASE main market index and sub-indices representing the banking, insurance, services, and industry sectors. Through time-series analysis, it was determined that the daily cumulative confirmed cases of COVID-19 had a significant adverse effect on the daily return of the Amman Stock Exchange index. This outcome indicated that the financial sector was the most adversely affected during the pandemic, followed by the service and industrial sectors. While the insurance industry displayed a positive impact, it was not statistically significant. The second level of analysis sought to evaluate how various corporate financial characteristics could impact corporate resilience during a pandemic. The sample included all non-financial firms listed on the ASE, totaling 75 firms. Based on quarterly data, the findings revealed a statistically significant negative effect of the COVID-19 pandemic on non-financial corporate stock returns. Furthermore, the evidence suggested that larger firms with higher levels of cash holdings exhibited better resilience, resulting in higher returns during the pandemic period. Despite highlighting the substantial negative impact of the pandemic on market performance and corporate returns, the authors concluded by proposing several measures for policymakers to safeguard the market and uphold investor confidence. These conclusions align with the observations made by Nia (2020), who also noted that the financial sector experienced the most significant impact on the Vietnamese stock market.

The study by Saputra et al. (2023) aimed to analyse the influence of newly reported COVID-19 deaths and the number of cases on stock prices and returns, specifically focusing on companies within the health and technology sectors. The research utilised a sample comprising 30 companies listed in the technology sector (TECH and PGJO) and the health sector (CARE and SOHO). The sample period spanned from January 4, 2021, to December 30, 2021. The variables utilised in this study encompassed the daily closing prices and daily returns of the stocks, which were calculated as the quotient of the difference between the current price and the previous price, divided by the previous price. The research employed correlation and mean difference tests within the framework of hypothesis testing. The results of the correlation and mean difference analyses suggest that there is no significant evidence to support the notion that fluctuations in stock prices and returns in either sector is primarily driven by the number of COVID-19 cases and associated fatalities. The study's results indicate that the performance of management or the potential of both sectors may lead to a synergistic effect in establishing a unidirectional relationship between stock prices and stock returns. This paper extends the

existing body of research by Rahmentio et al. (2022), which found that companies in the technology sector demonstrated robust performance amidst the COVID-19 pandemic in 2021. In a recent study conducted by Novita and Suryani (2022), it was determined that the COVID-19 pandemic did not exert a substantial influence on the abnormal returns exhibited by companies operating in the pharmaceutical sector between January and March 2020. In a similar vein, the study conducted by Hardi and Sihombing (2022) demonstrated that the announcement of the first COVID-19 case in Indonesia did not yield a statistically significant impact on stock returns.

The studies above present diverse empirical evidence on the impact of COVID-19 on stock markets within developed countries, employing varied methodologies and focusing on different sectors. Vasileiou (2021) utilizes a fundamental financial analysis approach to assess the U.S. stock market, finding a negative impact during the pandemic. Algamdi et al. (2021) conduct a sectoral analysis focusing on oil prices in Saudi Arabia, using the Auto-Regressive Distributed Lag (ARDL) estimation approach and highlighting the economic consequences of volatile oil prices. Urazbaeva et al. (2020) model the impact of foreign companies and COVID-19 on tech shares, emphasizing positive shocks for the information and communication technology sector. Tanrivermis (2020) studies the real estate sector in Turkey, noting stability in the housing market but accelerated changes in commercial real estate. Tan et al. (2022) investigate G7 countries, using a time-varying parameter Bayesian vector autoregression stochastic volatility (TVP-BVAR-SV) model, revealing heterogeneous effects on stock market returns. Engidaw (2022) employs a survey of German firms, emphasizing the negative impact of COVID-19 on firm performance, especially for small and medium-sized businesses in tourism, hospitality, and retail. Chen (2022) examines the pharmaceutical sector in China, employing an event analysis approach and finding a positive impact on investor expectations. Ullah et al. (2022) analyse Chinese stock markets using the quantile-on-quantile regression method, revealing negative stock returns and suggesting that future research should explore sectoral impacts to aid policymakers and investors in managing volatility. The critical assessments of these studies highlight the need to consider sector-specific nuances and the importance of adapting to changing economic conditions to navigate the challenges posed by the pandemic.

3.3.3 Empirical evidence of COVID-19 within South Africa

Hu and Zhang (2021) explored the impact of the COVID-19 pandemic on global corporate performance by characterizing and tracking the massive increase in uncertainty caused by the pandemic. Cumulative and new coronavirus cases were used to measure economic uncertainty. The study utilised quarterly data from 16148 firms during 2020 (from 107 countries, including South Africa) and analysed their financial performance using return on assets (ROA) and return on equity (ROE) as performance indicators. The results found that firm ROA was negatively related to cumulative cases, which suggests that the overall average corporate performance declines as the cumulative count rises. The impact of the pandemic on firm performance varied across industries. Specifically, the industries that were most negatively impacted by the pandemic were those that were heavily dependent on physical interaction, such as hospitality, travel, and tourism. These industries experienced a significant decline in performance, with a decrease in ROA and ROE by more than 50% in the first half of 2020. On the other hand, industries that were less dependent on physical interaction, such as information technology and healthcare, were noted to be more resilient to the negative impact of the pandemic on performance. These industries experienced a smaller decline in performance, with a decrease in ROA and ROE by less than 20% in the first half of 2020. It should also be noted that firms that operate in countries with better healthcare infrastructure, governance, and financial systems are able to thrive amid the pandemic (Hu and Zhang, 2021). Overall, the study provides cross-country evidence on the impact of the COVID-19 pandemic on firm performance, highlighting the need for firms to adopt strategies to mitigate the negative impact of the pandemic. These strategies could include improving financial resilience, adopting digital technologies, and diversifying supply chains to reduce dependence on specific regions.

A study exploring the effects of the COVID-19 pandemic on company performance by Golubeva (2021) utilised a regression performance model that was based on a data set of 5730 firms from 13 countries (including South Africa). The study confirmed the significance of various factors on firm performance: size, sector, market demand for the firms' products and participation in exports. The study found that the pandemic had negatively impacted firms' performance in all 13 countries analysed. The decline in performance was more pronounced in the first half of 2020, with a gradual recovery observed in the second half of the year. Furthermore, the study examined the impact of the pandemic on firms' performance by industry. The results suggest that COVID-19 had a significant impact on industries that are more reliant on physical interactions, such as tourism and hospitality, which experienced a

more significant decline in performance compared to other industries. In contrast, industries that were able to transition to remote work and online services, such as information technology and healthcare, experienced a smaller decline in performance. Golubeva (2021) adds that business experts and policymakers should figure out how vulnerable businesses, industries, and countries are to the coronavirus pandemic and deal with it through a variety of subsidies and effective policies.

A South African study by Akinola et al. (2021) examined the financial market's response to the new wave of the virus, with a focus on twenty companies within the Finance sector listed on the Johannesburg Stock Exchange (JSE). Daily panel data from November 2020 to January 2021 was gathered from S&P Capital IQ and Google online to improve the quality of the study's frequency. Twenty JSE-listed businesses' stock returns, together with other factors that may affect them, were examined along with the effect of COVID-19. The daily exchange rate (in dollars), dividend-adjusted share price, and daily COVID-19 infection rate are the variables studied. Robust descriptive and fixed-effect time-variant analyses were utilised. The study provided empirical evidence that the daily occurrence of the contagious COVID-19 virus and stock market returns are, despite their sluggish relationship, crucial variables. This favourable link shows that COVID-19 and financial activity may work together to raise stock returns in South Africa. Trend and fixed effects analysis findings demonstrate that during the COVID-19 epidemic, enterprises react differently to market shocks. Several ways of looking at market behaviour suggest that putting a complete stop to the economy during COVID-19 might not have been the best way to help the South African economy as a whole.

A separate study conducted in South Africa by Vengesai (2022) sought to investigate the effects of the COVID-19 shock on sector returns within the South African stock market. The Autoregressive Distributed Lag (ARDL) model was employed using a Pooled Mean Group estimator to analyse a dataset of daily stock returns from 10 Johannesburg Stock Exchange (JSE) sectors. The study results indicated a varied and diverse reaction among sector stock returns in response to the impact of the COVID-19 pandemic. Based on the study's findings, it can be concluded that the Pandemic had a detrimental influence on a significant proportion of industries. Nevertheless, the pandemic outbreak yielded favourable consequences for certain sectors, whereas others demonstrated resilience in the face of the disruption. The pooled autoregressive distributed lag (ARDL) panel analysis reveals a statistically significant inverse association between the occurrence of COVID-19 and the performance of stock market returns

in the immediate term. A discernible correlation between stock market returns and the prevalence of COVID-19 cases was not observed for an extended period. The study additionally demonstrated that the reaction of sectors and stock returns to different factors exhibits temporal variability. The author's conclusion posits that the shock caused by the COVID-19 pandemic is temporary in nature, and that the adverse effects of the pandemic are alleviated over time. Therefore, investors in the stock market should focus their attention on the long-term patterns exhibited by stock returns. The findings emphasise the significance of portfolio diversification across different stock market sectors for investors. The analysis exclusively concentrated on the South African stock market, and as a result, the findings lack generalizability to other stock markets, including those in developing nations. This limitation arises from the distinct economic contexts, capacities, and national responses to pandemics, all contributing to divergent investor reactions across various markets.

These articles collectively explore the impact of COVID-19 on corporate performance in various countries, with a focus on South Africa. Hu and Zhang (2021) adopt a quantitative approach, analysing the financial performance of firms globally, including South Africa, using return on assets and return on equity as indicators. The study highlights the negative relationship between cumulative COVID-19 cases and firm performance, particularly impacting industries reliant on physical interaction. Golubeva (2021) employs a regression performance model across 13 countries, including South Africa, emphasizing the role of factors like firm size, sector, market demand, and export participation in influencing performance. The study finds a negative impact on performance, especially in physical interaction-dependent industries. Akinola et al. (2021) specifically focus on the Finance sector in South Africa, finding a nuanced relationship between daily COVID-19 infection rates and stock returns, suggesting a complex interplay between the pandemic and financial activity in the country. Vengesai (2022) analyses sector returns within the South African stock market, employing the Autoregressive Distributed Lag model. The study reveals varied reactions among sectors, indicating both detrimental and favourable consequences of the pandemic. The findings suggest that the shock is temporary, emphasizing the importance of long-term investment strategies and portfolio diversification. Overall, these studies underscore the complexity of the relationship between the pandemic and corporate performance, calling for adaptive strategies and diversification, especially in industries heavily affected by physical interaction. For future pandemics, these insights emphasize the need for proactive strategies to mitigate negative impacts, taking into account the specific economic contexts, capacities, and national responses

to pandemics in different regions. Overall, existing empirical studies analysing the impact COVID-19 had on industry and company performance suggest that a negative relationship exists between the pandemic and its effects on industries and companies. However, the significance and scale of this relationship vary' between countries and their economies.

3.4 Empirical Evidence of COVID-19 on the impact of Investor Sentiment on the equity market

Numerous studies have provided substantial evidence supporting the notion that emergency events significantly influence investor sentiment, particularly when disseminated through the media. According to Kaplanski and Levy (2010), the emergence of Internet media has led to a notable influence of visual content, such as pictures and live videos, on investor sentiment. This, in turn, has been found to have a substantial effect on abnormal returns. The emergence of social media has led to a shift in how investors acquire information and receive announcements, primarily through online platforms. Consequently, users' responses on these platforms to emergency events have the potential to influence investor sentiment. The initial application of Internet data to gauge public response was observed within the health research domain. In his seminal work, Ginsberg et al. (2008) pioneered the utilisation of Google data as a basis for developing an influenza surveillance model. He elucidated that individuals tend to employ search engines to seek information about the disease, informing their decision-making process. Unforeseeable occurrences, such as the outbreak of diseases, elicit public apprehension and prompt extensive media attention.

3.4.1 Empirical Evidence of COVID-19 within emerging and developed countries

The stock market's reaction during the COVID-19 pandemic has exhibited an exceptional and unprecedented nature, distinct from previous crises and pandemics marked by significant market volatility and fluctuations. Baker et al. (2020) conducted a study on stock market jumps in the United States caused by the pandemic, defined as movements of 2.5% or more in either direction. The research findings indicate that from February 24 to March 24, 2020, there were 18 instances of significant market fluctuations observed within 22 trading days - surpassing any other recorded period with an equivalent number of trading days. The observed jump frequency surpassed the average pace observed in the US stock market since 1900 by more than 20 times. In order to demonstrate the adverse consequences of these fluctuations in the market, it is noteworthy that the S&P 500 listed companies reported cumulative losses

exceeding 9 trillion US dollars from January to March 2020. Consequently, each firm suffered an average loss of approximately 18 billion US dollars (Schoenfeld, 2020). While the S&P 500 index had partially recovered, reclaiming 30% of its losses by the end of April 2020, the performance of individual S&P 500 companies was noticeably affected in a negative manner (Baker et al., 2020).

It is crucial to highlight that the numbers presented above are particular to the US stock market. Smaller markets, characterised by greater economic and social fragility, exhibit higher risk perception among investors, resulting in a slower recovery compared to larger markets (David et al., 2021). The study by Salisu et al. (2020) examined the disparities in risk perception between emerging and developed markets. Their research findings revealed that developed stock markets exhibit superior capabilities in mitigating uncertainty stemming from pandemics and epidemics compared to emerging stock markets. This discovery implies that the influence of government policies on the relationship between uncertainty arising from pandemics and epidemics and the stock returns of emerging markets is constrained. According to He et al. (2020), there is a correlation between the stock market responses of different nations and the extent of the outbreak and the reported cases within each respective country. As a general trend, emerging markets exhibit varying risk levels, which are contingent upon the reported cases within each respective country.

The factors contributing to the atypical response of the market are indeterminate. One salient and conspicuous factor pertains to the quantity of COVID-19 cases and fatalities documented and disseminated through various media outlets. According to Salisu and Akanni (2020), there was a correlation between the rising number of cases and the heightened level of panic, resulting in adverse effects on the stock market and businesses. In a study conducted by Albulescu (2020), the author examined the relationship between reported cases of infection and the stock market. The study indicated that increased global infection cases led to heightened financial volatility. Furthermore, the study revealed a significant correlation between the fatality ratio and volatility. Despite the increased availability and rapid dissemination of information to market participants, Baker et al. (2020) contend that these factors are insufficient to explain the substantial stock market response to COVID-19. This is particularly noteworthy when considering the relatively minor impact on the stock market during the Spanish Flu pandemic, despite its significantly higher mortality rate of ten times that of COVID-19. Disruptions in global supply chains and government policies exacerbate the economic

downturn and adverse stock market reaction. The impact of government policies, including limitations on individual mobility, commercial activity, and voluntary social distancing, on today's service-oriented economy is widely recognised as significant (Baker et al., 2020). The disruption of the international supply chain is also acknowledged as a significant contributing factor. In their study, Salisu et al. (2020) arrived at the unexpected finding that government policies did not exert any discernible influence on individuals' uncertainty levels amidst the COVID-19 pandemic. The researchers assert that the elevated level of uncertainty observed in the stock market can be attributed solely to the pandemic. The potential impact of government policies on individuals' uncertainty levels is contingent upon the pre-existing degree of uncertainty experienced by individuals.

Yung and Nafar (2017) studied the impact of investor sentiment in the retail space on the expected returns of Real Estate Investment Trusts (REITs). The study employed the Google Trends data analysis method to measure investor sentiment. Results indicate that an increase in investor sentiment led to a greater expected return of Real Estate investment trusts. Swamy, Swamy et al. (2019) employed data from S&P BSE 500 firms listed on the Indian Stock Exchange for the period 2012–2017 with the aim of examining the effectiveness of investor sentiment, quantified by the Google Search Volume Index (GSVI), in predicting stock returns. They conclude that a higher Google search volume index is effective in predicting positive and significant earnings. The study found that higher quantiles of GSVI resulted in higher returns. Research by Da et al. (2011) provides strong empirical evidence that GSVI captures the active attention of retail investors. The study found strong evidence that increases in GSVI temporarily pushed up stock prices, especially in the context of an IPO.

A comparable analysis by Smales (2021) strongly validates Da et al. (2011) findings, demonstrating that GSVI is essentially a proxy for retail investors' attention and that investor attention had a detrimental impact on global stock returns during the crisis. It was discovered that more significant internet usage during the COVID-19 crisis allowed information to move faster into financial markets, which is connected to increased volatility. Even after controlling for the number of COVID-19 instances and the impact of the macroeconomic climate, the relationships remained statistically and economically significant. With fewer retail investors in the market, the findings suggest that retail investors are seeking information to assuage household anxieties (Da et al., 2011), rather than information on potential equities to buy (Barber and Odean, 2008).

Dash et al. (2023) examined how investor interest is transmitted between different equity markets throughout the world before and after the COVID-19 outbreak. Using the recently developed fully-fledged time-varying parameter vector autoregressive (TVP-VAR), it was found that investor attention spillovers exist across all equity markets globally, with developed markets playing a disproportionately large role as shock transmitters. Furthermore, it was established that market risk is moderately high, heterogeneous over time, and dependent on economic events.

The impact of investor sentiment on the telecoms business was investigated by Almuqren and Cristea (2021a). The paper presented a new research methodology based on extracting a Saudi dialectal data set from Twitter mining to quantify consumer satisfaction in Saudi Arabia during the pandemic. They also use the popular sentiment analysis (SA) method. According to the report, customer satisfaction with telecommunication firms increased during the pandemic due to government involvement measures such as lockdowns and quarantining and increased demand for voice and internet services.

Yahya et al. (2021a) employ panel data testing to capture COVID-19's impact on investor sentiment. They found that investors portrayed an overall pessimistic sentiment during the pandemic. The correlation indicates a significant negative association of investor attention in the market with COVID-19 new cases and deaths. In contrast, a positive relationship was identified between recovered cases of COVID-19 and investor sentiment. Zhai et al. (2021) found that firms closer to the epicentre of COVID-19 in China (Hubei Province) had the greater significance of its adverse effects on investor sentiment.

The articles above collectively investigate the intricate relationship between COVID-19, investor sentiment, and stock market reactions. Kaplanski and Levy (2010) and Ginsberg et al. (2008) highlight the evolving role of media, especially online platforms, in influencing investor sentiment during emergencies. The subsequent section on the impact of COVID-19 in emerging and developed countries reveals the unprecedented and exceptional nature of stock market reactions. Baker et al. (2020) present a detailed analysis of significant market fluctuations in the United States during the pandemic, underscoring the substantial losses incurred by S&P 500-listed companies. The distinction between developed and emerging markets is evident in Salisu et al.'s study, indicating that developed markets are more adept at mitigating uncertainty. Government policies, information dissemination, and global supply

chain disruptions are identified as key contributors to market responses. The analysis of investor sentiment specifically delves into how it affects stock returns in various sectors. Studies by Yung and Nafar (2017), Swamy et al. (2019), Da et al. (2011), Smales (2021), Dash et al. (2023), Almuqren and Cristea (2021b), Yahya et al. (2021b), and Zhai et al. (2021) employ diverse methods such as Google Trends data, sentiment analysis, and time-varying parameter vector autoregressive models. The findings collectively suggest that investor sentiment, influenced by information-seeking behaviour and pandemic-related factors, significantly impacts stock market dynamics. The studies emphasize the role of media, government policies, and global interconnectedness in shaping investor sentiment during crises. For future pandemics, these insights underscore the importance of understanding and managing investor sentiment, taking into account factors that go beyond direct health impacts, such as information dissemination and global economic interdependencies.

3.4.2 Empirical evidence of COVID-19 within South Africa

A South African study by Dalika and Seetharam (2014) examined the effect of investor attitude on stock returns between 1999 and 2009. The study was predicated on the notion that constraints to arbitrage and an ignorant demand shock both contribute to mispricing. The study used Baker and Stein (2004) technique to create the sentiment index. In the orthogonalized sentiment proxies, the sentiment series was estimated as the first principal component, and a collection of portfolios was created. The findings show that the South African market's share returns are significantly impacted by investor mood. Returns after periods of low sentiment were generally high, particularly for start-up and growth companies with small market caps and significant volatility. However, it was found that these patterns changed when the mood was positive.

Muguto et al. (2019) investigated the fluctuations in volatility and investor sentiment on the Johannesburg Stock Exchange (JSE). The study used GARCH-M specifications supplemented by a sentiment factor while considering three error distribution assumptions. The study examined daily data from 2002 to 2018. The results indicate that traders who receive positive feedback are more inclined to engage in trading activities when market sentiment is relatively high. This suggests a noteworthy positive correlation between risk and return. This discovery supports the earlier findings of Kurov (2008) and Chau et al. (2011), which established a correlation between the level of positive feedback trading and the prevailing sentiment during

that period. This further lends credibility to the notion that the expectations of noise traders regarding the US market play a significant role in driving feedback trading.

Another South African study by Enow (2022) sought to examine the reaction of the six primary sectors listed on the Johannesburg Stock Exchange (JSE) to the substantial influence of COVID-19 on global economic activities and financial markets. The Threshold GARCH model (TGARCH) was applied in the research to investigate instances of overreaction and underreaction in the banking, industrial, healthcare, consumer goods, telecommunications, and technology sectors. Results from the TGARCH model revealed that the returns of the chosen stocks followed an asymmetric pattern, with the coefficient of the leverage term being positive and statistically significant in most cases but the consumer goods industry being an exception. The existence of these asymmetries results in an imbalance in supply and demand, which had the potential to distort the market's efficiency. Enow proposes that participants and investors should determine and trade on the fundamental values of these stocks rather than trading on their emotions in order to limit behavioural biases. This would involve establishing the values of these stocks. This study adds to the current body of information on market anomalies by investigating overreaction and underreaction during the COVID-19 epidemic. Overreaction and underreaction are essential ideas in behavioural finance. The study's findings are important for market participants who want to trade on the Johannesburg stock exchange since they provide valuable insights into behavioural patterns and anomalies. As a result, the findings are important to market players.

The three South African studies, Dalika and Seetharam (2014), Muguto et al. (2019), and Enow (2022), collectively contribute to understanding the impact of investor sentiment on the Johannesburg Stock Exchange (JSE) and the implications for future pandemics. Dalika and Seetharam (2014) employ Baker and Stein (2004) sentiment index to investigate the effect of investor mood on South African stock returns. The study suggests that investor sentiment significantly influences stock returns, particularly for start-up and growth companies. However, the dynamics change when sentiment is positive. Muguto et al. (2019) explore volatility and investor sentiment on the JSE, utilizing GARCH-M specifications and finding a positive correlation between risk and return, supporting earlier studies on the role of positive feedback trading and noise trader expectations. Enow (2022) focuses on the reaction of six JSE sectors to the substantial influence of COVID-19, using the Threshold GARCH model. The findings reveal asymmetries in stock returns, proposing an imbalance in supply and demand,

potentially distorting market efficiency. Enow emphasizes the importance of trading on fundamental values rather than emotions to limit behavioural biases, contributing valuable insights into market anomalies during the pandemic. Collectively, these studies underscore the significance of investor sentiment in shaping stock market behaviour in South Africa. For future pandemics, understanding these behavioural patterns becomes crucial for market participants, emphasizing the need for a fundamental approach to trading and addressing potential anomalies that may arise during crises.

3.5 Empirical Evidence of COVID-19 on the volatility impacts

Stock volatility implies that market prices tend to deviate from intrinsic values due to the actions of irrational investors who are influenced by euphoria or panic Pečarić (2012). As a result of the arbitrage opportunities, rational investors enter the market and correct the mispricing caused by irrational investors (Engel and Morris, 1991).

Price volatility and return are components of financial volatility and can explain the behaviour of it. The price volatility is triggered by information flows and changes in liquidity, while the return is triggered by events such as major shifts in financial markets and policy changes (Glosten and Milgrom, 1985). Moreover, as stated by Azimli (2020), heightened uncertainty impacts the necessary rate of return, consequently influencing the present market valuation of stocks. Scholars have posited that the fluctuation of stock market returns exhibits a strong correlation with market uncertainty, thus making it a pivotal factor in most investment and portfolio management choices. The measurement of volatility serves as a significant gauge of risk, and the ability to accurately forecast fluctuations in stock market volatility is of utmost importance (Green and Figlewski, 1999). Increased volatility indicates a substantial fluctuation in the price of shares within a brief timeframe. Consequently, as volatility rises, so does the level of risk. According to Glosten et al. (1993), lower volatility indicates minimal fluctuations in stock prices within a short timeframe, with changes occurring steadily over a specified duration.

The associated volatility present in global stock markets left investors in quest of safe haven alternatives, with real estate being a lucrative choice, suggesting that the real estate sector may possibly benefit from the effects of the pandemic Baker et al. (2020). Other recent studies indicate substantial increases in systematic risk, negative stock market reactions and rising

stock market volatility in response to COVID-19 deaths and infections (Albulescu, 2020, Al-Awadhi et al., 2020, Ashraf, 2020, Baig et al., 2020, Salisu et al., 2020, Wang and Enilov, 2020, Zhang et al., 2020). Al-Awadhi et al. (2020) explains that COVID-19 deaths and increases in stock market volatility are negatively associated within the Chinese stock market. Their findings indicate that the medical manufacturing and information technology industries returns were less volatile compared to the cumulative market. However, the returns of the water, highway, air transportation, and beverage producer industries were negatively impacted and displayed a more volatile environment. Likewise, Haroon and Rizvi (2020) analyse the relationship between sentiment generated by coronavirus-related news and volatility of the US equity market by employing the GARCH model. Their findings suggest that COVID-19-related fear stimulated by news related to the pandemic had a positive and significant association with volatility in the travel and leisure, transportation, energy, and automotive sectors.

Zhao et al. (2022) conducted a study utilising time series analysis to examine the response of the stock market in the United States to the COVID-19 pandemic. This study investigated the temporal effects of the COVID-19 pandemic on the United States stock market. It analysed the relationship between daily COVID-19 newly confirmed cases, both domestically and globally, and the returns of major stock market indices such as the Nasdaq, S&P 500, and Dow Jones. The data spanned from December 31, 2019, to December 30, 2021. In order to analyse the relationship between domestic and global COVID-19 infections and their impact on the performance of the US stock market, a vector autoregression model (VAR) and an autoregressive moving average-generalised autoregressive conditional heteroskedasticity (ARMA-GARCH) model were employed. The study's findings indicate that the emergence of COVID-19 had an initial adverse impact on the stock market, characterised by a concentration of heightened volatility occurring within 60 days following the initial outbreak of the pandemic. After a period ranging from 200 to 300 days, the daily incidence of new COVID-19 cases exhibited no statistically significant influence on the performance of the United States stock market. This finding indicates that COVID-19 exhibited a robust reaction in the initial months but subsequently demonstrated a lack of significant impact on the performance of the US stock market when examining a more extended timeframe following the initial outbreak of the pandemic.

Baig et al. (2020) studied the effects of the COVID-19 pandemic on US equity markets by employing the GARCH (1,1) and OLS regression models, alongside the use of Google Trends

search data as a proxy for investor sentiment, to identify market uncertainty related to the pandemic. The paper concluded that uncertainty linked to an increase in the death and infection rate resulted in lower liquidity and greater implied stock market volatility among US stocks. In a similar way, Smales (2021) used OLS regression models and Google Trends data to measure how investors felt and found that the pandemic had a negative effect on volatility (in the G7 countries) and stock returns (in the G20 and G7 countries).

Lyócsa et al. (2020) compare the market accuracy of high- and low-frequency volatility models for various major currency pairs. By including Google Trends data related to the pandemic as a measure of fear and panic, they conclude that a rise in fear and panic leads to amplified volatility in 10 developing and developed financial markets. Likewise, Papadamou et al. (2020) discover that higher levels of uncertainty have a direct influence on implied volatility and an indirect influence across the study of 13 financial market returns, covering Europe, Asia, USA and Australia.

Szczygielski et al. (2021a) examined the impacts of uncertainty stemming from COVID-19 on returns and volatility in global industries. They utilized a dataset comprising 68 global industries and incorporated Google Trends search data to assess the level of COVID-19-related uncertainty. The results imply that COVID-19-related uncertainty diminishes returns across various industries while concurrently elevating overall volatility. These findings suggest a prevailing uncertainty concerning future financial performance and the emergence of new market opportunities in certain sectors. It is noteworthy that the industries experiencing the most significant negative returns are not always the ones exhibiting the highest levels of increased uncertainty, as the resilience of industries varies.

In addition, Zaremba et al. (2021) revealed that governments' responses to the COVID-19 outbreak raised stock market volatility in 67 countries around the globe (including South Africa), particularly announcements around government non-pharmaceutical interventions. Just and Echaust (2020) studied the link between S& P500 returns and market indicators such as implied correlation, implied volatility, and liquidity. The short-term dependency between both deaths and confirmed cases in 12 countries and market movements were considered. The study confirmed that there exists a structural break between stock market returns and crucial stock market indicators.

A South African study by Vengesai (2022) utilised conventional symmetrical and asymmetrical GARCH models to investigate the effect of COVID-19 on the conditional volatility of stock returns in several small cap and large cap South African stock market indices. To comprehend the dynamics of conditional correlations between the leading indices, the MDCC-GARCH model was used. The study's findings imply that COVID-19 had increased the volatility on returns for most industries, albeit not all sectors were similarly impacted. The main and small cap indices were seen to have large positive correlations according to the DCC-GARCH model, which suggests that diversification during pandemics won't have much of an impact. In the wake of the pandemic, it was observed that the alternative exchange (ALTX) exhibited declining correlations with prominent sectors, thereby indicating a rise in the advantages derived from the diversity offered by the ALTX. Investors and portfolio and risk managers ought to utilise this information to modify their value at risk (VaR) calculations, adjust their capital allocation, and proactively implement measures to ensure the resilience of their institutions and portfolios in the face of heightened risk during pandemics.

The empirical evidence on the impact of COVID-19 on stock market volatility is discussed in a series of studies employing diverse methodologies. The studies collectively address the notion that market prices deviate from intrinsic values due to the influence of irrational investors. While Pečarić (2012) and Engel and Morris (1991) suggest that arbitrage opportunities correct such mispricing, other studies delve into the intricacies of volatility. Glosten and Milgrom (1985) differentiate between price volatility triggered by information flows and liquidity changes, and return volatility triggered by events and policy changes. These studies collectively highlight the importance of accurately forecasting stock market volatility as a gauge of risk. Notably, the effect of COVID-19 on global stock markets, including the U.S. (Zhao et al., 2022), China (Al-Awadhi et al., 2020), and G7 countries (Smales, 2021), is explored. Findings indicate heightened volatility initially, with varying recovery periods. The role of investor sentiment, measured using Google Trends data, is also emphasized in studies by Baig et al. (2020), Smales (2021), Lyócsa et al. (2020), and Papadamou et al. (2020). Moreover, studies by Vengesai (2022) and Szczygielski et al. (2021a) focus on South Africa, revealing increased volatility across industries and the impact of COVID-19-related uncertainty on global industry returns. Collectively, these studies underscore the intricate relationship between pandemic-induced uncertainty, investor sentiment, and stock market volatility. Future pandemics may prompt similar reactions, necessitating comprehensive policy interventions for economic stability. Given the predicted losses and the decline in stock

markets, significant fiscal and monetary policy interventions as well as economic assistance are required to protect human health, stop economic losses, and defend the stock market's financial stability from COVID-19 (Gourinchas, 2020).

3.6 Empirical Evidence of COVID-19 on the trading volume impacts

This section of the literature review aims to comprehensively explore and analyse existing research on the impact to trading volume amidst the pandemic. This review aims to unveil the nuanced patterns, sectoral variations, and underlying factors driving fluctuations in trading volumes. Understanding these dynamics is imperative for stakeholders, including investors, regulators, and financial institutions, as they navigate the evolving landscape of stock market activity in the wake of the ongoing global health crisis.

According to the findings of Odean (1998), an increase in overconfidence among investors was associated with a rise in trading volume. This correlation arose from the tendency of overconfident investors to believe that their private information held greater reliability compared to publicly available information. Consequently, they tended to overreact to subjective and less relevant information while underreacting to abstract and highly relevant information, as outlined by Odean in 1998. Overconfident investors, as highlighted by Barber and Odean (1999), were inclined to trade in riskier securities due to an underestimation of their risk exposures. Although this behaviour could lead to higher returns, it posed a potential hazard to investors' wealth as overconfident individuals might continue trading even when the trading costs exceeded the gains, as emphasized by Odean in 1998.

Chiah and Zhong (2020) investigated the repercussions of the COVID-19 pandemic on stock market trading volumes globally. A substantial increase in trading activity is observed across 37 international equity markets - this surge was noted to be closely linked to the national culture and institutional context of individual countries. Specifically, heightened trading volumes were seen to be associated with societies characterized by elevated levels of trust and individualism, along with lower levels of uncertainty avoidance. Moreover, investors display a greater inclination towards trading in wealthier nations, those with robust legal rights protection, effective governance systems, and increased opportunities for speculative activities. These results are consistent with that of Guiso et al. (2008) who found a positive relationship between stock market participation and trust.

Utilizing granular transaction data, Chiah et al. (2022) observed a significant upsurge in retail trading volume throughout the year 2020, surpassing institutional trading levels. This trading pattern aligns with the hypothesis that individuals turn to the stock market as an easily accessible substitute for gambling. The authors delved into two additional rationales driving this trend, revealing that investors perceive stock trading as an enjoyable and thrilling pursuit, particularly during the second phase of lockdown spanning July to October 2020. Assessing the profitability of retail trading, the study's findings indicate that stocks heavily favoured by retail investors consistently yield negative returns. This outcome mirrors the anticipated negative consequences of gambling losses and underscores the perils associated with engaging in trading within a volatile market environment.

Lahmiri (2023) explored the multifractal characteristics of daily price returns and variations in trading volume across 35 cryptocurrencies, employing the wavelet leaders method before and during the COVID-19 pandemic. The outcomes derived from the analysis of scaling exponent functions and multifractal spectrums indicated a prevailing multifractal nature in both price returns and trading volume variations before the onset of the COVID-19 pandemic. Interestingly, during the pandemic, these indicators tended to exhibit a shift toward monofractal behaviour. Consequently, there was a discernible reduction in the level of multifractality during the COVID-19 period for both price returns and trading volume variations. With the decreased complexity observed in these aspects during the pandemic, cryptocurrencies appeared to present an intriguing investment avenue, particularly during periods of significant global economic downturns.

In their investigation, Toe and Ouedraogo (2022) explored the interplay among trading volume, return, and volatility across eleven African Stock Exchanges. The analysis encompassed the timeframe spanning September 2010 to September 2020, involving a total of 3037 daily observations per country. To scrutinize the link between trading volume and return, the researchers employed the Granger causality test. Additionally, an asymmetric EGARCH (1, 1) model was utilized to assess the connection between trading volume and return volatility. The findings suggested that returns did not instigate volume changes, whereas trading volume influenced returns in certain Stock Exchanges of various countries. Regarding the daily returns' volatility, the study disclosed a low persistence in volatility, with trading volume contributing to an increased persistence in the majority of Stock Exchanges. Conversely, lag trading volume demonstrated an impact on the daily volatility of the markets.

A notable study conducted in South Africa, distinct from the pandemic context, was carried out by Mpofu (2012), examining the relationship between trading volume and stock returns within the JSE Securities Exchange. The investigation encompassed the price and trading returns of the FTSE/JSE index from July 22, 1988, to June 11, 2012. The results revealed a positive correlation between stock returns and the concurrent change in trading volume. Additionally, it was noted that past returns did not experience a significant impact from variations in trading volumes. The study emphasized a noteworthy link between trading volume and the absolute value of price changes. Autoregressive tests were employed to investigate the causal relationship between return and volume. The findings suggested that volume was influenced by a lagged returns effect for the FTSE/JSE index, indicating that return information played a role in shaping investors' decision-making processes.

The studies on the empirical evidence of COVID-19's impact on trading volume provide insights into the complexities of investor behaviour during the pandemic. Odean (1998) and Barber and Odean (1999) delve into overconfidence among investors, highlighting its association with increased trading volume and the potential risks it poses. Chiah et al. (2022) and Chiah and Zhong (2020) global study on COVID-19's impact indicates a substantial rise in trading activity, emphasizing the influence of national culture and institutional contexts. Contrarily, Chiah et al. (2022) focus on the surge in retail trading volume during the pandemic, attributing it to individuals viewing the stock market as a substitute for gambling. The study reveals the negative returns associated with stocks favoured by retail investors, underscoring the risks involved in such speculative trading. Lahmiri (2023) exploration of cryptocurrencies indicates a shift toward monofractal behaviour in both price returns and trading volume during the pandemic, presenting an interesting avenue for investment amid global economic downturns. The study by Toe and Ouedraogo (2022) on African Stock Exchanges unveils the nuanced relationship between trading volume, return, and volatility, providing a comprehensive understanding of market dynamics. The South African study, Mpofu (2012), although not related to the pandemic, contributes by highlighting the positive association between stock returns and contemporaneous changes in trading volume within the JSE Securities Exchange. Overall, these studies underscore the need for nuanced analyses of trading volume patterns during pandemics, considering factors like investor behaviour, cultural influences, and the specific characteristics of different markets. The findings imply that future pandemics may prompt diverse responses in trading volumes, necessitating tailored strategies for investors, regulators, and financial institutions.

3.7 Summary of Literature Review

The literature review presents a comprehensive overview of the multifaceted impacts of COVID-19 on both developed and developing countries. In developed countries like the United States, the pandemic challenged market efficiency, especially in the stock market, which led to adverse effects on companies and heightened volatility. Saudi Arabia's oil industry experienced volatility linked to COVID-19 deaths, showcasing the intricate relationship between the pandemic and economic sectors. Analysis of real estate and financial markets in Turkey highlights sector-specific repercussions and the need for strategic investment decisions. G7 stock market studies revealed heterogeneous effects, with Germany showcasing resilience through swift adaptation to digital technologies.

For developing countries, sector-specific vulnerabilities and varied industry responses were emphasized. Proactive strategies, such as diversification and technology adoption are recommended for the food and beverage industry to mitigate long-term negative effects. In India, tourism, hospitality, and consumer companies suffered, while pharmaceuticals and media experienced positive impacts. Jordan's financial sector was significantly impacted, urging policymakers to strengthen market resilience. Studies on health and technology sectors underscore the role of management capability in stock performance. Overall, industry-specific adaptive strategies and effective policymaking are noted as being crucial in mitigating the pandemic's economic repercussions.

Globally, the pandemic induced unprecedented volatility within stock markets, notably in the United States, resulting in severe economic impacts on companies, particularly in the S&P 500. Disparities in risk perception between emerging and developed markets demonstrated the latter's superior ability to mitigate uncertainty. Factors like rising cases, fatalities, and government policies contributed to intricate market responses. Studies on investor sentiment using Google Trends revealed its significant role in predicting stock returns and providing insights for investors and policymakers - understanding the impact of investor sentiment on various sectors offer valuable insights for navigating market anomalies. In South Africa, investor sentiment has been seen to significantly influence stock returns, emphasizing the importance of trading on fundamental values and mitigating behavioural biases. Future strategies should focus on establishing fundamental values to navigate market anomalies effectively. Overall, the literature underscores the complex interplay of factors shaping market

dynamics during the pandemic and calls for adaptive strategies and effective policymaking to ensure stability and investor protection.

CHAPTER : 4 DATA & METHODOLOGY

The first part of this chapter will review the data utilised in the study, whereas the methodological methods will be discussed in the second part.

4.1 Data Description

The data used in this thesis is based on the South African stock market (represented by the Johannesburg Stock Exchange (JSE)). This study focuses on the eight largest industry sectors within the South African stock market and are listed on the JSE. Table 4.1 illustrates the Index (industry) and its respective Index Code:

Table 4-1: JSE Industry sectors which will be utilised in this study

Index Name	Index Code
Technology	JI0010
Telecommunications	JI0015
Health care	JI0020
Financials	JI0030
Consumer Discretionary	JI0040
Consumer Staples	JI0045
Industrials	JI0050
Basic Materials	JI0055
Energy	JI0060
Utilities	JI0065

Source: Authors own construction

The source data spans the period 1 January 2017 – 30 August 2022 and consists of daily data extrapolated from the IRESS database. Following Szczygielski et al. (2021a), 3 March 2020 will be utilised as this was 2 days prior to the first index case announced by government – this will be captured with the use of a dummy variable. The sample includes the pre COVID-19 period (1 January 2017 – 28 February 2020) and the COVID19 period (3 March 2020 – 30 August 2022). The selected period ensured to include stock market performance before the COVID-19 outbreak, allowing a more accurate comparison of industry performance.

4.2 Variable Construction

4.2.1 COVID-related investor sentiment proxy

A key variable for this study is the construction of a COVID-related investor sentiment proxy. Odean (1999) explains that investors could solve the problem of selecting from thousands of potential stocks to invest in by simply restricting their selection to the stocks that have recently captured their attention. One's interest in a subject is evident by their search for information on it. Internet searches are a significant way for investors to deliver their information needs in a way that is more direct and transparent (Papadamou et al., 2020). Google Trends, a free public service, has lately begun to give aggregated data on the number of inquiries for various search phrases and how these volumes fluctuate over time. This information might assist in giving fresh insights into the information collecting process before the trading choices reflected in stock market statistics. Thus, the Google Search Volume Index (GSVI) provides a prompt and straightforward measure of attention and has the potential to mirror the search patterns of the broader populace. The utilization of the Google Search Volume Index (GSVI) as an indicator for investor sentiment was first introduced by Da et al. (2011).

In their study, Ji and Guo (2015) analysed short-term Google Trends data to validate the influence of Google Trends on investor attention toward the oil market. Ji and Guo (2015) employed data from Google Trends to construct an AR-GARCH model. Their findings provided empirical evidence that the information from Google Trends regarding storms, financial crises, Libyan conflicts, and OPEC meetings significantly impacted the anomalous returns of Brent oil prices. Zeng and Li (2019) assert that Google Trends responds to investor apprehensions by utilising non-commercial and non-public market data. Ultimately, a correlation was established between Google Trends data and fluctuations in crude oil prices. A study by Afkhami et al. (2017) collected 90 energy-related terms from Google Trends. These terms were then utilised to construct a GARCH model, which was employed to examine the price volatility of six prominent commodities within the United States energy market. Ultimately, the researchers identified the three Google search terms that exerted the most significant influence on the pricing of each respective product. Using identical frequency data in prior studies constrained their potential for broader application. In contrast, the study conducted by Afkhami et al. (2017) employs a mixed-frequency model to generate simulated

data encompassing a range of frequencies. This approach introduces novel perspectives for examining the dynamics of high-frequency futures trading.

Previous studies found that internet search-based data accurately measures investor sentiment (Baig et al., 2020, Yung and Nafar, 2017, Smales, 2021). Therefore, COVID-related investor sentiment will be measured by the versatile and useful functionality of Google Trends (Google Trends, 2022). Google Trends provides the popularity of a given word over a period and is calculated using daily search interest which is then normalised to control for the overall increase in the number of internet searches over time:

$$\text{Search Interest} = \frac{\text{no. of queries for specific word}}{\text{Total Google search queries}}$$

Subsequently, every data point of search interest is normalised by dividing it by the maximum point of interest observed for the particular keyword within the specified range of data. The level of search interest is subsequently assigned an index value ranging from 0 to 100, with 0 representing the lowest level of interest and 100 indicating the highest level of popularity for a given search query. Google Trends provides daily data for each term searched. For each data point, the Search Volume Index of the prior day is also recorded as $GSVI_{pre}$, which correlate any changes in $GSVI$ with stock movements in the following day:

$$\text{Daily Change In } GSVI = \Delta GSVI_t = \log \left(\frac{GSVI_t}{GSVI_{t-1}} \right)$$

Where $GSVI_t$ is the Google Search Volume Index for day t .

Consistent with Da et al. (2015), this paper identifies the top five COVID-19 related search terms to formulate a single COVID-19 related search term index, which amalgamates the top five searched terms. COVID-related investor sentiment may be assessed in relation to the pandemic using the Google Trends index by searching up the primary terms/keywords most commonly used to describe the virus in literature and the media. COVID-19, coronavirus, COVID, COVID19, and COVID 19 are examples of these. Figure (4.1) depicts the indices for each of the search phrases.

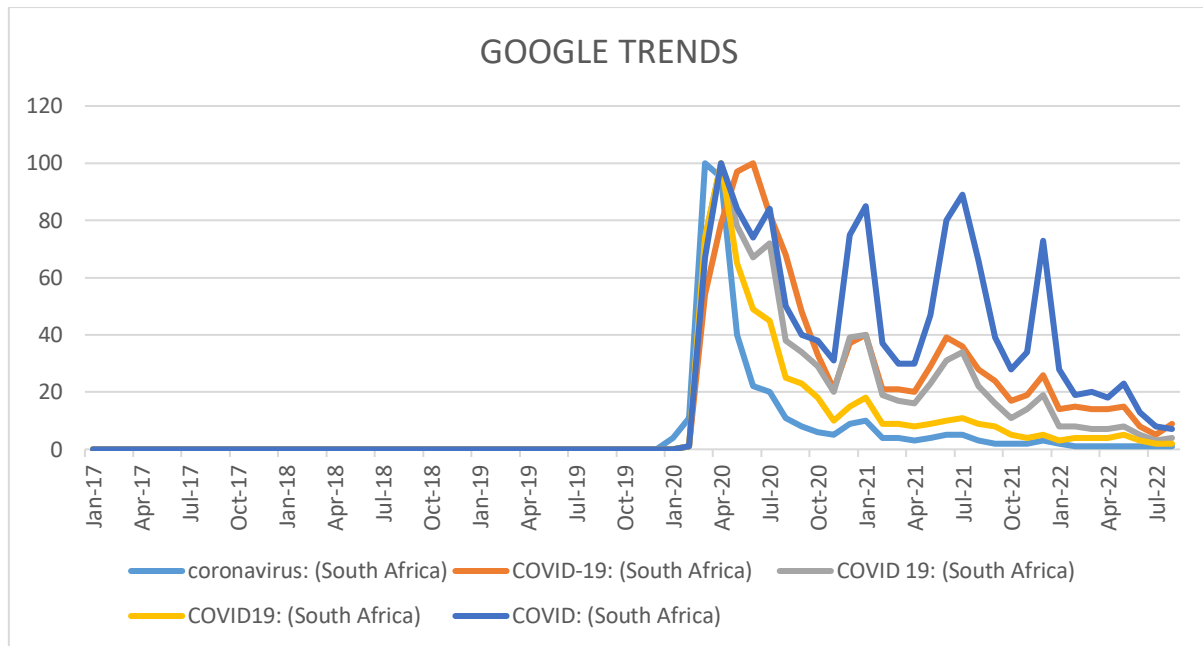


Figure 4-1: Trends in COVID-19 related searches

Source: Author's own work

According to Fig. (4-1), in the early phases of the pandemic, Coronavirus was the most searched phrase, but in the latter stages, COVID was the most searched. This paper's application will quantify the increase in investor interest as a logarithmic shift in the Coronavirus search query.

4.2.2 Risk-Free Rate and Market Return Data

A study by Strydom and Charteris (2009) offers empirical evidence supporting the selection of the risk-free rate for S.A. (South Africa). The study sought to evaluate the applicability of several instruments as proxies for the risk-free rate. It emphasised the need to consider inflation risk when finding an acceptable risk-free rate. The analysis revealed that the long-term Government Bond was the best surrogate, outperforming the Treasury Bill. This is true if the bond's maturity matches or substantially resembles the investment or security under consideration in the Capital Asset Pricing Model (CAPM).

Therefore, the average rate of return on the South African R2023 Bond (a 5-year bond) will be substituted for the risk-free rate (R_f). This choice corresponds to the bond's maturity, corresponding to the duration of the 5-year sub-periods and the 5-year sample period. Studies on the JSE All Share Index (JSE ALSI), which will serve as a proxy for the market portfolio

(RM), inform the selection of the specific average rate of return. Msindo (2016) contends that the JSE ALSI is the most suitable proxy because it includes approximately 99 percent of the total market value of all ordinary securities listed on the JSE. IRESS will be used to acquire the essential data for the R2023 bond proxy and the JSE ALSI proxy.

4.2.3 Return Computation

Using the daily closing prices of the indices, the daily compounded total returns will be computed as follows:

$$R = \ln\left(\frac{V_t}{V_{t-1}}\right)$$

Where;

R = fund/index daily return

V_t = fund/index closing value at time t

V_{t-1} = fund/index value at period $t-1$ or previous day.

4.2.4 Fama-French 3 factor computation

Based on the Ordinary Least Squares (OLS) Regression below and following Naidoo (2019), the computation of the Fama-French 3 factors is outlined. The use of this model within the study is further discussed in the Methodology sub-section.

$$R_{i,t} = \alpha + \gamma MKT_t + \delta SMB_t + \eta HML_t + \varepsilon_t \quad (1)$$

The Small Minus Big (SMB) factor was developed to quantify the extra return obtained historically by individuals who invest in stocks of companies with relatively lower market capitalization. This additional return is typically referred to as the 'size premium'. The terms "small" and "big" pertain to the size of a company's market capitalization (MC), which is calculated by multiplying the share price by the number of outstanding shares.

The High Minus Low (HML) factor aims to quantify the 'value premium' investors receive for investing in companies with high book-to-market (B/M) values. The B/M value represents the ratio of the firm's value determined by accountants to its value as perceived by the public markets (Auret and Sinclair, 2006).

In their work, Fama and French (1993) proposed a method for constructing portfolios that involved calculating SMB and HML risk factors. The Johannesburg Stock Exchange (JSE) will be used to adapt this procedure for a South African perspective instead of the New York Stock Exchange (NYSE). The classification of shares listed on the JSE as small or big (S or B) is based on whether the firm's market capitalization is below or above the median MC for JSE shares. Subsequently, the JSE shares are assigned to three equity groups based on their book-to-market (B/M) values, determined through independent sorting using percentile breakpoints. These breakpoints include the bottom 30% - low (L), middle 40% - medium (M), and top 30% - high (H) categories.

Ultimately, the combination of market capitalization portfolios and book-to-market (B/M) groups leads to the formation of six final portfolios: S/H, S/L, S/M, B/H, B/L, and B/M. For instance, the B/L portfolio consists of shares from the big-size and low-B/M portfolios. The average excess return of the constituent shares within each portfolio is computed to calculate the excess return of these portfolios on any given day. The excess return of an individual share is determined by comparing its value-based return with the risk-free rate.

SMB is calculated for any given day by taking the three large-cap share portfolios' average daily returns and subtracting the small-cap share portfolios' average daily returns.

$$SMB = [(S/H + S/L + S/M) - (B/H + B/L + B/M)]/3 \quad (2)$$

HML is calculated in a given day as the difference between the mean returns on two high book-to-market portfolios and the mean returns on two low book-to-market portfolios.

$$HML = [(B/H + S/H) - (B/L + S/L)]/2 \quad (3)$$

In order to adapt the method proposed by Fama and French (1996) to the South African context for this study, certain modifications will be made. Given that the Johannesburg Stock Exchange (JSE) already provides indices based on market capitalisation and book-to-market ratio, these existing indices will be utilised to compute the SMB (Small Minus Big) and HML (High Minus Low) factors, eliminating the need to employ equations 2 and 3 as originally proposed. To calculate the SMB factor, the return differential between small and large-sized firms will be determined by subtracting the logarithm of daily returns of the JSE Small-Cap index

(representing small-sized firms) from the logarithm of daily returns of the JSE Top 40 index (representing large-sized firms). Similarly, the HML factor, which captures the performance difference between Value and Growth stocks, will be constructed by subtracting the logarithm of daily returns of the JSE Growth Index from the logarithm of daily returns of the JSE Value Index. This approach follows the work of Atsin and Ocran (2015).

4.3 Methodology

Following Da et al. (2015) and Szczygalski et al. (2021a), this study adopts an event study analysis to evaluate the pandemics immediate impact on industry performance (objective 1 of the study), OLS and ARCH/GARCH model frameworks to measure stock market return, COVID-related investor sentiment, trading volume impacts and volatility (objectives 2, 3, 4 and 5 of the study). Each of these methods will now be further discussed.

4.3.1 Event study methodology (Research objective 1)

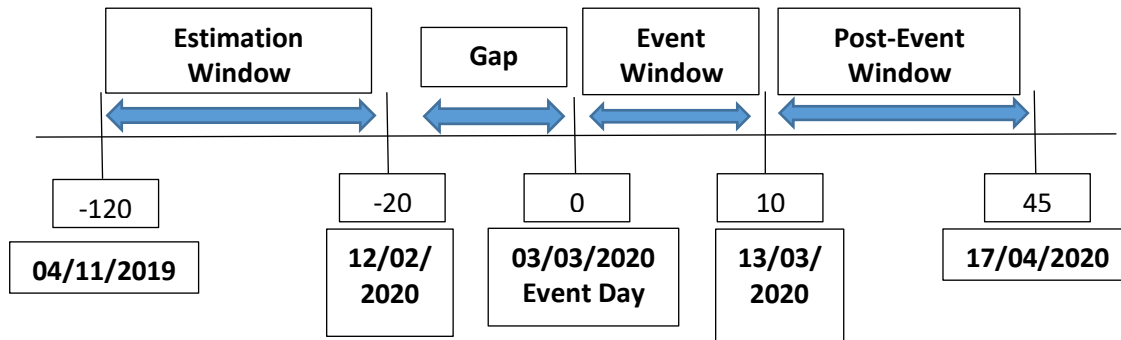
This paper employs an Event study analysis to identify any abnormal/excess returns in the financial market immediately after the governments' confirmation of the first COVID-19 case in South Africa, March 03, 2020.

An event study examines abnormal changes (and returns) of sample stock prices after a specific event and can reveal greater market trends or patterns (He et al., 2020). The model fulfils all requirements of meeting the first objective of this paper by analysing the short-term impact of the pandemic on stock market returns. For this paper, the methodology adopted in analysing the short-term impact of the pandemic on stock market performance follows a method conducted by Sun et al. (2021) and He et al. (2020), who were successful in investigating the impact of COVID-19 on the Chinese stock market and different stock market sectors of China.

To compare any potential differences in how firm performance differs prior to and at governments announcement of the pandemic, 100 days prior to the event date will be selected as the estimation window to provide a clear view of a change in stock market performance. To analyse the reversal effect, the event window is defined as 10 trading days after the event day (the first day COVID-19 was announced by South African government) and the post-event window as 10 to 45 days after the event date. A 20-day gap defined is set between the event

date and estimation window. This will avoid data contamination and capture true abnormal returns as confirmed by the study conducted by Sun et al. (2021).

Figure 4-2: Set up of the Event Study



Source: Author's own work

Expected returns are derived using the Fama-French model. Therefore, the ordinary least squares (OLS) regression is based on the following model:

$$R_{i,t} = \alpha + \gamma MKT_t + \delta SMB_t + \eta HML_t + \varepsilon_t \quad (1)$$

Where $R_{i,t}$ denotes the return of index i on date t in the estimation window, and MKT_t , SMB_t , and HML_t are the 3 factors of the Fama-French model. These factors will be proxied as follows:

- MKT_t – Return on the JSE ALSI
- SMB_t – Historic excess returns of small-cap companies over large-cap companies listed on the JSE ALSI
- HML_t – Historic excess returns of ‘value stocks’ (high book-to-price ratio) over ‘growth stocks’ (low book-to-price ratio) traded on the JSE ALSI

Alpha (α) serves as a metric for measuring the disparity between the actual returns of an index and its anticipated performance, taking into account the associated level of risk. A positive alpha of statistical significance suggests that the index has surpassed its beta, resulting in an excess return. Conversely, a statistically significant negative alpha indicates that the index has

underperformed relative to the expectations established by its beta. In the previous regression analysis (represented by Equation 1), the return from investing in sector i should ideally exhibit statistical insignificance or proximity to zero. However, if the return is indeed zero and lacks statistical significance, it indicates that the investment has generated a return that corresponds adequately to the assumed level of risk.

When the SMB factor coefficients are examined, a substantial positive value implies that the Index had a greater representation of small-cap companies than large-cap stocks on average throughout the assessment period. On the other hand, a substantial negative coefficient indicates that the fund had a greater allocation to large-cap companies. Similarly, a large positive coefficient for the HML component implies that the fund had a higher proportion of value equities than growth companies on average throughout the assessment period. On the other hand, a large negative coefficient indicates that the fund had a higher allocation to growth equities.

Abnormal returns are calculated as follows:

$$AR_t = R_t - [\hat{\alpha} + \hat{\gamma}MKT_t + \hat{\delta}SMB_t + \hat{\eta}HML_t] \quad (2)$$

Where R_t represents actual returns of index i on date t in the estimation window. To determine the overall impact of an event over a given period (“event window”), the individual abnormal returns must be added to create a “cumulative abnormal return (CAR)” as follows:

$$CAR = \sum_{t=1}^n AR_t \quad (3)$$

Lastly, parametric tests are conducted to test significance once abnormal returns are identified and CAR is quantified within the specified event window. Existing literature demonstrates that daily anomalous return distributions are related to a normal distribution (Fama, 1965). The null hypothesis is $CAR=0$, according to it. As a result, if the pandemic has a strong positive influence on stock market values, the t-stat should also be highly positive, and vice versa – the t-stat is estimated from the regression results of equation (2) at each event window (i.e., 0-9 days and 10-45 days respectively).

4.3.2 OLS and ARCH/GARCH methodology (Research questions 2/3/4/5)

The great workhorse of applied econometrics is the least squares model (Engle, 1982). This option is viable, as applied econometricians frequently encounter the task of forecasting the extent to which changes will influence a given variable in another variable. However, there is a growing demand for econometricians to predict and analyse the extent of the model's imperfections. In this particular scenario, the concerns revolve around volatility, and the prevailing methodologies employed are the ARCH/GARCH models. According to Campbell et al. (1997, p.86), "it is both logically inconsistent and statistically inefficient to use volatility measures based on the assumption of constant volatility over some period when the resulting series moves through time." These assertions have endured the test of time because the study of volatility continues to intrigue not just econometricians but also financial specialists. They continue to employ Engle's classic ARCH and GARCH models. Engle's (1982) autoregressive conditional heteroscedasticity (ARCH) model recognises the distinction between unconditional and conditional variance, allowing the latter to evolve due to previous mistakes. The generalised autoregressive conditional heteroscedasticity (GARCH) model is an extension of the ARCH model, including a moving average component and the autoregressive component (Bollerslev, 1986).

Following Szczygielski et al. (2021a) and Miah and Rahman (2016), this study aims to evaluate the impact of uncertainty related to COVID-19 on (a) returns (mean), (b) trading volume (mean), and (c) the conditional variance, with the latter considered as a proxy for risk. The specifications are detailed in Table (4-2), where $r_{i,t}$ represents the return on index i at time t and $Vol_{i,t}$ denotes trading volume on index i at time t . $\Delta GSVI_t$ represent the first differences in the combined COVID-19 search index and $h_{i,t}$ signifies the conditional variance. A shift dummy is incorporated into both mean and conditional variance equations ($Dum_{0,1}$), this will depict both pre-COVID-19 and COVID-19 periods by employing a value of 0 for the former period (Al-Rjoub, 2009). Statistical significance will be assessed by utilizing the t-stat values from the results of the mean equations outlined in table (4-2).

Table 4-2: Model Specifications - This table outlines the model specifications employed in this section of this thesis.

Model	Specification
Mean:	$r_{i,t} = \alpha_i + B_{iGSVI} \Delta GSVI_t Dum_{0,1} + \gamma_i r_{i,t-\tau} + \varepsilon_{i,t}$ (1)
Mean:	$Vol_{i,t} = \alpha_i + B_{iGSVI} \Delta GSVI_t Dum_{0,1} + \gamma_i Vol_{i,t-\tau} + \varepsilon_{i,t}$ (2)
GARCH	
GARCH (1,1)	$h_{i,t} = \omega_i + \alpha_i \varepsilon_{i,t-1}^2 + \beta_i h_{i,t-1} + \varphi_i \Delta GSVI_t Dum_{0,1}$ (3)

Source: Author's own work

In order to evaluate research questions 2, 3, and 5, mean equations 1 and 2 are employed with an OLS regression to analyse the effect of COVID-19-related uncertainty on the eight sectors of the JSE. This would assess the enduring consequences of the pandemic and the influence of COVID-related Investor Sentiment on stock market returns and trading volume across various industry sectors on the Johannesburg Stock Exchange (JSE). B_{iGSVI} serves as a metric for gauging COVID-related investor sentiment and endeavours to quantitatively assess the influence of uncertainty stemming from the COVID-19 pandemic. It must be noted that this measure is not a holistic measure of investor sentiment (which can be multifaceted). However, for the purpose of this study, where focus is on covid-related investor sentiment being captured as a factor within the methodology, B_{iGSVI} is the choice of proxy for COVID-related investor sentiment.

If B_{iGSVI} exhibits both a negative sign and statistical significance, it can be inferred that the industry returns and trading volumes are adversely affected by the uncertainty associated with COVID-19. In contrast, if B_{iGSVI} is not statistically significant, it can be explained that the industry returns and trading volumes are not impacted by COVID-19 related uncertainty and can be considered to have a high level of resilience to the aspect of the COVID-19 pandemic. The factors that result in industry resiliency will be discussed in the paper's conclusion and would assist other industries in becoming resilient to future disease outbreaks.

In order to evaluate research question 4, the influence of COVID-19 on the volatility of the eight JSE sectors has to be quantified and analysed. Testing starts with an ARCH test at the first lag. If ARCH effects are present, a GARCH (1,1) model will be used (Miah and Rahman,

2016). To examine the impact of COVID-19 on the volatility of the 8 JSE sectors and COVID-related investor sentiment, the mean equation (3) is executed, where $\phi_i \Delta GSVI$ in the conditional variance quantifies the impact of COVID-19 related uncertainty. If $\phi_i \Delta GSVI$ is positive and statistically significant, then the respective industry is negatively impacted by COVID-19 related uncertainty and would imply the presence of volatility. In contrast, if $\phi_i \Delta GSVI$ is not statistically significant, it can be explained that the industry is unaffected by COVID-19 related uncertainty and can be considered to have a high level of resilience to the pandemic.

4.4 Chapter Summary and Conclusion

Chapter 4 explains the parameters of the sample period, data, and methodology in. The sample period will be 5 years using daily data, resulting in 1825 days of data for this thesis. The actual data is based on price data collected from the 8 industry sectors listed on the JSE in South Africa and will be extracted from IRESS. The methodology involves three proxies for measuring the impact COVID-19 has on the South African stock market: an event study analysis, an OLS regression and a GARCH (1,1) model. These proxies will satisfy the 5 research objectives outlined at the beginning of this paper.

CHAPTER : 5 DATA ANALYSIS AND RESULTS

5.1 Overview

Chapter 5 seeks to answer the research questions provided at the start of this study. This will be accomplished by analysing the outcomes of the procedures indicated in the preceding chapter, followed by a discussion of the empirical results acquired. Firstly, the event study results from section 4.4.1 are discussed to answer research question 1. Following this, the results from the GARCH method outlined in section 4.4.2 are analysed and discussed to answer research questions 2, 3 and 4, showing the results of each industry within the JSE.

5.2 Event Study reports – Short-term impact of COVID-19 on the stock market sectors

By analysing stock returns around the time of an event, we can gain insights into the market's perception of the event's impact. An event study analysis is a powerful tool for understanding the financial implications of significant events and can be used by investors, analysts, and researchers to make more informed decisions (Sun et al., 2021). For this paper, the main aim of the event study analysis is to explore the short-term impact of COVID-19 on the stock price returns of the 8 JSE sectors and evaluate its significance.

5.2.1 Descriptive statistics of the Event Study

Tables 5-1 present summary statistics for the JSE market daily return, stock daily return, and COVID-related investor sentiment for the estimation, event, and post-event window, respectively. The sample period in the estimation window is from November 4, 2019 to February 11, 2020. The sample period in the event window is from March 3, 2020 to March 12, 2020. The sample period for the post-event window is March 13, 2020 to April 17, 2020. The market return and stock return data are sourced from IRESS. The sentiment data is estimated using Google Trends, as detailed in section 4.2.1.

Table 5-1: Summary Statistics for different event windows

Variable	Estimation Window		Event Window		Post-Event Window	
	Mean	SD	Mean	SD	Mean	SD
JSE ALSI statistics	0.0001	0.0084	-0.0196	0.0422	0.0043	0.0413
COVID-related Investor Sentiment	0.0879	0.1965	1.6511	0.3911	0.1157	0.0796
Technology Index Returns	0.0027	0.0152	-0.0096	0.0381	0.0086	0.0403
Telecommunications Index Returns	-0.024	0.0135	-0.0283	0.0546	0.0015	0.0555
Health care Index Returns	0.0010	0.0104	-0.0031	0.0309	-0.0028	0.0429
Financials Index Returns	-0.0008	0.0098	-0.0133	0.0307	-0.0080	0.0631
Consumer Discretionary Index Returns	-0.0015	0.0094	-0.0135	0.0379	-0.0002	0.0317
Consumer Staples Index Returns	-0.0001	0.0108	-0.0159	0.0368	0.0074	0.0288
Industrials Index Returns	-0.0014	0.0104	-0.0109	0.0343	-0.0063	0.0451
Basic Materials Index Returns	0.0001	0.0108	-0.0369	0.0665	0.0117	0.0525

Source: Author's own work

Tables 5-1 reports the descriptive statistics of market (JSE ALSI) returns, stock returns and COVID-related investor sentiment for different event windows. During the event window, the mean stock returns and mean market returns react negatively after the event day (03/03/2020) for all sectors analysed. The standard deviation of both stock and market returns increases during the event window for all sectors analysed, which indicates that the South African stock market yield declines due to the pandemic. COVID-related investor sentiment is also significantly increased during the event window. Possible reasoning for this includes behavioural factors such as social media trends and herd behaviour - positive narratives or trends on social platforms can create a sense of optimism and influence investors' perceptions

and decisions. Another possible reason could be due to growth experienced by technology and remote work-related industries - Investors may have become more optimistic about companies in these sectors, anticipating their resilience and potential for future gains.

A reversal effect is noted during the post-event window within the Technology, Telecommunications, Consumer discretionary, Consumer staples and Basic materials sectors, where mean stock and market returns rise, exceeding the average levels before the pandemic outbreak. However, the opposite result is noted for the Health care, Financials and Industrials sectors, where mean stock and market returns decreased further.

5.2.2 Event Study results

The event study methodology was utilised to address research objective 1. The results of this analysis are shown in table 5-2. The event dates and windows are defined as in Figure 4-2.

Table 5-2: Cumulative abnormal return for the different event windows

Event Window Indices	[0,9] CAR	T-Stats.	[10,45] CAR	T-Stats.
Technology	-0.0019	-0.9417**	0.0021	-3.0527***
Telecommunications	-0.0290	-0.9417**	0.0194	0.7536***
Health care	-0.0061	-0.6642**	-0.0284	-2.0563***
Financials	0.0083	-1.3605**	-0.0093	3.4962***
Consumer Disc	-0.0015	0.7509***	-0.0055	-4.1690***
Consumer Staples	-0.0180	-0.4268*	0.0147	-3.5685***
Industrials	0.0027	-1.0897***	-0.0204	-1.3049***
Basic Materials	0.0006	3.3929***	-0.0005	2.4769***

NOTE: CAR denotes mean cumulative abnormal returns. [0,9] and [10,45] represent the event window and post-event windows respectively. ***, **, * indicate significance at the 1%, 5%, and 10% levels, respectively.

Source: Author's own work

The t-values for all sectors are statistically significant, demonstrating that the pandemic significantly impacted the South African stock market industries during the COVID-19 pandemic announcement. The event study's findings examine the cumulative abnormal returns across multiple event periods and market groups. According to the statistics, the cumulative abnormal return for the event window [0,9] shows a positive tendency for the Financials,

Industrials, and Basic Materials sectors. This suggests that the pandemic has a notable and favourable influence on stock prices within these sectors over a brief period. Nevertheless, the Telecommunications, Consumer Discretionary, Health Care, Technology and Consumer Staples sectors exhibit a negative cumulative abnormal return within the event window. This implies that the outbreak of the pandemic has exerted a substantial adverse influence on the stock prices of these sectors within a limited time frame. These impacts can be explained by the nature of the firms or industries operating within these sectors and how closely their operations are linked to the average person's daily needs or requirements – the Financials, Industrial and Basic Material sectors are sectors in which individuals rarely require daily goods or services from, which could explain why these sectors were not immediately negatively impacted by the pandemic.

Moreover, it should be noted that the ongoing pandemic is currently in its nascent phase within the specified time frame, and its trajectory remains uncertain. Consequently, its influence on various sectors outside its immediate domain is comparatively constrained. Due to quarantine implemented by government on 26 March 2020, which fell within the post-event window [10,45], the Technology, Telecommunications and Consumer Staple sectors are seen to provide good investment opportunities to investors - the cumulative abnormal returns of these industries were significantly higher than the others in the post-event window. These lucrative investment opportunities can further be explained that the demand for goods and services from firms within these sectors had significantly increased during the country's lockdown period – the need for technology and telecommunication services had increased substantially as companies created a work from home environment and the need for consumer staples had risen due to individuals' stock-piling commodities amidst the pandemics outbreak.

In contrast, the cumulative abnormal return outlined in table 5-4 for the Financial, Health Care, Consumer Discretionary, Industrials and Basic Materials sectors is significantly negative during the post-event window, implying that the effects of the pandemic persist beyond the time frame analysed in the event study and exert a substantial influence on the returns of the stock market. The phenomenon above can be elucidated by the proliferation of the pandemic, leading to a wide-ranging influence on the stock market and economy.

Overall, the event study analysis results confirm that the COVID-19 pandemic significantly impacted stock returns on all 8 of the JSE sectors in the short-run. This impact was noted to

vary throughout the different event windows. After governments announced the pandemic, the Basic Materials, Industrials and Financials sectors were positively impacted. However, the Technology, Consumer Discretionary, Health Care, Telecommunications, and Consumer Staples sectors were negatively impacted. For 10-45 days after governments announced the pandemic, the Telecommunications, Health Care, Consumer Discretionary and Consumer Staples sectors displayed positive and significant cumulative abnormal returns.

The results from the event study analysis conform to the findings of many similar papers that have studied the short-term impacts of COVID-19 globally. One of which, Kandil Göker et al. (2020) aimed to assess the repercussions of the COVID-19 outbreak on the returns of the Borsa Istanbul sector index (BIST). The event study analysed data from 26 sectors on the BIST. The findings indicate that in the majority of the examined event windows, most sectors exhibit negative cumulative abnormal returns (CAAR). However, during certain periods, a few sectors show positive CAARs. Similar varying results can be seen by Sireesha and Haripriya (2021), who assessed the influence of the pandemic on all 14 sectoral indices of NSE using an event study analysis. The findings reveal a noteworthy positive impact in the Pharma, Health Care, and FMCG sectors. Conversely, all other sectors exhibit a significant negative impact. Other notable studies have shown similar results to the aforementioned (Sun et al., 2021, Ullah et al., 2022, Kharabsheh et al., 2022, Pathak, 2021, Chen, 2022, Szczygielski et al., 2021a). Based on the event study analysis findings in this paper, investors should not panic immediately after macroeconomic events. The findings reveal that during pandemic outbreaks, investors may benefit from hedging against risks and potentially generating profits by adjusting their investment strategy towards firms operating in the Consumer Staples sector, Health Care sector, and those with a significant level of digitalization.

5.3 Long-term impact of COVID-19 related uncertainty and COVID-related investor sentiment on stock returns

The results discussed in this section addresses both research question 2 and 3. The results from the mean equation (1) outlined in table 4-2 are shown below and aim to evaluate the long-term impact of COVID-19 on the returns of the 8 largest JSE sectors. The coefficient, B_{iGSVI} quantifies the impact of COVID-19 related uncertainty on investor sentiment. Suppose B_{iGSVI} is both negative and statistically significant. In that case, the respective industry returns are negatively impacted by COVID-19 related uncertainty - COVID-related investor sentiment

decreases therefore deterring investors from investing in the respective sector. In contrast, if $B_{i\Delta GSVI}$ is not statistically significant, it suggests that the industry returns are not impacted by COVID-19 related uncertainty and can be considered to have a high level of resilience to the aspect of the pandemic - therefore attracting investors attention to the respective sector.

Table 5-3: Long term Impact of COVID-19 related uncertainty on industrial sector returns.

Parameter	α_i (Constant)	$B_{i\Delta GSVI}$ (Sentiment indicator)	γ_i (Lagged return)
Technology	0.0003	0.0000	0.0524*
Telecommunications	0.0001	-0.0014***	-0.0503*
Health care	-0.0003	-0.0007**	-0.0020
Financials	0.0000	-0.0016***	0.0014
Consumer Discretionary	0.0005	-0.0007	0.0188
Consumer Staples	0.0001	-0.0003	0.0201
Industrials	-0.0001	-0.0001***	-0.0386
Basic Materials	0.0007	-0.0007**	-0.0120

NOTE: $B_{i\Delta GSVI}$ captures the sensitivity of returns to this factor in the third column. ***, **, * indicate significance at the 1%, 5%, and 10% levels, respectively.

Source: Author's own work

Table 5-3 reports the regression results of returns on the various industrial sectors on $\Delta GSVI_t$, the measure of COVID-19 related uncertainty employed in this study.

The first result from table 5-3 is that the $B_{i\Delta GSVI}$ coefficient for all industries except one (Technology) are consistently negative. Furthermore, this coefficient is only statistically significant at the 1% level for the Telecommunications, Financials and Industrials sectors; and at the 5% level for the Health Care and Basic Materials sectors. This can be construed as substantiation that the uncertainty surrounding COVID-19 is linked to adverse returns in five of the eight sectors of the Johannesburg Stock Exchange (JSE) examined in this study. Specifically, these sectors include Telecommunications, Health Care, Financials, Industrials, and Basic Materials. COVID-19 uncertainty has been observed to have a detrimental effect on stock prices. This can be attributed to a decline in the anticipated future cashflows of companies and/or a rise in risk aversion among investors. Consequently, there is a tendency for the forward-looking discount rate to exhibit a higher risk premium. This phenomenon has been documented by Andrei and Hasler (2015), Cochrane (2018), and Smales (2021).

From the analysis above, the 3 industrials most impacted by COVID-19 related uncertainty is the Financials sector ($B_{i\Delta GSVI}$ of -0.0016) followed by Telecommunications and the Industrial Sector ($B_{i\Delta GSVI}$ of -0.0014 and -0.0001 respectively) – statistically significant at the 1%, 5%, and 10% levels. This finding is unsurprising as economies worldwide suffered greatly with many countries entering lockdown from February 2020 onwards, halting normal business operations, negatively impacting the economy.

The sectors least impacted by COVID-19 related uncertainty is Technology, Consumer Staples and Consumer Discretionary sectors ($B_{i\Delta GSVI}$ of 0.0000, -0.0003 and -0.0007 respectively), as $B_{i\Delta GSVI}$ was confirmed to be insignificant for these sectors. Companies operating in these industries demonstrated considerable resilience amidst the uncertainties brought about by the pandemic. This can be attributed to the nature of their business activities, which primarily catered to the needs of individuals confined by lockdown measures. Consequently, these companies experienced minimal losses in business, and in certain instances, even witnessed an increase in sales. Notable examples include supermarkets that supplied essential food and other necessities and technology companies that provided work-from-home solutions like teleconferencing systems.

The γ_i coefficients are seen to be significant at the 10% level within the Technology and Telecommunication sectors (0.0524 and -0.0503). This indicates that the lagged returns have a significant impact (positive/negative) on current stock returns within these sectors.

Lastly, the negative/positive $B_{i\Delta GSVI}$ coefficients from table 5-3 describe the impact on COVID-related investor sentiment. The results confirm that COVID-related investor sentiment decreases (as indicated by the negative $B_{i\Delta GSVI}$ coefficient) within the Financials, Consumer Discretionary, Telecommunications, Consumer Staples, Industrials, Health Care and Basic Materials sectors. COVID-related investor sentiment was seen to be at its lowest within the Telecommunications and Financials sectors ($B_{i\Delta GSVI}$ coefficients of -0.0014 and -0.0016 respectively). The results further confirm that the Technology sector was that only sector with a neutral (zero) sentiment coefficient – possibly attracting potential investors to invest within this sector in the long run amidst macroeconomic events such as the COVID-19 pandemic.

Notably, the results also confirm a negative relationship (negative $B_{i\Delta GSVI}$ coefficient) between COVID-related investor sentiment and returns to all sectors excluding the Technology sector. This further explains that COVID-19 negatively impacts COVID-related investor sentiment – a rise in COVID-related investor sentiment is associated with decreased returns in the Telecommunications, Consumer Discretionary, Consumer Staples, Financials, Industrials, Health Care and Basic Materials sectors.

5.4 Long-term impact of COVID-19 related uncertainty and COVID-related investor sentiment on trading volume

The results discussed in this section addresses research question 5. The results from the mean equation (2) outlined in table 4-2 are shown below and aim to evaluate the long-term impact of COVID-19 on the trading volume of stocks listed on the 8 largest JSE sectors. The coefficient, B_{iGSVI} quantifies the impact of COVID-19 related uncertainty on trading volume. Suppose B_{iGSVI} is both negative and statistically significant. In that case, the respective industry trading volume is negatively impacted by COVID-19 related uncertainty – trading volume decreases, therefore deterring investors from investing in the respective sector. In contrast, if B_{iGSVI} is not statistically significant, it suggests that the industry's trading volume is not impacted by COVID-19 related uncertainty. This lack of impact may attract investor attention to the sector, potentially resulting in increased trading volume as investors find the sector appealing despite the prevailing uncertainties associated with the pandemic.

Table 5-4: Long term Impact of COVID-19 related uncertainty on industrial sector trading volume.

Parameter	α_i (Constant)	$B_{i\Delta GSVI}$ (Sentiment indicator)	γ_i (Lagged volume)
Technology	-0.0021***	0.0014***	-0.3612
Telecommunications	-0.0002***	0.0000***	-0.3395
Health care	-0.0005***	-0.0038**	-0.3548
Financials	0.0003***	0.0030***	-0.3688
Consumer Discretionary	-0.0009***	0.0025***	-0.3566
Consumer Staples	-0.0003***	0.0076***	-0.3438
Industrials	-0.0002***	0.0016***	-0.3686
Basic Materials	-0.0005***	0.0067***	-0.3399

NOTE: $B_{i\Delta GSVI}$ captures the sensitivity of trading volume to this factor in the third column. ***, **, * indicate significance at the 1%, 5%, and 10% levels, respectively

Table 5-4 reports the regression results of trading volume on the various industrial sectors on $\Delta GSVI_t$, which is the measure of COVID-19 related uncertainty employed in this study.

The results from Table 5-4 indicate a consistent positive and statistically significant $B_{i\Delta GSVI}$ coefficient for all industries (at the 1% level), except Health Care, which is negative but statistically significant at the 1% level. This implies a confirmed positive association between COVID-19 uncertainty and increased trading volume across 7 of the 8 sectors of the Johannesburg Stock Exchange (JSE) examined in the study. The link between COVID-19 uncertainty and heightened trading volume suggests a dynamic relationship between returns, investor sentiment, and volatility during the pandemic.

The positive $B_{i\Delta GSVI}$ coefficient indicates that heightened uncertainty during the COVID-19 pandemic is correlated with increased trading volume. This connection may suggest that investors are actively responding to market conditions, seeking potential returns or adjusting their portfolios based on perceived opportunities arising from short-term price fluctuations. The positive impact on trading volume could be reflective of investors' willingness to engage in the market, influenced by sentiment and expectations regarding future returns. Furthermore, the heightened market volatility mentioned in the context of the COVID-19 onset is crucial. Increased volatility, characterized by sharp and rapid movements in stock prices, often attracts various market participants, including day traders, speculators, and algorithmic trading strategies. These contribute to higher trading volumes as they take advantage of short-term

price movements. The positive $B_{i\Delta GSVI}$ coefficient suggests that the observed increase in trading volume is closely linked to the volatility induced by the pandemic.

Notably, the results from column 4 (γ_i) suggests that a decrease in trading volume prior to the onset of the pandemic (as indicated by the negative coefficients across all sectors) is associated with an increase to trading volume during the pandemic.

5.5 ARCH/GARCH preliminary test

To evaluate the impact COVID-19 has on volatility of the 8 largest JSE sectors, testing begins with an ARCH test at the 1st lag to evaluate the presence of ARCH effects to estimate the GARCH (1,1) model.

Table 5-5: Heteroskedasticity test results at 1 lag

Parameter	<i>Chi – squared (1)</i>
Technology	0.0016***
Telecommunications	0.0190**
Health care	0.0000***
Financials	0.0000***
Consumer Discretionary	0.0001***
Consumer Staples	0.0000***
Industrials	0.0000***
Basic Materials	0.0000***

NOTE: The results from the Heteroskedasticity test, chi-squared, is displayed in the second column. ***, **, * indicate significance at the 1%, 5%, and 10% levels, respectively.

Source: Author's own work

The results from the ARCH test (heteroskedasticity test) of mean equation (1) from table 5-5 confirms the presence of ARCH effects as the chi-squared values are statistically significant for all sectors of the JSE. Therefore, volatility testing would be conducted using a GARCH (1,1) model.

5.6 Impact of COVID-19 related volatility on stock returns

Table 5-6: GARCH (1,1) results

Parameters	ω_i (Constant)	α_i (Squared residual)	β_i (Conditional variance)	$\phi_i \Delta GSVI$
Technology	0.00000166	0.0863***	0.8875***	0.0004*
Telecommunications	0.000000882	0.0574***	0.9202***	-0.0021***
Health care	0.000000661	0.0437***	0.9282***	-0.0008***
Financials	0.000000529	0.1185***	0.8564***	-0.0009*
Consumer Discretionary	0.000000443	0.0619***	0.9223***	-0.0008**
Consumer Staples	0.000000837	0.1005***	0.8421***	0.0010***
Industrials	0.000000267	0.0705***	0.9153***	-0.0009***
Basic Materials	0.000000358	0.0646***	0.9236***	-0.0012***

NOTE: α_i captures the squared residual of the conditional variance equation in the second column and $\phi_i \Delta GSVI$ captures COVID-19 related uncertainty in the third column. ***, **, * indicate significance at the 1%, 5%, and 10% levels, respectively.

Source: Author's own work

The first striking result from table 5-6 above is that the coefficient of the squared residual from the conditional variance equation and $\phi_i \Delta GSVI$ is statistically significant at all levels, excluding the Technology sector which is significant at the 5% and 10% levels. This provides evidence that COVID-19 uncertainty was a driver of volatility on all JSE sectors, irrespective of its impact. This is further confirmed by the graphs of the volatility of returns from the GARCH (1,1) test in appendix 1. To quantify the impact, $\phi_i \Delta GSVI$ is seen to be positive and statistically significant for the Technology and Consumer Staples sectors. This indicates that the respective industry has a low resilience to the pandemic and is negatively impacted by COVID-19 related uncertainty. This revelation indicates a positive correlation between volatility and uncertainty surrounding COVID-19, leading investors to actively seek additional information.

In contrast, it's observed that $\phi_i \Delta GSVI$ exhibits a negative and statistically significant relationship with the Telecommunications, Health Care, Financials, Consumer Discretionary, Industrials, and Basic Materials sectors. This discovery suggests that volatility tended to decrease as uncertainty surrounding COVID-19 increased. Consequently, investors were

inclined to invest in these sectors without additional information. This explanation provided is justified by acknowledging the nuanced nature of the relationship between volatility, uncertainty, and investors' information-seeking behaviour. This result recognizes that volatility and the desire for more information are distinct concepts. While it's commonly understood that higher uncertainty may drive investors to seek more information, a decrease in volatility does not necessarily mean that investors are less interested in acquiring additional knowledge. Investors might continue to actively seek information even when the market is less turbulent. Another possible reason for this outcome is that investors could be actively seeking information on specific sectors, irrespective of their current volatility levels. Even if the relative volatility of certain sectors decreases, investors may still be engaged in researching and gathering information to make informed investment decisions.

The variety of outcomes suggests that increasing uncertainty is not restricted to industries that have suffered the most in terms of poor returns but also extend to other areas. These data show that uncertainty arises from new opportunities due to the pandemic in various businesses. As a result of the market's perception of COVID-19-related risk, certain sectors may need help to capitalise on new business opportunities. Lockdown measures, remote working arrangements, higher healthcare demands, and increased necessary needs (basic materials) are projected to benefit industries in the telecommunications, health care, financials, consumer discretionary, industrials, and basic materials sectors.

5.7 Chapter Summary and Conclusion

Chapter 5 presents and discusses the outcomes from the Event Study analysis, OLS and GARCH (1,1) model framework. The tables in the chapter summarise the results to answer the four research questions proposed at the beginning of this thesis.

From the event study analysis results, it is evident that COVID-19 had an overall significant negative impact on the analysed sectors of the JSE. Five of the eight sectors were negatively impacted by the government's announcement of the pandemic. In the post-event window, four of the eight sectors were negatively impacted. The sectors that experienced positive impacts in both the event-window and post-event window demonstrated significant and positive cumulative abnormal returns. This indicates that investors can potentially mitigate risks and

generate profits by adjusting their investment strategy towards companies operating in these sectors.

Section 5.3 of this paper further explains that COVID-19 negatively impacts COVID-related investor sentiment – a rise in COVID-related investor sentiment is linked to decreased returns within all the JSE sectors analysed. The GARCH (1,1) results suggests that COVID-19 related uncertainty, quantified by Google Trends search data is associated with negative returns across the six of the eight JSE sectors included in this paper, namely the Financials, Consumer Discretionary, Telecommunications, Industrials, Basic Materials and Health Care sectors. The model also confirms that COVID-19 uncertainty was a significant driver of volatility across all JSE sectors as indicated by the significant $\varphi_{i\Delta GSVI}$ coefficient, suggesting that volatility tends to increase/decrease with a rise/fall in uncertainty related to COVID-19.

Section 5.4 confirms a positive association between COVID-19 uncertainty and increased trading volume in all of the sectors of the Johannesburg Stock Exchange (JSE), except the Health Care sector. The onset of the pandemic induced global market volatility, creating trading opportunities that attracted day traders, speculators, and algorithmic strategies, contributing to heightened trading volumes. Moreover, the negative lagged variable indicates that a pre-pandemic decrease in trading volume is linked to an increase in trading volume during the pandemic, suggesting that sectors experiencing reduced trading activity before the pandemic saw a surge in trading volume amid the uncertainties, potentially driven by market reactions to central bank interventions and policy announcements aimed at stabilizing the financial markets.

Chapter 5 underscores the multifaceted impact of the COVID-19 pandemic on the JSE sectors, with both short-term shocks and long-term consequences. COVID-related investor sentiment, trading volume, and market volatility are intricately linked to uncertainties, and understanding this correlation is vital for making informed investment decisions. Resilience is observed in certain sectors, highlighting the importance of diversification and strategic positioning in investment portfolios. The dynamic nature of market conditions in the face of uncertainty presents not only challenges but also opportunities for investors to navigate and capitalise on emerging trends.

CHAPTER : 6 CONCLUSIONS AND RECOMMENDATIONS

6.1 Review of Research Objectives

This paper aimed to provide an extensive analysis of the COVID-19 impact on industry returns, trading volume, volatility, and COVID-related investor sentiment for a sample of eight sectors listed on the JSE.

There have been numerous international studies evaluating this impact on global economies, however, to the authors knowledge there has been no such study conducted on the South African JSE market on a sectoral level. This lack of empirical studies in the South African market further provides a basis for this study.

On this background, the objective of this study are as follows:

- To determine the immediate response of the different industry sectors on governments' announcement of COVID-19.
- To evaluate how does COVID-19 affect the returns of different industry sectors on the JSE.
- To determine what effect does COVID-19 have on COVID-related investor sentiment on the different industry sectors of the JSE.
- To determine what effect does COVID-19 have on volatility of the different industry sectors on the JSE.
- To determine what effect does COVID-19 have on trading volume of the different industry sectors on the JSE?

This study used an Event Study analysis and the GARCH (1,1) model framework to achieve the objective above, the findings of which are discussed in the preceding chapter. The next section provides an overview of the primary findings to address the study's research questions.

6.2 Summary of Results Obtained:

6.2.1 Research Question 1: What was the immediate response of the different industry sectors on governments' announcement of COVID-19?

Table 5-2 results conclude that COVID-19 significantly impacted the stock returns of the eight JSE sectors in the short-run. This impact was noted to vary throughout the different event windows. Upon government's announcement of the global pandemic, the Financials, Industrials and Basic Materials sectors were positively impacted. However, the Technology, Consumer Discretionary, Telecommunications, Consumer Staples and Health Care sectors were negatively impacted – this could be explained by the immediate shock to these sectors caused by the novelty of the virus.

For the post event window (10-45 days after government announced the pandemic), the Consumer Discretionary, Health Care, Consumer Staples and Telecommunications sectors displayed positive and significant cumulative abnormal returns - this result can be explained perfectly by the fact that investors highly sought after stocks in these sectors during the pandemic. Government's announcement of the country's lockdown in this period significantly contributed to the increased demand for goods or services from firms within these sectors, which resulted in good investment opportunities to investors.

Based on the findings of the event study analysis in this paper, it is suggested that investors have the potential to mitigate risks and achieve financial gains by adjusting their investment strategy towards companies operating in the Consumer Staples sector, Health Care sector, and those characterised by a significant level of digitalization during periods of pandemic outbreaks.

6.2.2 Research question 2: How does COVID-19 affect the returns of different industry sectors on the JSE in the long-term?

Table 5-3 shows that COVID-19-related uncertainty, measured by Google Trends search data, is associated with negative returns in the telecommunications, health care, finance, industrials, and basic materials sectors. This negative impact shows that COVID-19 uncertainty reduces companies estimated future cash flows and/or increases risk aversion, contributing to a larger risk premium in the forward-looking discount rate. This discovery is hardly surprising given that economies worldwide have suffered considerably, with several countries entering

lockdown beginning in February 2020, disrupting normal commercial operations and negatively impacting the GDP.

The sectors with least impacted returns caused by the pandemic were the Technology, Consumer Staples and Consumer Discretionary sectors. Firms in these sectors were significantly resilient to uncertainty surrounding the pandemic. A main contributor to this resilience is because of the nature of their business activities, such as providing to those trapped by lockdown, and as a result has lost little business and, in some cases, gained more sales - such as supermarkets selling food and other necessities or tech companies which offer work from home alternatives such as teleconferencing systems.

6.2.3 Research question 3: What effect does COVID-19 have on COVID-related investor sentiment on the different industry sectors of the JSE?

Table 5-3 confirms that COVID-related investor sentiment decreases within the Telecommunications, Health Care, Consumer Staples, Financials, Industrials, Consumer Discretionary and Basic Materials sectors. The results further confirm that the Technology sector was that only sector with a neutral (zero) sentiment coefficient – possibly attracting potential investors to invest within this sector in the long run amidst macroeconomic events such as the COVID-19 pandemic. Furthermore, the results confirm a negative relationship between COVID-related investor sentiment and returns to all sectors excluding the Technology sector. These results conform with the Behavioural finance theory, which suggests that investors' emotions and anxiety affect their investment decisions in stock markets. Overall, Investor concerns about COVID-19 seem to have a negative impact on financial markets.

6.2.4 Research question 4: What effect does COVID-19 have on volatility of the different industry sectors on the JSE?

The GARCH (1,1) model results suggest that COVID-19 uncertainty was a substantial driver of volatility across all JSE sectors, impacting them positively or negatively. The technology, consumer staples, and basic materials sectors were identified as having low resilience to the COVID-19 pandemic and negatively impacted by COVID-19-related uncertainty - this implies that volatility increased in response to mounting uncertainty over COVID-19, causing investors to seek additional information. COVID-19-related uncertainty benefited the Telecommunications, Health Care, Financials, Consumer Discretionary, Industrials, and Basic

Materials sectors - this implies that volatility decreased as COVID-19 uncertainty increased, resulting in investors buying in these areas without needing more information.

6.2.5 Research question 5: What effect does COVID-19 have on trading volume of the different industry sectors on the JSE?

The findings presented in Table 5-4 reveals a robust connection between COVID-19-related uncertainty and heightened trading volume in the eight sectors examined on the Johannesburg Stock Exchange (JSE). The observed impact suggests that the uncertainty surrounding COVID-19 has positively influenced trading activity across these sectors during the pandemic.

The global market volatility induced by the onset of the COVID-19 pandemic has been seen to create significant opportunities for trading, particularly with sharp and rapid movements in stock prices. Investors, seeking to capitalise on short-term price fluctuations, are drawn to increased volatility. This attraction extends to day traders, speculators, and algorithmic trading strategies, collectively contributing to higher trading volumes. Additionally, the implementation of various measures by central banks and governments to stabilize financial markets and support economies during the pandemic has played a role. Policy interventions, such as changes in interest rates or stimulus packages, can promptly impact market sentiment and trading activity as investors adjust their positions in response to these measures.

6.2.6 Contradicting results and their interpretation

The results from chapter 5 note contradicting results. However, given that these results stem from different tests, the following section of the study attempts to elaborate and reconcile these apparent contradictions.

Possible reasoning to the contradicting results observed on the impact of the COVID-19 pandemic on various sectors can be attributed to several factors, reflecting the diverse nature of businesses within each sector. The following are possible reasons for the differing outcomes between the tests' results:

6.2.6.1 Nature of Business Activities:

Technology, Consumer Staples, and Consumer Discretionary Sectors: These sectors were least impacted due to the nature of their business activities. Businesses in these categories generally provide the more essential goods and services, such as technology for remote work, consumer staples, and home-related products. These offerings remained in demand during lockdowns, contributing to the sectors' resilience.

Telecommunications, Health Care, Financials, Consumer Discretionary, Industrials, and Basic Materials Sectors: On the other hand, these sectors benefited from COVID-19 uncertainty. The sectors that benefited from COVID-19 uncertainty often provided essential services or products. Telecommunications met the increased demand for connectivity, health care addressed medical needs, financials offered support during economic uncertainties, and industries producing basic materials and consumer discretionary items saw elevated demand due to shifts in consumer behaviour.

6.2.6.2 Perception of Safe Havens:

Investor Perception: The results suggest that, contrary to expectations, increased COVID-19 uncertainty was associated with decreased volatility in the benefiting sectors. This could be explained by investors perceiving certain sectors, such as Telecommunications, Health Care, and Financials, as safe havens during times of uncertainty. Such perceived stability might have led to increased investment, contributing to reduced volatility in these sectors.

6.2.6.3 Business Resilience:

Resilience of Certain Sectors: Sectors like Consumer Staples, and Consumer Discretionary demonstrated resilience due to their ability to adapt to the challenges posed by the pandemic. They offered products and services that remained essential during lockdowns, ensuring a steady demand.

Increased Demand in Benefiting Sectors: Sectors that benefited from increased uncertainty, such as Telecommunications, Health Care, and Consumer Discretionary, saw a surge in demand for their products and services, driven by changing consumer behaviours and needs during the pandemic.

6.2.6.4 Investor behaviour and perception:

Volatility and Investor Behaviour: The study suggests that, counterintuitively, volatility decreased as COVID-19 uncertainty increased in the benefiting sectors. This paradoxical result may be attributed to investors perceiving certain sectors as safe havens or reliable investments during times of uncertainty, leading to increased buying activity in those areas.

6.2.6.5 Unique economic conditions

Specific Economic Conditions: The unique economic conditions created by the pandemic, such as lockdowns, remote work, and shifts in consumer behaviour, had varying impacts on different sectors. Sectors aligned with emerging needs or those providing essential goods and services fared better, while others faced challenges.

6.3 Conclusion

This study examines the effects of the COVID-19 pandemic on the South African stock market, focusing on a sectoral analysis. This research incorporated several economic theories, namely the Theory of Efficient Market Hypothesis, Behavioural Finance, Prospect Theory and Adaptive Market Hypothesis, which were utilised effectively and demonstrated a significant level of prevalence. These theories have been successfully employed in the methodology, as investors perceived stock prices as a comprehensive representation of all relevant information, including the impact of pandemics. However, many investors deviated from the conventional market theories, as their sentiments, ego, and emotions influenced them and the actions of others (herding behaviour). Additionally, some investors relied heavily on assumptions and speculations regarding market conditions. Hence, these three theories were most effectively employed to represent investors' actions and behaviours accurately.

In the South African context, the papers findings indicate that the COVID-19 pandemic substantially influenced all sectors of the Johannesburg Stock Exchange (JSE) examined in this study, manifesting in both immediate and enduring effects. The findings further indicate that firms respond differently to market shocks amidst the COVID-19 pandemic. Certain sectors experienced gains due to the pandemic, while others faced negative consequences. Notably, the number of sectors adversely affected surpassed those that benefited. These varying results could be attributed to the dynamic nature of markets and the unprecedented circumstances of the COVID-19 pandemic. Different sectors have unique characteristics and vulnerabilities,

influencing their responses to economic shocks. Market participants' emotions, perceptions, and speculative behaviours may contribute to varying outcomes, as evident in behavioural finance deviations from conventional theories.

The literature review conducted in this paper further revealed that the level of synchronicity observed among various global markets was unparalleled, as the divergence in performance across different asset classes reached an unprecedented minimum. It should be emphasised that the South African governments' policies on lockdown may be viewed from various market perspectives. Implementing a complete economic lockdown during the COVID-19 pandemic may not have been the optimal strategy for financial intervention in the best interest of South Africa's national economy. Various financial instruments, including the Rand, bonds, equities, listed properties, income assets, and preference shares, experienced a simultaneous decline during the March 2020 sell-off in direct response to the implementation of lockdown measures.

The potential for future global events/pandemics will certainly result in a substantial increase in the country's debt, posing potential challenges for governments when both nominal and real interest rates experience an upturn. The assessment of inflation and its implications for monetary policy will play a crucial role in shaping the trajectory of an economy's performance and its financial markets in the foreseeable future. Investors are urged to consider the abovementioned factors in their financial decisions amidst macroeconomic events.

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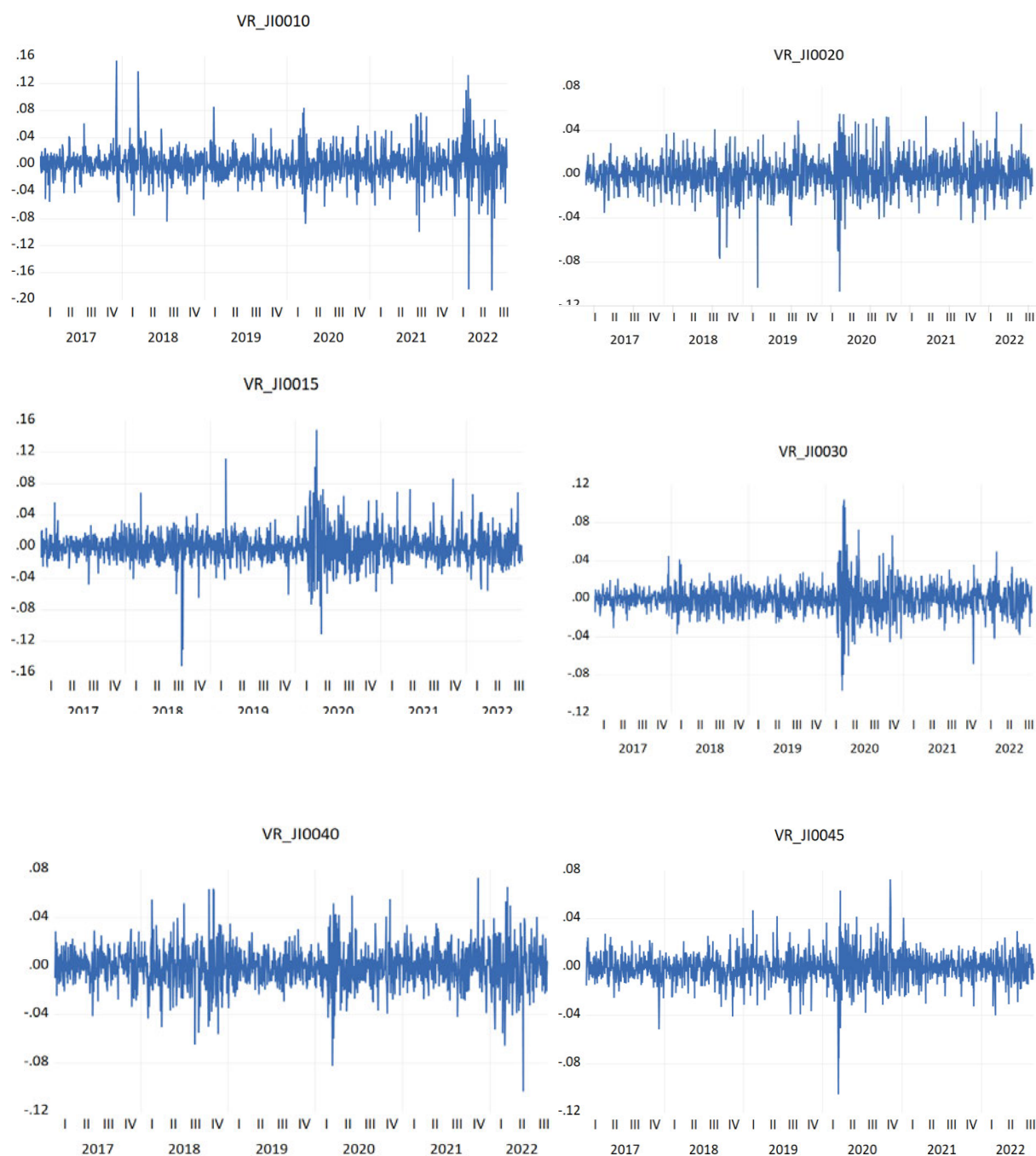
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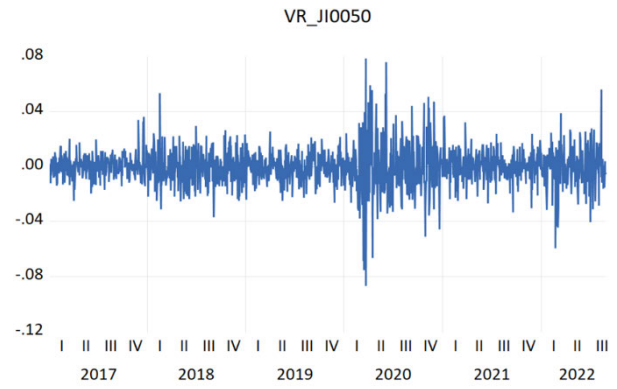
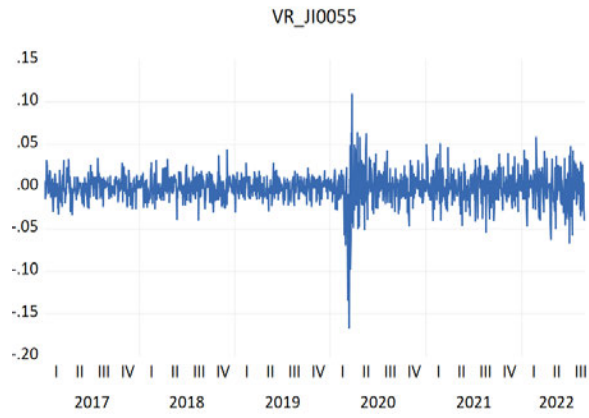
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APPENDIX

Appendix 1: Volatility of returns of the JSE sectors





Appendix 2: Ethical Clearance Letter



18 July 2023

Mr Akshay Saish Ramterath (213516328)
School Of Acc Economics&Fin
Westville

Dear Mr Akshay Saish Ramterath,

Original application number: 00016063

Project title: The impact of COVID-19 on the South African stock market: A sectoral-level analysis

Exemption from Ethics Review

In response to your application received on 18 July 2023, your school has indicated that the protocol has been granted **EXEMPTION FROM ETHICS REVIEW**.

Any alteration/s to the exempted research protocol, e.g., Title of the Project, Location of the Study, Research Approach and Methods must be reviewed and approved through an amendment/modification prior to its implementation. The original exemption number must be cited.

For any changes that could result in potential risk, an ethics application including the proposed amendments must be submitted to the relevant UKZN Research Ethics Committee. The original exemption number must be cited.

In case you have further queries, please quote the above reference number.

PLEASE NOTE:

Research data should be securely stored in the discipline/department for a period of 5 years.

I take this opportunity of wishing you everything of the best with your study.

Yours sincerely,



Prof Josue Mbonigaba
Academic Leader Research
School Of Acc Economics&Fin

UKZN Research Ethics Office
Westville Campus, Govan Mbeki Building
Postal Address: Private Bag X54001, Durban 4000
Website: <http://research.ukzn.ac.za/Research-Ethics/>

Founding Campuses: ■ Edgewood ■ Howard College ■ Medical School ■ Pietermaritzburg ■ Westville

INSPIRING GREATNESS

Appendix 3: Turnitin Summary Report

Masters Final			
ORIGINALITY REPORT			
15%	13%	11%	%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS
PRIMARY SOURCES			
1	rgu-repository.worktribe.com Internet Source	2%	
2	www.researchgate.net Internet Source	2%	
3	ukzn-dspace.ukzn.ac.za Internet Source	1%	
4	www.ncbi.nlm.nih.gov Internet Source	1%	
5	researchspace.ukzn.ac.za Internet Source	1%	
6	scholar.ufs.ac.za Internet Source	1%	
7	Hardeep Singh Mundi, Yamini Yadav. "Impact of COVID-19 on Market Sentiment and Abnormal Returns in India: A Comparative Analysis of Two Waves", FIIB Business Review, 2023 Publication	<1%	